

DATA AND ANALYSIS

ALACHUA COUNTY COMPREHENSIVE PLAN: 2001 - 2020

DATA AND ANALYSIS
FOR
FUTURE LAND USE ELEMENT
OF
ALACHUA COUNTY
COMPREHENSIVE PLAN: 2001 - 2020

**FUTURE LAND USE ELEMENT
DATA AND ANALYSIS**

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INTRODUCTION

Scope and Purpose

The Future Land Use Element is a required comprehensive plan element under Florida's Local Government Comprehensive Planning and Land Development Regulation Act (Chapter 163, Florida Statutes). The Future Land Use Element must designate the proposed future general distribution, location, and extent of the uses of land. The Future Land Use Element must also include standards for the densities and intensities of each land use category. To this end, the Future Land Use Element contains both a series of maps to depict the future land use pattern and a complementary section of Goals, Objectives, and Policies.

The Future Land Use Element serves as a guide for the development and use of land within unincorporated Alachua County. It is designed to promote sustainable land development that includes a balance of social equity, economic opportunity, and environmental protection. This includes the determination of an efficient pattern and location of future land uses through the relationship between land use and the transportation system, the provision of public facilities and services, and protection of the natural environment. The Future Land Use Element contains objectives and policies to promote more compact growth, while providing choice of living environments, separation of urban and rural areas, and protection of agriculture and natural resources.

The Alachua County Comprehensive Plan has utilized the concept of sustainability for the overall relationship between social, environmental and economic systems. Smart growth is emphasized for urban development. Specific urban forms include Traditional Neighborhood Developments, with emphasis on connected streets and public spaces, mixed-use Village Center developments and transit oriented developments. Carrying capacity generally forms a basis for conservation. The rural area is envisioned as maintaining agricultural uses and rural character. New residential rural development is required as rural open space subdivisions. A greenway is a possible form of an interconnected open space system, linking the urban and rural areas of the County.

A major feature of the ecological system of Alachua County, Payne's Prairie, was first described by naturalist William Bartram in his *Travels* in the late 1700s:

“...a level green plain, above fifteen miles over, fifty miles in circumference, and scarcely a tree or bush of any kind to be seen upon it. It is encircled with high, sloping hills, covered with waving forests and fragrant wild Orange groves rising from an exuberantly fertile soil...”

Protection of the Payne's Prairie and the entire ecosystem of the county is a focus of this plan within a framework of sustainable development.

Evaluation and Appraisal Report

Pursuant to F.S. 163.3191, an assessment and evaluation of the current Future Land Use Element was performed which included the following components.

- I. A summary of the data and analysis from the element as adopted (October 2, 1991).
- II. The condition of the element at the date of the evaluation and appraisal report (1997).
- III. A summary matrix for evaluating the objectives of the Future Land Use Element.
- IV. An evaluation of the effect on the adopted element of changes to Chapter 163, Part II, F.S.; Rule 9J-5, F.A.C.; the state comprehensive plan; and the strategic regional policy plan.
- V. Recommendations regarding the Evaluation and Appraisal Report (EAR) of the Future Land Use Element of the Alachua County Comprehensive Plan.
- VI. Unforeseen or unanticipated changes resulting in problems or opportunities (none reported in EAR).
- VII. Successes or shortcomings.
- VIII. Public participation.

This was adopted in 1998 by County Ordinance 98-36.

Update

The Future Land Use Element of the updated Comprehensive Plan 2001 - 2020 includes specific policy language to implement the EAR recommendations. The general approach promotes creating pedestrian friendly, mixed use neighborhoods in the urban area and protecting agriculture and open space in the rural area. The methodology explained in Section III addresses the EAR recommendations.

Table A indicates the population projections used for the planning process. These projections utilize the University of Florida Bureau of Economic and Business Research projections based on the 1999 estimate of population. Although the 2000 Census data reported a slightly different population total for Alachua County than the BEBR estimate, the percentage difference is less than 3% and is acceptable for the purposes of calculations of the land use need for the Urban Cluster. (Nationally the US Census reported approximately 3% margin of error in the population count).

POPULATION PROJECTION - COMPREHENSIVE PLAN

Total Population - Projected to 2020 assuming constant percentage of total County

	1999	%County	2000	%County	2005	%County	2010	%County	2015	%County	2020	%County
	BEBR Est.											
Alachua	6,305	2.9%	8,342	3.79%	9,413	3.97%	10,524	4.15%	11,143	4.15%	11,736	4.15%
Archer	1,452	0.7%	1,937	0.88%	2,015	0.85%	2,080	0.82%	2,202	0.82%	2,319	0.82%
G'ville	101,405	46.9%	101,319	46.03%	106,677	44.99%	113,279	44.67%	119,939	44.67%	126,327	44.67%
Hawthorne	1,394	0.6%	1,849	0.84%	1,897	0.80%	1,953	0.77%	2,067	0.77%	2,178	0.77%
High Spr.	3,944	1.8%	4,930	2.24%	5,335	2.25%	5,706	2.25%	6,041	2.25%	6,363	2.25%
LaCrosse	150	0.1%	132	0.06%	119	0.05%	101	0.04%	107	0.04%	113	0.04%
Micanopy	644	0.3%	836	0.38%	806	0.34%	812	0.32%	859	0.32%	905	0.32%
Newberry	2,601	1.2%	3,015	1.37%	3,225	1.36%	3,449	1.36%	3,652	1.36%	3,846	1.36%
Waldo	1,049	0.5%	1,387	0.63%	1,423	0.60%	1,446	0.57%	1,530	0.57%	1,612	0.57%
Uninc.	97,305	45.0%	96,353	43.78%	106,191	44.79%	114,251	45.05%	120,959	45.05%	127,401	45.05%
(Sum)	216,249	100.0%	220,100	100.00%	237,100	100.00%	253,600	100.0%	268,500	100.0%	282,800	100.0%
Total County	216,249	100.0%	220,100	100.0%	237,100	100.0%	253,600	100.0%	268,500	100.0%	282,800	100.0%
BEBR	LOW		217,955		212,800		212,700		211,000		207,300	
PROJ.	MEDIUM		217,955		232,800		248,100		263,900		279,900	
2000 Census	HIGH		217,955		254,900		287,800		323,200		360,700	

Total County source is BEBR Projections based on 1999 Estimate (rounded to nearest 100)
 City of Gainesville 2000-2010 source is City data, projected to 2020 assuming constant percentage
 Municipal totals assume a constant percentage from NCFRPC data (derived from Shimberg AHNA)

I. AVAILABILITY OF FACILITIES AND SERVICES

Detailed analysis of facilities and services to serve existing land uses and land for which development orders have been issued is provided in the other elements of the plan as summarized below.

Transportation Mobility

A review of the existing traffic circulation network is provided in the Transportation Mobility Element of this Plan. The existing level of service provided by these facilities serving existing land uses is reviewed in detail. Gainesville Regional Transit System currently provides transit services along a 48 mile route network.

Potable Water and Sanitary Sewer

Map 1 shows the existing and planned central water and sewer lines in the Urban Cluster. The analysis of existing potable water facilities in the Potable Water and Sanitary Sewer Element, indicates that taking into account existing as well as committed demand for unbuilt units, there is a surplus capacity of 5.2 mgd for the urban cluster. When complete, the planned expansions in 2003 will serve the community beyond 2015.

The analysis of sanitary sewer facilities is based on the Potable Water and Sanitary Element. Analysis of the Gainesville Regional Utilities System level of service indicates a surplus capacity at present of 3.77 mgd. The present wastewater system, with planned expansions, is projected to adequately serve the future needs of customers beyond 2016.

Solid Waste

The analysis of existing solid waste facilities in the Solid Waste Element indicates the Leveda Brown Environmental Park and transfer station should have adequate capacity to serve both Alachua and Gilchrist Counties well beyond 2020 utilizing the regional solid waste disposal facility. Options are also discussed in the plan.

Stormwater Management

The analysis of stormwater management systems in the Stormwater Management Element indicates LOS is adequate. The plan emphasizes utilizing natural topography for stormwater management and hazard mitigation.

Conservation and Open Space

The analysis of existing conservation and open space facilities in the Conservation and Open Space Element indicates the importance of conservation policies to avoid, minimize and mitigate adverse impacts to wetlands, floodplains and all other strategic ecosystems.

II. CHARACTER AND MAGNITUDE OF VACANT LAND TO DETERMINE SUITABILITY FOR USE

Gross Vacant Land

Vacant or undeveloped land in unincorporated Alachua County was identified from data obtained from the Alachua County Property Appraiser's Office, and is shown on the Existing Land Use Map (Map 2). The gross vacant or undeveloped land in the unincorporated county consists of approximately 16,562 acres within the Urban Cluster. The gross residential vacant land in the urban cluster is 15,453 acres which is 47.8 percent of the total urban residential land uses. The gross non-residential vacant land in the

urban cluster is 6,637 acres which is 42.9 percent of the non-residential future land use categories (commercial, industrial, institutional, recreation and utility). The gross vacant or undeveloped land within the Urban Services Line is approximately 12,749 acres. The Urban Services Line is discussed in detail in Section III. LAND NEEDED TO ACCOMMODATE PROJECTED POPULATION and Section VII. DEVELOPMENT CONTROLS.

Soils

General soils are shown on the USDA Soils Map incorporated by reference in the Future Land Use Map Series. The soils of Alachua County have been surveyed and mapped by the Soil Conservation Service (SCS). A copy of the completed survey is on file at the Alachua County Office of Planning and Development. Included in that survey is detailed information on each of the soil series identified in Alachua County, and maps showing the extent of those soils in the County. The acreage and proportionate extent of the soils of Alachua County are discussed in the Conservation and Open Space Element.

Characteristics pertaining to planning decisions are American Association of State Highway Transportation Officials (AASHTO) classification, drainage class, permeability class, depth to seasonal high water table, shrink-swell potential, hydric classification, available water capacity, farm capability class, and woodland suitability class. These characteristics are discussed in detail in the Conservation and Open Space Element.

Topography

Alachua County lies in the North-central portion of the Florida peninsula and is part of the Central Highlands or Central Florida Ridge of the Atlantic Coastal Plain (Spangler, 1985). The County is comprised of approximately 892 square miles and consists of a low, flat karst limestone plain in the West bounded by a West-facing escarpment and a flat upland plateau in the east (Williams, et al., 1977). Elevations in the county range from approximately 25 feet above sea level near the Santa Fe River to over 195 feet northwest of Gainesville. The topographic relief map is a digitized image of the topographic contours on the United States Geological Survey 1:24,000 scale quadrangle maps of Alachua County (Lindquist and Arrington, 1987). Topography is discussed in detail in the Conservation and Open Space Element.

Natural Resources

Natural resources in Alachua County consist of soils, surface and groundwater, strategic ecosystems, wetlands and floodplains as discussed in detail in the Conservation and Open Space Element (COSE). The Wetlands and Floodplains Map is included in this report (Map 3) and other conservation maps are in the COSE. Analysis of the effect of natural resources on the suitability for use of residential land within the Urban Cluster and within the Urban Services Line was performed as part of the Comprehensive Plan update process. The Urban Cluster analysis is shown in Table 6 and 7. The Urban Services Line analysis is shown in Table 5. These tables are discussed in the text in Section III, "Methodology of Demand Analysis/Estimated Gross Acreage."

Historic Resources

Historic resources in Alachua County are discussed in the new Historic Resources Element. Historic structures as classified by architectural style are as follows: Folk Victorian (15); Bungalow (2); Craftsman (45); Frame Vernacular (756); Georgian Revival (9); Gothic Revival (4); Greek Revival (1); Masonry Vernacular (34); Mediterranean Revival (1); Mission (2); Minimal Traditional (17); Neo-Classical (3); Other (9); Queen Anne (8); Ranch (22); Tudor Revival (2); other not specified (2). Archaeological and paleontological resources are also inventoried and protected.

III. AMOUNT OF LAND NEEDED TO ACCOMMODATE PROJECTED POPULATION

A. Methodology of Demand Analysis/Estimated Gross Acreage

This calculation was completed by County planning staff with expert assistance from consultants. The general methodology for analysis of urban growth boundaries was refined for Alachua County by Gail Easley in Spring 2001, based on her American Planning Association report *Staying Inside the Lines: Urban Growth Boundaries* (PAS Report # 440, 1992). This methodology determines future urban land needs for unincorporated Alachua County, and whether the amount of land currently in the urban cluster is sufficient in size to meet those needs through 2020. The commercial/retail sub-analysis was done by Fishkind and Associates, Inc., utilizing DOR and property appraiser data.

The analysis is based on the following information:

- forecast of land needed to meet the need for residential uses within unincorporated Alachua County.
- forecast of land needed to meet the need for commercial (office and retail), industrial, recreation, institutional, and other activities within unincorporated Alachua County.
- existing development patterns, considering density and intensity of development, average household size, and the allocation of land use and development activity to urban and rural portions of Alachua County.
- data included in the Evaluation and Appraisal Report, adopted in 1998.

The planning process included analysis of the Future Land Use Map (Map 4) to accommodate anticipated growth through the updated planning time frame. The projected population increase was compared with vacant land suitable for development for the years 2010 and 2020. The land suitable for urban development within the Urban Cluster exceeded the projected need through the year 2020 and 2010. Therefore, the plan includes an urban service line to phase urban development through 2010. This line was determined in the portion of the Urban Cluster east of I-75 by the location of boundary forming natural areas, consideration of the need to promote economic development in this area and the previously adopted boundary of the Urban Cluster. West of I-75, existing and planned central sewer lines were used as a critical indicator of urban infrastructure and services to determine where urban development should be concentrated in the period through 2010. West of I-75 and south of Archer Road (which is part of the area identified in the Metropolitan Transportation Planning Organization's Livable Communities Reinvestment Plan as a future transit corridor) the line is drawn generally 1/4 mile south of existing and planned central sewer lines. West of I-75, north of Archer Road, areas were included based on the extent of existing and planned central sewer lines. Other general factors relating to where urban development should be concentrated in the areas west of I-75 include the development of the transportation network, provision of mass transit, recreation facilities, provision of public services, Karst topography and other conservation issues, public school impacts, and fiscal impacts.

The methodology applied to Alachua County is shown in the attached tables. Table 1 shows the number of dwelling units needed in 2010 and 2020, based on the average household size (2.2 persons per household), the vacancy rate (10%), and a market factor providing for twice the units needed to accommodate the population projected through 2010 and 1.5 times the need for the population growth projected through 2020. New units were then distributed among low density, medium and high density

residential land use categories. The trend of 20% of residential development occurring in the rural area is expected to continue through the planning period. The distribution among low, medium through high density and the rural/urban splits are based on the EAR data that was derived from final building permit data. Table 2 of the methodology is the calculation of the number of acres needed in the Urban Cluster to accommodate the dwelling units shown in Table 1. Table 3 is the estimate of non-residential land use activity in the Urban Cluster. Table 4 shows the relationship between land needs in 2020 and the current size of the Urban Cluster. There are 4,378 acres beyond the projected need in the Urban Cluster through the year 2020. (Table 4A indicates the land needs in 2010 and the current size of the Urban Cluster. This calculation shows 7,396 acres available for urban development beyond the projected need in the Urban Cluster through the year 2010). Therefore there is no need in both 2010 and 2020 for modification of the area designated for urban development.

The vacancy rate is simply 1 minus the ratio of households to total housing stock. The number of vacancies is the vacancy rate times the housing stock. These are total vacancies--single family, multifamily, mobile home & other. Housing occupied by seasonal residents is considered vacant. The methodology utilizes a vacancy rate of 10 percent, which is based on historic and projected vacancies (Email communication with Dr. David Lenze, 2/12/01).

A market factor is included in the calculation to allow for a measure of flexibility between supply and demand. A sufficient market factor allows flexibility in the siting of development, thereby helping ensure that developers can find locations favored by the market. Market factor is a multiplier used in developing a forecast of future land use needs, specifically housing, to allow for market choice. The market factor results in additional developable land in the urban cluster and thereby can have a positive effect on housing affordability. The market factor also addresses market uncertainty with respect to the accuracy of market predictions, for example if some landowners withhold their land from development. The market factor ensures that enough land is set aside for residential purposes to accommodate these residential support activities--parks, easements for utilities, churches, to name a few. Across the country the range in factors is as low as 1.15 (Portland, Oregon) to over 2.0 (several Florida locations). Alachua County has used the market factor 2.0 for calculations for the year 2010 and the market factor 1.5 for the year 2020.

It is projected that an additional 5,203 housing units will be needed in the unincorporated area of the County from 2000 to 2010. Applying the market factor for this timeframe (2.0) results in a total capacity needed equal to 10,405 units. Based on recent trends in the County and the plan policies which encourage development in the Urban Cluster, 80% of these new households will occur in the urban area, so 8,324 additional urban residential units will be needed within the Urban Cluster during the planning period. The required acreage for these new units was then calculated based on conservative projections of average urban gross densities shown in Table 2 for the year 2010: This translates into approximately 4,265 additional gross acres of Urban Cluster residential land needed to accommodate projected population growth through the year 2010.

It is projected that an additional 11,844 housing units will be needed in the unincorporated area of the County from 2000 to 2020. The total capacity needed is 17,766 units, using the market factor of 1.5. Factoring for 80% of needed units to locate in the Urban Cluster, 14,213 additional urban residential units will be needed within the Urban Cluster during the planning period. With the average urban gross densities from Table 2 for the year 2020, this would translate into approximately 7,283 additional gross acres of urban cluster residential land needed to accommodate projected population growth through the year 2020.

The next step in the methodology, shown in Tables 5-6, determined the impact of conservation constraints based on the best available scientific data for GIS mapping of primary and secondary conservation areas. Since policies in the plan require protection of 80 percent of strategic ecosystems, a development factor of 0.20 is used in the calculations for primary conservation areas. Since the policies require protection of 25 percent of secondary areas the development factor for the calculation of development potential for these lands is 0.75. This is a general assumption, since site-specific verification of the location of conservation resources will be done during development review and may result in greater development potential (for example, the mapping scale may show an area as all primary conservation whereas site specific verification may indicate the land is partially secondary conservation). This analysis calculates the urban services line residential development potential based on a total of 10,834 vacant acres of land with conservation characteristics.¹ There are 6,768 residential acres, including 2,348 acres of primary conservation and 4,420 acres of secondary conservation. Applying the development potential factors results in an estimated residential developable acreage of 3,785 acres. There is additionally 1,236 undeveloped acres within the USL without conservation constraints, so the total residential land available for development within the USL is calculated to equal 5,021 acres. This exceeds the 4,265 acres needed for residential development for the year 2010. A similar calculation of development potential calculated with vacant land conservation constraints for the year 2020 in the Urban Cluster indicates 7,392 acres vacant residential land available for a need of 7,283 acres. In both calculations the vacant residential land available exceeds the land needed.

Methodology – Determining Future Need for Commercial Land

The methodology to determine the future need for commercial land analyzed land use needs data for the unincorporated rural area, the urban cluster, and municipalities. The current distribution among these sub-areas is 61.2% of commercial square footage in the unincorporated urban area, 8.5% in the unincorporated rural area and 30.3% in the municipalities. A future acreage need was calculated based on the current distribution. This was consistent with the goal of the comprehensive plan to maintain the character of the rural area and concentrate urban development in more highly developed areas, with better overall access, surrounding services, and concentrations of available labor.

Table: Distribution of Commercial Square Footage in Alachua County, Year 2000

	TOTAL	Uninc. Urban	Uninc. Rural	Municipal
Hotel	100%	84.3%	2.8%	13.0%
Industrial	100%	39.2%	18.9%	41.9%
Office	100%	81.1%	1.7%	17.2%
Retail	100%	64.0%	4.5%	31.5%
TOTAL	100%	61.2%	8.5%	30.3%

Source: Fishkind & Associates, Inc. March 2001. Historic Employment Trends and Conditions (utilizing data from Alachua County Property Appraiser)

In 2000, the largest employment sectors in Alachua County are the University of Florida and Shands Medical Center. Of the 27,000 state employees in the County, 23,000 are in educational services, representing 20 percent of Alachua County total employment. The next largest employment category is medical and health services, with nearly 14,000 employees and 12 percent of employment countywide. Local government employs about 10,500 employees or 9 percent of the total. These three largest sectors represent about 41 percent of County employment, a trend since 1980, although there has been

¹ Including three parcels totalling 62 acres, with 52 acres of conservation characteristics, approved by BoCC March 25, 2002.

diversification and change in the local economy (Source: Fishkind and Assoc., Inc, 2001).

Strategic Growth Segments and Land Use Needs

There are emerging employment sectors with rapid growth and these areas represent important trends, opportunities and needs. These high growth industries are concentrated in four major areas: A) high technology products and services (industrial and medical); B) transportation related air and ground; C) Information Services (financial and business service); D) recreation convenience and personal service.

The methodology utilized by Fishkind and Associates for the land use needs analysis is to forecast employment by SIC code, then convert employment to square feet and convert square footage to acreage by assuming a floor area ratio (determined by existing land use patterns). Floor area ratios are based on the property appraiser’s data.

Non-Residential Square Footage Demand Analysis

	<u>2000</u>	<u>2010</u>	<u>2020</u>
Office Employment	9,405,834	11,557,267	13,241,345
Industrial Employment	9,549,169	11,356,194	12,998,054
Retail Employment	8,034,555	9,355,909	10,541,150

Activity Centers Analysis

Activity Center analysis was done by the consultants to determine the locational distribution of future non-residential uses. At present there are slightly more than 2,500 acres designated in Activity Centers. Based on the Fishkind analysis, there is sufficient vacant activity center acreage to accommodate the future unincorporated urban retail, office, hotel and industrial demand.

B. Categories of Land Use

The future land use categories for the Comprehensive Plan: 2001 - 2020 are:

Residential (Estate, Low, Medium, Medium-High, and High Densities), Roadway Commercial, Commercial, Office, Tourist/Entertainment, Rural Commercial, Industrial, Light Industrial, Institutional, Institutional/Medical, Institutional/Corrections, Rural/Agriculture, Rural Employment Center, Rural Community Employment Center, Rural Cluster, Recreation, Preservation.

Areas mapped for Activity Centers also include areas for Conservation, Open Space, Shopping Center, Tourist/Entertainment/Office, Office/Medical, Office/Business Park, Warehouse/distribution, Office/Residential, and Utility.

General acreage data for County land is as follows:

Total land acreage of Alachua County	620,876 ac	
Total parcel acreage of Alachua County	593,585 ac	
Total parcel acreage of unincorporated area	501,492 ac	.845 of County
Total parcel acreage of Urban Cluster.....	45,437 ac	.091 of unincorporated area
Total parcel acreage of Rural Unincorporated....	456,055 ac	.909 of unincorporated area
Total parcel acreage of municipalities	92,011 ac	.155 of County
Total parcel acreage of private land	524,345 ac	.883 of County
Total parcel acreage of public land	69,240 ac	.117 of County

The following table, Future Land Use Distribution in unincorporated Alachua County, Year 2020, shows acreage and percentage data for specific land uses.

Future Land Use Distribution in Unincorporated Alachua County, Year 2020

Land Use	Acreage	Percentage
Commercial	3,061	0.6%
Industrial	2,539	0.5%
Institutional	8,009	1.6%
Recreation/OS	1,833	0.4%
Utility	4	0.0%
Residential	32,345	6.6%
Estate (1 DU/Ac)	6,020	1.2%
High (14-24 DU/Ac)	1,326	0.3%
Med (4-8 DU/Ac)	2,234	0.5%
MH (8-14 DU/Ac)	844	0.2%
LM (2-4 DU/Ac)*	572	0.1%
L (1-4 DU/Ac)	20,106	4.1%
Very L (0-2 DU/Ac)*	1,241	0.3%
Preservation/Conservation	69,285	14.2%
Rural/Agricultural	372,766	76.1%

TOTAL

489,842

* In Special Area Studies only

Source: Alachua County GIS, January 2002

There are 456,055 acres of rural unincorporated land. The rural/agricultural land use totals 372,766 acres. There are 83,289 acres of other land uses, including institutional, preservation, and uses in the rural clusters, in the rural unincorporated area.

Urban Residential

Low density residential (1-4 units per acre) land use is about 63% of all residential. Medium (4-8 units/acre), medium-high (8-14 units/acre), and high (14-24) density residential together represent about 17 % of all residential.

Mixed- use development has been occurring in Alachua County. Haile Plantation is a planned unit development including 2,686 residential units on 1626 acres. The gross density is 1.65 du/acre. The development includes single family residential at an average density of 3 du/acre, zero lot line/patio homes at an average density of 6 du/acre, and multi-family at 16.7 du/acre. There is also 450 acres of

open space and 280,000 of non-residential uses (Alachua County Growth Management Department records). The Town of Tioga is another example of mixed -use development. Town of Tioga is a 500-acre Traditional Neighborhood Development built on the site of an old abandoned settlement. It will have a mix of essential retail, institutional and recreational uses linked via alley ways, common areas, sidewalks, and bike lanes to facilitate pedestrian activity. Streets are narrow and organized in a grid pattern to permit connectivity of adjacent neighborhoods. Parks, amenities and planned retail districts are within walking distance of all residents, while 19% of the development is preserved as green space.

Rural/Agricultural

The rural agricultural landscape has existed in Alachua County at least since the sixteenth century A.D., when the Spanish made the area the hub of their cattle ranching. Alachua County has since been a main center for agriculture in Florida. Cattle and dairy products, poultry, vegetables, tobacco, corn, and timber produce the greatest revenue. The whole state is served by the University's Institute of Food and Agriculture Sciences through its research and education centers. Several state and federal agricultural agencies also have headquarters in Gainesville. Transportation of agricultural products is essential to the state and local economy. The rural agricultural landscape is increasingly threatened by sprawling, uncontained urban development.

Once topsoil is paved and converted for urban uses, the value as farmland or forest is diminished forever. Sometimes climatic events result in land use changes. For example, Windsor settled in 1846 as a cotton plantation and was named after its English founders; the town prospered as a citrus center in the 1880s. During these years, it also attracted tourists and had a population of more than 400. The freezes of the 1890s destroyed the citrus industry and now only a few homes remain, one a historic site.

The total number of farms in Alachua County in 1997 was 1,086 farms on 198,193 acres. The average farm size was 182 acres, up from 176 in 1992. The market value of farms changed from an average value of \$1566.9/acre in 1992 to \$1983.2/acre in 1997, based on a sample of the total farms. In 1997 there were 8,123 acres of foreign-owned farmland acreage in the County, 1.57 percent of total farmland (BEBR, 2000: Tables 9.35 and 9.45).

The state average for water use for agricultural irrigation is 1,653 gallons per acre (Source: BEBR, 2000 Statistical Abstract, Table 9.50). The water management districts project water demand for agriculture to be 35 percent (SJRWMD) and 40 percent (SRWMD) of total water usage for the year 2020 (Source: FDEP).

As of 1997, there were approximately 296,535 acres of forest in Alachua County. The portions of land within the Rural/Agricultural land use category that are in large scale silviculture/timber use are concentrated in the northeast and eastern parts of the County. The following data indicates about 240,000 acres in timber in 2001, so about 55,000 acres converted from timber to either another agricultural use or a residential use. The resulting loss of tree canopy has far-reaching impact both on local stormwater runoff and global warming.

Acreage and Agricultural use data from the Alachua County Property Appraiser Report is as follows:

	Timber	Orchard	Pasture	Nursery	Crops	Misc.
2000 Parcels	5,204	275	3,315	171	892	43
2000 A c r e s	245,012	3,302	100,540	1,354	29,823	357
2001 Parcels	5,249	270	3,345	163	865	41
2001 Acres	240,947	3 ,229	99,935	1,368	28,426	354

Source: Alachua County Property Appraiser website (The property appraisal notes that some parcels may have more than one use, therefore the total agricultural use parcels will not equal the sum of the individual uses.)

Data from the Census of Agriculture, 1992 and 1987, are directly comparable for acreage and inventories although dollar values have not been adjusted for changes in price levels. This is included as Appendix AGRI.

Residential conversions of the rural area, if not appropriately designed, can worsen land use conflicts. New subdivision lots less than 20 acres in the Rural/Agricultural area since 1995 are shown here:

Calendar YEAR	< 3 acres	3-8 acres	>8 acres	Total/year
1995	32	42	12	86
1996	0	56	33	89
1997	94	60	21	175
1998	30	34	21	85
1999	0	22	7	29
2000	0	35	4	39
2001 (partial)	20	6	5	31 (partial)

Source: Alachua County Department of Growth Management

It should be noted, however, that residential use permits in the Rural/Agriculture land use has shown a six year average of 345 new single family residential units, including mobile homes, on lots up to 20 acres. This indicates a rapid rate of conversion of the rural area to allow low density development. Therefore the rural land character is threatened by the piece-meal development of residential uses. The

data indicates that mobile homes are the predominant building type on new lots in the rural area (slightly more mobile homes than site-built homes for 5 years out of six, 1995-2000). Data for residential use in the Rural/Agriculture land use, including new subdivision lots by size of lot, is included in Appendix Table “New Building Permits Issued.”

The problem of small lot development in the rural area was noted in a 1992 report by the American Farmland Trust, *Florida’s Growth Management Plans: Will Agriculture Survive?* This report noted that the degree to which rural low density residential zones are effective in conserving farmland is directly related to the minimum lot size required for each residence. The larger the minimum lot size, the more effective the zone is in conserving farmland. The current policy allowing residential development on 5 acre lots in the rural area is totally ineffective, according to this report. The minimum lot sizes can be rated as follows according to their effectiveness in conserving farmland:

under 4.9 acres	totally ineffective
5 to 9.9 acres	generally ineffective
10 acres	moderately ineffective
10.1 to 20 acres	moderately effective
20.1 to 40 acres	generally effective
over 40 acres	highly effective

In the six years, 1995-2000, the average numbers for single family and mobile home permits issued by lot size in unincorporated Alachua County were as follows:

Less than 3 acres	162 average yearly
3 to 8 acres	182 average yearly
8 to 12 acres	72 average yearly
12 to 20 acres	35 average yearly
Total 20 acres or less	511 average yearly

While some of these small lots may have continued some type of agricultural use and received the agricultural exemption, the viability of farmland is reduced as the parcels are fragmented. Agricultural lot sizes of five acres or less are identified as rural residential zones, and are not recommended for agricultural areas (*Holding Our Ground: Protecting America’s Farms and Farmland*, by Tom Daniels and Deborah Bowers). In addition, five acre lots are often too large for a homeowner to manage without incurring problems such as exotic invasive vegetation and soil erosion.

The requirement in the current plan for clustering of subdivisions with 25 or more lots has been weakened as a result of phased subdivision applications, each with less than the 25 lot threshold. As reported in the EAR, two requests for cluster development were denied by the County. One application was denied based on the presence of large wetland and floodplain areas in the vicinity of Kanapaha Prairie, and another application was denied based in part on the impact of the anticipated population upon buildout with such a concentration in an area remote from fire and school services (EAR, FLUE Page I-

24). Within Rural Clusters, Rural Employment Centers and Rural Community Employment Centers, very limited development has occurred.

New policies requiring mandatory clustering of all residential subdivision development in the rural area are designed to protect the characteristics and features of the rural area while continuing to allow a gross density of 1 unit per 5 acres. The discussion of rural clustered subdivisions under Development Controls section will expand on this new requirement, which is intended to help Alachua County use the development regulation process to their advantage to protect interconnected networks of greenways and permanent open space for rural areas.

The *Rural Lands Stewardship Program*, created by the 2001 Legislature, or a similar transfer of development right program, may help Alachua maintain the economic value of agricultural and silvicultural lands, while directing growth to locations within areas more-suitable for increased densities, mixed uses and cluster development, using transferrable land use credits. See the Development Controls section for more discussion of these methods.

Conservation

Resource areas of wellfield protection areas, lakes, floodplains, wetlands, and minerals and soils are generally mapped in the Future Land Use map series. Strategic ecosystems and other habitat resources, archaeological resources and sinkholes are also mapped. Identification and protection of these conservation resources are also identified in detail in the policies in the Conservation and Open Space Element.

Commercial/Retail

The 1999 Property Appraiser data indicates existing retail square footage is approximately 10 million square feet. National Research Bureau Shopping Center Directory reports shopping center supply of 3.5 million square feet. The Fishkind retail demand model estimates countywide household based retail demand in year 2000 of 5.7 million square feet. The Fishkind report reconciled this discrepancy among data sources with the assumption that a percentage of “one story stores” are not used for retail but instead are service or office type uses. Fishkind estimates the share of these parcels in office type uses is nearly one third, which leaves a total retail supply of 7.8 million square feet in the County. Fishkind estimates the number of retail acres to be 1,800.

The identification of areas for higher intensity activities in the commercial and institutional land use categories has been based in part on analysis of projected population within defined market areas. Criteria for this identification are in policies in Sections 3 and 5 of the Future Land Use Element. The acreage sum of all Activity Centers is 2,528.6 acres. The methodology for determining commercial land use needs includes acreage for each activity center.

The 2001 Alachua County Property Appraiser Report indicates a total just value of business, commercial and industrial uses of \$1,388,428,700 (http://www.acpafl.org/annual_reports/2001_report/realuse_2001.htm).

Industrial

The 1999 property appraiser data indicates existing industrial square footage Countywide (including municipalities) is approximately 9.3 million square feet. It is not possible to directly determine the number of corresponding acres in use due to the limits of the property appraiser data, which identify parcel size by front foot or lot, rather than acres. However, the number of acres in use was

estimated. Based on Floor Area Ratios (FAR) of 0.10 (as determined from the Appraiser data) there are approximately 6,500 industrial acres in use, including two large uses, the Gainesville Regional Airport and the Gainesville Regional Utilities Deerhaven site, which account for 2,253 acres of the total.

Activity Centers Analysis

At present there are slightly more than 2,500 acres designated in Activity Centers. The Activity Center analysis by Fishkind and Associates determined acreages based on DOR codes. Vacant acreages in the Activity Centers calculated from DOR codes equals 1226 acres. Based on the Fishkind analysis, there is sufficient vacant activity center acreage to accommodate the future unincorporated urban retail, office, hotel and industrial demand. The total acreage by Activity Centers is as follows:

Activity Centers	
Archer/34th Street	257.3 acres
Archer/Tower Road	185.2 acres
Eastgate	4.3 acres
Eastside	344.8 acres
Jonesville	281.6 acres
Millhopper	52.7 acres
North Main	50.7 acres
Oaks Mall	261.9 acres
Santa Fe	117.1 acres
Springhills	723.8 acres
Tower/24th Ave.	47.4 acres
Williston/13th	62.4 acres
Williston/I-75	139.5 acres
Total	2,528.6 acres

IV. NEED FOR REDEVELOPMENT

A. Renewal of Blighted Areas

Gainesville was the fourth (4th) fastest growing city in Florida during the 1990s. The percentage population increase was 19.2 % for the decade. This rate of growth has primarily led to suburban sprawl, however, and existing developed areas have declined, especially in the area known as “East Gainesville.” Plan East Gainesville is a recent project of the Metropolitan Transportation Planning Organization (MTPO) to address the need for redevelopment. The Mission Statement of the MTPO is as follows:

As a result of a significant public participation program, develop a joint City of Gainesville and Alachua County special area plan, land conservation plan and transportation plan to revitalize the eastern Gainesville Urbanized Area, after considering the environmental, economic, neighborhood and transportation impacts of proposed development in this area.

In an effort to promote redevelopment and reduce blight, the County designated the East Side Activity Center, located within the Urban Cluster (east of Gainesville city limits and west of Newnans Lake), as an area for mixed use development. The County is currently considering a program to set up a Community Redevelopment Agency for the activity center to be funded through tax increment financing. In 1998, the General Accounting Office identified Census Tracts 2, 6 and 7 as economically depressed areas based on the criteria of level of unemployment, poverty and percentage of low income households. The area continues to remain blighted and economically distressed and has experienced little economic activity beyond County and City of Gainesville initiated projects. Inadequate infrastructure, public transportation facilities and the deterioration of buildings are significant factors contributing to the current

conditions and blight in the area.

Alachua County continues to provide housing rehabilitation and neighborhood revitalization through its State Housing Initiatives Partnership (SHIP) and Small Cities Community Development Block Grant (CDBG) Programs for residential units located within existing neighborhoods in the small cities and communities and scattered rural sites in the unincorporated areas of the County.

B. Elimination or Reduction of Inconsistent Uses

Administrative rezonings in the late 1990s resulted in reduction of inconsistent land uses types. Excessive expanses of parking areas at sprawling developments is one example of development form inconsistent with the goals of the Comprehensive Plan. Policies addressing redevelopment according to pedestrian design standards will reduce this problem.

V. PROPOSED DEVELOPMENT AND REDEVELOPMENT OF FLOOD PRONE AREAS

In Alachua County there are a total of 5,721 parcels, which cover an area of 176,140 acres, that include land within the 100 year flood plain. (This data is based on GIS floodplain maps produced by the Federal Emergency Management Agency in 1996 and subject to change when these maps are updated in the next few years.) Of these 5,721 parcels, 1,215 are vacant non-agricultural parcels, totalling 18,964 acres. This is the total acreage of the parcels and not necessarily just the portion of the parcels that are in the flood plain. The total parcel count and parcel land acreage of all Alachua County (including the municipalities) is 8,294 parcels totalling 593,585 acres (Source: County GIS/Property Appraiser Data, Sept. 2000).

Parcels including Floodplain	# Parcels	Acreage
Total Alachua County	8,294	593,585 acres
Total with Floodplain	5,721	176,140 acres
% of County Total	(69%)	(29.7%)
Total with Vacant Floodplain	1,215	18,964 acres
% of Floodplain Total	(21%)	(10.7%)

Source: Property Appraiser Data, and Growth Management GIS, Sept. 2000 based on 1996 FEMA maps.

The Comprehensive Plan combines locational and design approaches for hazard mitigation of flooding. The plan emphasizes protecting the floodplain and minimizing structural approaches.

Six basic structural alternatives are available to address flooding in floodprone areas. These are capacity improvements, regional detention/retention, purchase of floodprone properties, development restrictions, no action, and the use of operational control structures.

VI. PROPOSED DEVELOPMENT AND REDEVELOPMENT BASED ON HAZARD

MITIGATION REPORTS

Floodplains, sinkholes, fires, tornadoes and hurricanes are natural hazards in Alachua County. Man-made hazards includes chemical and other emergencies.

The Alachua County Local Hazard Mitigation Working Group identified eight (8) situations and recommendations, but acknowledged these strategies are a “work-in-progress.” Each is subject to review and change. The eight (8) identified Strategies are:

(1) Develop and incorporate pre- and post mitigation planning into Comprehensive Plans and Elements; review, revise and create ordinances and procedures that promote community wide mitigation benefits. Coordinate activities with other local agencies to promote cooperation between jurisdictions. This strategy was incorporated into the Comprehensive Plan update.

(2) Alachua County has submitted four (4) county flood control mitigation actions for action following review by the State. These projects are the stormwater pump station at South West 34th Street Industrial Park, the Flood Control Project at Robin Lane subdivision, a drainage project (pump station) for the Heatherwood subdivision at NW 39th Ave. and NW 54th Terrace, and retention basin construction of Shaw’s Pond near NW 143rd Street.

(3) Develop a partnership between the public and private sectors and the general public for Wildland/Urban interface wildfire mitigation. This partnership should address public education, fuel reduction, use of fire resistant building materials and landscaping practices. A “Firewise Community” workshop was held in Alachua County on Oct. 4, 2001.

(4) Identify, retrofit and construct safe disaster shelter space. The County has 40,500 Category 5 disaster shelter spaces using the pre-American Red Cross 4496 criteria.

(5) Complete a total shelter/building analysis to determine retrofit feasibility.

(6) Establish a community wide preparedness and response organization.

(7) Create a local ordinance establishing a cost recovery mechanism to recover expended funds. The ordinance would serve two purposes: a deterrent and a revenue source for unbudgeted expenditures.

(8) Review existing data regarding Flood Mitigation Assistance Program and determine the most feasible course of action.

VII. DEVELOPMENT CONTROLS

As a guide for the development and use of land within unincorporated Alachua County, the Future Land Use Element incorporates principles of sustainable land development that includes a balance of social equity, economic opportunity, and environmental protection. These principles include natural resource and agricultural protection, efficient use of infrastructure and services, distinct urban and rural areas, more compact development patterns, residential neighborhoods as a collective asset, reduced dependency on single occupant vehicles, and more diverse and vital communities. In order to implement these principles, the Future Land Use Element contains a variety of techniques and strategies, including:

- Urban growth boundary, i.e. Urban Cluster line
- Urban services line
- Traditional neighborhood developments
- Mixed use village centers

- Activity center design standards
- Clustered subdivisions
- Transfer of development rights program
- Community and neighborhood planning program

A review of each of these techniques is provided below.

Urban Growth Boundary (Urban Cluster Line)

An Urban Growth Boundary is a line on a map that is used to mark the separation of urbanizable land from rural land and within which urban growth should be contained for a period of time specified by the growth management program. The Alachua County Future Land Use Map terms this line the Urban Cluster. This designation, which has been a part of the County's Plan since 1991, cannot be changed without a Comprehensive Plan Amendment.

Urban Services Line

The Future Land Use Element designates an urban services line on the Future Land Use map to promote efficient use of land and infrastructure, and minimize sprawl, by phasing development of land within the urban cluster.

The urban services line identifies the area within the urban cluster within which phased development is promoted through 2010. The urban services line has been analyzed for capacity and determined adequate through at least 2010, as detailed in Table 5. The Plan calls for a reevaluation of the urban services line prior to 2006 for adequate capacity. This evaluation will include factors such as population growth rates and density rates, build out rates, housing prices and market factors, and effects of environmental constraints on development.

Before additional wastewater lines are extended, urban development is directed into the area currently served by wastewater lines. Before development proposed outside the urban services line can occur, it must provide a full complement of urban services. Flexibility for applications for development in the urban cluster but outside the urban services line allows for special review and approval based on a set of factors including not only provision of central wastewater, but an adequate local road network, mass transit, recreation, public protection facilities, public schools, fiscal impacts to the public, and a management plan for conservation areas. Other factors considered include enhancement of the local jobs-housing mix, inclusion of a mixed use village center and affordable housing, and purchase of development rights through the County's Transfer of Development Rights (TDR) program provided for in the Plan.

Traditional Neighborhood Developments

Traditional Neighborhood Development (TND) is a form of development following the principles of New Urbanism. New Urbanism is an architectural and urban design movement based on settlement patterns prevalent in North America prior to the Second World War, and culminating in the American town planning movement of the 1920s. New Urbanism is often held out as an alternative to the single-use, automobile-oriented "conventional" suburban development occurring after WWII. In contrast to conventional development, characterized by separation of uses and housing types within developments accessible only by automobile, New Urbanism holds the traditional neighborhood, with housing and other uses integrated at a fine grain, to be the basic building block of a walkable, interconnected

community (*Suburban Nation*, Duany, et al, 2000, pp. 3-4, 15-20.).

Traditional neighborhood developments with mixed housing types and mixed uses are strongly encouraged through the development review process. These traditional neighborhood developments are required to meet specific criteria to protect the natural environment, create usable interconnected open space, achieve higher net densities and integration with surrounding areas, achieve a sense of community through well-defined centers and edges and an integrated range of housing types and lot sizes, and utilize an interconnecting grid system of pedestrian friendly streets.

Citing sprawl as a conventional Florida development pattern with enormous economic and social costs, Reid Ewing distinguishes exemplary new developments, as well as traditional towns, using several criteria. While sprawl is characterized by poor accessibility – to jobs, schools, etc. – and lack of community open space, the criteria distinguishing good community development are market success, shopping and recreational opportunities, environmental themes, affordable housing with amenities, road connections, and street life (*Best Development Practices*, Ewing, 1996, pp. 1, 5-6.).

Traditional Neighborhood Development is distinguished from conventional master planned development by its use of principles focused on compact walkability. These principles include public space in the form of a distinct center as a generator of neighborhood form, the distance of a five-minute walk as a unit of measure, an interconnected street grid system, and pedestrian-scaled streets designed as multi-use space, including details such as narrow street width, wide sidewalks, shade trees, and buildings oriented close to the street. This basic framework of human scale and orientation also allows for the possibility of mixing a variety of housing types and uses in close proximity, while maintaining livability through an overall discipline and order (*Suburban Nation*, Duany, et al, 2000, pp. 3-4, 15-20).

Guidelines for best development practices for land use, transportation, environmental, and housing have been developed by Ewing as a means to blend desirable aspects of contemporary and traditional development. These practices advocate such strategies as keeping vehicle miles traveled below the area average, mixing land uses and housing (including affordable housing) at the finest grain the market will bear, making subdivisions into neighborhoods with well-defined centers and edges, taming auto-oriented land uses, designing the street network with multiple connections, providing pedestrian and bicycle networks equal to the auto network. Ewing advocates using a systems approach to environmental planning for best development, including developing in already disturbed areas while preserving connected areas and corridors of significant habitat (*Best Development Practices*, Ewing, 1996, pp. 17, 51, 91, 129.).

As an alternative to conventional suburban development patterns, the Alachua County Future Land Use Element encourages Traditional Neighborhood Developments (TNDs) as an urban residential design strategy in policies under Objective 1.4. Specifically, Policy 1.4.2 provides for TNDs within residential zoning districts. Such provision allows for expedited “as of right” approval of TNDs based on clear design and performance criteria, rather than the more costly, time-consuming, and uncertain planned development/ rezoning process.

The performance criteria for TNDs included in the Comprehensive Plan include strategies from the New Urbanism and Best Development Practices. These criteria include protection of the natural environment, creation of usable interconnected open space, higher net densities designed for integration with surrounding areas, a sense of community through well-defined centers and edges and an integrated range of housing types and lot sizes, and an interconnecting grid system of pedestrian friendly streets. In addition, the Future Land Use Element provides an option to include mixed uses within a new TND provided they are designed at a limited scale and consistent with policy standards for village centers, as discussed below.

Mixed Use Village Centers

The Future Land Use Element provides for mixed use village centers as a strategy to encourage reduction of automobile use and greater use of non-automobile forms of transportation, by providing limited daily retail and service needs integrated with residential areas. The village center is an alternative to the existing provision for Neighborhood Convenience Centers, which may be included in existing residential areas when integrated with a planned unit development. Village centers are provided with incentives to encourage their development, and standards to ensure integration with neighborhoods at a pedestrian friendly, human scale.

Village centers are encouraged through several incentives. They are allowed in urban residential areas as part of a new traditional neighborhood development, through development plan approval in standard residential zoning districts. Village centers may include up to 30,000 square feet of commercial area as part of a new residential development. They may include up to 50,000 square feet of commercial area within an identified radius of a new development, provided the additional need is demonstrated through a market study and the development plan provides connectivity and integration with the surrounding area. When located along well-served planned transit system corridors, TNDs with village centers are eligible for consideration as a Transportation Concurrency Exception for Projects that Promote Public Transit, higher densities through designation as a transfer of development rights receiving area, and commercial areas up to 50,000 square feet based on demonstrated need to serve the transit ridership.

Traditional Neighborhood Developments may include mixed use village centers through the development plan approval process provided they meet specific site and design standards in the Comprehensive Plan and land development regulations (LDRs), to ensure integration with new residential developments. These standards specify the village center must be part of a new TND of a minimum of 30 acres, located at least one-half mile apart, and achieve at least 90% of the maximum density allowed by the residential land use. In order to be considered through the development plan approval process, a public involvement process must be used, including a facilitated neighborhood charrette or similar forum to help identify common interests as well as concerns between surrounding neighborhoods and the developer. In addition, design standards are required to ensure compact, multi-purpose, walkable centers, which integrate a mix of uses within an overall pedestrian-friendly environment. These design standards include a balanced mix of uses, however, industrial and highway-oriented uses specified in the LDRs are not allowed. The mix of uses are required to be integrated through an overall design framework of size, scale, proportion, and materials. Public space must be an organizing element around which other development is located.

The village center must also be organized along a density and intensity gradient to ensure integration with the site and surrounding uses. Village centers must be located at the geographic center of the TND, unless site constraints prevent it or the village center is located along a public road. In both cases, the village center must be effectively integrated with surrounding uses with minimized impacts, and oriented primarily toward the TND. Other design standards address the pedestrian circulation system, pedestrian street character, impacts of auto access, parking, and signage, and design of stormwater facilities as amenities.

A primary characteristic of mixed use village centers is the provision of a high quality pedestrian environment. However, the Comprehensive Plan recognizes that certain limited uses that do not contribute to this environment, such as parking lots and service areas, must also be included. In order to maintain a continuous high quality pedestrian streetscape while allowing for these uses, an "A/B" street grid is allowed. The A/B street grid is a technique that allows the pedestrian quality of a limited number of streets to be compromised in order to maintain a primary pedestrian friendly network. The primary grid of A streets maintains continuous streetscape definition through pedestrian oriented uses and frontages. The automobile oriented uses are assigned to the B streets, rather than being dispersed throughout the site where they would interrupt pedestrian continuity. (Suburban Nation, Duany, et al, 2000, p. 161.)

Limited flexibility for village centers that do not meet all requirements in the TND provision within standard zoning districts may also be included in residential developments through the planned

development process. However, the village center must still meet all comprehensive plan policy standards.

Activity Centers

Activity centers are located within the urban cluster designated on the Future Land Use map, to provide for the concentration of mixtures of higher intensity and density land uses in the urban area. Activity centers include design standards to ensure that they are pedestrian-friendly compact centers integrated with surrounding uses and connected to a multi-modal transportation system.

Different levels of activity centers are identified based on their primary and secondary functions, market size and area, and intensity. Activity centers are identified as retail or employment oriented, and as high, medium, or low intensity. A comprehensive plan amendment is required for new, expansion, or redevelopment of activity centers to establish the level, type, and uses on the Future Land Use map and to establish specific activity center plan policies in the Comprehensive Plan. Such comprehensive plan amendments are considered based on the findings of a market or employment study, and urban form location and size requirements.

These design standards include a balanced mix of uses, integrated within a pedestrian-friendly environment through an overall design framework of size, scale, proportion, and materials. Public space must be an organizing element around which other development is located. The activity center must also be organized along a density and intensity gradient to ensure integration with the site and surrounding uses. Other design standards address the pedestrian circulation system, pedestrian street character, connectivity and street grid system, impacts of auto access, parking, and signage, and design of stormwater facilities as amenities.

Research conducted by 1000 Friends of Oregon concludes that building orientation and pedestrian orientation are closely correlated, and that variation in building orientation can account for changes of 10% or more in vehicle miles traveled (VMT) per household. In addition, the equations used in this research included a variable for employment density at the zonal level. This measure of "mixed use" at the zonal or neighborhood level was also statistically significant in explaining observed variations in automobile dependence. The report states, "Ordinances and policies which are designed to regulate the built environment need to be drafted in a manner that reflects these lessons learned from Portland's 'traditional' neighborhoods... The research demonstrates that building orientation, as one of several land use variables which can be influenced by public policy, has a statistically significant impact on household vehicle miles of travel, an important measure of travel behavior." – Parsons Brinckerhoff Quade & Douglas, Inc. Building Orientation, a supplement to The Pedestrian Environment, Volume 4B, 1000 Friends of Oregon, 1994. <http://ntl.bts.gov/DOCS/bob.html>

An Alachua County ordinance will regulate the following aspects of shopping center and large retail establishments:

- The aesthetic character of facades and exterior walls;
- The design of site entrances in relationship to the surrounding community;
- Sidewalks for pedestrian circulation;
- Parking lot design and location;
- Landscaping that improves the aesthetic appearance of parking lots and entrances;
- Stormwater management that is aesthetically pleasing and environmentally sound;
- The size, color, and materials of signs so they are functional and aesthetically compatible with the surrounding community; and

The placement, height, and materials for lighting which enhances security without unnecessary “light pollution.”

The Comprehensive Plan also specifies the evaluation and update of all activity center plans to bring them into compliance with these mixed use pedestrian-friendly standards. This evaluation will include a public participation process incorporating neighborhood meetings, charrettes, and notice to property owners.

Rural Clustered Subdivisions

While rural areas contain valuable resources of agriculture, open space, natural resources, and rural character, they are also under increasing development pressures. The Comprehensive Plan provides for the use of clustered subdivisions as a means to protect the characteristics and features of rural areas, while allowing for rural residential lifestyles. Clustered subdivisions are existing in other Florida counties including St. Johns, Leon and Hillsborough.

The Future Land Use Element contains six goals for protecting rural areas through rural clustered subdivisions. These goals are:

- Protect natural and historic resources.
- Support continued agricultural activities by preserving viable soils and effective land masses.
- Minimize land use conflicts.
- Provide recreational and habitat corridors through linked open space networks.
- Achieve flexibility, efficiency, and cost reduction in the provision of services and infrastructure.
- Reduce natural hazard risks to life and property.

At a workshop at the Florida Farm Bureau on January 9, 2002, concerning the requirement for rural clustered subdivisions in the Alachua County Comprehensive Plan Update, national expert Randall Arendt explained the merits of this form of development.

According to Arendt, rural clustered subdivisions are advantageous for reasons which include:

- Open space can remain in production.
- Geometry determines design and results in aesthetic quality and efficiency.
- Reduction in management costs (time and money) for homeowners.

Arendt’s rural cluster subdivisions design concepts are framed by the rural area purpose, and are based on symbiotic relationships. Site design criteria address issues such as avoidance of critical wildlife habitat areas, preservation of significant site features (sinkholes, large trees, hedgerows, etc.), and providing road connections and trail linkages between current and future subdivisions (Arendt, 1994, p. 229). The application of his design concepts in high fire hazard areas will advance hazard mitigation

planning.

Rural cluster subdivisions are advantageous when natural stormwater management is incorporated into the design, allowing for protection of water quality and the natural aquifer recharge function. Often roadway paving is decreased, thereby resulting in less runoff problems. The use of natural pesticide management can also be incorporated where the open space is productive agriculture, thereby improving water quality.

Rural cluster subdivisions can be one component of area-wide planning for conservation and development. The resource area planning approach required by the Alachua County Conservation and Open Space Element may typically map (in addition to wetlands and floodplains) farm fields, pastures, steep slopes, sinkholes, ridgelines and hilltops; high aquifer recharge areas; significant wildlife habitats; waterfront land; and scenic corridors. Rural cluster subdivisions allow new development at higher net densities outside such areas on a development parcel. In essence, rural cluster subdivisions are simply an internal transfer of density involving the same number of dwellings (Arendt, 1994: 253).

Transfer of Development Rights Program

The Comprehensive Plan provides for establishment of a voluntary Transfer of Development Rights (TDR) program as one of several tools to help protect agricultural land and uses. The TDR program provides a means to allow owners of rural property the option of protecting land in the rural area while still receiving an economic return. An owner that decides to participate in a TDR program relinquishes his or her right to develop the property at the maximum density allowed, in exchange for monetary compensation. The purchaser of the development rights is then allowed to develop at a density higher than the maximum allowed, based in part on the number of rights purchased.

A TDR program would include designation of sending areas and receiving areas for development rights. The sending areas are the areas to be preserved, and are based on factors such as viability of existing agricultural uses, soils, and general land use patterns. The receiving areas are based on appropriate infrastructure, environmental suitability, and capacity to absorb additional development potential.

The Rural Lands Stewardship Program, created by the 2001 Florida Legislature, may help Alachua County maintain the economic value of agricultural and silvicultural lands, while directing growth to locations within rural areas more-suitable for increased densities, mixed uses and cluster development, using transferrable land use credits. Once funded, landowners will be able to receive financial payments for one of the following arrangements: a protection easement lasting in perpetuity, a 30-year protection easement, or a 5-10-year protection easement. The easements are attached to the landowner's property deed. These easements may restrict the construction of buildings, roads, billboards, other advertising, or utilities; subdividing the property; dumping; or any activities that adversely affect the hydrology of the land, soil conservation, fish or wildlife habitat. The Act also requires that, concurrent with an agricultural protection agreement, the landowner must grant the state an option to purchase the property in fee simple at the conclusion of the agreement or an extension of up to five years with the right to purchase attached (Source: 1000 Friends of Florida). The Florida Department of Agriculture and Consumer Services is given the responsibility for implementing the program. However, until funding is provided, the Department is not prepared to enter into any agreements, although rule development is underway. The program is created through Ss. 570.70 and 201.15, F.S. The requirements of this program for designating 50,000 acres for sending areas and transferring the development within the rural area may not be advisable for Alachua County, however, due to the 1 unit per 5 acre density already allowed for rural residential development and the resulting transportation impacts within the rural area if density bonuses are allowed there.

Under Alachua County's proposal for developing a voluntary TDR program, a rural landowner

could choose to sell development rights equivalent to one dwelling unit per five acres, the maximum density currently allowed in the rural area to a designated area within the Urban Cluster or a municipality where infrastructure is available. The sending area that has successfully sold these rights will then be required to rezone to an Agriculture or Silviculture zoning district. Agricultural zoning can help reduce conflicts between farmers and nonfarmers, protect valuable soils, promote efficient and orderly growth, maintain a “critical mass” of agriculture as a viable industry in the local economy, as well as serving other public values such as retaining open space and protecting water and air quality. The Agriculture district is primarily for agricultural uses such as row crops, grazing land, and orchards, but also allows limited residential development at a maximum density of one unit per twenty acres. The Silviculture district is primarily for forestry or silviculture, but allows limited residential development at a maximum density of one dwelling unit per forty acres.

Some key components of a successful TDR program are:

1. Well defined and defensible sending and receiving areas must be established.

-legitimate public purpose to preserving the area defined as a sending area.

-the sending and receiving areas must be of adequate size to accommodate and create a viable market for the property right exchanges.

2. Program mandates.

-Owners of land in sending areas have no right to use their land other than in conformity with the plan (in Alachua County it has been proposed that land will be changed to appropriate zoning after the TDR sale is completed).

-The receiving areas must be adequately zoned so that added densities are encouraged, available, and feasible. (This concept incorporated from Transfer of Development Rights to Protect Water Resources. Strong, Ann Louise. Land Use Law, September 1998, Page 5).

3. TDRs are Part of a Multi-dimensional approach. Other incentives, such as tax breaks for agriculture, public purchase of land, purchase of development rights, urban growth boundaries, impact fees or concurrency requirements are also necessary to combat sprawl.

The determining factor, however, for the viability of any TDR program maybe that there must be a market demand for development at a density or intensity higher than that available under the current zoning (APA, Growing Smart).

Community and Neighborhood Planning Program

The Comprehensive Plan envisions greater involvement in the planning process through a community and neighborhood planning program. This program will empower communities and neighborhoods to address specific needs and circumstances of their area by incorporating their vision and goals into focused special area plans. These plans will include both urban and rural areas and promote more cohesive communities by utilizing the basic planning components of neighborhood, district, and corridor.

The neighborhood can range from a free standing village to part of a larger collection of neighborhoods and districts making up an urbanized town. Neighborhoods have distinct centers and edges, a balanced mix of uses, are walkable, structured by an interconnected network of streets, and prioritize public space. Corridors, of transportation or open space, can connect neighborhoods and districts, or act as natural boundaries between urban areas.

The neighborhood, district, and corridor are identified in the New Urbanist literature as the fundamental components for creating complete communities that mix uses, and for “integrating natural environments and man-made communities into a sustainable whole.” (*The New Urbanism*. Katz, Peter, 1994, p. xvii-xx.)

VIII. PUBLIC PARTICIPATION

The update of the Comprehensive Plan since the Evaluation and Appraisal report has included a public meeting process aimed at involving a cross section of community participants.

Phase 1 of this process, several town meetings were held around Alachua County to hear citizens express views on the main issues related to the Comprehensive Plan Update. Next a series of stakeholder meetings were held in 2000 to develop “Issue Papers” and prepare a Consensus Report. On January 8, 19 and 24, Town Meetings were held including the LPA and BoCC that resulted in the completion of the “Neighborhoods, Housing, and Mobility” Issue Paper. The LPA and BoCC held workshops on February 1 and 15, issuing the “Infrastructure, Utilities and Sustainable Construction” Issue Paper. During the February 29 LPA workshop, work was completed on the “Protection of Farmland and Existing Natural Areas, Environmental Education” Issue Paper. The March 21 BoCC Workshop completed the “Protection of Natural and Rural Areas” paper. “Jobs, Sense of Place and Protecting Rural and Natural Areas II” was compiled at public meetings with the LPA and BoCC on March 25, 29 and April 10. “Protecting Rural and Natural Areas III” was the result of a April 2 Town Meeting and May 2 LPA Workshop. A May 22 LPA workshop resulted in “Protecting Natural and Natural Areas.” A stakeholder and BoCC Workshop on June 14 completed the Consensus Report. A Land Use/Spatial Area-Based Analysis was completed on the GIS in August 2000.

Phase 2 of the public participation process began in Fall 2000 with a series of Joint Meetings of the LPA and BoCC. These meetings allowed public comment on draft policies for plan elements. The schedule included Solid Waste, Potable Water and Sanitary Sewer, Stormwater Management, and Housing on October 16. On October 23 the meetings discussed FLUE (Urban Residential), Recreation and Open Space (Recreation Goal), and Economic. FLUE and the Conservation/Aquifer Recharge Element were the topic on November 20. December 13 followed with Conservation/Aquifer Recharge (including Open Space part II), Recreation (resource-based), FLUE (part III), and Historic. This series concluded on January 24, 2001 with Conservation, Transportation, Intergovernmental Coordination, and FLUE.

The Local Planning Agency meetings also allowed formal citizen participation through public comment.

October 30 reviewed Stormwater Management, Potable Water and Sanitary Sewer, and Solid Waste.

November 15 included Housing, Recreation and Open Space (Goal I-Recreation), and Economic. Some elements were repeated, for example January 31 included Housing and Historic. FLUE (Rural Agriculture policies), Conservation and Open Space were discussed on February 19, and Transportation, and FLUE on February 26. March 19 covered FLUE, FLUE Map Series, Transportation, and Capital

Improvement. The LPA meeting on April 16, 2001 finalized the recommendations to the BoCC for all eleven elements.

The next phase of meetings were the BoCC Special Meetings held on April 30, and May 1, 21 and 29. A brochure was mailed out to all Alachua County property owners from the property tax records in early June, giving information about the Comprehensive Plan Update process. Public forums were held on June 13, 18 and 20 to allow discussion of the plan, and specifically the draft primary and secondary conservation resources map.

The Board of County Commissioners held Transmittal Public Hearings in 2001 according to the following schedule:

June 25	Conservation and Open Space
July 2	FLUE amendments - CPA-01-00, CPA-02-00, CPA-04-00, CPA-05-00
July 17	Housing, Recreation
July 23	Stormwater Management, Potable Water and Sanitary Sewer, Historic
August 6	Transportation Mobility, Capital Improvement
August 9	Solid Waste, Intergovernmental Coordination, Economic
August 23	All Elements for transmittal
August 30	Continued from 8/23/01, all elements approved for transmittal

At the time of the vote for transmittal, the BoCC also voted to continue public discussion on specific issues with a series of public forums. These were organized by County staff and included state and national experts speaking on the issue areas. The forums were held as follows:

Agricultural Protection Policies (October 31, 2001), Transportation Concurrency (November 26, 2001), High Aquifer Recharge Area Maps and Wetland Buffers (December 5, 2001), Rural Clustered Subdivisions (January 9, 2002), Urban Design (January 28, 2002) and Urban Services Line (February 18, 2002).

Adoption phase Public Hearings were held in March 2002.

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Support documents of the Alachua County Comprehensive Plan that specifically relate to TDRs include:

Save Your Rural Landscape by Using TDRS. May 1995, Montgomery County, Pennsylvania.

This report describes the Transfer of Development Rights (TDR) concept of preserving farmland and rural character while protecting property values and answers some commonly asked questions about TDRs.

Transfer of Development Rights: Cases, Statutes, Examples. November 1998. This APA Planning Advisory Service memo examines legal issues associated with TDRs and provides examples of TDR

programs.

Table 1. FORECAST DWELLING UNITS TO ACCOMMODATE FUTURE POPULATION OF THE URBAN CLUSTER						
<u>Dwelling units needed</u>	<u>2010</u>	<u>Refere</u>	<u>2010 to</u>	<u>Refer</u>	<u>Total</u>	<u>Refe</u>
Unincorporated population	114,251	1	13,150	2	127,401	1
<i>divided by</i>						
Average household size	2.20	3	2.20	3	NA	
<i>equals</i>						
Dwelling units	51,932		5,977			
<i>adjusted for vacancy</i>						
Total Dwelling Units Needed	57,703	4	6,641		64,344	
<i>minus</i>						
Existing units	52,500	5	NA	6	52,500	
<i>equals</i>						
New units needed	5,203		6,641		11,844	
<i>times</i>						
Market factor	2.00	7	NA		1.50	7
<i>equals</i>						
Total capacity needed	10,405		7,361		17,766	
<i>times</i>						
% low density	0.63	8	0.63	9		
<i>equals</i>						
units to be accommodated in low density land use category	6,555		4,637		11,193	
<i>and</i>						
Total additional units needed	10,405		7,361		17,766	
<i>times</i>						
% medium, med-high, and high	0.17	8	0.17	9		
<i>equals</i>						
units to be accommodated in med, med-high, & high density use categories	1,769		1,251		3,020	
<i>and</i>						
Total additional units needed	10,405		7,361		17,766	
<i>times</i>						
% "other"	0.20		0.20			
<i>equals</i>						
units to be accommodated in rural	2,081		1,472		3,553	

1. Source: BEBR and Alachua County Department of Growth Management , January 2001
2. Calculated based on 2020 projection minus 2010 projection
3. Shimberg report and Alachua County Department of Planning and Development, January 2001
4. Vacancy rate is assumed to be 10%

5. EAR Future Land Use Element Tables 18 and 23 for existing housing units in 1991, plus Building Permit data, 1992-00, from Alachua County. Department of Growth Management, Jan. 2001
6. No adjustment for existing units since this column is only for new units from 2010 to 2020
7. Established by proposed policy in the Alachua County Comprehensive Plan
8. Ratio of actual use in the EAR
9. Assumed to be constant through the planning period for purposes of calculations

TABLE 2. CALCULATION OF LAND NEEDED IN URBAN CLUSTER			
<u>Land Area Needed 2010</u>	<u>units</u>	<u>average</u>	<u>"new"</u> <u>acres</u>
low density residential land use	6,555	1.60	4,097
med, med-high, & high density residential	1,769	10.50	168
rural area	2,081	NA	NA
Total new acres needed in the urban cluster			4,265
From Table 1 of this worksheet.			

<u>Land Area Needed 2020</u>	<u>units</u>	<u>average</u>	<u>"new"</u> <u>acres</u>
low density residential land use	11,193	1.60	6,995
med, med-high, & high density residential	3,020	10.50	288
rural area	3,553	NA	NA
Total new acres needed in the urban cluster			7,283
From Table 1 of this worksheet.			

TABLE 3. ESTIMATE OF ALLOCATIONS TO NON-RESIDENTIAL USES

Vacant Land needed for new non-residential uses	<u>Acres</u>	<u>Reference</u>
Recreation	1,504	1
Institutional	1,305	2
Commercial, Office and Hotel	817	3
Industrial	314	3
	3,940	

1. This is the current allocation of land for recreation land use in the Urban Cluster, EAR Future Land Use Element Table 7. For purposes of estimating additional land needed for 2020, this current allocation has been used.
2. The existing institutional land use in the Urban Cluster of 4,050 ac, from the Dept. of Revenue land use codes, was divided by the total unincorporated population of 96,353 to derive a ratio of 42 ac of Institutional land per 1,000 population. This ratio was applied to the total 2020 unincorporated population of 127,401 to yield an estimated need for an additional 1,305 ac of Institutional land use in the Urban Cluster: $42 \text{ ac}/1,000 \times 127,401 = 5,355 \text{ ac} - 4,050 \text{ ac} = 1305 \text{ ac}$
3. This is the demand calculated for future acreage non-residential need allocation in the Urban Cluster from the Fishkind report (Fishkind and Associates, Activity Centers by Land Use and Geographic Distribution of Commercial Land Use Needs, March 2001).

Note: Fishkind also calculates capacity of existing Activity Centers to total 2,529 acres for all land uses.

TABLE 4. COMPARISON OF LAND NEEDED TO LAND AVAILABLE IN THE URBAN CLUSTER, YEAR 2020		
	<u>Acres</u>	<u>Refer</u>
Total land area (urban cluster)	45,437	1
<i>minus</i>		
Land in Right of Ways	4,135	1A
<i>minus</i>		
Estate Residential land use	5,137	2
Other existing exclusive residential land	11,755	3
<i>minus</i>		
Residential land use in other categories	1,933	4
<i>minus</i>		
Existing non-residential land use	6,876	5
<i>minus</i>		
Vacant land needed for new	3,940	6
<i>minus</i>		
Vacant land needed for new residential	7,283	7
<i>equals</i>		
Surplus within the urban cluster	4,378	8

1. County GIS, March 2001

- 1A. County GIS, March 2001.

2. EAR, Future Land Use Element, Table 7, total of all land designated for estate residential land use. The forecast of housing needs assumes that lands in estate residential will not be increased and that units accommodated on estate residential land have a de minimus impact on the future housing supply.

3. EAR, Future Land Use Element, Table 7, total of land actually used for low, medium, medium-high, and high density residential land use. This does not include vacant land in those land use categories.

4. EAR, Future Land Use Element, Table 7, total of land that is actually used for residential purposes, but is located on land designated in a non-residential (for example, commercial) land use category.

5. EAR, Future Land Use Element, Table 7, total of land that is actually used for the following purposes: commercial, industrial, institutional, activity centers, and recreation.

6. From Table 3 of this worksheet. This is an estimate of land to be allocated to the specified non-residential uses (based on forecasts of additional need), without regard to the current land use designations.

7. From Table 2 of this worksheet.

8. Distribution of future residential and non-residential uses would need to be consistent with Activity Center plans and mixed use policies

TABLE 4A. COMPARISON OF LAND NEEDED TO LAND AVAILABLE IN THE URBAN CLUSTER YEAR 2010

	<u>Acres</u>	<u>Referen</u>
Total land area (urban cluster)	45,437	1
<i>minus</i>		
Land in Right of Ways	4,135	1A
<i>minus</i>		
Estate Residential land use	5,137	2
<i>minus</i>		
Other existing exclusive residential land	11,755	3
<i>minus</i>		
Residential land use in other categories	1,933	4
<i>minus</i>		
Existing non-residential land use	6,876	5
<i>minus</i>		
Vacant land needed for new non-residential	3,940	6
<i>minus</i>		
Vacant land needed for new residential	4,265	7
<i>equals</i>		
Surplus within the urban cluster	7,396	8

1. County GIS, March 2001

- 1A. County GIS, March 2001.

2. EAR, Future Land Use Element, Table 7, total of all land designated for estate residential land use. The forecast of housing needs assumes that lands in estate residential will not be increased and that units accommodated on estate residential land have a de minimus impact on the future housing supply.

3. EAR, Future Land Use Element, Table 7, total of land actually used for low, medium, medium-high, and high density residential land use. This does not include vacant land in those land use categories.

4. EAR, Future Land Use Element, Table 7, total of land that is actually used for residential purposes, but is located on land designated in a non-residential (for example, commercial) land use category.

5. EAR, Future Land Use Element, Table 7, total of land that is actually used for the following purposes: commercial, industrial, institutional, activity centers, and recreation.

6. From Table 3 of this worksheet. This is an estimate of land to be allocated to the specified non-residential uses (based on forecasts of additional need), without regard to the current land use designations.

7. From Table 2 of this worksheet.

8. Distribution of future residential and non-residential uses would need to be consistent with Activity Center plans and mixed use policies

Table 5

Capacity of Urban Service Line (2010) For Residential Development

**Including the addition of parcels as approved by the BoCC
March 25, 2002 and April 8, 2002**

	<u>Urban Service Line Acreage</u>	<u>FLUM Designation Residential L,M,MH,H</u>	Development X Factor=		<u>Estimated Residential Developable Acreage</u>
Total vacant land area	13,173	8,366			
Vacant land in Primary Conservation	5,083	2,552	0.20	(*)	510
+ Vacant land in Secondary Conservation	6,067	4,532	0.75	(*)	3,399
= Total Vacant land in Conservation in U.S.L.	11,150	7,084			3,909
Total Vacant w/o Conservation Constraints	2,023	1,282	NA		1,282

Total Vacant Residential land available- Year 2010 5,191

Source: County GIS, August 2001 and updated March 2002

Notes: (*) Factor representing the estimated minimum of land identified as Primary and Secondary Conservation area on which development would be possible. The factors are based on the requirement for Primary Conservation areas with Strategic Ecosystems to protect 80% of the land per Conservation & Open Space Element Policy 4.10.5., and policies applicable to Secondary Conservation resources. Designated conservation land could yield additional development potential due to site-specific verification of location of conservation resources during development review, allowing for developing allowable gross density through clustering, and other approaches in the amended policies.

Residential land available for development	1,282	Vacant land available w/o Conservation Constraints
+	3,909	Vacant land constrained based on Dev. Factor (*)
equals	5,191	Vacant Residential land available- Year 2010

This exceeds the 4,265 acres needed for new urban residential use for Year 2010

See Map "Unincorporated Alachua County Future Land Use Map: 2020 for Urban Cluster and Surrounding Area with Urban Services Line."

TABLE 6

Capacity of Urban Cluster (2020) for Residential Development

	Urban Cluster Acreage	FLUM Designation Residential L,M,MH,H	Development X Factor		Estimated Residential Developable Acreage
Total vacant land area		16,562	11,618		
Vacant land in Primary Conservation	6,017	3,483	0.2	(*)	697
+ Vacant land in Secondary Conservation	7,394	5,759	0.75	(*)	4,319
=Total Vacant land in Conservation	13,411	9,242			5,016
Total Vacant w/o Conservation Constraints	3,151	2,376	NA		2,376
Total Vacant Residential land available- Year 2020					7,392

Source: County GIS, June 2001

Notes: (*) Factor representing the estimated minimum of land identified as Primary and Secondary Conservation area on which development would be possible. The factors are based on the requirement for Primary Conservation areas with Strategic Ecosystems to protect 80% of the land per

Conservation & Open Space Element Policy 4.10.5., and policies applicable to Secondary Conservation resources. Designated conservation land could yield additional development potential due to site-specific verification of location of conservation resources during development review, allowing for developing allowable gross density through clustering, and other approaches in the amended policies.

Residential land available for development	2,376	Vacant land available w/o Conservation Constraints
+	5,016	Vacant land constrained based on Dev. Factor (*)
equals	7,392	Vacant Residential land available- Year 2020

This exceeds the 7,283 acres needed for new urban residential use for Year 2020

See Map "Unincorporated Alachua County Future Land Use Map: 2020 for Urban Cluster and Surrounding Area with Urban Service Line."

TRANSPORTATION MOBILITY ELEMENT DATA AND ANALYSIS

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INTRODUCTION

The Transportation Mobility Element addresses long range planning for the provision of acceptable mobility for residents of unincorporated Alachua County. One goal of the Transportation Mobility Element is to “establish a multi-modal transportation system that provides for the needs of pedestrians, bicyclists, transit users, motorized-vehicle users, users of rail and aviation facilities, and is sensitive to the cultural and environmental amenities of Alachua County.” In the past more attention has been concentrated on automotive travel. The intent of the Transportation Mobility Element is to provide support for all modes of transportation.

Some major additions to the Transportation Mobility Element are the policies supporting Transportation Concurrency Exception Areas (TCEA), Transportation Concurrency Exception for Projects that Promote Public Transportation (PPPT), and Multi-Modal Transportation Districts (MMTD). A TCEA and a MMTD would both require a comprehensive plan amendment to designate specific areas, while a PPPT would not require a comprehensive plan amendment, but would be applied to specific projects meeting certain special standards. The comprehensive plan amendments would include data and analysis demonstrating that the proposed locations for a TCEA or MMTD are appropriate and meet the necessary statutory criteria. A brief synopsis of each of these alternative methods to transportation concurrency are identified below.

Transportation Concurrency Exception Area (TCEA):

- promote land use goals for redevelopment or infill in particular areas;
- require a specific transportation plan with pedestrian, transit and bicycle friendly design standards, and use of traffic calming techniques;
- development would have to mitigate transportation impacts;
- the Plan provides for consideration of a TCEA with the City of Gainesville to implement the recommendations of the SW 20th Avenue Charrette for the purpose of creating a pedestrian and bicycle-oriented student village.

Transportation Concurrency Exceptions for Projects that Promote Public Transportation (PPPT):

- allows exceptions from road level of service requirements for projects meeting requirements for access to public transit and design requirements that promote use of transit;
- located within 1/4 mile of an existing public transit line, or a planned public transit line, with 15 minute peak hour frequencies or equivalent alternatives that are funded and assured to be operational within the first phase of the development;
- have a main transit station in a commercial center, so that 80% of the residents/workers have walking access (i.e. within a 1/4 mile) of the station or a feeder system;
- contain a mix of uses and densities;
- meet standards for Traditional Neighborhood Developments, including pedestrian-friendly street design and building orientations;
- provide connections to adjacent and nearby uses;
- be located in the Archer Road/Tower Road Activity Center and the Springhills Activity Center designated on the Future Land Use Map.

Multi-Modal Transportation Districts (MMTD):

- give priority to pedestrians and connections to transit through adoption of an overlay zone incorporating a complementary mix and range of land uses of a density and intensity appropriate to support transit within walking distance;
- be designed to provide connectivity to minimize use of major thoroughfares;
- provide a neighborhood center;
- transportation modifications needed to support all transportation modes would have to be identified, and included in the Capital Improvements Program. The SW 20th Avenue Charette area is specifically noted as an area that could be considered for an MMTD.

The intent of each of the above concurrency management tools is to increase the use of non-automotive transportation methods by utilizing pedestrian and bicycle friendly design to increase accessibility and providing increased opportunity to bicycle, walk, or take the bus.

Bicycling is one of the transportation options that would be supported by the concurrency management tools. The recently completed Alachua Countywide Bicycle Master Plan identifies some of the reasons that bicycling is important to Alachua County. Some of these reasons include that:

- “Bicycling, along with walking and transit, provides residents and visitors with multiple transportation choices that increase their mobility and reduces traffic congestion.”
- “Bicycling is a necessary part of Alachua County’s transportation system.”
- “Bicycle facilities are needed to form important connections among the City of Gainesville, the University of Florida, and adjacent jurisdictions.”
- “Many people in Alachua County need an alternative method of travel.... Bicycling is an affordable option when compared to the expense of owning and operating an automobile (\$120/year compared to over \$5,000/year).”
- “Many trips made in Alachua County, and in particular the City of Gainesville, are short enough to be made by bicycle.”
- “Providing adequate and safe bicycle connections from the surrounding community to the University can increase the considerable number of bicyclists that ride to the campus and help to relieve traffic congestion on the major corridors into campus.”

The provision of acceptable mobility involves several aspects. Annual upkeep of existing facilities is vital to a well-functioning system. Paving, the replacement of deteriorating facilities such as bridges, drainage-improvement projects, and landscaping are but several examples of annual upkeep required to maintain existing conditions. Adding new facilities to improve pedestrian, bicycle, transit, and automobile mobility is yet another aspect of providing an acceptable transportation network. One method of tracking bicycle and pedestrian conditions and monitoring roadway conditions is through evaluation of the **level of service**. For bicycles, the Alachua Countywide Bicycle Master Plan provides qualitative measures describing the conditions impacting bicycle travel. These conditions are described with factors such as lateral separation between bicyclists and adjacent motor vehicle traffic, volume and speed of motor vehicle traffic, percentage of trucks, number of travel lanes, presence of a paved shoulder/bike lane, and pavement conditions. For automobiles, level of service is a qualitative measure describing operational conditions within a traffic stream, and the perception by motorists and/or passengers of those conditions. These conditions are generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

Alachua County must set level of service standards for automobiles for all arterial and collector roadways,

including county roads within municipalities. It must also set level of service standards for facilities within unincorporated Alachua County which are maintained by entities other than Alachua County (such as state-maintained facilities).

This Transportation Mobility Element is part of the Comprehensive Plan for unincorporated Alachua County. It is intended that this Element be applied in conjunction with the other elements of the Plan as an entirety, not as an individual, separate Element.

BACKGROUND INFORMATION

This section provides definitions and explanations of key components required in the analysis of the traffic circulation network.

ROADWAY NETWORKS

The network of roadways may be divided into the State Highway System, the County Road System, and the City Street System.

The State Highway System consists of the following:

- a. the Interstate System;
- b. the Intrastate Highway System.
- c. all rural arterial routes and their extensions into and through urban areas;
- d. all urban principal arterial routes;
- E. those urban minor arterial routes on the existing primary road system as of July 1, 1977, with the addition of segments of such routes which lie between and connect those parts of the routes previously included in the primary system and which are necessary to provide continuity to the system; except that no segment in excess of 2 miles shall be so added; and

The County Road System of each county consists of all collector roads in the unincorporated areas and all extensions of such collector roads into and through any incorporated areas, local roads specifically accepted for maintenance in the unincorporated areas, and all urban minor arterial roads not in the State Highway system.

The City Street System of each municipality consists of all local roads within that municipality, and all collector roads inside that municipality, which are not in the County Road system.

TRANSPORTATION CORRIDORS

The public purpose of establishing transportation corridors is to protect State and local government's ability to provide transportation infrastructure in the future. The identified need for corridors should be sufficient to acquire land. If the opportunity is lost to acquire sufficient right-of-way to establish needed transportation infrastructure, then economic development and growth management are weakened and the

cost to the taxpayers is increased.

Florida Transportation Plan

In order for transportation corridors to be established, the state adopted enabling legislation providing for transportation planning agencies to prepare and adopt a plan. Some of the transportation issues identified in the State Comprehensive Plan lend themselves to the transportation corridors approach. Within the Florida Transportation Plan, a selective focus on statewide and regional corridors is taken, rather than a comprehensive approach.

The statewide corridors address inter-regional corridor demand and are not specific to local traffic or heavy congestion. These corridors consider multi-modal alternatives to transportation; therefore, the corridor systems include the following: Statewide Highway Corridor, Statewide Aviation Corridor, Statewide Rail Corridor, and Statewide Water-Borne Corridor.

Unless designated otherwise, all section and half-section lines are generally designated Transportation Corridors.

FLORIDA INTRASTATE HIGHWAY SYSTEM PLAN

The Florida Intrastate Highway System Plan is a part of the Florida Transportation Plan addressing intrastate highway needs.

Roadway facilities established as part of the Intrastate Highway System Plan include: SR 26 from Gilchrist County to I-75, I-75 south to SR 331, SR 331 north to SR 20, SR 20 east to Putnam County and US 301 from Marion County to Bradford County.

FUNCTIONAL (AND OPERATIONAL) CLASSIFICATION

Functional classification is defined in Chapter 334.03 (11) F.S. as the assignment of roads into systems according to the character of service they provide in relation to the total road network. Basic functional categories include arterial roads, collector roads, and local roads which may be subdivided into principal, major, or minor levels. Those levels may be additionally divided into urban and rural categories.

Roadway functional classification is defined in Rule 9J-5 F.A.C. as "...the assignment of roads into categories according to the character of service they provide in relation to the total road network. Basic functional categories include limited access facilities, arterial roads, and collector roads, which may be subcategorized into principal, major or minor levels. These levels may be further grouped into urban and rural categories".

Chapter 334 F.S. provides definitions of roadway types such as interstates, arterials, principal arterials, minor arterials, and collectors. Rule 9J-5 F.A.C. in some cases provides slightly different definitions than those of Chapter 334 F.S. Both definitions are provided.

Interstate highways are also referred to as **limited access highways** and **freeways**. According to Chapter 334.03 (13) F.S., **limited access highways** are defined as a street or highway especially designed for through traffic, and over, from, or to which owners or occupants of abutting land or other persons

have no right or easement of access, light, air, or view by reason of the fact that their property abuts upon such limited access facility or for any other reason. Such highways or streets may be facilities from which trucks, buses, and other commercial vehicles are excluded; or they may be facilities open to use by all customary forms of street and highway traffic.

Limited access highways are defined in Rule 9J-5 F.A.C. as roadways especially designed for through traffic, and over, from or to which owners or occupants of abutting land or other persons have no greater than a limited right or easement of access.

Arterial roads are defined in Rule 9J-5 F.A.C. as roadways providing service which is relatively continuous and of relatively high traffic volume, long trip length, and high operating speed. In addition, every United States numbered highway is an arterial road.

Arterial roads are defined in Chapter 334.03(1) as a route providing service which is relatively continuous and of relatively high traffic volume, long average trip length, high operating speed, and high mobility importance. In addition, every United States numbered highway is an arterial road.

Urban principal arterial roads are defined in Chapter 334.03(35) as a route that generally serves the major centers of activity of an urban area, the highest traffic volume corridors, and the longest trip purpose and carries a high proportion of the total urban area travel on a minimum of mileage. Such roads are integrated, both internally and between major rural connections.

Collector roads are defined in Chapter 334.03 (4), F.S. as routes providing service which is of relatively moderate average traffic volume, moderate average trip length, and moderate average operating speed. Such a route also collects and distributes traffic between local roads or arterial roads and serves as a linkage between land access and mobility needs.

Collector roads are defined in Rule 9J-5 F.A.C. as roadways providing service which is of relatively moderate traffic volume, moderate trip length, and moderate operating speed. Collector roads collect and distribute traffic between local roads or arterial roads.

Local roads are defined in Chapter 334.03 (15), F.S. as routes providing service which is of relatively low average traffic volume, short average trip length or minimal through-traffic movements, and high land access for abutting property.

Local roads are defined in Rule 9J-5 F.A.C. as roadways providing service which is of relatively low traffic volume, short average trip length or minimal through-traffic movements, and high volume land access for abutting property.

LEVEL OF SERVICE

Level of service as defined by the 2000 Highway Capacity Manual is "a qualitative measure describing operational conditions within a traffic stream. Level of Service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of such service factor measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience."

Six LOS are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with LOS A representing the best operating conditions and the driver's perception of those conditions. Safety is not included in the measures that establish service levels. As noted above, each type of facility has a specific set performance measures by which LOS is determined. For example, measures may include speed, density and flow or volume, and the amount of control delay incurred at signalized intersections. The following definitions given below characterize LOS conditions for multilane highways but are general enough to convey the concept without becoming analytically complex.

Level of service A describes completely free flow conditions. The operation of other vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and by driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed without a change in travel speed.

Level of service B also indicates free flow, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver. Minor disruptions are still easily absorbed, although local deterioration in LOS will be more obvious.

Level of service C, the influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Minor disruptions can cause serious local deterioration in service, and queues will form behind any significant traffic disruption.

Level of service D, the ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and service deteriorating.

Level of service E represents operations at or near capacity, an unstable level. The densities vary and vehicles are operating with a minimum spacing for maintaining flow. Disruption cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F.

Level of service F represents forced or breakdown flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity of a planned facility. Although operations at these points-and on sections immediately downstream-appear to be at capacity, queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. Note that the term LOS F may be used to characterize both the point of the breakdown and the operating condition within the queue. Although the point of breakdown causes the queue to form, operations within the queue generally are not related to deficiencies along the highway segment.

The authority and requirement to establish level of service standards for limited access, arterials, and

collector roads is set in Florida Statute and by Administrative Rule.

Level of service can be analyzed using several methods ranging from detailed, individual analysis using the 2000 Highway Capacity Manual (HCM), to ARTPLAN, a computer spreadsheet developed by the FDOT based upon characteristics from the HCM, to generalized tables developed by the FDOT based upon the HCM.

Basic information required for purposes of determining levels of service based upon these generalized tables include: urban/rural classification, number of lanes, average daily traffic (ADT) count, length (in miles), number of signalized intersections per mile, and the functional classification. In addition, level of service can be affected by other factors such as presence or absence of left turn bays or an adjustment for a roadway that is undivided or divided.

Once the roadway type, number of lanes, the number of signals per mile, and any necessary adjustments are determined for a road segment, the ADT can be checked against the FDOT "Generalized Daily Level of Service Maximum Volumes for Florida's Urbanized (and Rural) Areas" table to determine the level of service at peak hour. (This table factors ADT to peak hour volumes using a "K" factor of approximately 9% of ADT. Site specific analysis of particular segments may result in indication of a different level of service that should be considered for specific project programming.)

DATA AND ANALYSIS

I. Existing Transportation System Levels of Service and Needs

A. Existing Level of Service Standards, Design and Operating Capacity

Policy 1.1.1 in the Comprehensive Plan lists the adopted Level of Service (LOS) standard for the various types of roads in Unincorporated Alachua County.

In this most recent version of the Comprehensive Plan (2002) Alachua County revised the LOS standard for state roads in the unincorporated area by raising the standard from LOS D to LOS C for two-lane state rural roads, except for three specified segments, which remain at LOS D. The LOS Standard for county-maintained rural collectors was revised from LOS D to LOS B, except for one segment which was raised to LOS C.

The attached Alachua County Level of Service Tables (Appendix) list the road segments with the adopted LOS standard and the maximum service volume for each segment.

The Future Traffic Circulation Map Series (FTCMS) consists of eight maps which include the roads functional classification and number of lanes for the years 2006 and 2020, with separate maps for the entire unincorporated county and the urban area for each category. These maps provide information regarding future changes in the road network.

B. Most Recent Estimates for Average Daily and Peak Hour Trips

The attached Alachua County Level of Service Tables identify the Existing Volume for roadways, basically the number of automobiles counted on a specific segment of road (Annual Average Daily Trips (AADT)) plus the reserved trips, which is the number of automobiles from approved development that has not yet been completed. The AADT are based on the traffic counts in the year 2000. The attached tables also include the remaining trips available on the road segments for automobile travel.

C. Existing Modal Split and Vehicle Occupancy Rates

The modal split for the area within the MTPO area is approximately three percent based on information from the MTPO.

D. Existing Public Transit Facilities

Table 1, below, provides a fiscal year comparison for the city routes, campus routes, and the total system for the past five years. The RTS table in the Appendix provides information for each of the Regional Transit System (RTS) routes for September, 2001 and for FY2001.

**TABLE 1
RTS RIDERSHIP FOR FY1997 TO FY2001**

Fiscal Year Comparisons	City	%Change from Previous Year	Campus	%Change from Previous Year	Total	%Change from Previous Year
FY1997	1,221,597	NA	947,676	NA	2,175,278	NA
FY1998	1,923,168	57.4%	985,049	3.9%	2,949,724	35.6%
FY1999	3,147,883	63.7%	1,184,643	20.3%	4,412,773	49.6%
FY2000	3,793,270	20.5%	1,281,250	8.2%	5,203,221	17.9%
FY2001	4,526,616	19.3%	1,620,287	26.5%	6,302,953	21.1%

RTS is in the process of completing a Comprehensive Operational Plan which will provide additional information about the future transit routes, service goals, trip generators, and attractors.

E. Population Characteristics, including Transportation Disadvantaged

As stated in the City of Gainesville Transportation Element Data and Analysis (Draft, January 25, 2001) - "The estimated walking distance (1/4-mile from routes) transit area population for the year 2000 is approximately 107, 300. For the year 2020, it is approximately 130,000."

The following table provides estimates of people “with transit-related disabilities for the city and the unincorporated portion of the urban area.”

**TABLE 2
PERSONS WITH TRANSIT-RELATED DISABILITIES**

Group	1980	1996	2001	2005	96-01 Change	Total Change
City* 16-64	843	993	1,050	1,098	57	207
City* 65+	1,040	1,314	1,419	1,509	105	379
Unincorp. 16-64	336	585	647	701	62	311
Unincorp. 65+	330	1,200	1,391	1,565	191	1,061
Total	2,549	4,092	4,507	4,873	415	1,958

City* is the City of Gainesville

Source: City of Gainesville, Transportation Element Data and Analysis, Draft January 25, 2001

Source cited by the City of Gainesville: Bureau of the Census, July 1983; Department of Community Development staff calculations, April 2000.

Numbers do not always total due to the use of samples and rounding error. Data for 2005 are extrapolated forward from 1996-2001 annual percentage increases for each age group. 2000 Census data are not available at this time.

F. Existing Characteristics of Major Trip Generators and Attractors

The major trip generators and attractors in Alachua County are predominantly educational institutions such as the University of Florida and Santa Fe Community College, hospitals and medical complexes, and designated activity centers. It is also anticipated that some of the smaller municipalities within Alachua County will begin to experience greater growth than they have ever experienced in the past.

II. Availability of Transportation Facilities and Services to Serve Existing Land Uses

As of February, 2002 there is one County maintained road segment and two State maintained road segments that exceed 100% of the adopted LOS capacity. There are six road segments that are County facilities and four road segments that are State facilities that are operating at over 85% of the adopted LOS capacity. All of these roadway segments are subject to additional analysis.

The County facility exceeding 100% of the adopted LOS capacity is:

- SW 20th Ave. from SW 62nd Blvd. To SR 121/W 34th St.

The six County facilities exceeding 85% of operating capacity include:

- SW 75th St. from SR 24/Archer Rd. to SW 8th Ave.
- SW 40th Blvd./SW 42nd/43rd St. from SR 24/Archer Rd. to SW 20th Ave.
- SW 20th Ave. from SW 75th St. to SW 62nd Blvd.
- NW 23rd Ave. from NW 98th St. to NW 55th St.
- NW 83rd St. from NW 23rd Ave. to SR 222/N 39th Ave.
- NW 43rd St. from SR 26/Newberry Rd. to NW 53rd Ave.

The first two of these segments each have less than 500 trips available before the capacity is exceeded.

The two State facilities exceeding 100% of the adopted LOS capacity are:

- SR 222/NW 39th Ave. from NW 98th St. to NW 43rd St.
- SR 26/Newberry Rd. from I-75 (east ramp) to NW 8th Ave.

The four State facilities exceeding 85% of operating capacity include:

- SR 24/Archer Rd. from I-75 to SR 226/SW 16th Ave.
- SR 121/SW 34th St. from SR 24/Archer Rd. to SR 26/Newberry Rd.
- SR 26/Newberry Rd. from SW 154th St. to NW 98th St.
- SR 24 from East City Limit of Archer to SW 91st Street (MTPO Boundary)

The two State facilities exceeding 100% of capacity are identified as constrained facilities in the Plan, SR 26 (Newberry Rd.), a principal arterial from Interstate 75 (east ramp) to NW 8th Avenue and SR 222 (NW 39th Ave.), a principal arterial from NW 51st St. to NW 43rd St. The designation as constrained facilities is based on the most recent available data (February, 2002). SR 26, as a six-lane facility, may not have additional lanes added. NW 39th Ave. is impacted by trips authorized within the City of Gainesville TCEA and would be a difficult facility to widen, due to the building setback along portions of the northern side of the segment. Policies are included which address future strategies for these facilities.

The road segments which exceed 85% of their capacity are located in the northwest and southwest portions of the urban area.. Conditions on some of these segments will be improved by other roadway projects that are proposed in the area and listed in the Capital Improvements Program. Other roadway segments are exceeding 85% of capacity due to large numbers of trip reservations granted for future development, including segments adjacent to or within the City of Gainesville and affected by the City's TCEA.. Most of the adjacent land on some of these roadway segments has little land available for development and additional traffic is expected to level off on these segments. The County will continue to implement TSM and TDM strategies on these segments and monitor them to determined if inclusion in the CIP is needed.

The Alachua Countywide Bicycle Master Plan addresses projects to increase the number of bicycle facilities in the county. The Bicycle/Pedestrian Advisory Board will prioritize both on-street and off-street bicycle facilities based on the information in the Alachua Countywide Bicycle Plan.

III. Adequacy of Existing and Projected Transportation System to Evacuate Coastal Populations

Prior to an Impending Natural Disaster

Alachua County is generally a place that people evacuate to or through when natural disasters necessitate evacuation. Over the past several years, there have been several evacuations in Florida for natural disasters including hurricanes and wildfires. There has not been a problem with the transportation system in Alachua County during any of these evacuations.

IV. Growth Trends, Travel Patterns, and the Interactions between Land Use and Transportation

As noted in the data regarding current LOS above, Alachua County is increasingly facing road related concurrency problems. There are numerous ways to respond to approaching and exceeding the road capacity for automobiles including reducing the LOS standard, increasing people's mobility by improving transportation options such as mass transit, bicycle and pedestrian options, amending the manner in which concurrency is regulated, and building additional lanes. There has been an increasing desire in Alachua County for alternatives to building additional lanes for automobiles, in part because pedestrian and bicycle comfort is reduced as the number of lanes is increased. Additionally, there is a lack of funds for construction of additional roads.

Another lesson that has been learned from concurrency management is that development is limited or, at times, shut down, on the roads surrounding the major trip attractors, but it continues further away from the core where capacity has not yet been reached. The development which is further out still generates more trips going to the major attractors, the LOS is exceeded, and development ends up occurring even further from the major attractors.

The concurrency management tools discussed below provide an alternative to the potential problem of development being pushed to the urban fringe due to concurrency constraints or the inability to proceed with redevelopment projects.

V. Existing and Projected Intermodal Deficiencies and Needs

The Livable Community Reinvestment Plan (LCRP) Needs Plan identified eight intermodal centers at the following locations - Airport, Butler Plaza, Oaks Mall, Royal Park, SFCC-Downtown, Shands, Springhills, and Tower Square. The Needs Plan identified 5 Park-n-Ride lots with express bus service at the following locations - Alachua, Archer, Hawthorne, Newberry, and Waldo.

The LCRP Cost Feasible Plan funded the Butler Plaza (Archer Rd. and I-75) intermodal center and the park-n-ride lots with express bus service in Alachua and Archer.

VI. Projected Transportation Levels of Service and System Needs based upon the Future Land Use Categories

A. Need for New Facilities

Current Status

There are currently (February, 2002) three County and State maintained facilities that exceed 100% of their capacity and 10 County and State maintained facilities that exceed 85% of their capacity with less than 500 trips available on two of these segments. There are several levels of increasingly segment specific analysis that can be utilized to determine the operating capacity of a road. Frequently, although not always, further analysis finds additional capacity on a road segment. Additional analysis has already been performed on seven of these 13 segments. One of the two segments with less than 500 remaining trips has had additional analysis performed.

Future Projections

The MTPO's Livable Community Reinvestment Plan (adopted December, 2000) forecasts traffic volumes for the year 2020 based on a computer model, FSUTMS. The Livable Community Reinvestment Plan (LCRP) provides future traffic volumes for three different scenarios, the Existing and Committed network (E + C), the Needs network, and the Cost Feasible network (CF). The E + C network consists of the current facilities and any facilities for which funding is committed within the next 5 years. Any projects which occur after 2006 would not be part of the E+ C network, because at this time, they are not funded. The Needs network consists of the projects identified which are necessary to maintain transportation mobility for the next 20 years. The Cost Feasible network consists of the projects from the Needs network that are financially feasible. The segments projected to exceed 85% of capacity or 100%of capacity are listed below for the E + C and the CF.

Alachua County calculates LOS for concurrency using AADT. The Alachua County Level of Service Tables (Appendix), which are used to determine available trips, identify the maximum service volume for each road and the current existing trip volume. For the Tables, several of the roads in the County have been analyzed with Art-Plan in order to more precisely determine their capacity. The Projected Peak Hour LOS Map is based on a straight-line projection of AADT, rather than a model, and provides just generalized LOS information.

The following table lists the roads which are currently or projected to exceed 85% or 100% capacity based on modeling done in connection with the Livable Community Reinvestment Plan developed by the MTPO.

TABLE 3**COMPARISON OF CURRENT AND PROJECTED FACILITIES EXCEEDING 85% OR 100% OF CAPACITY**

x - facilities exceeding 85% of capacity

XX - facilities exceeding 100% of capacity

	Current County Maintained Facilities above 85% or 100% of Capacity	Projected 2020 Existing & Committed Network (LCRP)	Projected 2020 Cost Feasible Network (LCRP)
County Maintained Facilities			
SW 75 th St. from SR 24/Archer Rd. to SW 8 th Ave.	x		
SW 20 th Ave. from SW 62 nd Blvd. To SR 121/W 34 th St.	XX		
SW 40 th Blvd./SW 42 nd /43 rd St. from SR 24/Archer Rd. to SW 20 th Ave.	x		
SW 20 th Ave. from SW 75 th St. to SW 62 nd Blvd.	x		
NW 23 rd Ave. from NW 98 th St. to NW 55 th St.	x		
NW 83 rd St. from NW 23 rd Ave. to SR 222/N 39 th Ave.	x	x	XX
NW 53 rd Ave. from NW 52 nd Terr. To US 441/W. 13 th St.		x	
NW 43 rd St. from SR 26/Newberry Rd. to NW 53 rd Ave.	x	XX	XX
NW 75 th St./Tower Rd. from W. University Ave. to SR 26/Newberry Rd.		x	
State Maintained Facilities			
SR 24/Archer Rd. from I-75 to SR 226/SW 16 th Ave.	x	x	
SR 26/Newberry Rd. from NW 98 th St. to I-75 (east ramp)		x	
SR 26/Newberry Rd. from I-75 (east ramp) to NW 8 th Ave.	XX	XX	XX
SR 121/SW 34 th St. from SR 24/Archer Rd. to SR 26/University Ave.	x	x	
SR 222/N 39 th Ave. from NW 98 th St. to NW 43 rd St.	XX		

SR 331/SR 121 from I-75 (south) to US 441/SW 13 th St.		x	x
I-75 from SR 222/NW 39 th Ave. to GMA Boundary			x
SR 121 from SW 85 th Ave. to I-75 (south)		x	x
SR 26/Newberry Rd. from SW 154 th St. to NW 98 th St.	x		x
SR 20/Hawthorne Rd. from CR 329B to GMA Boundary		x	XX
NW 39 th Ave. from NW 110 th St. to NW 98 th St.		XX	
NW 39 th Ave. from CR 241 to NW 110 th Terr.		XX	
SR 24 from East City Limits Archer to SW 91 st St. (MTPO Boundary)*	x	–	--

*This segment is outside of the MTPO boundary therefore it was not included in the LCRP 2020 model.

There are 10 County and State maintained facilities that are currently exceeding 85% and three that are currently exceeding 100% of their capacity. Based on the LCRP, there are projected to be four facilities which exceed 100% of capacity and nine facilities which exceed 85% of capacity in the year 2020 using the existing and committed scenario. There are projected to be four facilities exceeding 100% of capacity and four facilities exceeding 85% of capacity using the Cost Feasible scenario from the LCRP. Two of the six County maintained facilities that are currently exceeding 85% of capacity are projected to exceed 100% of capacity in 2020 (CFN), while the one County facility currently exceeding capacity is not projected to exceed capacity in 2020. Although, SW 75th Street is above 85% of capacity, a parallel route, SW 91st Street, was recently completed which provides an alternative route, likely reducing the automobile trips on SW 75th Street.

One of the three State maintained facilities within the MTPO boundaries that is currently exceeding 85% of capacity is projected to exceed 85% capacity in 2020 (CFN). One of the two State maintained facilities which is currently exceeding 100% of capacity is projected to exceed 100% capacity in 2020 (CFN).

In order to promote non-automotive transportation choices and make full use of roadway capacities, the Plan identifies a variety of concurrency management tools. These tools could include a variety of options such as Transportation Concurrency Exception Areas, Multi-Modal Transit Districts, Transportation Concurrency Management Areas, and Transportation Concurrency Exception Projects Promoting Public Transportation. These tools have specific requirements which, if met, allow development to proceed where the road capacity may have been exceeded under the concurrency management ordinance. These tools all require strong emphasis on the provision of pedestrian, bicycle, and transit facilities along with relatively specific design requirements.

A major revision to land use designations is not part of this update of the comprehensive plan.

The Urban Services Line added to the Future Land Use Map series will limit new residential developments in the western portions of the urban cluster. (See the Future Land Use Element for more details on the Urban Services Line).

The Activity Center plans are to be updated to provide better community design including improved pedestrian and bicycle access. One possible result of this could be to increase the residential land use and density within the activity centers and to increase the residential density adjacent to the activity centers to help achieve densities that are more supportive of transit.

B. Expansions of Non-Automotive Transportation Modes and Integration Among Various Transportation Modes

The Alachua Countywide Bicycle Master Plan was recently completed using a Bicycle Level of Service Model, based upon a Latent Demand Method, providing a detailed analysis of bicycle facilities and future options for modifications. This document, which was adopted by the County, will be used to assist with the prioritization of future bicycle facilities.

Several of the concurrency management tools require expansions of the opportunities for non-automotive transportation as part of their requirements. Additionally, there are design requirements included in the Comprehensive Plan, in both the Future Land Use Element and in the Transportation Mobility Element (as requirements under the concurrency management tools) that provide for improved bicycle and pedestrian design and connectivity and for improved integration among the various modes of transportation.

The Regional Transit System is currently completing a Comprehensive Operational Plan. This plan will be used to help establish future transit routes and transit level of service in conjunction with the City of Gainesville.

C. Impact of Transportation Concurrency Management Areas and Transportation Concurrency Exceptions

There are not currently any Transportation Concurrency Management Areas (TCMA) or Transportation Concurrency Exceptions in unincorporated Alachua County. Policies support the creation of Transportation Concurrency Exception Areas (TCEA) and Transportation Exception for Projects that Promote Public Transit (PPPT). The Archer Road/Tower Road Activity Center and the Springhills Activity Center are specified as possible locations for a PPPT.

A comprehensive plan amendment is required for the designation of a TCEA and would need to include appropriate data and analysis to show that the area meets the statutory criteria.

VII. Analysis of the FDOT Adopted Work Program and the MTPO Long Range Transportation Plan and Transportation Improvement Program

Major construction projects in Unincorporated Alachua County include widening NW 39th Ave from 2 lanes to 4 lanes at the I-75/NW 39th Ave. interchange, widening SR 20 from 2 lanes to 4 lanes from CR 325 to US 301, widening SR 26 from SR 45 to CR 241 (South), and extending SW

62nd Blvd. from SW 20th Ave. to SW 34th St.

The LCRP Cost Feasible Plan, in the Appendix identifies the SW 20th Charette projects as the top priority, followed by an extension of SW 24th Ave. from SW 34th St. to Archer Rd. The tenth prioritized item is projects related to the Bicycle Master Plan.

VIII. Level of Service Standards

A. Modifications Needed to Maintain the Adopted Level of Service

The Adopted Year 2020 Liveable Communities Reinvestment Needs Plan (Needs Plan), (see Appendix), indicates the modifications that are needed to maintain the LOS standard. There are still several segments, as indicated in Table 3, that will exceed 100% capacity even with completion of all of the projects included in the Needs Plan.

The Year 2020 Liveable Community Reinvestment Cost Feasible Plan (Cost Feasible Plan) in the Appendix, indicates the projects from the Needs Plan that have top priority and are financially feasible. There are four segments that are still projected to exceed the LOS standard in 2020, including NW 83rd St., NW 43rd St., SR 26, and SR 20.

SW 20th Ave. is paralleled by SW 24th Ave., which is scheduled for construction from SW 43rd St. to SW 34th St. in FY 02/03. It will connect with SW 62nd Blvd. which will be constructed from SW 43rd St. to SW 20th Ave. in FY 03/04. These new 2-lane roads will improve the grid network in the SW 20th Ave. area, providing additional alternative routes for non-automotive and automotive travel. Additionally, the comprehensive plan accepts the map and guidelines for the SW 20th Ave. Charette, and the SW 20th Ave. area is recognized as an area that might be appropriate for a TCEA or a MMTD. The intent of these concurrency management tools would be to create a pedestrian, transit, and bicycle oriented area supporting non-automotive trips. The SW 20th Ave. Charette projects are the first priority of the Cost Feasible Plan.

In order to address the remainder of the roads currently exceeding 85% of capacity TCEAs and MMTDs may be considered in appropriate areas along with options such as additional improvements for transit, reducing the LOS standard in appropriate areas, and continued efforts to provide bike lanes and sidewalks for non-automotive transportation.

The Plan update designates SR26 from I-75 to NW 8th Ave as a constrained facility because is already six lanes. The Plan also designates NW 39th Ave. from NW 43rd St. to NW 51st Street, which is adjacent to the City of Gainesville's TCEA as a constrained facility.

B. Relationship between Level of Service and Goals, Objectives, and Policies of the Comprehensive Plan

The purpose of the transportation element, based on 9J-5.019, “shall be to plan for a multi-modal transportation system that places emphasis on public transportation systems.”

The comprehensive plan would allow a variety of concurrency management tools which permit alternatives to the LOS standards. The TCEA allows a development to be excepted from roadway concurrency requirements, although the development must mitigate its transportation impacts, if it promotes urban redevelopment, urban infill, or the use of alternatives to the single-occupancy vehicle. A development which qualifies as a PPPT may also be excepted from roadway concurrency requirements if it meets the development standards which include locating within 1/4 mile of a transit line with 15 minute peak hour headways and a number of design standards to improve pedestrian and bicycle access to the bus stops. A development which meets the requirements of an MMTD, if designed as a TND, may also be excepted from roadway concurrency requirement. Some of these concurrency management tools allow options for developments to be excepted from the concurrency requirements by providing a performance based standard as opposed to a capacity based standard in order to improve the opportunity for people to use mass transit or other forms of non-automotive travel. This supports the purpose of 9J-5 for multi-modal transportation systems and especially for an increase in use of mass transit. Many of the requirements of these concurrency management tools are also consistent with the policies in other parts of the plan for improved neighborhood design, improved pedestrian access, etc.

IX. Internal Consistency of the Comprehensive Plan Relative to Transportation, Land Use, and Availability of Facilities and Services

One of the major revisions to the Transportation Mobility Element involves the support for the concurrency management tools, TCEA, PPPT, and MMTD. Each of these require specific standards for pedestrian, bicycle, transit and automotive facility design, such as TME policies 1.2.4, 1.2.12, 1.3.3, 1.3.7, and 1.3.9. The FLUE also supports design standards for facilities with requirements addressing the needs of pedestrian, bicycle, transit, and automotive users with policies including FLU policies 1.4.2, 1.6.6, 1.6.9, 2.1.8, 2.1.11

A similarity between TME policies relating to concurrency management tools and revisions to the FLUE include the support for Traditional Neighborhood Developments, including similar, consistent design requirements. Additionally, in the case of the PPPTs, TNDs are specifically referred to as part of the design requirements.

Each of the concurrency management tools requires adoption of connectivity index standards to ensure appropriate levels of internal and external connections for bicycles, pedestrians, transit, and motorized vehicles. This is consistent with FLUE Policy 1.6.4 and Policy 1.6.9 regarding village center development.

The Intergovernmental Coordination Element (ICE) supports Alachua County and the municipalities engaging in joint planning. TME Policy 1.2.2 specifies that a joint Special Area

Study to identify a TCEA with the City of Gainesville will be conducted. TME Policy 1.2.7 includes both the FDOT and the City of Gainesville, and any other municipalities as organizations to coordinate for a TCEA. This is consistent with policies in the ICE.

TME Policy 1.1.8 specifies that developments which qualify under one of the concurrency management tools (TCEA, PPPT, MMTD) do not have to meet the concurrency requirements except as indicated in the appropriate policies. This is consistent with CIE Policy 1.3.2-C which allows the exceptions to the basic road concurrency requirements specified in TME Policy 1.1.8.

X. Land Use and Transportation Management Programs Needed to Promote and Support Public Transportation Systems in Designated Public Transportation Corridors

One of the concurrency management tools included in the Plan is the Transportation concurrency Exception for Projects that Promote Public Transportation (PPPT). The policies allow the use of a PPPT in the Archer Rd./Tower Rd. Activity Center and the Springhills Activity Center. The LCRP discussed Archer Rd. as a radial transit-oriented corridor and the CFN includes a bus service enhancement along Archer Rd.

XI. Analysis of Community Design Elements for Specified Multimodal Transportation Districts and Impact on Vehicle Miles Traveled and Multimodal Transportation System

Alachua County proposes to include policies that would support the creation of Multi-Modal Transportation Districts (MMTD), as allowed by Ch. 163.3180 F.S.. The MMTD allows “primary priority to assuring a safe, comfortable, and attractive pedestrian environment, with convenient interconnection to transit” with “secondary priority to vehicle mobility”. An analysis based on multimodal level of service methodologies is required by state law that demonstrates that there will be an adequate level of mobility within the district. A comprehensive plan amendment would be required to designate an overlay zone delineating the MMTD. A MMTD is required to include a mix of land uses with a density and intensity to support transit, which must be located within walking distance. Basic design elements in the policies include connectivity standards, bicycle, pedestrian, and roadway connections within the district to the maximum extent possible, developments orienting pedestrian access to transit centers, pedestrian accessibility to building entrances from the street (not requiring the pedestrian to cross the parking area to get to an entrance), and required sidewalk connections.

The policies in the comprehensive plan provide specific design elements for a Traditional Neighborhood Development (TND) in a MMTD. The TND design standards include mixed uses, a walking distance of approximately 1/4 mile, streets, alleys, sidewalks, street furniture, public greens, a neighborhood center as a focal point, a bicycle and pedestrian circulation system, traffic calming, direct pedestrian access to buildings from the street, etc. A development that meets all of the TND requirements that is located within a MMTD is excepted from roadway concurrency requirements.

The guidelines and map for the SW 20th Avenue Charrette and the standards and recommendations for the Tower Rd. Charrette were both accepted by the County in the Transportation Mobility Element. One intent of both of these charrettes is to provide bicycle, pedestrian, and transit friendly design to increase the use of non-automotive transportation.

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**HOUSING ELEMENT
DATA AND ANALYSIS**

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Introduction

The Housing Element is part of the Comprehensive Plan for unincorporated Alachua County. It is intended that this element be applied in conjunction with the other elements of the plan in its entirety, not as an individual, separate element.

The inventory and data analysis section of this element evaluates existing housing conditions within the County and provides projections and analysis for the future housing needs of the County, emphasis is placed on identifying and projecting deficits in the housing supply for moderate, low, very low income households and those with special needs. A set of Goals, Objectives and Policies provide direction for meeting the housing needs of the County. Rule 9J-5.010 from the *Florida Administrative Code* lays out the data and analysis requirements which are to be included in the Housing Element of the local Comprehensive Plan.

Much of the data used to project the future needs for very low, low and moderate income housing groups comes from the *Affordable Housing Needs Assessment (AHNA)* provided from the Shimberg Center for Affordable Housing. The data provided in the *AHNA* is to assist local communities with developing and writing their comprehensive plans. There are limitations to the data and these limitations have been noted where relevant throughout this document. It should also be noted that the most recent *AHNA* available at the time of drafting this document was the 1998 assessment, which is based on the 1990 U.S. Census and 1995 BEBR (Bureau of Economic and Business Research) projections. Projections are made out to 2010. The local population and housing data based on the 2000 US Census is not scheduled to be released until later in 2002. Policy 1.1.3 in the transmitted Housing Element provides that a more extensive study of the housing market and needs be conducted prior to the drafting of the affordable housing ordinance, which is directed by Policy 1.1.6.

I. Inventory Data--9J-5.010

The items included below are the data required under Rule 9J-5.010 for the Housing Element of the Comprehensive Plan. The inventory and analysis data, unless otherwise noted, is from the *Affordable Housing Needs Assessment (AHNA)* provided by Shimberg Center for Affordable Housing. The data was compiled by the Shimberg Center using data from the 1990 Census of Population and Housing (CPH), US Census and BEBR (Bureau of Economic and Business Research). The *AHNA* includes data for the whole County and for each municipality. When possible, the data for both the unincorporated area of the County and for the whole of Alachua County has been presented for comparative purposes.

Characteristics of Existing Housing

Table 1, Housing Units by Type

	Single Family		Multi-family		Mobile Home		Other		Total	
Unincorporated County	17,288	44.7%	12,619	32.7%	8,373	21.7%	368	1.0%	38,648	100.1%
County Total	40,874	51.7%	27,255	34.5%	10,196	12.9%	697	0.9%	79,022	100%

Source: Shimberg Analysis, US Census, STF 3A, Table H20, 1998.

Table 1 is a comparison of housing units by type. Approximately 45% of the dwelling units in the unincorporated area of the County are single-family residential, which includes one unit attached and detached. Mobile homes meet approximately 22% of the housing needs for the unincorporated area while they meet only 13% of the need for the whole County.

Table 2, Housing Units by Tenure

	Total Occupied Units		Owner Occupied Units		Renter Occupied Units	
Unincorporated	34,211	100%	19,704	57.6%	14,507	42.4%
County Total	71,258	100%	38,525	54.1%	32,733	45.9%

Source: Shimberg Analysis, US Census, STF 1A, Table H3, 1998.

Table 2 shows the dwelling units by tenure (owner or renter occupied), it also includes the units which were vacant during the census. The units which were vacant, for sale, or for rent during the Census were placed in owner or rental category based on the distribution of the other units (Shimberg Users Guide). Approximately 58% of the units in the unincorporated County are owner occupied.

Table 3, Housing Units by Age, 1990

	1980 to March 1990		1970-79		1960-69		1950-59		1940-49		>1939	
Unincorporated	18,306	47.4%	13,516	35%	3,682	9.5%	1,676	4.3%	763	2%	705	1.8%
Alachua County	27,003	34.2%	24,253	30.7%	13,307	16.8%	7,210	9.1%	3,788	4.8%	3,461	4.4%

Source: Shimberg Analysis, 1990 CPH, Table 32, STF 1A.

Table 3 shows the breakdown of the age of units by decade in the County as a whole and the unincorporated part. The percentage column indicated the share by decade of the housing stock.

Table 4, Monthly Contract Rent

Gross Rent	Unincorporated County Number (Percentage of Total)		Alachua County Number (Percentage of Total)	
0-\$299	2,152	(15.10%)	7,627	(23.51%)
\$300-\$549	8,613	(60.49%)	17,646	(54.37%)
\$550-\$999	2,659	(18.66%)	5,707	(17.57%)
\$1000 or more	168	(1.18%)	372	(1.15%)
No Cash Rent	561	(3.94%)	1,097	(3.38%)
Total	14,253		32,449	

Source: Shimberg Analysis, 1990 CPH, STF 3A, Table H43.

Note: Table excludes one family houses on 10 acres or more from the count of specified renter-occupied units.

Table 4 shows the monthly contract rent. Approximately 53% of the rent for the unincorporated County is between \$300 and \$499 per month.

Table 5, Value of Owner Occupied Housing Units

	Unincorporated County		Alachua County	
Up to \$29,999	753	6.49%	2,266	8.10%
\$30,000 - \$49,999	1,930	19.22%	6,338	22.67%
\$ 50,000 - \$74,999	3,208	27.64%	8,603	30.75%
\$ 75,000 - \$124,999	3,781	32.57%	7,491	26.78%
\$125,000 or more	1,935	16.67%	3,274	11.71%
Total	11,607		27,970	

Source: Shimberg Analysis, 1990 CPH, STF 3A, Table H61

Note: Specified owner occupied units "include only one family houses on fewer than 10 acres without a business or medical office on the property. The data...exclude mobile homes, houses with a business or medical office, houses on 10 or more acres, and housing units in multi-family buildings."

Table 6, Gross Rent as a percentage of Household Income, Unincorporated County

Income Range	Less than \$10,000	\$10,000-\$19,999	\$20,000-\$34,999	\$35,000-\$49,999	\$50,000 or more
Less than 30%	227	1,329	2,623	1,059	639
30%-34%	184	680	234	13	0
35% or more	4,312	1,598	174	13	0
Not Computed	863	147	96	49	13

Source: Shimberg Analysis, 1990 CPH, Table 33 or Table H50, STF 3A.

Table 7, Percentage of Households paying 30% or more of their income for Gross Rent, specified renter occupied housing units.

	Unincorporated County	Alachua County
Less than \$10,000	95.2%	90%
\$10,000 to \$19,999	63.2%	59.6%
\$20,000 to \$34,999	13.5%	13.4%
\$35,000 to \$49,999	2.4%	2.8%
\$50,000 or greater	0.0%	0.0%

Source: Shimberg Analysis, 1990 CPH, Table 33 or Table H50, STF 3A.

*Note: The Census excludes one-family houses on 10 acres or more from the count of specified renter-occupied units.

Table 8, Percentage of Households paying more than 30% of their income for Owner-occupied Housing Units

	Unincorporated County	Alachua County
Less than \$10,000	53.5%	59.9%
\$10,000 to \$19,999	47.1%	41.2%
\$20,000 to \$34,999	24.2%	19.1%
\$35,000 to \$49,999	8.9%	6.1%
\$50,000 or greater	1.8%	1.7%

Source: Shimberg Analysis, 1990 CPH, Table 33 or Table H59, STF 3A.

Note: Specified owner occupied units "include only one family houses on fewer than 10 acres without a business or medical office on the property. The data...exclude mobile homes, houses with a business or medical office, houses on 10 or more acres, and housing units in multi-family buildings."

Substandard Housing Units

The Shimberg Center uses the US Census numbers which show “the number of dwelling units lacking complete plumbing, lacking kitchen facilities, lacking central heating and overcrowded” to determine local housing conditions. Shimberg notes that the Census data does not measure “livability” or “quality of dwelling”. For the purposes of the Housing Element, the Shimberg numbers, derived from the 1990 US Census are being used to determine substandard housing units. It should be noted that the Alachua County Housing Authority, in cooperation with the County will be conducting a Substandard Housing Study for the County. The results are expected by the end of 2002.

Table 9, Overcrowded Units, 1990

	Number of Units with 1.01 or more persons*	Share of Occupied Units
Unincorporated County	1,211	3.5%
Alachua County	3,055	4.3%

Source: Shimberg Analysis, US Census, STF 1A Table H21.

Table 9 shows the number and percentage of units considered overcrowded. For the purposes of this study dwelling units with more than 1.01 persons per bedroom was considered overcrowded. Less than 5% of the units in the unincorporated area of the County and in the County as a whole were considered overcrowded.

Table 10, Houses lacking heating, kitchen or plumbing facilities, 1990

	House Heating Fuel*		Kitchen Facilities^		Plumbing Facilities^	
	No Fuel Used	Share of occupied units	Lacking Complete Kitchen Facilities	Share of occupied units	Lacking Complete Plumbing Facilities	Share of occupied units
Unincorporated County	133	0.4%	268	0.7%	314	0.8%
Alachua County	361	0.5%	497	0.6%	562	0.7%

Source: Shimberg Analysis, 1990 CPH, Table 32.

*Occupied housing units

^All housing units

Table 10 shows the number of units that lack heating, complete kitchen facilities or complete plumbing facilities. As can be seen from the table less than 1% of the occupied housing units lack heating facilities and less than 1% of all housing units lack complete kitchen or plumbing facilities.

Inventory of renter-occupied housing developments
using federal, state or local subsidies

Table 11, Renter-occupied housing using subsidies, Unincorporated Alachua County

Development	Location	Number of Subsidized Units	Subsidy Type
Madison Cove	5000 Archer Road	97	FHFC*/HOME/Housing Credits
Majestic Oaks	5800 SW 20 Ave.	172	HUD**/ 221(d)(4)/Market Rate
New Horizons	4300 SW 13 St.	8	HUD/202 Direct Loan (elderly)
Pine Meadows	7025 W. University Ave.	78	HUD/FHFC/ 221(d)(4)/Market Rate
Reserve at Kanapaha	4440 SW Archer Road	272	FHFC
Santa Fe Oaks 1 & II	8203 NW 31 Ave.	195	FHFC/Housing Credits
Harbor (University) Cove	66931 W. University Ave.	208	FHFC

*FHFC: Florida Housing Finance Corporation

**HUD: Department of Housing and Urban Development

Source: Shimberg Center Compilation, 2002 and County staff information.

Table 11 lists rental apartments, located in the unincorporated area of the County which were built with subsidy from various federal, state and local programs. Some are rent restricted, where there is a maximum rent that can be charged for the units and the units can only be rented to people that fall below certain income limits, others base the rent on the tenant's income. The type of subsidy determines the restrictions.

In addition to the inventory listed in Table 11, the Alachua County Housing Authority has 316 public housing units (which they own and operate). One hundred sixteen (116) of the units are located in the unincorporated area of the County. The remaining 200 are located in within the municipal limits of the cities within Alachua County. The Housing Authority also has 472 Section 8 certificates and vouchers (75 of which are reserved for the elderly or disabled). The waiting list for Section 8 certificates with the Alachua County Housing Authority has approximately 1,100 families and has been closed since July 2001. The approximate waiting time for a Section 8 certificate or voucher is 3.5 years.

Group Homes Inventory

Table 12, Inventory of Group Homes

Name	Address	Type	Capacity
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Al'z Place	3303 NW 83 ST, Gainesville	ALF	26
Alachua ARC GH 4	3630 NW 71 ST, Gainesville	Group Home	7
Alachua ARC 5	7810 SW 75 ST, Gainesville	Group Home	8
Alachua ARC 7	4617 NW 33 CT, Gainesville	Group Home	6
Edengardens	1415 Ft. Clark Blvd., Gainesville	ALF	100
Elevations Group Home	7202 W. State RD 235	Group Home	6
Elevations Group Home 3	1826 SE 51 ST, Gainesville	Group Home	6
Grandville Group Home	5106 SW 63 Blvd., Gainesville	Group Home	6
Guin's Manor	6606 SW 59 ST, Gainesville	Group Home	6
Hu Group Home 3	7502 NW 14 Ave., Gainesville	Group Home	6
HU Group Home 1	1259 NW 60 ST, Gainesville	Group Home	6
Jackson Group Home 1	11521 NE 81 ST, Gainesville	Group Home	5
Jackson Group Home 2	8702 NE Waldo Road, Gainesville	Group Home	4
Johnson Group Home	2935 SW 56 Ave, Gainesville	Group Home	6
McBride Group Home	2891 SE 15 ST, Gainesville	Group Home	6
Melrose County Manor Christian	24715 NE SR 26, Melrose	ALF	8
Misty Meadows	103 NW 298 ST, Newberry	ALF	15
NF Retirement Village	2801 NW 83 ST, Gainesville	ALF	282
Positive Images GH 1	3711 SE 18 Ave., Gainesville	Group Home	5
Serenity Group Home	5026 SW Archer Road, Gainesville	Group Home	4
SW Retirement Home	3207 SW 42 PL, Gainesville	ALF	12
Vera's Grove	7507 SW 75 Street, Gainesville	ALF	4

Source: DCF Adult and Developmental Disabilities Program Office and Agency for Health Care Administration, 2001.

Table 12 lists the group homes and adult living facilities (ALFs) currently licensed by the State of Florida, in the unincorporated area of the County. The inventory shows there to be 15 group homes, with a capacity of 87 beds and 7 ALFs with a capacity of 447 beds.

Inventory of Mobile Home Parks licensed by the State of Florida

Table 13, Licensed mobile home parks located in the unincorporated area of the County.

Name	Location	Licensed Capacity
Alamar Gardens*	4400 SW 20 Ave Gainesville, 32607	224

Arredondo Farms*	7117 SW Archer Rd.	Gainesville, 32608	441
Brittany Estates	5010 NE Waldo Rd	Gainesville, 32609	172
Clayton Estates	100 Castle Drive	Gainesville, 32607	462
Cross Creek Mobile Estates*	14402 SE 174 PL	Hawthorne, 32640	13
Cross Creek Residence Inn	14301 SE CR 325	Hawthorne, 32640	3
Elwood Trailer Park	7330 NE Waldo Rd.	Gainesville, 32609	8
Hillcrest Mobile Home	3009 SE Hawthorne RD	Gainesville, 32641	100
Kanapaha Highlands*	SW 84 Blvd	Gainesville, 32608	84
Oak Park Village*	4000 SW 47 Street	Gainesville, 32608	347
Palmeters Cross Creek Lodge	14430 E CR 325	Hawthorne, 32640	4
Pinehurst Trailer Park	3530 SW 24 Avenue	Gainesville, 32607	146
Progress MHP	12105 Hwy 441	Gainesville, 32609	15
Steves Service & Trailer Park	7330 NE Waldo Rd	Gainesville, 32601	6
Sunshine MHP	4139 SW Archer Rd.	Gainesville, 32608	100
Windmeadows MHP	3540 SW Archer Rd	Gainesville, 32608	315

* indicates a mobile home subdivision

Source: Florida Department of Health, Environmental Health Division, 2002 Tracking Sheet

Table 13 lists the mobile home parks, located in the unincorporated area of the County which have been licensed by the State through the Department of Health. The listing for the entire County shows there to be 3,451 mobile home spaces in 33 licensed mobile home parks. Sixteen of the parks are located in the unincorporated area of the County, with 2,440 spaces. Seventy-one percent of the licensed spaces are in the unincorporated portion of the County. Please note this table lists only the mobile home spaces located in licensed parks. It does not account for mobile homes located on individually-owned parcels, not associated with any parks throughout the unincorporated County. Mobile homes are allowed by right in the “R-1c” (Single-family) and “A”(Agriculture) zoning districts, as well as the “RM”(Manufactured/Mobile Home Park) district.

Inventory of historically significant housing listed on the Florida Master Site File, National Register of Historic Places or designated as historically significant by or in accordance with a local ordinance

The County has consolidated the material related to historic housing and neighborhoods in the Historic Element. Please see the Historic Element and the related data and analysis for a listing and discussion of historically significant housing.

Housing Construction Activity

Table 14, Building Permit Data, 1995 to 2001

	Single Family*	Multi-Family		Mobile Homes^	Total
2001	784	104 Buildings	1,256 Units	321	2,361
2000	714	71 Buildings	657 Units	347	1,718
1999	782	93 Buildings	1,463 Units	472	2,717
1998	757	79 Buildings	1,022 Units	568	2,347
1997	740	44 Buildings	335 Units	611	1,686
1996	656	38 Buildings	693 Units	612	1,961
1995	546	44 Buildings	718 Units	553	1,817

Source: Alachua County Building Permit Data

*Single Family includes single family detached, attached and duplex.

^ Total number of permits, includes new and replacement mobile home permits.

Table 14 shows the housing construction for the unincorporated County since 1995. Building permits issued have averaged 711 single-family and 698 multi-family units per year between 1995 and 2001, with an average of 498 mobile home permits issued each year. Of the mobile home permits, a portion are for replacement mobile homes. In 2001, 199 of the mobile home permits were for new homes and 122 were replacement mobile homes.

II. Analysis Requirement--9J-5.005(2).

The preceding section, inventoried the unincorporated County’s current housing stock in order to get a picture of the housing stock in the unincorporated area of the County. This section, the analysis, projects various housing needs out to 2010. Please note, much of the data and projections used (unless otherwise noted) are from the *1998 Affordable Housing Needs Assessment (AHNA)* done by the Shimberg Center for Affordable Housing. The *AHNA* projections use 1995 as a base year. The 1995 base population data used is from BEBR (Bureau of Economic and Business Research), and uses the middle range of the population projections (BEBR provides low, medium and high projections). Previous trends from the jurisdiction are used to project future populations. Conditions not reflected are recent annexations, and recent, large development projects. A further discussion of the methodology used in the *AHNA* can be found in the *Users Guide, Affordable Housing Needs Assessment Methodology*.

Policy 1.1.3 of the Housing Element requires the County to undertake a study which will look at the affordable housing needs of the County in greater detail, the results of which will be one of the bases for the Affordable Housing Ordinance, which is directed by Policy 1.1.6. The study is targeted to be complete by the Fall of 2002. In the process of the study, directed by Policy 1.1.3 we anticipate updating the *AHNA* with Census 2000 numbers and local inventory data gathered during the study phase.

Projection of the anticipated number of households by size and income range

Table 15, Projected number of households by size, Unincorporated-area of County

Size	1990	1995	2000	2005	2010
1 person	9,052	9,330	10,480	11,522	12,621
2 persons	12,528	12,902	14,627	16,376	18,204
3-4 persons	10,316	10,751	12,129	13,157	14,075
5 to 7 persons	2,347	2,449	2,756	2,911	3,037
Total	34,243	35,432	39,992	43,966	47,937

Source: Shimberg, AHNA, US Census special tabulation of STF3A.

Table 15 is a projection of households by household size, to the year 2010.

Tables 16 and 17 estimate the number of households by income and tenure. These are estimates based on a 1998 Shimberg analysis of the 1990 US Census. Only the resident population is projected by these numbers, institutional populations, such as college students are removed prior to population projections. (Shimberg).

The *AHNA* breaks the income groups into smaller increments, for the purposes of the data analysis, these groups were merged. The more *AHNA* table down can be found in the appendix.

Table 16, Projection of households by income range, Owner-occupied

Income	1990	1995	2000	2005	2010
\$0-\$15,000	3,889	3,937	4,513	5,139	5,789
15,000-25,000	3,424	3,498	3,977	4,429	4,885
25,000-30,000	1,612	1,650	1,870	2,054	2,253
30,000-37,500	2,298	2,389	2,707	2,968	3,203
37,500-47,500	2,813	2,903	3,294	3,598	3,884
47,500-55,000	1,525	1,597	1,825	1,992	2,136
55,000-100,000	3,531	3,738	4,297	4,748	5,115
100,000-150,000	699	749	870	974	1,055
150,000 +	383	411	480	552	612
Total	20,174	20,872	23,833	26,454	28,932

Source: Shimberg, Special Tabulation of US Census, STF 3A.

Table 17, Projection of households by income range, Renter-occupied

Income	1990	1995	2000	2005	2010
\$0-\$15,000	7,456	7,752	8,653	9,439	10,297
15,000-25,000	3,131	3,213	3,547	3,828	4,142
25,000-30,000	1,002	1,009	1,102	1,181	1,275
30,000-37,500	862	878	962	1,027	1,099
37,500-47,500	850	875	962	1,033	1,111
47,500-55,000	226	235	261	280	303
55,000-100,000	451	499	560	609	658
100,000-150,000	42	45	50	54	54
150,000 +	49	56	63	68	73
Total	14,069	14,562	16,160	17,519	19,012

Source: Shimberg, Special Tabulation of US Census, STF 3A.

Projected Housing Need of Current and Future Residents

Table 18, Projected Number of Households by Tenure for unincorporated County

1995 Baseline		2000		2005		2010	
Owner	Renter	Owner	Renter	Owner	Renter	Owner	Renter
20,872	14,559	23,830	16,165	26,445	17,519	28,933	19,005

Source: Shimberg, AHNA

Table 19, Projected Growth in Households by Tenure for Unincorporated County

1995 Baseline		2000		2005		2010	
Owner	Renter	Owner	Renter	Owner	Renter	Owner	Renter
20,872	14,559	2,958	1,606	5,573	2,960	8,061	4,446

Source: Shimberg AHNA

Table 20, Projected Housing Demand by Housing Type for the Unincorporated County

1995 Baseline		2000		2005		2010	
SF*	MF**	SF	MF	SF	MF	SF	MF
26,287	12,935	29,327	14,445	32,238	15,878	35,150	17,312

Source: Shimberg AHNA

*: Single Family, includes Mobile Homes and Other

**Multi-family

Tables 18-20 are show projections of growth of households by type and tenure for the unincorporated County based on past growth trends. The tables show the expected demand for single-family and multi-family as well as owner and renter occupied units. The Future Land Use element has a more detailed analysis of the additional land needed for development of new housing.

Table 21, Projection of Housing need for very low, low and moderate income groups. (for entire County)

	0-30% AMI		31%-50% AMI		51%-80% AMI		Total Need
# of Households	1998	1999-2010	1998	1999-2010	1998	1999-2010	by 2010

Owners	3,025	849	2,757	721	4,994	1,210	13,564
Renters	10,377	1,995	6,591	1,262	7,040	1,195	28,460

Source: State of Florida Affordable Housing Study Commission, Final Report, 2001

Table 21 shows the projection of additional housing units required by 2010 to house families in the very low, low and moderate income groups. Note, this is a projection for the entire County, including the incorporated areas and does not break out the unincorporated area of the County.

Table 22, Cumulative Surplus/Deficit of Affordable Occupied Units by Income Category

	Owner-occupied Units				Renter-occupied Units			
	1995	2000	2005	2010	1995	2000	2005	2010
30% of AMI	-660	-892	-1,145	-1,403	-3,026	-3,479	-3,882	-4,323
50% of AMI	-691	-1110	-1565	-2,034	-3772	-4508	-5153	-5854
80% of AMI	660	-74	-842	-1,629	691	-282	-1,117	-2,027
120% of AMI	1,291	151	-983	-2,159	1,852	597	-485	-1,676

Source: AHNA, Shimberg projections and analysis, 1998

Table 22 is a projection of the surplus and deficit of affordable units through 2010. The numbers were based on 1990 US Census information and the area median income. Though Tables 21 and 22 vary because of different methodologies, they both show that there will be deficits in the affordable housing supply for the very low, low, and moderate income groups through 2010. These numbers will be updated using more current population estimates as part of the study directed by Policy 1.1.3.

Existing Housing Delivery System

The housing delivery system is extremely complex, requiring the coordination of numerous professionals, firms, businesses and industries, including developers, contractors, home manufacturers and mobile home suppliers. These interests cannot function without the support and assistance of numerous other participants: land owners, real estate brokers, title companies, architects, engineers, surveyors, lawyers, lending institutions, mortgage companies, building material suppliers, insurance companies, planners, consultants, and zoning and building code officials.

In the private housing delivery process there are 746 registered general, building and residential contractors licensed with Alachua County, with 333 being active. Raw land costs for single-family houses are estimated to be approximately 30-35% of the cost of the home, with another 30% being the cost of building materials for a house. The Alachua County Codes Enforcement office, for permit fee purposes, estimates the cost of building the conditioned space of a house to be \$46.90 per square foot and the unconditioned space to be \$25.95 per square foot. Codes Enforcement estimates the actual cost to have a house built by a contractor in Alachua County is between \$60 and \$120 per square foot.

Building permit review and approvals generally take between 7 and 10 days. Rezoning, which require public hearings before the Planning Commission and the Board of County Commissioners generally take 16 weeks, to accommodate the advertising and public hearings required. The development review process (site plan review), which is required for planned developments and subdivisions, generally takes 3 months. Policy 1.2.2 of the transmitted Housing Element allows for expedited development review for development of affordable housing.

The County is currently evaluating its development review process to see if more streamlining can be done.

Supporting Infrastructure and Concentration of Affordable Housing

The Housing Element in conjunction with the other elements of the Comprehensive Plan inventories the current population and projects the future population to determine the housing needs of the current and future population by income group and family size along with the associated infrastructure. In relation to affordable housing, Goal 1 of the Goals, Objectives and Policies of the Housing Element states that Alachua County shall provide for affordable housing to be dispersed throughout the County. Policy 1.1.3 requires further, more in depth studies to look at the current distribution of affordable housing in the County and an assessment of the current affordable housing developments. This study will be used as one of the bases for the development of the affordable housing ordinance (Policy 1.1.6) which will establish the amount of new affordable housing to be developed and where. It will also provide incentives for the rehabilitation of existing housing to assure long-term affordability.

Substandard Housing

Elimination of substandard housing is an on-going process and one of the goals of the County. Addressing the problem requires a multi-faceted approach which includes identification of substandard housing through codes enforcement and surveys and identifying sources of funding to assist in the repair the housing for very low, low and moderate income families. The County will be partnering with the Alachua County Housing Authority in undertaking a county-wide substandard housing inventory, this study is also directed by Housing Element Policy 1.1.3(4). The study is anticipated to be completed in 2002. The County also successfully competed for \$750,000 in CDBG funding in 2001, in addition to the CDBG grants received in 1993 and 1997. This money is used to rehabilitate income-qualified, owner-occupied housing units which have been identified as substandard in that they have significant code violations. The County also contributes a portion of its annual SHIP funding for housing rehabilitation programs, this has included \$200,000 annually for the Alachua County Housing Authority's Housing Rehabilitation Program, funding to Alachua County Habitat for Humanity and awards to various community agencies which rehabilitate housing.

Provision of adequate sites for housing for Very Low, Low and
Moderate Income Households and for Mobile Homes

Various programs work together to help address the needs of housing the very low, low and moderate income households. These programs include the Section 8 voucher program and public housing, both administered through the Alachua County Housing Authority. The Section 8 program provides certificates and vouchers to eligible families to assist them with paying their rent, the tenant's portion is determined based on income. Public housing units are owned and operated by the Housing Authority, rent is determined based on the tenant's income. There are several apartment complexes throughout the County which are subsidized either by State or Federal dollars which limit rent or base rent on the tenant's income. A listing of the subsidized units is found in the data section of the Housing Element. Additionally, programs such as SHIP help very low and low income residents increase their purchase power by providing down payment assistance for home purchases. Additionally, mobile and manufactured homes also are an affordable option to many residents who can not afford site built homes. Mobile homes are allowed by right in the "RM"(Manufactured/Mobile Home Park), "R-1c" (Single-family) and "A"(Agriculture) zoning districts. By State Statute, manufactured homes, which are approved by DCA, cannot be treated any differently than site built homes from a development regulations standpoint and are allowed in all zoning districts which allow single-family, site built homes.

Rural and Farmworker Housing

The Shimberg Affordable Housing Needs Assessment estimated there to be a total of 400 migrant workers in Alachua County, in 1995, with an additional 85 family members who accompany the migrant workers. This 1995 estimate included the incorporated areas as well as the unincorporated area for the County. Alachua County does not have specific numbers addressing the number of migrant workers in the County, however Policies 3.1.2, 3.2.1 and 3.2.2 of the transmitted Housing Element address their housing needs. Policy 3.1.2 requires the County to continually review the needs of rural and farmworker housing. Policy 3.2.1 allows for maximum densities, as shown on the Future Land Use map to be exceeded to provide for farmworker housing while performing agricultural duties. This policy is currently implemented in the development regulations as a Special Exception in the Agriculture zoning district. The Special Exception requires Board of County Commission approval. A review of applications shows there have been 3 requests (one of which was withdrawn) for a Special Exception, between 1993 and February 2002, for farmworker housing.

Group Homes

Florida State Statute section 419.001 specifically provides that homes which fall into the category of community residential homes, with six or fewer residents be allowed in all single-family and multi-family zoning districts, subject to spacing requirements. Homes of seven to fourteen residents shall be allowed in all multi-family zoning districts, also subject to spacing requirements. Policy 3.2.3 of the transmitted Housing Element revised the group home (community residential home) policies to require the development regulations to be consistent with State Statutes. The group home (community residential home) is specifically licensed by the State as such, these are different from other special needs housing types, such as homeless shelters and transitional housing facilities, which are not regulated by Statute 419.001. The group homes, are fairly well distributed around the unincorporated area of the County.

Identification of Conservation, Rehabilitation, or Demolition Activities
and Historically Significant Housing or Neighborhoods

The Local Housing Assistance Plan, which guides the spending of money the County receives from State Housing Initiatives Partnership (SHIP) Program has housing rehabilitation as a part of several strategies. For the past several years the first \$200,000 received annually in the SHIP program has been dedicated for housing rehabilitation for owner-occupied units owned by very low and low income residents, this program is administered by the Alachua County Housing Authority, through a contract with the County, up to \$30,000 of SHIP money can be spent per unit on rehabilitating a house. Additionally, the down payment assistance strategy, administered by the County, can provide up to \$6,000 toward rehabilitation of homes being purchased by clients of the SHIP down payment program. The down payment assistance program also serves low and very low income residents who are first time home buyers. The third SHIP strategy which incorporates housing rehabilitation is the matching of Community Development Block Grant (CDBG) funds. When the County is eligible for CDBG funds, a match from the SHIP program is made to help further the number of houses that can be rehabilitated under the CDBG program. This grant was last applied for in FY 2001 and \$200,000 of SHIP funds were committed as a local match.

For the past several cycles, 1993, 1997 and 2001 the County has applied for and received CDBG funding. This grant from the State has been used for housing rehabilitation for very low, low and moderate income families in owner-occupied houses. The focus has been on the rehabilitation of substandard housing.

Historically Significant Housing

The County is in the process of identifying historically significant housing and neighborhoods. The County will also be drafting a Historic Preservation Ordinance, which will include provisions for protection of historic resources, including historically significant housing. Further detail and analysis is available in the data and analysis for the Historic Element of the Alachua County Comprehensive Plan.

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Appendix

Table 16, Projection of households by income range, Owner-occupied

Income	1990	1995	2000	2005	2010
\$0-5,000	988	979	1,130	1,304	1,468
5,000-10,000	1,356	1,374	1,574	1,782	2,006
10,000-12,500	824	850	974	1,107	1,250
12,500-15,000	721	734	835	946	1,065
15,000-17,500	1,046	1,079	1,239	1,395	1,537
17,500-20,000	799	812	907	994	1,093
20,000-22,500	851	870	991	1,102	1,207
22,500-25,000	728	737	840	938	1,048
25,000-27,500	963	972	1,100	1,199	1,313
27,500-30,000	649	678	770	855	940
30,000-32,500	767	799	909	995	1,069
32,500-35,000	842	879	1,001	1,092	1,170
35,000-37,500	689	711	797	881	964
37,500-40,000	656	672	757	825	896
40,000-42,500	889	924	1,055	1,151	1,233
42,500-45,000	574	594	674	739	802
45,000-47,500	694	713	808	883	953
47,500-50,000	562	586	669	743	806
50,000-55,000	963	1,011	1,156	1,249	1,330
55,000-60,000	802	840	962	1,050	1,121
60,000-75,000	1,731	1,829	2,104	2,329	2,512
75,000-100,000	998	1,069	1,231	1,369	1,482
100,000-125,000	517	550	637	714	776
125,000-150,000	182	199	233	260	279
150,000 +	383	411	480	552	612
Total	20,174	20,872	23,833	26,454	28,932

Source: Shimberg, Special Tabulation of US Census, STF 3A.

Table 17, Projection of households by income range, Renter-occupied

Income	1990	1995	2000	2005	2010
\$0-5,000	2,847	2,982	3,341	3,655	3,989
5,000-10,000	2,718	2,825	3,149	3,444	3,775
10,000-12,500	1,274	1,316	1,466	1,587	1,716
12,500-15,000	617	629	697	753	817
15,000-17,500	890	940	1,046	1,132	1,224
17,500-20,000	861	887	981	1,055	1,135
20,000-22,500	822	825	905	967	1,042
22,500-25,000	558	561	615	674	741
25,000-27,500	661	675	742	798	860
27,500-30,000	341	334	360	383	415
30,000-32,500	516	525	576	617	663
32,500-35,000	170	175	193	207	220
35,000-37,500	176	178	193	203	216
37,500-40,000	320	335	370	400	431
40,000-42,500	239	238	260	280	305
42,500-45,000	132	134	145	156	169
45,000-47,500	159	168	187	197	206
47,500-50,000	98	98	107	114	124
50,000-55,000	128	137	154	166	179
55,000-60,000	115	119	131	144	162
60,000-75,000	194	220	249	271	289
75,000-100,000	142	160	180	194	207
100,000-125,000	42	45	50	54	54
125,000-150,000	0	0	0	0	0
150,000 +	49	56	63	68	73
Total	14,069	14,562	16,160	17,519	19,014

Source: Shimberg, Special Tabulation of US Census, STF 3A.

**POTABLE WATER AND SANITARY SEWER ELEMENT
DATA AND ANALYSIS**

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Potable Water and Sanitary Sewer Element Data and Analysis

INTRODUCTION

This Potable Water and Sanitary Sewer Element is part of the Comprehensive Plan for unincorporated Alachua County, excluding the municipalities. It is intended that this element be applied in conjunction with the other elements of the Plan as an entirety, not as an individual, separate element.

The format for this element includes the following: a discussion of the regulatory framework pertinent to potable water and sanitary sewer issues; an analysis of the currently adopted Potable Water and Sanitary Sewer Element; summaries on hydrogeology, drainage patterns, and recharge areas to provide background information; an inventory and analysis of existing systems; projections and analysis of future systems and needs; and goals, objectives, and policies for the future.

PLANNING FRAMEWORK

The development of policies regarding potable water and sanitary sewer systems at the planning level is extensive. Goals and policies are formulated in the State Comprehensive Plan, which form the basis for the goals and policies in the regional comprehensive plans. In turn, local governments are required by law to develop comprehensive plans which are "consistent with and further" the State and regional plans.

Rule 9J-5, Florida Administrative Code, establishes a required series of elements, a provision for any optional elements, and the minimum criteria for determination of compliance of local government comprehensive plans with Chapter 163, F.S. Section 9J-5 establishes the minimum requirements for data and analysis, as well as goals, objectives, and policies pertaining to the potable water and sanitary sewer element.

Section 9J-5 establishes criteria for consistency with the State Comprehensive Plan as adopted in Section 187.201, Florida Statutes, and the appropriate comprehensive regional policy plan. The local plan must be "consistent with", i.e. not in conflict with, and "further" those plans by taking action in the direction of realizing goals or policies of the state and regional plans.

REGULATORY AND INTERGOVERNMENTAL FRAMEWORK

A regulatory framework governing potable water and sanitary sewer systems exists which needs to be considered during the planning process. Programs, legislation, and agencies exist at the federal, state, and local levels to protect an adequate supply of drinking water as well as to promote water quality. A review of the programs, legislation, and agencies which may have some control over activities involving potable water and/or sanitary sewer follows.

Federal

The Federal government has established quality standards for public water supplies, including system operating standards and quality controls for public water delivery systems. These regulations are set forth in the Safe Drinking Water Act (PL 93-523) which establishes minimum drinking water standards nationwide.

The Federal Water Pollution Control Act (PL 92-500) is the controlling national legislation relating to the provision of sewage treatment. The intent of this act is the restoration and/or maintenance of the chemical, physical, and biological integrity of the nation's waters.

The federal regulatory network includes the U.S. Environmental Protection Agency (EPA) which is responsible for implementing these acts, the U.S. Army Corps of Engineers which regulates dredging and filling operations in waters of the U.S. through the issuance of permits, and the National Flood Insurance Program which has regulatory requirements for development within flood-prone areas.

State

The need for the protection of Florida's drinking water resources resulted in the passage of the Water Quality Assurance Act of 1983. This legislation led to the establishment of the Ambient Ground Water Quality Network, designed to predict and detect contamination of the state's groundwater resources.

The Florida Safe Drinking Water Act, Sections 403.850 - 403.864, F.S. continues the policies of the Federal Safe Drinking Water Act. Chapter 17-22, F.A.C. contains rules classifying and regulating public water systems.

Rules for the regulation of wastewater facilities are found in Chapter 17-6, F.A.C. These rules apply to facilities which treat flows exceeding 5,000 gallons per day (gpd) for domestic establishments, flows exceeding 3,000 gpd for food service establishments, and in cases where the sewage contains elevated concentrations of industrial, toxic, or hazardous chemical wastes.

The Florida Department of Environmental Protection (DEP) is charged with the maintenance of environmental quality in the State of Florida. Environmental regulation is accomplished through three basic regulatory mechanisms used by the department:

1. Establishment of standards designed to protect natural systems and prevent harmful pollutants from impacting these systems;
2. Applying the standards through permitting of potential sources of pollution and monitoring pollution dischargers for compliance with state standards;
3. Taking enforcement action for non-compliance with environmental standards.

The DEP is responsible for ensuring that the state carries out responsibilities assigned to it under the Federal Safe Drinking Water Act as well as the Federal Water Pollution Control Act.

The Florida Department of Health (DOH) regulates septic tank and drainfield installation within the state. These requirements have been adopted by rule in Chapter 10D-6, F.A.C. and are administered through local health departments.

The Suwannee River Water Management District (SRWMD) and the St. Johns River Water Management District (SJRWMD) are responsible for managing water supplies to meet existing and future demands. Regulation of consumptive uses is achieved through a permitting process, through which water resources are allocated among the permitted consumers. Water management districts have the authority to declare water shortages and implement reductions of water withdrawals during drought (373.175, 373.246, F.S.). Districts are also mandated to close abandoned free-flowing artesian wells in order to maintain groundwater levels and prevent contamination.

Local

The Alachua County Public Health Unit, a Division of the Florida Department of Health, is responsible for the permitting of On-site Disposal Systems (OSDS), commonly known as septic tanks.

The Alachua County Environmental Protection Department (ACEPD) performs several functions pertaining to water resources, including: monitoring of groundwater throughout the county; water quality testing; enforcement of underground storage tank ordinance; and the determination of wetland buffers.

The City of Gainesville (through Gainesville Regional Utilities, GRU) and the smaller municipalities within Alachua County having potable water or sanitary sewer systems in place, can affect development patterns in portions of the unincorporated area of Alachua County in or near the service areas of these systems through policies addressing issues such as the extension of lines, planned capacity enhancements, and the establishment of rates. These entities require the permission of the Alachua County Board of County Commissioners to extend into the unincorporated area of Alachua County. It is in the interest of sound growth management to develop, whenever possible, compatible policies regarding this important component of infrastructure.

RELATIONSHIP TO OTHER PLAN ELEMENTS

The Potable Water and Sanitary Sewer Element is part of the Comprehensive Plan of Alachua County, which consists of a collection of distinct elements. The following discussion of other Plan elements describes how each is affected by and, in turn, affects the Potable Water and Sanitary Sewer Element.

The Future Land Use Element establishes policies and standards for the proper distribution and development of varying land uses in the unincorporated area of Alachua County. Some of the policies included implement requirements for the availability of utility service to serve development as development orders are issued.

Included in the Future Land Use Element is the Future Land Use Map Series which prescribes patterns of land use development and intensity. The element is based upon an inventory and analysis of existing conditions including analyses of areas served by a range of infrastructures, such as potable water and sanitary sewer, that can support more intensive and higher density development, either through existing service or by the extension of lines or the expansion of capacity. It identifies future development needs based upon population projections. It also identifies needs for the protection of natural and cultural resources in conjunction with proper design as an important feature in managing growth.

The Transportation Mobility Element projects the needed transportation infrastructure for existing development and for the anticipated growth of the unincorporated area of Alachua County.

Coordination of the roadway network with the potable water and sanitary sewer networks leads to increased efficiency of the infrastructure system as a whole. The extension of potable water and sanitary sewer lines should be linked to those areas where development is desirable, provided there are existing roadway capacities, or planned roadway improvements in the future to accommodate growth.

The provision of mass transit and aviation facilities, as outlined in the Transportation Mobility Element, also should be coordinated with the provision of centralized potable water and sanitary sewer facilities, in order to maximize these facilities.

The Stormwater Management Element describes the general drainage conditions for the unincorporated area of Alachua County. These conditions can indirectly influence the quantity and quality of potable water

supplies available to the public and will affect the ability of an area to treat wastewater effluent.

The Conservation and Open Space Element establishes policies for the protection of Alachua County's (as well as other counties' to a certain extent) natural resources. These policies are designed to protect the quality and quantity of potable water sources from the encroachment of new development. Included as natural resources are the groundwater aquifers which are important sources of potable water not only for Alachua County but also for the surrounding counties.

The Housing Element projects the future mix of housing types and establishes guidelines for promoting a healthy and diverse housing market. The density of housing developments is closely related to the availability of potable water and the capacity of sanitary sewers at any location.

The Solid Waste Element examines unincorporated Alachua County's current and future system of waste collection and disposal. The operation of landfills must be assessed for impacts on the quality of potable water at any location.

The Intergovernmental Coordination Element promotes cooperation between governments and among various agencies. A joint understanding of the problems and solutions to the provision of potable water and sanitary sewer services can protect the fiscal and natural resources of the entire county. This includes policies setting the framework for the coordination of potable water and sanitary sewer planning between various entities (such as GRU) and the county's concurrency management program.

The Recreation Element identifies the need for public recreational facilities and resource-based open space lands. Irrigation of golf courses are a good use for re-use of treated wastewater.

The Economic Element seeks to create an economic environment that will enhance the economic prosperity of all citizens of Alachua County. The availability of potable water and sanitary sewer facilities is an important factor in the location of appropriate industrial uses that the Economic Element seeks to encourage in order to provide expanded employment opportunities and enhance Alachua County's economic base.

The Capital Improvement Element identifies capital needs and corresponding fiscal resources for a planning period of five years. Alachua County does not own or operate either central potable water or sanitary sewer systems, and therefore requires no direct expenditures for central water or sewer facilities. However, Alachua County is responsible for associated infrastructure improvements such as roads, drainage, recreation and open space, and fire service, which are affected by and can affect the potable water and sanitary sewer networks. Expenditures for these county-maintained types of infrastructure must be coordinated with the capital facilities planning of the utilities to maximize efficiency as well as to maintain adequate levels of service.

The Historic Preservation Element preserves, protects, enhances, and supports historic and paleontological resources and properties. All development activities (including water or sewer line extensions) subject to the County's development review process, as well as all County capital improvement projects, are required to consider potential impacts to historic and paleontological resources. Policies in the Historic Preservation Element require relevant survey and analysis, avoidance and minimization of impacts to significant resources, or appropriate mitigation where avoidance is not possible.

ANALYSIS OF POTABLE WATER FACILITIES

This section presents an inventory of Potable Water facilities, or infrastructure¹, related to the provision of potable water, followed by an analysis examining the level of service² provided by such facilities, and projections for the future. Potable water refers to water that is available for drinking purposes. Potable water facilities as defined by Rule 9J-5 refers to "a system of structures designed to collect, treat, or distribute potable water, and includes water wells, treatment plants, reservoirs, and distribution mains."

Water facilities can be classified as either central water systems including municipal systems, or private wells. The components of a municipal water system include a source of raw water, pump stations, treatment plant, a storage system, and a distribution system.

The capacity of a system can be measured in terms of the average daily capacity, the maximum (or peak) daily capacity, and the fire-flow capacity³.

The state minimum potable water system pressure standard is 20 pounds per square inch (psi). This requirement ensures the distribution system will not be contaminated by bacteria. If the pressure drops below 20 psi, disinfection of the system is required.

Water consumption varies greatly by type of use. Table 1 depicts various uses and their corresponding average consumption measured in gallons per day.

Table 1
Typical Water Consumption by Use

¹Infrastructure- "those man-made structures which serve the common needs of the population, such as: sewage disposal systems; potable water systems; potable water wells serving a system; solid waste disposal sites or retention areas, stormwater systems..." (9J-5.003(39))

²Level of Service- "an indicator of the extent or degree of service provided by, or proposed to be provided by a facility based on and related to the operational characteristics of the facility. Level of service shall indicate the capacity per unit of demand for each public facility." (9J-5.003(41))

³The average amount of water used in a 24-hour period for any given month is termed the average daily flow. These figures vary from month to month due to the seasonal demand for water.

The maximum daily flow represents the greatest number of gallons (peak) used in any 24-hour period over a period of one year.

Fire-flow is the demand placed on municipal water systems to fight a fire. This type of water demand is one measure used to rate a municipal water system by insurance officials. This measure compares required standard fire-flows for different size communities with the capability of their existing water system. Required fire-flow is the rate, measured in gallons per minute, which a water system should be able to supply in order to fight a fire.

<u>Source</u>	<u>Gallons / Day</u>
Airports: (per passenger)	3-5
Residential:	
Single Family (per resident)	50-150
Multi-Family (per resident)	40-60
Commercial:	
Hotel (per room)	60-100
Laundry (per customer)	50
Restaurant (per person)	2-10
Service Station (per vehicle)	10
Store (per toilet room)	400
Industrial: (per person per shift)	
Factory	15-35
Construction	50
Agricultural:	
Livestock	2-35
Parks: (per person)	25-50
School: (per student)	15-100

MUNICIPAL SYSTEMS

Alachua County does not own or operate a potable water system. However, some Alachua County residents are served by municipal potable water systems. Municipal potable water systems exist in Waldo, Newberry, Alachua, Archer, Micanopy, Hawthorne, High Springs and Gainesville. The systems in Archer, Micanopy, and Waldo serve only a few residents within unincorporated Alachua County. Gainesville Regional Utilities is the major supplier of potable water to the unincorporated area.

The table below provides best available data on municipal potable water systems. The table shows plant design capacity, population served, daily demand, surplus capacity, and the expected life of the facility. According to the data, all plants have excess surplus capacity. The County adopts LOS Standards for municipal potable water systems for purposes of concurrency determinations for any development in the unincorporated county that utilizes these municipal systems. The County uses most recent standards adopted by the municipalities in their comprehensive plans. These LOS standards are in the discussion of each municipality following the table on pages 8 through 17.

Summary of Municipal Potable Water Systems

Status: 2001

Municipality	Design Capacity (Gallons/Day)	Population Served (Estimated)	Daily Demand (Gallons/Day)	Surplus Capacity (Gallons/Day)	Expected Life of the Facility
Alachua	3,500,000	6,300	1,200,000	2,300,000	Year 2010 +
Archer	1,150,000	2,100*	147,687	1,002,313	Year 2010 +
Gainesville	40,000,000 Plans to expand to 44,000,000 by 2002 and 51,000,000 by 2003.	155,788 53,061 residential connections 66,576 households	25.1 million (Av.) 34.8 million (Max.) **	5.2 Million	Year 2002 at current capacity. Year 2007 at 44 mgd. Year 2015+ at 51 mgd.
Hawthorne	1,500,000	1,587	87,800	1,412,200 1,405,142 after approved and proposed development	Year 2010 +
High Springs	1,728,000	4,025	460,000 (Av.) 925,000 (Max)	803,000	Year 2015 +
Micanopy	520,000	365	85,800 (Av.) 171,600 (Max)	434,200	Year 2010 +
Newberry	700,000	3,316 (2000 Census)	552,000	148,000 140,042 after approved and proposed development	Year 2010 +
Waldo	500,000	875	85,000	415,000	Year 2010 +

*Sources: City of Gainesville (GRU); Data on Alachua, Archer, Micanopy, and Waldo was received from city administrators. High Springs data from City of High Springs Comprehensive Plan (2001). Data on Newberry and Hawthorne from North Central Florida Regional Planning Council. * Population data in Archer from DEP data.*

The **surplus capacity** is calculated by subtracting the daily demand (amount used on average day) from the design capacity (amount the plant is engineered to treat per day).

** Due to water conservation during drought conditions, even and odd addresses had set days of the week when watering was permitted. On some days there was no watering at all. On one watering day, demand reached a peak of 40.7mgd; the excess was made up by storage water.

CITY OF GAINESVILLE⁴

⁴City of Gainesville Comprehensive Plan, August 2000. GRU Master Plan 2000-2001.
GRU Strategic Planning Dept., November 2001.

The City of Gainesville has operational responsibility for its potable water facility. The Murphree Water Treatment Plant is the source of potable water collection, treatment, and distribution for the GRU service area (Map 1). Capacity is allocated to new customers on a first-come, first-served basis. Capacity is not reserved for particular geographic areas within GRU's entire service area. The forecasted plant flows and capacities in this analysis include both inside and outside the City of Gainesville. Based on 2000 billing data, approximately 37% of the water from GRU's system is delivered to customers in the unincorporated portion of Alachua County. Future extensions and capacity expansions may service portions of the system within the unincorporated areas of Alachua County. Forecasts of demand and capacity show that on a system-wide basis, accounting for all customers in the City of Gainesville and the unincorporated area of Alachua County, demand will not exceed the available capacity.

The GRU service area is shown on Map 1. Map 2 shows the location of central potable water lines provided by GRU in the urban cluster.

The Murphree facility consists of 13 wells extending 550 feet in depth to the Floridan aquifer providing a combined capacity of 44 mgd.

The treatment plant has a current operating capacity of 40 mgd, and provides lime softening and filtering. The treatment plant potential capacity is 60 mgd.

Equalization and operating water storage requirements are each 20 percent of maximum daily flow and the fire storage requirement is one million gallons of stored water. Five ground storage reservoirs provide a total of 18 mgd of storage capacity while two elevated storage tanks provide a total of 1.5 mgd of storage capacity. The system has the capability of providing 4,000 gpm for four hours for firefighting.

Bulk water is provided to the University of Florida and the Brook Point subdivision in Alachua.

The generalized existing land use is shown in the Alachua County Existing Land Use Map in the Future Land Use Data and Analysis section.

The average daily demand on the Murphree Water Treatment Plant in 2000 was 25.1 mgd, while peak daily demand was 34.8 mgd. With a capacity of 40 mgd, the plant still showed a surplus in capacity.

Levels of Service

Four existing level of service (LOS) indicators have been examined in cooperation with the GRU Strategic Planning Department for the Murphree Water Treatment Plant. These are:

1. Minimum design flow;
2. Peak design flow;
3. Pressure; and
4. Storage tank capacity.

Minimum Design Flow

The minimum design flow is measured as the average daily per capita consumption. The consumption rate includes average daily base consumption, commercial consumption, and a 10% factored increase for unaccounted water uses, including fire hydrant tests, fire flows, water theft, and leaks. Two sources of relatively constant consumption, the University of Florida and the Kelly Power Plant are excluded, since these are not a function of population growth.

A five year (1993-98) period⁵ was used to determine the level of service standards for residential and non-residential uses. For residential purposes, the number of connections to the system was determined, as was the corresponding number of units per connection. Multiplying the number of units by the persons per household yields the population served. Consumption divided by population served yields average daily per capita consumption. Commercial standards were determined based upon demands for the same five year period.

The base data are as follows:

1998 water sales	8,064 mg
1998 residential water sales	5,037 mg
1998 commercial water sales	2,062 mg
2000 residential connections	53,061
1998 commercial connections	4,774
2000 dwelling units per residential connection	1.25
2000 persons per household	2.34
2000 average daily consumption per d.u.	219 gpd

The average residential and non-residential standards are:

residential: 219 average gpd per dwelling unit

non-residential: Average annual daily demand as estimated for plant connection fees using GRU connection policies outlined in city ordinances

Peak Design Flow

Peak design flow is measured as the maximum daily demand. This is the basis for the Florida Department of Environmental Protection's permitting of potable water facilities.

The peak residential and non-residential standards are:

peak day residential: 317 daily gallons per dwelling unit, 200 daily gallons per capita

peak day non-residential: the average daily demand multiplied by 1.5 as estimated for plant connection fees using GRU connection policies outlined in city ordinances

Pressure

GRU's internal planning criteria is 40 psi, which is used to evaluate facilities under peak hour conditions assuming normal system operation. This criteria provided a necessary margin of safety to accommodate main breaks and fire flows while assuring at least 20 psi.

Minimum Pressure LOS: 20 psig for the entire system

⁵Gainesville Regional Utilities, Black & Veatch . March 1999. Gainesville Regional Utilities FIVE-YEAR REPORT. Gainesville, FL.

Storage Capacity⁶

The state standard for storage tank capacity is one-half (1/2) of the maximum day consumption volume.

The 2000 maximum day consumption was estimated to be 36.8 mgd. Therefore, one-half of this consumption, 18.4 mgd, is the LOS standard.

Storage LOS: one-half of peak day volume in gallons. This requirement may be met by a combination of storage and auxillary power.

The water storage existing capacity, including fire, equalization, and operating reserve storage, in 2000 was 20.2 mgd.

Condition of the System

A study⁷ undertaken to satisfy bonding requirements evaluated GRU's potable water facilities and presented the following summary findings:

1. The water system facilities are in excellent condition, efficiently operated, and well-maintained relative to, and in accordance with, prudent utility practice, and meet all current permit requirements.
2. The transmission and distribution systems are adequate.
3. The present water system and its planned expansion are projected to adequately serve the present and future needs of its customers beyond 2016.

Future Projections

The Murphree Water Plant is scheduled for a 11 mgd expansion which will increase operating capacity from 40 mgd to 51 mgd by 2003.

The GRU potable water system is expected to have a surplus of 10.2 mgd in 2005 and a surplus of 5.9 mgd in 2010, based upon current projections.

Water storage capacity requirements are projected to be 20.2 mgd in 2000. There are no planned expansions to ground storage. Requirements will be met by auxillary power.

The peak demand is projected to be 42.1 mgd in 2005 and 46.3 in 2010. The capacity will be 51mgd (after expansion in 2003), leaving an 8.9 mgd surplus in 2005 and 4.7 mgd in 2010 available for new development.

The Urban Service Area Map is in the Future Land Use Element. This is the area designated by the county as desirable for higher densities in order to control urban sprawl and to coordinate land use with the provision of infrastructure. The Urban Service Area is based upon factors such as population projections, the availability of infrastructure or the ability to provide it, and analysis of the suitability of land for urban development. The Future Land Use Map for the urban service area is also shown in the Future Land Use

⁶Data from 2000-2001 GRU Master Plan, GRU Strategic Planning Dept., November 2001.

⁷Gainesville Regional Utilities, Black & Veatch . March 1999. Gainesville Regional Utilities FIVE-YEAR REPORT. Gainesville, FL.

Element.

Impact on Natural Resources⁸

There are no known negative impacts on adjacent natural resources from the Murphree Water Plant. The only documented effect of the Murphree Plant has been drawdown in the potentiometric surface of the underlying Floridan Aquifer. However, the confined nature of the Floridan Aquifer produces artesian conditions, and no ill effects have been noted to date.

CITY OF WALDO⁹

The City of Waldo has operational responsibility for its potable water facility. The service area consists of most of the city, as well as limited, site specific uses outside the city limit. Currently, there is no agreement, either verbal or written, which describes proportional capacity of the Waldo system as related to the provision of services within the Alachua County jurisdiction. Future extensions and capacity expansions may service portions of the system within the unincorporated areas of Alachua County.

The predominant types of land use served by this facility are residential (93%) and commercial/other non-residential (7%).

The design capacity of the system is 500,000 gpd. The existing (2000) estimated population served is 875, with a demand of 85,000 gpd. This leaves an estimated surplus capacity of 415,000 gpd. The population served in 1991 was 1,042 indicating that there has been a migration out of Waldo in the past 10 years, which will extend the life of the water facility.

The existing per capita water consumption is 89 gallons per day. The proposed level of service standard is 89 gallons per day per capita for residential customers.

Waldo has a 150,000 gallon elevated water storage tank.

The fire flow requirement for the highest rated structure in the city is an additional 451,200 gallons per day. Should the maximum daily flow and the fire flow requirement happen the same day, the capacity of the system will be surpassed.

Condition of the System

The general condition of the centralized system is considered to be good. The wellfields are providing an adequate level of service and the tank capacities are providing adequate reserves. The expected life of these facilities is projected to exceed 2010, based upon the projected limited demand and proper maintenance procedures being continued.

Future Projections

⁸GRU. 12 October, 1989. Impact of Water and Wastewater Treatment Plants on Adjacent Natural Resources. Strategic Planning Department.

⁹City of Waldo Comprehensive Plan, April 1991, Data from City Manager, 2001.

The City of Waldo is not planning improvements or expansions of capacity at this time.

Projected Water Demand			
<u>Year</u>	<u>Population Served</u>	<u>Average Daily Flow</u>	<u>Maximum Water Flow</u>
2010	1,510	134,400	293,000

Projections were made in 1991. The City of Waldo has not determined new projections. The population in Waldo has dropped significantly in recent years, and therefore will have lower daily and maximum flows and a larger surplus.

Impact on Natural Resources

There are no known negative impacts on adjacent natural resources from the Waldo potable water system.

CITY OF NEWBERRY¹⁰

The City of Newberry has operational responsibility for its potable water facility. The service area includes all of the urbanized area within the city limits. Due to a recent annexation, several areas in the unincorporated portion of the county that were served are now located within the city limits, leaving no service outside the corporate limits. The predominant types of land use served are residential, commercial, and industrial.

The design capacity of the system is 700,000 gpd. The 2000 Census population (estimated to be equal to the number served) is 3,316. The current demand is 552,000 gpd, but there is approved and proposed new development which will be served by this plant. The current surplus capacity is 148,000, but after the new development is added, it leaves an estimated surplus capacity of 140,042 gpd.

The existing per capita water consumption is 124 gallons per day. The proposed level of service standard is 124 gallons per day per capita for residential customers.

A 150,000 gallon elevated tank provides for water storage.

Condition of the System

The general condition of the centralized system is considered to be good. The wellfields are providing an adequate level of service and the tank capacities are providing adequate reserves. The expected life of these facilities is projected to exceed 2010, based upon the projected limited demand and proper maintenance procedures being continued.

Future Projections

The City of Newberry is not planning improvements or expansions of capacity at this time.

¹⁰City of Newberry Comprehensive Plan, May 1991, Data derived from 1998 EAR was received from City Administrator in 1998.

<u>Year</u>	<u>Population Served</u>	Projected Water Demand	
		<u>Average Daily Flow</u>	<u>Maximum Water Flow</u>
2010	2,920	362,100	1,343,200

Projections were made in 1991. The City of Newberry has not determined new projections. Due to a significant increase in population, the daily and maximum flows are expected to be higher and the surplus capacity would be lower.

Impact on Natural Resources

There are no known negative impacts on adjacent natural resources from the Newberry potable water system.

CITY OF ARCHER¹¹

The City of Archer has operational responsibility for its potable water facility. The service area consists of the entire corporate limits with the exception of 25 residents, which translates to a 2% proportional allocation to the unincorporated portion of the county. The predominant types of land use served by potable water facilities are residential and commercial. Residential customer connections comprise 90% and non-residential connections comprise 10% of the total potable water connections.

The design capacity of the system is 1,150,000 gpd. The existing (2000) estimated population served is 2,100 (from DEP), with a demand of 147,687 gpd. This leaves an estimated surplus capacity of 1,002,313 gpd.

The existing per capita water consumption is 116 gallons per day. The proposed level of service standard is 116 gallons per day per capita for residential customers.

Archer has a 75,000 gallon elevated water storage tank.

Condition of the System

The general condition of the centralized system is considered to be good. The wellfields are providing an adequate level of service and the tank capacities are providing adequate reserves. The expected life of these facilities is projected to exceed 2010, based upon the projected limited demand and proper maintenance procedures being continued.

Future Projections

The City of Archer is not planning improvements or expansions of capacity at this time.

<u>Year</u>	<u>Population Served</u>	Projected Water Demand	
		<u>Average Daily Flow</u>	<u>Maximum Water Flow</u>
2010	2,039	236,524	371,098

Projections were made in 1991. The City of Archer has not determined new projections.

¹¹City of Archer Comprehensive Plan, April 1991, Data from City Manager, 2001.

Impact on Natural Resources

There are no known negative impacts on adjacent natural resources from the Archer potable water system.

TOWN OF MICANOPY¹²

The Town of Micanopy has operational responsibility for its potable water facility. The system services approximately 365 customers. Currently, there is no agreement, either verbal or written, which describes proportional capacity of the Micanopy system as related to the provision of services within the Alachua County jurisdiction. Future extensions and capacity expansions may service portions of the system within the unincorporated areas of Alachua County.

The design capacity of the system is 520,000 gpd. The average daily flow in 2000 was 85,800 gpd. The maximum daily flow in 2000 was 171,600 gpd. The surplus capacity is 434,200 gpd.

The existing per capita water consumption is 120 gallons per day. The proposed level of service standard is 120 gallons per day per capita for residential customers.

Micanopy has a 100,000 gallon elevated water storage tank. The storage requirement to sustain fire flow (880 gallons per minute for two hours) is 110,000.

Condition of the System

The general condition of the centralized system is considered to be good. The wellfields are providing an adequate level of service but the tank capacities are currently deficient for fire flow. The expected life of these facilities is projected to exceed 2010, based upon the projected limited demand and proper maintenance procedures being continued.

Future Projections

The Town of Micanopy has no planned improvements or expansions of capacity at this time.

<u>Year</u>	<u>Population Served</u>	Projected Water Demand		
		<u>Average Daily Flow</u>	<u>Maximum Water Flow</u>	<u>Peak Hourly Flow</u>
2010	1,123	123,530	247,060	15,441

Projections were made in 1991. The Town of Micanopy has not determined new projections.

Impact on Natural Resources

There are no known negative impacts on adjacent natural resources from the Micanopy potable water system.

¹²Town of Micanopy Comprehensive Plan, April 1991, Data from Town administration, 2001.

CITY OF HAWTHORNE¹³

The City of Hawthorne has operational responsibility for its potable water facility. The service area consists of all of the urbanized area within the corporate boundary. Residential customer connections comprise 85% and non-residential connections comprise 15% of the total potable water connections.

The design capacity of the system is 1,500,000 gpd. The existing (2000) estimated population served is 1,587, with an current average daily demand of 87,800 gallons, but there is approved and proposed new development which will be served by this plant. The current surplus capacity is 1,412,200 gpd, but after the new development is added, it leaves an estimated surplus capacity of 1,405,142 gpd.

The LOS standard adopted by the City of Hawthorne is 104.

Hawthorne has a 75,000 gallon elevated water storage tank.

Condition of the System

The general condition of the centralized system is considered to be good. The wellfields are providing an adequate level of service and the tank capacities are providing adequate reserves. The expected life of these facilities is projected to exceed 2010, based upon the projected limited demand and proper maintenance procedures being continued.

Future Projections

The City of Hawthorne has no improvements or expansions of capacity planned at this time.

<u>Year</u>	<u>Population Served</u>	Projected Water Demand	
		<u>Average Daily Flow</u>	<u>Maximum Water Flow</u>
2010	1,430	148,700	400,000

Projections were made in 1991. The City of Hawthorne has not determined new projections. The population served projection for 2010 is lower than the current 2000 population served due to a population increase in the Hawthorne service area.

Impact on Natural Resources

There are no known negative impacts on adjacent natural resources from the Hawthorne potable water system.

CITY OF ALACHUA¹⁴

The City of Alachua has operational responsibility for its potable water facility. The service area consists of most of the city.

The design capacity of the system is 3,500,000 gpd. The existing (2000) estimated population served is

¹³City of Hawthorne Comprehensive Plan, May 1991, Data from City Administrator, 2001.

¹⁴City of Alachua Comprehensive Plan, April 1991, Data from City Public Works Director, 2001.

6,300, with an average daily demand of 1,200,000 gallons, leaving an estimated surplus capacity of 2,300,000 gpd.

The existing per capita water consumption is 124 gallons per day. The proposed level of service standard is 124 gallons per day per capita for residential customers.

Alachua has elevated water storage tanks totaling 1,000,000 gallons of capacity.

Condition of the System

The general condition of the centralized system is considered to be good. The wellfields are providing an adequate level of service and the tank capacities are providing adequate reserves. The expected life of these facilities is projected to exceed 2010, based upon the projected limited demand and proper maintenance procedures being continued.

Future Projections

The City of Alachua has no improvements or expansions of capacity currently planned at this time.

<u>Year</u>	Projected Water Demand		
	<u>Population Served</u>	<u>Average Daily Flow</u>	<u>Maximum Water Flow</u>
2010	6,340	750,500	1,100,000

Projections were made in 1991. The City of Alachua has not determined new projections.

Impact on Natural Resources

There are no known negative impacts on adjacent natural resources from the Alachua potable water system.

CITY OF HIGH SPRINGS¹⁵

The City of High Springs has operational responsibility for its potable water facility. The service area consists of most of the city, as well as limited, site specific uses outside the city limit. Currently, there is no agreement, either verbal or written, which describes proportional capacity of the High Springs system as related to the provision of services within the Alachua County jurisdiction. Future extensions and capacity expansions may service portions of the system within the unincorporated areas of Alachua County.

The design capacity of the system is 1,728,000 gpd. The existing (2000) estimated population served is 4,025, with an average daily demand of 460,000 gallons. The maximum daily flow is 925,000 gallons, leaving an estimated surplus capacity of 803,000 gpd. The peak hour flow is estimated to be 1,350,000 gpd.

The existing per capita water consumption is 135 gallons per day. The level of service standard of 135 was adopted in 2001.

¹⁵City of High Springs Comprehensive Plan, Jan 2001.

High Springs has a 265,000 gallon elevated water storage tank. The fire flow requirement for storage is 228,000 gallons.

Condition of the System

The general condition of the centralized system is considered to be good. The wellfields are providing an adequate level of service and the tank capacities are providing adequate reserves. The expected life of these facilities is projected to exceed 2015, based upon the projected limited demand and proper maintenance procedures being continued.

Future Projections

The City of High Springs is projected to have a surplus capacity of water supply and storage supply by 2000 and by 2010. No improvements or expansions of capacity are currently planned by the City of High Springs.

Projected Water Demand				
<u>Year</u>	<u>Population Served</u>	<u>Average Daily Flow</u>	<u>Maximum Water Flow</u>	<u>Peak Hourly Flow</u>
2005	4,553	525,000	1,050,000	65,500
2010	5,279	605,000	1,215,000	75,900
2015	6,119	705,000	1,410,000	88,100

Projected Storage Requirements			
<u>Year</u>	<u>Peak Hourly Flow (8 hrs)</u>	<u>Max. Daily Flow (8 hrs)</u>	<u>Storage Requirement</u>
2005	525,000	350,000	175,000
2010	605,000	405,000	200,000
2015	705,000	470,000	235,000

Impact on Natural Resources

There are no known negative impacts on adjacent natural resources from the High Springs potable water system.

ALL WATER SYSTEMS

The Florida Administrative Code (Chapter 17-550.200) defines a Community Water System as a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. Community water systems provide potable water to residential uses such as municipalities, residential subdivisions, and mobile home parks.

A Non-Community Water System is defined as a public water system for provision to the public of piped water for human consumption that serves at least 25 individuals daily at least 60 days out of the year but that is not a community water system.

Table 3 provides descriptions of each system. Due to security considerations, more extensive data on potable water systems is not available to the public unless obtained by the Florida Department of Environmental Protection in writing. Table 3 shows the best available data for the potable water systems in Alachua County as of January 2002.

There are approximately 40 additional small water systems permitted by the Florida Department of Health (as opposed to the Department of Environmental Protection), which are not in the table. They are not permitted under the Florida Safe Drinking Water Act, which means they serve less than 25 individuals per day or for less than 60 days per year and have less than 15 service connections. All of the other potable water systems in the County (listed in Table 3) are permitted by FDEP and are under the Florida Safe Drinking Water Act.

With the exception of the municipal systems, there are no plans for expansions to these water systems, which are generally designed to accommodate the ultimate buildout of the project (a subdivision, for example), and are generally not expected to expand beyond the original projection. Most of the systems servicing residential land uses are near or at capacity; therefore few, if any, additional connections may be expected. Policies in this plan limit both the expansion of existing systems and the development of new systems.

TABLE 3

Water Systems of Alachua County

Facility Name	Design Capacity	Maximum Flow	Average Flow	Population Served	Land Use
Community Water Systems					
Alachua Water Plant	3,500,000	1,295,000	1,11523	6,300	various
Archer WTP	1,150,000	252,000	75,133	2,100	various
Arredondo Estates	290,000	65,000	48,000	575	residential
Arredondo Farms	290,000	55,000	45,000	600	residential
GRU Murphree Water Plant	40,000,000	30,262,000	2,716,7000	155,788	various
Hawthorne Water Department	1,280,000	350,000	174,610	1,587	various
High Springs Water Department	1,400,000	672,600	432,610	4,025	various
Hillcrest Trailer Park	43,000	33,600	23,586	250	residential
Kincaid Hills	245,000	167,000	116,000	900	residential
Lake Alto Estates Subdivision	250,000	14,900	10,543	150	various
Town of Micanopy	518,000	116,400	78,747	365	various
Newberry Water Department	670,000	506,000	353,677	3,316	various
Progress Trailer Park	1,900	3000	1,000	80	residential
Santa Fe Hills Subdivision	110,040	25,633	21,827	200	residential
Sunshine MHP	100,000	24,950	15,541	300	residential
Waldo WTP	500,000	156,210	75,253	875	various
Westgate MHP	229,000	55,475	24,813	200	various
GRU Cross Creek	86,000	4,333	2,212	95	residential

Facility Name	Design Capacity	Maximum Flow	Average Flow	Population Served	Land Use
Non Community / Non Transient Water Systems					
A Step Ahead Enrichment Center	2,400	655	219	70	institutional
Acorn Clinic	1,500	54,000	1,861	40	institutional
Alachua Learning Center	6,300	1,280	673	208	institutional
Medical Manager Research	7,872	4,400	2,097	65	industrial
Moltech Power System	24,000	1,850	1,330	1,100	industrial

Source: Florida Department of Environmental Protection - Drinking Water Database and Potable Water Staff, January 2002. Population statistics for municipalities came from the municipalities and/or US Census.

Table 3 continued on next page.

TABLE 3
Water Systems of Alachua County (continued)

Facility Name	Design Capacity	Maximum Flow	Average Flow	Population Served	Land Use
Non-Community Water Systems					
Alachua Regional Marine Inst.	4,600	3,978	2,082	25	institutional
Austin Cary Forest Conference Center	22,000	170,676	38,540	50	institutional
Café Risque	10,000	6,429	4,679	25	commercial
Camp McConnell	30,000	4,000	2,836	150	recreation
Canterbury Equestrian Show Place	200,000	4,328	4,327	150	recreation
Center for Aquatic Weeds	25,000	1,680	603	25	institutional
Christian Life Fellowship	28,000	n/a	n/a	100	institutional
Citgo #515	14,000	1,380	895	25	commercial
Copeland Park	14,000	8	6	25	recreational
Cross Creek Fish Camp	36,000	9,000	n/a	50	commercial
Diamond Sports Activity Center	28,000	1,580	1,106	300	recreational
Fast Track # 220 US 441	20,000	236	184	25	commercial
Fast Track # 227 SR 26	999	253	209	25	commercial
Fellowship Baptist Church	36,000	902	531	200	institutional
Florida Welcome Station	28,000	2,210	1,742	25	tourist
Gainesville Livestock Market	28,000	2,000	n/a	n/a	commercial
Gator Landing RV Park	25,200	7,976	4,575	35	residential
Smoke Express #2416	29,000	650	418	25	commercial
High Springs Campground	7,000	7,190	1,259	60	commercial
Kulaqua Youth Camp	57,000	22,500	3,168	200	recreational
Lake Wauberg	50,000	1,160	229	100	conservation
Lewis Oil Co. #9	14,000	1,350	750	25	commercial
Lil Champ #58	999	390	248	25	commercial
Oasis Lounge	2,400	830	206	36	commercial
Payne's Prairie State Preserve	n/a	6400	4353	100	tourist
Poe Springs Park	50,000	1,502	379	100	recreation
Powers Park	10,000	156	89	25	recreation
Micanopy Amoco	22,000	3,635	2,401	25	commercial
Rawlings Park	72,000	63	42	30	recreation
Santa Fe Lake Park	43,000	22	13	25	recreation
Knights Inn	273,000	15,000	10,383	350	commercial
Sunshine Food Mart #128	10,000	814	519	25	commercial
Thomas Oil Co. / Chevron	2,400	1,215	794	25	commercial
Cross Creek Outpost	2,000	744	231	35	commercial
Travelers Safari Campground	72,000	7,646	5,107	25	commercial
Waldo Farmers Flea Market	36,000	1,120	622	25	commercial
Yankee Landing / Finway Inc.	6,000	430	315	25	commercial
Yearling Restaurant	n/a	530	378	50	commercial

Source: Florida Department of Environmental Protection - Drinking Water Database and Potable Water Staff, January 2002.

PRIVATE WELLS

Private wells provide potable water to those residents who are not served by central systems. They are defined as a well, pump, and piping located on an individual residential lot. The number of private wells in the county is estimated at 20,000 in 2000¹⁶.

Most of these wells are located in the rural portions of the county, and many are located at homes having septic tanks as well. Groundwater quality is very important for homes having private wells. If the wells are not deep enough to access good groundwater, health problems may arise. Groundwater contamination can easily occur where the aquifer is at or near the surface, such as in the western portion of the county. Septic tanks that are not regularly maintained and cleaned will eventually contaminate the groundwater around the home, groundwater that gets pumped by the well into the home.

There have been situations in the unincorporated area of Alachua County where drinking well contamination has occurred. There are policies in the element which provide for an extensions of central water or wastewater system lines when the public health is at risk. For example, in 1993, 11 private drinking wells in the vicinity of the Alachua County Northwest Landfill, located near the City of Alachua, were found to be contaminated with a soil fumigant. Alachua County and the City of Alachua did work out an arrangement whereby the affected residents were connected to the City of Alachua's central water system.

There have also been cases where waivers were granted to allow a facility inside the urban service boundary to have a private well as opposed to connecting to the central potable water system. From 1992 to 2001, there have been 4 cases when a waiver was granted, all of which were for financial hardship. Two of them were at a church, one at an office, and one at a storage warehouse.

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This was calculated by subtracting the estimated number of persons on community water systems in the county from the county total population. This number was then divided by the number of persons per household to arrive at the number of households on wells.

217,955 persons in Alachua County
-169,647 persons on community water systems
48,308 persons on private wells, divided by 2.34 persons per household (pph) equals approximately 20,000 private wells in the county in 2000.

ANALYSIS OF SANITARY SEWER FACILITIES

This section presents an inventory of Sanitary Sewer facilities. Sanitary sewer facilities include municipal centralized systems, package treatment plants, and individual on-site disposal system, more commonly known as septic tanks. The level of wastewater treatment can vary among these facilities, depending upon the methods used. Wastewater generation varies greatly by type of use. Table 4 depicts various uses and their corresponding average generation measured in gallons per day.

Table 4
Typical Wastewater Generation by Use

<u>Source</u>	<u>Gallons/Day</u>
Airports: (per passenger)	2-4
Residential:	
Single Family (per resident)	40-135
Multi-Family (per resident)	35-55
Commercial:	
Hotel (per room)	55-80
Laundry (per customer)	40
Restaurant (per patron)	2-8
Service Station (per vehicle)	8
Store (per toilet room)	320
Industrial: (per person per shift)	
Factory	10-30
Construction	40
Agricultural:	
Livestock	2-30
Parks: (per person)	20-40
School: (per student)	10-80

MUNICIPAL SYSTEMS

Sanitary sewer facilities, as defined by 9J-5.003(82), are "structures or systems designed for the collection, transmission, treatment, or disposal of sewage and includes trunk mains, interceptors, treatment plants and disposal systems."

The collection system is composed of a network of pipes, analogous to the branching structure of a tree. Waste is carried from the periphery to a central treatment location through small lines carrying waste from the individual customer connecting to larger collector lines which eventually convey the waste to the treatment plant. Sewer lines are classified according to their location rather than by size, in order to facilitate identification of downstream components which may be affected by sewage flow from the periphery.

The components of the collection system include service connections, service laterals, sewer lines, and interceptors¹⁷.

¹⁷The service connection (typically 4 inches in diameter) is the line which connects the plumbing of a structure to the service lateral. The service lateral (typically 4 to 6 inches in diameter) is the line running from the sewer line, typically located in the street, to the property line of the structure being serviced.

The sewer line (typically 8 inches in diameter) is usually located in the street with service laterals extending out to either side to

Wastewater is conveyed through pipelines either under the force of gravity or by pumping. Gravity lines must be sloped to achieve gravity flow. Thus, the practical limitation on the depth to which a line can be constructed and the variation in topography will create drainage districts out of which gravity flow is not feasible. In such cases, the sewer lines flow to a pumping station which can pressurize the flow in a force main which is then routed over the topographic obstruction to the next point in the system.

The treatment plant is the component which functions to remove solid and dissolved materials from the sewage. There are a large number of processes which can accomplish this, but they are generally grouped into either primary, secondary, or tertiary treatment, depending on the proportion of materials removed¹⁸.

Effluent and sludge are the by-products of the treatment process. Effluent is the treated wastewater which flows out of the treatment plant. Effluent disposal alternatives include discharge to a water body, spray irrigation re-use, industrial re-use, or injection into deep aquifers. Sludge refers to the accumulated solid residues of the treatment process. Prior to final disposal, sludge is usually subjected to an additional biological treatment process to remove pathogens and to physical dewatering processes to facilitate transportation and disposal. Disposal methods can include burial in solid waste landfills (although this is not done in Alachua County) and land application as a soil conditioner for agricultural purposes such as sod farms.

Infiltration/inflow (I/I) is a problem with wastewater facilities. Infiltration refers to water entering the sewer system from the ground through such means as breaks or cracks in pipes, pipe joints, or manhole walls. Inflow refers to water entering the sewer system from such sources as roof leaders, manhole covers, and other means of drainage.

Alachua County does not operate a central sanitary sewer facility. County residents in the urbanized area surrounding the City of Gainesville have access to central sewer via Gainesville Regional Utilities. Other municipalities having their own systems include Alachua, Hawthorne, Newberry, and Waldo.

The table below provides best available data on municipal sanitary sewer systems. The table shows plant design capacity, population served, daily demand, surplus capacity, and the expected life of the facility.

serve adjacent properties. Manholes are installed along the sewer line to provide access to the lines for clearing blockages, conducting repairs, etc. The sewer lines are connected so that wastewater flows are continuously compiled or centralized along the direction of flow.

A sanitary sewer interceptor (typically 10 inches or larger in diameter) is a sewerage conduit which collects wastewater from upstream sewer lines.

¹⁸Primary treatment refers to the removal of between 30 and 35 percent of the organic materials and up to 50 percent of the solids from the sewage. This is also commonly referred to as physical treatment because screens and settling tanks are the most common methods used to remove the solids.

Secondary treatment processes remove between 80 and 90 percent of total organic materials and suspended solids from sewage. This level of treatment generally requires multiple steps involving one biological process and one or more processes for removal of suspended solids.

Tertiary treatment adds steps to primary and secondary processes to remove additional organic compounds or inorganic chemicals which may create pollution problems if not removed. The most common tertiary processes remove compounds of phosphorus and nitrogen. The effluent of advanced treatment processes often approaches potable water purity.

According to the data, all plants have excess surplus capacity. The County adopts LOS Standards for municipal sanitary sewer systems for purposes of concurrency determinations for any development in the unincorporated county that utilizes these municipal systems. The County uses most recent standards adopted by the municipalities in their comprehensive plans. These LOS standards are in the discussion of each municipality following the table on pages 25 through 31.

**Summary of Municipal Sanitary Sewer Systems
Status: 2001**

Municipality	Design Capacity (Gallons/Day)	Population Served (Estimated)	Daily Demand (Gallons/Day)	Surplus Capacity (Gallons/Day)	Expected Life of the Facility
Alachua Paul O’Dea Plant and Turkey Creek Plant	1,337,000 (937,000 at Paul O’Dea + 400,000 at Turkey Creek)	1,785 (1,236 at Paul O’ Dea + 549 at Turkey Creek plant)	645,000 (520,000 at Paul O’Dea + 125,000 at Turkey Creek)	692,000 (417,000 at Paul O’Dea + 275,000 at Turkey Creek)	The Paul O’Dea Plant until Year 2010 + Turkey Creek Plant until 2008
Gainesville	Kanapaha: 10 mgd Plans to expand to 12.5 mgd by 2003. Main Street: 7.5 mgd	141,051 people 47,463 residential connections 60,278 households	Av. combined daily demand of Kanapaha & Main Street WWTPs in 2000 = 6.865 mgd Kanapaha: 8.39 mgd Main Street: 5.34 mgd Total: 13.73 mgd	Surplus Capacity = 3.77 mgd Kanapaha: 1.61 mgd Main Street: 2.16 mgd Total: 3.77 mgd	Year 2003 at 17.5 mgd. Two additional expansions at Kanapaha will extend the life of the facility: Year 2009 at 20 mgd Year 2016 at 22.5 mgd.
Hawthorne	150,000 (permitted capacity)	793*	80,000	70,000 64,588 after approved and proposed development	Year 2010 +
Newberry	415,000	3,316 (2000 Census)	147,000	268,000 262,089 after approved and proposed development	Year 2010 +
Waldo	100,000	875	58,000	42,000	Year 2010 +

Sources: City of Gainesville (GRU); Data on Alachua and Waldo was received from city administrators. Data on Newberry and Hawthorne from North Central Florida Regional Planning Council.

* Estimated as 1/2 of the population who is served by the potable water plant (1,587).

CITY OF GAINESVILLE¹⁹

GRU has operational responsibility for two sanitary sewer treatment plants. The Kanapaha and Main Street plants are major treatment facilities serving connections in the unincorporated area of the county. Their service areas are shown in Map 3. Map 4 shows the location of central sanitary sewer lines provided by GRU in the urban cluster. There are sections within this generalized area that are not currently served by sanitary sewer collection lines. Capacity is allocated to new customers on a first-come, first-served basis. Capacity is not reserved for particular geographic areas within GRU's entire service area. The forecasted plant flows and capacities in this analysis include both inside and outside the City of Gainesville. Future extensions and capacity expansions will service portions of the system within Alachua County. Forecasts of demand and capacity show that on a system-wide basis, accounting for all customers in the City of Gainesville and the unincorporated area of Alachua County, demand will not exceed the available capacity.

The generalized existing land use is shown in the Alachua County Existing Land Use Map in the Future Land Use Data and Analysis section.

The Kanapaha WWTP operates as a 10 mgd advanced wastewater treatment plant. The system provides tertiary treatment. Discharge is via deep well injection to a depth of 1,000 feet.

The Kanapaha plant has a design capacity of 10 mgd. The current (2000) peak flow is 8.39 mgd, leaving a surplus of 1.61 mgd.

The Main Street WWTP operates as a 7.5 mgd advanced wastewater treatment plant. Secondary effluent is discharged to Sweetwater Branch, which eventually discharges to Alachua Sink, at which point substantial additional dilution occurs through mixing with wetlands runoff from Paynes Prairie also draining to the sink.

The Main Street plant has a design capacity of 7.5 mgd. The current (2000) peak flow is 5.34 mgd, leaving a surplus of 2.16 mgd.

The total design capacity of the two plants is 17.5 mgd. Current (2000) total flow is 13.73 mgd, leaving a total surplus of 3.77 mgd. Currently, approximately 3.5 mgd of the wastewater collection system can be routed to either facility for treatment. The decision to route wastewater to a given system depends on system-wide flow conditions as well as the operating conditions at the two treatment plants. A feature has been constructed to allow for the shifting of approximately 3.5 mgd from one treatment plant to the other. This should be adequate to handle any projected collection increases at either of the plants. For this reason, the combined system is considered when forecasting flow rates or projecting capacity.

Levels of Service

Two existing level of service (LOS) indicators have been examined in cooperation with the GRU Strategic Planning Department for the Kanapaha and Main Street Wastewater Treatment Plants. These are:

1. Average flow design capacity (measured as average daily per capita flow); and,
2. Peak flow design capacity (measured as maximum daily per capita flow).

¹⁹City of Gainesville Comprehensive Plan, August 2000, GRU Strategic Planning, September 1991.

Average Flow Design Capacity

The residential daily per capita flow was calculated from the combined flows of the plants. The contributions to this flow rate include the average daily base flow, infiltration/inflow, and commercial and industrial flows.

A five year (1993-98) period²⁰ was used to determine the level of service standards for residential and non-residential uses. Infiltration/inflow was estimated at 10%. For residential purposes, the number of connections to the system was determined, as was the corresponding number of units per connection. Multiplying the number of units by the persons per household yields the population served. Generation divided by population served yields average daily per capita generation. Commercial standards were determined based upon flows for the same five year period.

Non-residential units can vary widely in their wastewater generation. Therefore, the standard proposed for non-residential uses is to use best available engineering practices and methods to estimate average daily flow for the purposes of assessing plant connection fees.

The base data are as follows:

2000 dwelling units per wastewater connection	1.27
2000 persons per household	2.34

The average residential and non-residential standards are:

- residential: 200 average daily gallons per dwelling unit.**
- non-residential: Average annual daily flow as estimated for plant connection fees using GRU connection policies outlined in city ordinances**

Peak Flow Design Capacity

Peak flow design capacity is measured as maximum month average daily flow. This is the basis for the Florida Department of Environmental Protection's (DEP's) permitting of wastewater facilities.

Peak flow is estimated using the maximum month average daily flow to average day flow ratio from historical GRU wastewater records.

- peak residential: 200 daily gallons per dwelling unit**
- peak non-residential: average daily flow multiplied by 1.15 as estimated for plant connection fees using GRU connection policies as outlined in city ordinances**

Condition of the Systems

²⁰Gainesville Regional Utilities, Black & Veatch. March 1999. Gainesville Regional Utilities FIVE-YEAR REPORT. Gainesville, FL.

A study²¹ undertaken to satisfy bonding requirements evaluated the sanitary sewer facilities and presented the following summary findings:

1. The wastewater system facilities are in excellent condition, efficiently operated, and well-maintained relative to, and in accordance with, prudent utility practice, and with the upgrade of the Main Street plant, will meet all current permit requirements.
2. The present wastewater system, with the planned improvements, is projected to adequately serve the present and future needs of its customers beyond 2016.

Impact on Natural Resources²²

In 1989 effluent from the Main Street Wastewater Plant was listed by the US Environmental Protection Agency (EPA) as having levels of lindane and silver higher than currently permissible for Class III surface waters (the effluent is being disposed into Sweetwater Branch Creek). An upgrade has been completed which allows the plant to meet the new effluent limits, and, in conjunction with GRU's Industrial Pre-treatment Program, to reduce lindane and silver levels. Current data shows that lindane and silver are not exceeding limits and are not a concern anymore.

Assessments of the plant's effects on Sweetwater Branch's dissolved oxygen (DO) levels have been conducted and are summarized in two reports²³. These reports indicate that while the plant's DO levels have probably been lower than the Class III standard during recent years, the levels were not likely to have interfered with spawning. The exception is in the lower reaches of the stream, which under high water levels, is contiguous with Paynes Prairie and naturally has low DO. Sweetwater Branch has been stressed as a result.

The Kanapaha Plant's major impact on the environment is an alteration of the groundwater quality at a depth of 450-1,020 feet below ground level in the Floridan Aquifer. Extensive monitoring and analysis have suggested that water is at acceptable background conditions for nutrients, organic chemicals, and microbiological constituents within 2,300 feet of the plant due to absorption, adsorption, filtration, precipitation, and bacterial breakdown below the surface. This conclusion is based on 13 years of operating data including data collected from groundwater monitoring wells designated and constructed to intercept the discharge plume. However, there is a degree of uncertainty as to the adequacy of using groundwater monitoring wells to monitor groundwater plumes in highly karst areas.

Additionally, lindane (a chemical used in animal shampoos for the control of fleas) has been detected in some of the groundwater monitoring wells near the Kanapaha plant at varying concentrations which do not violate the federal secondary drinking water standards. This data indicated that the plant is not able to remove all of the lindane which comes into the plant.

A large holding pond at the plant is used for by-pass should the effluent not meet drinking water standards

²¹Gainesville Regional Utilities, Black and Veatch. March 1999. Gainesville Regional Utilities FIVE-YEAR REPORT. Gainesville, FL.

²²GRU. 12 October, 1989. Impact of Water and Wastewater Treatment Plants on Adjacent Natural Resources. Strategic Planning Department.

²³CH2M-Hill, 1987. Gainesville's Main Street Wastewater Treatment Plant and Sweetwater Branch. Report prepared for GRU, 1989. Response of Gainesville Regional Utilities to May 17, 1989 Information Request by the Environmental Protection Agency.

prior to aquifer recharge. This pond has suffered water loss in the past due to sinkhole formation and is now lined to prevent the re-occurrence of such events. As a precautionary measure, all private wells adjacent to the plant have been replaced by central water.

Under severe storm events, if the holding pond becomes full, Kanapaha is permitted to discharge to Lake Kanapaha which is naturally hypereutrophic. The plant can implement phosphorous removal and the only instances of such discharge do not appear to have adversely affected the lake²⁴.

Odors have been significantly reduced at the plant by the installation of a biofilter for odor control. Monitoring of this system by the University of Florida has found it to remove 99.9% of the H₂S from the waste air stream²⁵.

CITY OF WALDO²⁶

The City of Waldo has operational responsibility for its sanitary sewer facility. The service area consists of most of the city, as well as limited, site specific uses outside the city limit. Currently, there is no agreement, either verbal or written, which describes proportional capacity of the Waldo system as related to the provision of services within the Alachua County jurisdiction. The predominant types of land use served by this facility are residential (93%) and commercial/other non-residential (7%).

The design capacity of the system is 100,000 gallons per day. The 2000 estimated population served is 875 persons. Demand is 58,000 gpd, which leaves a surplus capacity of 42,000 gpd.

The current demand per capita is 44 gpd. The adopted level of service standard is 61 gpd.

Condition of the System

The City of Waldo's 201 Facilities Plan states that the facilities are in good condition and have an expected life beyond 2010.

Impact on Natural Resources

The Waldo sanitary sewer system consists of an extended aeration treatment plant with discharge of effluent to a drainage ditch, and ultimately to wetlands. The FDEP monitors the plant monthly in order to prevent or contain groundwater pollution.

CITY OF NEWBERRY²⁷

²⁴KBN Engineering and Applied Sciences. 1987. Lake Kanapaha: Application of Treated Domestic Wastewater As a Restorative Technique for a Hypereutrophic Lake. Study prepared for GRU. Gainesville, FL.

²⁵Allen, Eric. 1989. Design and Assistance of an Odor Control Biofilter System at the Kanapaha Wastewater Treatment Plant. Report prepared for GRU. Gainesville FL.

²⁶City of Waldo Comprehensive Plan, April, 1991, Data from City Manager, 2001.

²⁷City of Newberry Comprehensive Plan, May 1991, Data derived from 1998 EAR received from City Administrator, 1998.

The City of Newberry has operational responsibility for its sanitary sewer facility. The service area consists of a portion of the city. A recent annex included several connections that previously were located outside the corporate limits. Currently, there is no agreement, either verbal or written, which describes proportional capacity of the Newberry system as related to the provision of services within the Alachua County jurisdiction. The predominant types of land use served by this facility are residential, commercial, and institutional.

The design capacity of the system is 415,000 gallons per day. The 2000 estimated population served is 3,316 persons, according to the US Census. Current demand is 147,000 gpd, which leaves a surplus capacity of 268,000 gpd. There is approved and proposed new development which will be served by the system. After the development is connected, the surplus capacity is estimated to be 262,089 gpd.

The current demand per capita is 120 gpd. The adopted level of service standard is 120 gpd.

Condition of the System

The City of Newberry's 201 Facilities Plan states that the facilities are in good condition and have an expected life beyond 2010.

Impact on Natural Resources

The Newberry sanitary sewer system consists of an extended aeration treatment plant with discharge of effluent to holding ponds and then to a spray field. The FDEP monitors the plant monthly in order to prevent or contain the possibility of groundwater pollution.

CITY OF ARCHER²⁸

No centralized sanitary sewer system exists within the City of Archer. Two package treatment plants are in operation. Details of the plant are discussed in the following section regarding package treatment plants.

Impact on Natural Resources

Sewage disposal in the City of Archer is comprised primarily of septic tanks. Septic tank systems offer a greater potential to groundwater contamination than does a centralized system. While septic tank systems may be installed properly, ultimately the septic tank system will fail unless routine cleaning is performed. Currently there are no requirements for periodic monitoring or cleaning of septic tanks; therefore the potential for groundwater contamination is high, due to a lack of monitoring and enforcement of cleaning and maintenance.

The package treatment plant also may be constructed to work adequately, but proper operation and monitoring must take place in order to prevent groundwater contamination, especially in the western portion of the county where the aquifer is at or near the surface.

²⁸City of Archer Comprehensive Plan, April 1991.

TOWN OF MICANOPY²⁹

No centralized sanitary sewer system exists within Micanopy. There are two package treatment plants in operation.

Impact on Natural Resources

Sewage disposal in the Town of Micanopy is comprised of septic tanks. Septic tank systems offer a greater potential to groundwater contamination than does a centralized system. While septic tank systems may be installed properly, ultimately the septic tank system will fail unless routine cleaning is performed. Currently there are no requirements for periodic monitoring or cleaning of septic tanks; therefore the potential for groundwater contamination is high, due to a lack of monitoring and enforcement of cleaning and maintenance.

CITY OF HAWTHORNE³⁰

The City of Hawthorne has operational responsibility for its sanitary sewer facility. The service area consists of a portion of the city. The predominant types of land use served by this facility are residential and commercial. There are also two package treatment plants in Hawthorne.

The design capacity of the system is 175,000 gallons per day. Demand is 95,000 gpd, which leaves a surplus capacity of 80,000 gpd. The level of service standard adopted in 1991 is 100 gpd. There was no central wastewater plant in the City of Hawthorne in 1991 (at the time of the City's Comprehensive Plan adoption), so the LOS standard adopted was a projection for when the plant would begin operation. Since 1991, there has been no update of the LOS standard.

Condition of the System

The facilities are in good condition and have an expected life beyond 2010.

Impact on Natural Resources

The City of Hawthorne recently changed from septic tanks to a centralized wastewater system. Septic tank systems offer a greater potential to groundwater contamination than does a centralized system. As a result of the conversion to the centralized system, any potential contamination has been decreased.

²⁹Town of Micanopy Comprehensive Plan, April 1991.

³⁰City of Hawthorne Comprehensive Plan, May 1991, Data from City Administrator, 2001.

CITY OF ALACHUA³¹

The City of Alachua has operational responsibility for two sanitary sewer facilities, the Paul O’Dea Plant and the Turkey Creek Plant. The service area consists of a portion of the city. The predominant types of land use served by this facility are residential, commercial, and institutional. There is also a package treatment plant in Alachua.

The design capacity of both plants together is 1,337,000 gallons per day. The 2000 estimated population served is 1,785 persons. Demand is 645,000 gpd, which leaves a surplus capacity of 692,000 gpd. For specifics on each plant, see the Summary of Municipal Sanitary Sewer Systems on page 24.

The current demand per capita at the Paul O’Dea Plant is 81 gpd, and 60 gpd at the Turkey Creek Plant. The adopted level of service standards are 81 gpd and 60 gpd, respectively.

Condition of the System

The facilities are in good condition and have an expected life beyond 2010.

Impact on Natural Resources

The Alachua sanitary sewer system consists of a complete mix optional stabilization treatment plant with discharge of effluent to spray fields. The FDEP monitors the plant monthly in order to prevent or contain the possibility of groundwater pollution.

CITY OF HIGH SPRINGS³²

No centralized sanitary sewer system exists within High Springs. Five package treatment plants are operating in High Springs. However, a centralized wastewater collection system has been proposed for the downtown area.

Impact on Natural Resources

Sewage disposal in High Springs is comprised primarily of septic tanks. Septic tank systems offer a greater potential to groundwater contamination than does a centralized system. While septic tank systems may be installed properly, ultimately the septic tank system will fail unless routine cleaning is performed. Currently there are no requirements for periodic monitoring or cleaning of septic tanks; therefore the potential for groundwater contamination is high, due to a lack of monitoring and enforcement of cleaning and maintenance. Package treatment plants also may work adequately, but proper operation and monitoring must take place in order to prevent groundwater contamination, especially in the western portion of the county where the aquifer is at or near the surface.

³¹City of Alachua Comprehensive Plan, April 1991, Data from City Public Works Director, 2001.

³²City of High Springs Comprehensive Plan, January 2001.

PACKAGE TREATMENT PLANTS

Package treatment plants are wastewater treatment facilities having a permitted capacity of less than 100,000 gallons per day. Essentially, they are small treatment systems which have a collection network, treatment system, and disposal system. Package plants may be designed to provide any level of treatment, but plants providing secondary treatment are most commonly used. They are generally used to serve isolated development in lieu of septic systems and are usually partially or completely pre-assembled by the manufacturer prior to shipment to the site of use.

Package treatment plants can be designed to operate effectively, but in some instances the operation and maintenance of the plants are not adequate. While monitoring is performed by the FDEP, and County Environmental Protection Department staff, groundwater contamination can occur for up to a month before being discovered. This is a problem, especially for the western portion of the county where the aquifer is at or near the surface. Either more stringent restrictions on the location of package treatment plants, or better monitoring and enforcement is required to minimize the chance of groundwater contamination. Package plants can fail for a number of reasons, and Policy 5.3 is designed to focus on preventing inadequately treated wastewater from entering the groundwater and endangering the health of the community.

Map 5 shows the locations of the package treatment plants as well as the municipal facilities in Alachua County, while Table 6 provides descriptions of each. The plants are inspected four times per year by the Alachua County Environmental Protection Department staff and annually by FDEP.

There are no plans for expansions to the package treatment plants. Package treatment plants are generally designed to accommodate the ultimate buildout of the project (a subdivision, for example), and are generally not expected to expand beyond the original projection. Most of the package treatment plants servicing residential land uses are near or at capacity; therefore few, if any, additional connections may be expected. Policies in this plan encourage (and require in some cases) the upgrading of the levels and types of treatment, including connection to the centralized sewer system where available, in order to protect the groundwater quality. Policy 5.3 goes further to coordinate connection to centralized sewer systems. These improvements would not increase the capacities of the facilities beyond current expansion plans, and thus would not impact the provision of other municipal services.

New package treatment plants are not allowed in areas served by centralized wastewater treatment plants. Inside the urban cluster, the only consideration for a package plant is in the event of septic tank failure causing a health or groundwater concern (Policy 2.2). Outside the urban cluster, Policy 2.6 outlines considerations for use of a package plant. It is only as a last resort and will have to be retrofitted to connection to a centralized system once it becomes available.

TABLE 6
Permitted Wastewater Treatment Plants as of November 2001

Facility / Operating Agency	Permitted Annual Average Daily Flow (MGD)	Flow	Average Served	Population LOS	Land Use	Effluent Disposal/Method	
1 Archer Community School	0.005		0.00374	73	51	Institutional	3 percolation ponds
2 Archer Homes. LTD.	0.0083		0.00216	73	30	Residential	absorbtion field
3 Arredondo Village MHP	0.06	0.0287	710	40	Residential	2 percolation ponds	
4 Brittany Estates MHP	0.06		0.025	372	67	Residential	Little Hatchet Creek (class III water)
5 Camp Kulaqua	0.0201		0.0021	400	5	Recreation	2 percolation ponds
6 Camp McConnell YMCA	0.0075		0.0032	150	21	Recreation	2 absorbtion fields
7 City of Alachua*	1.337		0.645	1,785	81, 60	Various	sprayfield
8 City of Hawthorne*	0.15		0.80	793	100	Various	3 percolation ponds
9 City of Newberry*	0.415		0.147	3,316	120	Various	sprayfield
10 City of Waldo*	0.10		0.58	875	61	Various	constructed wetland to natural wetland to Santa Fe River (class III water)
11 Florida Welcome Station	0.009		n/a	25	n/a	Commercial	percolation pond
12 Gainesville Raceway	0.00825		0.0083	n/a	n/a	Recreation	sprayfield
13 GRU #1 Main Street*	7.5		5.34	**	**	Various	Sweetwater Branch (class III water)
14 GRU #5 Kanapaha*	10		8.39	**	**	Various	Reuse and deep well injection
15 High Springs Apartments	0.018		0.0066	100	66	Residential	2 percolation ponds
16 High Springs Care Center	0.015		0.0016	150	11	Commercial	2 percolation ponds
17 High Springs Commercial Park	0.03		n/a	n/a	n/a	Commercial	constructed wetland to natural wetland
18 Hillcrest Mobile Home Park	0.013		0.013	120	108	Residential	sprayfield
19 Knight's Inn Micanopy	0.015		n/a	350	n/a	Commercial	sprayfield
20 Oaks Plaza Shopping Center	0.0035		0.0022	68	32	Commercial	percolation pond
21 Prairie View Apartments	0.00424	0.004	42	95	Residential	percolation pond	
22 Progress Mobile Home Park	0.0099		0.006	100	60	Residential	ditch to Turkey Creek (class III water)
23 Sonny's of Hawthorne	0.0025		0.002	200	10	Commercial	percolation pond
24 Springhill Middle School	0.015		0.0065	750	9	Institutional	2 percolation ponds
25 Sunshine Mobile Home Park	0.015		0.014	150	93	Residential	2 percolation ponds
26 Turkey Creek, Inc.	0.15		0.127	3,500	36	Residential	reuse irrigation for golf course
27 Texaco Food Mart #691	0.005		0.005	100	50	Commercial	2 percolation ponds
28 University of Florida	3.0		2.1	40,000	45	Institutional	deep well injection /reuse/ lake augmentation
29 Winn Dixie High Springs	0.0075		n/a	n/a	n/a	Commercial	2 percolation ponds

* Analysis for municipal systems provided in earlier portion of this document.

n/a = information either not applicable or not available

** Both GRU plants are combined due to ability to shift flow from one to the other. Population served is 141,051; LOS is 173 ave/du.

Sources: Department of Environmental Protection Wastewater Facility Regulation Database. Florida Department of Environmental Protection, Alachua County Environmental Protection Department.

SEPTIC TANKS

Septic tank systems (also referred to as On Site Disposal Systems, OSDS) commonly serve individual housing units or small-scale non-residential uses generating effluent of such small quantity and intensity (low bacterial and/or chemical levels) that it can be treated adequately by an OSDS. The system consists of two components, the septic tank and the drainage field. The tank receives wastewater from the land use and provides a period of settling, during which time a significant portion of the suspended solids settle out. The settled solids are gradually decomposed by bacteria in the tank. The remaining liquids are discharged through underground drainage pipes into the drainfield and percolate into the soil where micro-organisms and filtration processes purify the liquids.

Septic tanks generally require cleaning every three to five years to remove accumulated solids. These solids, called septage or biosolids, are generally transported to regional sanitary sewer facilities for treatment prior to disposal. In Alachua County, septage is hauled, treated, and disposed by five private, licensed operators.

Septic tank systems are prevalent throughout all parts of the county. They are located within areas where soils are most suitable for septic systems, and within areas with soils least suitable for septic systems (discussed below). They are also located within service areas of centralized systems. The number of septic tanks in Alachua County was estimated at 27,000 in 2000³³.

Soils are a determinant of the suitability of septic tanks as a means of sewage disposal. The soils of Alachua County have been surveyed and mapped by the U.S. Department of Agriculture Soil Conservation Service (USDA SCS) *Soil Survey of Alachua County Florida*, August 1985. Included in that survey is detailed information on each of the soil series identified in the county, and maps showing the extent of those soils. The Conservation and Open Space Element (Objective 4.2 Soils and Slopes) of this plan describes soil properties in greater detail and should be referred to for additional information.

The *Soil Survey of Alachua County Florida* contains maps which show the general soil types within the county and tables to denote which soils are most suitable for septic tanks (generally those that are moderately- to well-drained), as well as those soils which are least suitable (generally poorly drained, clayey, and organic soils) and would require extensive site preparation to accommodate septic tanks. Other important factors that contribute to the assessment of septic tank suitability include depth-to-water table as well as degree of aquifer confinement. A map of the *Degree of Aquifer Confinement of the Floridan Aquifer System of Alachua County Florida* can be found at the end of the Conservation and Open Space Element. It should be stressed that both the soils map from the Soil Survey book and the degree of aquifer confinement map are generalized maps and should be used in conjunction when assessing the general suitability of areas for septic tanks. In the case of specific sites, the SCS Soil Survey should be used to examine the general area and soil boring to evaluate the specific site. Policy 3.6.11 of the Conservation and Open Space Element states that septic systems should be sited in a manner to protect conservation areas from discharge of improperly treated effluent.

³³This was calculated by subtracting the estimated number of persons on municipal wastewater systems and package treatment plants in the county from the county total population. This number was then divided by the number of persons per household to arrive at the number of households on septic systems. The data was verified by Alachua County Public Health Dept.

217,955 persons in the county (US Census 2000)
-155,000 persons on municipal systems or package plants*
62,955 persons on septic systems, divided by 2.34 (pph) equals: approximately 27,000 septic systems in the county in 2000.

*The number of persons on septic tanks is estimated as follows:

141,000 on the GRU system;
7,000 on other municipalities' systems;
7,000 on other package plants.

Septic tank systems can be designed to be an effective means of sewage treatment for certain land uses (such as large lot residential), but they must be properly maintained, including routine cleaning which is recommended every three years. This does not occur in all cases however, since there are neither requirements at the federal, state, or local levels for mandatory cleaning, nor are septic tank systems monitored by regulatory agencies, such as FDEP or by Alachua County Public Health Unit. Residential septic tanks are only inspected (by Alachua County Public Health Unit) if there is a complaint or report of failure. Industrial Manufacturing Systems and Commercial sites (particularly restaurants) which have septic systems are subject to annual inspections by the Alachua County Public Health Unit. This is to prevent harsh chemicals, paint thinners, and grease from entering the groundwater.

Septic tank systems will eventually fail without periodic maintenance and cleaning. Should the system fail and the contamination be discovered (by chance or through a complaint), the problem will have to be remedied. But since individual septic tank systems are not monitored, failing septic tank systems could contaminate the groundwater for months or years before being detected.

One possible solution is a requirement (by some level of government) to have septic tank systems cleaned on a periodic basis, possibly through some form of permit that must be renewed after a determined time frame.

Another possible solution is the periodic monitoring of all individual septic tank systems to ensure proper functioning³⁴.

A third solution is to limit (where possible) the number of septic systems placed in the ground in order to reduce the number of new septic systems, and thus to reduce the chance of septic system failure and corresponding groundwater contamination and public health threat.

This plan provides such policies (particularly 2.1) for the required connection of new urban development to municipal systems (where accessible). This policy refers to all development inside the urban cluster. The exceptions described in the policy are engineering factors which make connection infeasible. In addition, for septic systems that fail, Policy 2.7 requires for connection to a centralized system if other corrective remedies would not be effective. A failed septic system inside the urban cluster would not be replaced with another septic system. If connection to a municipal system was not feasible, Policy 2.2 allows a new package wastewater treatment plant to be considered to replace failed septic systems.

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Package treatment plants and larger centralized systems are monitored on a monthly basis, and so should smaller individual septic tank systems. While the potential damage to groundwater from a single package treatment plant or a larger centralized sanitary sewer system is much larger than that of a single septic tank system failing, when put into the perspective of over 27,000 individual septic tank systems operating in Alachua County, all of which could fail, the potential for groundwater contamination (from a lack of control over septic tank systems once installed in the ground) is high.

**SOLID WASTE ELEMENT
DATA AND ANALYSIS**

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Introduction

Alachua County provides a variety of solid waste services, including solid waste disposal for all of Alachua County and Gilchrist County. Solid waste collection services are provided to single family residents in the unincorporated area of the county, a portion of which has mandatory collection. Five rural collection centers are available to residents without collection service. County-wide public education programs focus on waste reduction, waste prevention, composting and recycling. The county provides long term care for four closed landfills.

Operational Responsibility

In Florida the responsibility for solid waste disposal rests squarely on the shoulders of counties. Chapter 403.702, Florida Statutes expressly states: *The governing body of a county has the responsibility and power to provide for the operation of solid waste disposal facilities to meet the needs of all incorporated and unincorporated areas of the county.* Historically, counties have met this responsibility by owning and operating Subtitle D landfills, waste to energy plants, incinerators, or some combination thereof. Alachua County has chosen to construct and operate a solid waste transfer station with disposal at a regional landfill located outside the county. Currently the county contracts with the New River Solid Waste Association for disposal at the the New River Regional Landfill in Union County via an interlocal agreement, executed on November 6, 1997. The agreement has an initial ten year term with unlimited renewal in five year increments. The location of the New River Landfill is on **Map 1**.

Existing Service Facilities

Leveda Brown Environmental Park

The solid waste transfer station is at the core of a solid waste services complex known as the Leveda Brown Environmental Park. In addition to the transfer station, the park provides:

- a scalehouse, with inbound and outbound truck weighing scales
- recycling of yard waste and pallets into mulch given away free to the public
- recycling of waste tires into rubber playground mulch and other reusable products
- appliances and white goods are recycled after removal of refrigerants and PCBs.
- a combination education/visitor's center with conference room and administrative offices
- a recovered materials processing facility (recycling center), leased to private enterprise
- a household hazardous waste collection and processing center
- a tractor-trailer maintenance and repair facility
- a pilot-scale food waste composting facility

The solid waste transfer station has a design capacity of 2,000 tons per day or 620,000 tons per year. It serves all of Alachua and Gilchrist Counties, currently accepting about 550 tons per day or 170,000 tons per year.

The location of the Leveda Brown Environmental Park is shown on **Map 1**.

Solid Waste Collection

The County provides collection of solid waste for single family residents in a mandatory area of the unincorporated area. Included in the once-per-week collection is garbage, recyclables and yardtrash. Residents in the mandatory area are assessed for this service based upon the size of their garbage cart, either a twenty, thirty-five, sixty-five or ninety gallon cart. There is no charge for recycling. Yardtrash is limited to ten bags or bundles per resident per week. The mandatory area serves approximately 19,000 households.

For those residents in the unincorporated area, outside the mandatory area, the County operates five rural collection centers that accept garbage, recyclables and a limited amount of household hazardous waste. Residents in the non-mandatory unincorporated area are assessed a flat rate for this service. Residents in this area may elect to subscribe to garbage collection from an exclusive vendor, determined by bid as part of the mandatory collection area vendor selection process. The subscription fee is set at the time of the bid and paid directly to the vendor.

The mandatory area and collection center locations are depicted on **Maps 2 and 3**.

Disposal levels between 1986 and 2000 varied from 0.90 to 0.69 tons per capita as shown in **Table 1**. During this time recycling percentages varied from 2% to 23%. Based on this data and recycling goals the LOS for the plan is 0.73 tons per capita.

Commercial solid waste is collected by private carters on a free enterprise basis.

Waste Alternatives

The County provides a county-wide public education service that focuses on waste prevention, waste reduction, composting and recycling. This service is funded by a non ad-valorem assessment. Each of the municipalities in Alachua County, with the exception of LaCrosse, has elected to impose this assessment, via ordinance, on their residents. This assessment also covers the cost of the county-wide household hazardous waste program and a portion of the rural collection center operations, since the rural collection centers are open to all residents within the county.

The following is a listing of Public Education Programs sponsored by the Division of Waste Management:

- 1) The “Big Blue” curbside recycling promotional campaign: residential, commercial and schools
- 2) Annual Alachua County Recycling Fair: residential, commercial and schools
- 3) North Central Florida Buy Recycled Guide: commercial
- 4) Waste Watcher Reduction Plan: residential, commercial, and schools
- 5) “Buy S.M.A.R.T.” (Saving Money And Reducing Trash): residential
- 6) Reduce-Reuse-Repair: residential, commercial and schools
- 7) “Cindy Possum Saves the Day”, a puppet show for elementary students,

- focusing on source reduction
- 8) 4R's Curriculum Teacher Workshops and Guides: schools
 - 9) "Litter Pal" and "Compost Kid": characters that instruct elementary students on the subject of litter prevention and composting.
 - 10) "Commissioners' Challenge Waste Reduction Awards": commercial
 - 11) "Don't Bag It" lawn refuse and composting for residential, commercial and schools
 - 12) "Waste Watchers at Work", a recycling program for businesses
 - 13) "Alachua County Waste Xchange", an online, internet waste exchange program for citizens and businesses

Recycling

From its inception, the recycling program in Alachua County has relied upon source separation to provide efficient and clean materials for the recycling market. Citizens place recyclables such as glass and plastic containers, aluminum and steel cans, magazines and newspapers in plastic bins and place them at curbside for collection. Businesses and institutions separate cardboard, office paper, metals and other recyclables, which are collected and processed by private vendors. The current recycling rate in Alachua County is 29%. See **Table 2**, "Alachua County Solid Waste Collection and Recycling".

In October, 2001, the Board of County Commissioners adopted Ordinance 01-18, requiring all commercial establishments within the unincorporated area to have a recycling program. The County has been recycling office paper and cardboard from all county facilities since 1991. Aluminum cans and plastic beverage containers were added to the county recycling program in 2001.

A number of other waste reduction and recycling initiatives are being explored by solid waste staff. Those initiatives are detailed in the "Maximizing Waste Prevention and Waste Reduction" report, a.k.a. the "Blue Sky Report" to the Board of County Commissioners, 2001. A copy of the report can be obtained by calling the Division of Waste Management at 352-374-5213.

Closed Landfills

The County's only lined Class I landfill, the Southwest Landfill, was closed in December 1998. Long term care of the Southwest landfill provides monitoring of groundwater and landfill gas. Leachate is collected and treated at the Kanapaha waste water treatment plant. Landfill gas is collected and burned in a flare.

Four other closed, unlined landfills are also monitored for groundwater contamination. They are: the Northeast Landfill and Northeast Auxillary Landfill, both located between Waldo and Gainesville; the Southeast Landfill in southeast Gainesville; and the Northwest Landfill near High Springs. Closed landfills are located on **Map 2**.

Construction and Demolition (C&D) Debris

Construction and demolition debris is a prohibited waste in the lined cell at the New River

Landfill, thus C&D is prohibited at the transfer station. The County relies upon private C&D landfills for disposal of this type solid waste. Currently only one private facility is open to the general public. Two private C&D landfills receive waste from their own operations and a third facility accepts C&D waste at a C&D transfer station on a limited contractual basis. The County will continue to monitor C&D landfill activity and capacity and will take the necessary steps to provide disposal of this segment of the waste stream, should the private sector no longer supply this service.

The County regulates private C&D facilities with requirements based upon site specific conditions, including ground water monitoring and reporting of amounts of debris recycled and disposed.

Household Hazardous Waste (HHW)

Alachua County Environmental Protection Department operates a HHW collection and processing center, located at the Leveda Brown Environmental Park. **Map 1.** The waste is placed in bulk containers and either recycled or disposed in appropriate hazardous waste disposal facilities. The center includes a reuse area for items such as household pesticides, waxes, polishes, fluids and solvents. Paint is processed and given to charitable organizations and private, not-for-profit agencies. The center also collects HHW from the five rural collection centers.

New River Regional Landfill

New River Landfill is located on S.R. 16, near the State Correctional Facility at Starke and is owned and operated by the New River Solid Waste Association. The Association is a consortium of Bradford, Baker and Union Counties. The board of directors is comprised of two county commissioners from each county. Day to day operations are managed by an executive director.

New River policy for accepting out-of-region waste requires there to be 25 years remaining capacity for the three participating counties in addition to any out-of-region waste. Based upon current waste generation projections, that point will be reached at approximately the same time as the end of term (October, 2008) for the interlocal agreement for solid waste disposal between New River and Alachua County. New River is seeking to acquire an additional 300 acres from the State Department of Corrections. If they are successful, New River will have an additional 50 years of capacity. New River has indicated that if they obtain the additional property, they will entertain extending the interlocal agreement with Alachua County. (New River and Alachua County staff are currently working on the terms of an extension.) If not, Alachua County will need to explore disposal options at other regional landfills.

Facility Capacity Analysis by Geographic Service Area

As Table 1 shows, the Leveda Brown Environmental Park and transfer station should have adequate capacity to serve both Alachua and Gilchrist Counties well beyond 2022. Space

limitations at the environmental park will not permit expansion of the transfer station to accommodate more than the design capacity. Should out-of-county disposal remain the county's objective when the transfer station nears capacity, the county should consider building another transfer station, perhaps south of Gainesville, to accommodate growth in that area. A second disposal location may also be advisable. Another option would be to acquire more land adjacent to the park, if available at the time, and construct a second facility there.

The transfer station and other structures within the park are of high quality and are expected to last a minimum of thirty years. The capital cost of the buildings at the facility are amortized over thirty years.

The primary affect on facility capacity is availability of disposal capacity at regional disposal facilities that lie within reasonable distance from the transfer station. There are a number of other regional landfills within reasonable transportation distance. An economic analysis of these options would weigh travel distance and tipping fees at the receiving facility. Greater distances will increase operating costs which may be offset by smaller tipping fees.

In addition to out of county disposal in regional landfills, the County has acquired a 1,600 acre parcel of land known as Balu Forest. Approximately 740 acres of that land is designated as a future solid waste management facility site, should the need arise and no other environmentally acceptable option be found. In the interim, Balu Forest is being managed as an longleaf pine flatwoods natural area.

Table 1

TABLE 2
ALACHUA COUNTY SOLID WASTE
COLLECTION AND RECYCLING
(January 1, 2000 - December 31, 2000)

Materials Type	Collected Tons	Percent Total Tons	Pounds per Capita per Day	Recycled Tons			Percent Recycled
				Public	Private	Total	
1. Minimum 5 Materials							
a. Newspaper	12,043	6	0.30	3,043	3,005	6,048	50
b. Glass	4,014	2	0.10	2,601	1,123	3,724	93
c. Aluminum cans	2,007	1	0.05	92	405	497	25
d. Plastic bottles	2,007	1	0.05	381	172	553	28
e. Steel cans	2,007	1	0.05	179	123	302	15
2. Special Waste Materials							
a. C&D debris	48,170	24	1.21	0	352	352	1
b. Yard trash	26,092	13	0.66	7,426	5,599	13,025	50
c. White goods	4,014	2	0.10	2,219	0	2,219	55
d. Tires	4,014	2	0.10	778	1,430	2,208	55
e. Process fuel	NA	NA	NA			0	0
3. Other Waste Materials							
a. Other plastics	14,050	7	0.35	0	87	87	1
b. Ferrous metals	14,050	7	0.35	12	11,636	11,648	83
c. Non-ferrous metals	2,007	1	0.05	0	1,582	1,582	79
d. Corrugated paper	18,064	9	0.45	3,104	7,329	10,433	58
e. Office paper	6,021	3	0.15	0	2,051	2,051	34
f. Other paper	18,064	9	0.45	1,678	244	1,922	11
g. Food	6,021	3	0.15	312	251	563	9
h. Textiles	4,014	2	0.10	0	186	186	5
i. Miscellaneous	14,050	7	0.35	196	649	845	6
4. County Totals	200,709	100.00	5.05	22,021	36,224	58,245	29

Source: Florida Department of Environmental Protection, Certified Recyclers Report

Bibliography

“Maximizing Waste Reduction and Waste Prevention”, a.k.a., “Blue Sky Report”, Solid Waste Division Staff, August 2001

Interlocal Agreement with New River Solid Waste Association, November 1997

Interlocal Agreement with Gilchrist County, April 1998

Annual Report, Alachua County Division of Waste Management, March 2001.

Annual Report, Florida Department of Environmental Regulation,

**Table 1
(continued)**

**Alachua/Gilchrist Population
and Solid Waste
Disposal Rates**

Waste Disposal		WASTE DISPOSED					RECYCLING		WASTE GENERATED	
Actual Fiscal Year	Population* Alachua Co.	Gilchrist Co.	Total Class I Tonnage**	Total Class III Tonnage**	Tons Per Capita	Total MSW	Tonnage***	Percentage	Total MSW Generated	Tons Per Capita
1986/87	174,000		174,320			174,320				
1987/88	176,112		158,385		0.90	158,385				
1988/89	178,854		154,057			154,057	3,875	2%	157,932	0.88
1989/90	181,596	9,667	120,828	20,299	0.74	141,127	26,779	16%	167,906	0.88
1990/91	183,773	9,984	120,002	18,399	0.71	138,401	30,744	18%	169,145	0.87
1991/92	186,201	10,196	121,597	19,698	0.72	141,295	28,425	17%	169,720	0.86
1992/93	190,655	10,722	129,799	21,950	0.75	151,749	41,760	22%	193,509	0.96
1993/94	193,879	11,526	133,303	23,741	0.76	157,044	47,113	23%	204,157	0.99
1994/95	198,261	11,888	131,522	15,258	0.70	146,780	44,034	23%	190,814	0.91
1995/96	202,140	12,150	132,996	22,120	0.72	155,116	36,378	19%	191,494	0.89
1996/97	208,125	12,531	145,522	0	0.66	145,522	41,208	22%	186,730	0.85
1997/98	211,403	13,140	167,369	0	0.75	167,369	45,184	21%	212,553	0.95
1998/99	216,249	13,406	165,845	0	0.72	165,845	40,365	20%	206,210	0.90
1999/2000	217,955	14,437	159,648	0	0.69	159,648	41,584	21%	201,232	0.87
2000/01	222,935	14,699	163,160	0	0.69	163,160			163,160	

**Table 1
(continued)**

**Alachua/Gilchrist Population
and Solid Waste
Disposal Rates**

Projected	Population*		WASTE DISPOSED			RECYCLING		WASTE GENERATED		
	Alachua Co.	Gilchrist Co.	Total Class I Tonnage**	Total Class III Tonnage**	Tons Per Capita	Total MSW	Tonnage***	Percentage	Total MSW Generated	Tons Per Capita
2001/02	229,299	14,830	177,394		0.73	177,394	53,218	30%	230,612	0.95
2002/03	233,420	15,436	180,828		0.73	180,828	54,248	30%	235,076	0.95
2003/04	237,614	16,058	184,328		0.73	184,328	55,298	30%	239,626	0.95
2005/06	241,884	16,699	187,896		0.73	187,896	56,369	30%	244,265	0.95
2006/07	246,231	17,357	191,533		0.73	191,533	57,460	30%	248,993	0.95
2007/08	250,655	18,035	195,241		0.73	195,241	58,572	30%	253,813	0.95
2008/09	255,159	18,732	199,020		0.73	199,020	59,706	30%	258,726	0.95
2009/10	259,744	19,448	202,872		0.73	202,872	60,862	30%	263,734	0.95
2010/11	264,412	20,185	206,799		0.73	206,799	62,040	30%	268,839	0.95
2011/12	269,163	20,943	210,802		0.73	210,802	63,241	30%	274,043	0.95
2012/13	274,000	21,721	214,883		0.73	214,883	64,465	30%	279,348	0.95
2013/14	278,924	22,522	219,042		0.73	219,042	65,713	30%	284,755	0.95
2014/15	283,936	23,345	223,282		0.73	223,282	66,985	30%	290,267	0.95
2015/16	289,038	24,191	227,604		0.73	227,604	68,281	30%	295,885	0.95
2016/17	294,232	25,060	232,010		0.73	232,010	69,603	30%	301,613	0.95

*Source: Bureau of Economic and Business Research in medium/high population growth projection rates

**Source: Southwest Landfill Scalehouse records

***Source: Alachua County Office of Waste Management Recycling and Education Grant Application (Annual Solid Waste Report to FDEP)

Lines in bold represent tonnages recieved at the Leveda Brown Environmental Park

Source: Alachua County Department of Public Works, March 1997, revised February 2002

TABLE 3
**WASTE REDUCTION
 GOALS WORKSHEET**
 (January 1, 2000 - December 31, 2000)

COUNTY: Alachua

1. BASE YEAR #1: July 1, 1988 - June 30, 1989

a. Total MSW disposed (landfilled plus combusted)	221,407 Tons
b. Population (Official April 1, 1988 figure)	182,940 People
c. MSW/Capita: 1a/1b =	1.21 Tons/Capita

2. BASE YEAR #2: July 1, 1989 - June 30, 1990

a. Total MSW disposed (landfilled plus combusted)	222,163 Tons
b. Population (Official April 1, 1989 figure)	186,772 People
c. MSW/Capita: 2a/2b =	1.19 Tons/Capita

3. BASE YEAR #3: July 1, 1990 - June 30, 1991

a. Total MSW disposed (landfilled plus combusted)	175,350 Tons
b. Population (Official April 1, 1990 figure)	190,852 People
c. MSW/Capita: 3a/3b =	0.92 Tons/Capita

4. BASE YEAR #4: July 1, 1991 - June 30, 1992

a. Total MSW disposed (landfilled plus combusted)	211,372 Tons
b. Population (Official April 1, 1991 figure)	183,773 People
c. MSW/Capita: 4a/4b =	1.15 Tons/Capita

5. BASE YEAR #5: July 1, 1992 - June 30, 1993

a. Total MSW disposed (landfilled plus combusted)	144,224 Tons
b. Population (Official April 1, 1992 figure)	186,201 People
c. MSW/Capita: 5a/5b =	0.77 Tons/Capita

6. BASE YEAR #6: July 1, 1993 - June 30, 1994

a. Total MSW disposed (landfilled plus combusted)	151,116 Tons
b. Population (Official April 1, 1993 figure)	190,655 People
c. MSW/Capita: 6a/6b =	0.79 Tons/Capita

7. CURRENT YEAR: January 1, 2000 - December 31, 2000

a. Total MSW disposed (Table 1, line 5b plus 5c(iii))	142,386 Tons
b. Population (Official April 1, 2000 figure)	217,955 People
c. MSW/Capita: 7a/7b =	0.65 Tons/Capita

8. WASTE REDUCTION PROGRESS (a)

a. Base Year #1 to Current Year:	$[(1c - 7c) / 1c] \times 100 =$	46%
b. Base Year #2 to Current Year:	$[(2c - 7c) / 2c] \times 100 =$	45%
c. Base Year #3 to Current Year:	$[(3c - 7c) / 3c] \times 100 =$	29%
d. Base Year #4 to Current Year:	$[(4c - 7c) / 4c] \times 100 =$	43%
e. Base Year #5 to Current Year:	$[(5c - 7c) / 5c] \times 100 =$	16%
f. Base Year #6 to Current Year:	$[(6c - 7c) / 6c] \times 100 =$	18%

(a) A negative number indicates that there has been an increase in the MSW disposal rate per capita.

**STORMWATER MANAGEMENT ELEMENT
DATA AND ANALYSIS**

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Stormwater Management Element Data and Analysis

INTRODUCTION

The purpose of the Alachua County Stormwater Management Element is to prepare a general stormwater management plan that addresses existing deficiencies, analyzes projected future needs, and establishes recommended goals, objectives and policies. The plan is also intended to minimize future environmental degradation.

The adopted goals, objectives and policies provide the general and specific direction to be followed for future stormwater management activities. The goals and objectives are implemented through by the policies which will direct the implementation of the Stormwater Management Element at the staff level.

These policies will, in turn, be implemented and enforced through local land development regulations. The identification and consolidation of stormwater management related standards from other ordinances were adopted with the Stormwater Ordinance dated July, 1992. Amendments to the existing policies will require the adoption of amendments to this Ordinance.

The Alachua County Stormwater Management Element is designed to meet the technical and administrative requirements of the Florida Department of Community Affairs' Rule 9J-5.011 (1)&(2) F.A.C. for those requirements dealing specifically with Stormwater Management. Potable Water, Sanitary Sewer, Solid Waste, and Conservation and Open Space are treated separately as elements elsewhere in this plan. The geographical extent of the Stormwater Management Element is limited to the unincorporated area of Alachua County. Groundwater recharge is covered in the Conservation and Open Space Element of the Alachua County Comprehensive Plan.

The regulation of stormwater management in Alachua County is governed by the St. Johns River Water Management District (SJRWMD) and the Suwannee River Water Management District (SRWMD) in their respective jurisdictions. Alachua County has a Stormwater Ordinance which is intended to provide additional control over the type, location, and maintenance of stormwater facilities and impacts due to erosion and sedimentation. Alachua County is currently drafting a Water Quality Ordinance to further address these issues. Alachua County has a Flood Hazard Area Ordinance in place to control the impacts of development in floodplains and the design of structures and utilities in floodplain areas. In some cases, the County's regulations may exceed the requirements of the Water Management Districts or they may address design features which are not addressed by the District's standards. These regulations will require modification with the amendments proposed in the Plan.

For stormwater conveyance facilities evaluated in conjunction with the study performed with the adoption of the 1991 Comprehensive Plan¹, the range in the level of service provided was broad. Some facilities provide less than a 2-year level of service while others provide in excess of a 50-year level of service. For the 11 facilities which were judged to be serving low-use highways, the following estimates of existing levels of service (hydraulic capacity) were made: five were estimated to provide a level of service equal to or less than a 2-year frequency storm event, one was estimated to provide a 5-year frequency level of service, one was estimated to provide a 10-year frequency level of service, and three were estimated to provide a level of

¹ 1991 Study performed by Law Engineering

service equal to or greater than a 25-year frequency storm. The level of service of one structure could not be determined because the structure is inaccessible and its size was not available.

For 16 conveyance structures on high-use highways, three provided less than a 2-year frequency level of service, one provided a 5-year frequency level of service, four provided a 25-year frequency level of service, and eight provided a level of service equal to or exceeding a 50-year frequency storm event.

Alachua County upgrades stormwater management systems in conjunction with other public works projects, as development occurs, or when specific level of service deficiencies are identified and corrective action is funded.

INVENTORY OF EXISTING STORMWATER MANAGEMENT FACILITIES

There are currently 210 Stormwater Management Facilities maintained by Alachua County, covering a total of 321.6 acres. This includes facilities located in 168 residential subdivision and 42 roadway systems.

Specifics on each basin will be provided with NPDES, Phase II permit referenced in Policy 1.1. A new rating criteria and inventory program will be utilized as part of the NPDES, Phase II permitting process.

PROJECT PRIORITIES

Benefits to be achieved by the identified capital improvements will be a reduction in localized flooding and associated damage to public and private facilities. During the review of stormwater management complaint files provided by the Alachua County Public Works Department, no substantial evidence of physical damage to structures could be specifically identified. However, potential damage may have been caused to road bases, banks, berms and other water control facilities due to prolonged saturation, overtopping and erosion. The majority of the damage appears to have been associated with general inconvenience to the public in terms of lack of access to properties, restrictions to travel, damage to vehicles and perhaps other less tangible losses.

In the projects identified in this study, the first projects to be funded would be those generally within the urbanized area and which have an estimated capacity less than that necessary for a 2-year 24-hour storm. Intermediate priority projects would be for those projects draining relatively large areas which may extend into the urbanized areas with a capacity less than that of a 2-year, 24-hour storm. Lower priority projects would be those projects in rural areas, or with capacities greater than about a 5-year 24-hour storm.

Other projects that were ranked included at least two projects previously identified by Alachua County. The Heatherwood and Sunningdale projects, whose costs have been estimated at \$860,000 and \$1,100,000, respectively. The final projects to be considered are not necessarily capital improvements, but are the recommended studies for other areas which may have problems which have not been identified in this element. In addition to the projects included in this analysis, numerous other detailed projects had been proposed in a 1974 study by Sverdrup and Parcel.

IMPLEMENTATION NEEDS

Several activities will be required for implementation of this element.

1. Preparation of revised/recommended local ordinances for amendment to implement the new LOS Standards.
2. Enhancement of a Monitoring and Evaluation System through the NPDES, Phase II permitting process. Final determinations regarding the scope of NPDES, Phase II permitting criteria have not been made by the Florida Department of Environmental Protection. It is unclear if permitting criteria will be for the urbanized area around Gainesville or on all of unincorporated Alachua County. Monitoring and Evaluation criteria for all of Alachua County will be made once that determination is made.
3. Alachua County is currently undertaking an ortho-photography project to map the County and establish one and two-foot contour intervals for all of the County. This will enhance the capability of performing future drainage studies.
- .5.. Provisions of an adequate source(s) of additional funding to remedy existing deficiencies. (The County has adopted an ordinance allowing for the establishment of Special Assessment Districts for this purpose.)

A concurrency management process as well as a monitoring and evaluation system has been established to ensure that adequately sized stormwater management facilities are in place to accommodate future growth. A concurrency management system has been established and all new development is required through implementation of the Stormwater Ordinance to provide mitigation for all stormwater impacts. The proposed new Level of Service Standards will provide additional capacity and rate-control and thereby enhance the capability of existing systems.

The establishment of a "Stormwater Utility" could provide a stable funding source for the construction of stormwater management projects if such a proposed utility could actually be adopted and implemented. The Stormwater Utility could also be used to fund the ongoing monitoring and evaluation needed to maintain a viable County-wide stormwater management system.

Where existing information has been or found to be inadequate to identify drainage basins, structures and conditions, limited new data has been or will be collected. Field verification of some drainage features has been performed. This activity exceeds the minimum requirements stated in DCA's Rule 9J-5.005(2)(b)&(c). A map of Water Basins in Alachua County can be found in the Conservation and Open Space Element Data and Analysis map series. A Flood plain map of Alachua County is part of the adopted Map Series.

FUTURE LEVELS OF SERVICE

Alachua County falls within the jurisdiction of the St. Johns River and Suwannee River Water Management Districts. Stormwater Management criteria, as outlined in the Comprehensive Plan, and the existing stormwater management regulations, meets or exceeds the permitting criteria of each of the Water Management Districts. This includes the design standards for new developments which include maintenance related issues, developments in floodplains, standards limiting allowable runoff rates and volumes, systems within karst sensitive areas, wet detention systems used for stormwater treatment, erosion and sediment control, wetlands, drainage conveyance systems, and roadway clearances. Alachua County has also adopted the Drainage Retention Basin Landscaping and Surface Water and Wetlands Policies of the Gainesville-area Metropolitan Transportation Planning Organization.

FUTURE PROJECTS

Studies have been performed for selected areas of Alachua County to determine the causes of flooding problems. In many instances, localized flooding may impact a single subdivision or several lots. Improvements would rectify the problem for dwellings in those areas only. In some cases, the cause of the problem and the resultant cost of the solution may be the responsibility of the developer or homeowner. Alachua County has adopted ordinances that would allow for the implementation of improvement projects through the Special Assessment process so that costs associated with these projects be borne only by those property owners within the limits of an affected watershed. To date, consensus among affected property owners has not been reached and no Special Assessment Districts have been implemented.

Future studies are also recommended to address capital improvement needs in drainage areas which were too complex to be analyzed using generalized methods for estimating peak rates of runoff. These needs are identified and described below.

Closed Basins With Sinks

As development occurs, it is necessary to evaluate the capability of closed basin(s) to assimilate stormwater runoff and to estimate the maximum capacity which the basin can provide without endangering life or incurring substantial property losses. The storage and assimilative capacity of these basins needs to be compared against runoff rates and volumes due to theoretical storm events of selected return frequency and duration for the purpose of establishing the level of service provided.

Closed Basins Without Sinks

It is necessary to evaluate the capability of the basin(s) to assimilate stormwater runoff and to estimate the capacity which the basin can provide without endangering life or incurring substantial property losses. Flooding problems within these areas are very common and similar to those of closed basins which have sinks. However, because of a lack of an identifiable outlet, these areas may remain flooded for longer periods of time. These basins are very common east and west of the I-75 corridor, the site of fairly intense development. The maximum storage capacity of the basins compared against runoff volumes due to theoretical storm events of selected frequency and duration for the purpose of establishing the level of service provided. Alachua County adopts increased standards through the implementation of 100-year, critical duration storm analyses.

Individual Sub-basins And Detention Pond Systems

It is necessary to evaluate the capability of the stormwater management system to control stormwater runoff. Many of these smaller systems which may have been built prior to more restrictive stormwater management requirements have been the site of many recent drainage complaints listed by Alachua County. At the present time, these systems are poorly understood and often very difficult to drain, even when pumped. An estimate should be made of the maximum capacity which the system can provide without endangering life or incurring substantial property losses. The capacity needs must be compared against runoff rates and volume conditions due to recurring substantial property losses, using theoretical storm events of selected frequency and duration in order to establish the level of service provided.

III-Defined And Interconnected Drainage Basins

Areas that fall under this category include the Buck Bay/Hatchet Creek drainage basin, the drainage system east of Lake Lochloosa, Paynes Prairie and perhaps others.

In general, an evaluation needs to be made of the level of service provided by outfall structures serving interconnected channels and low-lying swampy areas. An estimate of the floodplains of these basins should be provided for storm events of selected return frequency and duration. Alachua County has requested that these areas be analyzed by the Federal Emergency Management Agency in conjunction with the Federal Flood Insurance program. This analysis is currently underway.

STORM WATER HAZARD MITIGATION

The Alachua County Local Mitigation Strategy² states the county participates in the National Flood Insurance Program (NFIP) and the Community Rating System (CRS). The Alachua County NFIP community number is 120001. Alachua County is a CRS rated #9 community. Alachua County has had and enforced a Flood Hazard Area Ordinance since 1982. Improvements to the County mapping systems within the last few years have enhanced the County's ability to enforce the Ordinance. All applications for development approval, including routine building permits, are checked to determine if development is proposed within flood hazard areas with all development within those areas being designed to mitigate development impacts. The NFIP Repetitive Loss Worksheet shows two losses for a single family residence in Flood Zones A and A10. The loss dates were Oct. 8, 1992 and Feb. 20, 1998. There was another structure located on the urban fringe of Gainesville that had suffered repetitive losses. The County, with assistance from the Federal Emergency Management Agency, recently purchased this property, deconstructed the structure and converted the property to a neighborhood park.

The Alachua County Local Hazard Mitigation Working Group identified eight (8) situations and recommendations, but acknowledged these strategies are a "work-in-progress." Each is subject to review and change. The identified strategies that apply to Stormwater Management are:

(Strategy 1) Develop and incorporate pre- and post mitigation planning into Comprehensive Plans and Elements; review, revise and create ordinances and procedures that promote community wide mitigation benefits. Coordinate activities with other local agencies to promote cooperation between jurisdictions. This strategy was incorporated into the Comprehensive Plan update.

(Strategy 2) Alachua County has submitted four (4) county flood control mitigation actions for action following review by the State. These projects are the stormwater pump station at South West 34th Street Industrial Park, the Flood Control Project at Robin Lane subdivision, a drainage project (pump station) for the Leatherwood subdivision at NW 39th Ave. and NW 54th Terrace, and retention basin construction of Shaw's Pond near NW 143rd Street.

(Strategy 8) Review existing data regarding Flood Mitigation Assistance Program and determine the most feasible course of action.

² Alachua County Local Mitigation Strategy, Final Deliverables.

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EXECUTIVE SUMMARY

Alachua County, by virtue of its subtropical climate and variable hydrology and geology, supports a rich and diverse complement of natural resources. The County borders one of the most scenic and life-giving waters of the state, the Santa Fe River, and several major lake systems distinguish the County's interior (See Alachua County Location Map). The County is underlain by the Floridan aquifer system, the largest and highest quality potable water aquifer in the state, and contains some of the richest springs in the North Central Florida region. The karst geology of the County has created a mosaic of solution sinks and depressions which contain a wide variety of wetland flora and fauna, while the higher well-drained elevations support increasingly rare sandhill and scrub habitats.

Over the past century, however, development has slowly destroyed and degraded the rich natural resources of the County. The unregulated filling of wetlands, discharge of pollutants, mining of limestone and phosphate deposits, clearing of forests, dredging of lake bottoms, and channeling of streams and rivers has irretrievably destroyed or altered much of the original natural resource base. Environmental legislation passed at the federal, state, regional and local levels over the past three decades has done much to stem the tide of this destruction. Advance planning and further safeguards, however, will be needed to ensure the preservation and conservation of the County's remaining natural resources for future generations.

Alachua County's population has increased by approximately 20% over the last 10 years and consequently has increased the conversion of natural areas for urban development. The North Central Florida Regional Planning Council (1997) has identified a number of Regionally Significant Natural Areas in Alachua County. Several of these, including Payne's Prairie, San Felasco Hammock, Devil's Millhopper, and various recharge areas, are characterized as receiving significant amounts of growth. Additional scattered development has proliferated west of the Gainesville urban area and is impacting agricultural areas and natural systems at a rapid pace. As growth occurs, the need for protection and management of the County's natural, agricultural, and historic resources will increase. The identification of the types of resources, their location, and their significance to the residents of the County and region are necessary to understand policies intended to guide future growth and development in Alachua County in a manner compatible with the unique environment of North Florida.

The role of the Conservation and Open Space Element is to maintain or improve the quality of the County's environment and natural resources, and its citizens' quality of life, in light of the anticipated population growth. The Conservation and Open Space Element must work in harmony with the Future Land Use, Transportation Mobility, Recreation and other elements of the Comprehensive Plan in ensuring environmental protection while fostering economic growth and development.

Purpose of Conservation and Open Space Element

The Conservation and Open Space Element addresses long range planning for the conservation and protection of the natural resources and human-related resources, including open space areas, in Alachua County. The purposes of the Conservation Element are generally to identify the natural resources of the area, including air resources, earth resources (soils, minerals, and geological resources), water resources (groundwater and surface water quantity and quality, floodplains, natural groundwater recharge areas and natural drainage features) and natural communities and wildlife (vegetative communities, wildlife and wildlife habitats), and to establish policies to protect and conserve those resources. This Element also identifies certain human-related resources with close connections to natural resource or conservation objectives. These include energy, open space, scenic quality, vegetation management, agricultural and silvicultural resources, wildfire mitigation, and hazardous materials and waste resources. The purposes of the Open Space portion of the Element are to identify open space needs and to establish policies to protect natural areas and open space for wildlife and people. Implementation of these policies will include a broad array of strategies that include education and outreach, public participation, regulations, incentives, acquisition, intergovernmental coordination, and other appropriate mechanisms.

Element Organization

The Element is presented in two sections, the Data and Analysis portion and the Goals, Objectives, and Policies portion. The Data and Analysis section presents historic and current conditions upon which to base the recommended planning and management strategies. The Goals, Objectives, and Policies section presents the recommended planning guidelines, programs and other operative provisions which are intended to drive private and governmental decisions regarding natural resources. The Goals, Objectives, and Policies section is the most critical portion of this element, as it is adopted in ordinance form and provides the measurable guidelines within which Alachua County will operate in the future. The Data and Analysis shall be updated on a regular basis and will be used to support the Goals, Objectives, and Policies. The Evaluation and Appraisal process under Section 163.3191 F.S. will be used to update the Goals, Objectives, and Policies every five years. It will be necessary to adopt regulations to enforce these objectives and policies and to identify funding sources to provide additional services for future needs. These issues are fundamental to the implementation of this Element.

Overview of Data and Analysis

The Element divides the Data and Analysis into three broad categories: conservation strategies, natural resources, and human-related resources.

The section on conservation strategies is presented to give a basic overview of Alachua County's approach to environmental conservation. The Conservation and Open Space Element is designed to protect and manage natural resources on a system-wide basis, through a comprehensive approach that encompasses an array of strategies. Strategies are presented under four major categories: information strategies, acquisition, regulatory approaches, and incentives. Information strategies include commitments to indicators tracking, information sharing, education and outreach, civic engagement, and intergovernmental coordination. Acquisition encompasses the use of voluntary acquisition tools, such as sales, donations, and dedications of interests in land for conservation purposes. The new Alachua County Forever program is described, as well as various state programs available in the County. Under regulatory approaches, various efforts are described within a whole-systems thinking framework. Conservation and preservation land use categories are discussed, and an overview of resource protection

standards and natural resources maps is provided. Incentives discussed in this part of the data and analysis include tax breaks, innovative planning and zoning, rural land stewardship areas, and cost-shares and certification programs. All of these strategies are discussed in later portions of the data and analysis in further detail.

Natural resources are presented under five major topic areas: air quality, earth resources, water resources, wetland ecosystems, and natural communities and wildlife. Air quality and sources of air pollution are discussed, as well as the County's efforts to seek local air quality program delegation from the state. Earth resources are identified, including soils, minerals, and geological resources. Ground water resources are identified in the physiographic and geologic context of Alachua County. Aquifer characteristics, including flow, discharge, and recharge are described and mapped. Ground water quality, pollution problems, and existing regulatory structure are presented, along with current and projected water needs and sources. Surface water types, watershed basins, wetlands, floodplains and floodways are identified. Surface water quality, pollution problems, and existing and potential recreation and conservation uses are described. Finally, various components of biodiversity, including natural upland and wetland communities, forests, native mammals, birds, reptiles, amphibians, and fish, and rare and endangered species, are inventoried. A map series of uplands and wetlands is included, as well as inventory lists of plants and animals found in the County.

Human-related resources are presented in the form of seven broad categories: energy conservation, open space, scenic quality, vegetation management, agriculture and silviculture, wildfire mitigation, and hazardous materials. The section on agricultural and silvicultural practices provides an in-depth discussion of current issues related to farming and forestry in Alachua County. Other portions of the data and analysis reference this section for overlapping discussions of resource impacts, management strategies, and incentives. In addition, new sections devoted to scenic quality, vegetation management, and wildfire mitigation are representative of increasing interest in and attention to these issues.

Overview of Goal and Objectives

The Goal of the Conservation and Open Space Element is to conserve, manage, restore, or enhance the natural and human-related resources of Alachua County to ensure long-term environmental quality for the future. Objectives and policies for implementation are presented in the following areas:

Conservation Strategies: Embrace multiple, diverse strategies for the conservation of natural systems in Alachua County, and establish environmental conservation as a priority in all decision-making for Alachua County.

Environmental Information Management: Increase public understanding of natural resources issues and provide access to the most current and reliable information so that the public may make informed decisions regarding their health, welfare, and safety. Manage natural resources at a scale appropriate to their protection, and facilitate consensus-building in the public participation process.

Environmental Land Use Categories: Establish and map conservation and preservation areas to recognize and protect natural resources within privately and publicly owned lands in Alachua County utilizing appropriate regulatory, acquisition, and incentive mechanisms.

Natural Resources:

- *Air Quality:* Take appropriate steps to maintain or improve ambient air quality to ensure the protection of public health and the environment and to exceed compliance with state and national ambient air quality standards.
- *Soils/Slopes:* Reduce the rate of soil erosion and sedimentation from development activities and encourage the utilization of the soil consistent with the ability of the physical properties of the soil to support appropriate land uses.
- *Minerals:* Regulate extraction activities so that they do not adversely affect the quality of air, groundwater, surface water, land, and wildlife.
- *Geology:* Protect and maintain significant natural geologic features such as special karst features -- springs, caves and sinkholes in their natural condition.
- *Groundwater:* Protect and conserve the quality and quantity of groundwater resources to ensure long-term public health and safety, potable water supplies from surficial, intermediate, and Floridan aquifers, and the ecological integrity of natural resources.
- *Surface Water:* Ensure the protection and improvement of the water quality, biological health, and natural functions of surface water systems in Alachua County.
- *Wetlands:* Ensure the protection and improvement of biological health and natural functions of wetland systems in Alachua County. Wetland acreage and function shall be protected.
- *Floodplains:* Protect and maintain the natural functions of floodplains, floodways, and all other natural areas having hydrological characteristics of the one hundred (100)-year flood elevation. Natural functions include water purification, flood hazard mitigation, water supply, and wildlife habitat and connectivity.
- *Biodiversity:* Maintain and enhance plant and animal species diversity and distribution within Alachua County by protecting significant plant and wildlife habitats, providing for habitat corridors, and preventing habitat fragmentation.
- *Ecosystems:* Protect, conserve, enhance, and manage the ecological integrity of strategic ecosystems in Alachua County.

Human-Related Resources

- *Energy:* Provide for energy efficiency in human activities, land uses, and development patterns in order to reduce overall energy requirements for the County and its residents.
- *Open Space:* Preserve or establish open space within developments to ensure public health, safety and welfare and to protect recreational and natural resources and functions.
- *Scenic Quality:* Protect the natural resources and scenic quality of the community to preserve and cultivate a unique sense of place while maintaining economic well-being.
- *Vegetation:* Require and encourage public and private land clearing and landscaping practices that conserve, appropriately use, and protect native vegetation, including forests.

- *Agriculture/Silviculture:* The County shall encourage the retention of agricultural and silvicultural operations that are conducted in accordance with best management practices.
- *Wildfire Mitigation:* Protect life, property, and the economy by eliminating or minimizing the present and future vulnerability to wildfire hazards.
- *Hazardous Materials:* Act to reduce the risks associated with hazardous materials and encourage the reduction of hazardous waste generation. Protect and enhance the quality and safety of the environment by requiring that disposal methods for hazardous waste and handling and storage methods for hazardous materials are properly designed, operated, and monitored.

Land Conservation Program: Establish and maintain a land conservation program that uses a variety of strategies for the purchase, preservation, and management of natural areas and open space to complement the regulatory approaches identified in other sections of this element. Improve the environmental stewardship of all preservation, conservation and recreation areas within County boundaries.

Relationship to Other Plan Elements

The **Conservation and Open Space Element** is part of the Comprehensive Plan of Alachua County, which is made up of a number of distinct elements. No single element has a higher status or greater importance than any other -- the individual elements collectively are part of a whole. The following list of other Plan elements describes how each is affected by and, in turn, affects the Conservation and Open Space Element.

The **Future Land Use Element** establishes policies and standards for the proper distribution of varying land uses. It identifies the protection of natural and cultural resources in conjunction with proper design as an important feature in managing growth. The conservation policies give specific guidelines on development of lands containing important natural and cultural resources. Of crucial importance to the relationship between natural resources and land use is the completion and implementation of multi-objective special area plans that provide for the conservation and efficient utilization of human-related and natural resources in the area.

The **Transportation Mobility Element** projects the needed roadway infrastructure for the anticipated growth of the County. The Conservation and Open Space Element identifies areas where roadways can be constructed so as to direct growth away from important natural areas and into areas where urban development has already taken place or is projected to occur. In addition, the Conservation and Open Space Element includes standards for tree conservation, landscaping, and lighting of transportation corridors generally, as well as additional considerations for specifically identified scenic corridors.

The **Solid Waste Element** projects the future demand for landfilling and other forms of waste disposal. Careful selection of waste disposal sites and adequate regulations can also prevent contamination of the County's resources.

The **Potable Water and Sanitary Sewer Element** establishes guidelines for providing water to the community. The quality and quantity of ground and surface water resources can be influenced by the development activities on or around sources of potable water. The Conservation and Open Space

Element provides protection for well fields and community water supplies. It also projects future needs and establishes policies for sewage collection and treatment facilities. Adequate facilities help to protect water and land resources from contamination and aid in the conservation of the resources of the County.

The **Recreation Element** identifies the need for public recreational facilities and user-oriented parks. Public acquisition and private participation in the utilization of certain sensitive areas for recreation and open space purposes can enhance the public's appreciation of the landscape while conserving the natural and cultural resources of the County.

The **Intergovernmental Coordination Element** establishes policy for cooperation among governmental entities in Alachua County. When natural resources are threatened, joint efforts among governmental agencies can help avoid problems and promote awareness.

The **Housing Element** projects the future mix of housing types and establishes guidelines for promoting a healthy and diverse housing market. New housing construction may be guided by conservation policies to allow both development and protection of historic and natural resources.

The **Economic Element** seeks to create an economic environment that will enhance the economic prosperity of all citizens of Alachua County. The Conservation and Open Space Element establishes policies for the protection and enhancement of natural resources vital to public health and welfare, while providing for appropriate use of natural resources of economic importance to the citizens of Alachua County commensurate with the need to ensure long-term environmental quality.

The **Stormwater Element** identifies floodprone areas and determines natural drainage capacity to project the need for necessary infrastructure to reduce flooding problems. The Conservation and Open Space Element provides for protection of the natural functions of floodprone areas and requires that development be designed to minimize additional impacts on natural drainage features that could cause flooding or stormwater contamination.

The **Capital Improvements Element** projects the financial capabilities of the County to meet capital demands for the future. This includes prioritizing and scheduling capital projects to be constructed by the County and identifying revenue sources for financing such projects. The Conservation and Open Space Element coordinates with the Capital Improvement Element to insure that capital projects are designed to conserve natural resources.

The **Historic Preservation Element** is a new element created largely from objectives and policies located within the former Conservation/Aquifer Recharge Element. The Historic Preservation Element preserves, protects, enhances, and supports historic and paleontological resources and properties. All development activities subject to the County's development review process, as well as all County capital improvement projects, are required to consider potential impacts to historic and paleontological resources. Policies in the Historic Preservation Element require relevant survey and analysis, avoidance and minimization of impacts to significant resources, or appropriate mitigation where avoidance is not possible. The Element, as well, calls for creation of a comprehensive Historic Preservation Plan and Historic Preservation Ordinance in the interest of implementing and furthering the stated goals, objectives, and policies.

APPENDIX Definitions

Adverse Impact (upon a natural resource): Direct contamination, alteration, or destruction, or that which contributes to the contamination, alteration, or destruction of a natural resource, or portion thereof, to the degree that its environmental benefits are or will be eliminated, reduced or impaired.

Agriculture: The use of land predominantly for the cultivation of crops and livestock including: cropland, pastureland, orchards, vineyards, nurseries, ornamental horticulture areas, groves, confined feeding operations, specialty farms, and silviculture.

Ambient: Circulating or surrounding.

Aquifer: A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs. (See Floridan Aquifer System; Intermediate Aquifer System; and Surficial Aquifer System.)

Aquifer Recharge: The replenishment of groundwater in an aquifer occurring primarily as result of infiltration of rainfall, and secondarily by the movement of water from adjacent aquifers or surface water bodies.

Area of Special Flood Hazard: Any locality that, because of topography, soil limitations or geographic location, is subject to periodic or occasional inundation.

Assimilative Capacity: The greatest amount of a pollutant loading that a water or wetland can receive without violating state water quality standards.

Best Management Practices (BMPs): **A series of guidelines or minimum standards** ~~Management or design criteria~~ adopted for areawide application, ~~typically~~ ~~usually~~ associated with agricultural, ~~horticultural, or commercial forestry pursuits~~ silvicultural, golf course, and similar operations, designed primarily to prevent soil erosion and water pollution, and to protect certain wildlife habitat values in riparian and wetland areas.

Bikeway: Any road, path, or way which in some manner is specifically designated as being open to bicycle travel regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes. This includes bike lanes, wide curb lanes, sidewalks, and local streets.

Biodiversity (Biological diversity): The variety, distribution and abundance of living organisms in an ecosystem. Maintaining biodiversity is believed to promote stability, sustainability and resilience of ecosystems.

Bona Fide Agricultural Purposes: Good faith commercial agricultural use of the land, provided the land is classified for assessment purposes by the property appraiser as “agricultural” pursuant to Chapter 193, Florida Statutes. In determining whether the use of the land for agricultural purposes is bona fide, the following factors may be taken into consideration:

- (1) The length of time the land has been so utilized;
- (2) Whether the use has been continuous;
- (3) The purchase price paid;
- (4) Size, as it relates to specific agricultural use;
- (5) Whether an indicated effort has been made to care sufficiently and adequately for the land in accordance with accepted commercial agricultural practices, including, without limitation, fertilizing, liming, tilling, mowing, reforestation, and other accepted agricultural practices;
- (6) Whether such land is under lease and, if so, the effective length, terms, and conditions of the lease; and
- (7) Such other factors as may from time to time become applicable.

Borrow Activities: See Excavation.

Buffer: ~~The use of naturally occurring vegetation or open space for the purposes of limiting the effects of development on natural systems or the recreational value of natural features.~~ An area of planted or natural vegetation or open space, maintained for various purposes, including reduction of erosion and siltation along surface waters and wetlands, reduction of poaching and wind erosion along roads and field edges, and provision of wildlife travel corridors and habitat.

Champion Trees: Those trees that have been identified by the Florida Division of Forestry as being the largest of their species within the State of Florida or by the American Forestry Association as the largest of their species in the United States. The current list of champion trees in Gainesville and Alachua County is on file in the office of codes enforcement. This list is subject to revision and will be updated yearly.

Class I Waters: Potable water supplies as classified and specified in Chapter 62-302, Florida Administrative Code.

Class II Waters: Shellfish propagation or harvesting water as classified and specified in Chapter 62-302, Florida Administrative Code.

Class III Waters: Waters deemed suitable for recreation, propagation and protection of fish and wildlife as classified and specified in Chapter 62-302, Florida Administrative Code.

Class IV Waters: Agricultural water supplies as classified and specified in Chapter 62-302, Florida Administrative Code.

Clustering: The grouping together of structures and infrastructure on a portion of a development site.

Common Area: Any part of a development designed and intended to be used in common by the owners, residents or tenants of the development.

Common Open Space: All open space, natural areas and recreational areas which are part of a common area.

Compensating Storage: Physical replacement of natural flood water storage volumes that would be displaced in areas of special flood hazard due to development. The volume of compensating storage shall be calculated assuming normal wet season ground water levels.

Cone of Depression: A description phrase relating to the events that occur in an aquifer when withdrawal of well water exceeds recharge.

Confined Aquifer: An aquifer that is bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself.

Confining Layer: A rock or soil bed that lies above or below an aquifer and that allows very little water to flow through the other layers.

Connected Wetland: A vegetative community which is part of a flowing water system or a runoff system where waters flow through during times of heavy rainfall.

Conservation Area/Land: In the land use category context, this term encompasses both primary and secondary conservation areas and refers to identified natural resource areas on privately owned lands in Alachua County.

Conserve/Conservation: The prudent use of natural resources commensurate with environmental functions.

Creation: A type of mitigation in which persistent wetlands are created through the engineered conversion of non-wetland areas.

Criteria Pollutants: Air pollutants for which National Ambient Air Quality Standards exist. The United States Environmental Protection Agency has set National Air Quality Standards for the following six air pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.

Critical: Of special importance, requiring high-priority treatment, usually applied to resource areas of special importance due to their usefulness, hazard, or pending impact from alteration.

Critical Habitat (also called essential habitat): The specific areas that contain biological or physical features upon which a **listed threatened or endangered** species depends. These include feeding, breeding, and nesting areas.

Depression Basins: Natural depression watershed areas which have no positive outfall for surface water runoff except by infiltration as evapotranspiration.

Detention: The collection and temporary storage of stormwater in such a manner as to provide for treatment through physical, chemical or biological processes with subsequent gradual release of stormwater.

Development **Activity: Any man-made change to property including, but not limited to, building or erecting a structure, locating a mobile home, mining, dredging, filling, grading, paving, excavating, or drilling operations. Any dredging, filling, excavation, construction of new structures, expansion of existing structures, installation of utilities, roads, personal wireless service facilities, stormwater**

management systems, septic tanks, bulkheading, agricultural activities, land clearing, tree cutting, mechanized vegetation removal and the disposal of solid or liquid waste. Agricultural and silvicultural activities that qualify as bona fide agricultural activities pursuant to Chapter 193, Florida Statutes, and that follow best management practices are exempt from this definition of development activity.

Drainage Basin: A subdivision of a watershed.

Ecological Integrity: The condition of an ecosystem having the biotic communities and physical environment with structure, composition, and natural processes that are resilient, self-sustaining, and able to accommodate stress and change. Its key ecosystem processes, such as nutrient cycles, succession, water levels and flow patterns, and the dynamics of sediment erosion and deposition, are functioning properly within the natural range of variability.

Ecological Value: The value of functions performed by uplands, wetlands, and other surface waters to the abundance, diversity, and habitats of fish, wildlife, and listed species. These functions include, but are not limited to, providing cover and refuge; breeding, nesting, denning, and nursery areas; corridors for wildlife movement; food chain support; and natural water storage, natural flow attenuation, and water quality improvement, which enhances fish, wildlife, and listed species utilization.

Ecosystem: A community of all plants and animals and their physical environment, functioning together as an interdependent unit.

Ecosystem Management: The conservation, restoration or enhancement of, and planning for the maintenance of, parts or whole natural systems inter-related or associated with particular resources. Ecosystem management is an approach to natural resources that integrates ecological, economic, and social principles to manage biological and physical systems in a manner that safeguards the ecological sustainability, natural diversity, and productivity of the landscape. Examples of ecosystem management practices include: using fire to restore longleaf pine forests, leaving buffer zones to protect water quality, and using harvesting techniques that enhance forest productivity and provide critical wildlife habitat.

Endangered species: Species in danger of extinction if the deleterious factors affecting their populations continue to operate. These are forms whose numbers have already declined to such a critically low level or whose habitats have been so seriously reduced or degraded that without active assistance, their survival in Florida is questionable.

Enhancement: A type of mitigation in which there is an engineered increase in one or more values of all or a portion of an existing wetland, surface water, or upland.

Environmentally Sensitive Areas: Areas where natural resource values or hazards play a primary role in land suitability and capability. These include areas with special natural resource characteristics which may be described as fragile and subject to harm with a minimal amount of alteration.

Environmentally Significant Lands: Lands containing natural resources and open space that Alachua County acquires for resource protection and the provision of appropriate resource-based recreation.

Environmental Quality: The character or degree of excellence or degradation in the total essential natural resources of the area as measured by the findings and standards of the physical, natural, and social sciences, the arts and technology, and the quantitative guidelines of federal, state and county governments.

Environmental Stewardship: Care and supervision of natural resources common to all citizens.

EPA Identified Toxic Pollutants: The 188 toxic air pollutants listed in the 1990 amendments to the Federal Clean Air Act that the United States Environmental Protection Agency is required to control.

Excavation: The removal and transport of earth materials (sometimes referred to as "borrow" activities). This definition excludes commercial mining operations (such as limerock and sand mining operations), excavation associated with construction of storm water management facilities, excavation activities governed by the Alachua County Subdivision Regulations, and excavation associated with sod farming and removal activities, and tree farming activities.

Extraction: The removal of soil, sand, mineral, etc. from the earth through mining or excavation (borrow) activities.

Fill: Raising the surface level of the land with suitable soil material.

Flatwood: Broad, nearly level, low ridges of dominantly poorly drained soils characteristically vegetated with open woods of pine and saw palmetto.

Flood or Flooding: The inundation of land by the overflow of a stream basin or depression basin, the accumulation of runoff, or the rise of ground water.

Flood plain: **Any land area susceptible to being inundated by water from a storm of a specified frequency of occurrence. Lowlands adjoining the channels of rivers, streams or other watercourses, or lakes or other bodies of standing water. Includes the floodway and flood fringe.**

Flood plain, 100-year: Areas subject to inundation by a flood having a one-percent (1%) probability of occurrence in any given year. The 100-year flood elevation is the highest elevation of flood waters during the 100-year storm event and is calculated or estimated from the best available information.

Floodway: The channel of a river, **stream**, or other watercourse **and of** the adjacent land areas that must be reserved in order to discharge the **100-year base** flood without cumulatively increasing the **100-year flood water surface** elevation more than **a designated height one (1) foot**.

Floridan Aquifer System: The thick carbonate sequence which includes all or part of the Paleocene to early Miocene Series and functions regionally as a water-yielding hydraulic unit. Where overlaid by either the intermediate aquifer system or the intermediate confining unit, the Floridan contains water under confined conditions. Where overlaid directly by the surficial aquifer system, the Floridan may or may not contain water under confined conditions, depending on the extent of low permeability materials in the surficial aquifer system. Where the carbonate rocks crop out, the Floridan generally contains water under unconfined conditions near the top of the aquifer system; but, because of vertical variations in permeability, deeper zones may contain water under confined conditions. The Floridan aquifer system is present throughout the County in the deepest part of the active ground water flow system. The top of the aquifer system generally

coincides with the absence of significant thicknesses of clastics from the section and with the top of the vertically persistent permeable carbonate section. For the most part, the top of the aquifer system coincides with the top of the Suwannee Limestone, where present, or the top of the Ocala Group. Where these are missing, the Avon Park Limestone or permeable carbonate beds of the Hawthorn Formation form the top of the aquifer system. The base of the aquifer system coincides with the appearance of the regionally persistent sequence of anhydrite beds that lie near the top of the Cedar Keys Limestone.

Florida Scenic Highways Program: Grass-roots effort to heighten awareness of our State's historical and intrinsic resources - cultural, historic, archaeological, recreational, natural and scenic - which collectively, enhance the overall traveling experience. Program participation provides benefits to the community, such as resource preservation, enhancement and protection, as well as community recognition and promotion of tourism and economic development. The program is a partnership between Florida Department of Transportation, Federal Highway Administration, Florida citizen groups, businesses, and local governments.

Fragmentation: The loss of connections between natural areas, or the breaking up of habitat into isolated areas.

Functional Connectedness: The characteristic of a natural community that has connections to other natural areas. Wild plants and animals typically require avenues for dispersal to different feeding and breeding sites in order to survive.

Geologic Features: A prominent or conspicuous characteristic of earth materials in the landscape. In Alachua County, prominent geologic features include sinkholes, caves, stream bluffs, escarpments, outcroppings, and springs.

Geophysical: Of or pertaining to the physical properties of earth materials and their chemical composition and transformations.

Glare: The sensation produced by a bright source within the visual field that is sufficiently brighter than the level to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance and visibility; blinding light. The magnitude of glare depends on such factors as the size, position, brightness of the source, and on the brightness level to which the eyes are adapted.

Greenway: A corridor of protected open space that is managed for conservation, recreation purposes. Greenways follow natural land or water features or abandoned railroad corridors or canals, and link natural reserves, parks, cultural and historic sites.

Groundwater: Water occurring beneath the surface of the ground, whether or not flowing through known or definite channels.

Habitat: The natural abode of a plant or animal **that contains the arrangement of food, water, cover and space required to meet the biological needs of a given species. Different species have different requirements, and these requirements vary over the course of a year. The kind of environment in which a plant or animal normally lives, as opposed to the range, or spatial distribution.**

Habitat Corridors: A naturally-vegetated transportation route for plants and animals that connects larger natural areas. Wild plants and animals typically require avenues for dispersal to different feeding and breeding sites in order to survive.

Habitat Diversity: The variety of habitat features and types in a specific area. Habitat diversity takes many forms: the variety of plants and animals on a site; structural diversity or the vertical arrangement of vegetation from canopy to forest floor; horizontal diversity or the distribution of habitat types across the landscape; and temporal diversity or habitat changes over time. Generally, areas with substantial habitat diversity will support more wildlife species than areas with less habitat diversity.

High Aquifer Recharge Areas: Areas where stream-to-sink surface water basins occur, and areas where the Floridan aquifer system is designated as unconfined or semiconfined in Florida Geological Survey Open File Report 21, "Geologic Interpretation of the Aquifer Pollution Potential in Alachua County, Florida,"

Human-related Resources: Resources or products that are associated with human interaction with the environment, including energy, open space, scenic quality, landscaping/vegetation management, agricultural and silvicultural resources, wildfire hazards, and hazardous materials.

Hydrogeologic: Of or pertaining to the interrelationship of earth materials and processes with water. The movement patterns and chemistry of groundwater are heavily dependent on geology of the area.

Hydroperiod: ~~The annual period of inundation.~~ **Period of time and frequency in which soils, waterbodies, and sites are wet.**

I-75 Corridor Council: Intergovernmental work group that provides guidance to the Florida Department of Transportation on the highway beautification and tourism promotion project established in 1996 for the portion of I-75 that extends from the Georgia state line to Florida's Turnpike in Wildwood.

Impervious Surface: Land surfaces which do not allow, or minimally allow, the penetration of water; included as examples are building roofs and typical continuous concrete and asphalt pavements.

Important Agricultural Areas: The important farmlands that are identified by the U.S. Natural Resources Conservation Service. These include prime and unique farmlands, and additional farmland of statewide and local importance as described in 7 Code of Federal Regulations 657.

~~Important ecological community - An assemblage of native biota which may be easily recognized because of characteristic species or overall appearance, and which is sustainable through maintenance or ecosystem regulators such as fire to period inundation.~~

Indicator (Key) Species: An organism that occurs only in areas with specific environmental conditions.

Indicators: Quantitative information, or data, tracked over time, designed to provide a comprehensive assessment of trends in community conditions (i.e. environmental quality) to support planning and management decisions affecting the County's future.

Injection Well: A well into which fluids are drained, either by gravity flow or under pressure. The terms deep well and shallow well injection have no real significance relative to the actual depth of a well. Specific depths should be stated. **Deep well injection does not include the return of groundwater used for heat exchange, or the injection of non-contact cooling water from residential and commercial heat pumps, to the aquifer.**

Intermediate Aquifer System: All rocks that lie between the overlying surficial aquifer system and the underlying Floridan aquifer system. These rocks in general consist of fine-grained clastic deposits interlayered with carbonate strata belonging to all or parts of the Miocene and younger Series. In places, poorly-water-yielding to non-water-yielding strata mainly occur; there the term "intermediate confining unit" applies. In other places, one or more low- to moderate-yielding aquifers may be interlayered with relative impermeable confining beds; there the term "intermediate aquifer system" applies. The aquifers within this system contain water under confined conditions. The top of the intermediate aquifer system or the intermediate confining unit coincides with the base of the surficial aquifer system. The base of the intermediate aquifer is the top of the vertically persistent permeable carbonate section that comprises the Floridan aquifer system, or, in other words, that place in the section where clastic layers of significant thickness are absent and permeable carbonate rocks are dominant. Where the upper layers of the persistent carbonate section are of low permeability, they are part of either the intermediate aquifer system or intermediate confining unit, as applicable to the area.

Invasive Species: Imported plant species that are widespread in Florida and have the established potential to invade and disrupt native plant communities; are localized but have a rapidly expanding population or have shown a potential to invade and disrupt native vegetation in other areas or other countries with climates similar to Florida.

Isolated Wetland: ~~cypress domes, shallow marshes, bayheads or other wetlands where no naturally occurring outfall exists.~~ **Any wetland without a direct hydrologic connection to a lake, stream, estuary or marine water.**

Karst Topography: The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Land Application: The act of disposing of sewage effluent and/or sludge on the earth's surface. There are three primary types of land application: (1) overland flow, which includes depository sludge in landfills, (2) rapid rate infiltration, such as in percolation ponds, and (3) slow rate infiltration such as spray irrigation.

Landscape: A geographical mosaic composed of interacting ecosystems resulting from the influence of geological, topographical, soil, climatic, biotic and human interactions in a given area.

Light Pollution: Any adverse effect of manmade light.

Light Trespass: Light falling where it is not wanted or needed, typically across property boundaries.

~~Listed - Refers to those lists of endangered species which are not accompanied by protection legislation, such as rare and endangered species lists compiled by academic or conservation groups.~~

Listed Species: Those species of plants and animals listed as endangered, threatened, rare, or species of special concern by an official state or federal plant or wildlife agency, the Florida Natural Areas Inventory (FNAI), or the Florida Committee on Rare and Endangered Plants and Animals (FCREPA). These species are targeted for protection for a number of reasons, e.g. they are in imminent danger of extinction, are rapidly declining in number or habitat, or have an inherent vulnerability to habitat modification, environmental alteration, or human disturbance which puts them at risk of extinction.

Littoral Zone: In reference to stormwater management systems, that portion which is designed to contain rooted aquatic plants.

Management Plan: A plan prepared to address preservation/restoration and management of natural resources. The plan consists of a set of documents, including maps, that describes and depicts the location of areas and natural resources to be preserved, including any protective buffers. The plan identifies specific implementation activities, schedules, and assignments of responsibilities.

Mineral Resource Areas: Areas of active or proposed resource extraction activity and areas containing known valuable mineral resource deposits.

Minimal Impact Activities: Activities that will have no significant adverse impact on the resource. Such activities may include installation of navigational aids marked consistent with the requirements of Section 327.40, Florida Statutes; construction and maintenance of public or private nature trails not more than ten (10) feet in width; installation of docks not in excess of one thousand (1,000) square feet in size, subject to performance standards, and other similar activities.

Mining: The extraction of natural deposits from the earth which are regulated by the State of Florida under Part II of Chapter 211 and Chapter 378, Florida Statutes, and by Alachua County Ordinance 68.

Mitigation: An action or series of actions that offsets adverse environmental impacts. Mitigation may consist of any one or a combination of monetary compensation, or acquisition, restoration, enhancement, or preservation of wetlands, other surface waters or uplands.

Mounding: Filling the area of the absorption field of a septic tank with suitable soil material to raise it above the water table to meet state and local regulations.

Multiple-use Forestry: Managing a forested area to simultaneously provide more than one of the following resource objectives: fish and wildlife, wood products, recreation, aesthetics, grazing, watershed protection, and historic or scientific values.

Native biota - The natural occurrence of species of plants and animals in a specific region. Native biota does not include species that are exotic or introduced by humans and that have become "naturalized".

Native Species: Plants and animals that, based on current knowledge, are known to have been present regionally before the time of documented European contact (~1500 A.D.).

Natural Ecological Communities: An assemblage of **native** plants and animals that is: (1) repeatable in general terms under similar physical conditions over the landscape, (2) capable of self-maintenance, (3) **recognizable can be recognized** as being distinct from adjoining communities, and (4) has not been significantly altered by previous manmade activities. A community can usually be recognized by a few key species of plants. A natural ecological community is one that is important as a reserve of biological diversity.

Natural Resources: Alachua County’s biological, physical, geological and hydrological components of the environment.

Non-native Species: Plants and animals that are not native regionally.

Non-point Source Pollution: Contamination arising from the discharge of wastes to water bodies or to the atmosphere from dispersed sources.

Open Space: Any natural, recreational, or common open areas, either publicly or privately owned, set aside, dedicated, designated, or reserved for the private use or enjoyment of owners or occupants of land adjoining such open space, or for the public at large.

Outstanding Florida Waters (OFWs): Surface waters that have been determined to be worthy of special protection as identified in Section 62-302.700, Florida Administrative Code. In Alachua County, these surface waters include Lochloosa Lake (including Little Lochloosa Lake, Lochloosa Lake Right Arm, and Lochloosa Creek upstream to County Road 20A); Orange Lake up to the U.S. Highway 301 bridge, the River Styx up to Camps Canal, and Cross Creek; and the Santa Fe River System (consisting of the Santa Fe River, Lake Santa Fe, Little Lake Santa Fe, Santa Fe Swamp, Olustee Creek, and the Ichetucknee River south of S.R. 27, but excluding all other tributaries). Also included are waters within state parks and preserves, such as Devil’s Milhopper State Geological Site, the Marjorie Kinnan Rawlings State Historic Site, O’Leno State Park, Paynes Prairie Preserve State Park, River Rise Preserve State Park, and San Felasco Hammock Preserve State Park.

Overriding Public Interest: Actions required by local, regional, state, or federal government, necessary for the promotion of public safety, health or general welfare, such as clean-up of a spill of hazardous material, removal of exotic species, or fighting wildfires.

Paleontologic: Dealing with the use of past geological periods as known from fossil remains.

Percolation: The downward movement of water through the soil **or geologic features.**

Permeability: The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil.

Personal Wireless Service Facility (PWSF): Facility for the provision of personal wireless services, as defined by Section 704 of the Telecommunications Act of 1996. A PWSF is any facility for the transmission and/or reception of personal wireless services, which may consist of an antenna array, transmission cables, equipment shelter or building, access road, mount, and a guy system.

Point Source Pollution: Contamination arising from direct discharge of wastes to water bodies or to the atmosphere through a pipe, ditch, channel, or other concentrated means.

Pollution: The presence in the outdoor atmosphere, ground or water, of any substances, contaminants, noise or man-made or human-induced alteration of the chemical, physical, biological, or radiological integrity of air, soil, or water, in quantities or at levels that are or may be potentially harmful or injurious to human health or welfare, animal or plant life, or property, or that does or may unreasonably interfere with the enjoyment of life or property.

Ponding: Standing water on soils in closed depressions.

Prescribed Burn: The controlled application of fire to naturally occurring vegetative fuels, under specified environmental conditions and following appropriate precautionary measures, to achieve specific objectives, such as ecosystem restoration, brush control or reduction of fuel hazards.

Preservation: In the mitigation context, this term refers to the protection of wetlands, surface waters, or uplands from adverse impacts by placing a conservation easement or other comparable land use restriction over the property or by donation of fee simple interest in the property.

Preservation Area/Land: An environmental land use category that consists of publicly owned lands which are intended for use as natural reserves or managed conservation lands for the preservation of natural resources. Preservation areas include lands owned in fee simple or less-than-fee simple title.

Preserve/Preservation: To maintain areas in their natural state in perpetuity; the perpetual maintenance of areas in their natural state.

Productivity (soil): The capacity of a soil for producing a specified plant or sequence of plants under specified management.

~~**Protected – Refers to official Federal, State or international treaty lists which provide legal protection for the rare and endangered species they list.**~~

Public Access: The ability of the public to physically reach, enter or use recreation sites.

Public Facilities: Major capital improvements owned, operated, or maintained by a governmental entity on behalf of the public, including, but not limited to, government buildings, transportation, sanitary sewer, solid waste, stormwater, potable water, educational, parks and recreational, and health systems and facilities.

Public Water Supply Well: A system for the provision of piped water to the public for human consumption which serves at least fifteen (15) service connections used year-round or regularly serves at least twenty-five (25) individuals daily at least sixty (60) days out of the year.

Rare species: Species which, although not presently endangered or threatened as defined, are potentially at risk because they are found only within a restricted geographic area or habitat in the State, or are sparsely distributed over a wider range.

Rarity: The characteristic of a natural community or organism that is imperiled at the state, regional, or local level.

Reclamation: The filling, backfilling, restructuring, reshaping, and/or revegetation within and around a land excavation or filling area to a safe and aesthetic condition.

Recreation Facility: A component of a recreation site used by the public such as a trail, court, athletic field, or swimming pool.

Relief: The elevations of inequalities of a land surface, considered collectively.

Remove or Removal: The actual physical removal of a tree or plant or the effective removal through damaging, poisoning or other direct or indirect action resulting in or likely to result in, the death of a tree or plant.

Restoration: A type of mitigation in which wetlands, surface waters, or uplands are returned from a disturbed or altered condition to a previously existing natural condition to the maximum extent possible.

Retention: The prevention of the discharge of a given volume of stormwater runoff by complete on-site storage.

Reuse: The planned activity or activities that are intended for the land excavation or filling area and/or abutting land after the excavation or filling ceases and reclamation is completed.

Runoff: The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from groundwater.

Scenic Corridor: A visual opening along a traveled route, such as a road, waterway, bike path, or pedestrian trail, that allows either glimpses or extended views of built or natural resources having historical or cultural significance or scenic beauty.

Scenic Resources: Shared images of what is special or unique about the County's landscape.

Scenic Road: Any presently existing or future public roadway in the county system having historical or cultural significance or natural beauty as designated pursuant to the Alachua County Scenic Roads Ordinance.

Secondary Treatment: The second step in wastewater processing whereby most of the organic material in sewage areas are broken down to simpler, inorganic molecules. The biological demands of sewage, such as the heavy use of oxygen, are reduced at this step. This kind of treatment is commonly the last step in sewage treatment plants.

Seepage: The movement of water through the soil.

Sheet Flow: The pattern of water movement where large quantities of water move in broad-spread, shallow layers across the ground's surface. This is typical in wetlands, marshes, grasslands, pine flatwoods, and prairies such as Payne's Prairie and the Everglades.

Significant Adverse Impact (upon a natural resource): Direct contamination, alteration, or destruction, or that which contributes to the contamination, alteration, or destruction of a natural resource, or portion thereof, to the degree that its environmental benefits are or will be eliminated, reduced or impaired, such that the activity will cause long term negative impacts on the natural resource.

Significant Geologic Features: Geologic features such as sinkholes, springs, caves, stream bluffs, escarpments, outcroppings, and other karst features.

Significant Habitat: Contiguous stands of natural upland plant communities which have been documented to support, and which have the potential to maintain, healthy and diverse populations of plants or wildlife.

~~Significant Natural Upland Communities - outstanding examples of the twelve ecological community types adapted from the Florida Natural Areas Inventory (FNAI) Natural Community Classification System. These communities are generally greater than 50 acres in size and warrant protection through preservation or conservation/ management strategies. Other areas have also been identified in the Conservation Element as Protected Areas. These have similar characteristics and are under public ownership. Community types include scrub, sandhill, xeric hammock, upland pine forest, mesic hammock, slope forest, mesic flatwoods, scrubby flatwoods, floodplain forest, baygall, wet flatwoods, and hydric hammock.~~

~~Criteria for identification:~~

- ~~1. size - generally 50 or more acres.~~
- ~~2. shape - of relatively equal dimensions or connected to larger natural systems.~~
- ~~3. location, connectedness - has actual or potential links to wildlife habitats, green space zones, trail systems or other natural areas.~~
- ~~4. completeness of the community - quality of the site's ecological features including the extent that the community has a full complement of species, diversity of habitats, flora and fauna, and degradation of the site.~~

~~Sites identified as "Significant Upland Communities" are shown on Conservation Element Map B1. For further information on the criteria and methods used to identify these areas, refer to the report titled Final Report Comprehensive Inventory of Natural Ecological Communities in Alachua County (Prepared for Alachua County Department of Planning and Development by KBN Engineering and Applied Sciences, 1987).~~

Silviculture: Of or pertaining to commercial forestry. The art and science of producing and tending a forest by manipulating its establishment, composition and growth to best fulfill the objectives of the owner. This may, or may not, include timber production.

Sinkhole: A funnel-shaped depression in the land surface, generally in a limestone region, caused by solution processes and often resulting in connection(s) with subterranean passages and groundwater systems.

Sky Glow: The brightening of the night sky that results from the scattering of artificial visible radiation from the constituents of the atmosphere.

Slough: A broad, slightly depressional, poorly defined drainageway.

Soil: A natural three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Source Separation: The separation of the components of solid waste (glass, metal, paper, chemicals, plastic, kitchen wastes, etc.) at the source of generation before disposal to allow for alternative waste management practices such as reuse, recycling, and energy recovery.

Species of special concern - Species that do not clearly fit into the endangered, threatened or rare categories, yet warrant special attention. Included in this category are: (1) species that, although they are perhaps presently relatively abundant and widespread in the State, are especially vulnerable to certain types of exploitation or environmental changes and have experienced long-term population declines; and (2) species whose status in Florida has a potential impact on endangered or threatened populations in the same or other species outside the State.

Specimen Tree: A tree which has been identified by the County to be of notable interest or high value because of its age, size, species, condition, historic association, or uniqueness.

State Water Quality Standards: Numerical and narrative standards that limit the amount of pollutants that are allowed in waters of the state, as defined by Chapter 62-302, Florida Administrative Code.

Steep Slope: Any topography having a slope of greater than or equal to 5%.

Stormwater: The flow of water which results from, and which occurs immediately following a rainfall event.

Strategic Ecosystem: Outstanding examples of ecosystems that are intact or capable of restoration and that require conservation or management to maintain important reserves of biodiversity at landscape, natural community and species specific levels. Strategic ecosystems are greater than 20 acres in size and contain one or more natural ecological communities, including but not limited to scrub, sandhill, xeric hammock, upland pine forest, upland mixed forest, mesic hammock, prairie hammock, wet prairie, seepage slope, slope forest, mesic flatwoods, scrubby flatwoods, floodplain forest, baygall, wet flatwoods, and hydric hammock. The natural resources that comprise strategic ecosystems are identified through means including, but not limited to: the Florida Fish and Wildlife Conservation Commission's "Closing the Gaps in Florida's Wildlife Habitat Conservation System" (1994), as supplemented with "Habitat Conservation Needs of Rare and Imperiled Life in Florida" (2000); FDEP's "Statewide Ecological Network," contained in The Greenways System Planning Project (1998); the Florida Natural Areas Inventory; and Golder's "Alachua County Ecological Inventory Project" (1996).

~~Streambank and Lakeshore Stabilization (SLS) Zones – transitional or buffer zones associated with surface water bodies. These zones are identified by four factors: soil erodibility in the upland zone adjacent to the water management district jurisdictional wetland lines, depth of the groundwater table underlying the upland adjacent to the wetland lines, aquatic and wetland-dependent wildlife habitat requirements associated with maintaining wetland suitability, site specific requirements for water quality and quantity maintenance. Typical examples of SLS zones include floodplain forests and slope forests.~~

Stream Basins: Watershed areas which drain surface water runoff via streams and channels, both natural and manmade.

Stream Crossing: Transportation and utility crossings of stream basins.

Stream-to-sink Aquifer Recharge Basins: A drainage basin typified by streams discharging into sinkholes and other karst features.

Structure: Anything constructed or erected, the use of which requires permanent location on the ground or attachment to something having a permanent location on the ground as well as a mobile home.

Surface Waters: Rivers, streams, creeks, springs, lakes, ponds, intermittent water courses and associated wetlands that hold or transport water on the ground surface.

Surficial Aquifer System: The permeable hydrogeologic unit contiguous with land surface that is comprised principally of unconsolidated to poorly indurated clastic deposits. It also includes well-inundated carbonate rocks, other than those of the Floridan aquifer system where the Floridan is at or near land surface. Rocks making up the surficial aquifer system belong to all or part of the upper Miocene to Holocene Series. It contains the water table and water within it is under mainly unconfined conditions; but beds of low permeability may cause semi-confined or locally confined conditions to prevail in its deeper parts. The lower limit of the surficial aquifer system coincides with the top of laterally extensive and vertically persistent beds of much lower permeability. Within the surficial aquifer system, one or more aquifers may be designated based on lateral or vertical variations in water-bearing properties.

Tertiary Treatment: The third and usually most expensive in a series of processes whereby pollutants such as phosphorous or nitrogen compounds are removed from wastewater. Most sewage treatment plants are only capable of secondary treatment of wastewater.

Threatened Species: Species that are likely to become endangered in the State within the foreseeable future if current trends continue. This category includes: (1) species in which most or all populations are decreasing because of overexploitation, habitat loss, or other factors; (2) species whose populations have already been heavily depleted by deleterious conditions and which, while not actually endangered, are nevertheless in a critical state; and (3) species which may still be relatively abundant, but are being subjected to serious adverse pressures throughout their range.

Toxic Air Pollutants: Also known as hazardous air pollutants, toxic air pollutants are generally defined as those pollutants that are known or suspected to cause serious health problems.

Unconfined Aquifer: An aquifer that has no impermeable layer between the zone of saturation and water table.

Upland Communities: Those non-wetland, non-aquatic areas not subject to regular flooding. These include **but are not limited to**: scrub, sandhill, xeric hammock, upland pine forest, **upland mixed forest**, mesic hammock, slope forest, mesic flatwoods and scrubby flatwoods. For this Element, communities that do not consistently meet legal criteria for protection as a wetland have also been included. These are floodplain forest, baygall, wet flatwoods, and hydric hammocks.

~~Urban area - That property which is located within that area of unincorporated Alachua County which receives thirty-one (31) or more points as determined by the Residential Density Checklist of the Alachua County Land Use Element.~~

~~Urban development - Development which is permitted by the Alachua County Land Use element within the urban area.~~

~~Urban/suburban densities - Two dwelling units per acre (2 DU/acre) or greater.~~

Vertical Drainage: The characteristic of porous soils and rocks whereby water pools only temporarily and cannot form perennial streams on the earth's surface; instead, water flows straight down through soils and rock to an underlying aquifer.

Viewshed: A generally recognizable, noteworthy view that is characteristic of the visual appeal of Alachua County, such as the view of Paynes Prairie.

Water Dependent Facilities: Facilities such as boat ramps, parks, beaches, stream crossings, and other similar facilities which require close proximity to surface waters.

Water Management District: Any flood control, resource management, or water management district operating under the authority of Chapter 373, Florida Statutes. Unless otherwise stated, water management district shall refer to either or both, the St. Johns River Water Management District or the Suwannee River Water Management District.

Watershed: The land area which contributes to the flow of water into a receiving body of water.

Water table: That surface in an unconfined water body at which the pressure is atmospheric. It is defined by the levels at which water stands in wells that penetrate the water body just far enough to hold standing water.

Wellfield Protection Areas: Identified areas surrounding public water supply wellfields which, because of low potentiometric surface of water yielding aquifer units resulting from pumping large amounts of water from these units, are considered critical aquifer recharge areas with significant risk of contamination of public water supply from overlying land uses within the area.

Wetlands: **Those** areas that are inundated **or saturated** by surface water or ground water **at with** a frequency and a duration sufficient to support, and **which**, under normal **conditions circumstances** do support, a prevalence of vegetation typically adapted for life in saturated **or seasonally saturated** soil **conditions**. **Soils present in wetlands generally are classified as hydric or alluvial, or possess characteristics that are associated with reducing soil conditions. The prevalent vegetation in wetlands generally consists of facultative or obligate hydrophytic macrophytes that are typically**

adapted to areas having soil conditions described above. These species, due to morphological, physiological, or reproductive adaptations, have the ability to grow, reproduce or persist in aquatic environments or anaerobic soil conditions. Florida wWetlands generally include swamps, marshes, bayheads, bogs, cypress domes and strands, sloughs, wet prairies, riverine swamps and marshes, hydric seepage slopes, tidal marshes, mangrove swamps and other similar areas. Florida wetlands generally do not include longleaf or slash pine flatwoods with an understory dominated by saw palmetto.

Wildfire: An uncontrolled fire, burning vegetation, structures, or other improvements.

Xeriscape Landscaping: Landscape methods that conserve water and protect the environment through the use of native, drought-tolerant plants and planting techniques. The St. Johns River Water Management District provides seven xeriscape principles which may be referenced at: <http://sjr.state.fl.us/index8.html>.

CONSERVATION STRATEGIES

1. Introduction

The citizens of Alachua County do not accept environmental degradation as part of their vision for a sustainable community. Awareness of environmental concerns has increased steadily over the last few decades, and with that, have come new and innovative attempts to address these concerns. Alachua County reaffirmed its commitment to environmental protection through strong support of Charter Amendment 1, Alachua County Forever, membership in the Florida Sustainable Communities Network, and the Air Quality Initiative, as well as policies of the comprehensive plan, and many other plans, programs, policies and actions. This is a bifocal vision with both near and distant horizons.

Alachua County has numerous citizens' advisory committees and organizations, such as the Sierra Club, Women for Wise Growth, Sustainable Alachua County, Environmental Protection Advisory Committee, Recreation and Open Space Committee, Land Conservation Board, and Alachua Conservation Trust, as well as responsible individuals in the development community, and our farming and forestry families, who share this commitment. Their dedicated efforts help advance our knowledge of environmental concerns, and find effective solutions for all members of the community. New organizations continue to emerge in response to evolving issues. The Scenic 441 Corridor Advocacy Group, Santa Fe Land Trust, and Conservation Trust of Florida are some of the more recent examples. These are examples of adjusting our vision for the near horizon.

In past decades, land use decisions were made with little consideration given to the natural attributes of the land. Environmental features were often considered obstacles or hindrances to be overcome through engineered design solutions or intensive site modifications. As a result, urban land uses were often allowed to replace or permanently alter environmentally sensitive lands and natural systems. With a better understanding of the ecological impacts of land uses, it has become clear that the natural carrying capacity of the land must be carefully considered in land use decisions if the natural attributes and functions of the environment are to be maintained for future generations. Policies and regulations that appropriately preserve or conserve valuable natural resources, while allowing for orderly economic growth, should continue to be implemented. In addition, complementing these strategies with a new land acquisition program, and a strong commitment to maintaining working partnerships with citizens, land trusts, agencies and organizations, will add important new dimensions to an increasingly comprehensive approach to environmental conservation in Alachua County.

Public input into the update of the Comprehensive Plan over the last five years has contributed to the generation of several long-term planning directions or principles, which provide the basis for the goals, objectives and policies of the Conservation Element. These directions reflect the kind of community the residents of Alachua County desire and envision for the future. Forefront among these guiding principles is recognition of the need for sustainability. This is an example of distant horizon visioning.

Although there is no general agreement regarding a precise definition of sustainable development, most interpretations of the term refer to the availability of natural resources and ecosystem functioning over many generations, and to the enhancement of human living standards through ecologically sound economic development. The United Nations has defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

A commitment to sustainable development requires us to reconcile the desire to raise the standard of living with the limitations imposed on us by our local and global constraints, in view of the need to consider our actions over greater lengths of time. Sustainable development requires innovative solutions for improving our welfare that are derived from practices and technologies that work harmoniously with earth's systems and across diverse groups of people.

Patterns of human development – physical, social, and economic – affect sustainability at the local and global level. County and regional planning is integrally tied to defining how, where, and when human development occurs, which affects resource use. Planning can therefore play a crucial role in improving the sustainability of communities and the resources that support them. However, a range of indicators suggest that there is a growing gap between human consumption of resources and Earth's capacity to supply those resources and reabsorb resulting wastes. Species extinction is one example. Human activity is creating a biodiversity deficit by destroying ecosystems faster than nature can create new ones. In North America, an estimated 36% of fish, 35% of amphibians, 17% of mammals, and 11% of birds are either in jeopardy or are already extinct (APA, 2000).

Many of these environmentally unsustainable practices are directly connected to incremental local – including remotely influenced local – decision-making. Some examples in Alachua County include suburban sprawl, loss of agricultural land and open spaces, degradation of water resources, loss of wetlands, traffic congestion and air pollution.

What is contributing to unsustainability? Overconsumption, population growth, dependence on non-renewable resources, pollution, environmentally and socially destructive development patterns, and inequities in resource distribution are major contributing factors. Scientists estimate that our present consumption level exceeds the Earth's carrying capacity by 30%. The ecological footprint (estimated amount of land to support consumption and waste generation patterns) of the typical U.S. resident per year is 25.5 acres, compared to 6.9 acres for the average world resident and 2 acres for the average resident in India (APA, 2000). Historically, human development has not considered the natural processes upon which we depend, thereby damaging or destroying the systems that support us. The typical suburb paves over land that was once the habitat of other species, or productive arable land.

One of the root causes of the problems described above is the failure to recognize the fundamental limits to Earth's ability to withstand alterations to its natural systems. As a result, most Americans consume wastefully, using our limited resources inefficiently and inequitably. People need to acknowledge that we are an interconnected part of nature. Policies and actions must reflect the important linkages among a healthy environment, a strong economy, and social well-being.

Planning for sustainability promotes responsible development rather than an anti-development philosophy. The protection of a sustainable local economy is directly related to ecosystem protection and the sustainable use of resources. A variety of techniques can be used in Alachua County to provide for balanced economic growth, sustained quality of life and the protection of our natural heritage for future generations. The approach in the Conservation and Open Space Element is to encourage restoration and protection of viable, native ecosystems and listed species by limiting the impacts of growth on those systems; direct incompatible growth away from them; encourage environmentally sound land use planning and development and recognize the carrying capacity and/or limits of stress upon these fragile areas.

The first policy in the first section of the Conservation and Open Space Element sets the framework for a comprehensive, multi-faceted approach: rather than emphasize regulations, it positions them amongst a diverse array of potential options for the long-term maintenance of natural systems in Alachua County. These strategies include information, education and outreach, public and private partnerships, public acquisition, incentives, and regulations. Coordination of all of these strategies is needed to promote conservation of natural resources.

2. Information Strategies

Section 2 of the goals, objectives and policies in the Conservation and Open Space Element is an entirely new section devoted to environmental information management. This section expresses the commitment of Alachua County to tracking environmental quality and informing the public about the health of our natural resources. The manner of communicating this information is critical. Information must be conveyed in a manner that is understandable and useful to non-planners and non-regulators, so that all members of the public can make informed decisions about their health, safety, and welfare. This means employing a variety of tools and efforts, from the Alachua County Environmental Protection Department (ACEPD) website, with its helpful hints and hyperlinks, to printed brochures, checklists, and worksheets, verbal presentations to neighborhoods, schools, and citizens groups, participation in multi-disciplinary workshops, task forces, and volunteer cleanups, as well as day-to-day consultations with citizens of Alachua County. The public will be provided with knowledge of practices they can use to become better stewards of our natural resources.

A. Indicators tracking

Effective conservation requires that we know what resources exist, where they are found, and in what condition. The identity and geographical distribution of water resources, natural communities and species, important agricultural soils and open spaces, become among the most important information needed for preservation efforts to succeed. Policy 2.1.1 calls for mapping and database management of important environmental resources in the County.

Indicators provide a glimpse of a bigger picture. They reveal whether our community, the economy, or the environment is going forward or backward, increasing or decreasing, improving or deteriorating, or staying the same. Knowing where we are, and where we are headed will reveal declining or improving trends. Policy 2.1.2 calls for the County to establish a comprehensive monitoring program using performance indicators to detect and document long term trends in environmental quality, to support research efforts, and to confirm the effectiveness of environmental protection efforts. The information gained from monitoring will help citizens, planners, and state and local government officials understand the impacts of our decisions on natural resources.

Not only must the indicators be identified and measured, they must be analyzed and reported annually. The goal is to have feedback on our policies and regulations, to identify areas that need improvement to ensure the meaningful protection of natural resources. Another goal is to integrate these indicators into a performance-based development review process, so that a development proposal does not go forward unless it meets minimal standards of sustainability.

The establishment of this monitoring program will require a concerted work effort within Alachua County government and among its constituents. Fortunately, there are already a number of citizens groups

dedicated to this task. Sustainable Alachua County, Women for Wise Growth, Sierra Club, and the Environmental Protection Advisory Committee, among others, have each spearheaded important research efforts and built momentum for this type of accountability-based approach. Within the last two years, the University of Florida has initiated an indicators approach through the development of its sustainability indicators report. Alachua County will build on these efforts, and work together with these and other partners in synthesizing the components of a program that will offer a reasoned, scientific basis for decision-making. Such planning decisions should be made in a holistic and fully-informed manner that involves broad-based community participation and input.

B. Technology

Although many organizations have been using computer-based business information systems for over 30 years, this is an area that is still characterized by rapid technological development. During the last decade, many new technologies such as the internet, relational database management systems, data warehousing, geographical spatial information management, and imaging systems have been developed, offering many exciting possibilities for aiding the County in its mission. The ACEPD strives to adapt to this continuous evolution of information technology in order to provide better service to its customers and increase productivity of its employees. According to the Florida Department of Environmental Protection (FDEP), over half of all households now own computers and about 40% are connected to the internet (FDEP 2000). Opportunities for cyber-democracy range from passive public access to information to interactive services and e-commerce.

Alachua County is attempting to respond to current trends in information technology through a management strategy that combines increased public access to information and services, increased internal efficiency, increased functionality of data, systematic data gathering and storage.

Increase public access: ACEPD recognizes the potential of the internet to change the way the public gathers environmental information, participates in environmental decision making and engages the services of environmental agencies. It is our goal to establish and continually refine the EPD's internet website to provide ready public access to information including laws and regulations, general environmental problems and conditions, and opportunities to participate as environmental citizens.

More functional data storage and presentation: There is no shortage of data and information; providing useful and relevant information is the challenge. Improved document imaging systems have allowed a number of departments to better acquire and store certain forms of information while at the same time reduce paper records. Similarly, the use of GIS database systems that relate data to specific geographic areas allows for visual representation of data, making it easier and faster to ascertain the points of environmental interest.

As part of the Comprehensive Plan update, ACEPD spearheaded an effort to communicate policy changes through a new electronic data format, with hyperlinks to lead citizens through old and new policies and highlight policy changes. As part of the implementation of this update, we aim to provide citizens user-friendly copies of the data and analysis, as well as the goals, objectives, and policies of the Conservation and Open Space Element. A multi-media color presentation, including not only text, but also interactive maps, digital photos of natural resources and resource concerns, and hyperlinks to cross-referenced state statutes, supporting studies and reports, local regulations and policies in other elements, will breathe life into what should be a citizen-oriented planning tool that continually evolves in response to community conditions and needs.

Increase internal efficiency: The County recognizes the role that information technology plays in increasing productivity. Interoffice communication and networking remains the focus for achieving productivity gains.

C. Education and outreach

Education and outreach is the most important natural resource protection strategy. Local officials cannot make informed decisions about land uses in natural resource areas if they do not understand the relationship between land uses within resource areas and environmental quality. Homeowners, farmers, golf course superintendents, and public works officials will not reduce their use of fertilizers if they do not understand the impacts of their actions on groundwater that feeds springs. The successful resolution of many other threats to natural resources is dependent on the actions of an educated populace.

Instilling an awareness of the impact of disruption to natural processes conveys the relationship between environmental quality and environmental protection, and provides information about maintaining and improving the environment around us. Education can nurture appreciation of Alachua County's natural resources and bring about cooperation and voluntary actions to protect the environment. Therefore, it is our responsibility to inform students, citizens, and local leaders about the values, function, and protection needs of natural resources. The public must be informed about threatened resources. However, a positive message must also be delivered: we can still protect our resources if we work together.

Policies under Objectives 2.2 and 2.3 demonstrate Alachua County's commitment to advancing the environmental stewardship of all of our citizens. The term environmental stewardship is a convenient way to describe the responsibility we have to the natural world around us. Environmental stewardship involves knowing our relationship to Florida's environment and then taking appropriate action based on that knowledge, and tailoring management and protection strategies to the nature and scale of the resources to be protected (such as watersheds, regional corridors, or greenways) rather than transitory political boundaries. Environmental stewardship is the idea that we are an integral part of our environment.

As part of our commitment to environmental stewardship, we must provide Alachua County's landowners the tools to protect natural resources. This includes disseminating and providing technical assistance on the implementation of best management practices (BMPs), for topics such as landscape fertilization, agriculture, silviculture, stormwater management, and golf course design and management. BMPs, when properly implemented, may provide effective protection without the need to implement new regulations.

The County's webpage, interpretive facilities at county natural parks and preserves, distribution of brochures and reports, staff presentations to groups, and participation in collaborative working groups and task forces represent just a few ways that the County can engage the public. We should also be proactive in forming and supporting teams to partner with citizens, agencies, and our academic institutions in the protection and restoration of environmental quality.

“Places need keepers – people who know how things are changing, whether from bad to good, or vice versa. People who have their eyes on the place and their hearts in it. The land itself needs people who know it, care about it, keep track of it, and work on its behalf.” – Scott Russell Sanders, author and essayist.

Land conservation measures are undertaken by governments, community leaders, non-profit organizations and private landowners in recognition of the human connection to the land and in response

to the responsibility felt by many to steward land for future generations. Land stewardship isn't only a government responsibility. The bulk of Florida's land area is controlled and managed by large private landowners, many of whom are excellent stewards of the land. Small landowners, such as family farmers and suburban and urban homeowners, can help too. No single government agency has the sole authority or resources required to provide complete protection for our natural resources. Participation by all of our citizens is imperative for environmental conservation.

D. New framework for public involvement

With the Consensus Project that formed as an outgrowth of this Comprehensive Plan update, Alachua County has taken a tremendous step towards creating a new framework for public involvement that seeks to honor and explore the perspectives of all citizens. In September 1998, the Board adopted more than 250 recommendations for needed plan amendments as part of the Comprehensive Plan Evaluation and Appraisal Report (EAR). The EAR-based plan amendments (Plan Update) are adjusting the goals, objectives and policies in all of the adopted elements of the Plan. To manage the Plan Update, and to facilitate greater public involvement early in the process, the Comprehensive Planning Team (staff) presented the public policy proposals through a series of "Issue Papers." The purposes for developing the papers were to stimulate public dialogue and present proposals about interrelated community concerns rather than single Plan Elements.

Staff presented six papers to the Alachua County Planning Commission and the Board in workshops beginning in January and ending in May of 2000. Topics ranged from infrastructure, utilities and sustainable construction to integrating neighborhoods into communities. Through these workshops, three interest groups emerged. The Committee for Smart Growth, the Alliance for Responsible Growth, and the Alachua County Forestry and Agricultural Coalition are umbrella associations with members from the builder community, citizen activists on growth management and the environment, foresters, farmers, and landowners. A fourth group, the Committee for Social Concerns was also created.

Staff provided assistance to the four emergent stakeholder groups and asked each participant group to consider policies contained in each of the six Issue Papers. The groups met together, working through their concerns, and presented findings for their representative groups in writing. Staff later met with the groups to clarify information, ask questions, and collect the ideas presented by the participants.

As the work sessions continued, staff recognized the opportunity to develop a broader dialogue with these groups through a consensus project. It is not staff's intention to imply that this part of the consensus project has successfully included all potential stakeholders; however, these groups represent the first steps toward transforming a potentially adversarial climate into one where participants can seek creative solutions to the issues facing Alachua County.

The results identify stakeholder positions and ideas. One possibility would be to use this work as the basis for creating a roundtable that allows for representation from all affected interests to complete the search for consensus in follow up to the Comprehensive Plan update. To date, these groups have not had the opportunity to engage in this type of consensus process. Although consensus may or may not be found, it is through the search process that one gets clearer about one's own and others' interests and ideas.

The diverse ideas emerging from the issue paper phase of the Comprehensive Plan update offer staff new perspectives and possibilities. Moreover, the potential exchange between the stakeholder groups, representing environmental, development, and social concerns, provides an opportunity for deeper

understanding of what is best for the community as a whole. This is especially true when the discussion extends beyond special interests and the bureaucratic process.

The goal is to find strategies that offer the diverse interests in the community ways to accomplish their goals through honoring and exploring the perspectives of all citizens. Using the energy of diversity to generate wisdom, we begin to see clearly, not just from a single viewpoint, but the larger picture we have painted together.

The challenge to Alachua County will be to try to continue to engage these stakeholder groups in ongoing community planning and visioning, and also to expand participation to citizens and interests that have remained outside of the process to date. This will require going beyond our efforts which have traditionally been limited to statutorily mandated notifications of public hearings. Rather, we must provide interactive opportunities through town meetings, surveys, and public work sessions, as well as neighborhood discussions, church groups, internet exchange, and other non-traditional forums that invite interested members to become involved.

E. Intergovernmental coordination

To ensure that the County's resources are protected and managed appropriately, it is imperative that the appropriate state, regional and local land planning agencies, environmental agencies and service providers coordinate and provide accurate information and recommendations to decision makers so that full consideration is given to environmental issues when making land use decisions.

3. Land Acquisition Program

Alachua County's natural topography includes pinelands, prairies, hardwood hammocks, sandhill, swamps, marshes, lakes, and rivers. As population continues to grow at a steady pace, urban sprawl is incrementally taking its toll on natural areas. In 1999, 84% of Alachua County voters polled felt that if natural lands are not protected now, they will be lost forever. Alachua County Forever was created to alleviate these fears and to help keep Alachua County beautiful and ecologically viable.

Land acquisition is currently recognized as the best way to protect natural resources from land use practices that reduce environmental quality. In order to be effective, acquisition must be accompanied by proper management that preserves and, where necessary, restores the natural functions and conditions of the land. Presently, the primary protection afforded natural resources in Alachua County is through public ownership and management of natural areas as preservation lands.

In Alachua County, most public acquisition of land has been by the state or the water management districts over the last 10 years. Alachua County still lags behind other neighboring counties, as well as other counties within the region, with respect to conservation purchases. In recognition of the need to do more, the citizens of Alachua County voted on November 7, 2000 to approve our own local acquisition program. Various state programs, as well as our new Alachua County Forever (ACF) program, are described briefly below.

A. State programs

Since the 1909 acquisition of the Olustee Battlefield Site, Florida has pursued the preservation of its unique natural and cultural resources. Through purchases, long-term leases, donations and other means, the state has acquired lands to protect endangered species, natural communities, archaeological and historical sites, geological features, and water resources. Protection of these lands enhances the quality of the environment, as well as the quality of life of the state's residents. Conservation lands provide habitat for wildlife, beneficial services such as water storage and flood protection, and outdoor recreation opportunities for millions of residents and tourists. In addition to other benefits, these public lands also serve to protect the state's water quality and drinking water supply.

Florida's first organized land acquisition program began in 1963. The largest state funded acquisition programs, the Conservation and Recreation Lands (CARL) and Save Our Rivers (SOR) programs, began in 1979 and 1981, respectively. In 1990, the Florida legislature approved the Preservation 2000 (P2000) Act, an initiative to increase funding for land acquisition programs by providing an additional \$300 million annually for a ten-year period. In 1999, the Florida Forever Act was adopted to continue the state's commitment to buying natural, recreational and culturally important lands. Funding under the P2000 program was focused on the purchase of environmentally important lands whereas, under the newly constituted program, more money is being allocated for water resources and land purchases in urban areas to protect open space and parks. At the same time, additional acres of sensitive lands are being purchased as well. The new Act distributes an annual allocation of \$300 million in Florida Forever funding among the following programs: CARL program (35%), water management districts (35%), FCT (22%), Florida Recreational Development Assistance Program (1.5%), FFWCC (1.5%), Division of Forestry (1.5%), Division of Recreation and Parks (1.5%), Office of Greenways and Trails (1.5%).

Water Management Districts

Since 1991, both water management districts have actively pursued land acquisitions in Alachua County, adding approximately 33,346 acres of preservation lands through 1997. The main funding sources for these land acquisition programs are the Save Our Rivers Program (see s. 373.59, F.S.) and the Preservation 2000 Program (see s. 259.101, F.S.), supplemented by district funds from ad valorem taxes.

In its Land Acquisition & Management 1998 Five Year Plan, SJRWMD reports on acquisitions to date and future acquisition plans. The southeastern part of Alachua County, including Paynes Prairie and the Orange Creek Basin are part of the Ocklawaha River Basin. As of 12/97, SJRWMD had some ownership interest in lands in Alachua County. These include the Newnans Lake CARL Project, the Lochloosa Wildlife Conservation Area, the Lochloosa Less-than-fee easement, and the Orange Creek muck farm.

In its Land Acquisition and Management Plan 1996, the SRWMD identifies its main land acquisition focus as the Suwannee River and its tributaries, including the Santa Fe River. The Santa Fe River Basin planning area consists of 1,390 square miles draining into the river, which originates in the Santa Fe Lake/ Santa Fe Swamp / Lake Alto area. As of 10/31/95, SRWMD owned 7,781 acres along a total of 15 miles of the Santa Fe River and proposed to acquire 12,315 additional acres. Of this acreage, 1,629 acquired acres were located in Alachua County; 4,250 additional acres in Alachua County were proposed for acquisition as of 12/97. Acquisition objectives are to preserve headwater wetlands, to protect buffers around springs and along spring runs, and to preserve natural communities in headwater wetlands and surrounding springs.

Statewide Greenways

A statewide system of greenways, which eventually will connect natural areas throughout Florida, also is being developed. Greenways are corridors of protected open space that are managed for conservation and recreation. Greenways follow natural land and water features, such as ridges or streams, or human landscape features such as abandoned railroad corridors or canals. They link natural reserves, parks, cultural and historical sites.

The state's Greenways and Trails program, managed by the FDEP, assists citizens, landowners, and developers in constructing greenways and trails, and provides funding. At the federal level, the USDA Forest Service has a program to acquire land to provide a route for the Florida National Scenic Trail. The Florida Trail Association works with the USDA Forest Service to build and maintain FNST and other hiking trails in Florida.

B. Alachua County Forever

In addition to these state programs, about one-third of the counties in Florida have passed referenda creating and funding local land acquisition programs for the purpose of open space, recreation, and environmentally sensitive land purchases. Some of these funds are used to match state program grants or private land conservation efforts.

On November 7, 2000, Alachua County joined their ranks when voters approved a property tax to fund up to \$29 million for land acquisition and management through Alachua County Forever (ACF). The purpose of the program is to acquire and manage environmentally significant lands that contribute to the quality of life and enjoyment of our citizens. These lands will provide opportunities for both existing residents and future generations to enjoy wild and scenic areas.

ACF is a voluntary program. Landowners can decide whether or not to participate. If the owner wants to preserve their property, but does not want to sell, there are other options. For example, conservation easements prevent development, construction, or other activities that would disturb the environment while allowing property owners to reside on the property. They do not have to allow public access to the property.

Land acquisition is only the first step. Without management, many of the lands could lose the ecological characteristics that make them so important to protect in the first place. ACF staff will develop a management plan for each site that is acquired. These sites may then be made accessible to the public for compatible, resource-based recreation, provided there are no significant adverse impacts to the ecological or historical values of the property. Depending on the site, nature trails, parking areas, or educational displays may be added to facilitate public access.

C. Local land trusts

There are now three active local land trusts in Alachua County. Formed in 1988, the Gainesville based Alachua Conservation Trust was the first and has initiated and collaborated on acquisitions of numerous sites in its nearly 15-year tenure. The mission of the Alachua Conservation Trust is to protect the natural, historic, scenic and recreational resources in and around Alachua County. Land protection is promoted through purchases, donations, conservation easements and public advocacy. The Alachua Conservation Trust has completed real estate transactions, grant applications, research efforts or advocacy programs for

projects such as: Paynes Prairie CARL Additions (over 2460 acres), Hogtown Creek Greenway FCT Grant (over 900 acres), Historic Haile Homestead (acquisition, building restoration and site work), SRWMD Small Parcel Acquisitions (over 1000 acres), and The Saarinen Preserve (80 acres). Most recent achievements include successful pursuit of FCT funding for the Blues Creek Ravine/Fox Pond FCT Grant (over 320 acres).

The Micanopy based Conservation Trust of Florida formed in 2001 to protect working rural landscapes (family farms, ranches, and timberlands), as well as natural areas, through conservation easements, land purchases, and by helping rural landowners retain their traditional and productive land-use activities. Most recently, the Santa Fe Land Trust formed in the fall of 2001 in order to secure a 10-mile long wildlife corridor between the 7,000 acre San Felasco Hammock Preserve State Park and the Santa Fe River. The trust wants to conserve 4,000-5,000 acres of mostly low-lying land, and several big wetlands, including the now-dry Burnett Lake, and more than 2,000 acres of hardwood forest.

The dedication of these groups, and the individuals that comprise them, reveals another aspect of the strong commitment to environmental protection shared among citizens of Alachua County. Through working partnerships with these groups, as well as various state agencies and water management districts, Alachua County aims to maximize use of funds for valuable acquisitions through ACF and other acquisition programs.

D. Means of acquisition

There are a variety of tools through which acquisition may be accomplished, from fee simple purchase, to conservation easements, conservation trusts, land donations and dedications, transfer or purchase of development rights, long-term leases, and restrictive covenants. Our policies seek to use these tools in the most cost effective manner that ensures long-term protection of natural areas and open space.

Outright acquisition of property is probably the most easily understood of all of the options. This is also referred to as fee simple purchase, which involves the purchase of all of the rights in the property. This can be accomplished either by deed or by will. Together with outright purchase, rights of first refusal and options to purchase are additional tools which may be integrated into an overall acquisition strategy.

Another type of legal mechanism involves donations of remainder interests. The right to live on the property until a person dies is called a “life estate” or a “life tenancy.” The act of making the gift of the land now, to take effect at death, is called the gift of a “remainder interest.” When a remainder interest is donated, the person decides to reserve the right to live on the land but upon death the property will then go to a conservation organization or other qualified entity for conservation purposes. To satisfy the conservation purposes test, the contribution must truly add to the public conservation good; interpreted as contributing to the preservation of open space, significant wildlife habitat, threatened farmland or watershed, or historic property.

A fee simple (leaseback) is another possible method of protecting the property. This would allow the property owner to donate or sell full title to the property. The land would be leased back to the previous owner or a third person subject to appropriate conservation restrictions.

A conservation easement is a voluntary legal agreement between a landowner and an easement holder that permanently limits uses of the land in order to protect scenic or wildlife resources. Each easement is tailored to fit the owner’s personal management objectives and goals for the property. The proven, effective approach provides for land conservation in addition to tax savings through reduced property

assessments. With the purchase of development rights, ownership of the land remains with the private property owner, but development of the property is constrained as provided in the contract agreement. Silviculture, hunting, and low intensity agriculture are examples of the uses that may be allowed under the agreement.

According to Tall Timbers Research, Inc., saving land through conservation easements is the fastest growing movement to protect land in the US. They note that there are 1,213 non-profit trusts operating throughout the country, and that as of 1998, approximately 4.7 million acres of land have been protected by local and regional land trusts (an area larger than the states of Connecticut and Rhode Island combined). The Land Trust Alliance serves as the national clearinghouse and information center for land trusts and easements.

Private restrictions are used predominately in residential subdivisions to limit land use and to prevent nuisances. Frequently, private restrictions are found in homeowners' association documents where many individuals live in ordered communities containing common areas. Other examples are residential restrictions that call only for single-family residences and building line restrictions which prohibit the erection of a building nearer than a specified distance from the lot lines.

Under the appropriate circumstances, each of these techniques could be utilized in acquiring property for conservation. Donating land for conservation purposes may be the best strategy for a landowner who does not wish to pass the land on to heirs, owns property that is no longer being used, owns highly appreciated property, has substantial real estate holdings and wants to reduce estate tax burdens, or wants to be relieved of the responsibility of managing the property. An outright land donation may involve an agency or a land trust that would own and protect the land.

E. Recreational opportunities on public lands

Uncontrolled public access to natural resources often leads to a range of ecological problems, including damage to habitats, trampling of vegetation, and littering and dumping. Proper management for recreation can be relatively easy and effective, and starts with a management plan. Management actions can protect natural resources from damage associated with uncontrolled or inappropriate recreational use.

Increased access to recreation and open space areas requires awareness and planning to minimize any adverse impacts to our natural systems. As we coordinate the acquisition of environmentally sensitive lands with our network of recreation and open space facilities, we must identify the kind and degree of human access which natural systems in these areas can support. As we link these natural areas into an interconnected system, we must consider the broader implications of that linkage. Opening areas to human contact can be detrimental if development is allowed to proceed in a manner that fragments natural systems. On the other hand, allowing natural areas to serve the community's needs and desires for recreation can be an effective way to preserve these areas for future generations.

The balance between access to recreational opportunities and the preservation or restoration to health of natural systems is a critical consideration for policy changes. The location of transportation corridors, including paved and unpaved roadways, as well as bicycle and pedestrian trails, must be strategic to avoid fragmentation of natural systems. Research has identified ways to reduce the impacts of habitat fragmentation by creating "permeable" roadways or corridors allowing wildlife to cross roads and highways through oversized culverts in different habitats. However, policy and economic impediments are the current barriers to facilitating viable habitat and wildlife populations. A challenge for this community and the future of wildlife and habitat in the County is to preserve the integrity of natural areas

as affected by recreation and open space issues, as well as transportation modifications, and to recognize their value to the public's well-being and its legacy of stewardship.

Lands acquired by public entities for conservation or preservation purposes must be managed to achieve the objectives of the purchase. The SJRWMD has codified its land management policy in Rule 40C-9, FAC, and focuses its activities on three priorities: (1) water resource conservation and protection, (2) ecosystem restoration and preservation, and (3) public recreation. Land management plans for SJRWMD lands in the Lochloosa Wildlife Conservation Area, the Prairie Creek Conservation Area, and the Gum Root Swamp Conservation Area. The Lochloosa Wildlife Conservation Area is managed by the SJRWMD and is open to public access, including fishing, hunting, horseback riding, boating, camping, and hiking. The Prairie Creek Conservation Area, managed by FDEP as part of Paynes Prairie, is open to public access, including fishing, boating, and hiking. The Gum Root Swamp Conservation Area, managed by the City of Gainesville, is open to public access, including fishing, horseback riding, camping, and hiking.

The SRWMD codifies its land management policies in Rule 40B-9, FAC, and also balances public recreation and use with resource conservation objectives for the land. The Santa Fe Swamp Wildlife Environmental Area, managed cooperatively by the SRMWD and the Florida Game and Fresh Water Fish Commission, is open to public access, including fishing, seasonal hunting, hiking, bicycling, and horseback riding. The Lake Alto area is open to hiking and fishing, although no vehicular access is allowed. The SRWMD also supports region-wide Greenway initiatives and concepts of Greenways proposed for the Suwannee River Valley and will participate in acquisition activities that link communities and protected open spaces, provide corridors for wildlife and recreational trails, support ecotourism, and protect natural, scenic, and historic resources of the region.

Linear open space recreational opportunities presently existing within the county include the Gainesville to Hawthorne Rail Trail, a 17-mile converted railbed running from Gainesville's Boulware Springs Park to the City of Hawthorne and designed for walking, cycling, and horseback riding. In addition, the City of Gainesville, with the County's participation, received matching funds from the Florida Communities Trust to acquire land for the Hogtown Greenway project. As part of the project, the County purchased a parcel of land at the southwestern terminus of the proposed project at Lake Kanapaha in order to provide alternative access to Kanapaha Botanical Gardens.

In addition, the county owns approximately 754 acres of nature parks which could be evaluated, monitored, and managed for native species and diversity goals.

F. Eco-tourism

Eco-tourism is one area in which resource protection interests and economic development interests can overlap. Land held in either public or private ownership can be opened to public use and enjoyment in a way which preserves its resource values while providing recreational, educational, cultural, and entertainment values to people.

One key element in a resource protection program which has been gaining popularity in the North Central Florida region may be local resource tourism built around recreational trails. Developments demonstrating the draw of these features are the Suwannee River Bicycle Tours, the first year-round bicycle touring company in the state (based in White Springs, now known as Suwannee Bicycle Association, a nonprofit), and the Florida state bicycling program, located within FDOT. Travel and tourism writer Herb Hiller, who writes for numerous magazines and developed both programs listed

above, describes heritage tourism as a way of maintaining habitat for wildlife while offering a sense of the original Florida.

The linking of greenways and trails can serve both to create a recreational network and to link wildlife habitats within counties, regions, and the state. In so doing, it can also create a critical connection between tourism as an economic sector and tourism as a way to stimulate a shared sense of who we are together in this state. The State Office of Greenways and Trails, part of the Florida Department of Environmental Protection, is currently developing and testing a cost-benefit decision model to assist communities in evaluating the relevant costs and benefits associated with five types of greenways and trails - ecological, recreational, historic/scenic, transportation-bases, and multi-purpose.

4. Regulatory Approach

Controls on land use are nothing new. They have existed in various forms since 451 B.C. (Code of Roman Law), and were present in England for hundreds of years before the founding of the United States. Early controls on land use in the U.S. extend back into the colonial period (Wright and Webber, 1978). The U.S. Supreme Court long ago recognized that the concept that police power is essential to government. As generally interpreted in the U.S., the police power is the right of government to interfere with private activity (or the use of private property) for the protection of the public health, safety and general welfare. Zoning is the most common use of the police power as it affects land, although related subdivision regulations and building codes are also important exercises of the police power. In thousands of state and federal court cases, the courts have upheld the right of local government to intervene in private activity to protect the public health, safety and welfare.

It is the police power that allows the government to require a landowner to clean up a cesspool leaking onto a neighbor's property or to remove a junkpile that attracts vermin to a residential area. It is under the police power that a local government adopts zoning regulations that prohibit the operation of junkyards and auto repair shops in residential neighborhoods. Under the police power most local governments prohibit landowners from distracting motorists with flashing signs that look like traffic signals and that those same governments prohibit noisy or noxious businesses near residential areas.

As our society has become more populous, with more people living relatively close together, the police power has become more important. It is a sort of civilizing agreement among humans living in a community that allows them to live in peace. Communities depended upon the police power to separate heavy industry from homes and businesses during the first century of the industrial revolution. Today, other police power regulations require that industry eliminate most pollution, thus making it a better neighbor and making separation less important. By the mid-1950s the Supreme Court recognized that government could legitimately use the police power to make a city "beautiful as well as healthy," and it is under that principle that today most communities prohibit billboards and large flashing signs in residential areas. As the Florida Supreme Court noted in Graham v. Estuary Properties (399 So.2d 1374, Fla. 1981), a landowner does not have an absolute right to change the natural condition of the land when the purpose of the change is not appropriate to the natural state of the land, and the proposed change would injure others.

Alachua County continues to embrace regulatory techniques as one component of a comprehensive approach to environmental conservation. The regulatory component has been in effect across the U.S. for the last seventy years with some enhancements -- providing relief for those who suffer great economic hardships but otherwise allowing property owners and the free market to operate freely without undue

government intervention. If a government rezones land from a zone allowing only farming to one permitting shopping centers, and thereby increases the value of property, and the property owners pays nothing for that, this is considered a windfall for the property owner. On the other hand, if it reduces (or even lessens the increase of) the value of the shopping center by denying the construction of a gasoline station at the entrance corner, this is sometimes construed as a wipeout and results in a “takings” claim. One way to fund efforts to compensate landowners for every reduction in value caused by regulation is also to charge landowners for every increase in value caused by government action, such as regulating the use of adjacent property or construction a new highway. Most property owner groups, however, oppose this funding mechanism; they are unwilling to pay for their gains but they still expect to be compensated for their losses. Planners are not enthusiastic about such a system of payments for gains and benefits because it would require a complex bureaucracy to administer.

The simple fact remains that, for the most part, the system works well. Although there are some hardship situations under some local regulations, the vast majority of property owners are able to function under local regulations and most also benefit from local regulations that prevent other property owners from generating excessive air or water pollution. Most property owners accept the regulations imposed on their property, and recognize that their neighbors must also accept some limitations to live together in relative harmony. Thus, they all share in the responsibility of living in a modern society. The vast majorities of communities and regulators, including Alachua County, take very seriously their responsibilities of protecting both the public interest and respecting individual property rights.

A. Whole-systems thinking

Regulations form only one component of an approach that places new emphasis on an array of strategies that include incentives and acquisition, as well as education and outreach. Regulations are necessary because the protection of the quality of life for present and future citizens is undermined by piecemeal development. To ensure resources are maximized and used in the most cost effective manner, a framework is needed to provide the basis for land use decisions in order to create and maintain sustainable communities. Protection begins with the policies in the Conservation Element, but these policies must be coordinated with implementing ordinances and regulations, as well as fair and consistent administration and enforcement.

The Conservation Element has adopted a whole-systems thinking approach. According to Green Development: Integrating Ecology and Real Estate, “Whole-systems thinking is a process through which the interconnections between systems are actively considered, and solutions are sought that address multiple problems at the same time.” Unfortunately, as the various design and engineering professions have become highly specialized in recent decades, conventional development has moved further and further from the whole-systems approach. Architects think about building design, mechanical engineers about HVAC systems, lighting designers about electric lighting, and interior designers about how to utilize and beautify the resulting spaces. This separation of design functions and professions has largely prevented whole-systems thinking from occurring.

By conducting the fundamental planning work up-front with all players at the table, the whole systems thinking approach can be put to work by developers. In standard developments, resource efficiency and environmental impacts are often considered only as afterthoughts, if at all, despite the potential for substantial and continued saving throughout a development’s life cycle. Greater up front investments of time and money typically are required, but those costs are often recovered, with interest, by avoiding such downstream costs as expensive redesigns, drawn out approvals, litigation, and stalled construction.

Undertaking a development in an environmentally responsible manner can reduce capital costs in a number of important ways: costs of infrastructure, such as storm sewers, can be lowered by relying on the land's natural features; mechanical systems can be downsized or even eliminated through smart energy design; and approval can be expedited if opposition to a project is reduced. By using native landscaping in place of standard turf grass, the need for mowing, irrigating, and chemical treatments can be eliminated, while enhancing groundwater recharge and wildlife habitat. Day-lighting designs in office building can reduce the need for artificial lighting during the daytime.

The County's sustainable approach towards growth management eliminates the concept of "waste" water; all water must be managed as a resource, used to accomplish a wide range of multiple public objectives. Growth and development, including roads and public facilities, can only take place consistent with environmental protection. County government, in coordination with other governments, the private sector and its citizens, must continue to take an approach which coordinates land and water management in an effort to manage stormwater, wastewater and provide potable water supplies in a manner that protects, improves and restores the natural environment.

B. Conservation land use categories

Policies under Objective 3.1 of the Conservation Element define two conservation land use categories in order to recognize privately owned natural resources, and protect and enhance the ecological, recreational, and economic values of these resources. Environmental features within these two categories, Primary Conservation and Secondary Conservation, have more stringent development design or performance criteria associated with them. These areas may be used for wildlife management, appropriate resource-based recreation, and environmental restoration/preservation.

Primary conservation areas are particularly sensitive areas that are highly vulnerable to alterations and would be severely impacted by development. These areas include wetlands, water bodies, wellfields, significant geological features such as sinkholes and steep slopes, as well as areas of exceptional environmental significance and habitat of listed species. Alteration due to development would result in destruction or severe degradation of the natural resource function. As a result, these areas are unsuitable for all but extremely low-density development. The transfer of density to non-environmentally sensitive portions of the site is required. Development can be transferred at the same density allowed by the existing land use category. If there is no area suitable for density transfer, development can be allowed at the rate of impact of ½-acre per ten acres. The amount of density may also be limited by other applicable requirements and ordinances such as the requirements for stormwater retention, open space and landscaping, buffers, setbacks, transportation access and any concurrency requirements. This may result in less density than the maximum density allowed by the land use category in which the parcel is located.

Secondary conservation areas are areas that require special considerations for development due to significant environmental constraints. This category includes the 100-year floodplain, significant habitat, designated scenic corridors, and areas that contain special status trees. Best management and design standards are required of potential development in order to ensure that the ecological integrity and ecological and historical resource values of these resources are protected. Assessed impact upon natural resource determines density and/or intensity within a prescribed range within which the parcel is located.

Native habitats possess ecological and physical characteristics that warrant maintaining these important natural resources. As an overall environmental constraint, all development must preserve wetlands and native uplands onsite in grouped, clustered orientation with connection to offsite habitat corridors and natural resources in accordance with the policies in the Conservation and Open Space Element.

C. Preservation land use category

Certain areas in Alachua County have been recognized or are beginning to be identified by federal, state and local programs as worthy of special protection due to their environmental sensitivity and special value. Policies under Objective 3.2 define the Preservation land use category, which includes lands that have actually been purchased by any of a number of public entities for conservation purposes.

Activities on and adjacent to these properties will be prescribed based on management plans specific to each property, as provided in policy 3.2.3. Only activities compatible with protection of natural resource values and ecological integrity will be allowed on and adjacent to these sites. This may include variable degrees of access and limited modifications to portions of the property, including parking and other facilities which make possible the management of the resource and the public enjoyment of the resources. The resources within these areas shall be subject to the conservation policies of the Comprehensive Plan that are applicable to resources within those areas. For example, wetlands shall be protected in accordance with policies under Objective 4.7 of the Conservation Element.

Some examples of properties in this category include Austin Cary Memorial Forest, Devil's Milhopper State Geological Site, Dudley Farm State Historic Site, Goethe State Forest (Watermelon Pond Unit), Gum Root Park/Gum Root Swamp Conservation Area, Lake Alto Swamp, Lochloosa Wildlife Management Area (portions), Lower Santa Fe Conservation Area, O'Leno State Park, Orange Lake (Bird Island), Paynes Prairie Preserve State Park, Poe Springs, Prairie Creek Conservation Area, River Rise State Preserve, San Felasco Hammock, Santa Fe Swamp Conservation Area, and Warren Cave.

In addition, this category includes properties acquired or managed under the new Alachua County Forever program, as well as Florida Communities Trust, Save-Our-Rivers, and Conservation and Recreation Lands, provided the purpose of acquisition is for the preservation of natural resources in perpetuity. As policy 3.2.2 indicates, the identification of less-than-fee properties as preservation areas will be based on the management goals and objectives of the property.

Environmentally sensitive lands that are acquired under these programs will be reclassified to the Preservation land use designation during the next plan amendment cycle following acquisition, and identified on the Future Land Use Map.

D. Resource protection standards

Implementation of policies and regulations to protect sensitive environmental features will be accomplished through use of resource protection standards provided under Objective 3.6. Regulations will provide specific criteria, standards, and procedures for development and activities that have similar adverse affects to the environment, including provisions such as appropriate setback, buffers, natural open areas, BMPs, minimization and mitigation, and restoration requirements to protect the sensitive environment.

Ecologically sensitive features on or adjacent to a development site may include, for example, significant upland habitats, wetlands, surface water bodies, sinkholes, floodplains, problem soils, archaeologically significant areas, scenic roads, or threatened/endangered species habitat. For large development projects, such features can often be preserved without reducing development potential by clustering development on less sensitive portions of the development tract. In other cases, development potential may be reduced by the presence of these features on a site.

It can be shown that protection of sensitive site features during the development process is more efficient than remediation of environmental problems later. Therefore, it is important (1) to identify potentially sensitive ecological features as early as possible during the development review process, and (2) to permit flexibility in the site design process in order to accommodate sensitive features requiring some degree of protection. Fostering an attitude of respect for the natural features and natural environmental functions of every acre of land in the county is the foundation of this approach.

Development regulations can play an important role through techniques such as buffer requirements, setback requirements, mitigation provisions, restoration requirements, minimizing impervious surfaces, drainage studies involving design capacities/discharge areas and storm water treatment, monitoring requirements, tree and vegetation preservation, soil erosion provisions and endangered species regulations.

When land development involves the conversion of native habitat, the County's open space requirements are fulfilled first with native habitat that qualify for conservation. Other types of open space may be used to fulfill any remaining open space requirements. Representative wetland and upland habitats are typically retained and incorporated into open space areas of cluster and planned developments. These areas often become amenities which aid in the sale of properties within the development. The cluster and planned development options require that open space areas be retained in perpetuity, or for a period of not less than 99 years, and that continued management of the native habitats and open space areas occur to ensure that their long-term functions and values are retained.

The designation of such environmentally sensitive areas as preservation or conservation on final subdivision plats ensures that no development occurs within these areas after surrounding properties are sold to individual owners. This is not always the case when environmental areas are incorporated into individual lots, and thus are under individual ownerships. The development of subdivisions on uniform lots of 5 or 10 acres in size in the rural area offers no real protection and thus adversely impacts natural resources. This issue is addressed by the policy to require clustering, or the implementation of other measures to minimize adverse environmental impacts, whenever areas of significant native habitats are involved. Alternatives which allow variable lot sizes are provided to address concerns that clustering in the rural area changes the character to a more suburban lifestyle.

E. Natural resources maps

Large-scale, generalized environmental feature maps are included within the Data and Analysis portion of the Conservation Element and in overlays to the Future Land Use Map. These maps contain general representations for informational purposes only; they do not constitute new development standards and have no regulatory effect. Specific mapping of environmental features on-site is required prior to any development approval, as provided in policies under Objectives 3.3 and 3.4.

The maps in the Conservation Element map series are intended to provide guidance to decision makers involved in public land acquisition, land use planning, development regulation, and other conservation efforts. The maps represent our best estimate of those lands within Alachua County that require some form of conservation to ensure that natural resources are sustained for future generations. However, these maps represent only a snapshot of conservation needs at one time. As a consequence, some areas identified for protection may already be in public ownership or may no longer support the habitat features or species predicted to occur there. The maps have not been incorporated into policy or regulation as inviolate zones in which no development may occur. Rather, the maps are to be used as a layer of

information when decisions are made concerning land acquisition, land use planning, and development regulation.

New data are continually being added to the project database as new parcels of land come into public ownership, new records of the locations of listed species become available, and more up-to-date vegetation maps are created. As a result, the latest versions of the project maps actually reside in the computer. Before using the maps in this Element for detailed management decisions, users should contact the ACEPD for the latest information.

Alachua County will continue to pursue environmental protection on many fronts. Increasingly, innovative partnerships and agreements that promote voluntary efforts of the regulated community will be promoted. At the same time, there is still a role for time tested approaches to compliance through regulatory measures. The county will also employ outreach, training, and education efforts to address issues where awareness, knowledge and informed decisions will result in better compliance and protection. We are all temporary stewards of Florida's environment striving to achieve a lasting legacy of environmental protection.

5. Incentives

Incentives to landowners can be enacted to protect the environment and preserve native habitats. They can include tax relief or increased flexibility in site development, clustered subdivisions, planned development techniques, variable lot size, and the ability to transfer development rights. The Rural Land Stewardship Program may provide a mechanism through which transfer or purchase of development rights is viable in Alachua County. There are also numerous cost-share and certification programs that the County endorses and will promote in order to achieve conservation objectives.

A. Tax breaks

The most common form of tax relief is the reduced ad valorem taxation of land devoted to agricultural use. This relieves some of the development pressures faced by landowners who own properties on the urban fringe and who wish to retain their land in agricultural use. The retention of land in agricultural use offers the potential of preserving open space. However, agricultural operations do not always preserve environmentally sensitive areas or native habitats to the same degree as other development techniques. Therefore, other incentives are needed to encourage continued agricultural operations in the County and to preserve environmentally sensitive areas.

B. Innovative planning & zoning

Some of the ways in which protection and preservation can be provided to environmentally sensitive areas include incentive mechanisms such as density bonuses, development flexibility to concentrate development away from sensitive areas, height relief, tax credits, conservation easements, and provision for common natural areas (open space). Policies in this element encourage innovative planning and zoning such as flexible lot sizes, clustering, onsite density transfer, and planned developments to design in harmony with the natural features of each site.

Flexibility: Clustering and planned developments

Clustering and planned developments are two development options that preserve environmental areas and open space. Under these options, no minimum lot sizes are required and the property owner can cluster the development away from environmentally sensitive areas. The permitted density, and thus the property rights, for the overall tract of land is retained. These development options require a certain percentage of the land to be set aside as open space.

Transfer of Development Rights

Landowners, by law, have certain rights that are associated with their land. For example, a person has development rights, mineral rights, fishing and hunting rights. These rights can be sold in total or conveyed in part to someone else. Natural resource and farmland protection may be achieved by conveying a portion of a development property right, while retaining others, through a process called the Transfer of Development Rights (TDR).

For example, a farmer can sell the right to develop his land to a developer. The developer then is authorized to transfer the development rights to another more suitable property closer to county and municipal services. Usually the newly purchased development rights allow the developer to increase developable density in an area more suitable for such development. The person farming the original land is paid a sum of money for their development rights, thereby foregoing the ability to develop their land in the future. The county and community benefit because the program prevents sprawl and it avoids the requirement for costly infrastructure and public service extensions in the rural area. The developer benefits by getting increases in developable density within the defined receiving area. Receiving areas are made more marketable offering by urban services.

TDRs tend to work better when large tracts of agricultural lands are available and farmers are willing to sell their development rights. Equally important, the receiving area must be a place where developers can build and attract potential homebuyers. Residents of these areas must also be willing to accept the increased densities. For the TDR approach to work effectively, it must also be coupled with appropriate zoning. For instance, if too much density is allowed in counties as a whole, it diminishes the value and impact of the TDR program. At present, TDRs have not been shown to be a viable alternative in Alachua County.

As a Florida example, Palm Beach County established a TDR program in 1992 to help preserve agricultural lands. 1000 Friends of Florida has assisted the county with its mandatory TDR program, as contained in the local comprehensive plan. Under the program, to increase density in urbanized areas, developers will “buy” development rights from environmentally sensitive land and farmlands in the Agricultural Reserve, thereby precluding its future intensive development. The TDR program can reduce costs to developers in certain instances, allowing them to obtain density increases without having to seek an amendment to the comprehensive plan.

Rural Land Stewardship Areas

In 1995, the Legislature created a section of state law dealing with “innovative planning and development strategies” (S. 163.3177, F.S.). That law was expanded in the 2001 Legislative Session to provide for the designation of Rural Land Stewardship Areas. Under this program, the Florida Department of Community Affairs is authorized to test a new concept involving clustering development in rural areas and using the

purchase of development and density rights to preserve the land around the development. The method referred to in the legislation involves the use of transferable rural land use credits. These credits can only exist inside a designated Rural Land Stewardship Area.

A local government may apply to the Department of Community Affairs for the establishment of Rural Land Stewardship Areas. Five such areas are authorized to be designated under this pilot program. Those approved will be subject to a joint agreement between the DCA and the local government. According to the law, a stewardship area shall not be less than 50,000 acres and shall not exceed 250,000 acres in size. Designation of the receiving areas will take place by way of Local Comprehensive Plan amendments which will also be reviewed by the Department of Community Affairs.

Transferable rural land use credits may be assigned different ratios of credits per acre, with the highest number of credits being given to preserve environmentally valuable land. Each receiving area will buy credits from the designated preservation areas. If the price is too high for the credits, then developers may be reluctant to buy them. Developers will also need to sell the property in the receiving area in order to justify buying more credits.

Agencies are being asked to encourage land stewardship agreements by offering incentives such as landowners being allowed to accumulate extended permit agreements, recreational leases, payment for land management services on public land and options to sell land to government if certain conservation objectives are achieved.

One of the stated purposes of this legislation is to acknowledge the problem inherent with scattered development by attempting to use both innovative planning tools and transferable development rights to stop sprawl or spot development. The pilot is further aimed at exploring the potential for protecting environmentally sensitive lands and better preserving agricultural areas through this approach. The market will in large measure determine how successful it may be from a land preservation standpoint.

Among the unknowns of this new concept is what effect existing federal or state land conservation programs will have on the stewardship areas. No county has requested such a designation at this time.

C. Cost-Shares and Certification Programs

In the 1980s, federal and state agencies began to focus on voluntary participation programs to address water quality problems, particularly with agriculture. Cost-share programs became the policy institution of choice and continue to dominate today. Cost-share programs essentially transfer funds from public agencies to agricultural practitioners who install conservation practices or new waste management structures on their farms. As with the best available control technologies, payments are tied to the installation of specific practices or structures that are expected to reduce the offsite effects of land management. In recent years, these practices have been termed BMPs.

The financial scale of cost-share programs is quite large. Between 1996 and 2002, the USDA will have distributed over \$1.6 billion to farmers through the Environmental Quality Incentive Program and the Wildlife Habitat Incentive Program. While cost-share programs provide important financial resources for land based conservation, it is not clear that they alone will be sufficient to meet the goals of the Clean Water Act. Instead of requiring specific levels of pollution reduction associated with installation of new practices, cost-share payments require only the installation of BMPs. Programmatic success is determined by the number of different practices that were installed rather than actual gains in water

quality or resource protection. For this reason, cost-share programs cannot be relied upon in isolation, but may provide one of several important means of achieving Alachua County's conservation objectives.

There are numerous forest certification programs that have developed over many years in an effort to promote BMPs and various management concepts that address natural resource concerns. The principles and criteria advanced by the Forest Stewardship Council (FSC) as advancing the most encompassing ecosystem management approach and the highest protective standard for biodiversity across species, ecosystem, and landscape scales. The County is also fortunate to have many small family operations certified by the long-standing American Tree Farm System, as well as key industrial operations that subscribe to the emerging Sustainable Forestry Initiative. The County encourages all foresters to become acquainted with the principles and criteria of these programs and will attempt to incentivize and facilitate certification of public as well as private lands in Alachua County. FSC principles may be used in conjunction with other certification standards to ensure ecosystem and landscape level natural resource protections that may not be addressed in other programs.

Please see the Agricultural and Silvicultural Practices section for more detailed discussion of cost-share and certification programs.

6. Conclusion: A Synthesis

Conservation of biological diversity cannot be accomplished by any one of the above strategies alone. Nor can effective conservation be achieved by government alone, or by any single level of government. Each strategy has its practical, financial, and legal limits. Each level of government has its own sphere of authority and limitations. Each private conservation organization has its particular strengths and weaknesses. Understanding and being sensitive to these is necessary if effective coordination of these various strategies is to be achieved.

It is also important to keep in mind that though public support of conservation goals has remained strong, changing times require different strategies. At the beginning of the 20th century, over-harvest of birds and other species for their feathers, their meat, or their fur was a dominant conservation concern. As the century draws to a close, that threat has receded in importance for most species. The tools for dealing with yesterday's threats are not likely to be well suited for handling tomorrow's challenges. In addition, in the last half century, many shifts in national mood have occurred with respect to the relative roles of state and federal governments, the need for stringent regulation of private activity, the importance of competing social goals for limited public spending, and other factors. Smart conservation recognizes that each of these shifts presents not just challenges but opportunities. The availability of a diverse array of conservation strategies, and the ability to shift emphasis from one to another as the prevailing sentiments dictate, will make possible a sustained effort at conserving the County's natural resources.

Conservation must ultimately take place at specific sites and be carried out by local communities. Each place represents a unique mix of ecological and human values, and effective conservation efforts must take both into account. On the other hand, while conservation action typically occurs at the local level, natural resources conservation is not just a local enterprise. It is precisely because conservation has regional, national and even global dimensions that this section takes a broad view of the status of natural resources across the county.

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NATURAL RESOURCES

AIR

Perhaps more than anything else, air interacts directly and constantly with us. All land creatures breathe gases and materials suspended in the air. By the same token, trees, grasses and other plant species carpeting the earth are equally dependent on clean air. It has significant potential impact on agriculture, which remains an important industry in Alachua County. A more recent concern related to air quality is the impact on water quality via atmospheric deposition. We all have a stake in the quality of our air.

A. Climate and weather

The climate of Alachua County is characterized by warm humid summers and mild dry winters (see Dohrenwend, 1976). Temperatures range from an average annual maximum of 96 degrees F in July and August to a mean low of 40 degrees F in January and February. On average, four frosts occur per year. "Hard freezes" have occurred for the last several years. These freezes have effected both native and introduced vegetation in the County. The greatest effects have been upon introduced vegetation.

Rainfall is extremely variable throughout the year and among years. The mean annual rainfall in the Gainesville area is 54 inches per year and can show a 20 inch variation in some years. Rapid flooding can occur in low-lying areas; e.g., floodways and flood-prone areas, due to sudden downpours in thunderstorms or heavy rain events such as hurricanes. Besides aquifer recharge and agricultural maintenance, rainfall is essential for maintaining the wetland and aquatic resources in the County. Droughts occur at intervals from 3 to 12 years in north central Florida. This condition can affect vegetation, wildlife, and water use patterns in the County.

For the most part, the climatological conditions influence the other resources in the County although some human activities, such as urban development and deforestation can alter temperature, rainfall, wind, and evapotranspiration conditions in localized areas. "Heat Island" conditions have been described for Gainesville (Dohrenwend and Wetterquist, 1977).

Air temperature inversions occur about one or two times per year in Alachua County, primarily in the urban center of Gainesville and typically last one or two days (FDEP, unpublished data). These inversions occur primarily in winter at times of low wind activity. Pollutants such as smoke, dust, and car exhaust can become trapped in the lower levels of the atmosphere, causing health problems. The major sources of pollutants during inversions are automobile emissions, industry located outside Alachua County, and smoke from forest wildfires or wood burning stoves. Alachua County may be more susceptible to inversions because of its location in the interior of the peninsula away from shore breezes.

B. Air quality

Outdoor air quality is affected by many human and natural activities. Manufacturing companies, power plants, small businesses, automobiles, and forest fires are all sources of air pollution. Air pollution can be defined as a condition in which any foreign or natural substance is discharged into the atmosphere at levels that produce a measurable and undesirable effect on humans, animals, vegetation or materials. Any activity that releases materials into the air affects air quality. Factors that contribute to air quality include the primary emissions in the area, secondary pollutants formed in the atmosphere, pollutants transported

into the area, meteorological conditions and geographical conditions. The county generally enjoys good air quality with the exception of ozone (mainly in summer), and fine particulates, and possibly, mercury.

The population of Alachua County has increased about 20% since 1990. As population increases, so do various sources of air pollution. The major threats to air quality in Alachua County are vehicle emissions and pollutants generated locally as well as those blown in by winds from other areas. In addition to vehicle emissions, other local sources affecting air quality include wood stoves and fireplaces, open burning, wildfires, and combustion emissions from major stationary sources, including Gainesville Regional Utilities, Florida Power Corporation (UF), Florida Rock (Newberry) cement plant, and Metal Container Corporation.

The number of stationary source industries requiring air emission permits has also increased from 30 in 1991 to over 50 in 2001 (YiZhu, DARM, FDEP, personal communication). The vast majority of these sources are relatively small sources, such as dry cleaners and crematoriums. Approximately 30% of the permitted sources can be classified as major sources. Major sources are defined as permitted sources emitting over 100 tons per year (TPY) of any regulated criteria air pollutant. They also include permitted sources emitting over 10 TPY of any one hazardous air pollutant (HAP) or over 25 TPY of two or more HAPs. The Florida Department of Environmental Protection (FDEP) requires these sources to submit annual operating reports. The annual operating reports contain the permitted facilities annual emissions, which are obtained from continuous monitoring data or calculated from an engineering estimate based on operating activity. Table 1 contains a list of permitted air emission sources required to submit annual operating reports in the county as of the year 2000.

Table 1. Year 2000 Permitted Air Emission Sources Required to Submit Annual Operating Reports and Year 2000 Reported Emissions, Alachua County (all emissions in tons)

Facility Name	General Description	N0x	S02	CO	VOC	PM10
GRU Deerhaven	Electric Power Generation	3,922	7,942	2,744	22.7	144.2
GRU Kelly	Electric Power Generation	123	40	33.4	-	-
Florida Power Corp	Electric Power Generation	128	0.86	29.8	0.65	3.19
Florida Rock	Cement Production	1,951	7.08	1,869	61.5	34.35
VA Medical Center	Medical Incinerator	2.83	0.34	1.00	0.03	0.25
Bear Archery	Sport Equipment Manufacturing	0.21	-	0.16	28.9	8.27
Vet School UF	Medical Incinerator	0.5	0.2	-	0.3	0.2
VE Whitehurst	Asphalt Plant	1.82	0.28	14.0	2.17	1.68
White Construction	Asphalt Plant	6.00	4.48	2.88	5.52	4.03
Hipp Construction	Asphalt Plant	0.93	1.02	1.74	1.58	0.23
Driltech	Drilling Equipment Manufacturing	-	-	-	14.9	0.42
Metal Container Corp	Metal Cans	-	-	-	184	-
Clariant (PCR)	Chemical Manufacturing	-	-	-	62.4	-
Total in Tons		6,136	7,996	4,696	385	197

Map 2 shows major industrial sources within Alachua County. With continuing growth in the county, the air quality can be expected to deteriorate. An expanded air quality monitoring program will be needed to

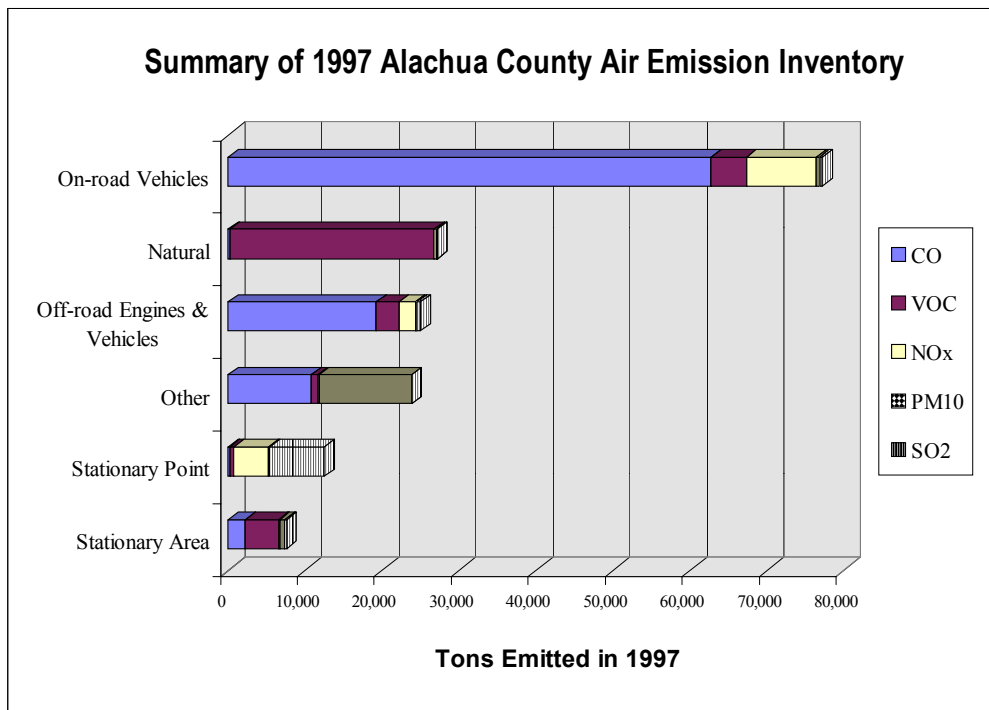
assess impacts on ambient air quality.

C. Creation of local program

The major opportunity presenting Alachua County at this time is the opportunity to define its role in maintaining air quality in the county. The federal government, through the Environmental Protection Agency (EPA), delegates authority for air quality programs to the states. This delegation is the basis for state and local air quality programs. Florida has accepted EPA delegation and has an approved air quality program. The State of Florida, through FDEP, in turn has delegated partial authority to eight county programs: Miami-Dade, Broward, Palm Beach, Duval, Orange, Hillsborough, Pinellas, and Sarasota. Alachua County is currently pursuing state delegation.

In December 1998, the Alachua County Board of County Commissioners began a series of initiatives to develop a "pro-active, community-based air quality program." The kick-off event for the county's air quality initiatives was the Air Quality Summit held in February 1999. The summit, attended by over 120 people, addressed public concerns over air quality and explored strategies on how to protect air quality in the future. The summit also introduced the public to the newly appointed Air Quality Commission (AQC), a ten member blue ribbon panel of scientist, engineers, and medical professionals who accepted a charge to study and report on a number of air quality issues.

Under the direction of the AQC, the county's Environmental Protection Department (ACEPD) developed an Alachua County emission inventory for 1997. Combined with ambient air data, emission inventories allow for the assessment of the impacts of emission sources on ambient air quality and of the effectiveness of emission reduction strategies. A summary is shown below as Table 2.



The AQC also identified airborne pollutants known to impact ecological systems, as shown in Table 3.

Table 3. Airborne Pollutants Known to Impact Ecological Systems in Alachua County

<u>Pollutant</u>	<u>Affected Systems</u>	<u>Method</u>	<u>Result</u>
Ozone	Terrestrial	Direct contact	Foliage damage
Mercury	Terrestrial, aquatic	Deposition	Bio-accumulation
Sulfur Dioxide	Terrestrial	Deposition	Weathering soils & nutrients
Nitrogen Oxide	Terrestrial, aquatic	Deposition	Weathering soils & nutrients, algae blooms

The AQC’s work was the first comprehensive scientific review of air quality issues in the county. The AQC’s findings and recommendations, published in final report in January 2000, will serve as the foundation for the county’s future air quality protection efforts.

ACEPD is in the process of developing various monitoring and modeling projects to further examine the county’s air shed. For example, the county is participating in the Cities for Climate Protection Campaign (CCP). The CCP is a global campaign to reduce greenhouse gases. As part of the campaign, the county has developed an inventory of its greenhouse gas emissions and is in the initial stages of drafting an emissions reduction target action plan. ACEPD is also planning to perform an air toxic inventory within the year. Toxic air pollutants originate from a variety of natural and man-made sources and are substances that are known or suspected to cause cancer or other serious health effects.

The Status Report on Local Air Quality, approved in March of 2000, outlines a plan for implementing the recommendations of the AQC and a plan for further developing the county’s air quality program. In developing the Status Report, ACEPD evaluated a variety of air quality strategies, both traditional and nontraditional, for their applicability to Alachua County. ACEPD also toured six local air programs in Florida for their guidance and advice in developing air quality program recommendations. As currently envisioned, the framework of ACEPD’s air program is modeled after the standard format that most air quality programs follow and is proposed to be composed of the following elements: ambient air monitoring, regulatory requirements, and environmental education.

At the direction of the County Commissioners, ACEPD submitted a work plan and application to FDEP for local air program approval on November 16, 2001. The work plan established a 10 year schedule of activities including increased local air program resources and staffing, ambient monitoring, staff training and joint training activities with FDEP, leading toward eventual delegation of regulatory authority for compliance, enforcement and air permitting in Alachua County.

1. Air Monitoring

A number of air pollutants can cause damage to human health and the environment. Ambient air (i.e., background air, outdoor air) quality monitoring is conducted by the EPA, states and local governments across the nation to determine compliance with National Ambient Air Quality Standards (NAAQS). Results from the monitoring are used to determine the quality of air and to provide the basis for reviewing applications for proposed new sources of major air emission sources. The monitoring also provides data,

which indicates the overall effectiveness of air pollution control strategies.

Six major pollutants have been identified by the EPA as causing health effects above known, safe levels in the ambient air. NAAQS have been established for these pollutants. These standards are based on the best available scientific data and health studies. With the exception of a slightly stricter sulfur dioxide standard, Florida has adopted the identical standards for these pollutants, which are listed in Table 4.

Table 4. Florida Ambient Air Quality Standards		
Pollutant	ppm	($\mu\text{g}/\text{m}^3$)
Carbon Monoxide (CO) - 8-hour Average - 1-hour Average	9 35	10,000 40,000
Ozone (O_3) - 8-hour Average - 1-hour Average ¹	.08 .12	157 235
Sulfur Dioxide (SO_2) - Annual Average - 24-hour Average - 3-hour Average	.023 .1 .5	60 260 1,300
Nitrogen Dioxide (NO_2) - Annual Arithmetic Mean	0.053	100
Particulate Matter less than 10 microns (PM_{10}) - Annual Average - 24-hour Average	N/A N/A	50 150
Particulate Matter less than 2.5 microns ($\text{PM}_{2.5}$) - Annual Average - 24-hour Average	N/A N/A	15 65
Lead (Pb) - Quarterly Average	N/A	1.5
<p><i>Note 1:</i> Depending on the nature of pollutant and its measurement technique, the NAAQS for different pollutants vary in measurement averaging times.</p> <p><i>Note 2:</i> Pollutant concentrations are expressed in micrograms per cubic of air ($\mu\text{g}/\text{m}^3$) or in parts of pollutant per million (or billion) by volume of air (ppm or ppb).</p>		

The FDEP has occasionally monitored air quality in Alachua County over the past 20 years. The earliest measurements were started during the mid-1970s. FDEP currently operates three types of air quality

monitors in Alachua County: PM_{2.5}, PM₁₀, and ozone. ACEPD recently installed new monitors for PM_{2.5}, PM₁₀, ozone, NO_x, and sulfur dioxide (SO₂). The purpose of the county study is to establish an air quality baseline and to provide specific measurements for air quality management decisions. The current air quality monitoring network is shown on Map 3.

2. Regulatory Requirements

In order to establish a strong foundation for the county's air program, ACEPD recommended that the County Commission adopt the state laws and rules governing air pollution control and ambient air quality. This was accomplished on May 22, 2001. This action is considered an essential step in obtaining FDEP delegation for an approved local air program, which would allow the county to act on the state's behalf within its borders.

Other Status Report recommendations included a request to further evaluate proactive measures to offset air pollution impacts in the county, implementation of policies and programs that promote a "greening" of county operations that reduce air emissions, and promotion of transit-oriented and sustainable land-use policies.

Policy updates recognize these efforts, and include restrictions on open burning of land clearing debris in the urban area (see Map 4).

Permits for the burning of land clearing debris (i.e., open burning) in Alachua County are obtained from the Florida Division of Forestry (DOF). DOF has a cooperative agreement with the City of Gainesville and the City of Newberry to carry out the program within their respective boundaries. The County's Fire Rescue Department works with DOF to implement the program within the unincorporated portions of Alachua County. Those wishing to burn land clearing debris in the rural portion of the County simply contact the DOF on the day of burn for authorization. In most cases this authorization is given over the phone after careful consideration of weather conditions. Due to limited staff, DOF inspects only a small number of burns to determine compliance. Consequently, DOF estimates that about 30% of the burns are out of compliance with state rules. Reportedly, very few land clearing burns occur within the city limits of Gainesville because of setback requirements and a general discouragement of such practices. In the City of Newberry, inspectors inspect each burn to determine compliance with state laws.

The County encourages implementing best management practices to reduce land clearing debris and alternative methods of disposal, such as land farming and C&D landfilling. Although prescribe burning activities cause adverse air quality impacts, the County recognizes that its benefits outweigh its problems. Prescribe burns are a very important part of the fire control and resource management in Florida by reducing the fuel loading and enhancing wildlife habitat.

3. Environmental Education

The focal point of ACEPD's air quality environmental education effort is a county-maintained air quality website. In addition to displaying up-to-date ambient air monitoring data, the website also shows the location of major permitted emission sources in Alachua County as well as north central Florida. Brief descriptions of the sources and their annual emission data are also displayed. Emission inventories and reports may be reviewed and downloaded.

As recommended by the AQC, ACEPD plans on developing an indoor education campaign. In addition to the campaign, ACEPD plans on approaching the School Board and the Public Health Unit in a joint effort, funded by grants, to assess indoor air quality in schools and take appropriate corrective action.

D. Indoor air

Indoor air is often more polluted than the air outside our homes and workplaces. This has been shown to be true across the country, even in neighborhoods without heavy industrial pollution. More than 90% of our time is spent indoors where we are exposed to contaminants from faulty heating units, gas stoves, fireplaces, cleaners, solvents, cosmetics, cigarette smoke, wall coverings, paints, and improperly stored chemical products. Another significant health hazard results from radon gas, which seeps from the earth into homes.

Radon is a natural gas found in the environment and is formed from the radioactive decay of uranium. Radon gas seeps out of the ground and into the air at levels that are not harmful. However, problems arise when the gas accumulates in high levels in a confined space (i.e., houses and buildings). Radon can seep through cracks and holes of foundations, becoming concentrated and posing health risks to those who are exposed to it. Since radon is colorless, tasteless, and odorless, it is virtually undetectable without proper testing equipment.

Recent studies have shown radon exposure to be the second leading cause of lung cancer in the U.S. Radon kills between 7,000 and 30,000 people annually. This issue is of concern in Alachua County, where the uranium minerals that are the precursors of radon are found in sediments of the Hawthorn Group. In July 1992, the National Association of Counties entered into an agreement with Alachua County to fund a radon testing program. The main purpose of the program was to provide reduced cost radon detection kits to residents of the county and to use the test results to compile a radon map for Alachua County.

Radon is measured in picocuries per liter of air (pCi/L). The maximum acceptable level is 4 pCi/L. If the radon level is higher than this value, mitigation should be considered to permanently reduce it to below 4 pCi/L. Alachua County purchased test kits from AirChek Inc. and sold them through selected retail stores. Results from each test were sent to the respective homeowners and to ACEPD. Results were compiled into database and analyzed.

There were 1000 readable test results in the county reported by AirChek Inc. during the time period of March 3, 1993 to March 4, 1998. The minimum value was < 0.3 pCi/L and the maximum was 75.5 pCi/L. The average amount of radon in the tested homes was 4.47 pCi/L, while the median was 2.7 pCi/L. The high average was likely due to two factors, the occurrence of duplicate sampling in high risk areas and more frequent testing in these areas. Thirty-seven percent of homes tested showed results higher than 4 pCi/L and 3.20% were above 20 pCi/L. All homes with radon levels greater than 20 pCi/L

were located in northwest Alachua County, most in the City of Gainesville. These results confirm the fact that Alachua County homes, especially those in northwest Gainesville where Hawthorn sediments outcrop along the Cody Scarp, are susceptible to accumulation of radon gas.

The results correlate well with the soil radon potential map prepared for the Florida Department of Community Affairs (DCA) by the GeoPlan Center at the University of Florida. The Soil Radon Potential Map (Map 5) identifies seven zones of radon potential in Alachua County. This data has been further translated into a Soil Radon Protection Map (Map 6) that divides the County into three zones of relative concern, with varying protective measures identified for each zone.

Currently the ACEPD provides general information on radon, including EPA pamphlets, soil radon maps, and new construction guidelines to citizens when requested. There are several ways to check and safeguard your home, with proper ventilation being one of the simplest. ACEPD is no longer selling radon kits, but is distributing the remaining kits at no charge to residents who request them.

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NATURAL RESOURCES

EARTH

A. Introduction

Many of the County's natural and built features are direct reflections of its underlying geology. Most of Florida, including Alachua County, was formed by sedimentary processes that have occurred in relatively recent geologic time. Alachua County lies in the North-central portion of the Florida peninsula and is part of the Central Highlands or Central Florida Ridge of the Atlantic Coastal Plain (Spangler, 1985). Its 965 square miles are comprised of low, flat karst limestone plain in the west bounded by a west-facing escarpment and a flat upland plateau in the east (Williams, et al., 1977). Elevations in the County range from approximately 25 feet above sea level near the Santa Fe River to over 195 feet northwest of Gainesville. Shaded topographic relief is shown on Map 7. In addition, topographic contours are surface mapped using a color ramp to indicate areas that grade from high to low (see Map 8).

The following sections describe the physical geography, underlying geology, mineral resources, and soils that comprise the earth resources of Alachua County.

B. Physiography

Alachua County lies along the boundary of two major geomorphic divisions of the Florida peninsula, the Northern or proximal zone and the Central or mid-peninsula zone (White, 1970). Features characteristic of the Northern zone include dry, steep walled sinks, abandoned spring heads, dry stream courses, and intermittent lakes and prairies, which were formerly broad shallow lakes. The Central zone is comprised of ridges and broad valleys, the latter containing large shallow lakes. Within these divisions are three physiographic regions (White, 1970). These can be described as follows: a plateau region covering most of the Eastern and Northeastern part of the County; a Western plains region of karst topography and occasional hills; and an area in the South central to Southeast part of the County containing flat-bottomed lakes and prairies.

Physiography is further defined by Williams et al. (1977) who breaks the County into seven physiographic zones. These zones are as follows: Northern Highlands, Northern Highlands Marginal Zone, Western Valley, Alachua Lake Cross Valley, Brooksville Ridge, Brooksville Ridge Marginal Zone, and Fairfield Hills. Location of these zones is shown on Map 9. Descriptions of these seven physiographic zones are presented in Inset 1.

Inset 1: Descriptions of Physiographic Zones in Alachua County

The Northern Highlands Plateau is a relatively high area of low relief. Elevations, above mean sea level, generally range from slightly under 200 feet on the western edge to approximately 145 feet on the eastern side. The plateau extends north and east from Gainesville and is continuous into Georgia. The plateau is characterized by cypress wetlands and poorly drained swampy areas. Drainage is generally north toward the Santa Fe River, or east toward Newnans Lake.

In this area of the County the Ocala Limestone is encountered at depths greater than 100 to 150 feet below land surface. The Hawthorn Group, consisting of varying amounts of sands, clayey sands, clays, carbonates and phosphates, supports an intermediate aquifer system under confined conditions within permeable beds. Above the Hawthorn Group lie sands and clayey sands ranging from 0 to 30 feet thick that support the surficial aquifer system.

The Northern Highlands Marginal Zone lies between the Northern Highlands Plateau and the Western Valley. Elevations range from over 190 feet in the east to approximately 75 feet in the west, where the Northern Highlands Marginal Zone adjoins the Western Valley. The Northern Highlands Marginal Zone extends from the north along the Santa Fe River, southeast to south of Gainesville. Relief in this area is the greatest found in Alachua County. This relief is at least in part due to erosion by streams cutting into the plateau. Many of these streams end in sinks or swallow holes when they reach the limestone units of the Western Valley.

Much of the topographic relief found in the Northern Highlands Marginal Zone is due to the presence of the Hawthorn Group sediments and the underlying Ocala Limestone. Clayey units present in the Hawthorn Group produce lenses of perched water which in some areas may be expressed as small ponds. There are also many small springs associated with the surficial sediments contacting the clayey sediments of the Hawthorn Group. Small springs around the sides of the Devil's Millhopper, Glen Springs, and Bouleware Springs are examples of this. The influence of the Ocala Limestone is demonstrated by the presence of sinkholes, sinkhole ponds and caves.

One prominent example of the underlying control of the Ocala Limestone on the topographic features is the Alachua Stream System. This stream basin drains over 70 square miles and is intersected by 10 sinks or swallow holes that divert water under ground. The system includes Townsend Branch, Mill Creek, the streams flowing into Burnetts Lake, Turkey Creek, Blues Creek, and Sanchez Prairie.

The Fairfield Hills adjoin the Alachua Lake Cross Valley and the Western Valley just north of the Marion County line. Elevations above mean sea level in Alachua County range from 60 to 160 feet. Relief and topography are similar to that found in the Northern Highlands Marginal Zone. Williams et al. (1977) concluded that the Fairfield Hills and the Northern Highlands once formed a continuous highland across Alachua County.

The Western Valley is a limestone plain covered by a thin veneer of sands and residual sediments of the Hawthorn Group. The first limestone unit encountered at depth is the Ocala Limestone. Elevations, above mean sea level, for this region average approximately 70 feet. The region is generally flat with sinkholes, quarries, low hills, and erosional remnants of the Northern Highlands providing topographic relief. The Western Valley is bounded on the east by the Northern Highlands Marginal Zone and on the west by the Brooksville Ridge and the Brooksville Ridge Marginal Zone.

Drainage in the Western Valley is vertical and there are very few surface water bodies present. The Santa Fe River flows across the limestone plain in the northern part of the County but is diverted underground for a portion of its flow path. There are many sinkholes in the Western Valley, often occurring along linear trends. This trend provides a surface reflection of the control of solution caused by the jointing of the limestone of the Ocala Limestone. Over 160 terrestrial and aquatic caves are known to exist in Alachua County (M. Drummond, 2001). Most are reported to be short in length. One exception is Warrens Cave near Alachua, having a mapped length of over 3 3/4 miles.

The Alachua Lake Cross Valley is a low area in the southern and southeastern part of the County characterized by large flat-bottomed lakes and prairies. Relief is low. Typical elevations above mean sea level range from 75 to 50 feet. The northern and southern boundaries of the Alachua Lake Cross Valley are defined by the erosional scarp of the Northern Highlands Marginal Zone and the Fairfield Hills.

The lake region is underlain by the eroded surface of the Ocala Limestone. Erosional remnants of the Hawthorn Group and limestone ridges separate the basins. Origins of the large shallow lake basins have been attributed to solution. At present, many of the basins have floors that are below the potentiometric surface of the Floridan or intermediate aquifer systems.

Only a small portion of **the Brooksville Ridge** is present in the southwest corner of Alachua County. Relief on the ridge is high. Elevations above mean sea level range from 135 to 55 feet. The ridge itself is comprised of a thick mantle of Pleistocene sands overlying the residual Alachua Formation and the Ocala Limestone. All drainage is internal and solution of the underlying limestone plays a major role in the topographic features present in this area.

The Brooksville Ridge Marginal zone is basically an extension of the Western Valley. The major differences being the presence of reworked sediments and the absence of the thick sand cover present on the Brooksville Ridge. Drainage is internal. Open pit, hardrock phosphate mining occurred in this area in the early 1900's due to the presence of the reworked sediments and the thin sand cover.

C. Geology

There are four major geologic groups or formations that occur at or near land surface in Alachua County (Spangler 1985). These sediments, in order of decreasing age, are the Ocala Limestone, the Hawthorn Group, reworked sediment (formerly the Alachua Formation), and the Plio-Pleistocene Terrace Deposits (Spangler, 1985; Scott, 1988). The western part of Alachua County is comprised of a relatively flat limestone plain underlain by the limestones of the Ocala Limestone (Williams et al., 1977). This limestone is typically overlain by a thin mantle of sandy soils and some reworked sediments. The eastern part of the County consists of a sequence of Hawthorn Group sediments that overlie the Ocala Limestone. These formations and their ages are presented in Figure 1.

Inset 2 provides a general overview of the geology of Alachua County, as condensed from works by Clark et al. (1964), Williams et al. (1977), Spangler (1985), Scott (1988), and Hoenstine et al. (1990).

Inset 2: Geologic Formations in Alachua County

*The oldest formation penetrated by water wells within Alachua County is the **Avon Park Formation**. The Avon Park Formation is typically a hard, dense, tan to dark brown dolostone or dolomitic limestone. This formation may exceed 500 feet in thickness in portions of eastern Alachua County. Lying unconformably above the Avon Park Formation is the Upper Eocene age Ocala Limestone.*

*The **Ocala Limestone** is the oldest formation to appear at land surface in Alachua County. This formation underlies the entire County, and occurs at land surface in the western portion of the County. This limestone has been (and currently is) quarried in Alachua County, primarily in areas north and east of Newberry. The most common lithology present in the Ocala Limestone is a white to cream, massive, soft, granular, fossiliferous limestone. Portions of this formation have been replaced by silica to form chert. Large boulders of chert remain as residual remnants of the reworked limestone. The Ocala Limestone sediments are approximately 200 feet thick in the County and constitute a major component of the Floridan aquifer system.*

*Evidence showing the existence of **Oligocene age sediments** has come from reported occurrences derived from well logs in the vicinity of the Gainesville Regional Airport. These reports give indications of the **Suwannee Limestone formation** overlying the Ocala Limestone. This marine limestone may have been deposited unconformably on the sediments of the Ocala Limestone in most of the County. Erosion has removed almost all traces of this unit. Sediments of Oligocene age are represented by silicified boulders of the Suwannee Limestone. The residual boulders of Suwannee limestone containing molds of an echinoid, *Rhyncholampus gouldii* are very common around High Springs. They can be seen along the Santa Fe River and have been found in the area near Newberry and Arredondo.*

Clastic sediments of the Miocene Series **Hawthorn Group** unconformably overlie the Ocala Limestone sediments in central and eastern Alachua County. The Hawthorn Group is a complex unit comprised of interbedded and intermixed carbonate and clastic sediments containing varying percentages of phosphate grains. The Hawthorn Group in northern peninsular Florida is made up of, in ascending order, the Penny Farms Formation, the Marks Head Formation, the Coosawhatchie Formation and the Statenville Formation. Lithologically, the Hawthorn Group in northern Florida is comprised of a basal carbonate containing interbedded clastics (Penny Farms), an interbedded clastic - carbonate sequence (Marks Head), a clastic unit containing varying percentages of carbonates (Coosawhatchie), and a cross-bedded clastic unit (Statenville).

There are few locations in Alachua County where sediments of the Hawthorn Group are exposed. These locations include some small creek banks north and east of Alachua, the eroded banks of Hogtown Creek in the Gainesville area, and the Devil's Millhopper State Geologic Site. The extensive sections visible at the Devil's Millhopper are the best location in the County to view the Hawthorn sediments, although they are somewhat obscured by surficial sands and vegetation. Differentiation of the units at this location are difficult to distinguish. Sections of the Hawthorn visible at Brooks Sink, north of Brooker in Bradford County, give some indication of what Hawthorn sediments would be present in the northern part of Alachua County. Brooks Sink is steep walled and devoid of vegetation providing an excellent opportunity to see distinct beds within the Hawthorn sediments.

The thickness of Hawthorn sediments ranges from zero in west-central Alachua County to almost 150 feet in the northeast portion of the County (Map 10) The green, blue, or gray clays and sandy clays present in sediments of the Hawthorn Group provide separation of geologic units into distinct aquifer systems in the eastern portion of the County. In the eastern portion of the County sediments of the Hawthorn Group serve to confine the Floridan aquifer system.

In small areas of the southwestern corner of Alachua County sinkhole and channel fill deposits exist, as reworked deposits. These sediments lie directly on limestone of the Ocala Limestone. These sediments are comprised of white, gray or buff sands frequently containing clays, phosphate pebbles, and vertebrate fossils. The origin of these sediments appears to be the Hawthorn Group. As erosion of the Hawthorn sediments occurred in the western portion of the County, small solution features were filled with these reworked deposits.

A blanket of **undifferentiated sands and clayey sands of Pliocene to Recent age** form a thin veneer over most of Alachua County. In the western part of the County these sediments directly overlie sediments of the Ocala Limestone. In the central and eastern portion of the County, these sands overlie the Hawthorn Group sediments.

Figure 1. Major Stratigraphic Units of North Florida

(To be inserted)

D. Mineral resources

The major mineral resources which have been, or may in the future be, utilized for economic purposes are limestone, phosphate, sand, clay, peat and undifferentiated resources. The mineral resources shown in Map 11 represent a general overview of major minerals in the area. Factors such as thickness of overburden as well as the quality and volume of the deposit will affect the mining of the mineral commodity at any specific site.

Limestone and sand are the only mineral resources currently being mined in the County. Limestone has been mined extensively in western Alachua County for many years due to its availability near the surface and due to readily available transportation. Sand is mined chiefly in the southwestern and northeastern portions of the County. Peat presently is not being mined in the County, but evidence of potentially valuable deposits exists. The following provides a discussion of the various mineral types found in Alachua County.

1. Mineral types

a. Limestone

Limestone has been mined extensively in western Alachua County for many years. The Ocala Limestone lends itself to mining because of its location at or near the surface in this area (Map 12). Several limestone quarries are currently in operation, notably northeast of Newberry. Many abandoned quarries are located throughout western Alachua County, forming steep-sided ponds where they are found. Limestone quarried in Alachua County primarily is used as a base coarse material for roadfill, as a raw material component of Portland cement, or in construction as crushed rock. Limestone products usually are distributed to nearby Florida markets and occasionally to South Georgia.

The open pit method for extracting rock is used for mining limestone in Alachua County. There are currently four major rock producers in the County: Florida Rock Industries, Limerock Industries, Limestone Products, and the S.M. Wall Company. In addition, a Portland cement plant recently began operation on the site of an existing limerock mining operation, generating air quality and other concerns in the County. It is conceivable that additional operations of these types may attempt to utilize this non-renewable resource. Potential environmental impacts of these operations should be reevaluated and policies formulated to address them.

Due to economic limitations, mining usually occurs near adequate road or railway transportation. As a result of the relative accessibility of a large volume of naturally available limestone, the production of crushed dolomite and limestone in Alachua County is projected to be economically feasible for many years.

b. Phosphate

In the late 19th and early part of the 20th century, Alachua County produced significant amounts of hardrock phosphate; however, when pebble phosphate began to be mined at a substantially lower cost, hardrock phosphate mining began to decline. The industry continued through the mid 1960s when mining of the commodity in Alachua County finally ceased.

Alachua County has been mapped in the Northern Phosphate District. Phosphatic sediments of the pebble variety are present in the Hawthorn Group sediments within the County. The general location of these deposits is shown in the area described as undifferentiated resources on Map 11. The phosphatic sediments found in the Hawthorn Group are often deeply buried and consist of pebble-sized grains comprising 2 to 10% of the sediment suite. It was in Alachua County that mining of pebble phosphate began in 1883 near Hawthorne.

Phosphate deposits in Alachua County are of a lower grade than those currently being mined in other parts of the State. As such, it currently is not economically feasible to mine the deposits found in Alachua County. However, as other Central and Northern Phosphate District areas become further depleted, deposits in and around Alachua County may take on increased significance.

Should it become economically feasible to mine phosphate in Alachua County, the methods and technologies of land reclamation developed in the current mining districts will then become extremely important. The County's mining ordinance should anticipate the need for mine reclamation should active mining again be undertaken in Alachua County.

c. Sand

Quartz sand occurrences in the County typically contain clay and silt. Mining is concentrated in the Brooksville Ridge area in the southwestern portion of the County and the Northern Highlands in the northeastern portion of the County as shown on Map 9. Sand is used primarily as fill material, construction ingredients, and in asphalt mixtures. The Natural Resource Conservation Service (NRCS) has determined that as many as 14 soil types located throughout the County are suitable as sources for road fill. Many of these areas are described by the NRCS as "probable" sources of sand based on compaction, processing, and other construction practices.

d. Clay

Clay is present in the surface and near-surface sediments of Alachua County. The NRCS has identified several clay, sandy clay, clayey sand, and clayey loam soil types. One soil type, O'lono clay, is described as clay or clayey from its total depth to the surface. It is found primarily along the Santa Fe River. The NRCS rates this clay poor as a construction material. Many other clayey soil types are present in the County around Paynes Prairie, Levy Lake, Orange Lake, and the community of Island Grove.

Aside from small extraction sites used by aboriginal peoples, clay has not been mined in Alachua County since the early 1920s when it was extracted near Campville. The extracted clay was used for the manufacture of a poor grade common brick. The quality of the clay present near Waldo and Hawthorne was determined to be suitable only as poor grade common brick as well. One test, however, indicated that the material could be suitable as ceramic clay.

Due to the generally low grade of the clay present in the County it is not currently economically feasible to mine it. Because of the extent of clay deposits in the County, however, there may be future potential for clay production, based upon further exploration, and improvement in technologies for the utilization of lower grade materials.

e. Peat

Peat is comprised of partly decomposed organic matter (primarily plant matter) that accumulates in continuously wet areas. Other factors important in the accumulation of peat include topography and climate. Alachua County is well suited for the occurrence of peat deposits in several areas scattered throughout the eastern half of the County including the Santa Fe Swamp, Lake Alto Swamp, Newnans Lake, Lake Wauberg, and Lochloosa and Orange lakes.

The Soil Conservation Service designated many other areas as having peaty soils including those mentioned above and Levy Lake, Ledwith Lake, Paynes Prairie and other smaller areas. Soil type associated with peat include Samsula, Shenks, Okeechobee, Terra Ceia and Ledwith.

Peat is not being mined in Alachua County at present; however, evidence exists that areas with potential value for peat mining could be feasibly extracted. All Florida peats are generally used for horticultural purposes.

f. Undifferentiated resources

According to the Florida Geological Survey (Hoenstine, et al. 1990), a large portion of central and eastern Alachua County's surface and near-surface sediments are composed of sand, clayey sand, clay and organic muck. The Florida Geological Survey terms these "undifferentiated resources" and describes them as the largest area-wide deposits in the County with potential value as top-soil. The sand and clayey sand may be especially important as a source of fill in the County for many areas which are subject to flooding. Future investigations of this resource may lead to additional economic or industrial applications. While this is not considered a major mining resource, it does represent a vast area for a minor resource that may represent increasing economic activity.

g. Other subterranean resources

Mining other subterranean resources, such as water, for export may need to be specifically addressed as it relates to effects on wellfields and surface flow. The County has abundant supplies of pure water at this time. The County should recognize that this is an exploitable resource and that exploiting this resource could have serious impacts for ground and surface water protection. Zoning regulations address buffer specifications and site planning.

2. Mining regulations

The current **Surface Mining/Reclamation Ordinance** (Alachua County Code, Ch. 352) has been in effect for over 20 years. It requires a special use permit for new or expanded mining operations. Application requirements include identification of wetlands, soil types, aquifer recharge areas, depth to ground water, drainage plans, and a reclamation plan, among other things. To protect groundwater resources, mining operations are limited to maximum water withdrawals of 500 gallons per minute without a hydrological investigation. To protect surface waters and floodplains, mining activities may not occur within 100 feet of the 100-year floodplain of a flowing stream or natural lake. Surface water drainage must be free of pollutants and directed away from any groundwater connection. Impacts on water quality and quantity in aquifers to be intercepted by the mining operation must be evaluated.

Excavation and fill activities for the purpose of obtaining fill for construction are regulated by the **Excavation and Fill Ordinance** (Alachua County Code, sec. 393.13). All excavation operations are required to get a permit from the County based on the regulations set forth in the excavation and fill ordinance. Exemptions include land excavation and fill activities pursuant to an approved building permit, final site plan, or final development plan; on-site excavation and/or filling in connection with the construction of a public facility or public improvement under the supervision of the Department of Public Works or in connection with the construction of a public road; excavation or filling activities involving the removal or filling of less than 200 cubic yards of material at a single site; or emergency filling of newly formed or expanded sinkholes affecting public safety. Substantial revisions to the Excavation and Fill Ordinance were proposed in 1994 but not adopted.

The existence of cement-grade limerock and the successful development application for one cement plant in western Alachua County have raised issues related to this resource, including air quality concerns and the adequacy of current regulations to protect groundwater resources. In addition, the desirability of continuing sand excavation in certain significant natural ecological communities should be evaluated.

These existing and future operations may adversely impact not only Alachua County's environment, but its tourist/retirement economy as well. Although state regulations have been strengthened in order to reduce the impacts of mining, dangers to the environment remain. Local governments may mitigate the risks of mining by enacting ordinances more stringent than the state's regulations, by ensuring that the conditions that led to permitting are upheld, and by incorporating state of the art advances into the permitting requirements.

Policies in the "Mineral Resources" section of this element call for a comprehensive review and revision of all regulations that address mining, land excavation, and filling activities to ensure comprehensive natural resources protection and consistency with current state law.

E. Soils and slopes

Soil characteristics are determined by climate, composition of parent materials, topography, biological activity, and the duration of soil development. In 2001, as in 1991, the primary land use in Alachua County, in terms of acreage, was agricultural, including cropland, specialty crops, and forestry. With urban development encroaching on farmland, it is important to assess the qualities of that land for agricultural use. In terms of the natural characteristics of soils that make it more or less suitable for various uses, most exhibit a wide range throughout the County.

Under normal volumes of precipitation, the streams and creeks of Alachua County create few erosional changes. Erosion does occur, though, when the rate of runoff is increased by improper or poorly designed drainage modifications that carry away topsoils. Soil erosion is also a problem during the construction activities of development. Topsoils, which are end products of thousands of years of natural buildup, are important to vegetation. Once carried off, not only are they lost to vegetation, but they often create siltation and sedimentation problems in the receiving waters.

Soils, slopes, and erosion control as a result of non-agricultural development are reviewed and evaluated through development review and zoning application review processes. To mitigate soil erosion problems created during agricultural and urban development activities, best management practices, which have been recommended in the past, are now required for these activities.

1. Soil properties

The soils of Alachua County have been surveyed and mapped by the Natural Resource Conservation Service (NRCS). A copy of the completed survey is on file at the Alachua County Office of Planning and Development. Included in that survey is detailed information on each of the soil series identified in Alachua County, and maps showing the extent of those soils in the County. One particularly informative map has been adapted from the Soil Survey for this element. Map 13 identifies four general categories of soils of Alachua County. These groupings show the connections between the geology and physiography of Alachua County and the natural communities that thrive in the soils associated with them.

The symbols for individual soil mapping units found in Alachua County are listed in Table 5. A mapping unit is the combination of a soil series, and a certain phase or characteristic of that soil. For example, the soil series Blichton Sand is found in the survey as map symbols 31A, 31B, and 31C. Each of these mapping units (symbols) refers to a Blichton Sand (31), with the phases A, B, and C, referring to that soil found at varying slopes. Generally, the letters A, B, C, and D, as used in the soil survey, refer to 0-2%, 2-5%, 5-8%, and 8-12% slopes, respectively. Soils without a letter postscript are level, usually poorly drained.

Relevant characteristics of soils for planning decisions have been evaluated. These include the American Association of State Highway Officials (AASHO) classification, drainage characteristics, permeability, depth to high water, shrink-swell potential, hydric designation, available water capacity, farm capability class, and woodland suitability class. The significance of each of these characteristics is discussed in Inset 3. In general, ratings reflect the relative suitability of soils for various types of development, thus serving as guides to development planning. Several characteristics of the soils pertinent to planning decisions are given in Table 5.

Many soils have characteristics that limit their ability to be developed in their natural state. While poor

drainage is perhaps the major limitation, others include wetness (amount of water in the soil at various times of year), effective depth (to water and plant nutrients), depth to rock, shrink and swell behavior (changes in soil volume due to amount of moisture), presumptive bearing value (ability of soil to sustain dead weight), and corrosion. Map 14 shows the drainage characteristics of Alachua County soils.

As a result of these limitations, major soil modifications (such as draining or excavating) are frequently necessary before areas can be developed. The modifications necessary to overcome these limitations may destroy valuable soil and vegetation. In addition, such modifications often destroy the valuable habitats that have evolved in response to the natural characteristics of the soil. An example would be the destruction of wetland vegetation when naturally wet soils are subjected to improperly designed artificial drainage. Table 6 lists soil limitations ratings for Alachua County soils, and Table 7 defines the degree of limitation for several soil properties affecting land use.

Due to the fact that well-drained soils have little surface runoff and allow fairly easy water movement, they may serve as important recharge areas for ground-water systems. Riverine soils also serve valuable environmental functions. Riverine soils are important for water table recharge, flood control (by storing excess water), filtration of stormwater runoff, as transition areas along riverbanks, and for the support of hammock and freshwater marsh vegetation.

Inset 3: Characteristics of Soils for Planning Purposes

AASHO. The American Association of State Highway Officials classification is a system which rates soils for use as roadway subgrade, and is based on properties which affect highway construction and maintenance. These properties include grain size distribution, liquid limit, and plasticity index (see the Soil Survey for more complete description of these terms). The rating is from A-1 (soils of high bearing strength, the best soils for foundations) through A-7 (clay soils of low strength when wet, the poorest soils for foundations). The values listed in Table 5 are for the soil horizon with the lowest rating.

Drainage Class. The drainage class describes the degree to which water percolates through, or is ponded on, a soil in its natural condition. The drainage class is thus a description of a soil's hydrologic place in the landscape, based in part on water regime, permeability of the soil, and underlying strata.

The drainage classes of the soils, from most well drained to most poorly drained, are:

Excessively well drained (EW)
Well drained (W)
Moderate well drained (MW)
Somewhat poorly drained (SP)
Poorly drained (P)
Very poorly drained (VP)

Permeability Class. Permeability is that quality of the soil which enables it to transmit water or air. The values of permeability given estimate the rate of downward movement of water in the major soil layers when saturated, but allowed to drain freely. Thus, a soil which is poorly drained in its natural condition, but has a rapid rate of permeability, may respond favorably to drainage activities.

Permeability is measured in inches of downward movement of water per hour. Permeability classes given in Table 5 correspond to the following range of permeability rates:

<u>Class</u>	<u>Rate (inches/hour)</u>
Very slow (VS)	less than 0.06
Slow (S)	.06 - .2
Moderately slow (MS)	.2 - .6
Moderate (M)	.6 - 2
Moderately rapid (MR)	2 - 6
Rapid (R)	6 - 20
Very rapid (VR)	more than 20

The permeability given is the slowest rate for soil layers between 24 and 60 inches from the surface.

Depth to high water table. This is the zone of saturation of the soil at the highest average depth, during the wettest season. The range given for each soil reflects the year-to-year variation in average highest depth. Most water tables occur within the soil, and are measured from the soil surface down to the free-water level. For some soils, however, the water table is above the surface much of the time, and the water table is measured from the surface of the water down to the soil surface. In the latter instance, the value is given preceded by a (+). Where a water table is given as >6.0, the water table is below six feet, or exists for less than one month per year above that depth.

Shrink-swell potential. This is the relative change in volume to be expected of soil material, with change in moisture content; that is, the extent to which a soil shrinks when it dries out, or swells when it gets wet. The shrink-swell potential is influenced by the amount of kind of clay in the soil, and is rated low (L), moderate (M), or high (H). High shrink-swell potential indicates a hazard to the construction of buildings, roads, and other structures. The value given for each soil is the highest potential (poorest for development) in the zone between 10 and 60 inches below the surface.

Hydric soils. Hydric soils are those which, in their natural, undrained state, are saturated with water at or near the surface during much of the growing season. Such soils are capable of supporting, and frequently do support, hydrophytic -- water-loving -- vegetation.

Essentially, these are the soils of the wetlands of Alachua County. Such soils, in combination with vegetation, have been used in the identification of the wetlands of the County. Soils rated as hydric by the Natural Resource Conservation Service (NRCS) are denoted by the word "Yes" in the Hydric column of Table 5. Those which exhibit hydric characteristics, but require field checking on a case-by-case basis, are denoted by an asterisk (*) in that column.

Available water capacity. The available water capacity (AWC) rates the ability of a soil to hold water for use by most plants, based on particle size, organic matter content, and the arrangement and size of soil pores. AWC is measured in inches of water per inch of soil. Values in Table 5 represent the available water capacity in the upper twenty-four (24) inches of each soil.

Farm capability class. This rating is a broad designation of the suitability of a soil for growing various field crops, the limitations of the soil for growing such crops, and the hazards (e.g., erosion) associated with the use of the soil for cropland. Class 1 soils have the fewest limitations which restrict their use for cropland, while Class 8 soils have limitations that preclude their use for commercial plants. There are no Class 1 soils in Alachua County; Class 2 and 3 soils are the best soils for agricultural use.

Capability subclasses are soil groups within one class, and show the main limitation for use of the soil. They are designated by a lower-case letter following the Class number:

- e - erosion, unless close-growing plant cover is maintained
- s - shallow, droughty (drains excessively), or stoney
- w - wetness in soil surface, which may interfere with plant growth.

Woodland suitability class. This classification serves to group soils that are suited to growing about the same kinds of trees, and that have approximately the same potential productivity. The woodland ordination symbol indicates the relative productivity of the soil for growing trees, from 1 (very high potential) to 5 (low potential). The lower-case letter indicates the important soil property that imposes the major limitation for managing the soil for wood production. These properties are:

- c - clay in the upper soil
- s - sandy
- w - excessive water in or on the soil
- o - no significant restrictions or limitations

Limitations for development. Limitations for use of a soil for septic tanks, dwellings without basements, small commercial buildings, (three stories or less) and local roads and streets are given in Table 6. The limitation rating reflects the degree and kinds of restrictions that must be overcome or modified in using a soil for any of these purposes. The limitation ratings are:

Slight - the soil has properties favorable for the proposed use. The degree of limitation is minor and can easily be overcome.

Moderate - soil properties are moderately favorable for the use. This degree of limitation can be overcome or modified by special planning, design, or maintenance.

Severe - the soil has one or more properties unfavorable for the rated use. This degree of limitation generally requires major soil reclamation, special design, or intensive maintenance.

The soil properties considered in rating limitations for development, and the ranges for each of the uses, are given in Table 7. The overall rating for each soil is based on the most restrictive feature of that soil. That is, if one or more of the properties considered for a given use is in the severe range for a soil, then the soil is rated as having severe limitation for that use. Otherwise, the soil is rated for the next most restrictive limitation for the desired use.

Some limitations can be overcome by reducing or removing the soil feature that limits the use. However, in many situations, it is difficult and costly to alter the soil or design a structure so as to compensate for a severe degree of limitation. In other instances, overcoming a limitation in one area may have adverse effects in an adjacent area.

These limitation ratings serve as guides to development planning, but do not eliminate the need for on-site study for the design and construction of a particular use. Consideration must also be given to surrounding land use, and prior use of a similar soil for a similar use.

Table 5. Important Features of the Soils of Alachua County

Map Symbol	AASHO	Drainage Class	Permeability Class	Depth to High Water Table (ft)	Shrink-Swell Potential	Hydric Designation	Available Water Capacity	Farm Capability Class	Woodland Suitability Class
2B	A-3	Excessively	Rapid	>6.0	Low		0.48-1.44	4S	4S
2C	A-3	Excessively	Rapid	>6.0	Low		0.48-1.44	6S	4S
3B	A-3	Well	Moderate	>6.0	Low		1.20-2.40	3S	3S
3C	A-6	Well	Moderate	>6.0	Low		1.20-2.40	4S	3S
5B	A-2	Well	Rapid	>6.0	Low		1.72-3.10	3S	3S
6B	A-6	Well	Rapid	>6.0	Low		0.72-1.20	3S	3S
6C	A-6	Well	Rapid	>6.0	Low		0.72-1.20	4S	3S
7B	A-6	Poorly	Slow	0-1.0	Low		0.72-2.40	3W	3W
8B	A-4	Mod. Well	Mod. Rapid	3.5-6.0	Low		1.20-2.40	3S	3S
8C	A-4	Mod. Well	Mod. Rapid	3.5-6.0	Low		1.20-2.40	4S	3S
11	A-3	Poorly	Slow	0-1.0	Low	*	1.20-1.92	3W	3W
13	A-7	Poorly	Moderate	0.5-1.5	Low	Yes	0.96-1.68	(F)	2W
14	A-6	Poorly	Mod. Slow	0-1.0	Low	*	1.38-2.98	4W	3W
15	A-3	Poorly	Rapid	0-1.0	Low	*	0.48-1.20	4W	4W
16	A-6	Very Poorly	Slow	0-0.5	Low	Yes	1.20-4.80	5W	2W
17	A-6	Poorly	Slow	0-1.0	Low	*	2.26-4.30	3W	3W
19	A-3	Very Poorly	Mod. Slow	+2.0-0	Low	Yes	3.00-5.40	7W	4W
20B	A-3	Mod. Well	Rapid	3.5-6.0	Low		1.20-2.40	3S	3S
21	A-6	Somewhat Poorly	Slow	1.5-2.5	Low		1.04-2.76	3S	3W
22	A-3	Very Poorly	Slow	+2.0-1.0	Low	Yes	1.90-3.80	7W	2W
23	A-3	Poorly	Slow	0-1.0	Low	Yes	2.40-3.60	3W	2W
25	A-6	Very Poorly	Mod. Slow	+2.0-1.0	Low	*	0.08-2.00	7W	4W
26	A-3	Very Poorly	Rapid	+2.0-1.0	Low	Yes	4.80-6.00	4W	(F)
28	A-3	Mod. Well	Rapid	2.0-3.0	Low		0.96-2.16	3W	2S
29B	A-7	Somewhat Poorly	Slow	2.5-5.0	Low		1.20-4.80	2W	2O
29C	A-7	Somewhat Poorly	Mod. Slow	2.5-5.0	Low		1.20-4.80	3E	2O

Table 5. Important Features of the Soils of Alachua County (Continued)

Map Symbol	AASHO	Drainage Class	Permeability Class	Depth to High Water Table (ft)	Shrink-Swell Potential	Hydric Designation	Available Water Capacity	Farm Capability Class	Woodland Suitability Class
30B	A-6	Well	Slow	>6.0	Low		1.20-1.68	2E	2S
30C	A-6	Well	Slow	>6.0	Low		1.20-1.68	3E	2S
31A	A-7	Poorly	Slow	0-1.0	Moderate		1.20-2.40	3W	2W
31B	A-7	Poorly	Slow	0-1.0	Moderate		1.20-2.40	3W	2W
31C	A-7	Poorly	Slow	0-1.0	Moderate		1.20-2.40	4W	2W
32B	A-7	Poorly	Slow	0-1.0	High		2.40-4.35	3W	2W
32C	A-7	Poorly	Slow	0-1.0	High		2.40-4.10	4W	2W
32D	A-7	Poorly	Slow	0-1.0	High		2.40-4.15	6W	2W
33B	A-7	Well	Slow	4.0-6.0	Low		2.04-3.99	2E	2O
33C	A-7	Well	Slow	4.0-6.0	Low		1.96-3.81	3E	2O
34	A-3	Very Poorly	Rapid	+2.0-1.0	Low	Yes	2.70-3.72	7W	(F)
35B	A-2	Well	Rapid	>6.0	Low		1.20-2.40	3S	3S
35C	A-2	Well	Rapid	>6.0	Low		1.20-2.40	4S	3S
36	-	-	-	-	-	-	-	-	-
37	A-3	Somewhat Poorly	Rapid	2.0-3.5	Low		1.28-2.80	3W	3W
38	-	-	-	-	-	-	-	-	-
39B	A-6	Well/Mod. Well	Slow	3.5-5.0	Low		0.96-1.42	2S	2S
41B	A-6	Well	Mod. Rapid	>6.0	Low		0.86-1.71	4S	3S
43	A-2	Mod. Well	Mod. Slow	>6.0	Low		<1.20-1.55	3S	3S
47	A-6	Well	Mod. Rapid	>6.0	Low		1.20-1.92	3S	3S
48	A-3	Poorly	Moderate	0-1.0	Low	*	0.48-1.20	4W	4W
49A	A-7	Somewhat Poorly	Slow	2.5-5.0	Low		1.20-80	2W	2O
50	A-6	Somewhat Poorly	Slow	1.5-3.5	Low		1.44-2.24	3S	3S
51	A-4	Poorly	Moderate	0-1.5	Low	Yes	0.72-4.80	4W	2W

Table 5. Important Features of the Soils of Alachua County (Continued)

Map Symbol	AASHO	Drainage Class	Permeability Class	Depth to High Water Table (ft)	Shrink-Swell Potential	Hydric Designation	Available Water Capacity	Farm Capability Class	Woodland Suitability Class
52	A-7	Very Poorly	Slow	+2.0-1.0	High	Yes	3.33-6.03	3W	4W
53	A-7	Very Poorly	Very Slow	+2.0-1.0	High	Yes	5.79-9.30	3W	(F)
54	A-7	Poorly	Slow	0-1.0	High	Yes	2.50-4.00	6W	2W
55B	A-3	Excessively	Rapid	>6.0	Low		0.72-1.92	4S	3S
56	A-7	Poorly	Slow	0-1.0	Moderate	Yes	0.90-2.85	3W	2W
57B	A-7	Somewhat Poorly	Slow	1.5-2.5	High		2.10-3.66	3W	2O
58B	A-3	Excessively	Rapid	>6.0	Low		0.72-1.92	4S	3S
59	A-3	Somewhat Poorly	Moderate	0-1.0	Low		0.72-2.40	4W	3W
60	A-6	Mod Well & Somewhat Poorly	Slow	3.0-6.0	High		2.40-4.80	6S	3C
61	A-7	Poorly	Slow	0.5-1.5	High	Yes	4.80-7.92	5W	2W
62C	A-7	Poorly	Slow	0-1.0	High		1.40-2.60	4W	2W
63	A-6	Very Poorly	Rapid	+1.0-1.0	Low	Yes	7.20-12.00	3W	(F)
64	-	Very Poorly	Rapid	+1.0-1.0	Low	Yes	7.80-12.60	3W	(F)
65	A-7	Very Poorly	Very Slow	+1.0-0	High	Yes	3.44-4.64	5W	2W
66	A-7	Poorly	Mod. Slow	0-1.0	High		1.25-2.55	3W	3W
67C	A-6	Poorly	Moderate	0-11.0	Moderate		1.41-2.20	4W	2W

Footnotes:

A - See individual mapping units for properties of each part of the complex.

F - Not determined.

Table 6. Soil Limitation Ratings

Map Symbol	Soil Mapping Unit	Limitations for: (A)			
		Septic Tanks	Dwellings Without Basements	Small Commercial Buildings	Local Roads & Streets
2B	Candler 0-5%	Sli (C)	Sli (C)	Sli	Sli
2C	Candler 5-8%	Sli (C)	Sli	Mod (1)	Sli
3B	Arredondo 0-5%	Sli (C)	Sli	Sli (1)	Sli
3C	Arredondo 5-8%	sli (C)	Sli	Mod (1)	Sli
4B	Arredondo-Urban Land Complex (B) 0-5%	-	-	-	-
5B	Fort Meade 0-5%	Sli (C)	Sli	Sli	Sli
6B	Apopka	Sli (C)	Sli	Sli	Sli
6C	Apopka	Sli (C)	Sli	Mod (1)	Sli
7B	Kanapaha	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
8B	Millhopper	Mod (2)	Sli	Sli	Sli
8C	Millhopper	Mod (2)	Sli	Mod (1)	Sli
9B	Millhopper-Urban Land Complex (B)	-	-	-	-
11	Riviera	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
13	Pelham	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
14	Pomona	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
15	Pompano	Sev (2,4)	Sev (2)	Sev (2)	Sev (2)
16	Surrency	Sev (2,5)	Sev (5)	Sev (5)	Sev (5)
17	Wauchula	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
18	Wauchula-Urban Land Complex (B)	-	-	-	-
19	Monteocha	Sev (2,3)	Sev (5)	Sev (5)	Sev (5)
20B	Tavaress	Mod	Sli	Sli	Sli
21	Newnan	(c)(2)	Mod (2)	Mod (2)	Mod (2)
22	Floridana	Sev (2)	Sev (5)	Sev (5)	Sev (5)
23	Mulat	Sev (3,5)	Sev (2)	Sev (2)	Sev (2)
25	Pomona	Sev (2,3)	Sev (5)	Sev (5)	Sev (5)
26	Samsula	Sev (3,5)	Sev (5,6)	Sev (5,6)	Sev (5)
27	Urban Land (D)	Sev (4,5)	-	-	-
28	Chipley	-	Mod (2)	Mod (2)	Mod (2)
29B	Lochloosa	Sev (2,4)	Sli	Sli	Sli
29C	Lochloosa	Sev (2)	Sli	Mod (1)	Sli
30B	Kendrick	Sev (2)	Sli	Sli	Sli
30C	Kendrick	Sli	Sli	Mod (1)	Sli
31A,B,C	Blichton, all phases	Sli	Sev (2)	Sev (2)	Sev (2)
32B,C	Bivans, 2-5 and 5-8%	Sev (2,3)	Sev (2,7)	Sev (2,7)	Sev (2)
32D	Bivans 8-12%	Sev (2,3)	Sev (2,7)	Sev(1,2,7)	Sev (2)
		Sev (2,3)			

Table 6. Soil Limitation Ratings (Continued)

Map Symbol	Soil Mapping Unit	Limitations for: (A)			
		Septic Tanks	Dwellings Without Basements	Small Commercial Buildings	Local Roads & Streets
33B	Norfolk	Mod (2)	Sli	Sli	Sli
33C	Norfolk	Mod (2)	Sli	Mod (1)	Sli
34	Placid	Sev (4,5)	Sev (5)	Sev (5)	Sev (5)
35B	Gainesville	Sli	Sli	Sli	Sli
35C	Gainesville	Sli	Sli	Mod (1)	Sli
36	Arents (D)	-	-	-	-
37	Zolfo	Sev (2,4)	Mod (2)	Mod (2)	Mod (2)
38	Pitss & Dumps (D)	-	-	-	-
39B	Bonneau	Mod (2)	Sli	Sli	Sli
41B	Pedro	Sev (8)	Sev (8)	Sev (8)	Sev (8)
42B	Pedro-Jonesville Complex (B)	-	-	-	-
	Jonesville part	Sev (8)	Sli	Sli	Sli
44B	Blichton-Urban Land Complex (B)	-	-	-	-
45	Urban Land-Millhopper Complex (B)	-	-	-	-
46B	Jonesville-Cadillac-Bonneau Complex(B)	-	-	-	-
	Cadillac part	Sli	Sli	Sli	Sli
47B	Candler-Apopka Complex (B)	-	-	-	-
48	Myakka	Sev (2)	Sev (2)	Sev (2)	Sev (2)
49A	Lochloosa	Sev (2)	Sli	Sli	Sli
50	Sparr	Sev (2)	Mod (2)	Mod (2)	Mod (2)
51	Plummer	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
52	Ledwith	Sev (3,5)	Sev (5,7)	Sev (5,7)	Sev (5)
53	Shenks	Sev (3,5)	Sev (5,7)	Sev (5,7)	Sev (5)
54	Emeralda	Sev (2,3)	Sev(2,7,9)	Sev(2,7,9)	Sev (2)
55B	Lake	Sli (C)	Sli	Sli	Sli
56	Wauberg	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
57B	Micanopy	Sev (2,3)	Sev (7)	Sev (7)	Sev (6)
58B	Lake	Sli (C)	Sli	Sli	Sli
59	Pottsburg	Sev (2)	Sev (2)	Sev (2)	Sev (2)
60	Udorthints	Sev (3)	Sev (7)	Sev (7)	Sev (6)
61	Oleno	Sev(2,3,9)	Sev(2,7,9)	Sev(2,7,9)	Sev (2)
62C	Boardman	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
63	Terra ceia	Sev (4,5)	Sev (5,6)	Sev (5,6)	Sev (5)
64	Okeechobee	Sev (4,5)	Sev (5,6)	Sev (5,6)	Sev (5)

Table 6. Soil Limitation Ratings (Con't)

Map Symbol	Soil Mapping Unit	Limitations for: (A)			
		Septic Tanks	Dwellings Without Basements	Small Commercial Buildings	Local Roads & Streets
65	Martel	Sev (3,5)	Sev (5,7)	Sev (5,7)	Sev (5)
66	Lynne	Sev (2,3)	Sev (2)	Sev (2)	Sev (2)
67C	Wacahoota	Sev (2)	Sev (2)	Sev (2)	Sev (2)

Footnotes:

Sli = Slight
 Mod = Moderate
 Sev = Severe

A = Features causing moderate or severe limitations are given in parentheses following each such rating. The features listed are:

- (1) slope
- (2) wetness
- (3) percolates slowly
- (4) poor filter
- (5) ponding
- (6) low strength
- (7) shrink-swell
- (8) depth to rock
- (9) flooding

B = See individual mapping units for limitations for each component off the complex.

C = There may be a hazard of groundwater contamination where there are many septic tanks because of poor filtration.

D = Not rated.

Table 7. Soil Properties and Ranges for Limitation Ratings

Property Affecting Use	Degree of Limitation (Ranges) (A)		
	Slight	Moderate	Severe
Drainage Class	(Excessively, well drained, moderately well drained) ^{2,3,4}	(Somewhat, poorly drained) ^{2,3,4}	(Poorly drained, very poorly drained) ^{2,3,4}
Depth to High Water Table	(>30") ^{2,3} (>72") ¹	(20-30") ^{2,3} (48-72") ¹	(<20") ^{2,3} (<48") ¹
Slope	(0-8%) ^{1,2,4} (0-4%) ³	(8-15%) ^{1,2,4} (4-8%) ³	(>15%) ^{1,2,4} (>8%) ³
Shrink-Swell Potential	(Low) ^{2,3,4}	(Moderate) ^{2,3,4}	(High) ^{2,3,4}
AASHO	(0-4) ⁴	(5-7) ⁴	---
Permeability Class	(Very rapid, rapid, moderately rapid) ¹	(Moderate) ¹	(Moderately slow, slow, very slow) ¹
Depth to Bedrock (B)	>40"	20-40"	<20"
Flooding (C)	(None) ^{1,2,3,4}	(None) ^{2,3} (Rare) ^{1,4}	(Rare, occasional frequent) ^{2,3} (Occasional, frequent) ^{1,4}

Footnotes:

A - Ranges listed apply to use given as superscript. Use are:

- 1 - septic tanks
- 2 - dwellings without basements
- 3 - small commercial buildings
- 4 - local roads and streets

B - Applicable only to Pedro fine sand (10-30") and Jonesville (20-40"), which overlie limestone at the depths given in parentheses.

C - Applies only to Emeraldalda fine sandy loam (rare) and Oleno clay (occasional).

2. Agricultural use of soil

The primary land use in Alachua County is for agriculture, including cropland, specialty crops, and forestry. Agriculture is thus an important part of Alachua County's economy, and must be duly considered in all land use planning in the County. Urban development often conflicts with agricultural use, and can encroach on important farmland as development spreads. It is therefore necessary to determine those lands most suitable and important as farmland, and to provide for the protection of those lands from urban development.

One such method for classifying important farmlands is the **Land Evaluation and Site Assessment (LESA) system**, which has been developed by the Natural Resource Conservation Service (NRCS). This system is comprised of two major portions: the land evaluation, and the site assessment. Combined, these two aspects of LESA allow for ranking those parcels of land most critical for preservation against urban encroachment. While the LESA system may not be the ideal agricultural land preservation program that might be developed in Alachua County, the factors which are utilized in that system are significant in any approach to farmland protection. A brief discussion of the LESA system is presented in Inset 4. Important agricultural soils discussed in the inset are depicted on Map 15.

In addition to the discussion of prime agricultural soils in the inset, more information on prime agricultural soils and farmland protection programs is provided in the Agricultural and Silvicultural Practices portion of this data and analysis.

3. Soil erosion

Most of the soil erosion in Alachua County occurs in the northwestern and western portions of the County. A severe potential for water erosion occurs when the slope is greater than eight percent and the surface is void of plant cover and/or residue. Wind erosion is most prevalent in the months of January through April when the plant cover and/or residue is at a minimum. Water and wind erosion may be reduced by the implementation of Best Management Practices (BMPs) adopted by the Alachua Soil and Water Conservation District and other federal and state agencies.

The Alachua Soil and Water Conservation District (ASWCD) provides technical assistance to landowners, especially agricultural producers, federal, state and local units of governments in the implementation of BMP. Their major areas of concern include soil erosion, water conservation, water quality, and conservation planning. The potential for significant erosion problems is minimized in Alachua County because of the lack of severe slopes and limited amount of cropland. Most potentially erodible soils in the County are in pasture land or natural vegetative cover. Because the ASWCD works primarily with agricultural producers, however, the County must ensure that BMPs are applied equally to non-agricultural development activities approved through its development permitting processes.

Inset 4: Description of Land Evaluation and Site Assessment (LESA) System

Land Evaluation. This portion of the LESA system is used to determine the quality of the land for agricultural uses. To be implemented, the soils of the County must be rated and placed into groups ranging from the best to the worst suited for a stated agricultural use (i.e., cropland, forestland, or rangeland). This ranking is based on such factors as farm capability, woodland class, soil productivity, soil potential, and important farmland.

The capability classifications (listed in Table 5, and described in the accompanying text) show the general degree of limitation inherent in the soils of the County, without taking into account the ability to overcome such limitations.

Soil productivity shows the predicted yields to be obtained for a soil for various products grown in the County. These predicted yields are based on production to be expected using standard agricultural management techniques.

The soil productivity is used along with estimates of costs to overcome or minimize limitations, and adverse effects of farming a soil with limitations, to determine the soil potential rating. This again is a method for comparing the relative value of each soil as an important agricultural resource. For Alachua County, soil potential ratings have been determined for all soils for use for corn and soybeans, two important field crops grown in the County. The soil ratings for these two crops are listed in Tables 8 and 9.

Important farmland classification is the determination of a soil as prime, important, or unique, for producing general or specialized products. In Alachua County, two soils have been classified as prime by the NRCS: Norfolk loamy fine sand and Micanopy loamy fine sand. Norfolk loamy fine sand - map symbols 33B and 33C - covers approximately 7,100 acres (1.2%) of the County. The major extent of this soil is in the triangular area formed by U.S. Interstate 75 and State Roads 235 and 26. Micanopy loamy fine sand - map symbol 57B (where drained for cultivated crops) - covers approximately 724 acres (0.1%) of the County. Additional soils that are considered locally important include those identified in Tables 8 and 9.

Site assessment. Site assessment identifies important factors other than soils that contribute to the quality of a site for agricultural use. This can include such factors as:

- * current land use
- * surrounding land use
- * current zoning
- * distance from urban areas, roads, and services
- * proximity of agricultural support systems
- * size of a site

In utilizing the site assessment portion of LESA, points are accrued and used to rank a site's potential for agricultural use. For example, a condition such as being near to central water and sewer or a municipality would take points away from a site's potential as important farmland.

Table 8. Land Evaluation, Ranked Numerically and by Relative Value for Soils in Alachua County - Based on Soil Potential Ratings for Corn (USDA Soil Conservation Service)

Map Symbol	Map Unit Name	Numerical Ranking	Relative Value
33B	Norfolk loamy fine sand, 2-5% slopes	1	100
33C	Norfolk loamy fine sand, 5-8% slopes	2	94
39B	Bonneau fine sand , 2-5% slopes	3	89
30B	Kendrick sand, 0-5% slopes	4	88
5B	Fort Meade fine sand, 0-5% slopes	5	82
29B	Lochloosa fine sand, 2-5% slopes	6	81
49A	Lochloosa sand, 0-2% slopes	7	80
8B	Millhopper sand, 0-5% slopes	8	78
35B	Gainesville sand, 2-5% slopes	8	78
57B	Micanopy loamy fine sand, 2-5% slopes	10	76
30C	Kendrick sand, 5-8% slopes	10	76
3B	Arredondo fine sand, 0-5% slopes	10	76
46B	Jonesville-Cadillac-Bonneaue complex	13	75
29C	Lochloosa fine sand, 5-8% slopes	13	75
8C	Millhopper sand, 5-8% slopes	15	73
3C	Arredondo fine sand, 5-8% slopes	16	71
35C	Gainesville sand, 5-8% slopes	16	71
28	Chipley sand, 0-2% slopes	18	65
31B	Blichton fine sand, 2-5% slopes	19	63
31A	Blichton fine sand, 0-2% slopes	19	63
32B	Bivans sand, 2-5% slopes	19	63
21	Newnan sand, 0-2% slopes	19	63
50	Sparr sand, 0-2% slopes	23	62
56	Wauberg sand, 0-2% slopes	24	60
14	Pomona sand, 0-2% slopes	25	59
42B	Pedro-Jonesville complex, 0-5% slope	26	56
23	Mulat sand, 0-2% slopes	27	55
13	Pelham sand, 0-2% slopes	27	55
58B	Lake fine sand, 0-5% slopes	27	55

Table 9. Land Evaluation, Ranked Numerically and by Relative Value, for Soils in Alachua County - Based on Soil Potential Ratings for Soybeans (USDA Soil Conservation Service)

Soil Symbol	Soil Mapping Unit	Relative Value	Numerical Ranking
33B	Norfolk loamy fine sand 2-5%	100	1
30B	Kendrick sand 2-5%	100	1
39B	Bonneau fine sand 2-5%	100	1
5B	Fort Meade fine sand 0-5%	96	2
33C	Norfolk loamy fine sand 5-8%	93	3
35B	Gainesville sand 2-5%	88	4
3B	Arredondo fine sand 0-5%	88	4
8B	Millhopper sand 0-5%	88	4
49A	Lochloosa sand 0-2%	88	4
29B	Lochloosa fine sand 2-5%	88	4
3C	Arredondo fine sand 5-8%	81	5
35C	Gainesville sand 5-8%	81	5
8C	Millhopper sand 5-8%	81	5
29C	Lochloosa fine sand 5-8%	81	5
30C	Kendrick sand 5-8%	81	5
57B	Micanopy loamy fine sand 2-5%	72	6
50	Sparr sand	59	7
21	Newnan sand	59	7
28	Chipley sand	59	7
31B	Blichton fine sand 2-5%	56	8
32B	Bivans sand 2-5%	56	8
31A	Blichton fine sand 0-2%	56	8
56	Wauberg sand	51	9
15	Pompano sand	51	9
20B	Tavares sand 0-5%	49	10
47B	Candler-Apopka Complex 0-5%	49	10
2B	Candler 0-5%	49	10
55B	Land sand 0-5%	49	10
6B	Apopka 0-55	49	10
58B	Lake fine sand 0-5%	49	10

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NATURAL RESOURCES WATER

A. Introduction

Water as rain, in rivers, streams and lakes, and underground - is a critical component of Alachua County's natural resource base, its ecology, its economy and its residents' quality of life. Water is a finite resource - all the water we have is what exists on our earth at this time. Although the vast majority of the Earth's surface is covered with water, the oceans and seas are salty. Only 3% is fresh - and two-thirds of that is ice. This means that only about half a percent of our planet's water resources is fresh water. Of these fresh water resources, 0.02% is found in rivers, lakes and streams while the rest, 0.48%, is ground water (APA, 2001). This tiny fraction of fresh water sustains a multitude of very specific life forms, including our own. Groundwater supplies the drinking water we need to survive. The economic support offered by plentiful and high quality surface waters includes agricultural irrigation, process and cooling waters for power plants, and chemical, steel, lumber, mining, and other industrial operations. In addition, lakes, rivers, and streams provide boating, swimming, fishing, and other forms of recreation.

The groundwater system is the principal source of water for domestic, agricultural, and industrial use in Alachua County. There are three aquifer systems present in Alachua County: the surficial aquifer system, the intermediate aquifer system and the Floridan aquifer system (SEGS, 1986). The Floridan aquifer system underlies the entire County. The surficial and intermediate aquifer systems are present only in the eastern portion of the County where sediments of the Hawthorn Group are present. These aquifers are described in Inset 5. Groundwater quality is generally good. However, with the potential for groundwater pollution, particularly in the area where the Floridan Aquifer is unconfined and the numerous stream to sink basins, it is necessary to continue monitoring groundwater on a long-term basis. In addition, policies that protect all three aquifers for potable supply and ecosystem health are necessary.

The surface water systems of Alachua County include areas of standing and flowing water, whether permanent, intermittent, or temporary, as well as the wetlands and floodplains associated with them. The rivers and streams that flow through Alachua County historically meandered through broad floodplains. Because of urbanization and agriculture, these broad floodplains have been restricted to narrower belts along the rivers and streams or otherwise modified for flood control. The general location of surface waters, wetlands, and floodplains today is shown on Map 17. For more detailed location and inventory of surface waters, the U.S. Fish and Wildlife Service, Florida Wetland Inventory maps and the USGS topographic maps are on file at the Alachua County Office of Planning and Development.

Surface water types in Alachua County include sand-bottomed creeks, large calcareous streams, springs, lakes, and ponds. Characteristics of these surface water bodies, as well as common plants and animals associated with them, are described in the context of three major study areas of water systems health: the Santa Fe River and springs, the Orange Creek Basin Study, and urban streams and creeks. A great wealth of wildlife may be found frequenting surface waters, and nearly all species do so at times. They may thus be considered as components of the surface water communities. Some species, however, may be considered as being truly aquatic, relying on those habitats for survival at nearly all times. For example, the Suwannee Cooter, the Florida Chorus Frog and the Pugnose Minnow are species which are endemic to aquatic communities in Alachua County. Although the species may be found in other portions of Florida, they are found no where else in the world.

Within the modified landscape, remaining riparian habitat is of great value to resident and migratory animal species as it provides corridors and linkages to and from the biotic regions of the County. The numerous essential habitat elements provided by the remaining riparian/riverine corridors in Alachua County make them perhaps the most significant contributor to wildlife habitat throughout the County.

Inset 5: Three Aquifer Systems in Alachua County

Surficial Aquifer

The surficial aquifer occurs primarily near the surface and consists of a few feet of sands of the Plio-Pliocene Age that overlie the Hawthorn Group. This aquifer is absent in the Western Valley in Western Alachua County and varies around 100 feet above mean sea level near the escarpment. It is greater than 150 feet above sea level northwest of Highway 24 between Gainesville and Waldo. In many places, the water table is less than ten feet below the surface and is recharged directly by rainfall and, to a minor extent, by upward seepage from the lower aquifers. The lower limit of the surficial aquifer system coincides with the top of the Hawthorn Group.

Water in the surficial aquifer moves from places of recharge to places of discharge following topography. Part of the water that leaves the aquifer is discharged either by evaporation from the surface of the land or by transpiration through vegetation. Part is withdrawn from wells, while part seeps downward into lower aquifers, when the water table is higher than the potentiometric surface of those aquifers (see discussion of Floridan aquifer). Finally, in some areas, water from the surficial aquifer is discharged into lakes and streams in the County. This occurs along portions of the Santa Fe River, all streams in eastern Alachua County, Hatchet Creek, and probably Newnans Lake.

Ground water flow in the surficial aquifer system generally follows topography. Many natural flow regimes have been altered by ditching and drainage modifications necessary for construction. In the central and eastern portion of the County the surficial aquifer system ranges from zero to 30 feet in thickness. Water depth below land surface in the surficial aquifer system varies from zero to approximately 20 feet. Depth to water in the surficial aquifer system varies seasonally, as it is directly recharged by rainfall. Water in the surficial aquifer system is seldom used for potable supply due to low capacity to yield water and high iron concentrations (Clark et al., 1964).

Intermediate Aquifer

The intermediate aquifer is sandwiched between the surficial aquifer and the Floridan aquifer. Water contained within it is generally confined and under artesian conditions, such that water in a well penetrating the aquifer would rise above the aquifer surface.

These materials, in general, consist of fine grained clastic deposits interlayered with carbonate strata belonging to all or parts of the Miocene and younger Series. In places poorly-yielding to non-water-yielding strata mainly occur and there the term "intermediate confining unit" applies. In other places, one or more low to moderate-yielding aquifers may be interlayered with relatively impermeable confining beds; there the term "intermediate aquifer system" applies.

The intermediate aquifer is limited vertically and laterally in extent, and occurs primarily in a few limestone layers and sandy layers within the Hawthorn Group. Although there are many wells drawing water from this aquifer system, its yield is generally low, being dependent on its recharge from the overlying surficial aquifer, or from the underlying Floridan aquifer in areas where the Floridan aquifer is under higher pressure than the intermediate aquifer. Discharge from the intermediate aquifer occurs upward to the surficial aquifer or downward to the Floridan aquifer when it is under higher pressure than either of those two aquifer systems.

Ground water flow within the intermediate aquifer system is not well understood. The carbonates and sands in the Hawthorn Group which yield water are not consistent and may not be continuous through out the eastern part of the County. The quantity of water that can be removed from a well in the intermediate aquifer system may be adequate for individual domestic supply, but is generally not sufficient for large withdrawals such as extensive irrigation or municipal supply.

Floridan Aquifer

The Floridan aquifer system is a thick carbonate sequence which includes all or part of the Paleocene to early Miocene Series and functions regionally as a water-yielding hydraulic unit. This aquifer is present throughout the state and is the deepest part of the active ground-water flow system on mainland Florida. In Alachua County it is found within the upper several hundred feet of limestone.

This aquifer is the most productive since it transmits and stores water easier than the other aquifers. The aquifer is confined (overlain by the Hawthorn Group) and therefore under artesian conditions in the Eastern part (plateau region) of the County. The Floridan aquifer is unconfined (water table condition) where the Ocala Limestone is near the surface. This is primarily in the Western Valley region.

Map 16, which shows the degree of confinement of the Floridan aquifer system, also illustrates areas where Hawthorn sediments are present in Alachua County. These sediments serve to confine the Floridan aquifer system. In the west, the Floridan aquifer system is unconfined and sediments of the Ocala Limestone are overlain by porous sands. In the central portion of the County, sediments of the Hawthorn Group overlie the Eocene limestones, but these sediments are perforated by sinkholes, providing a direct connection to the Floridan aquifer system. In the eastern portion of the County, sediments of the Hawthorn Group overlie the Floridan aquifer system.

For the most part, the top of the aquifer system coincides with the top of the Suwannee Limestone, where present, or the top of the Ocala Limestone. In small areas of central peninsular Florida and the southeast Florida where the Suwannee and Ocala are missing, the Avon Park Limestone forms the top of the Floridan aquifer system. In other parts of the State, permeable carbonate beds of either the Hawthorn Formation, the Bruce Creek Limestone, the St. Marks Formation, or the Tampa Formation constitute the uppermost part of the aquifer system. The base of the aquifer system in peninsular Florida, coincides with the appearance of the regionally persistent sequence of anhydrite beds that lies near the top of the Cedar Keys Limestone.

Flow is generally from the Eastern part of the County toward the Northwest.

B. Importance: Hydrologic connections

The water that is used in Florida is not only found within surface and ground water resources, but it moves back and forth between these water resources. This means the impacts that development will have on the quantity and quality of one water resource cannot be assessed without also assessing its impacts on all other water resources.

1. Aquifer recharge

Water enters the aquifer, or replenishes it, in several important ways. In the south and western portions of Alachua County, where the Floridan aquifer is at or near the surface, rainfall percolates directly into the groundwater. In addition, water recharges the Floridan aquifer through the intermediate aquifer, as well as through sinkholes and numerous stream-to-sink basins throughout the County. Groundwater recharge is important for many reasons, some of which are listed below.

- *Replenishment of water supplies.* Water withdrawals from an aquifer must be balanced by recharge to ensure the sustainable use of ground water.
- *Saltwater intrusion protection.* The Florida Peninsula is both surrounded and underlain by saline water. Any reduction in the volume of water stored in freshwater aquifers above the saline zone results in the upward or lateral movement of salt water. Once freshwater aquifers are thus contaminated, restoration is difficult and costly if not impossible.
- *Maintenance of lake levels, stream flows, and spring flows.* Many surface water systems have hydraulic connections to ground water, which may support surface water levels for all or part of the year via baseflow. Reduced groundwater recharge can result in a decline in groundwater levels, and a corresponding decline in surface water levels and spring flows.
- *Dilution of contaminants.* Ground-water recharge introduces fresh water underground which may serve to improve water quality where ambient ground water is degraded.
- *Reduction of surface flooding.* Natural recharge provides water storage during rainfall events, reducing and delaying stormwater runoff and thus the potential for flooding.
- *Prevention of sinkhole formation.* In some susceptible areas, the hydrostatic pressure of groundwater can prevent or retard the development of sinkholes. A drop in ground water levels in susceptible areas can induce a series of sinkhole formations.

2. Aquifer discharge

Water leaves the aquifer, or is discharged, primarily through pumping, but also through flow onto the surface, as occurs at springs. The primary area of discharge for the underground water of the County occurs along the Santa Fe River below River Rise. During flood stages, the direction of flow may be reversed, so that the underground course of the river serves as an area of recharge to the aquifer. Other areas of recharge occur in the vicinity of Lake Lochloosa, Orange Lake, and along the Santa Fe River.

Because they provide such important interconnections, springs and sinkholes constitute significant geological resources and are identified as primary conservation areas in need of protection. These features are described in Inset 6.

Inset 6: Description of Springs and Sinks

Springs:

Many springs discharge water from the Floridan aquifer, along the Santa Fe River and in other areas of the County. The two types of springs which occur in the County are water table springs and artesian springs.

Water Table Springs: Water table springs occur usually in streams, where rain that permeates through permeable sediments, such as sand, reaches a relatively impermeable bed, such as clay. This water then moves down-gradient along the top of the impermeable bed to a place of outcrop where the water issues as a spring or seep. Flow is normally small and variable.

Artesian Springs: Springs from the intermediate and Floridan aquifers are generally artesian springs. These occur where water is confined in permeable sediments beneath impermeable confining beds, and is under sufficient hydrostatic pressure to rise to the surface through a natural breach in the confining beds. Most of Florida's large springs are of this type, as are many of the smaller ones. The water originates from deep, generally vertical holes in limestone. Some of these holes open into nearly horizontal caverns.

The cavity through which water ascends to an artesian spring is generally a former sink in which direction of motion of the water has been reversed by the rise of the water table. If the water table were to fall below the mouth of the cavity, the spring would cease to flow and would revert to the form of a sink, provided the tubular cavity leading to the spring does not penetrate an impervious stratum, which might confine the water below it under pressure.

The runs of some of the larger springs may be characterized as calcareous streams, including the Silver and Wakulla rivers. The majority of Florida springs, including those in Alachua County, are much smaller. Vegetation is very dense just below the exit of a spring, but around the spring itself there is nothing but bare sand. Immediately beyond the periphery of the "boil" milfoil, coontail, arrowhead, and water primrose may become very abundant. The surface of the vegetation close to the spring is usually covered with a coating of calcium carbonate deposited from the water as the bicarbonate exposed to the air changes to carbonate.

The low oxygen content of the water is reflected in the small populations of truly aquatic insects in this region; however, snails of the genus Goniobasis are exceedingly numerous on the vegetation, and Ampullaria occurs frequently on the bottom sands. Approximately a quarter of a mile below the head of the springs, a more abundant insect fauna becomes noticeable, and in this region the plants are free of the calcium carbonate. The water of the springs is crystal clear, cool, and definitely alkaline.

Sinkholes

Sinkholes and solution channels are the result of the action of water in the highly soluble Ocala Limestone. As underlying limestones are eroded, caverns and underground channels are formed. Then, either through solution of limestone at the surface or from the excess weight of overlying sediments, collapse of these sediments may occur, forming sinkholes.

Sinkholes formed in this manner may provide a direct connection to the Floridan aquifer. In other instances, the connection is not complete or sediments may partially fill and block the channel. In such cases, perched ponds may form which fluctuate with rainfall. This may also be the cause of the many cypress domes in flatwoods areas where other formations overlie the aquifer system.

Stream-to-sink basins

Across the western edge of the erosional escarpment, sinkholes capture the several streams which flow across it. These streams often begin as seepage or springflow from the swampy areas of the northern highlands, and have been responsible for the erosion of the Hawthorne Group as they cut headward into the highlands.

The capture of streams by sinkholes in Alachua County occurs along an unusually linear band known as the Cross-County Fracture Zone (see Map 18). This band extends approximately 45 miles from the sink which captures the Santa Fe River to the sink in Orange Lake. Nearly all the sinkholes which capture streams in the County occur along this band

Most noteworthy of streams captured by sinkholes in the County is the Santa Fe River, which rises in the Northeast corner of the County at Santa Fe swamp, flows westward forming the northern border of the County, and flows underground for approximately three miles in the Northwest portion of the County near High Springs. The Santa Fe then re-emerges at River Rise and continues its flow to the Suwannee River.

Several other streams between the Santa Fe River and Paynes Prairie are also captured by sinkholes. Among these are: Townsend Branch, Mill Creek, the streams flowing into Burnetts Lake, Turkey Creek, Blues Creek, Hogtown Creek, and Sweetwater Branch/Canal. Additionally, a sink in the southeastern end of Orange Lake has been observed to drain that lake during periods of drought.

Orange Lake, which is very linear in shape, is also concurrent with this band, as is a large embankment on the Northeastern border of Paynes Prairie. Both of these features parallel the linear trend of the Cross-County Fracture Zone (Map 18).

Other prominent features which occur in this band are the Devil's Millhopper, and Sanchez Prairie in San Felasco Hammock State Preserve. The Devil's Millhopper is a very large sink Northwest of Gainesville, which is over 125 feet deep. It is presently maintained as a State Geological Site. Sanchez Prairie is a fairly large, flat-bottomed depression, some 80 to 90 feet below the surrounding highlands.

3. Water table elevation

The potentiometric surface of a confined aquifer is the elevation to which water would rise if it were unconfined, and is generally an expression of the "hydraulic head" or pressure within the confined aquifer. Alachua County performs mapping of the elevation of the Floridan aquifer system on a semi-annual basis over 50 wells. In addition, the County collects data from monthly water level trend wells.

The potentiometric surface of the Floridan aquifer varies seasonally, with highest and lowest levels occurring in September and May, respectively. See Maps 19 and 20 for seasonal 2001 data. September is normally the end of the wet season; May, the end of the dry season. Generally, more stress is placed on the aquifer in May because seasonal rains have not yet begun and crop irrigation is heaviest. Also, tourism in late winter and early spring places additional demands on the freshwater supply at a time when rainfall is least.

The amount of rainfall is the most important factor affecting the elevation of the potentiometric surface of the Floridan aquifer. For example, in 1998, which was a year marked by a relative abundance of rainfall, the water table was significantly higher than in 2001, the end of a multi-year drought. The difference is shown in Map 21. In May, 2001, water-levels ranged from 30 to 75 feet, whereas in May, 1998, water-levels ranged from 35 to 85 feet. Declines range from over 10 feet in eastern areas of the County to as much as 15 feet in the southwest.

4. Groundwater flow

The potentiometric surface maps also illustrate ground water flow in the Floridan aquifer system. The groundwater tends to move downgradient (i.e., from higher to lower elevations). Flow is generally from the Eastern part of the County toward the Northwest, and most discharge from the aquifer occurs beyond the boundaries of Alachua County. Local pumpage from wells, sinkholes, fractures in the limestones, rainfall and other factors may influence the flow regime. For example, the circular low of 40 feet near Gainesville is caused by pumping at the Murphree Wellfield for Gainesville's water supply. Drawdown in this manner may increase the amount of recharge that occurs in the vicinity of this pumping.

5. Surface water flows

Surface water flows are not only a product of runoff, but also include a groundwater baseflow component. In fact, many surface water systems in central Florida are closely interconnected with the underlying groundwater system through springs and sinkholes, as described above. In accordance with hydrologic conditions, these natural interconnections may augment flow, reduce flow, or perform both functions intermittently. Because the region manifests annual wet and dry seasons with significant variations in precipitation frequency and intensity, the contribution of surface runoff and groundwater baseflow to stream varies. This cyclic pattern of changing baseflow conditions results in variable surface water quantity and quality.

Extreme stream flow fluctuations occur due to intense and erratic seasonal precipitation. Excessive groundwater withdrawals in combination with periods of low rainfall have recently resulted in significant wetland and lake draw-downs leading to both temporary and permanent ecological damage to these natural systems. The summer of 2000 brought record drought to Florida. Water bodies receded and in some cases disappeared. In Lake Pithlachocco, the receding shoreline exposed an incredible discovery: ancient dugout canoes, some dating back 5,000 years.

This is in contrast to the high water conditions experienced only a few years earlier. High water conditions in 1998 led to a request by Alachua County for updated FEMA floodplain mapping. Floodplain areas serve as important reserve areas to store floodwaters during various magnitude storm events. In their natural state, they may also act as wildlife habitat areas. Information on areas where flood problems have been identified can be found in the Stormwater Element.

6. Watersheds

Surface water flow may be understood within the context of watersheds. Watersheds are nature's boundaries. They are the areas that drain to surface water bodies. A watershed generally includes lakes, rivers, estuaries, wetlands, streams, and the surrounding landscape. Activities within each watershed will impact surface waters and groundwaters accordingly.

There are two major surface water drainage systems in Alachua County: the Santa Fe River system, and the Oklawaha River System. The Waccasassa River System is only a groundwater system in Alachua County. They bear strong correlation to the physiographic regions described in the previous section. Watershed basins are shown on Map 22 and described in Inset 7. More detailed information on drainage basins within the County and an analysis of the effects of stormwater runoff can be found in the Stormwater Element.

Inset 7. Description of Major Watershed Basins in Alachua County

The **Santa Fe River Basin**, in the Northern area of the County, includes several tributary creeks along the Santa Fe River such as Montechoa Creek and Rocky Creek and includes several springs along the Santa Fe River itself toward the Northwest. All surface waters in the Northern part of the County drain through this system west to the Suwannee River.

The **Oklawaha River Basin**, extending into the Southeastern area of the County, includes all urban creeks in Alachua County, including Hogtown Creek, the Newnans Lake/ Hatchet Creek system, the Lochloosa/Orange Lake system, and the Orange Creek system. The surface waters in the Southeastern part of the County drain through these systems into Orange Creek and are carried east to the Oklawaha River which drains into the St. Johns River.

The **Waccasassa River Basin** that includes the Watermelon pond area in the Southwestern portion of the County is mainly comprised of internally drained areas. Surface waters enter the groundwater system via sinkhole ponds or through percolation into the thin layer of sands overlying the Floridan Aquifer. This area provides direct recharge to the aquifer.

Another type of watershed basin that is prevalent in Alachua County is the **stream to sink basin**. These are found primarily in the central portion of the County around Gainesville and North to the Alachua/High Springs area. Some of these including Hogtown Creek, Sweetwater Branch, Mill Creek, Turkey Creek and Blues Creek are situated within or near urban development areas. As such they are susceptible to the adverse effects of pollutants from urban stormwater runoff. This point is especially critical as these creeks drain into sinkholes which provide direct connections to the Floridan Aquifer, the primary drinking water source for the North Central Florida region.

For the past five years, EPA has promoted the watershed approach nationally as a means to further restore and maintain the physical, chemical and biological quality of our nation's waters. ACEPD shares EPA's vision is to achieve clean and healthy watersheds that support aquatic life and many human uses. The vision will be met by encouraging and supporting comprehensive water resource management. Recognizing that today's problems require more creative, comprehensive solutions, ACEPD has taken several steps to transcend political, social, and economic boundaries, placing greater attention on the resource systems and the achievement of real ecological results rather than administrative requirements. A more thorough understanding of threats and conditions in watersheds provides a stronger basis for targeting priority concerns. In addition to partnering with FDEP, SJRWMD, SRWMD, the City of Gainesville, and other agencies on multi-jurisdictional water resource issues, ACEPD has committed to generating reader-friendly status reports that describe the conditions of each watershed in Alachua County.

Activities such as urbanization and intensive agricultural practices on the land surface can and do have adverse impacts upon the quality and quantity of ground and surface waters. The watershed approach considers activities that occur throughout the watershed, including activities on and adjacent to surface waters and their associated wetlands and floodplains, as well as uplands. The intent is to foster an integrated approach to the management of our biological and physical environments so as to maintain, protect and improve our natural, managed, and human communities.

7. Wetlands and floodplains

Wetlands and floodplains play a critical role in regulating the movement of water within watersheds as well as in the global water cycle (Richardson 1994; Mitsch and Gosselink 1993). Wetlands, by definition, are characterized by water saturation in the root zone, at, or above the soil surface, for a certain amount of time during the year. This fluctuation of the water table (hydroperiod) above the soil surface is unique to each wetland type. The types and characteristics of wetland communities are described in the Natural Communities section of this data and analysis.

Wetlands may have different functions as a result of their position in the landscape and their dominant water source. For purposes of water quality and watershed management, wetlands are described below based on dominant water source. Wetlands may be precipitation dominated, surface flow dominated, or ground water dominated (Brinson 1993).

Wetlands store precipitation and surface water, and then slowly release the water into associated surface water resources, ground water, and the atmosphere. Wetland types differ in this capacity based on a number of physical and biological characteristics, including: landscape position, soil saturation, the fiber content/degree of decomposition of the organic soils, vegetation density and type of vegetation (Taylor et al. 1990). During the growing season, plants actively take up water and release it to the atmosphere through evapotranspiration. This process reduces the amount of water in wetland soil and increases the capacity for absorption of additional precipitation or surface water flow. As a result, water levels and outflow from the wetland are less than when plants are dormant. Larger plants and plants with more surface area will transpire more.

Precipitation dominated wetlands

Wetlands on local topographic heights are often precipitation dominated. Precipitation dominated wetlands may also be in flat or slightly elevated areas in the landscape, where they receive little or no surface runoff. Generally such wetlands have a clay and peat layer that retains the precipitation and also prevents discharge from ground water. Because wet meadows and wet prairies, for instance, are largely isolated from other surface water resources, these wetlands contribute little to watershed surface quality. When they do receive surface water inflow, they function like marshes, removing nutrients and other pollutants (Mitsch and Gosselink 1993; Rickerl et al. 1993). Wet meadows, and wet prairies generally contribute to ground water recharge (Weller 1981; Mitsch and Gosselink 1993).

Groundwater dominated wetlands

Wetlands also form in landscape positions at which the water table actively discharges, particularly at the base of hills and in valleys. Such ground water dominated wetlands may also receive overland flow but they have a steady supply of water from and to groundwater.

Surface water dominated wetlands

Most wetlands in low points on the landscape or within other water resources are dominated by overland flow. Such riverine and fringe (marsh) wetlands actively play a role in the landscape since they come in contact with, store, or release large quantities of water and act upon sediments and nutrients. These wetlands may be recharged by ground water as well, but surface water provides the major source of water. Two hydrologic connections related to two significant types of these wetlands, marshes and riparian forested wetlands, are described in Inset 8.

Inset 8: Hydrologic connections of marshes and riparian forested wetlands

Marshes

Marshes form in depressions in the landscape, as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). They are frequently or continually inundated with water, deriving most of their water from surface water, including streams, runoff, and overbank flooding; however, they receive inputs from ground water as well (Mitsch and Gosselink 1993; Brinson 1993). Marshes may help reduce local peak and flood flows and moderate stream flow (Demissie and Khan 1993; Mitsch and Gosselink 1993; Gosselink et al. 1990).

Marshes are also valuable in terms of protecting water quality. As a gross estimation, removal of nitrogen from surface water by marshes is approximately 50% and phosphorus removal is approximately 10 - 15% of inputs (Mitsch and Gosselink 1993). Marshes slow the flow of water moving through the system and facilitate the settling of suspended solids and pollutants adhering to sediment. Vegetation quantity and type are important factors in determining the ability of a wetland to reduce water velocity. Marsh vegetation utilizes nutrients, and, more importantly, provides attachment surfaces and a carbon source for organisms that assimilate and transform nutrients. Plant roots oxygenate the soil and provide additional microbial habitat, facilitating such processes (Whigham et al., 1988).

Riparian forested wetlands

Riparian forested wetlands are linear systems found along lakes, streams, and rivers from headwaters down to the sea. Dominated by surface water, these wetlands are saturated or inundated with water during the winter, when evapotranspiration is low, because plants are dormant and precipitation is high; and during the early part of the growing season, when precipitation and runoff are still abundant. These wetlands are generally not wet in the summer or fall except during flood conditions.

Riparian wetlands are particularly productive ecosystems, receiving large inputs of water and nutrients from upstream sources during flooding. This feature has led to their conversion for agricultural use, a practice that has contributed to water quality degradation (Mitsch and Gosselink 1993).

Southern deepwater swamps are riparian systems notable for the standing water present during much of the year. While they may be traversed by rivers or streams, which provide seasonal water inputs, these systems may also be headwaters. A cypress dome is an anomalous southern deepwater swamp type that is typically precipitation versus surface water, dominated. Cypress domes typically exist as isolated depressions in very gently sloping landscapes. Other examples of riparian forested wetlands include maple swamps, bottomland hardwood forests, and cottonwood riparian areas.

Riparian systems provide a continuum of water quality benefits. Headwater wetlands are the source of water; the forested wetlands and marshes along low order streams protect water quality and aquatic life; and wetlands along higher order streams provide flood control, water quality maintenance, and life support.

Water supply: Riparian forested wetlands and swamps have a significant water storage and ground water recharge role, and thus are valuable in water supply and flood control (Reilly et al. 1991; Hook et al. 1988; Ewel 1990; Brinson 1993; Demissie and Khan 1993; Brown and Sullivan 1988; Gosselink et al. 1990). The wider the floodplain, the greater the storage action and reduction of flood peaks that can occur. Large floodplains with long retention times can be important ground water recharge areas, depending on substrate permeability (Taylor et al. 1990; O'Brien 1988). A forested wetland overlaying permeable soil may produce 100,000 gallons of water per acre per day (Anderson and Rockel 1991).

Water quality: Riparian wetlands are important sinks for pollutants carried in upland runoff and from upstream areas (Brinson 1993). Riparian wetlands that are adjacent to small streams are particularly valuable in trapping pollutants and preventing nonpoint source pollution from ever reaching larger water resources (Gilliam 1994; Walbridge 1993). Riparian wetlands also serve as valuable transformers of pollutants. They are noted for processing large fluxes of energy and materials from upstream sources, and they typically show high primary productivity, functions that make them important ecological links and valuable habitat. Examples of the importance of forested wetlands in nutrient removal from water resources:

- A 50-meter wide riparian forest in an agricultural watershed of the Chesapeake Bay removed about 89% of the nitrogen that entered the forest from runoff, ground water, and precipitation (Peterjohn and Correll 1984).
- Riparian forests can reduce phosphate concentrations in runoff and flood water by 50% (Gilliam 1994). Systems with high concentrations of aluminum may remove up to 80% of total phosphorus (Peterjohn and Correll 1984; Richardson 1985; et al. 1994; Walbridge and Struthers 1993).
- Forested wetlands can protect ground water from agricultural runoff. The concentration of nitrate in ground water in an agricultural area was lower beneath forested wetlands than beneath upland covers (Phillips et al. 1993).

C. Status of water systems health in Alachua County

Both ground and surface water resources can be disrupted by contamination. Pathogens, minerals, and organic and inorganic chemicals polluting the ground water can cause surface water to become polluted and vice versa due to the interconnections between the two. Significant contamination sources include agricultural chemical use, wastewater discharges from wastewater treatment plants and on-site wastewater disposal systems, solid and hazardous waste landfills, storage tanks, and industrial materials spills and waste impoundments. Impervious surfaces can not only reduce aquifer recharge but also can increase water pollution and flood hazards by increasing the amount of runoff. Aquifer penetrations - such as injection wells, or improperly constructed or abandoned wells - may introduce contaminants directly into an aquifer. Atmospheric deposition of contaminants can also impair water quality. The minimal attenuation and the impracticality of remediation of contaminants in ground water, and the high cost of water treatment make prevention of contamination the only really effective means of protecting aquifers and the most efficient means of protecting surface water resources.

Alachua County has been identified as an area experiencing some aquifer contamination. Recent studies conducted by the ACEPD in conjunction with the WMDs have detected pollutants seeping into the Floridan aquifer and returning through springs. Rising levels of nitrogen-based nutrients have been detected in regional surface waters. Studies point to inorganic fertilizers as causes for increased nitrogen loadings in springs and in the groundwater of northwest Alachua County.

Surface water quality varies temporally and areally throughout the County. Poorest overall surface water quality has been observed in the urbanized watersheds of Tumblin Creek and Sweetwater Branch. The water quality in urban streams exhibits characteristics associated with human activities. Water quality generally declines during heavy precipitation events following a long period of drought. Rural watersheds show the effects of agricultural and septic tank use within the watershed. These effects are often manifested by the presence of high levels of nutrients and fecal coliform.

Three major focal areas for water systems health include: the Santa Fe River and its springs, the large lakes of Alachua County, and the urban creeks in and around the City of Gainesville. The characteristics of each system are first described, followed by a discussion of associated health concerns.

1. Santa Fe River and Springs

Santa Fe River corridor

One of the best examples of the interconnection between ground and surface waters may be observed along the Santa Fe River and its springs. The Santa Fe River (Spanish for "Holy Faith") begins at Santa Fe Lake and Little Santa Fe Lake in northeast Alachua County. Additional flow is derived from the many tributary streams which enter the Santa Fe River from the north and south as it courses along the County. Flowing west for 50 miles, it serves as the northern boundary for Alachua and Gilchrist Counties. Hernando DeSoto explored the river in 1539. Although scattered residential development dots certain sections of the streambank, visitors today may still observe a scenic canopy and an abundance of wildlife along the corridor, particularly in the upper sections. The Santa Fe is a living water system that supports an array of biological functions and values which change with the hydrology of the river.

The upper part of the Santa Fe River is an oligotrophic, blackwater stream underlain by thick Hawthorn Formation sediments and clay. Thus, the river and the swamps from which it flows are perched above the Floridan Aquifer. Water levels in this part of the river fluctuate only moderately. As the river moves westward, its characteristics evolve towards increasing fertility and water level variability. At Worthington Springs, the river gradually starts to become a spring fed river, thus increasing flow, clarity, pH, calcium content, temperature stability, and overall fertility. For the next two miles to I-75 and the start of O'Leno State Park, the river is intermingling freely with the Floridan Aquifer, and is deep, broad and slow moving. Apple snails are in evidence for the first time, indicating the higher calcium levels in the water. Even here, the water is dark, and the character of the river is more like that of a blackwater river than a typical Florida spring fed river.

It is not until the river goes underground in O'Leno State Park and comes up again at the River Rise, that

it dramatically changes to a strongly spring fed river. Within the state park, the river goes underground to pass through the Cody Scarp (or escarpment), an ancient coastline that divides the Gulf Coast Lowlands from what is called Florida's "Northern Highlands" (SRWMD, n.d.). After flowing underground for three miles, the river rises again just north of High Springs. Under new definitions, this river rise is considered a spring, adding another substantial first magnitude spring to the currently recognized total of 33. See Inset 6 for further discussion of springs in Alachua County.

As a calcareous stream at this point, the Santa Fe is clear, cool, and of moderate flow. This type of stream is the richest in Florida, both in numbers of individuals and fauna species. The Santa Fe ranges in depth from three to 20 feet or more, in width from 75 to 300 feet. Vegetation is composed chiefly of tapegrass, arrowhead, naiads, mosses, and many algae, which in the shallower zones form dense mats completely covering the floor of the stream. Leaf draft and other debris become entangled in fallen trees and other catchalls, and such debris forms an important habitat for small aquatic organisms. In some areas, there are outcrops of limestone, and many loose rocks are also of great importance as habitats for such organisms. Clearing and channelization of these streams and the smaller sand-and silt-bottomed types removes these habitats, in addition to increasing the possibility of flooding further downstream.

Local and state experts recognize the Santa Fe River corridor as some the best, most varied, and most important wildlife habitat in Alachua County and in the state of Florida. From the biological perspective, the Santa Fe River and its floodplain provides a critically important wildlife corridor connecting most of the various wildlife habitat areas in northern Alachua County to one another and to many areas to the north and west of the County. This is the most important natural systems connector in Alachua County, from both biological and hydrological perspectives. It provides an excellent connection from Lake Alto Swamp and the Northeast Flatwoods to O'Leno State Park and the River Rise Preserve. Its tributary creeks provide connectors of varying strength to all the rest of the sites in the northern part of Alachua County. Even San Felasco Hammock State Preserve and its satellite sites are tenuously connected in this way. In addition, the river's tributaries on the north side, such as the New River, Olustee Creek, and Sampson Creek provide wildlife connections as far north as The Osceola National Forest, which is, in turn, connected to the Okefenokee Swamp in Georgia.

Although much of the Santa Fe is in good condition, segments are showing degradation due in part to increased nutrients causing excessive algal mats and/or non-native species of algae. All the connections of the tributaries to the river corridor need protecting, and some of them are in great need of strengthening. There is a small percentage of the area that is fire-adapted upland that would require prescribed fire to maintain it in good condition.

Cooperative efforts and agreements with landowners and with organizations, both government and non-government, are also needed to help protect this resource. These cooperative efforts can help with river cleanups, facility maintenance, public education, and with the frequent observation, monitoring, and reporting of events that is needed to enforce laws and keep track of problems and changes. Enforcement of regulations pertaining to construction in the floodplain, septic tanks, clearing of bank vegetation, dredge and fill, and other related matters is also needed.

The Santa Fe River is used for swimming, fishing, canoeing, and other recreational activities. It is not a large river, and could easily be damaged by too much use or by inappropriate use. Carrying capacities need to be determined for various uses. Some uses, such as jet skis and power boats with powerful motors, may be inappropriate, due to the level of impact per user. These powerful motor vehicles can cause large wakes which damage the banks and the river channel. The wakes and the loud noise they make can also disturb and disrupt wildlife and other recreational users.

Springs

As described above, River Rise may be considered a spring, and along with Poe Spring and Hornsby Spring, form the major discharges into the Santa Fe River from Alachua County. River Rise, Hornsby Spring, and the newly discovered Treehouse Spring are all first magnitude springs, which discharge, on average, greater than 100 cubic feet of water per second. The major springs of Alachua County, their classification by magnitude, and the location of each, are listed in Table 10. Magnitude classifications are identified in Table 11.

Florida's springs are a world class natural resource that have been used and enjoyed by humans since this land was first occupied. Native Americans hunted, fished, drank from and lived by them for at least 12,000 years. According to legend, Ponce de Leon's search for a spring, "the Fountain of Youth," led to the European discovery of Florida in 1513. In the early 1900s, health spas were built at several springs because of their perceived medicinal qualities, and churches commonly conducted baptisms in local springs. Boulware Spring, in Gainesville, once provided water to the city of Gainesville. Today it is a city park and a National Historic Landmark. Described as "bowls of liquid light" by Marjory Stoneman Douglas, the mere mention of springs evokes, in most people, something magical, mysterious, pure, and visceral. Springs are part of our natural identity and comprise a multi-million dollar tourist industry. Florida's twelve state parks that are named for springs attracted over two million visitors in 1999.

Nitrates problem

Unfortunately, while some of our springs are still healthy, many are becoming impaired. Between 1950 and 1990, Florida's human population more than quadrupled, and our population continues to increase. With growth has come an unavoidable rise in water use, as well as extensive land use changes. Since the 1970s, scientists have documented a decline in water quality in most Florida springs, particularly in regard to nutrients such as nitrates. Nitrates are steadily increasing in most springs causing ecological degradation, most notably the rapid growth of algae and the invasive exotic hydrilla. Many springs have reduced flow and some have stopped flowing because of withdrawals from their recharge basins.

Increased levels of nitrates can cause nitrate poisoning in infants, and at-risk adults. Because of these health risks, a standard of 10 mg/L has been set for nitrates in drinking water. In surface water, nitrates are important to photosynthesis, but too much can cause rapid growth of algae and aquatic plants, depleting oxygen levels in the water.

Currently there is no environmentally based standard for nitrates, and negative environmental effects will occur at lower levels than current drinking water standards. Anecdotal evidence and field observations documented in the Florida Springs Task Force report suggest nitrate levels of less than 1 mg/L cause a significant shift in the balance of spring ecological communities, leading to intensified degradation of biological systems. What is safe for human consumption is, in the case of nitrate, catastrophic for biological systems.

Table 10. Springs of Alachua County

<u>Spring Name</u>	<u>Magnitude</u>	<u>Location</u>
Hornsby Spring	1	1.5 miles north of High Springs
Treehouse Spring	1	1.5 miles north of High Springs
Poe Spring	2	3 miles west of High Springs
Magnesia Spring	3-4	4 miles west of Hawthorne
Glen Spring	4	Northwest quadrant of Gainesville; tributary to Hogtown Creek
Boulevard Spring	-	2 miles southeast of Gainesville; used by the old City waterworks
Darby Spring	-	2 miles north of High Springs
Ford Spring	-	1/2 mile southeast of Melrose
High Springs	-	Several small springs near the City of High Springs
Iron Spring	-	In City of High Springs
Sulphur Spring	-	In City of High Springs

Table 11. Magnitude of Springs

<u>Magnitude</u>	<u>Average Flow (Discharge)</u>
1	100 or more cubic feet per second (cfs)
2	10 - 100 cfs
3	1 - 10 cfs
4	100 gallons per minute (gpm) - 1 cfs
5	10 - 100 gpm
6	1 - 10 gpm
7	1 pint per minute - 1 gpm
8	less than 1 pint per minute

Research efforts

In 1997, ACEPD evaluated available surface water and groundwater data for nutrients, including nitrates (Bird, 1998). It was observed in review of the data that nitrate plus nitrite in groundwater varied with the land use, aquifer, the degree of confinement of the aquifer, and well construction. In 1997, groundwater sampling of 39 wells was conducted as part of the FDEP Ambient Monitoring Program (FDEP, 1997). The highest nitrate plus nitrite concentration was found to be 3.7 mg/L (Bird, 1998). The highest concentrations of nitrate plus nitrite are generally found in areas where the Floridan aquifer system is unconfined or poorly confined. Nitrate plus nitrite concentrations for this same sampling event in the northwestern portion of Alachua County ranged from 0.33-2.20 mg/L.

More recent sampling activities have confirmed these elevated levels of nitrates in western and northwestern Alachua County. As part of the FDEP Ambient Monitoring Program, Status Network sampling was conducted in the Suwannee River Basin during 2001 (FDEP, 2002). During this time period, 20 groundwater sites in western Alachua County were sampled. The nitrates concentrations for samples from these sites ranged from <0.004 milligrams per liter (mg/L) to 4 mg/L. In June 2001, ACEPD sampled selected monitor and residential supply wells southwest of the City of Alachua in an area that had been used historically for agricultural activities. Concentrations in the samples obtained from these wells ranged from 1.6 to 30.3 mg/L (ACEPD, 2001).

The nitrate plus nitrite concentrations determined from surface water samples collected in 1997 showed a trend of increasing concentration downstream and the springs augment flow in the Santa Fe River. Generally, nitrates plus nitrites are higher when the river is under low flow conditions (Hornsby, 1997). The data show an increased trend of nitrates in the Santa Fe River downstream of River Rise. Upon review of the data, it appears that these increased levels in groundwater are the source of elevated nitrate-nitrogen concentrations observed in the river downstream from River Rise State Park, Hornsby Springs, and Poe Springs.

The inherent nature of karst geology, such as solution features, sinkholes, and caves, makes groundwater flow unpredictable. In limestone aquifers flow may follow fractures or solution features as conduit flow. The impact of development in Alachua County and adjacent areas on the level of nitrates in surface and groundwater cannot be determined with available information.

More research is necessary. Heightened water quality and water level monitoring (and possibly tracer studies) to identify flow paths and water level fluctuations, as well as water quality, will be required to determine the source and effect of nitrates in the County. To further the knowledge base, ACEPD is currently in the process of applying for a grant to fund additional studies of this problem.

Contamination is a major threat to our springs. Potential sources of nitrate contributors include: septic tanks, animal production wastes, fertilization of row crops and pasture, stormwater runoff, and atmospheric deposition from air pollution. Water can carry contaminants from the land surface into springs. Stormwater runoff can carry oil, fertilizer, pesticides, and bacteria. Septic tanks and underground storage tanks can contribute nutrients, bacteria, and chemicals via seepage. It should be noted that on-site domestic septic systems do not treat for nitrates. Air pollution releases ammonia, carbon dioxide, hydrogen sulfide, and methane, with deposition up to two miles away; causes excess fertilization and leaching of nitrates through soil. In "springsheds," recharge basins where surface water enters the aquifer through direct connections such as sinkholes and sinking streams, springs are especially vulnerable to contamination. Specific management strategies for springsheds are discussed later in the resource-based protection portion of this section.

2. Orange Creek Basin Study

The Orange Creek Basin consists of approximately 600 square miles in the lower Ocklawaha River System within portions of Alachua, Marion, and Putnam counties. The basin is characterized by a limestone topography and by the presence of shallow lakes, level prairies, irregular drainage patterns and several large sinkholes. Its six major sub-basins or drainage units are (1) Hogtown Creek, (2) Paynes Prairie, (3) Newnans Lake, (4) Lochloosa Lake, (5) Orange Lake, and (6) Orange Creek. In Alachua County, this includes the following surface water bodies: Bivens Arm, Cross Creek, Hatchet Creek, Hogtown Creek, Lake Forest Creek, Lake Lochloosa, Little Hatchet Creek, Little Lake Lochloosa, Little Orange Creek, Newnans Lake, Orange Creek, Orange Lake, Possum Creek, Prairie Creek, River Styx, Sweetwater Branch, Tumblin Creek.

Many wildlife species use the aquatic, wetland and upland habitats in the basin, including bald eagles, wood storks, Florida sandhill cranes, and several egret species. One of Florida's five most important bald eagle nesting sites is located in the Newnans-Orange-Lochloosa lakes area. The marshy River Styx area is home to a wood stork rookery, which was established more than 80 years ago. Paynes Prairie harbors many species of birds, reptiles and amphibians and is home to the round-tailed muskrat.

Over the years, the lakes of Orange Creek Basin have experienced significant changes in ecology and hydrology due to diversions of natural flow, drought, and various construction and transportation projects. In 1993 the SJRWMD recommended development of a comprehensive surface water management plan for the Orange Creek Basin in response to growing public concern regarding lake issues in the basin, including water levels. Approved by the SJRWMD Governing Board in 1996, the management plan is intended to provide a comprehensive, holistic basin-wide plan for management and restoration of aquatic and wetland resources in the basin. Some of the specific issues addressed include (1) altered hydrologic regimes, including impacts of water control structures; (2) extreme low lake levels; (3) control of exotic vegetation; (4) protection and restoration of native aquatic plant populations; (5) management of floating vegetation; (6) sources of pollution in the basin; (7) lake trophic conditions and trends; (8) organic sediment accumulation in lakes; (9) management and enhancement of fish and wetland wildlife habitats; (10) land conservation and restoration, and (11) public awareness and participation.

The environmental quality of lakes in Alachua County depends in large part on the intensity of human activity, both directly along the shoreline and within the lake's watershed. Lakes can be affected in different ways by a number of activities. Water quality data for the Orange Creek Basin, including Newnans Lake, Orange Lake, and Lake Lochloosa are available from the SJRWMD, and indicate declining water quality from the 1980s to the mid 1990s. Sufficeth to say that all of these lakes are experiencing eutrophication. Because Florida lakes tend to be relatively shallow and nutrient-rich, and our climate is warm and temperate, eutrophication, the natural aging process of lakes and ponds, is relatively rapid here naturally. Mankind's activities tend to hasten the process, which leads to an increase in total bio-mass but a reduction in over-all biological diversity and a general reduction in perceived benefits to mankind.

General characteristics of lakes and ponds in Alachua County are discussed in Inset 9.

Inset 9. Characteristics of Lakes and Ponds in Alachua County

Lakes:

Nearly all lakes in Florida are the result of a solution of underlying limestone. Those found in Alachua County are primarily silt-bottomed, and very shallow. They are typified by often dense mats of floating vegetation, particularly water hyacinths. The continual accumulation of dead hyacinths on the bottom of these lakes gives rise to thick layers of silt, which almost completely covers the bottoms to a depth of several feet. Almost no living organisms can be found in these bottom deposits, inasmuch as conditions are not conducive to life. The waters have a definite brownish tinge and are rather turbid.

Newnans, Orange, and Lochloosa Lakes in southeastern Alachua County are lakes of the type described above. Orange Lake is noteworthy in having many floating islands of vegetation, some of which are large enough to support trees. Santa Fe Lake, in the northeastern corner of the County, is less typical. Its bottom is much deeper, and the lake is more conducive to recreational activities, such as swimming and water skiing.

Ponds:

Sinkhole ponds are formed either when the bottom of a sink fills in with silt and other debris such that an impermeable lens is formed, preventing the downward movement of water; or when the local water table is above the bottom of the sink, in the case of a sink with a direct connection to groundwater. Though some of these ponds are dry, most have standing water that maintain a fairly constant level because the water table is high enough to supply the ponds continually. The sides of sinkhole ponds are steep and the zone of rooted aquatic vegetation is very limited. The sides of the sinkholes above the water are usually covered with vegetation that extends up to the rim of the depression.

The surface of the pond is often covered with a layer of floating vegetation, either water hyacinths or one of duckweed, water velvet, or floating moss. In this case, there is rarely any submergent or emergent vegetation. When there is no such floating vegetation, there is often a rich growth of both emergent and submergent vegetation, extending from the margin of the pond outward to the region where a dropoff to deep water occurs. The vegetation is usually some or all of bladderworts, cattails, rushes, or smartweed.

Fluctuating ponds are commonly found in Alachua County, and are often the inner or deeper portions of marshes, wet prairies, and wooded ponds. These ponds are very shallow, and are frequently just slight depressions in the flat topography. The level of the water in these hollows varies with the amount of rain and surface runoff. Though there is a great fluctuation in the area occupied by the water because a slight rise or fall causes marked spread or retreat of the margins, the depth usually does not change greatly because of the shallowness of the pond.

True aquatic vegetation follows the rise and fall of the water to some extent, but is chiefly confined to the part of the pond below the more permanent water level. The vegetation includes many true aquatics such as pickerelweed, smartweed, cattails, and water primrose, as well as maidencane, hydrocotyl, and many other semiaquatics. Plants are not confined to a shore zone as in the sinkhole ponds, but may extend much further out. Trout Pond is a typical example.

In April of 1997, the Orange Creek Basin Partnership was formed to address water quality and stormwater issues in the Orange Creek Basin. The partnership is comprised of six agencies: the SJRWMD, GRU, City of Gainesville Public Works, Alachua County Public Works, FDEP, and ACEPD. As part of this effort the ACEPD is currently under contract to conduct a large portion of the water quality assessment activities. Beginning in March of 1998, ACEPD has performed monthly baseflow sampling of urban surface waters in Gainesville. In January 2000, contract tasks were expanded to include: stream surveys, storm event monitoring, habitat assessments, benthic sampling, stream sign installation, and summary report preparation. Through stream surveys we have discovered several point sources of pollution, such as illicit discharges, leaking sanitary sewer lines, and abandoned landfills.

The sample collection portion of the study is nearing completion. Scientists are currently analyzing the data and will report a series of recommendations to address water quality concerns within the basin. On completion of the study, Alachua County will seek to implement these recommendations where feasible.

Protection of environmentally sensitive lands in the basin is also a high priority. The SJRWMD has purchased more than 16,000 acres of uplands and wetlands, and has purchased development rights on more than 19,200 acres within two conservation easements to forever preserve the area's water quality and wildlife habitat.

A restoration project is now under way at the former Orange Creek muck farm, located just east of Orange Lake in southern Alachua County and northern Marion County. Acquired by the SJRWMD in 1998, this 3,500-acre property is being restored to wetland habitat for many native aquatic, wetland and upland animal and plant species. This cost-share partnership between the SJRWMD and the USDA's NRCS was funded through the Wetland Reserve Program and two wetland mitigation projects.

The process of implementing the surface water management plan for the basin is progressing because of the concerned citizens and organizations who share a common goal - the restoration and protection of the natural environment and habitats throughout Orange Creek Basin.

3. Urban streams and creeks

All of the urban creeks in Alachua County are sand-bottom creeks. These are small, shallow, gently flowing streams with sandy beds. The creeks vary from as little as one foot to forty feet in width, and in depth from a couple of inches to as much as five feet. The bottom is composed of loose rolling sand that builds up in mid-stream into small ridges behind which small masses of debris accumulate. Several of these types of creeks exist in Alachua County.

Pebbles may be found in gravelly riffles where the water becomes quite shallow. There are occasional pools, but they are not a conspicuous element of the streams. The pools are usually small, quiet areas near the banks or at curves. Debris accumulates to a marked degree in some of the streams, almost any obstacle forming a nucleus for the accumulation of much leaf drift, sticks, and other objects.

Most of these streams are circumneutral to slightly acidic, but some may be extremely acidic. Nearly all of them have tinted waters which vary in shade from almost colorless to a strong tea color, according to the area drained and to the amount of rainfall. Most of the streams drain flatwoods, hammock lands, or swampy areas, and are fed by springs or diffuse seepage areas. Vegetation is almost completely absent from the streams except for a few scattered aquatic plants, such as golden club and smartweed.

Generally, the poorest water quality is observed in the more urbanized water sheds, Tumblin Creek, and Sweetwater Branch. Both of these streams have been channelized, are in part concrete lined, receive primarily urban runoff and point source discharges. The water quality in urban streams exhibits characteristics associated with human activities. Water quality generally declines during heavy precipitation events following a long period of drought.

There are several large industrial sites associated with water pollution of our surface waters and

groundwaters. Two of the more well known sites are the Cabot Carbon/Koppers Superfund Site in northeast Gainesville, and the GRU Main Street Waste Water Treatment Plant in downtown Gainesville.

Organic contaminants were detected in sediment samples from Springstead and Hogtown creeks in 1995 and 1996. These materials are likely residuals from discharges to a ditch the leads to Springstead Creek from the area of the Cabot/Koppers Superfund site. The Superfund site is still undergoing active remediation. More information may be obtained from ACEPD or the U.S. EPA.

GRU discharges treated effluent from its Main Street Wastewater Treatment Plant into Sweetwater Branch. Flow from this point continues to its terminus at Alachua Sink in Paynes Prairie Preserve State Park, where it drains into the Floridan Aquifer system. This situation required GRU to obtain a NPDES permit from the U.S. EPA. Additionally, the high levels of nitrates in the effluent discharge have in the past been a problem in the flora management of Paynes Prairie Preserve State Park. The elevated level of nutrients in Sweetwater Branch has caused an increase of plant communities not native to the preserve. There are several smaller, private wastewater facilities that also discharge treated effluent to surface water systems and have the potential to create similar water quality problems.

Under contract with SJRWMD, the ACEPD conducts monthly water quality sampling of Gainesville urban creeks. The department maintains a kiosk at Sweetwater Branch which displays information and pamphlets regarding stormwater and the environment. Recently, the ACEPD conducted field exercises with local Cub Scouts to educate them on the importance of keeping streams clean.

In addition, Current Problems, Inc. programs were established in Alachua County to take an active role in helping to keep our waterways free of litter. The Up The Creek! program provides for ongoing litter abatement work by adopting out stretches of streams and creeks to caring citizens who live on or nearby these waterways. Up The Creek! also conducts storm drain marking projects.

D. Protecting and improving water systems health

In addition to the efforts described above, the ACEPD has spearheaded numerous efforts to protect and improve water systems health in Alachua County. These include monitoring various indicators of resource health, and protecting water systems through both resource specific strategies and pollutant strategies. Resource specific strategies are focused on the protection of areas considered particularly vulnerable to contamination, including wellfield protection areas, high aquifer recharge areas, and surface waters, wetlands, and floodplains. Pollutant source strategies are focused on the manner in which activities that threaten the health of water systems are conducted, particularly stormwater management, fertilizer applications, wastewater treatment, mining and excavation, and hazardous materials operations.

I. Monitoring programs

In order to assess and improve the health of water systems in Alachua County, we measure numerous conditions, identify significant point and non-point sources of water pollution, and act to reduce the harmful impacts of these pollutants on the natural environment.

Our perspective has evolved from a strict focus on water quality alone to an integrated monitoring protocol that incorporates biological, water quality, habitat, and discharge monitoring. To successfully manage an ecosystem, a basic understanding of the system's biological components is critical. The members of a biological system respond cumulatively to a wide variety of factors, both natural and of human origin. When human actions adversely affect a system, biological populations will change, leading to an impaired or imbalanced community. Pollution-sensitive species will disappear, food webs will be disrupted, diversity of species will decrease, and undesirable nuisance species may dominate the community. Protection of ecological integrity requires four components: good water quality, natural discharge, appropriate habitat, and healthy biological communities.

a. What do we monitor?

Water Quality - In practical terms, water quality refers to the fitness of water for both human and natural uses, and can be described by concentrations of specific parameters (such as bacteria) or by the relation of observed concentrations to state standards (e.g., allowable levels of bacteria). The Clean Water Act requires states to conduct water quality surveys to determine if water resources are of sufficient quality to meet the designated use. Groundwater is regulated for potable use in the form of drinking water standards.

For the most part, surface waters in Alachua County are required to meet standards for recreational uses and the propagation and maintenance of healthy, well-balanced populations of fish and wildlife. In addition, there are several streams and lakes that require special protection as Outstanding Florida Waters (OFW) because of their exceptional richness of aquatic and wetland wildlife habitats. See Inset 10.

When groundwater emerges to land surface at a spring, the water is classified as surface water. Even though it is the same water, as surface water it is protected for different uses. Waters that interact, as Florida's groundwater and surface waters do, should be protected across the boundary between the two, and for all uses. Florida's water quality rules do not provide for protection that takes into account the unique interaction that naturally occurs between ground water and surface water at springs and sinks.

Plants - The numbers and diversity of the plants and animals that live in surface waters paint a picture of the water's health. A Floristic Quality Index for Florida is currently under development by FDEP scientists. Monitoring allows scientists to distinguish a water body's natural plant community from one that is out of balance. Changes in a water body's plant community is an early indicator of, for example, elevated nitrates. Nuisance algal mats and non-native species of rooted aquatic plants such as hydrilla have become increasingly common as high nitrate levels have become widespread in streams. Nuisance and non-native plants have caused adverse changes in many spring runs. These changes include the reduction of water flow, reduction in dissolved oxygen, and habitat changes. Monitoring is an important tool for distinguishing a natural spring-run plants community from one that has been affected by nitrate pollution.

Animals – Benthic macroinvertebrates are small animals without backbones that live on the bottoms of streambeds and within the plants that grow there. Many are juvenile forms of insects such as dragonflies and mayflies. Crayfish and other freshwater shellfish are also benthic macroinvertebrates. They are a critical link in the food web. These small animals do not respond directly to the nitrate enrichment so common in Florida's springs. They are, however, affected by changes in food quality, plant overgrowth, and decreased dissolved oxygen, all of which are caused by nitrate enrichment. They are also directly affected by pesticide contamination. Standardized methods for determining impairment exist and are in use in Alachua County.

Large aquatic vertebrates, such as birds or fish, are the last group adversely affected by changes in surface water quality. Their familiarity to casual observers and status at the top of the food web make this group worthy of limited monitoring efforts.

Spring and cave animals – Our spring caves harbor one of the richest underground aquatic faunas in North America. Many of Florida's spring and cave creatures are extremely rare. In fact, 22 Florida cave-dependent species are found nowhere else in the world. The FCREPA has recognized that most Florida spring and cave dependent species merit protection. However, currently only three species are protected under state or federal law. These populations of rare species are particularly vulnerable to changes in water quantity and quality, as well as to natural and manmade catastrophes. For instance, human-caused erosion may seal the entrances to these caves and may extinguish the species.

Inset 10. Surface Water Quality Classification

The Florida Department of Environmental Protection has developed a classification system for surface waters within the state. These classifications are arranged in order of the degree of protection required for each waterbody:

- | | |
|--------------|---|
| 1. CLASS I | Potable Water Supplies |
| 2. CLASS II | Shellfish Propagation or Harvesting |
| 3. CLASS III | Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife |
| 4. CLASS IV | Agricultural Water Supplies |
| 5. CLASS V | Navigation, Utility and Industrial Use |

Most waterbodies within Alachua County are designated as CLASS III waters. However, there are several streams and lakes that require special protection. Because of their exceptional richness of aquatic and wetland wildlife habitats, they have been classified as **Outstanding Florida Waters (OFWs)** by the state. In Alachua County, OFWs include waterbodies within:

1. San Felasco Hammock Preserve State Park
2. Paynes Prairie Preserve State Park
3. River Rise Preserve State Park
4. O'leno State Park

Within the OFW classification the following waterbodies are categorized as **special waters**:

- 1) Lochloosa Lake (including Little Lochloosa Lake, Lochloosa Lake Right Arm, and Lochloosa Creek upstream to County road 20(a).
- 2) Orange Lake up to the U.S Highway 301 Bridge, the River Styx up to Camps Canal, and Cross Creek.
- 3) Santa Fe River system - consisting of the Santa Fe River, Lake Santa Fe, Little Lake Santa Fe, Santa Fe Swamp, Olustee Creek, and the Ichetucknee River below S.R. 27, but excluding all other tributaries.

While water quality samples give snap shots of water quality, benthic macroinvertebrates act as continual natural monitors of environmental quality. Results from benthic sampling alone cannot distinguish between pollution and habitat problems. Habitat assessments look at stream characteristics that favor a healthy macroinvertebrate population. Water quality data, habitat assessments, and benthic sampling results can be used together to describe the overall health of a water system.

b. Who does the monitoring?

Since 1986, the County has maintained a groundwater monitoring network under contract with the state, pursuant to the Water Quality Assurance Act of 1983. Three phases of this ambient groundwater monitoring program consisted of a background network (79 wells) to evaluate water quality against EPA recommended standards for drinking water; a “Very Intense Study Area” network in the southwest urban area (19 sites) to evaluate impacts of land use on water quality; and a Background Temporal Variability Network (16 wells) to take more frequent samples of a subset of the background network wells. In addition, a high density unconfined Background Network was designed to focus on water quality in the aquifer-unconfined area.

Approximately 30 background wells were sampled every three years under this framework. However, beginning in 1998, the FDEP reconfigured its ambient groundwater monitoring program to include surface waters, resulting in decreased groundwater monitoring. The state program has dramatically reduced the number of wells in its network and now conducts two types of sampling, status and trend. As the name indicates, status sampling gives a broad picture or snapshot of water quality in a basin. Status network sampling is conducted every five years on randomly selected wells. Sites are sampled for a selected set of parameters based on the type of resource. For example, a lake resource would be sampled for chlorophyll while groundwater would not. Trend monitoring is also conducted; the sampling frequency is higher, but the number of samples is lower. Two groundwater sites have been identified for trend monitoring in Alachua County - one in the Floridan aquifer, and one in the intermediate aquifer.

The methodology for the state’s new approach is felt to be defensible statistically and will provide FDEP a regional look at water quality across the state. However, on a county-level, the reorganization means fewer, less frequent, and less consistent (due to the random nature of the sampling) groundwater monitoring. Sites sampled in 2000 and 2001 are identified in Map 23 for groundwater, Map 24 for lakes and Map 25 for streams.

In addition, Alachua County has monitored numerous surface water parameters since the late 1970s and early 1980s. Although the number and types of parameters have increased with scientific and technological advances, the number of sites monitored and frequency of monitoring has decreased. During the late 1980's the number of surface water sites monitored was also reduced from approximately 50 to 30 sites currently monitored under the ACEPD and SJRWMD programs. The focus of the ACEPD surface water program today is to monitor water quality and biological health in selected urban and rural streams not monitored by the water management districts. Since the SJRWMD monitors surface water quality in urban Gainesville as part of the Orange Creek Basin Study, ACEPD discontinued monitoring the urban creeks to avoid repetition and now focuses on surface waters in the SRWMD. Locations are expected to change through time to maximize coverage, as additional monitoring is conducted by various agencies including the SJRWMD, the SRWMD, and the FFWCC. See Map 26 for current sample locations.

For the County to begin to find the solutions to the problems identified in this section, it must have surface and ground water monitoring programs with sufficient flexibility, spatial coverage, breadth of parameters, and frequency/duration of sampling to address known and future problems in a scientifically supportable manner. As Alachua County continues to grow, this issue will become more and more important in finding an appropriate balance between economic development and natural resource protection.

2. Resource-specific strategies

a. Wellfield Protection

As of 1997, there were 22 community public water systems and four non-transient non-community public water systems in Alachua County, all of which draw water from the Floridan aquifer. Eight of these are municipal systems serving Alachua, Archer, Gainesville, Hawthorne, High Springs, Micanopy, Newberry, and Waldo. The remaining 14 community systems serve subdivision and mobile home parks. The four non-transient, non-community systems serve child care centers, an educational institution, and an industrial facility.

In 1995, a study of potential contamination sources near wellfield areas was conducted by the Alachua County Environmental Protection Department and reported in Final Project Report: A Comprehensive Contaminant Source and Well Inventory Near Wellfield Areas of Alachua County, March 25, 1996. The results of the study were (1) a contaminant source inventory of FDEP-regulated activities within the 500-foot setback distance identified in Chapter 62-521, Florida Administrative Code, and facilities regulated by Alachua County's Hazardous Materials Management Code within a one-mile radius of the identified 26 well systems, (2) a Floridan aquifer system comprehensive well inventory, a water level data collection program and potentiometric surface mapping, and (3) a review of existing federal, state, and local government files to obtain data on local aquifer hydraulic properties which were used to prepare County-wide maps of transmissivity, hydraulic conductivity, aquifer thickness, and confining unit thickness.

This project clearly defined the existing and potential risks for public water system contamination resulting from the close proximity of facilities with existing groundwater contamination, or the high potential of a discharge to soil or groundwater. It also identified the areas of highest concern for potential groundwater contamination, based upon a high number of facilities and the vulnerability of the Floridan aquifer system. A need for additional work was identified in four areas: (1) location of potential contamination sources County-wide, (2) long term aquifer tests to determine aquifer hydraulic characteristics, (3) evaluation of aquifer recharge in areas where the Floridan aquifer is confined, and (4) modeling wellhead protection areas for community and non-transient non-community water systems.

Current wellfield protection regulations are as follows:

- 1) The Murphree Wellfield Protection Code (Chapter 355 of the Alachua County Code) was developed to protect the primary water supply for the Gainesville Urban Area. This is a deep well system operated by the City of Gainesville that penetrates the Floridan Aquifer. The code regulates hazardous material transport and storage, well construction, and related activities in three protection zones around the Murphree Well Field.
- 2) The Hazardous Materials Management Code (Chapter 353 of the Alachua County Code) contains siting prohibitions for certain hazardous materials storage facilities within specified distances from public and private water supply wells.
- 3) Conservation Policy 4.5.2 in the Alachua County Comprehensive Plan provides for interim wellfield protection areas around public potable water supply wells serving at least 15 service connections or regularly serving at least 25 individuals daily at least 60 days out of the year and permitted to pump more than 100,000 gpd. These areas consist of a 200-foot exclusionary zone and a 200-400 foot restricted zone. These restrictions are to be replaced by permanent regulations once better data is available through modeling.
- 4) Conservation Policy 4.5.2 in the Alachua County Comprehensive Plan also provides for permanent wellfield protection areas around public potable water supply wells serving at least 15 service connections or regularly serving at least 25 individuals daily at least 60 days out of the year and permitted to pump less than 100,000 gpd. These areas also consist of a 200-foot exclusionary zone and a 200-400 foot restricted zone.

- 5) State Wellhead Protection rule, Chapter 62-521, FAC, implementing FS s. 403.061, restricts or prohibits certain uses within 500 feet of public water wells serving (1) at least 15 service connections used by year-round residents or regularly serving at least 25 year-round residents, or (2) at least 25 of the same persons over 6 months per year.

The Murphree Wellfield Protection Code was amended in the year 2000 to increase the size and extent of the existing wellfield protection zones based on hydrogeologic modeling (see Map 27). Criteria were added for well abandonment, backflow prevention, and testing. In addition, revisions to the code set up criteria for ACEPD to perform inventories of wells and non-residential septic systems. ACEPD has completed the initial stages of the well inventory and identified the potential for nearly 600 wells located within the protection zones. The code requires the proper abandonment of all wells not in use or which pose a threat to groundwater.

The current wellfield protection efforts need to be furthered by developing land development regulations for the other larger wellfields in the unincorporated area, and by working with the smaller municipalities to identify appropriate wellfield protection mechanisms for municipal wellfields in the smaller incorporated areas.

b. High Aquifer Recharge Protection

As described above, aquifer recharge can generally be defined as the replenishment of water in an aquifer system. There are two basic dimensions to the issue of recharge area protection: water quantity and water quality. From the quantity perspective, it is desirable to ensure enough recharge to sustain projected ground-water requirements for natural systems and the future population of the region. But in terms of water quality, recharge areas are sensitive zones, because water moving downward from the surface can transport contaminants to the aquifer.

Identification

Several studies have been conducted concerning aquifer recharge areas of Florida. As the most important source of potable water for the State, protection of the Floridan Aquifer has become a critical issue. The Alachua County Comprehensive Plan currently designates high aquifer recharge areas as those areas in the County where the Floridan Aquifer is unconfined or semi-confined. This method has the advantage of recognizing aquifer vulnerability in those areas where little or no clay confining layer exists between the ground surface and the aquifer.

Recharge rates depend on many variables, the most important of which are listed below:

- Permeability of surface soils and materials;
- Storage capacity of surface soils and materials;
- Elevation of the water table relative to the land surface;
- Elevation of the potentiometric surface relative to the land surface (confined aquifers);
- Rainfall frequency, duration and intensity;
- Rate of evapotranspiration;
- Vegetative cover, type and density
- Topography;
- Degree of development of natural surface drainage;
- Depth to the aquifer;
- Presence and nature of confining units;
- Hydraulic conductivity of the confining unit;
- Vertical hydraulic gradient; and
- Transmissivity and hydraulic gradient of the receiving aquifer.

Notice that some of the factors are interdependent, a fact that complicates the estimation of recharge. In general, the most productive recharge areas are uplands with highly permeable soils and poorly developed surface drainage. Most wetlands are not highly productive recharge areas, due to their tendency to hold

water above ground. Many wetlands are in fact discharge areas, where ground water seeps to the surface.

Areas of recharge to the Floridan aquifer in Alachua County have been mapped by numerous investigators, using a variety of methods, which have often led to conflicting results. Six of these efforts are described in Inset 11, and the maps associated with these efforts are shown on the following pages.

All parties recognize a lack of basic parameter data, rendering all existing modeling efforts very general in nature. While the SJRWMD model suggests the presence of high aquifer recharge areas even in areas where the Floridan aquifer is confined, the USGS conclusions estimate recharge rates to the Upper Floridan aquifer ranging from less than 12 inches per year in confined areas to 16-31 inches per year in unconfined areas, with semi-confined areas receiving intermediate amounts of recharge.

Additional studies are underway by various agencies, including the water management districts, to incorporate updated data and more accurately specifically identify these areas within their jurisdiction. The FDEP is currently revising the state's aquifer vulnerability mapping through a new program called Florida Aquifer Vulnerability Assessment (FAVA), which will be complete in approximately two years. FAVA accounts for karst and should represent a dramatic improvement in vulnerability mapping.

Before using any other mapping of high aquifer recharge areas in the County, more evaluation and analysis is needed. Alachua County has relied upon the 3-color map for the purposes of land use and development regulation over the last ten years. Policies relating to landfills, stormwater design, and hazardous materials management, and the Alachua County Hazardous Materials Code itself, require performance standards administered using the 3-color map (see policies 4.5.5, 4.5.6, 4.5.19). Because use of any of the more recent maps would result in the delineation of different high aquifer recharge areas than those currently adopted, policy 4.5.3 identifies the need for an updated recharge study to resolve potential discrepancies.

The County will coordinate a partnership with the USGS, WMDs, GRU, and other willing participants to perform the updated study, to be phased over the next four years at an estimated cost of \$90,000. Most of the cost would involve data collection and analysis, such as evapotranspiration studies and baseflow stream flow monitoring. Upon completion of the study, the Plan will be amended to adopt high aquifer recharge areas mapped as part of the updated study. Until more accurate information becomes available, the County is utilizing the Aquifer Confinement Zones, mapped by the Florida Geological Survey (Open File Report No. 21, 1988), as the basis for adopting regulations for the protection of aquifer recharge areas.

Regulations

State law requires the Comprehensive Plan to include objectives and policies that protect the functions of natural groundwater recharge areas and natural drainage features (see F.A.C. 9J-5.011(2)). Several policies in this element require groundwater protection for all of Alachua County (see 4.5.8-4.5.16, 4.4.4-4.4.6), and particularly earmark high aquifer recharge areas for increased protection (see 4.5.5, 4.5.6 and 4.5.19). In addition, the **Hazardous Materials Management Code** provides restrictions on hazardous materials applicable to aquifer-unconfined and/or semi-confined areas of the County. In the unconfined area (Western Alachua County), certain hazardous materials considered unsuitable due to their volatile nature or potential as severe groundwater contaminants are prohibited. The Code also prescribes containment standards, limits on the types and amounts of hazardous materials that may be stored, operating procedures including handling and transport, methods for monitoring and inspections, and emergency procedures.

Inset 11: High Aquifer Recharge Identification

FGS Aquifer Confinement [Map 16]

FGS Open File Report 21, "Geologic Interpretation of the Aquifer Pollution Potential in Alachua County, Florida" contains a map three areas of relative confinement of the Floridan aquifer in Alachua County. This report was published in 1988. Based on this map, high aquifer recharge areas are identified as areas where the Floridan aquifer is unconfined or semi-confined, as well as stream-to-sink basins. This includes most of the western half of Alachua County.

SJRWMD Annual Recharge [Map 28]

In 1993, the SJRWMD published a report on aquifer recharge entitled, "Mapping Recharge to the Floridan Aquifer System Using a Geographic Information System." An outgrowth of this report was the creation of a map of recharge areas to the Floridan Aquifer in Alachua County. This map depicts five ranges of recharge/discharge based on calculations using generalized, District-wide data. High aquifer recharge areas are identified as areas of annual recharge greater than or equal to eight inches per year. According to this map, high aquifer recharge areas potentially include a much larger portion north of Gainesville (between US 441 and SR 24), and east of US 301 (Orange Heights, Melrose, Campville vicinity) than the FGS map. However, use of this map would exclude much of the semi-confined portion south of Gainesville to Micanopy (between US 441 and CR 234 around Paynes Prairie).

SRWMD Recharge Potential [Map 29]

In 1994, the SRWMD published a report entitled "Recharge Potential of the Floridan Aquifer in the Suwannee River Water Management District." This report identifies on a qualitative color scale, from high to low, six areas of potential recharge/discharge to the Floridan Aquifer. As with the FGS map, most of the western portion of Alachua County is identified as high aquifer recharge, and most of the eastern portion of the County is excluded as low recharge.

USGS Recharge Study [Map 30]

The SRWMD contracted with the USGS to conduct another recharge study. The outcome of the study was USGS WRI Report 97-4283, "Recharge Rates to the Upper Floridan Aquifer in the Suwannee River Water Management District, Florida." This study includes a map of aquifer confinement akin to the FGS map. However, portions of Alachua County identified as unconfined and poorly confined are larger in geographic extent than those depicted on the FGS map. For example, while the southeastern portion of the County is identified as unconfined and poorly confined in the USGS map, the same area is depicted as confined in the FGS map. Based on degrees of confinement, recharge is estimated at 16-31 inches per year in unconfined areas.

DRASTIC [Map 31]

In addition, a fifth analysis, DRASTIC, has been performed by FDEP to map the hydrogeologic pollution potential of Alachua County. Hydrogeologic settings form the basis of the system and incorporate the major hydrogeologic factors which affect and control ground water movement including: the Depth to water table, net Recharge to the Aaquifer, Soil media, Topography, Impact of the vadose zone, and hydraulic Conductivity of the aquifer. The application of the DRASTIC system to the Floridan Aquifer in Alachua County has generated a map with symbols and colors which illustrate the areas of ground water vulnerability to contamination (Aller, 1985). The map identifies areas of high aquifer recharge that coincide fairly closely to the County's designation of unconfined and semi-confined areas of the aquifer.

NCFRPC's Composite Map [Map 32]

Yet another effort to identify recharge areas appears in the North Central Florida Regional Planning Council's Strategic Regional Policy Plan (SRPP), amended August 28, 1997. Its map of Regionally Significant Ground Water Resources synthesizes data from various sources, some of which are described above. The NCFRPC emphasizes that the map has been prepared as part of a strategic regional planning program and should be used only in conjunction with the text of the SRPP.

Bluebelt Ordinance

In recognition that Florida's groundwater is among the state's most precious and basic natural resources, the Florida Legislature created the Bluebelt Act of 1996 (Section 193.625, Florida Statutes) as an attempt to create private incentives for groundwater protection. This state law authorizes a voluntary tax assessment ("bluebelt") program that allows a tax reduction in high-water recharge areas. High-water recharge lands are those areas that contribute significant groundwater recharge to underlying aquifer systems, as determined by the appropriate water management district based on the hydrologic characteristics of the soils and the underlying geologic formations.

Eligible lands must be identified by one of two methods: (1) prime groundwater recharge areas established pursuant to F.S. 373.0395 ("groundwater basin resource availability inventory"); or (2) areas considered by the WMDs to supply significant groundwater recharge. The first method is not available for Alachua County. While the water management districts have provided a map that identifies "significant groundwater recharge" areas, the County is not satisfied with use of that map to implement the ordinance, given the mapping issues discussed above. Policy 4.5.4 indicates the bluebelt assessment will be considered on completion of updated study.

The bluebelt ordinance is an example of a tax incentive that is intended to encourage conservation and protection of natural resources, which is encouraged by Alachua County's comprehensive plan. A draft bluebelt ordinance is essentially ready to be advertised for public hearing in terms of format. However, several areas of concern must be addressed before proceeding. It should be noted that the legislature did not provide for the state to reimburse the counties for lost tax revenues under the program. In addition to reduced tax revenue, there are problematic issues related to potential undesired effects on land use patterns and land conservation initiatives, and quantifying the environmental benefit. There are specific policy issues where flexibility may be exercised by the Board, and no consensus has been reached on the combination of variables (minimum acreage requirements, length of contract, amount of tax reduction, eligible land use classifications) that would yield the desired outcome.

c. Springshed management

Florida's water quality rules do not provide for protection that takes into account the unique interaction that naturally occurs between ground water and surface water at springs. Waters that interact, as Florida's groundwater and surface waters do, should be protected across the boundary between the two, and for all uses. What is known to date must be considered in attempting to address the problem before it is too late. There are three fundamental tenets upon which the Florida Springs Task Group suggests we base our management strategies.

- (1) A spring is only as healthy as its recharge basin, or "springshed."
- (2) Activities within springsheds can and do have adverse impacts upon the quality and quantity of groundwater, thereby affecting spring flow, water quality, and the health of spring-run ecosystems.
- (3) Protection of spring water must occur in the springshed before the water reaches the spring.

Critical parcels of land around or within springsheds must be protected. Through a combination of public education, intergovernmental coordination, regulations, incentives, and voluntary purchase or conservation easements, land necessary for the survival of springs can be acquired or properly managed. When residents appreciate the springs, are aware that a problem exists, and understand how their actions affect not only the springs but their drinking water, they are motivated to help.

The Florida Springs Task Force recommends the creation of zones of special consideration for land use planning or regulation, according to model protocol for the development of wellhead protection areas and groundwater capture zones. Springsheds and areas that drain into sinkholes and other karst features should be included in these zones of protection via ordinances and land development regulations. Within these zones, the following should be required:

- a minimum 100-foot buffer around sinkholes and other karst features that are connected to spring conduits
- extension of OFW protections for streams and karst features that are known to have hydrologic connections to OFWs
- alternative OSTDS technologies, which are currently capable of removing up to 75% of nitrogen from OSTDS effluent; with mandatory OSTDS inspection and maintenance every five years or on sale of the property.
- limited or discontinued use of fertilizer
- tree preservation and landscaping standards that reduce water and fertilizer consumption. Native vegetation should be preserved as much as possible when land is cleared for residential development. Where native vegetation is not preserved, promote the use of plants that require a minimum of water. Minimize turf areas in landscape design and in common areas within subdivisions. Intersperse turf around large areas of native vegetation that is adapted to Florida soils and does not require fertilizer. Limit the area devoted to lawns (to reduce the need for fertilizer) and impervious surfaces (to reduce runoff).
- agricultural and silvicultural best management practices.

As Alachua County looks to protect its springs, we should consider each of these strategies sooner rather than later. The effects of chemical contamination on spring life, including submerged cave life, is not well known – much about the life cycles of these animals has yet to be learned. The known range of many of these species is limited to a few or only one spring system. Thus, entire species are highly vulnerable, with their survival totally dependent on a continuing supply of clean water.

Although certain land uses, such as landfills, are obviously unsuitable for sensitive karst areas and springsheds, where to draw the line, short of leaving all land in its natural state, remains a question. The challenges ahead include controlling high intensity land uses in the springsheds, reducing the use of fertilizers on residential lawns, golf courses and pastures, and insuring that the withdrawal of groundwater from springsheds will not reduce spring flow.

d. Surface waters and wetlands protection/restoration

The Santa Fe River, as well as other streams, creeks, lakes, and ponds are important natural and community resources that serve as scenic and recreational amenities while performing a number of beneficial environmental functions. They serve as important fisheries and as parts of wildlife habitat mosaics, providing sources of food for a variety of wildlife, including listed species such as osprey and southern bald eagle. Wetlands and their surrounding uplands also serve as natural buffers from development, filtering and attenuating stormwater and providing reliable aquifer recharge. Recreation opportunities along lakes and streams in Alachua County include fishing, boating, canoeing, swimming, windsurfing and other aquatic recreation activities. In the future it will be important to balance the demand for additional recreational access to water resource areas with the maintenance of sufficient undisturbed habitat and feeding areas for the numerous wildlife species in the County.

Surface waters and wetlands are protected in accordance with the Alachua County Surface Waters and Wetlands Code (Alachua County Code, Chapter 359, adopted 1992). The ordinance defines wetlands without reference to size and prohibits development activity adjacent to or connected to a surface water or wetland areas that would alter the surface water or hydroperiod necessary to sustain wetland structure and function equivalent to predevelopment levels. In addition, Newnans, Orange, Santa Fe, and other lakes are ‘managed’ as sovereign submerged lands by the state. There are currently no land use or management guidelines specific to lakes in effect County-wide.

Please see the Wetland Ecosystems section of this data and analysis for more specific discussion of techniques to minimize and mitigate impacts, buffers, financial incentives, cost-share and certification programs, and education and outreach.

Rivers and lakes are an important part of Alachua County's natural heritage, and the maintenance of their integrity is crucial. Management objectives must be realistic; lakes must be managed to produce the most feasible mix of multiple uses conducive to maintaining the desired level of environmental quality for any given lake. Generally, it is more economically feasible to maintain a natural resource in its existing state than attempt to restore it from a degraded condition. Therefore, the County's management objective should be to establish a process wherein a lake's existing environmental quality can be identified, and performance standards and criteria applied such that beneficial lake functions are maintained and, where feasible, restored.

The County has also established several policies relevant to lakes and streams. However, despite the amount of information available, there is not a significant database for a vast majority of the County's lakes and streams, and many lakes are becoming eutrophic at an accelerated rate, with potential for ecosystem collapse.

Invasive vegetation control

One of the undesirable water quality trends that has been identified in Alachua County is excessive algal and invasive plant growth in local surface waters, primarily due to increased concentrations of nitrogen and phosphorus. ACEPD is leading several efforts targeted at control and elimination of invasive vegetation. Special projects include aquatic weed management at Bivens Arm, an invasive plant inventory at Lake Santa Fe (with Adopt a River), and a revegetation project at Lake Lochloosa (with FFWCC).

Under the Bivens Arm program, hydrilla control has been achieved through an extensive grass carp release in 1999/2000, eliminating the need for chemical control. The area is currently under maintenance control for water lettuce/hyacinth. Grass carp are affecting plants by eating roots. Work to commence on wild taro control in spring 2002 in cooperation with UF Center for Aquatic and Invasive Plants. Pilot work will be performed on the UF area of the lake.

Watershed cleanups

In addition, Current Problems, Inc. programs were established in Alachua County to take an active role in helping to keep our waterways free of litter. The Adopt A River and Up the Creek! programs conduct waterway cleanups in the Santa Fe River and Orange Creek Basins. The Adopt A Shore and Up The Creek! programs both provide for ongoing litter abatement work by adopting out stretches of river, creek, or shoreline to caring citizens who live on or nearby these waterways. Up The Creek! focuses on Gainesville's urban creeks, while Adopt A River works throughout the County. Up The Creek! also conducts storm drain marking projects.

Current Problems also offers environmental education presentations about our region's aquatic systems and the threats to our waters at schools, libraries, and organization meetings.

e. Floodprone areas

It is the County's objective to protect and maintain the natural functions of the 100-year flood plain. Floodplain areas serve as important reserve areas to store floodwaters during various magnitude storm events. In their natural state, they also act as some of the most important wildlife habitat areas and movement corridors in Alachua County. Water purification and water supply are other important functions of floodplains. Protection of public health and safety and natural systems are dual goals.

The eastern lakes area of the County still contain large wetlands, floodplains and wildlife refuge areas that support many specialized plant and animals species. Policies under Objective 4.8 seek to protect riparian and wetland habitats in the County while allowing compatible uses where appropriate. The County will support the management of wetland and riparian plant communities for passive recreation, groundwater recharge, nutrient storage, and wildlife habitats.

Policy language encourages the development of a comprehensive watershed management program. The purpose is to identify and map the 100-year floodplain, evaluate the flood-handling capacities of natural drainage systems, maintain and enhance water quality, protect natural ecosystems, develop floodplain management guidelines, incorporate watershed information into a data base system, protect the hydrologic functions of the 100-year floodplain by prohibiting fill in a flood prone area without mitigation.

Identification

The 100-year floodplain in Alachua County has been delineated by various agencies, including the Federal Emergency Management Agency (FEMA), the U.S. Geological Survey (USGS), the Army Corps of Engineers (ACE), and the North Central Florida Regional Planning Council (NCFRPC). The County utilizes all these sources as well as onsite investigations to determine 100-year flood elevations. The County adopts by reference the FEMA maps for purposes of identifying flood-prone areas (see Map 33). Recent flood conditions have resulted in a call for reevaluation of FEMA floodplain mapping. Updated mapping should be available in digitized format by the end of 2002.

Acquisition

The County will work toward the acquisition by public agencies or private non-profit conservation organizations of creek corridors, wetland, meadows, and areas rich in wildlife or of a fragile ecological nature as public open space where such areas cannot effectively be preserved through the regulatory process. Such protection may take the form of fee acquisition or protective easements and may be carried out in cooperation with other local, state, and federal agencies and private entities. Acquisition will include provisions for maintenance and management in perpetuity.

Regulations

The County regulates development in the 100-year floodplain by designating these areas as Conservation areas. Development is required to cluster on upland portions of the property and minimize impacts on the conservation resource. The County also regulates development activity in 100-year floodprone areas in order to protect public safety by maintaining flood carrying capacity.

This is accomplished through the provisions of Alachua County Code, Chapter 342 (Flood Hazard Areas) and by prohibiting subdivision of land after 1/21/93 that would create new lots lacking sufficient buildable area as defined by setback requirements and other development standards, outside of the 100-year floodprone areas. If any lots in a proposed subdivision lack sufficient buildable area outside the flood prone area, the lots must be enlarged or otherwise reconfigured until the requirement is met.

In addition, County regulations require that the SRWMD and SJRWMD shall be notified of all development proposals within the 100-year floodplain of the Santa Fe River. Rule 64E-6.007(2), FAC, regulates location of septic system drainfields within the 10-year floodplain of rivers, streams, and other bodies of flowing water. The vegetative buffer overlay district also regulates development activity within 660 feet of Preservation areas in order to protect the natural functions of these areas (Preservation lands are lands held in public ownership for conservation/preservation purposes). Within the 660 foot buffer, a variable-width setback may be required, limiting permitted uses in order to attenuate visual, noise, herbicide and pesticide, listed species habitat, or water quality or quality impacts on the adjacent Preservation lands.

Other County activities directly or indirectly aimed at protecting floodprone areas include (1) County monitoring of the use of County-owned facilities at Poe Springs, partially located within the 100-year floodplain of the Santa Fe River, (2) participation by Alachua County Superintendent of Parks on SRWMD's Land Management Review Team, planning for recreational use of SRWMD-owned properties; and (3) completion of a County-sponsored ecological inventory of significant natural areas which included many areas subject to periodic flooding.

Currently, the County is divided into three stormwater management districts, with a County public works supervisor monitoring stormwater management and needs in each district. No comprehensive watershed management program has been implemented or is planned with respect to stormwater due to lack of available funding. The County implements individual watershed management plans as the need arises. Alachua County's approach to issues relating to flood prone areas is primarily need-based and reactive in nature due to funding constraints. If future developments point to a need for a more proactive stance on stormwater-related issues, a source of funding for needed activities will have to be identified.

3. Pollutant-source strategies

a. Stormwater

Stormwater is a major source of pollutants to lakes, streams, and creeks. Unlike domestic or industrial sources, stormwater is a nonpoint pollution. Undeveloped uplands and wetland systems help maintain good water quality by filtering, settling and/or assimilating these pollutants as stormwater flows through and across them. Land development with its accompanying increased impervious surfaces (roads and roof tops) fundamentally disrupts the natural treatment of rainfall and runoff. The quantity of runoff and rate of runoff is increased because roads and storm sewers provide a direct, unimpeded conduit to the receiving water. The problem is further compounded because there is less vegetation which results in lower nutrient uptake/assimilation. Thus, stormwater is laden with nutrients which are readily available to aquatic vegetation and algae, exacerbating the eutrophication problems evident in our lakes and streams.

The state first began regulating stormwater discharges in 1980s because of flooding and water quality impacts from stormwater. The stormwater rule required that new development include stormwater treatment systems, such as retention basins and detention ponds, to remove pollutants. In 1992, Alachua County adopted stormwater management regulations (Alachua County Code ch.343) to provide standards for the design, construction, and operation of stormwater management systems. Best overall management practices, as they existed at the time, were required to address the control of runoff volume and treatment of stormwater runoff for the protection of surface water and groundwater quality, and for the control and prevention of erosion, sedimentation, and flooding. New development plans must include stormwater management system designs documenting the location of the 100-year floodplain, if applicable, and providing for the creation of a Homeowner's Association to maintain these systems. Alternatively, a regional stormwater benefit assessment district may be created to address stormwater management needs on a regional basis and assess properties benefitted by any improvements.

Stormwater management remains a priority issue in the urban portions of the County, where runoff and discharges from construction activity, small municipal separate stormwater systems, industrial stormwater systems, and combined sewer overflows threaten surface and ground water quality. Updated best management practices, many employing land use controls, offer an important strategy for controlling these risks. Stormwater should be considered a water resource instead of a waste product, with natural attenuation, infiltration, and recharge promoted over collection, transport, storage, treatment and discharge.

Karst areas

In certain karst areas of western Alachua County, the limestone that contains the Floridan Aquifer is at or near the land surface and can be easily contaminated. The most common system used in karst areas is dry retention basins. Dry retention basins treat stormwater by percolating runoff into the ground beneath the basin. As runoff passes through soil, filtration, adsorption, and biological removal of contaminants occurs.

After a few years, it became apparent that special considerations were warranted when stormwater systems were sited in certain karst areas of the SJRWMD. There is concern in these areas by the tendency of solution-pipe sinkholes to form in the bottom of some stormwater basins. When a solution pipe forms, it creates a direct connection between the bottom of the basin, where pollutants are concentrated, and the aquifer below. Runoff entering the aquifer by this route bypasses treatment. To address the problem, SJRWMD adopted more stringent criteria within sensitive karst areas of western Alachua County. These criteria are incorporated by reference in Chapter 343 of the Alachua County Code, Stormwater Management. These include: Ch. 40B-4, FAC (SRWMD); Ch. 62-25, 40, FAC (FDEP); Ch. 40C-42, FAC (SJRWMD). Alachua County Code sec. 343.07(c)(4) provides alternative stormwater treatment and basin design standards for karst areas of the County.

NPDES Permits

Polluted storm water runoff is often transported to municipal separate storm sewer systems ("MS4s") and ultimately discharged into local rivers and streams without treatment. A municipal separate storm sewer system (MS4) is a publicly-owned conveyance or system that is designed for the discharge of stormwater to surface waters of the State.

EPA's Storm Water Phase I & II Rules established an MS4 storm water management program that is intended to improve the nation's waterways by reducing the quantity of pollutants that storm water picks up and carries into storm sewer systems during storm events. Phase I Permits cover discharges from "medium" and "large" MS4s (i.e., those MS4s located in areas with populations of 100,000 or greater). Phase II Permits cover discharges from certain "small" MS4s. Regulated MS4 operators must obtain an NPDES stormwater permit and implement appropriate pollution prevention techniques to reduce the contamination of stormwater runoff and prohibit illicit discharges to the MS4. All large and medium MS4s are currently permitted. Regulated small MS4s will have until March 10, 2003 to obtain permit coverage.

Operators of regulated MS4s, including Alachua County and the City of Gainesville, are required to obtain a permit and implement a program to reduce the discharge of pollutants to the "maximum extent practicable" (MEP). Implementation of the MEP standard will typically require the development and implementation of Best Management Practices (BMP) and the achievement of measurable goals to satisfy the following six minimum control measures:

1. Public Education and Outreach
2. Public Participation/Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Control
6. Pollution Prevention/Good Housekeeping

The County's proposed Water Quality Ordinance includes language to address two of these control measures: illicit discharge detection and elimination and construction site runoff control.

b. Fertilizer Use

Various land uses within watersheds can contribute to the pollution of groundwater and surface waters from nutrients, primarily phosphorus and nitrogen. BMPs for all land uses should be evaluated for effectiveness in water quality protection. Strategies to increase the efficiency of fertilizer use, and reduce the need for fertilizers, are essential to the survival of surface water systems.

Agricultural activities are known sources of nutrients from animal waste and commercial fertilizers. There is a concern that application of fertilizers and pesticides in karst areas and adjacent to surface waters may affect water quality. The effectiveness of Silviculture BMPs for groundwater protection needs to be evaluated. Based on scientific evidence, BMPs should be modified as necessary to achieve appropriate resource protection. Implementation of BMPs is necessary for protection of water quality.

This includes implementation of Landscape Fertilization BMPs, Florida Yards and Neighborhoods program to educate large groups (garden clubs, retailers, lawn care service companies) on the importance of the use of slow-release fertilizers for residential lawns and gardens as more effective.

With the increasing popularity of golf, and Florida's growing population, many new golf courses are being built in the state. Over 1,500 course, representing over 200,000 acres of land use, exist in Florida in the year 2000. Studies have shown that chemicals used on golf course can contaminate groundwater and surface water resources. The use of BMPs in the operation and maintenance of golf courses can reduce the potential for negative impacts to water resources. An integrated pest management plan (IPMP) is the cornerstone of environmentally responsible golf course management. An IPMP guides golf course

managers in the responsible storage, handling, and application of chemicals and in the use of native vegetation in golf course landscape plans. Ideally, IPMPs include water quality monitoring programs.

c. Wastewater treatment program

Chapter 363, Article IV of the Alachua County Code (Wastewater and Wastewater Treatment Facilities Ordinance) provides for the regulation, monitoring, and inspection of wastewater treatment facilities by requiring special use permits and establishing treatment facility design and effluent disposal standards. Four general types of treated wastewater disposal are allowed; these include deep well injection, disposal into surface waters, disposal into percolation ponds, and spray irrigation. The County currently monitors and inspects facilities with a monthly visual inspection and a bi-monthly (six times per year) testing. Monitoring data is provided to FDEP, Jacksonville office, which provides any enforcement action required, usually as a result of chronic non-compliance.

A 1998 draft report on ACEPD's Wastewater Treatment Plant Monitoring Program has been prepared to determine its effectiveness in meeting Florida and Alachua County regulations governing the operation of effluent treatment facilities within Alachua County. Total effluent design flow of all WWTPs permitted in the County is 22.4 million gallons per day (mgd).

There are nearly thirty treatment plants in Alachua County, which run the gamut from two large plants maintained by Gainesville Regional Utilities to smaller facilities serving seasonal or special event needs. See Map 34 for locations of wastewater treatment plants in Alachua County. Numerous plants experience chronic violations. ACEPD is working with TREEO to assess options for five problem plants, including: Hillcrest Mobile Home Park, Brittany Estates, Prairie View Apartments, Arredondo Mobile Home Park, and Gainesville Raceway.. The problems are generally related to poor plant operation and maintenance. FDEP is currently monitoring these plants closely and has taken enforcement action against Hillcrest Mobile Home Park. Plans are to encourage connection to GRU, where feasible, find funding sources to assist plants with connection costs, work with FDEP to include connection provisions in plant permits, and research additional options.

In addition, four plants will be removed from service by the summer of 2003 when they are connected to the municipal plants in the Cities of Alachua (Turkey Creek and Progress Mobile Home Park) and Hawthorne (Sonny's and Texaco Food Mart). Two new wastewater treatment plants are planned in the High Springs area.

The County will be revising the wastewater treatment plant code to decrease monitoring frequency from bimonthly to quarterly, in conjunction with more stringent inspections and the addition of ticketing authority for permit violations.

d. Septic tank regulation

Chapter 64E-6, Florida Administrative Code, implemented by the Florida Department of Health county health departments, establishes standards for on-site sewage treatment and disposal systems (OSTDS). These standards apply throughout the state as minimum standards, although local governments are free to apply stricter standards if they choose. The regulations include a permitting requirement and standards for location, site evaluation, system size, system type, and other requirements. In floodways, the bottom of the drainfield must be elevated above the 10-year flood level. For lots created before 1/17/90 and not meeting this requirement, however, a permit may be obtained if the lot is at least one-half acre in size and the bottom of the drainfield is at least 36 inches above the two-year flood level and the applicant installs certain alternative technologies.

In a 1991 report prepared by Henigar and Ray Engineering Associates, Inc., for SFWMD entitled Placement and Maintenance of Individual Septic Systems (On-Site Disposal Systems), some issues were identified as potentially applicable in many areas of Florida. These included minimum required distance between septic systems and private drinking water wells, the importance of the minimum 24-inch unsaturated zone beneath drainfields, septic tank density limitations, system maintenance issues, and the importance of public education. There have been numerous changes in septic system regulations since 1991 (e.g., increasing performance standards).

There is no conclusive evidence, however, that state rules governing septic system placement are adequate for eliminating the likelihood of groundwater pollution, particularly in areas of demonstrated high recharge/contamination potential. The question of whether or not existing locational standards and operational procedures is unresolved, but there is mounting evidence that poorly sited and maintained septic systems and disposal of septage and other sewerage by-products may lead to increased water quality problems.

In 1999, the Florida legislature began a state-wide review of current septic tank regulations. The ACEPD has assisted with the submittal of surveys and other information. ACEPD has also provided technical assistance to Alachua County Public Health personnel in regards to their review of existing septic tank regulation. See the Potable Water/Sanitary Sewer Element for more information on this subject. The County will work to improve the siting and operation and maintenance of these systems, and enforce requirements for connections to central facilities where available.

e. Private well regulation

According to one estimate in the Potable Water and Sanitary Sewer Element, there were approximately 20,000 private wells in use in Alachua County in the year 2000. Each of these wells represents a potential avenue for contamination of the surficial, intermediate, and Floridan aquifers. Improperly constructed or abandoned wells can provide opportunities for water supply contamination and aquifer interconnection, especially for larger wells used for public water supply, industrial, and irrigation purposes. To address this potential, the ACEPD performs some limited oversight of private wells in order to protect groundwater quality for public health, safety and welfare, and to ensure that the viability and functional values of other natural resources are maintained.

Pursuant to the Well Registration Code (Chapter 356 of the Alachua County Code), registration with ACEPD is required prior to construction, modification, or proper abandonment of any well less than 6" in diameter within the SJRWMD. This regulation is intended to supplement the existing regulations of other agencies. The SJRWMD currently permits wells greater than or equal to six inches in diameter and any size public supply well. The SRWMD currently permits all wells. The Alachua County Public Health Unit inspects and permits well construction, primarily to eliminate contamination from nearby septic tanks. See the Potable Water and Sanitary Sewer Element for more discussion of private wells.

f. Mining and excavation

The current Surface Mining/Reclamation Ordinance (Alachua County Code, Ch. 352) has been effect for over 20 years. It requires a special use permit for new or expanded mining operations. Application requirements include identification of wetlands, soil types, aquifer recharge areas, depth to ground water, drainage plans, and a reclamation plan, among other things. To protect groundwater resources, mining operations are limited to maximum water withdrawals of 500 gallons per minute without a hydrological investigation. To protect surface waters and floodplains, mining activities may not occur within 100 feet of the 100-year floodplain of a flowing stream or natural lake. Surface water drainage must be free of pollutants and directed away from any groundwater connection. Impacts on water quality and quantity in aquifers to be intercepted by the mining operation must be evaluated.

The County also regulates excavation and fill activities through its zoning regulations (Alachua County Code, sec. 393.13), requiring a Special Use Permit for these activities. Policies in the “Mineral Resources” section of this element call for a comprehensive review and revision of all regulations that address mining, land excavation, and filling activities to ensure comprehensive natural resources protection and consistency with state law.

g. Hazardous materials

In 2001, there are over 1,000 hazardous materials facilities regulated under the County’s Hazardous Materials Management Code. Each poses a different potential threat to the environment. The regulatory permitting process seeks to control this potential harm by setting strict locational, construction and maintenance standards for these facilities. Inspections are conducted to ensure compliance.

A "Pollution Source Network" has been compiled for Alachua County that contains 952 sites with actual or potential polluting capability. Most of these are hazardous waste generators (456) and underground storage tank facilities (432). Other sites include wastewater treatment plants, abandoned dumps, and landfills.

The FDEP "Early Detection Incentive Program" (EDI) was established under the State Underground Petroleum Environmental Response Act of 1986. EDI was designed to encourage early detection, reporting and cleanup of petroleum contamination from leaking underground storage systems. Currently, there are approximately 310 petroleum contaminated sites in Alachua County - up from the original 60 sites reported - in all phases of cleanup. Since the establishment of the petroleum program in the County in 1988, 78 facilities have been cleaned up, and 104 facilities have been prioritized for clean up. Priorities are based on several factors including the extent of contamination and potential endangerment to drinking water and other critical natural resources. The number of facilities being cleaned up has been increasing steadily with time. The risk of new discharges of petroleum products is considered to have decreased with the requirement for use of double walled tanks.

Dry-cleaning facilities are another significant source of industrial water pollution. Tetrachloroethylene is a chlorinated solvent used and, in the past, released into the groundwater by dry cleaning facilities. This solvent is considered to be less biodegradable than petroleum products and more of a threat to groundwater quality. However, the threat is relatively low in Alachua County where the numbers of dry-cleaning sites is low. The County works with the FDEP under the state’s dry cleaning solvent remediation program to address these sites.

There are several large industrial sites associated with water pollution of our surface waters and groundwaters. Two of the more well known contamination sites are the Cabot Carbon/Koppers Superfund Site in Gainesville, which has contaminated the surficial and intermediate aquifers, as well as Hogtown Creek, and the Florida Department of Transportation (FDOT) disposal pit in Fairbanks. These sites are undergoing remediation. More details are provided in the Hazardous Materials Section.

A total of twenty-nine dump sites have been identified in Alachua County. Many of these sites were used for landfilling by small municipalities such as Alachua, Archer, Waldo, Hawthorne, Newberry, High Springs, LaCrosse, Windsor, Orange Heights, and Arredondo. Although these sites have not been extensively investigated, they are generally less than ten acres in size and were used primarily for municipal refuse. The potential for industrially generated hazardous waste is felt to be minimal.

Many other small dump sites are located throughout the County. ACEPD receives information regarding dumping primarily in the form of complaints. These small dump sites are primarily a litter problem. County staff inspect the sites and usually refer them to codes enforcement. The owner of the dump site property is responsible for cleaning up the site. Any sites found that appear to contain hazardous wastes are referred to appropriate outside agencies (i.e., FDEP, EPA).

There are continued concerns about the potential impacts of construction and demolition (C&D) landfills on groundwater. There is particularly a need for environmental monitoring of these landfills and specifically a need for funding of an inspector to monitor these and other uses with potential environmental impacts. Although a new state rule has strengthened state regulation of C&D landfills, the rule exempts "clean fill" operations which will need heightened review to ensure environmentally safe operations. See the Hazardous Materials and Solid Waste section for further discussion.

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NATURAL RESOURCES WETLAND ECOSYSTEMS

A. Introduction

Paynes Prairie is a 21,000-acre preserve that is among the most significant natural and historic areas in Florida. In 1774, noted artist and naturalist, William Bartram wrote a detailed description of this area. He called it the "great Alachua Savannah." Within this national landmark, twenty distinct biological communities such as wet prairie, pine flatwoods, hammocks, swamp and ponds, provide a rich array of habitats for animal life. Most of the animal life Bartram described may still be found here today, including sandhill cranes, eagles, hawks, waterfowl, wading birds, alligators and otters.

"Wetlands" is the collective term for marshes, swamps, bogs, and similar areas, including many of those found within the landscape of Paynes Prairie. Wetlands are found in flat vegetated areas, in depressions on the landscape, and between water and dry land along the edges of streams, rivers, lakes, and coastlines. Wetlands occupy a specialized niche between land and surface water, where the water table is usually at or near the surface, and plants and animals abound.

In their natural state, wetlands perform ecological functions that are vitally important to the environment and economic health of the nation and impossible or costly to replace. Nevertheless, wetlands historically have been viewed as mosquito-ridden wastelands and impediments to development because of their saturated and frequently flooded conditions. The importance of wetlands to fish and wildlife, clean water, and flood control has gone largely unappreciated as draining and filling operations have destroyed more than 50% of wetlands nationwide. At the time of the nation's settlement, wetlands represented approximately 221 million acres of the land area in the lower 48 states. By 1997, only 105.5 million acres remained, leaving just 47.7 % of the original wetland acreage. Wetlands now occupy about 5.5% of the land surface of the lower 48 states (Dahl 2000).

Wetland losses have varied over time. Between the mid-1950s and the mid-1970s, the nation experienced a net loss of 9 million acres of wetland, an area about twice the size of New Jersey. This represents an annual loss of approximately 458,000 acres. Agricultural development was responsible for 87% of the national losses while urban development and other development caused 8% and 5% of the losses, respectively.

During the period from 1986 to 1997, the estimated total net loss of wetlands was 644,000 acres, representing an annual loss of 58,000 acres. This is a significant decline in the rate of loss as compared to the period of 1950 to 1970. Between 1986-1997, urban development accounted for an estimated 30% of all losses, with agriculture responsible for 26%, silvicultural activities 23%, and 21% attributed to rural development (Dahl, 2000). The rate of loss to agricultural activities declined markedly during this period, which is attributed to the "Swampbuster" provisions of the 1985 Food Security Act and agricultural set-aside programs. Changes were made in farm policy after 1990 resulting in less focus on the protection of wetlands.

Historically, Florida's wetlands have followed national trends in being drained and filled for agriculture and urban uses. To illustrate, from 1780 to 1980, Florida lost 9.3 million acres or 46% of estimated wetlands acreage (Dahl, 1990). Since that time, regional studies indicate that continued development has led to further impacts to wetlands and surface waters. For example, an analysis conducted by the

SJRWMD found that 51,300 wetland acres within the district were lost to agriculture or development from 1984 to 1994 (OPPAGA, 2001). Loss and degradation of Florida's wetlands and their associated functions have contributed to problems, such as flooding, poor water quality, and habitat loss.

In recent decades, a number of federal, state, and local government programs have been developed for preserving wetlands. Although the rate of loss has slowed markedly, both conservation and regulatory approaches typically have not been effective in preventing continued, large and small-scale losses and degradation.

B. Importance of wetland ecosystems

Many people use the terms functions and values interchangeably when discussing wetlands, even though functions and values are different. Functions are the physical, chemical, and biological processes occurring in and making up an ecosystem. Processes include the movement of water through the wetland into streams; the decay of organic matter; the release of nitrogen, sulfur, and carbon into the atmosphere; the removal of nutrients, sediment and organic matter from water moving into the wetland; and the growth and development of all the organisms that require wetlands for life.

Values are "an estimate, usually subjective, of worth, merit, quality, or importance" (Richardson 1994). Wetland "values" may derive from outputs that can be consumed directly, such as food, recreation, or timber; indirect uses which arise from the functions occurring within the ecosystem, such as water quality, and flood control; possible future direct outputs or indirect uses such as biodiversity or conserved habitats; and from the knowledge that such habitats or species exist (known as existence value) (Serageldin 1993).

The difficulty with determining the value of a wetland is that valuation can be a subjective assessment, particularly the valuation of indirect use, future use, or existence values. Some wetlands may have multiple uses or worth. Wetlands that are remote may not directly benefit any humans but may be critical, for instance, to the existence of a type of salamander. People may value the intangible fact that wetlands exist, but would not be able to place a price on them, perhaps feeling offended by the concept. In contrast, the value of estuaries in producing shrimp can be calculated based on the price of shrimp.

Conflicts may also arise between public and private valuation. For example, although an individual landowner may not receive the financial benefits of the wetland on his or her property, it may have worth to the town or county in improving public water quality or quantity. In more complex cases involving endangered wetland species found on private property, the government attributes a value to the preservation of the species and regulates the development of the private property, although the property owner may not value the organism at all or values it less than he does other possible land uses.

Within watersheds and ecosystems, human activities cause depletion and pollution. The watershed and its ecosystems sustain our way of life, regardless of our understanding of the biology, chemistry, and geology involved. However, when decision makers do not understand the basics of ecosystem functions and values, they may make choices that prevent ecosystems from fully functioning. The result may be long term and possibly irreversible changes. Such changes reduce the value of the ecosystem. They can even affect the economy. A familiarity with the functions and values of an ecosystem such as a wetland can improve decision making today and protect values that may be held by future generations as well.

1. Wetland functions

Five important wetland functions are described below: hydrologic flux and storage; biogeochemical cycling and storage; biological productivity; decomposition; and community structure and wildlife support

a. Hydrologic flux and storage

Functions of wetlands associated with hydrologic flux and storage include water balance, groundwater recharge, climate control, oxidation-reduction, and life support. Values of wetlands as a result of the functions of hydrologic flux and storage include: water quality, water supply, flood control, erosion control, wildlife support, recreation, culture, and commercial benefits.

Water balance: Wetlands play a critical role in regulating the movement of water within watersheds as well as in the global water cycle (Richardson 1994; Mitsch and Gosselink 1993). Wetlands, by definition, are characterized by water saturation in the root zone, at, or above the soil surface, for a certain amount of time during the year. This fluctuation of the water table (hydroperiod) above the soil surface is unique to each wetland type. Wetlands store precipitation and surface water and then slowly release the water into associated surface water resources, ground water, and the atmosphere (Taylor et al. 1990). See the Water Resources Section for more discussion of this topic.

Ground water recharge: Wetlands help maintain the level of the water table and exert control on the hydraulic head (O'Brien 1988; Winter 1988). This provides force for ground water recharge and discharge to other waters as well. The extent of ground water recharge by a wetland is dependent upon soil, vegetation, site, perimeter to volume ratio, and water table gradient (Carter and Novitzki 1988; Weller 1981). Ground water recharge occurs through mineral soils found primarily around the edges of wetlands, and particularly small wetlands (Verry and Timmons 1982). Researchers have discovered ground water recharge of up to 20% of wetland volume per season (Weller 1981).

Climate control: Climate control is another hydrologic function of wetlands. Many wetlands return over two-thirds of their annual water inputs to the atmosphere through evapotranspiration (Richardson and McCarthy 1994). Wetlands may also act to moderate temperature extremes in adjacent uplands (Brinson 1993).

Oxidation-Reduction: The fluctuating water levels that are characteristic of wetlands control the oxidation-reduction (redox) conditions that occur. These redox conditions governed by hydroperiod play a key role in: nutrient cycling, availability, and export; pH; vegetation composition; sediment and organic matter accumulation; decomposition and export; and metal availability and export.

When wetland soil is dry, microbial and chemical processes occur using oxygen as the electron acceptor. When wetland soil is saturated with water, microbial respiration and biological and chemical reactions consume available oxygen. This shifts the soil from an aerobic to an anaerobic, or reduced, condition. As conditions become increasingly reduced, other electron acceptors than oxygen must be used for reactions. These acceptors are, in order of microbial preference, nitrate, ferric iron, manganese, sulfate, and organic compounds.

Wetland plants are adapted to changing redox conditions. Wetland plants often contain aerenchymous tissue (spongy tissue with large pores) in their stems and roots that allows air to move quickly between

the leaf surface and the roots. Oxygen released from wetland plant roots oxidizes the rhizosphere (root zone) and allows processes requiring oxygen, such as organic compound breakdown, decomposition, and denitrification, to occur (Steinberg and Coonrod 1994).

Life support: Changes in frequency, duration, and timing of hydroperiod may impact spawning, migration, species composition, and food chain support of the wetland and associated downstream systems (Crance 1988). Normal hydrologic flux allows exchange of nutrients, detritus, and passage of aquatic life between systems.

b. Biogeochemical cycling and storage

Wetlands may be a sink for, or transform, nutrients, organic compounds, metals, and components of organic matter. Wetlands may also act as filters of sediments and organic matter. A wetland may be a permanent sink for these substances if the compounds become buried in the substrate or are released into the atmosphere; or a wetland may retain them only during the growing season or under flooded conditions. Wetland processes play a role in the global cycles of carbon, nitrogen, and sulfur by transforming them and releasing them into the atmosphere.

The values of wetland functions related to biogeochemical cycling and storage include water quality and erosion control.

Nitrogen: The biological and chemical process of nitrification/denitrification in the nitrogen cycle transforms the majority of nitrogen entering wetlands, causing between 70% and 90% to be removed (Reilly 1991; Gilliam 1994).

Phosphorus: Phosphorus can enter wetlands with suspended solids or as dissolved phosphorus. Removal occurs through use of phosphorus by plants and soil microbes; adsorption by aluminum and iron oxides and hydroxides; precipitation of aluminum, iron, and calcium phosphates; and burial of phosphorus adsorbed to sediments or organic matter (Richardson 1985; Johnston 1991; Walbridge and Struthers 1993). Wetland soils can, however, reach a state of phosphorus saturation, after which phosphorus may be released from the system (Richardson 1985).

Carbon: Wetlands store carbon within peat and soil. Storing carbon is an important function within the carbon cycle, particularly given observations of increasing levels of carbon dioxide in the atmosphere and concerns about global warming. When wetlands are drained, the oxidizing conditions increase organic matter decomposition, thus increasing the release of carbon dioxide. When wetlands are preserved or restored, the wetlands act as a sink for carbon since organic matter decomposition is stable or slowed.

Sulfur: Wetlands are capable of reducing sulfate to sulfide. Sulfide is released to the atmosphere as hydrogen, methyl, and dimethyl sulfides or is bound in insoluble complexes with phosphate and metal ions in wetland sediments (Mitsch and Gosselink 1993). Dimethyl sulfide released from wetlands may act as a seed for cloud formation (Hader et al. 1991). Sulfate may exist in soils or may enter wetlands through atmospheric deposition.

Suspended solids: Wetlands perform the same function for our ecosystem as kidneys do for our bodies, in that they filter and remove pollutants. As water passes through a wetland, much of the pollution that is dissolved or suspended in the water becomes trapped by the wetland plants and soils. Stems and leaves provide friction for the flow of the water, thus allowing settling of suspended solids and removal of related pollutants from the water column (Johnston 1991). Wetlands may retain sediment in the peat or as

substrate permanently (Johnston 1991). Sediment deposition is variable across individual wetlands and wetland types, as deposition depends upon the rate and type of water flow (channelized or sheet flow), particulate size, and vegetated area of the wetland (Aust et al. 1991; Johnston 1991; Crance 1988; USEPA 1993c; Hemond and Benoit 1988).

Metals: All soils contain at least a low concentration of metals but in some locations human activities have resulted in metal levels high enough to cause health or ecological risks in water resources. Metals may exist in wetland soils or enter wetlands through surface or ground water flow. Wetlands can remove metals from surface and ground water as a result of the presence of clays, humic materials (peats), aluminum, iron, and/or calcium (Gambrell 1994). Metals entering wetlands bind to the negatively ionized surface of clay particles, precipitate as inorganic compounds (includes metal oxides, hydroxides, and carbonates controlled by system pH), complex with humic materials, and adsorb or occlude to precipitated hydrous oxides. Wetlands remove more metals from slow flowing water since there is more time for chemical processes to occur before the water moves out of the wetland. Burial in the wetland substrate will keep bound metals immobilized.

c. Biological productivity

Regular inputs of water, sediments, and nutrients cause most wetlands to be highly productive. In fact, wetlands are among the most productive ecosystems in the world (Mitsch and Gosselink 1993). Immense varieties of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and other wildlife depend in some way on wetlands. Wetlands with seasonal hydrologic pulsing are the most productive.

Wetland plants play an integral role in the ecology of the watershed. Wetland plants provide breeding and nursery sites, resting areas for migratory species as well as rare and endangered species such as the wood stork and Florida sandhill crane, and refuge from predators (Crance 1988). Decomposed plant matter (detritus) released into the water is important food for many invertebrates and fish both in the wetland and in associated aquatic systems (Crance 1988). Physical and chemical characteristics such as climate, topography, geology, hydrology, and inputs of nutrients and sediments determine the rate of plant growth and reproduction (primary productivity) of wetlands (Brinson 1993; Mitsch and Gosselink 1993; Weller 1981; Crance 1988).

A wetland with more vegetation will intercept more runoff and be more capable of reducing runoff velocity and removing pollutants from the water than a wetland with less vegetation (Demissie and Khan 1993; Richardson and McCarthy 1994; NCDEM 1993). Wetland plants also reduce erosion as their roots hold the streambank, shoreline, or coastline.

Values associated with biological productivity of wetlands include: water quality, flood control, erosion control, community structure and wildlife support, recreation, aesthetics, and commercial benefits.

d. Decomposition

Decomposition rates vary across wetland types, particularly as a function of climate, vegetation types, available carbon and nitrogen, and pH (Johnston 1991). A pH above 5.0 is necessary for bacterial growth and survival (Richardson 1995). The nutrients and compounds released from decomposing organic matter may be exported from the wetland in soluble or particulate form, incorporated into the soil, or eventually transformed and released to the atmosphere. Decomposed matter (detritus) forms the base of the aquatic and terrestrial food web.

Decomposition requires oxygen and thus reduces the dissolved oxygen content of the water. High rates of decomposition -- such as occur after algae has bloomed -- can reduce water quality and impair aquatic life support.

e. Community structure and wildlife support

The inundated or saturated conditions occurring in wetlands limit plant species composition to those that can tolerate such conditions. Beaver, muskrat and alligators create or manipulate their own wetland habitat that other organisms, such as fish, amphibians, waterfowl, insects, and mammals can then use or inhabit (Weller 1981; Mitsch and Gosselink 1993).

Wetland shape and size affect the wildlife community and the wetland's function as suitable habitat (Kent 1994b; Brinson 1993; Harris 1988). The shape of the wetland varies the perimeter to area ratio. The amount of perimeter versus area has importance for the success of interior and edge species (Kent 1994b). Shape is also important for the possibility of movement of animals within the habitat and between habitats. Wetland size is particularly important for larger and wide ranging animals that utilize wetlands for food and refuge, such as black bear or moose, since in many locations wetlands may be the only undeveloped and undisturbed areas remaining.

Values associated with community structure and wildlife support in wetlands include: fish and wildlife support, recreation, aesthetics, and commercial benefits.

2. Wetland values

The following section describes several values associated with wetland processes: water quality; water supply; flood protection; erosion control; fish and wildlife habitat; recreation, aesthetics, cultural and scientific values; and commercial benefits.

a. Water quality

Wetlands help maintain and improve the water quality of our nation's streams, rivers, lakes, and estuaries. Since wetlands are located between uplands and water resources, many can intercept runoff from the land before it reaches open water. As runoff and surface water pass through, wetlands remove or transform pollutants through physical, chemical, and biological processes. For example, the Congaree Bottomland Hardwood Swamp in South Carolina removes a quantity of pollutants from watershed water resources equivalent to that which would be removed by a \$5 million water treatment plant (USEPA 1995). In another case, scientists estimate that a 2,500 acre wetland in Georgia saves \$1 million in water pollution control costs annually (OTA 1993).

Nutrient removal: Scientists have estimated that wetlands may remove between 70% and 90% of entering nitrogen (Reilly 1991; Gilliam 1994). Riparian forests can reduce nitrogen concentrations in runoff and floodwater by up to 90% and phosphate concentrations by 50% (Gilliam 1994). The estimated mean retention of phosphorus by wetlands is 45% (Johnston 1991). Wetlands with high soil concentrations of aluminum may remove up to 80% of total phosphorus (Peterjohn and Correll 1984; Richardson 1985; Gale et al. 1994; Walbridge and Struthers 1993).

Removal of Biological Oxygen Demand: Biological oxygen demand (BOD) is a measure of the oxygen required for the decomposition of organic matter and oxidation of inorganics such as sulfide. BOD is introduced into surface water through inputs of organic matter such as sewage effluent, surface runoff, and natural biotic processes. If BOD is high, low dissolved oxygen levels result. Low dissolved oxygen levels can lead to mortality of aquatic life. Wetlands remove BOD from surface water through decomposition of organic matter or oxidation of inorganics (Hemond and Benoit 1988). BOD removal by wetlands may approach 100% (Hemond and Benoit 1988).

Removal of suspended solids and pollutants: Suspended solids (such as sediment and organic matter) may enter wetlands in runoff, as particulate litterfall, or with inflow from associated water bodies. Sediment deposition in wetlands depends upon water velocity, flooding regimes, vegetated area of the wetland, and water retention time (Gilliam 1994; Johnston 1991). Sediment deposition in wetlands prevents a source of turbidity from entering downstream ecosystems. Typically wetland vegetation traps 80-90% of sediment from runoff (Gilliam 1994; Johnston 1991). Less than 65% of the sediment eroded from uplands exits watersheds that contain wetlands (Johnston 1991).

Other pollutants that impact water quality such as nutrients, organics, metals and radionuclides are often adsorbed onto suspended solids. Deposition of suspended solids, to which such substances are adsorbed, removes these pollutants from the water. Thus sediment deposition provides multiple benefits to downstream water quality (Johnston 1991; Hemond and Benoit 1988; Hupp et al. 1993; Puckett et al. 1993).

Removal of metals: Certain wetlands play an important role in removing metals from other water resources, runoff, and ground water (Owen 1992; Gambrell 1994; Puckett et al. 1993). Wetlands remove 20% - 100% of metals in the water, depending on the specific metal and the individual wetland (Taylor et al. 1990). Forested wetlands play a critical role in removing metals downstream of urbanized areas (Hupp et al. 1993).

Delfino and Odum (1993) found that lead leaking from a Florida hazardous waste site was retained at high levels by a wetland; less than 20 - 25% of the total lead in the soil and sediments was readily bioavailable. The majority of the lead was bound to soil and sediments through adsorption, chelation, and precipitation. Bioavailable lead was absorbed primarily by eel grass, which had bioaccumulated the majority of the lead. In another case, researchers found that wetland vegetation and organic (muck) substrate retained 98% of lead entering the wetland (Gambrell 1994).

Removal of pathogens: Fecal coliform bacteria and protozoans, which are indicators of threats to human health, enter wetlands through municipal sewage, urban stormwater, leaking septic tanks, and agricultural runoff. Bacteria attach to suspended solids that are then trapped by wetland vegetation (Hemond and Benoit 1988). These organisms die: after remaining outside their host organisms, through degradation by sunlight, from the low pH of wetlands, by protozoan consumption, and from toxins excreted from the roots of some wetland plants (Hemond and Benoit 1988; Kennish 1992). In this way wetlands have an important role in removing pathogens from surface water.

b. Water supply

Wetlands act as reservoirs for the watershed. Wetlands release the water they retain (from precipitation, surface water, and ground water) into associated surface water and ground water. In Wisconsin watersheds composed of 40% lakes and wetlands, spring stream outflows from the watersheds were 140% of those in watersheds without any wetlands or lakes (Mitsch and Gosselink 1993). Forested wetlands, kettle lakes and prairie potholes have significant water storage and ground water recharge (Brown and Sullivan 1988; Weller 1981). Forested wetlands overlying permeable soil may release up to 100,000 gallons/acre/day into the ground water (Anderson and Rockel 1991). Verry and Timmons (1982) studied a Minnesota bog which released 55% of the entering water to stream and ground water.

Ground water can be adversely affected by activities that alter wetland hydrology (Winter 1988). Drainage of wetlands lowers the water table and reduces the hydraulic head providing the force for ground water discharge (O'Brien 1988; Winter 1988). If a recharge wetland is drained, the water resources into which ground water discharges will receive less inflow, potentially changing the hydrology of a watershed (Brinson 1993; Winter 1988). Ewel (1990) calculated that if 80% of a 5-acre Florida cypress swamp were drained, available ground water would be reduced by an estimated 45%.

c. Flood protection

Wetlands help protect adjacent and downstream properties from potential flood damage. The value of flood control by wetlands increases with: (1) wetland area, (2) proximity of the wetland to flood waters, (3) location of the wetland (along a river, lake, or stream), (4) amount of flooding that would occur without the presence of the wetlands, and, (5) lack of other upstream storage areas such as ponds, lakes, and reservoirs (Mitsch and Gosselink 1993). The cost of replacing the flood control function of the 5,000 acres of wetlands drained each year in Minnesota was determined to be \$1.5 million (USEPA 1995).

Wetlands within and upstream of urban areas are particularly valuable for flood protection. The impervious surface in urban areas greatly increases the rate and volume of runoff, thereby increasing the risk of flood damage. The drainage of wetlands, the diversion of the Mississippi and Missouri Rivers from their original floodplains, and the development allowed in the floodplains over the past 100 years were partly responsible for the billions of dollars in damage to businesses, homes, crops, and property that occurred as a result of the Midwest flood of 1993 (OEP 1993).

During storm events, and shortly afterwards, we often face a surge of too much water. Fortunately, wetlands collect and store the excess stormwater that runs off uplands as well as the waters from flooding rivers. By providing temporary storage areas for this surplus water, wetlands slow down the rate at which the waters rise and reduce the maximum elevation of flood waters. This buffering capability helps to protect upland development from flood damage, thereby protecting against the loss of life and property. Wetland vegetation and gradually sloping topography also absorb much of the energy from fast flowing waters and waves, thereby protecting our shorelines from erosion.

d. Erosion control

By virtue of their place in the landscape, riparian wetlands, salt marshes, and marshes located at the margin of lakes protect shorelines and streambanks against erosion. Wetland plants hold the soil in place with their roots, absorb wave energy, and reduce the velocity of stream or river currents. Coastal wetlands buffer shorelines against the wave action produced by hurricanes and tropical storms (Mitsch

and Gosselink 1993). The ability of wetlands to control erosion is so valuable that states and landowners are restoring wetlands to control shoreline erosion in coastal areas (Lewis 1994).

e. Fish and wildlife habitat

Diverse species of plants, insects, amphibians, reptiles, birds, fish, and mammals depend on wetlands for food, habitat, or temporary shelter. Although wetlands make up only about 3.5 percent of U.S. land area, more than one-third of the United States' threatened and endangered species live only in wetlands (Mitsch and Gosselink 1993). An additional 20% of the United States' threatened and endangered species use or inhabit wetlands at some time in their life. Many of America's bird species utilize wetlands as sources of food, water, nesting material, or shelter. Migratory waterbirds rely on wetlands for staging areas, resting, feeding, breeding, or nesting grounds.

f. Recreation, aesthetics, culture, and science

Wetlands have archeological, historical, cultural, recreational, and scientific values. Societies have traditionally formed along bodies of water and artifacts found in wetlands provide information about these societies. Each person has his or her own opinion about the natural beauty of wetlands and the relative worth of that beauty. However, we know that waterfront property commands a premium price over otherwise similar, landlocked property partly because of these aesthetic qualities.

Wetlands offer people a sense of both beauty and well-being. It is comforting to spend time in these natural areas to enjoy the sounds, sights, and smells. Historically, painters and writers have used wetlands as their subject matter. Today, such artists are often joined by others with cameras and camcorders. The monetary value derived from the observation and photography of wetland-dependent birds by more than 50 million Americans is at least \$10 billion per year (USEPA 1994).

All revenue generated by people who camp, hunt, fish, canoe, sail, photograph nature, watch birds, or hike in and near wetlands must be included when figuring the economic benefits of wetlands. More than half of all U.S. adults hunt, fish, birdwatch or photograph wildlife, spending a total of \$59.5 billion annually (USEPA 1995). Waterfowl hunters spend over \$630 million annually to harvest wetland-dependent birds (OTA 1993).

Scientists value the processes of wetlands individually, particularly the role of wetlands in the global cycles of carbon, nitrogen, and water. Many scientists consider the removal of carbon dioxide from the atmosphere into plant matter and its burial as peat (sequestration) the most valuable function of wetlands (OTA 1993). Carbon sequestration is thought to be an important process in reducing the greenhouse effect and the threat of global warming.

g. Commercial benefits

Floridians depend on healthy and diverse populations of fish and wildlife, not only because they provide us with recreational opportunities and food, but also because they support our commercial fishing, tourism and recreation industries. Commercially important products harvested from wetlands include fish, shellfish, cranberries, timber, and wild rice, as well as some medicines derived from wetland soils and plants. Fish and shellfish species dependent on wetlands for food or habitat comprise more than 75% of the commercial and 90% of the recreational harvest (USEPA 1994; Feierabend and Zelazny 1987). Many mammals and reptiles harvested for their skins, including muskrat, beaver, mink, otter, and

alligator, require wetland habitats. The nation's harvest of muskrat pelts alone is worth over \$70 million annually, while the alligator industry is valued at \$16 million (Mitsch and Gosselink 1993; OTA 1993).

Wetlands containing timber comprise approximately 55 million acres (22 million hectares), with two-thirds of the acreage east of the Rocky Mountains (Mitsch and Gosselink 1993). Although historically the practice has been to clear-cut and drain the forests of the bottomland hardwood swamps, with proper management, the timber industry can harvest wetland timber with minimal adverse effect (Conner 1994; Shepard 1994). In addition, replicating wetland conditions may improve production of desired flood-tolerant pine and hardwood species by preventing competition by non-wetland species (Conner 1994).

C. Human impacts to wetlands

We now know that wetlands are more sensitive to alterations than we once believed. Small changes in water levels or the influx of pollutants can have significant effects on the functions of wetlands. Although wetlands are good at filtering and attenuating pollutants, there are limits to these capabilities. If we overload these natural systems, not only will pollutants reach our own water bodies but the pollutants could damage the wetlands and reduce their filtering capacity. These areas must be protected from abuse and destruction in order to maintain a healthy environment. Major causes of wetland loss and degradation include hydrological alteration, urbanization (including development), marinas and boats, industry (including industrial development), agriculture and silviculture, mining, and atmospheric deposition.

1. Hydrologic alterations of wetlands

Wetlands form as a result of certain hydrologic conditions which cause the water table to saturate or inundate the soil for a certain amount of time each year. The frequent or prolonged presence of water at or near the soil (hydrology) is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Thus alteration of wetland hydrology can change the soil chemistry and the plant and animal community.

Alteration which reduces or increases the natural amount of water entering a wetland or the period of saturation and inundation can, in time, cause the ecosystem to change to an upland system or, conversely, to a riverine or lacustrine system. This alteration can be natural, such as through the successional process of stream impoundment by beavers or climate change. Wetland loss and degradation through hydrologic alteration by man has occurred historically through such actions as: drainage, dredging, stream channelization, ditching, levees, deposition of fill material, stream diversion, ground water withdrawal, and impoundment.

These alterations can destroy wetlands by adding too much water, removing too much water, altering the pattern of the materials imported into or exported from the wetland, or altering the frequency and duration of fluctuating water levels that are needed by certain types of wetlands. The altered flow patterns can also concentrate pollutants, cause erosion, cause sedimentation, and reduce valuable shallow water habitats. Habitat fragmentation, as wetlands are drained or hydrologically altered, may result in changes in species composition as wetlands species are replaced by upland species; loss of large, wide-ranging species; loss of genetic integrity when isolated habitats are too small to support viable populations; reduced populations of interior species that can only reproduce in large tracts; and increased numbers of competitor, predator, and parasite species tolerant of disturbed environments (Harris 1988; Fleming et al. 1994).

a. Water diversion structures

Water diversion structures, such as canals (channels), ditches, and levees have been used to modify wetlands to achieve flood control, drainage, mosquito control, irrigation, timber harvest, navigation, transportation, and industrial activity (Mitsch and Gosselink 1993). Canals and channelization change the hydrology of wetlands and increase the speed with which water moves into and through wetlands. As a result, patterns of sedimentation are altered and wetland functions and values that depend on the normal slow flow of water through a wetland can be affected.

High sediment loads entering wetlands through channels, irrigation ditches and drainage ditches can smother aquatic vegetation, fill in riffles and pools, and contribute to increased turbidity (USEPA 1993a). Channelization and channel modification alter in-stream water temperature and diminish habitat suitable for fish and wildlife (USEPA 1993a). Normal sheet flow through wetlands is inhibited by the spoil banks that line a canal and by road embankments. Spoil banks and embankments also increase water stagnation. Channels often connect low-salinity areas to high-salinity areas, resulting in saltwater intrusion upstream, and causing species change and mortality of salt-intolerant vegetation.

b. Impoundments

Impoundment of natural wetlands for stormwater management or wildlife and habitat management may exploit one function of wetlands at the expense of others (USEPA 1993a; Mitsch and Gosselink 1993). Impoundment alters the natural wetlands' hydrology and decreases water circulation. Decreased water circulation causes increased water temperature, lower dissolved oxygen levels, and changes in salinity and pH; prevents nutrient outflow; and increases sedimentation (USEPA 1993a). Sedimentation reduces the water storage capacity, smothers vegetation, reduces light penetration, reduces oxygen content and affects the entire ecosystem richness, diversity, and productivity. Toxic substances, adhering to sediments, may accumulate in impoundments as a result of decreased water circulation and bioaccumulation of contaminants by wetland biota may occur.

2. Urbanization

Urbanization is a major cause of impairment of wetlands (USEPA 1994). Urbanization has resulted in direct loss of wetland acreage as well as degradation of wetlands. Degradation is due to changes in water quality, quantity, and flow rates; increases in pollutant inputs; and changes in species composition as a result of introduction of non-native species and disturbance. The major pollutants associated with urbanization are sediment, nutrients, oxygen-demanding substances, road salts, heavy metals, hydrocarbons, bacteria, and viruses (USEPA 1994). These pollutants may enter wetlands from point sources or from nonpoint sources. Construction activities are a major source of suspended sediments that enter wetlands through urban runoff.

a. Impervious surfaces

As roads, buildings, and parking lots are constructed, the amount of impervious surface increases. Impervious surfaces prevent rainfall from percolating into the soil. Rainfall carries sediments, organic matter, pet wastes, pesticides and fertilizers from lawns, gardens, and golf courses, heavy metals, hydrocarbons, road salts, and debris into urban streams and wetlands (USEPA 1993a; USEPA 1993c). Increased salinity, turbidity, and toxicity; and decreased dissolved oxygen, all affect aquatic life and, therefore, the food web (Crance 1988). Excessive inputs of nutrients can lead to eutrophication or result in the release of pollutants from a wetland into adjacent water resources (USEPA 1993a).

As runoff moves over warmed impervious surfaces, the water temperature rises and dissolved oxygen content of the runoff water decreases (USEPA 1993c). Increased water temperature, as well as the lower dissolved oxygen levels, can cause stress or mortality of aquatic organisms. Rising water temperatures can trigger a release of nutrients from wetland sediment (Taylor et al. 1990). For example, as temperature rises, sediments release phosphorus at an exponential rate. Thus water temperature increases can lead to eutrophication.

Impervious surfaces decrease ground water recharge within a watershed and can reduce water flow into wetlands (USEPA 1993c). Significant increases in stormwater peakflow rates, and longer-term changes in wetland hydrology, as a result of stormwater discharge, can cause erosion and channelization in wetlands, as well as alteration of species composition and decreased pollutant removal efficiency (USEPA 1993a; USEPA 1993c). Changes in frequency, duration, and timing of the wetland hydroperiod may adversely affect spawning, migration, species composition, and thus the food web in a wetland as well as in associated ecosystems (Crance 1988; USEPA 1993c).

b. Wastewater and stormwater

Wastewater treatment plant effluent and urban stormwater are a source of pollutants that continue to degrade wetlands (USEPA 1994). The "aging" of wetlands can occur when wetlands filter organic matter. "Aging" is the saturation of the ecosystem by nutrients and heavy metals over time that results in the reduced effectiveness and degradation of the wetland (Mitsch and Gosselink 1986). Wastewater and stormwater can alter the ecology of a wetland ecosystem if high nutrient levels cause extended eutrophication and metals cause plant and aquatic organism toxicity (Ewel 1990). Iron and magnesium, in particular, may reach toxic concentrations, immobilize available phosphorous, and coat roots with iron oxide, preventing nutrient uptake.

Urban and industrial stormwater, sludge, and wastewater treatment plant effluent, rich in nitrogen and phosphorus, can lead to algal blooms in estuaries. Algal blooms deplete dissolved oxygen, leading to mortality of benthic organisms. Some algae are toxic to aquatic life (Kennish 1992). Excess algae can shade underwater sea grasses, preventing photosynthesis and resulting in sea grass death (Batiuk et al. 1992; USEPA 1994).

c. Roads and bridges

Roads and bridges are frequently constructed across wetlands since wetlands have low land value. It is often considered to be more cost effective to build roads or bridges across wetlands than around them (Winter 1988). Roads can impound a wetland, even if culverts are used. Such inadvertent impoundment and hydrologic alteration can change the functions of the wetland (Winter 1988). Road and bridge construction activities can increase sediment loading to wetlands (Mitsch and Gosselink 1993). Roads can also disrupt habitat continuity, driving out more sensitive, interior species, and providing habitat for hardier opportunistic edge and non-native species. Borrow pits (used to provide fill for road construction) that are adjacent to wetlands can degrade water quality through sedimentation and increase turbidity in the wetland (Irwin 1994).

The maintenance and use of roads contribute many chemicals into the surrounding wetlands. Herbicides, soil stabilizers, and dust palliatives used along roadways can damage wetland plants and the chemicals may concentrate in aquatic life or cause mortality (USEPA 1993a). Runoff from bridges can increase loadings of hydrocarbons, heavy metals, toxic substances, and deicing chemicals directly into wetlands

(USEPA 1993a). Bridge maintenance may contribute lead, rust (iron), and the chemicals from paint, solvents, abrasives, and cleaners directly into wetlands below.

The effects of new roadways through wetlands are apparent beyond the right-of-way. The cleared alignment allows light to penetrate into the adjacent forested wetlands. This degrades wetlands by causing these areas to become hotter and dryer than normal. It also provides a vector for invasive and nuisance plants and animals to penetrate into the previously undisturbed interior of the wetlands. The possibility of vehicular collisions with animals crossing the road is a constant threat to many common wildlife species, as well as threatened and endangered species. For some species a filled roadway becomes an insurmountable barrier. In those cases, the new structure divides the wetlands into smaller habitats, which may not be large enough to support the existing populations.

d. Sanitary landfills

Landfills can pose an ecological risk to wetlands. Landfill construction may alter the hydrology of nearby wetlands. Leachate from solid waste landfills often has high biological oxygen demand (BOD), and ammonium, iron, and manganese in concentrations that are toxic to plant and animal life (Lambou et al. 1988). Sanitary landfills may receive household hazardous waste and some hazardous waste from small quantity operators, as well as sewage sludge and industrial waste. Although regulated (under RCRA Subtitle D), these facilities may not always be properly located, designed, or managed, in which case some surface water contamination may occur. Researchers who conducted a study of the proximity of 1,153 sanitary landfills to wetlands in 11 states, found that 98 percent of the sanitary landfills were 1 mile or less from a wetland, and 72 percent were 1/4 mile or less from a wetland (Lambou et al. 1988).

e. Non-native plants and animals

As a result of disturbance and habitat degradation, wetlands can be invaded by aggressive, highly-tolerant, non-native vegetation, such as purple loosestrife (*Lythrum salicaria*), water hyacinth (*Eichornia crassipes*), and salvinia (*Salvinia molesta*), or can be dominated by a monoculture of cattails (*Typha spp.*) or common reed (*Phragmites spp.*) (McColligan and Kraus 1988; Weller 1981; Mitsch and Gosselink 1993). Particularly in constructed wetlands, including restored wetlands, non-native and tolerant native species may outcompete other species leading to a reduction in species diversity.

Non-native species may be introduced on purpose. For example, water hyacinth has been noted for its ability to sequester nutrients and is used for wastewater purification (Mitsch and Gosselink 1993). Water hyacinth and similar species can rapidly fill a wetland and are a threat to water quality in some areas.

Carp and nutria are two introduced exotic animal species that degrade wetlands (Mitsch and Gosselink 1993). Carp, introduced for recreational fishing, severely increase the turbidity of water resources. Nutria, introduced for their pelts, are rodents that voraciously eat, as well as destroy, freshwater and coastal wetland vegetation. Domestic and feral cats can be extremely damaging as they prey on wetland birds.

f. Mosquito control programs

Mosquito control efforts in urbanized and resort communities has resulted in wetlands loss and degradation through drainage, channelization, and use of toxic pesticides.

3. Docks and piers

Docks and piers can eliminate submerged vegetation by reducing light penetration. Wood preservatives in the pilings contain toxic materials that can leach into the water. Marina construction and dredging activities can contribute suspended sediments into waters adjacent to wetlands. Even if a dock is situated and constructed in such a way as to avoid any significant direct impacts, the boats using the dock can cause propeller dredging in nearby grass beds, leach toxic materials from the anti-fouling hull paint, and collide with fish and wildlife. Intense boating activity increases turbidity and degradation of wetlands (USEPA 1993a).

4. Industry

Adverse effects of industry on wetlands can include: reduction of wetland acreage, alteration of wetland hydrology due to industrial water intake and discharge, water temperature increases, point and nonpoint source pollutant inputs, pH changes as a result of discharges, and atmospheric deposition. Petroleum hydrocarbon inputs from runoff, or from upstream releases can alter reproduction, growth, and behavior of wetland organisms, and can result in mortality. Plants suffocate when oil blocks their stomata (Dibner 1978).

Polynuclear aromatic hydrocarbons (PAHs) are extremely toxic compounds that can enter wetlands through industrial effluent and atmospheric deposition. PAHs concentrate in sediments and thus contaminate benthic organisms (Kennish 1992). Fish contaminated with PAHs exhibit external abnormalities, such as fin loss and dermal lesions.

5. Agriculture

Historically, agriculture has been the major factor in freshwater and estuarine wetland loss and degradation. Although the passage of the Food Security Act of 1985 "Swampbuster" provision prevented the conversion of wetlands to agricultural production, certain exempted activities performed in wetlands can degrade wetlands:

- harvesting food, fiber, or forest products;
- minor drainage;
- maintenance of drainage ditches;
- construction and maintenance of irrigation ditches;
- construction and maintenance of farm or forest roads;
- maintenance of dams, dikes, and levees;
- direct and aerial application of damaging pesticides; and
- ground water withdrawals.

These activities can alter wetlands hydrology, water quality, and species composition. Excessive amounts of fertilizers and animal waste reaching wetlands in runoff from agricultural operations, including confined animal facilities, can cause eutrophication.

Wetlands provide critical habitat for waterfowl populations. The drainage of U.S. and Canadian prairie potholes for agricultural production has been linked to a concomitant 50% - 80% decline in waterfowl populations since 1955 (USEPA 1995; DU 1995). Since the Swampbuster legislation was promulgated, the waterfowl population has begun to increase. Swampbuster rendered drainage of prairie potholes costly,

and encouraged farmers to allow prior converted wetlands to revert to their previous natural wetland state and to construct farm ponds or restore marshes. Duck populations in 1994 increased by 24% over 1993 populations, and were the highest since 1980, when duck populations had plunged to a low (USEPA 1995).

a. Toxic compounds

Irrigation ditching can increase contamination of wetlands receiving irrigation drainage water, particularly where soil is alkaline or contains selenium or other heavy metals (Deason 1989). Agricultural pesticides entering wetlands in runoff, as well as through atmospheric deposition, may bioaccumulate in fish and other aquatic organisms (Kennish 1992).

b. Grazing

Grazing livestock can degrade wetlands that they use as a food and water source. Urea and manure can result in high nutrient inputs. Cattle traffic may cause dens and tunnels to collapse. Overgrazing of riparian areas by livestock reduces streamside vegetation, preventing runoff filtration, increasing stream temperatures, and eliminating food and cover for fish and wildlife. As vegetation is reduced, streambanks can be destroyed by sloughing and erosion. Streambank destabilization and erosion then cause downstream sedimentation (Kent 1994b). Sedimentation reduces stream and lake capacity, resulting in decreased water supply, irrigation water, flood control, hydropower production, water quality, and impairment of aquatic life and wetland habitat (USEPA 1993b).

The economic losses attributed to the reduced quality and quantity of water and habitat from overgrazing of riparian wetland vegetation is more than \$200 million (USEPA 1993b). The depletion of vegetation from riparian areas causes increased water temperatures and erosion and gully formation, prevents runoff filtration, and eliminates food and cover for fish and wildlife (USEPA 1993b). If stocking of livestock is well managed, grazing can coexist with wetlands, benefiting farmers and increasing habitat diversity.

c. Silviculture/timber harvest

If best management practices are used and careful monitoring occurs, silviculture and timber removal may only minimally affect some wetland functions. Habitat and community structure, however, still may be seriously degraded.

Drainage, clearing, haul road construction, rutting, and ditching of forested wetlands, all may affect wetlands in some way, although the impact may only be temporary. Since timber removal generally occurs in 20-50 year rotations, careful harvest may not be a permanent threat to wetlands. Adverse effects of timber harvest can include a rise in water table due to a decrease in transpiration, soil disturbance and compaction by heavy equipment, sedimentation and erosion from logging decks, skid trails, roads, and ditches, and drainage and altered hydrology from ditching, draining, and road construction (Shepard 1994). By utilizing best management practices, hydrology and biogeochemical processes of wetlands may be altered for only one to three years following timber harvest (Shepard 1994).

Pesticides and fertilizers used during silvicultural operations can enter wetlands through runoff as well as through deposition from aerial application. Fertilizers may contribute to eutrophication of wetlands.

6. Mining

Phosphate mining has resulted in the loss of thousands of acres of wetlands in central Florida (Mitsch and Gosselink 1993). Other types of mining operations can also degrade wetlands through hydrologic alterations, high metal concentrations, and/or decreased pH.

Acid drainage from active and abandoned mines causes extensive ecological damage. Acid mine drainage introduces high levels of acidity and heavy metals into the wetland environment through runoff and through direct drainage from mines into wetlands. The acidity and the high metal concentrations alter the biotic community composition and can result in mortality (Lacki et al. 1992; Mitsch and Gosselink 1993). Although natural wetlands may have the capacity to buffer some of the acidity and absorb a certain amount of the pollutants, over time, the assimilative capacity will be saturated (Kent 1994; Wieder 1994).

7. Atmospheric deposition

Nitrous oxides, sulfurous oxides, heavy metals, volatilized pesticides, hydrocarbons, radionuclides, and other organics and inorganics are released into the atmosphere by industrial and agricultural activities, and from vehicles. These compounds can enter wetlands through wet and dry atmospheric deposition and can adversely affect aquatic organisms and the terrestrial organisms that feed on them.

D. Wetland-upland transition zone

The major structural components of an ecosystem, including energy, chemicals, and organisms, are connected by the systems of energy flow and nutrient recycling (Taylor et.al. 1999). As described above, the existence of wetlands and the functions they perform is, to a large degree, a direct result of the surrounding upland areas that they support. In fact, the area immediately adjacent to wetlands is often a transition zone between wetlands and uplands and exhibits vegetation, soils and hydrologic characteristics that are similar yet intermediate between wetlands and uplands.

Interactions between wetland and upland habitats can be a major factor in determining the amount of energy and nutrients in these systems and how the energy and nutrients are used. Wetlands provide habitat for many species of birds, mammals, reptiles, fish, amphibians, and a variety of invertebrates. These species feed and breed in wetlands, then spend time in adjacent upland habitats where they defecate, die, and become food for upland animals, adding both energy and organic matter to the upland community. Surface runoff then carries the organic and mineral material back into wetlands. The exchange provides important nutrients for both systems.

Wetlands also provide critical habitat components for species generally considered strictly terrestrial. A typical direct upland and wetland linkage occurs when a species resides and feeds in one of these two habitats and breeds in another. For example, aquatic turtles reside in wetlands and open water areas, but require adjacent uplands for nesting. Many amphibians, such as tree frogs, have the opposite pattern. The disruption or elimination of one habitat destroys the linkages that provide essential elements for species survival and could have drastic effects.

It long has been regarded that the highest plant species diversity occurs in transition zones between wetlands and uplands (JEA 2000). Studies of Florida landscapes indicate that plant species diversity is higher in transition zones than either the adjacent wetland or upland (JEA citing Clewell et al. 1982;

Gross 1987; Hart 1984). Likewise, wildlife species richness also shows direct spatial relationships to the increased diversity of the transition zone. Vickers et al. (1985) found that species richness and abundance of amphibians and reptiles were greater along the edge of six wetlands in north central Florida than in either the wetland or upland habitat. Harris and Vickers (1984) found that virtually all mammals reside in transition zones because it easily allows them to take advantage of both habitats. When water levels rise in wetlands, wildlife movement to peripheral areas also increases, suggesting the importance of transition zones in providing refuge for wildlife.

Alterations disrupting the flow of energy and nutrients between uplands and wetlands decrease the ability of each habitat to function normally. Disturbance and alteration of the transition zone and adjacent upland can result in elimination of wildlife species that utilize both uplands and wetlands, a loss in plant species diversity, an increase in sedimentation and erosion into the wetland, and alteration in hydrologic patterns within both the upland and wetland. Increases in runoff and pollutants associated with urbanization and agriculture stress wetland systems, thus threatening the functioning of the system as a whole.

The differences between developed lands and natural ecological areas are significant, and the more intensely developed or altered, the greater the differences (JEA 2000). Frequently, native vegetation on developed lands is removed and replaced with non-native ornamentals, soil drainage is altered, soils become compacted and covered with impervious materials, and wildlife species are displaced by human activities. The gradient in intensity of noise, waste, temperature, light, structure, and activity from developed to undeveloped lands is intense. In this edge between development and natural areas, water runoff carries sediments, nutrients, and pollutants. Noise and activities from development intrudes into the edge and interferes with wildlife activities. Wildlife populations also suffer greatly from predation from pets such as cats and dogs that are allowed to roam unconstrained, and from nest predation from animals such as the brown-headed cowbird that flourishes in disturbed habitats and limits the breeding success of less common, more vulnerable birds.

The preservation of linkages between uplands and wetlands is essential for protecting the structure and function of wetland systems, as well as the unique transitional zone between wetland and upland systems. For this reason, it is important to maintain native upland communities as well as wetlands, although the latter have received the most attention in recent years. This may be particularly true since upland areas have fewer limitations to development, and are thus the first to be subjected to developmental pressures.

One tool for preserving these linkages is the creation of buffer zones to separate developed upland areas from wetland systems, provided the buffer zone's size is determined scientifically. Although buffer zones can protect some of the aquatic and terrestrial linkages, they will not protect them all. For example, the importance of the amphibian component of a wetland's contribution to local energy cycles extend far beyond its borders. Some frogs and toads utilize habitat surrounding their breeding ponds up to a distance of 2 km (1.24mi). A buffer of 2 km around a small pond to protect this food web interaction would encompass over 3,000 acres. Since small wetlands tend to be scattered widely over the landscape, an upland of this size set aside to completely protect this linkage would not be realistic in a typical development, but might be in a large, intact area such as a mitigation bank.

As we learn more about wetland functions we realize the challenges in preserving them. Our ability to predict the effects of upland habitat loss on wetland habitats must be improved to provide a scientific basis for sound natural resource management decisions. Only then can these decisions reduce or eliminate the negative impacts caused by urban, suburban, and rural growth.

E. Status of wetlands in Alachua County

In the 1991 Comprehensive Plan, wetlands communities are discussed in the context of natural communities and are defined as those areas that are inundated by surface or ground water with a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated or seasonally saturated soil conditions. Wetland systems are defined by hydrology, soils, and vegetation and usually appear as transitional areas between terrestrial and aquatic communities or as isolated communities perched within the uplands. Because hydrologic data are often unavailable, wetlands in Alachua County are usually identified based upon floral composition and extent of hydric soils.

Wetlands communities occurring in the County include hydric hammock, wet flatwoods, wet prairie, baygall, seepage slope, bottomland forest, floodplain swamp, strand swamp, basin marsh, basin swamp, bog, depression marsh, and dome swamp. Descriptions of these communities are provided in the Natural Communities portion of the data and analysis.

Wetlands in Alachua County have been mapped variously by the U.S. Department of the Interior, Fish and Wildlife Service, National Wetlands Inventory; the Natural Resource Conservation Service; the U.S. Geological Survey; and the Suwannee River and St. Johns River Water Management Districts. These mapping efforts are adopted by reference in Comprehensive Plan policies and are available for viewing at the Alachua County Department of Growth Management or the Alachua County Environmental Protection Department.

Geographic Information Systems representations of these maps appear in the Conservation Map Series (see Maps 35-38). It must be noted that these maps, in most cases, were prepared from aerial photographs with limited ground proofing. Therefore, mapped locations of wetlands should be regarded as a guideline only, to be accompanied by ground proofing in a development context.

Wetland types and general distribution in the county have not changed significantly; however, there has been a net loss of wetlands quality and extent as a result of agricultural and development activities occurring since 1991. There has been some incremental net loss of wetlands, primarily consisting of (1) loss of isolated wetlands less than one-half acre in size (which currently are exempt from state, regional, and local regulation); (2) minor impacts such as from roads and driveway crossings; (3) minor non-permitted activities; and (4) conversion to row crops, improved pasture, and pine plantation (there is no measure of the extent of loss from these causes as most agricultural activities are not required to go through the development review process). There also has been some degradation of wetlands quality or function due to loss of connectivity with associated upland communities as a result of adjacent development. Impacts causing functional degradation include, for example, loss or restriction of normal water flows, fire control, water quality impacts, and spread of invasive plant species such as air potato, Chinese tallow, Japanese climbing fern, chinaberry, and tarrow.

There is presently no ready measure of wetlands loss as a result of development. A better tracking process would be helpful to identify acreage of wetlands impact, buffer areas, and mitigation projects.

In 2000, the St. Johns River Water Management District (SJRWMD) performed a brief Geographic Information Systems examination of visible wetlands impacts in Alachua County from 1990 to 2000 ([GIS Project Summary, Alachua County Wetlands Impacts – 1990 to 2000](#)). Based on National Wetland Inventory maps using 1984 source material, the SJRWMD determined that Alachua County has about 120,000 acres of total wetlands (wetlands plus water bodies). Of this total, approximately 29,000 acres

are water bodies, which can vary in areal extent with weather cycles, leaving about 91,000 acres in wetlands. “Loss,” for purposes of the analysis, was defined as conversion to a more intensive use, such as urbanization or intensive agriculture.

The study concluded that, although no significant losses were observed using the study method, there may be many small impacts to wetland edges and to small (less than half acre) wetlands that did not show up, due to the resolution of the imagery and the speed and scale at which it was viewed. The study also indicated that impacts to hydrology due to surface draining or water table drawdowns are known to occur in some locations. They were not visible, however, on aerial photos unless they resulted in gross changes to the vegetation community or land use. Other possible reasons for the observance of relatively few losses may include the availability and preference of uplands for development purposes in the central and western part of the County. As stated in the evaluation, it may also reflect a greater local regulatory commitment to wetlands protection, as the Surface Waters and Wetlands Ordinance has been in effect and enforced since 1992.

Wetland gains are generally the result of converting agriculture or silviculture back to wetlands hydrology and vegetation. The gain noted in this study was primarily due to public purchase and restoration of prior muck farm acreage at the southeast corner of Orange Lake, encompassing roughly 985 acres.

This is not necessarily a long-term trend. Development pressures on wetland areas are increasing. Also, hydrologic changes in some areas may convert wetlands to an uplands jurisdictional status, subject to development, and not protected by wetland regulations. It was observed in the study that such hydrologic changes may already have occurred in some areas.

The study concluded that functional impacts that are not considered “loss” also have occurred. These are significant, and fall under two main categories of impacts caused by vegetation management in and adjacent to wetlands.

- Silvicultural impacts – Tree harvesting was delineated on about 1,150 acres of wetlands, primarily hardwood swamps and cypress. In most cases these operations indicated good management practices. Some cases appeared to be clearcut, leaving more damage to the vegetation. The impacts were concentrated in certain areas and, where combined with adjacent upland forest removal, indicated significant adverse ecological impacts may have occurred in those areas.
- Impacts from adjacent land use – Uplands adjacent to wetlands have been cleared in many areas since 1990. In many cases, the clearing is routine harvesting of timber, after which regeneration takes place. In other cases, upland forest has been cleared for use as open space, pasture, or transition to more intensive development. There were too many cases of adjacent impacts to be delineated within the scope of the study. Adjacent development is particularly injurious to native habitat functions.

Upland habitats have been extensively developed for residential and agricultural use in Alachua County, often right up to the wetland boundaries, which may well have resulted in degradation and loss of the values for which wetlands were protected in the first place.

F. Protecting wetland ecosystems

Good planning and design are the best approaches to reduce or eliminate many of these adverse effects on wetlands. Of course, the best approach is to avoid wetlands in the first place. However, if that is not possible, regulatory programs at the federal, state, regional, and local levels have been established to review these kinds of activities and to prevent or minimize damage to wetlands or water quality.

1. Why activities are regulated

Although wetlands serve society in many ways, the nature of wetland benefits is such that the owners of wetlands usually cannot capture the benefits for their own use or sale. Just as the benefits of wetlands are utilized by people other than the property owner, likewise, the adverse impacts of wetland degradation and destruction are felt by people other than the property owner. Placing fill in a floodplain will cause higher flood waters and degraded water quality to be transmitted downstream with the flowing waters. Eliminating the vegetation in a freshwater marsh will reduce the number of fish and wildlife that will breed and migrate, thereby reducing the species that are captured or enjoyed by others. In such cases, it is clear that what happens on an individual's property will affect the public as a whole. That is why the people of Florida have authorized regulatory agencies to oversee wetland activities and prevent the wholesale destruction of these valuable areas, as has occurred in a bygone era.

2. Florida's wetland protection programs

The Florida Department of Environmental Protection (FDEP), the five water management districts (WMD), many local governments, and the U.S. Army Corps of Engineers share the responsibility for protecting wetlands in Florida. This is done both through regulatory (permitting) and land stewardship programs.

FDEP's 1996 Water Quality Assessment for the State of Florida, Section 305(b) Main Report warns that Florida's 11 million acres of wetlands are threatened by urban and agricultural growth. To address the problem, surface water and wetlands permitting underwent major revisions. In October of 1995, a new Environmental Resource Permit merged with and replaced FDEP's dredge and fill Wetland Resource Permits and the WMDs' Management and Storage of Surface Water Permits. FDEP does not use the federal methodology for delineating wetlands but has adopted its own, which must be used by all local, state, and regional agencies. The landward extent of a wetland is defined by the dominance of plant species, soils, and hydrologic evidence of regular or periodic saturation or inundation with water.

Wetlands are regulated at the state level through the Environmental Resource Permit (ERP) program, which went into effect in 1995. Five agencies administer the ERP program using an activity-based split of responsibilities, which is spelled out in operating agreements between the FDEP and the WMDs. The ERP program is designed to ensure that activities in uplands, wetlands, and other surface waters do not degrade water quality (such as through loss of wetlands, improper construction techniques in waters, or discharges of improperly treated runoff), cause flooding (such as by changing off-site runoff characteristics), or degrade habitat for aquatic or wetland dependent wildlife. Staff at the FDEP and WMDs can answer questions and help applicants determine the appropriate agency for any given application.

3. Sovereign submerged land approvals

If any ERP activities are located on sovereign (state-owned) submerged lands, the applicant will also need permission from the land owner (the State) to use these lands. This permission is known as proprietary authorization. The regulatory and proprietary reviews for an ERP project are linked so that they are conducted concurrently. However, activities that are eligible for a noticed general permit or an exemption are not linked in this way.

4. Local protections: Alachua County

Local governments are key players in comprehensive wetland protection. Compared to programs of broader geographic scope, strategic wetland plans adopted at the local government level offer advantages such as: more diverse protection capabilities, such as water management, land use, and zoning authority; landscape-scale consideration of wetland functions and values, allowing prioritization of protection and restoration efforts; ability to plan acceptable mitigation banking activities, and to coordinate with other environmental protection and efforts and local programs, such as wildlife corridors, greenways planning, riparian protection, and floodplain regulation; and the provision of greater predictability to wetland permitting programs, and overall, a more proactive approach to wetland protection.

a. Regulations

Prior to 1992, wetlands delineation and protection were addressed in Alachua County on a case-by-case basis through the development review process pursuant to applicable Water Management District and FDEP regulations and county policy as contained in the Comprehensive Plan. The County was hampered in its efforts to protect wetlands because there was no formally adopted local regulation or ordinance implementing its authority. In many cases, the County was forced to defer to state or regional regulations which didn't always sufficiently address local concerns.

In 1992 the Surface Waters and Wetlands Ordinance was adopted to provide local regulatory authority over these resources in Alachua County. In 1994, a unified statewide methodology for the delineation of the landward extent of wetlands was adopted (see ss. 373.421, 373.019(17), FS; ch. 62-340, FAC), preempting the county from delineating wetlands using any other methodology.

The County's basic approach to wetlands protection emphasizes avoidance and minimization of any wetland impact; mitigation is required where impact is unavoidable. Additionally, local regulations require undisturbed upland buffers of varying widths adjacent to wetlands. Minimal impact activities and activities that serve an overriding public purpose are allowed subject to certain criteria. We believe that this approach has been successful over the last 10 years in preventing significant losses of wetlands, largely due to a strong regulatory commitment to wetlands protection. Nonetheless, implementation over the last 10 years has demonstrated areas where the local regulations can be improved.

An applicant for development of a property that contains any portion of a wetland or wetland buffer must design and locate that development to avoid impact to the wetland and buffer wherever possible. When the applicant submits an application for land use change, zoning change, or Development Review Committee approval, the applicant is required to perform a natural resources inventory of the property. This is a site-specific analysis that includes delineation of the wetland and buffer, an assessment of the existing quality and characteristics, an evaluation of the impact of the proposed activity, a discussion of

proposed measures to protect or mitigate anticipated impacts, and a plan for maintenance and monitoring of the wetland and buffer.

If the inventory indicates that there are portions of the property which do not contain wetland and buffer areas, the applicant will only be approved for a plan under which all development is located outside of the wetland and buffer. If the applicant proposes activity that impacts a wetland or buffer, the applicant must demonstrate that they have made every effort to avoid and to minimize the adverse impact. Development must be located so that it occurs in the least sensitive portion of the wetland and buffer area, and the impact area is limited to the rate of ½ acre per 10 acres. In addition, the applicant must show that the impact is “justified” for one of three reasons: the activity is a minimal impact activity (e.g. installation of navigational aids; small-scale nature trails, docks smaller than 1,000 square feet in size); or, the activity is in the overriding public interest (e.g. cleanup of hazardous materials spill, removal of non-native invasive species, fighting wildfires); or, all economically beneficial or productive use of the property is otherwise precluded. An applicant’s desire to maximize the density or intensity of development is not sufficient justification for impact to a wetland or buffer.

Finally, before any impact is allowed, the applicant must submit and commence implementation of a plan for mitigation of any adverse impacts to the wetland and buffer. New policies provide specific standards for mitigation, including minimum mitigation ratio guidelines, intended to allow flexibility while ensuring quality mitigation plans. Should recently contemplated rule changes at the state level preempt the County’s ability to regulate one or more aspects of wetland mitigation, comprehensive plan amendments will be needed.

Minimizing and mitigating impacts

Unless exempted, any adverse impacts to wetlands must first be avoided or minimized. If these impacts are unavoidable, then the applicant must take mitigating actions to offset the adverse impacts of the proposed activity.

There are many ways to minimize the damaging effects of construction or other activities on wetlands and other surface waters. For example, the key to preventing damage from sewage and industrial waste is proper treatment and disposal. Better yet, conservation and pollution prevention may reduce the need for the discharge in the first place. Stormwater runoff is now the largest source of water pollution in Florida. Retaining and detaining stormwater runoff helps to reduce the pollutants discharged from this source. The adverse effects of docks may be reduced by selecting alignments that avoid submerged or shoreline vegetation or allow more light penetration, by extending docks to depths where dredging is not needed to allow boat access and mooring, and by using alternative building materials that don’t give off toxic chemicals. The impacts from road construction can be reduced by selecting the least damaging alignment and by building a bridge rather than a filled causeway to cross wetlands or other surface waters.

Mitigation requires those who must work in wetlands to make up for any damage caused by their work. For example, the applicant who cannot build on their property without encroaching into the edge of a cypress dome may be causing an unacceptable loss of wetlands. Mitigation requires the applicant to compensate for this loss by restoring a filled wetland, enhancing a degraded wetland in an adjacent cypress dome, or purchasing wetlands or associated uplands for protection of comparable ecological benefits. Also, mitigation may include activities on or off the impacted site. However, before any mitigation can be contemplated or accepted, the applicant must first attempt to eliminate or reduce their impacts.

Buffers

If a property is located next to a wetland or water body, a strip of upland must be left in its natural state between the wetland and any area of land disturbance. The buffer is intended to provide the upland habitat that is needed by many aquatic or wetland animals. The undisturbed soil and vegetation in these areas also helps to stabilize the wetland habitat and filter the runoff from your yard. Generally, vegetation may not be altered in the buffer except as part of a responsible stewardship or management plan that promotes buffer functions and values. Invasive, non-native plants may be removed and replaced with native vegetation. Yard trimmings and clippings may not be dumped in the buffer area. If you live along the waterfront, the natural slope of the shoreline must be protected.

A recent JEA report presents the scientific methodology for calculating buffer zone widths necessary for protecting wetland habitat, minimizing sediment transport, and minimizing groundwater withdrawal in wetlands of St. Johns County (JEA et.al. 2000). The report represents the culmination of a significant body of literature that has been developed in Florida and other parts of the country over time. Although produced for St. Johns County, the report, in addition to numerous other studies on buffers and specific species, is applicable to Alachua County because wetland types, habitats, wildlife species, and soil types are substantially similar (Brown 2001).

Upland vegetative buffers are widely regarded as necessary to protect wetlands, streams, and other aquatic resources. However, buffer size requirements typically have been established by political acceptability, rather than scientific merit. This often leads to insufficiently buffered aquatic resources and the false perception that the resources are being properly protected from potential impacts. Numerous scientific studies have shown that relatively wide buffers (150 to more than 300 feet) are necessary to protect wetlands. (JEA et.al. 2000). A dilemma exists. Undersized buffers may place aquatic and wetland resources at risk, while buffers that are sufficiently large to provide full protection may unrealistically deny landowners use of their land. Therefore, it is important to determine the minimum buffer width necessary for protection of most of the resources, or the most sensitive of the resources.

Three goals have been identified and used to determine buffer sizes: protection of wildlife habitat; minimization of sediment transport into wetlands; and minimization of groundwater drawdown in wetlands. The JEA report (2000) concludes that a minimum of 300 feet is necessary to reasonably protect a viably functioning wetland ecosystem. A 300-foot buffer would protect approximately 50% of the wetland-dependent wildlife species in freshwater wetlands, and protect water quality from sedimentation by coarse and fine sands. In some site-specific cases, such as with silt or clay soils, or from large draw-down structures, a greater buffer distance would be necessary to protect the wetland.

Any reduction in the buffer width below 300 feet can impose adverse impacts to the wetland, particularly to the wetland-dependent wildlife species that require a wide surrounding upland area in which to feed, forage, and use as protection from human disturbance. Lesser alternatives would still provide some protection to wetlands; however, any reduction can result in adverse impacts to wildlife populations, as well as degradation of water quality from deposition of fine sediments. The County has chosen an alternative to one large buffer distance. This alternative is intended to provide flexibility while accommodating private property concerns.

Buffers are required in Policy 3.6.8 to protect wetlands and surface waters from adverse impacts of development (e.g. dredging, filling, excavation, land clearing, tree cutting, construction of structures, installation of utilities, roads, septic tanks, etc.). Relevant Best Management Practices may substitute for policy-identified buffers in the cases of agricultural and silvicultural activities.

The County's new policy requires buffers to be determined case-by-case depending on what is demonstrated to be scientifically necessary to protect natural ecosystems from significant adverse impact. Buffer widths continue to be determined based on site specific considerations, such as type of development and potential for adverse impacts; natural community type and hydrologic or management requirements; buffer area characteristics and function; and the presence of rare, threatened, or endangered species of plants and animals.

The 35-foot minimum buffer width identified in the 1991 Comprehensive Plan has been removed. The following buffer widths apply unless scientific information is presented for a particular site that demonstrates a larger or smaller buffer width is appropriate to protect the wetland ecosystem from significant adverse impact: 75 feet from ordinary wetlands and surface waters, 200 feet from Outstanding Florida Waters, and 300 feet from areas where rare, threatened, or endangered species have been documented within 300 feet of a wetland or surface water. This approach is intended to provide the flexibility to adapt to special circumstances. For example, a 75 foot buffer may not be warranted in the case of a severely degraded wetland, or artificial wetland surrounded by uplands with little habitat value. The policy allows for reduction where scientific demonstration indicates smaller buffer is sufficiently protective. Conversely, buffer width may need to be widened where relevant data indicate that the default width is inadequate. In addition, if the buffer precludes all economically viable use of a particular property, limited development may be allowed within the buffer.

The buffer distance is measured from the outer edge of the wetland jurisdictional line. The buffer area must be clearly depicted on all site plans, development plans, and other documents submitted to the County for review of development, zoning approval, or land use change. In cases where the buffer is allowed to be reduced in a given area, a larger buffer than that specified in other areas of the development may be required in order to compensate for the reduction.

Native, undisturbed vegetation must be retained within the designated buffer area in order to maximize the habitat benefits to wetland-dependent wildlife species. Buffer areas that are devoid of natural associations of native vegetation should be restored with appropriate native vegetation. Planting of trees, shrubs, and non-woody species should mimic natural systems in the immediate area in terms of density and types of vegetation. Plantings should occur in staggered, random, and clumped patterns to reflect a more natural appearance.

Agricultural and silvicultural activities are allowed within the buffer provided they are conducted in accordance with relevant Best Management Practices (BMPs). Silvicultural BMPs require special management zones (SMZs) adjacent to streams, lakes, sinkholes, and wetlands. SMZs are based on the size and type of the water body, and soil type and slope.

In conjunction with BMPs, Policy 4.7.5 retains the requirement from the 1991 Comprehensive Plan that silvicultural activities maintain the overall ecological integrity of the wetlands community. This includes maintaining habitat for listed species populations onsite, planning harvests for varying age and height diversity, and maintaining natural hydrology. The requirements in this policy essentially parallel those in the BMPs, but are more explicit in identifying habitat protection as a performance standard. The need for habitat protection has been outlined in numerous studies, as discussed in more detail in other sections of this analysis. As JEA asserts (2000), by far the most common cause of wildlife population decline is alteration of the natural landscape through construction, agricultural and silvicultural activities. Given the mandate of the State Comprehensive Plan to protect and acquire habitat/ecosystems, we must be proactive in addressing habitat destruction and degradation.

b. Private land conservation tools

Natural resource protection goals can be achieved by providing options and incentives to landowners that allow for the prudent use of productive agricultural land. There are numerous state and federal financial and technical assistance programs available to landowners whose property possess certain natural values. A series of successful private land conservation efforts has illustrated that landowners can achieve natural resource protection and economic goals. Historically, many options have been used, both individually and in combination. Three types of assistance are described below.

Financial incentives

Financial incentives include cash benefits, limited development opportunities, cost sharing, tax incentives, wildlife agreements, and conservation management agreements. Some programs which have been successful in Alachua County include: the Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), Agricultural Conservation Program (ACP), Forestry Incentives Program (FIP), Forest Stewardship Program (FSP), Stewardship Incentives Program (SIP), and American Farmland Trust (AFT). These programs are described briefly below,

The major goals of the CRP include reducing soil erosion and sedimentation, improving water quality, maintaining fish and wildlife habitat, and providing support income to farmers. Lands in the CRP cannot be tilled or grazed until the end of a 10-15 year contract. In return, farmers receive annual rental payments for the land, cost-sharing, and technical assistance to plant vegetation for conservation.

The WRP is a voluntary program offering landowners a chance to receive payments for restoring and protecting wetlands on their property. The program offers landowners cost-share funds under three options: permanent easements (payment in an amount up to the agricultural value of the land, plus 100% of the restoration costs), 30-year easements (payment up to 75% of what would be paid for permanent easement, plus 75% of restoration costs), and restoration cost-share agreements of a minimum 10-year duration (payment of 75% of the cost of restoration activity). The landowners will maintain full control over access and use of the easement lands, and may lease the land, for hunting, fishing, and other undeveloped recreational activities. Compatible uses, such as cutting hay, grazing livestock or harvesting wood products, may be allowed if they are fully consistent with protection and enhancement of the wetland. Other agencies and private conservation organizations may provide additional assistance for easement payment and wetland restoration costs as a way to reduce the landowner's share of the costs.

The ACP encourages voluntary compliance with federal and state requirements for solving point and nonpoint source pollution problems on farms. ACP provides 50-75% cost-share funds for approved practices providing long term and community-wide conservation benefits. Practices that can help fund wetlands and riparian area wetland restoration and enhancement include: establishment of permanent vegetative cover, buffer strips, permanent wildlife habitat, shallow water areas for wildlife, integrated crop management, and source reduction of agricultural pollutants. The applicant must own between 10 and 1,000 acres to be eligible. The ACP agreements can be for one year or more, with maximum cost-share of \$3,500 per year. Farmers may enter into pooling agreements to jointly solve mutual conservation problems, such as restoration of a wetland covering portions of several properties.

The FIP is the major U.S. Department of Agriculture forest tree planting program and can be used to help restore wooded wetlands. The FIP provides technical and cost-share assistance to landowners participating in any one of four eligible forestry practices: tree planting, improving a stand of forest trees, site preparation for natural regeneration of trees, and special forestry practices. All FIP practices require a

minimum 10-year maintenance agreement, with maximum cost share of \$10,000 per year (not to exceed 65% of the actual, average, or estimated cost of performing the practice). Eligibility is limited to landowners of 10 to 10,000 acres.

The FSP provides technical assistance to help landowners protect and enhance their timber, fish and wildlife habitat, water quality, wetlands, and recreational and aesthetic values of their property. The SIP provides cost-share assistance to private landowners for implementing the management plans developed under the FSP. There are eight major categories for funding: management plan development, reforestation and afforestation, forest and agroforest improvement, windbreak and hedgerow establishment, riparian and wetlands protection and improvement, fisheries habitat enhancement, wildlife enhancement, and forest recreation enhancement. Cost-share is authorized for purchase, installation, and establishment of plant materials, streambank stabilization, fencing, and restoration of natural hydrology. Eligible landowners must own 1,000 acres or less of qualifying land, and funded practices must be maintained for a minimum of 10 years. Payments may not exceed \$10,000 per year (up to 65% cost-share).

The AFT is a non-profit organization that works with farmers, business people, legislators, and conservationists to encourage sound farming practices and preserve America's most critical agricultural resources. AFT's Forest Legacy Program purchases easements to conserve environmentally important forest lands, often including wetlands, threatened with conversion to other uses. The program also encourages individuals owning farms threatened by development to donate their lands to AFT. Landowners may retain lifetime use of the property, while receiving significant income and estate tax deductions. Upon receiving the donated property, AFT will sell the farm with conservation easements to guarantee the preservation of the property, using proceeds to protect other threatened farms.

Education and outreach

There are numerous education and outreach opportunities for marketing voluntary wetlands conservation programs. The Cooperative Extension Service educates citizens to apply practical, research-based knowledge to critical issues, including wetlands conservation, which face individuals, families, communities, and global partners. The total extension effort is accomplished through a large informal network of county and regional offices that offer seminars, workshops, publications, volunteer training and other assistance to educate citizens. Additional programs can be found by contacting the local Cooperative Extension agent.

Technical assistance is available from several sources in wetlands creation and restoration, landowner master plans, management of wildlife, forestry and agriculture. Land users may request technical assistance from the Natural Resource Conservation Service (formerly the Soil Conservation Service) through local soil and water conservation districts. Technical assistance and information is available for: making wetlands determinations; developing conservation plans; providing income-producing alternatives for use and management of wetlands; providing information on plant materials for wetland planting; and providing soil surveys and information for identifying, planning, and managing wetlands.

AFT conducts on-farm research and demonstration projects with grass-roots sustainable agriculture organizations and farmers to develop and encourage the use of sound environmental farming practices. AFT also provides advice to private landowners on ways to include conservation strategies in land use and estate plans for farmers, and accepts donations of land and conservation easements.

The Nature Conservancy (TNC) runs Natural Area Registries to honor private landowners of outstanding natural areas, such as bogs and other wetlands, for their commitment to the survival of the land's natural heritage. This is a voluntary, non-binding, and non-regulatory program. There is no payment involved in enlisting the property. In joining the Registry, the owner commits to preserving and protecting the area to the best of their ability, notifying TNC of any threats to the area, such as pollution, rights-of-way, or drainage; and notifying TNC of any intent to sell or transfer ownership. With the owner's permission, TNC will visit the registered area annually to assess changing conditions and identify new threats. In conjunction with the Registry, TNC also provides private landowners with information on additional programs for protecting wetlands (such as acquisition, conservation easements, bargain sale, donation, and other voluntary agreements), best management practices, and other relevant scientific information.

Private industrial programs

The American Tree Farm System is a nationwide organization which recognizes landowners for quality forest management on their property. A forest management plan will be developed based on landowner objectives and the property recognized as a pioneer tree farm. On a periodic basis, the property will be reinspected by a professional forester, and, if outlined management plans are implemented, the property will be recognized as a certified Tree Farm. There is no cost for the owner to participate. Eligibility requires 10 or more acres of woodland, managed for forest products, wildlife, water protection, and aesthetics. Please see the Agricultural and Silvicultural Practices section for further discussion of private forest certification programs.

The Wildlife Habitat Council (WHC) is a non-profit membership organization established by conservation groups and corporations to encourage and assist companies in enhancing their lands for the benefit of animal and plant life. Projects aim at physically improving wildlife habitat on private lands and fostering environmental awareness among company managers, employees, and the local community. Participants gain technical habitat management skills as well as greater awareness of the interconnection of ecologic, economic, and social elements within an ecosystem. When a plan is implemented, the WHC certifies completion and maintains a "Registry of Certified Corporate Wildlife Habitats." Habitats are certified through review and documentation of active management programs and must re-qualify every two years.

Homeowner stewardship

Here are a few tips on how you can practice environmental stewardship in your home and neighborhood and protect wetlands and water quality. You can reduce erosion by mulching, or planting ground cover over exposed soil in heavily trafficked areas, flower beds, and shaded areas. Re-vegetate bare patches of soil, and recycle the vegetation rather than piling, raking, or blowing leaves or grass clippings into the streets where they will wash into streams or lakes. Let rain water soak into the ground rather than letting it run off your property on impervious surfaces. Direct runoff from your roof through gutters and drain spouts to the lawn or garden, and not to the paved driveway or parking lot. Limit paved areas, and consider using flagstones or pervious materials that allow water to soak into the ground.

Use fertilizers and pesticides wisely. Nationally, lawns guzzle water, and use up to 10 times as much chemical and pesticide per acre than an equal area of cropland. U.S. lawns absorb more synthetic fertilizer each year than India applies to all of its food crops. Use compost and mulch (such as grass clippings or leaves) to reduce your need for fertilizers and pesticides. Never apply fertilizers or pesticides on bare ground or eroded areas, or near a well, waterbody, or wetland. Better yet, instead of using pesticides, buy disease and pest-resistant plants.

There still are 1.6 million septic tanks in use in Florida. Septic tanks are an acceptable means of sewage treatment in some locations, but when they are crowded together in subdivisions, if the soils aren't appropriate, and when the septic tanks are not kept up properly, they can become a major source of pollution. Keep the septic system clear of trees and large shrubbery – roots will clog the drainfield. Never dispose of household or other chemicals down the drain. Have the tank checked annually, and pump out surface scum and sludge about every three years. Septic tanks should be used only where there is no alternative. If a sewer system is available, hook up to it.

There are numerous publications which contain additional suggestions on good environmental stewardship practices on these topics and more, including car care, boating tips, and recreation. There are several good wetlands sites on the internet. Three very good sites that contain links to other wetland sites are:

The U.S. Fish and Wildlife Services' National Wetlands Inventory page at <http://www.nwi.fws.gov>

The U.S. EPA's Wetland page at <http://www.epa.gov/owow/wetlands>

The Society of Wetland Scientists' list of wetland-related internet sites at <http://www.sws.org/wetlandsweblinks.html>

Copies of state laws and application forms are available from:

Any of the DEP District Offices: <http://www.dep.state.fl.us/org/district.html>

Any of the WMDs: <http://www.dep.state.fl.us/org/water.html>

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NATURAL RESOURCES BIODIVERSITY

A. Introduction

When Spanish anchors first dropped into Florida waters nearly 500 years ago, Florida was essentially one large nature preserve that also supported a population of about one million native Americans. Wildlife at this time roamed freely across 35 million acres in search of food, shelter, and water, while individual human settlements covered less area than most modern-day parking lots. The state's road system in pre-Columbian times consisted of narrow foot paths that were used by panthers, bobcats, red wolves, and black bears as frequently as by native Americans, and the few human edifices present quickly gave way to a surrounding landscape consisting of tall, majestic trees, most hundreds of years old, and extensive open prairies and marshes (Cox et.al., 1994).

Florida is widely recognized as one of North America's most important reservoirs of biological diversity. The state's warm climate, ample rainfall, geologic history of multiple sea level fluctuations, diversity of habitats, and close proximity to the tropics create a unique environment that harbors myriad biological rarities. Nearly 700 vertebrate species and 4,000 plant species are found in Florida (Jue et.al. 2001). At least 17% of Florida's vertebrates, 410 invertebrates and about 300 plant species are thought to be endemic (Cox et.al., 1994). This means that they are found nowhere else in the world, which conveys a weighty responsibility: our conservation and management activities are of global importance in efforts to conserve the diversity of life on Earth.

In 1991, plant communities in Alachua County included approximately 150,000 acres of pinelands, 108,000 acres of grassland, 93,000 acres of swamp, marsh and open water, 72,000 acres of hardwood hammocks and forests, and 7,000 acres of sandhill (Elert, 1991). Unfortunately, Alachua County has lost much of its natural habitat to urban, agricultural and industrial development, both before 1991 and in the decade since. Although wetland protection laws passed in recent years have slowed the destruction of wetland habitat, the overall trend still continues in the case of mesic and xeric (upland) habitats.

Natural communities constitute habitat for a large number of wildlife species in Alachua County. Among vertebrate species (mammals, birds, reptiles, amphibians, and fish), there are 417 species native to the area and 21 species that were introduced (EAR, 1998). Representing over 60% of the species of vertebrates identified in the entire state of Florida, the presence of 438 different species in Alachua County represents a high level of diversity reflecting a wide variety of habitat and climatic types in this area. This is a significant natural and recreational resource for the . In addition, terrestrial caves provide important habitat for southeastern bats, and the wetlands and surrounding areas in south Alachua County are critical areas for sandhill crane and the southern bald eagle. Other species in need of habitat protection include gopher tortoise, eastern indigo snake, tiger salamander, limpkin, blackbanded sunfish and the Florida black bear.

Today, many species of wildlife are caught in a state of siege as the habitats needed to sustain their populations rapidly disappear. In just the last 50 years more than 8 million acres of forest and wetland habitats in Florida (about 24% of the state) were cleared or filled to accommodate an expanding human population (Cox et.al. 1994). This area is 16 times larger than our state's largest national forest and exceeds the total land area found south of approximately Port Charlotte. Florida's population exceeded

15 million people in 1999. As Florida's human population continues to grow towards an estimated 20 million residents by the year 2025, increasing demands will be placed on our remaining natural systems, and wildlife populations will be forced into smaller and smaller areas as a result. In an analysis of the country's most endangered ecosystems, Florida was identified as the state most at risk of losing its native habitats (Noss and Peters, 1995).

If diverse wildlife populations are to persist in the face of such sweeping changes, we must conserve a base of habitat that is sustainable far into the future. This habitat base should consist of preservation areas that are publicly owned and managed primarily for natural conditions, but it must also include private lands that allow natural resources to be conserved without sacrificing all private uses of the land. The next decade represents a critical turning point in efforts to conserve habitat for several rare, threatened, and endangered species. If we fail to act now, the chances of successfully maintaining species such as the Florida black bear and others will diminish greatly. Future Floridians will ultimately hold our generation responsible for the manner in which we conserve the species and natural resources that we inherited.

Conservation of habitat is an important part of protecting wildlife. In November 2000, the voters of Alachua County approved a \$29 million bond issue to fund the acquisition of environmentally significant lands for protection as natural areas and open space. Management plans will be developed for natural areas acquired with these funds. Long term management and maintenance of the sites are important in order to ensure that the natural resources and values of these lands are protected and maintained. Dedicated funding sources will be an integral part of providing the necessary maintenance and management of natural areas.

In addition to acquisition programs, the regulatory process plays a vital role and is an important factor in the County's efforts to protect natural areas and maintain the County's natural resources. The destruction and degradation of native vegetation and wildlife habitat through various forms of land alteration, water table lowering, and the quality of water entering these areas are major threats to the County's native vegetation and wildlife populations. Once lost, the plant and animal species diversity, groundwater recharge capacity, recreational and educational opportunities are irretrievable. The decline in health and natural diversity of our natural resources signals the need for continual protection and restoration efforts. Objectives specifically focused on biodiversity and strategic ecosystems seek to protect natural areas and to preserve the diversity of habitats in Alachua County.

B. Importance of biodiversity

1. What is biodiversity?

Biodiversity (biological diversity) is, in essence, the full array of life on Earth. The most tangible manifestations of this concept are the various species of plants, animals, and microorganisms that surround us. Yet biodiversity is more than just the number and diversity of species. The concept also includes the genetic variation within a given species of plant or animal. At a higher level, it includes the natural communities, ecosystems, and landscapes of which species are a part. The concept of biodiversity includes both the variety of these things and the variability found within and among them. Biodiversity also encompasses the processes – both ecological and evolutionary – that allow life on Earth to continue adapting and evolving. The Nature Conservancy describes three of the principal levels of biological organization as species, ecosystems, and landscapes (Stein et.al. 2000).

Species diversity encompasses the variety of living organisms inhabiting an area. This is most commonly gauged by the number of different types of organisms – for instance, the number of different birds or plants in a state, region, or ecosystem. While this is the most easily grasped aspect of biodiversity for most people, it is actually populations or “bands” of species in a geographic area and their interactions that together are the focus of on-the-ground conservation efforts. By extension, this concept includes the interactions of “populations of populations.”

Ecological diversity refers to the higher-level organization of different species into natural communities, and the interplay between these communities and the physical environment that forms ecosystems. Interactions are key to ecological diversity. This includes interactions among different species – predators and prey, for instance, or pollinators and flowers – as well as interaction among these species and the physical processes, such as nutrient cycling or periodic fires, that are essential to maintaining ecosystem function.

Landscape diversity refers to the geography of different ecosystems across a large area and the connections among them. Natural communities and ecosystems change across the landscape in response to environmental gradients such as climate, soils, moisture, or altitude and form characteristic mosaics. Understanding the patterns among these natural ecosystems and how they relate to other landscape features, such as farms, cities, and roads, is key to maintaining such regional diversity.

There is an old saw amongst ecologists that “diversity breeds diversity.” Conservation of biodiversity requires attention to each of these levels, because all contribute to the persistence and variety of life on Earth. More than most people realize, humans rely on wild biological resources for food, shelter, medicine, and essential life processes. Everything, one quickly begins to understand, really IS connected to everything else.

2. Why is biodiversity important?

The importance of maintaining the varied elements that comprise Florida’s biodiversity can be measured along many scales. Foods, medicines, and other products from living organisms are essential to human existence. Genes from wild plants, for instance, allow plant breeders to develop disease resistant crops or increase crop yields, passing along the benefits of biodiversity to farmers and ultimately consumers. In addition, approximately 1,500 new compounds are discovered each year from wild plants, and about 300 of these have potential use in medicine (Cox et.al. 1994). From the most obscure to the most common organisms, surprises abound. A relative of the rare Florida yew, for example, offers the greatest hope of any new discovery in the treatment of certain cancers. In 1960, a child with leukemia had a 1-in-5 chance of remission. Now, thanks to anti-cancer drugs developed from a compound discovered in wild periwinkle plants, the same child's chance of survival has increased to 80% (Myers, 1992).

Biodiversity not only provides direct benefits like food, medicine, and energy; it also affords us a "life support system." Biodiversity is required for the recycling of essential elements, such as carbon, oxygen, and nitrogen. It is also responsible for mitigating pollution and floods, protecting watersheds, and combating soil erosion. A one-acre patch of elm trees produces oxygen, removes carbon from the atmosphere, and captures at least 16 tons of airborne dirt, which rain then washes back to the ground as productive soil (Myers, 1983). Because biodiversity acts as a buffer against excessive variations in weather and climate, it protects us from catastrophic events beyond human control (McNeely et.al. 1990). We have learned that the future well-being of all humanity depends on our stewardship of the Earth. When we over-exploit living resources, we threaten our own survival (National Research Council, 1992).

A diverse natural environment also plays an important economic role. In 1991, recreation associated with wild birds alone generated nearly \$20 million in economic activity and 250,000 jobs in the United States, exceeding many Fortune 500 companies (IAFWA and USFWS, 1995). U.S. parks brought in \$3.2 billion from visitors in 1986 (WRI et.al, 1992). That same year, tourism in Kenya amounted to \$400 million. In that country, the economic value of viewing elephants alone totaled \$25 million in 1989 (Pearce and Moran, 1994). These large economic revenues reflect the high value people place on recreation involving biodiversity.

More than 67% of Florida's residents participated in non-consumptive natural resource activities such as bird watching, nature study, canoeing, and hiking in 1985, contributing \$1.3 billion to the economy (USFWS 1997). In addition, consumptive activities like hunting and fishing contributed about \$3.8 billion, for a combined total of approximately \$5.2 billion. At the time, this was the second largest industry in Florida, and every indication is that this industry has expanded considerably in the years since (Duda, 1987 and Cox et.al. 1994).

Plants, animals, and natural landscapes have beneficial effects on human health and well-being. The conservation of natural areas and wildlife populations provides us with many unparalleled experiences: the sight of a bald eagle soaring above rivers and lakes; the mysterious night sounds of barred owls and limpkins that slip from swamps and sloughs; the pursuit of fish and game in remote wilderness areas; the fresh, clean smell of pinewoods on a spring morning or the sharp, pungent aroma of a rosemary scrub. These and other experiences found only in the natural world quench a deep-seated human thirst for natural aesthetics and renew our links to the world around us. The very things we cherish will be lost if we don't make some hard decisions.

3. Rates of species extinction are unprecedented

Not since the disappearance of the dinosaurs has the rate of species extinction, the most common measure of biodiversity loss, been higher. Harvard biologist E.O. Wilson projects that, within the next 25 years, one of every five species will die out, unknown to our grandchildren (Sierra Club, 1998). Virtually all of the loss is caused by human activities, mostly through habitat destruction and over-hunting. In the contiguous United States, 98% of virgin forests have been destroyed, and 54% of wetlands have been lost (Noss, 1994). Over the past 500 years, 200 species of plants and 71 species and sub-species of vertebrates have become extinct in North America alone; another 750 species are officially listed as endangered or threatened. Unfortunately, only 13% of the approximately 14 million species that inhabit the Earth have been described by scientists (Suplee, 1995). With increasing human pressure on biological resources, rates of extinction can only be expected to accelerate.

In the past few decades, it has become obvious both nation-wide and state-wide that there were dwindling numbers of certain animal and plant populations. In Florida, native species such as the wood stork, the burrowing owl, and the Florida panther have suffered serious population reductions. These species are not the only ones that have suffered, however. Federal and state agencies list 167 species of wildlife and plants in Alachua County as endangered, threatened, species of special concern, or have the potential to be commercially exploited. This includes over 70 species of plants, 100 species of vertebrates excluding mammals, 12 species of mammals, and 38 species of invertebrates (EAR, 1998).

C. Human impacts upon biodiversity

The Nature Conservancy, Sierra Club, and FFWCC describe three overarching reasons for the decline of wildlife populations in Florida (TNC 2000, Sierra Club 1998, Cox et.al 1994). Habitat destruction, degradation, and fragmentation is documented as the foremost cause; the resultant loss of feeding and nesting sites has severely impacted bird and animal populations. Direct exploitation and human, or anthropogenic, disturbances are cited as the two remaining factors. The discussion below is based primarily on reports by The Nature Conservancy, Sierra Club, and FFWCC.

1. Habitat destruction

Habitat destruction and degradation is at least part of the reason why more than 95% of listed species are imperiled nationwide (Flather et.al. 1994). According to the Sierra Club, studies show that logging affects approximately 14-17% of listed species throughout the United States, grazing impacts 19-22%, water development affects 29-33%, recreation affects 23-26%, and mining impacts 14-21% (Sierra Club 1998). In Florida, only a few thousand acres remain of several important natural communities (Cox et.al. 1994). If we are to maintain current diversity, our system of conservation areas must be capable of supporting thousands of species on only a fraction of the original land base.

Loss of habitat is reaching critical proportions in many parts of the state, including Alachua County, for certain species. Two examples of this phenomenon in Alachua County are the red-cockaded woodpecker and the flatwoods salamander. The red-cockaded woodpecker, a federally “endangered” species whose favored habitat is old growth longleaf pine forests, is considered functionally extinct in Alachua County as recently as the 1990s. The lone male animal, under federal permit, was relocated to the Ocala National Forest a few years ago (M. Drummond, 2001). The flatwoods salamander, which uses the same habitat as the red-cockaded woodpecker, was proposed by the US Fish & Wildlife Service for listing as a threatened species as recently as December 1997. Its habitat is longleaf/slash pine flatwoods, which is being lost or degraded by agriculture, urbanization, and plantation pine silviculture, mostly the last.

2. Habitat fragmentation

In addition to outright habitat loss, other problems stem from the fragmentation of our remaining patches of natural habitat. Habitat fragmentation refers to the tendency for remaining patches of habitat to become reduced in size and increasingly isolated from one another as land is cleared. This creates problems since some species range widely and require large tracts of habitat to survive. As patch sizes fall below the minimum areas needed to sustain a breeding population, a species will likely disappear in areas that otherwise have appropriate vegetative conditions (Cox et.al. 1994). As habitat is lost, the remaining patches tend to become farther and farther away from each other. Small habitat fragments also tend to have a greater percentage of edge habitat when compared with larger habitat fragments (see Shafer 1990). Edge habitats near urban and residential areas are characterized by decreased survival and reproduction owing to increased predation, collisions with vehicles, and nest parasitism, as well as fundamental changes in habitat such as species composition and habitat management procedures (Ambuel and Temple 1983, Harris 1984, Janzen 1983, Doren et.al. 1987).

As developments sprout into the rural area and we pave long stretches of our open countryside in order to connect them, wildlife is forced into areas unsuitable for survival. Habitats shrink or are isolated from each other, or in many instances are completely eliminated. Cut off from others of their species, with no place to forage, breed and bring up their young, they simply die. Take, for example, the sandhill crane.

They forage (feed) by day in open fields and many of us see them two or three at a time, gracefully stalking their small prey. At night, however, they gather, breed and nest in swampy marshes. Without those areas these birds will not survive.

A regrettably tragic result of this pressure on our wildlife is increased road kill, which has become an increasingly serious threat to wildlife populations in recent years. From 1976 through 1998, for example, nearly 700 bears were killed on Florida's highways. Bear kills have been documented in 45 of the state's 67 counties (FFWCC 1999). That's why we now recognize the need to locate roads to avoid wildlife corridors in the first place. It's also why wildlife crossings are so important on major roads in this County, especially if they cross open land, preservation or conservation lands. The wildlife crossings retroactively installed under US 441 at Paynes Prairie are a good example of the steps that are being undertaken to address this issue in cooperation with the Florida Department of Transportation, Florida Department of Environmental Protection, and other agencies and departments.

3. Direct exploitation

Direct exploitation refers to the use of a wildlife or plant species; for example, hooking gopher tortoises, or harvesting wild orchids. Human disturbances include disturbance of nesting sites. Nest site disturbance threatens the viability of several species of birds, including the bald eagle. Also of significance in Alachua County is the alarming rate of disappearance of bats statewide. Disturbance of roosting sites due to development and vandalism are the greatest threats to Florida's seventeen species of bats. They are one of the most important control factors regarding night flying insects, including many agricultural pests. A single bat can eat up to 3,000 insects in one night (Pasco 2001).

4. Other human disturbances

Other human disturbances include the spread of invasive vegetation; water table reduction (a serious threat to wading bird species such as the wood stork that depend on marshes and seasonal ponds for feeding); fire suppression in habitats such as scrub or scrubby flatwoods, the only habitat in which the threatened scrub jay lives; short-rotation timber management of pinelands that support the red-cockaded woodpecker; and intensive boating in the rivers and lakes in which threatened wildlife dwell.

Wading birds have abandoned many of their former breeding sites within large wetland systems that have been radically altered due to past drainage or flood control practices, or pollution from intensively developed urban and agricultural lands (Sierra Club, 1998). Still other natural habitats have been invaded by non-native plants that often force out native plants species and eliminate appropriate habitat conditions for many native animal species. Endemic species are especially threatened by the invasion of non-native species (TNC 2000).

The suppression of fire has caused the decline of many of our most endangered ecosystems - grasslands, savannas, and open forests. While a commonly held belief is that fire only destroys, in many ecosystems the contrary is true. Fire is actually an integral part of many ecosystems, maintaining natural vegetation. In fact, there are many plant species that require fire to trigger the release of their seeds (Noss and Peters, 1995).

Another problem affecting biodiversity is land management practices on the remaining areas with forest cover. About 35% of Florida's remaining forests are in short rotation, commercial pine plantations. According to the FFWCC, while this management practice is suitable for some wildlife species, it also eliminates many plant and animal species that are normally associated with natural pine forests (Cox et.al.

1994). Numerous studies have demonstrated that dense, intensively site-prepped and managed commercial pine forests are biological deserts when compared to their natural counterparts.

Recreation also takes a toll on wildlife and habitats. Probably the most harmful form of outdoor recreation is the use of off-road vehicles. These vehicles provide access to remote wilderness areas, resulting in the harassment of wildlife and an increase in legal and illegal hunting and trapping. They also result in the killing of wildlife (e.g. crushing of gopher tortoises), acceleration of soil compaction and erosion, pollution of water and air, and destruction of vegetation (Noss and Peters 1995)

D. Status of biodiversity in Alachua County

1. Larger scale: Natural communities

Protecting the full range of biological diversity requires that we have a sound understanding of what ecological systems exist, where they are found, and how they are faring. The following section reviews our current understanding of the ecological diversity within Alachua County and the condition of our ecological resources.

The term "ecological community" refers to an integrated association of plants and animals adapted to and dependent upon a particular environment. In general terms, the natural systems of the County may be divided into three categories: (1) terrestrial, (2) wetland, and (3) aquatic. Each of these categories consists of, and provides habitat for, a wide variety of plants and animals. The natural terrestrial and wetland systems that occur in Alachua County are described below, while aquatic systems are described in the Water Systems portion of the data and analysis. Lists of characteristic plants and animals for each community type are provided in Appendix B. Forests are described as a separate category, as are disturbed/altered communities.

The hierarchical system of classification used is a simplified version of the natural community classification used by the Florida Natural Areas Inventory (FNAI), and includes customized descriptions for Alachua County where available. References used in the compilation of the various community lists and descriptions include Brown and Starnes (1983), Dunn (1982), Duever, et.al. (1987), Florida Natural Areas Inventory (1990), Laessle (1942), Monk (1960, 1965, 1966, and 1968), Pritchard (1982), Snedaker and Lugo (1972), Soil and Water Conservation Society (1989), Golder (1996).

a. Terrestrial/upland communities

The terrestrial communities of Alachua County are those non-wetland, non-aquatic systems that are not subjected to regular and periodic inundation. These upland habitats are dominated by plants that are not adapted to the anaerobic soil conditions imposed by prolonged inundation or saturation. While this includes most of the commercial forest and agricultural areas of the County, the emphasis in this section is on those areas remaining in predominantly native vegetation.

Upland communities provide numerous essentials to the survival of wildlife populations, including food, cover, and nesting habitat. Additionally, terrestrial systems are recognized to provide valuable functions such as, water table and aquifer recharge, wildlife movement corridors, environmental refuges, scientific study, and recreation. Descriptions of these communities are provided in Inset 12.

Inset 12. Upland Communities in Alachua County

Sandhill

When managed with fire, this is a very open, sunny forest of pine and deciduous oak with a grass and wildflower ground cover. Low intensity ground fires occurred naturally every 1 to 3 years before the advent of fire suppression.

The sandhill community occurs on well-drained, deep sands and provides important aquifer recharge sites because the porous sands allow water to percolate rapidly with little runoff or evaporation. Longleaf pine dominates sites that are burned frequently while turkey oak is more prevalent in areas burned less often. The canopy and midstory are relatively open, permitting sunlight to penetrate to the ground. Exclusion of fire promotes the growth of other xeric oaks and the nature of the area changes toward xeric hammock.

The most common variant of this community is dominated by a mixture of longleaf pine, turkey oak and wiregrass. Other trees, only locally prominent, are bluejack oak, sand live oak, sandhill dropseed, blazing star, and bracken fern, and, when fire is not frequent, persimmon.

Characteristic animals include Sherman's fox squirrel, pocket gopher, gray fox, bobwhite quail, Southeastern kestrel (sparrow hawk), red-headed woodpecker, Bachman's sparrow, gopher tortoise, Florida pine snake, and Florida gopher frog.

Sandhill communities are associated with and grade into scrub, scrubby flatwoods, mesic flatwoods, upland pine forest, or xeric hammock.

Sandhill was once abundant in Alachua County, primarily in the southwest. Fire suppression and fragmentation caused by development has severely degraded this habitat throughout its range. Significant remaining tracts have been identified in San Felasco Hammock, Austin Cary Memorial Forest, Morningside Nature Center, Paynes Prairie State Preserve, Oleno State Park, near Watermelon Pond, Kanapaha Prairie, Lochloosa Forest's Palatka Pond tract, and in the vicinity of Moss Lee Lake. Smaller tracts may be found at various locations around the County.

The typical condition in Alachua County now is conversion to a slash pine plantation with remnants of sandhill ground cover flora, a few turkey oaks, and a few gopher tortoises.

Former Sandhill

This sandhill habitat is almost identical to sandhill. It is very open and has most of the same plant species, but has been invaded with water oak, sand live oak, upland laurel oak, and loblolly pine due to fire suppression. When properly managed with fire, this former sandhill habitat will return to the open, sunny sandhill forest of longleaf pine and turkey oak with a grass and wildflower ground cover. Low intensity ground fires occurred naturally every 1 to 3 years before the advent of fire suppression.

Characteristic plants are similar to sandhill with the addition of water oak, sand live oak, upland laurel oak, and loblolly pine.

Scrub

The term "scrub" is normally applied to areas dominated by sand pine or various evergreen trees and shrubs that are adapted to extremely dry conditions. Ground lichens are normally abundant. Herbaceous vegetation is sparse and open patches of barren sand are common.

This community occurs on well-drained, deep sands and burns only infrequently. When a fire does start it is often a crown fire that burns all vegetation to the ground. The heat generated by the fire, however, triggers the release of seeds from the normally closed cones of the sand pine. In addition, many of the shrubs resprout from their root crowns. Because of its loose, easily eroded sands, this is a delicate system that is easily damaged by development and its associated foot and vehicular traffic.

Characteristic animals: spotted skunk, oldfield mouse, Florida scrub jay, rufous-sided towhee, coachwhip, mole skink, and scrub lizard. Other listed animals that occur here are gopher tortoise, Eastern indigo snake, and Florida mouse.

Scrub is associated with and often grades into sandhill, scrubby flatwoods, coastal strand, and xeric hammock.

The scrub community is virtually unique to Florida and is most abundant on the central Florida ridge south of Alachua County. Never a common habitat in the County, it also tends to lack the sand pine canopy so typical of the community further south. There are less than 1,000 remaining acres, with most of these located near Parchman Pond and Prairie Creek. Much smaller tracts can be found at Oleno State Park, Hornesby Springs, Watermelon Pond, and Palm Point Hill.

Xeric Hammock

In general terms, hammocks are woods dominated by broad-leaved, evergreen trees. Xeric hammock is a natural transition from sandhill and scrub habitats in which fire is rare or nonexistent. The canopy varies from open to closed and is dominated by species that are adapted to well-drained, sandy soils but not adapted to fire.

Characteristic plants include sand live oak, saw palmetto, crooked- wood, sparkleberry, beautyberry, scrub beakrush, and bracken fern. Other plants often present include live oak, laurel oak, pignut hickory, magnolia, huckleberry, and deerberry. Herbaceous vegetation is usually sparse and the soil is often covered by a thick layer of oak litter.

Characteristic animals include spadefoot toad and southern hognosed snake. Other animals usually common here include gray squirrel, white-tailed deer, armadillo, Carolina wren, blue jay, and cardinal.

Xeric hammocks often are associated with and grade into scrub, sandhill, mesic hammock or slope forest and, as such, the dividing line is often subtle.

Fire suppression and fragmentation resulting from development are likely serving to increase the acreage of this community in Alachua County. The County's best example is a 240-acre tract in the vicinity of Prairie Creek. Other good examples can be found at Paynes Prairie State Preserve, Oleno State Park, Watermelon Pond, Hickory Sink, Palm Point Hill, and Chacala Pond.

Mesic Hammock/Upland Mixed Forest

Usually called mesic hammock in this area, this is a tall, dense, closed canopy hardwood forest on level to moderately sloping fertile soil. Drainage may range from rather poor to excellent, but there is no flooding. Fire is rare and never intense.

The drier, more sterile areas tend to be dominated by evergreen hardwoods, while the more moist, fertile lands are dominated by deciduous hardwood species. The relatively dense canopy is usually composed of fire-intolerant species such as southern magnolia, live oak, red bay, pignut hickory, American holly, black cherry, pignut hickory, laurel oak, water oak, sweetgum, swamp chestnut oak, white ash, basswood and spruce pine in the overstory, and hop-hornbeam in the understory. Many other plant species are usually present including many kinds of vines such as wild grape, poison-ivy, and Virginia creeper and many shade tolerant herbaceous plants such as violets, spike grass, woods grass, and partridge berry in the ground cover. Loblolly pine is often a common component on disturbed sites.

Common animals include white-tailed deer, armadillo, gray squirrel, wild turkey, pileated woodpecker, red-bellied woodpecker, red-eyed vireo, summer tanager, parula warbler, box turtle, and yellow rat snake.

Mesic hammock often is associated with and grades into upland pine forest, slope forest, xeric hammock or bottomland forest.

While hundreds of small patches of young-growth mesic hammock may be found throughout Alachua County, large old-growth sites are extremely rare. Those found in San Felasco Hammock State Preserve are the best examples. Good examples of this community are at Hornsby Springs, Fred Bear Hammock, Barr Hammock, Buzzard's Roost, Domino Hammock, Kanapaha Prairie, Paynes Prairie State Preserve, Oleno State Park, Serenola Forest, Palm Point Hill, and the Cross Creek area.

Calcarious Mesic Hammock

This comes under the heading of upland mixed forest in the FNAI classification, but is distinct enough in north central Florida to warrant a separate category. The soils are moderately to well drained, sandy with varying amounts of organic matter and sometimes clay, overlying limerock that is near the surface. The forest is a densely shaded hardwood forest of high diversity and usually has a dense and diverse ground cover of herbaceous plants.

Characteristic plants are the same as for upland mixed forest except that laurel oak and water oak are not common and sugarberry, winged elm, shumard oak, and especially redbay are common. Some plants that are largely restricted to this habitat are

soapberry, bluff oak, Florida maple, climbing buckthorn, Godfrey's privet, Carolina buckthorn, silver buckthorn, virgin's bower, and rouge berry.

Sugarfoot Hammock, south of the Oaks Mall, formerly was one of the most diverse, highest quality, old-growth examples of this community in the North-Central Florida region. However, in the 11 years since adoption of the 1991-2011 Comprehensive Plan it has been all but lost to urban development.

Slope Forest

This community, along with mesic hammock, is the most diverse of the upland systems. It is characterized by a dense canopy of mostly deciduous, fire-intolerant hardwoods that occur on steep slopes, bluffs and ravines. While it includes many of the same species that occur in mesic hammock, the densely shaded slopes create cool, moist conditions that are conducive to the growth of some species that are more typical of the Piedmont and Southern Appalachian Mountains such as American beech, red buckeye, sugar maple, bluff oak and basswood.

The soils of slope forests are generally composed of sands, sandy-clays, or clayey-sands with substantial organic matter and, sometimes, calcareous material at the bottom of the slope. Moisture conditions may vary from nearly xeric at the top of the slope to nearly hydric at the foot. As a result of the substantial topographic relief, the soils of this community are subject to erosion. Fire is very rare and never intense.

Characteristic plants are magnolia, beech, spruce pine, shumard oak, water oak, Florida maple, sweetgum and basswood.

Common animals are white-tailed deer, gray squirrel, pileated woodpecker, parula warbler, red-eyed vireo, red-shouldered hawk, and yellow rat snake.

Slope forests often are associated with and grade into upland pine forest or sandhill at their upper elevations, and bottomland forest, seepage slope, or floodplain communities at their lower elevations.

The northwest part of Alachua County contains the southernmost extension of the slope forest community type. Mill Creek has been identified as the County's best example of this system with tracts of lesser quality in Beech Valley and Rocky Creek.

Upland Pine Forest

Upland pine forest is characterized by rolling hills of widely spaced longleaf or, in previously disturbed areas, loblolly pines, with relatively few understory shrubs and a dense ground cover of grasses (wiregrass is often dominant) and herbs. Characteristic plants also include southern red oak, post oak, mockernut hickory, chinquapin, sassafras, New Jersey tea, yellow hawthorn, and rusty blackhaw. Other common plants include bluejack oak, sand post oak, and a great many herbaceous plants.

Frequent fire (every 3-5 years) is necessary to maintain this community as it reduces encroachment by hardwoods and promotes the regeneration of pines and herbaceous

plants. With protection from fire, this community quickly becomes invaded by laurel oak, live oak, water oak, sweetgum, loblolly pine, and many other hammock species.

The soils of this community type are generally sandy with variable amounts of clay. The presence of clays helps to retain soil moisture, and results in more mesic conditions than might be expected of areas dominated by longleaf pine and wiregrass. For this reason, upland pine forest succeeds to mesic hammock in the absence of frequent fire.

Characteristic animals are the same as for sandhill. Indeed, these two habitats have historically been placed together in one main category called high pine.

While common in the Panhandle and further north, upland pine forest is restricted to Alachua and Marion Counties in peninsular Florida and is disappearing rapidly due to fragmentation and fire suppression. Hickory Sink used to be Alachua County's best example of this community type, but is now largely degraded by conversion to pine plantation. Other degraded remnants can be found in Serenola Forest, Domino Hammock, and Kanapaha Prairie.

Sinkhole

Sinkholes usually are characterized as cylindrical or conical depressions with steep limestone walls. They are most common in karst areas where the underlying limestone has been riddled with solution cavities. When water tables drop, the cavern roof is no longer supported by water pressure and portions of it collapse resulting in the typical cylindrical or conical depression. The organic and mineral debris that collapsed into the cavity often does not completely occlude the sinkhole's connection to the water table. For this reason sinkholes frequently function as aquifer recharge areas.

Some sinkholes do not have exposed limerock, but may have special habitat features, such as a different community of plants than the surrounding landscape or different microclimate. The plant community is often similar to upland mixed forest or slope forest. Those with steep limestone walls often have a very distinct flora of liverworts, mosses, ferns, herbs, shrubs, and hardwood trees (including rare, threatened and endangered species).

The vegetation of sinkholes is partly a reflection of the parent community in which it is found, especially around the rim and on the upper slopes. Additionally, sinkholes often are a refugium for plants not usually found in the parent community because of the moist microclimate provided by down-slope seepage from surrounding uplands and protection from drying winds in the depression. Similarly, sinkholes provide habitat for species of animals such as salamanders and invertebrates that would otherwise not survive in drier communities.

Sinkholes are a common occurrence in Alachua County, particularly in its southwestern half. The Devil's Mill Hopper Geological State Park is the County's best example.

Dry Prairie

Dry prairie is characterized as a nearly treeless, flat plain with a dense ground cover of wiregrass, saw palmetto and various other grasses and herbs. The soils typically are moderately to poorly drained acidic sands overlying an organic hardpan or clayey subsoil. Frequent fires (every 1-4 years) limit recruitment of pines and encroachment by hardwoods.

Some authorities suggest that dry prairie is not a natural community because of the unnaturally high frequency of fire. Other authorities argue that this system may have once been more prevalent than at present. In any case, fire suppression and agricultural conversion is rapidly eliminating this community type. Those acres that remain should be carefully managed as this is the preferred habitat of the Florida burrowing owl, a "Species of Special Concern" in Florida.

Dry prairie is associated closely with and often grades into wet prairie or mesic flatwoods.

While small dry prairie sites are scattered in commercial pinelands and in drier zones surrounding wet prairie, no significant tracts have been identified in Alachua County.

Mesic Flatwoods

Mesic flatwoods are characterized as having a relatively open canopy of pine with little or no understory but a dense ground cover of herbs and shrubs. The two most common variants of this community are the longleaf pine/wiregrass/runner oak association and the slash pine/gallberry/saw palmetto association.

Soils are moderately to poorly drained and consist of acidic sands generally overlying an organic hardpan or clayey subsoil that restricts the movement of water above and below it. Periodic fire (every 1-8 years) both restricts the encroachment of hardwoods and provides a suitable substrate for the regeneration of pines.

Mesic flatwoods are associated closely with and often grade into wet flatwoods, dry prairie, or scrubby flatwoods. The differences between these communities are usually related to small changes in topography. Wet flatwoods occupy the lower, wetter sites while scrubby flatwoods occupy the higher, drier lands.

Typical animals here include black bear, white-tailed deer, cottontail, cotton rat, towhee, yellowthroat, pine warbler, brown-headed nuthatch, black racer, diamondback rattlesnake, and pinewoods tree frog.

Mesic flatwoods once covered much of the northeastern half of Alachua County. Currently, however, most of these natural flatwoods have been converted to pine plantation and associated silvicultural practices have altered the understory vegetation and age structure of the canopy. The trend toward short rotations of planted pine has made these areas unsuitable habitat for certain wildlife species, such as the federally endangered red cockaded woodpecker, that depend upon mature, old-growth pine forests. While many small tracts of this community type may still be found, large, high-quality sites are becoming increasingly scarce due to continued pressure from development and silviculture.

The Palatka Pond area of Lochloosa Forest and Shenks Flatwoods have been identified as the County's best examples. Other, smaller tracts include portions of Austin Cary Memorial Forest, Paynes Prairie State Preserve, San Felasco State Preserve, Hatchett Creek, Oleno State Park, Lake Altho Flatwoods, Millhopper Flatwoods, and Gum Root Swamp.

Scrubby Flatwoods

Scrubby flatwoods are characterized by a canopy of scattered pines above a dense woody shrub thicket growing on a layer of well drained sand that is on top of poorly drained, flat subsoil. The fire cycle of moderate to intense fires varies from every 2 to perhaps every 10 years.

Characteristic plants are longleaf pine, slash pine, sand live oak, myrtle oak, chapman oak, saw palmetto, fetterbush, huckleberry, crookedwood, tarflower, flatwoods pawpaw, scrub hedge-hyssop, and pennyroyal. The vegetation is a combination of plants common to scrub and mesic flatwoods and is often found in the transition area between these communities.

While scrubby flatwoods is not a rare community type in Alachua County, most tracts are small. For example, there are several small, quality tracts at Prairie Creek, Paynes Prairie State Preserve, Oleno State Park, Lochloosa Forest, Austin Cary Memorial Forest, Hatchett Creek, Barr Hammock, and the South Melrose Flatwoods.

b. Wetland communities

Wetlands, like rainforests, are biological motherlodes. They are habitat for a tremendous number of plant and animal species. For instance, they are critical breeding, feeding and overwintering grounds for waterfowl and migratory birds. Nationally, more than half of the animal and one-third of the plant species listed under the ESA are dependent on wetlands (Noss and Cooperrider, 1995). In fact, the massive destruction of wetlands in the U.S. is a primary reason why the whooping crane is so critically endangered. Whooping cranes use wetlands for nesting and foraging. The destruction of the crane's habitat has been so severe that there was only one self-sustaining natural wild population left in this country as of 1998 (Sierra Club, 1998).

Wetlands communities occurring in the County include hydric hammock, wet flatwoods, wet prairie, baygall, seepage slope, bottomland forest, floodplain swamp, strand swamp, basin marsh, basin swamp, bog, depression marsh, and dome swamp. Descriptions of these communities are provided in Inset 13.

Please see the Wetland Ecosystems portion of this data and analysis for more in depth discussion of wetlands functions and values, human impacts to wetlands, wetlands protection strategies, and the interconnections between wetland and upland habitats.

Inset 13. Wetland Communities in Alachua County

Hydric Hammock

Hydric hammock is characterized by a well developed hardwood or cabbage palm canopy with a relatively sparse understory often dominated by bluestem and ferns. It occurs on low, flat, wet sites where limestone may be near the surface.

Soils are usually sands with a high organic content and are often saturated but seldom inundated for long periods of time. Fire is rare in this community because of the normally wet soils and sparse herbaceous ground cover.

This community occurs as patches in a variety of lowland situations, often in association with springs or karst seepage. In coastal counties hydric hammock often occurs in lowlands just inland of the coastal communities. Hydric hammock is associated with and grades into floodplain swamp, strand swamp, basin swamp, baygall, wet flatwoods, coastal berm, maritime hammock, slope forest, or mesic hammock.

Characteristic plants are live oak, water oak, swamp laurel oak, cabbage palm, southern red cedar, loblolly pine, Florida elm, sweetgum, red maple, sugarberry, sweetbay, persimmon, hornbeam, Walter's viburnum, green haw, rattan vine, greenbriar, and trumpet creeper.

Characteristic animals include white-tailed deer, gray squirrel, raccoon, wild hog, wild turkey, swallow-tailed kite, red-shouldered hawk, barred owl, acadian flycatcher, and box turtle.

Alachua County's best examples of hydric hammock are those that lie to the north of Orange and Lochloosa Lakes, including Prairie Creek and Orange Lake Palm Hammock in Lochloosa Forest. Quality tracts may also be found at Paynes Prairie State Preserve, Barr Hammock, and Chacala Pond.

Wet Flatwoods

Wet flatwoods have a relatively open canopy of scattered slash or pond pine trees and/or cabbage palms with either a thick understory and sparse ground cover, or a sparse understory and dense ground cover.

This community usually occurs in nearly flat, poorly drained areas. Soils are commonly acidic sands overlying a hardpan or clay layer. Cabbage palm flatwoods tend to occur in areas underlain by calcareous materials. Frequent fire prevents succession to a hardwood-dominated forest.

Wet flatwoods are associated closely with and often grade into hydric hammock, mesic flatwoods, wet prairie, or basin swamp.

In Alachua County, wet flatwoods dominated by slash pine are relatively abundant. Those dominated by pond pine, however, are scarce. Extensive tracts of any type are not common. As with mesic flatwoods, silvicultural practices have degraded many of these systems. The County's best examples have been identified at Kincaid Flatwoods, Townsend Branch (Mill Creek), and Barr Hammock. Smaller stands are scattered throughout the Hatchet Creek, Gum Root Swamp, Prairie Creek, and Lochloosa Forest.

Wet Prairie

Wet prairie is characterized as a nearly treeless plain with a variable ground cover of grasses, sedges, rushes and herbs. Shrubs such as wax myrtle and groundsel tree may dominate in areas not subjected to frequent fires.

This community occurs in low, nearly flat, poorly drained areas where fire is frequent (every 2-4 years) and soils are seasonally saturated or inundated. Soils are typically sands, often with a substantial clay or organic component.

The most characteristic plant is maidencane, but most karst prairies have been so altered by drainage, fire protection, cattle grazing, mowing, fertilizing, sewage effluent, etc. that a large assortment of native and exotic weedy plants often dominate. Karst prairies usually surround a basin marsh that occupies the center of the basin, whereas flatwoods prairies may or may not have deeper areas of marsh.

Characteristic animals of the prairie include marsh rabbit, round-tailed muskrat, cotton rat, sandhill crane, and Northern harrier (marsh hawk).

Wet prairie is associated closely with and often grades into wet flatwoods, depression marsh, basin marsh, seepage slope, mesic flatwoods, or dry prairie.

Few good quality, undisturbed tracts of this community remain in Alachua County. Pitcher plant prairies are especially rare. Wet prairie is vulnerable to overgrazing by livestock and alterations in hydrologic or fire regimes. The main areas of this community in Alachua County are on the moist parts of karst prairies like Paynes Prairie and Kanapaha Prairie. However, flat, shallow wetlands of herbaceous vegetation in pine flatwoods areas are also included in this category. Under natural conditions, both fire and flooding are frequent.

Baygall

Baygalls usually occur as forested, peat-filled depressions, often at the base of sandy seepage slopes. The dense canopy is composed of evergreen hardwoods dominated by sweetbay, swamp bay, and loblolly bay. Commonly, the understory is relatively open and consists of various shrubs, ferns, mosses and liverworts.

Soils are acidic peats that are saturated for much of the year by down-slope seepage and/or high water tables. Because these systems rarely dry out, fire is rare. When an occasional fire does occur, the bay trees usually resprout and replace themselves.

Baygalls usually occur as small strips and patches associated with and often grading into seepage slope, bottomland forest, or floodplain swamp.

This community occurs in scattered localities in north and east Alachua County. The best examples have been identified along Hatchet Creek. Other good quality baygalls may be found at Paynes Prairie State Preserve, Mill Creek, Barr Hammock, Lochloosa Forest, and Millhopper Flatwoods.

Seepage Slope

Seepage slopes are wetlands characterized as shrub thickets or boggy meadows on or at the base of slopes. They often occur where water percolating through sands encounter an impermeable layer of clay or rock. These communities usually are dominated by hydrophytic shrubs or herbs such as fetterbush, titi, male berry, waxmyrtle, ferns, grasses, and grass-likes. Seepage slopes most closely resemble bog communities but occur on slopes rather than flat land.

Soils are usually acidic, loamy sands with low nutrient availability and are usually saturated (but seldom inundated) by down-slope seepage. Small pools and rivulets are common, however. Fire occurs at irregular intervals in this community. Frequent fires produce a herbaceous seepage slope while occasional fires permit the establishment of woody plants. In the absence of fire, woody plant invaders decrease soil moisture through increased transpiration rates and the site may become more like a baygall community.

Alachua County's best examples occur in the San Felasco Hammock State Preserve and in the vicinity of Mill Creek.

Bottomland Forest

Bottomland forest is a low-lying, closed canopy forest with either a dense shrubby understory and little ground cover, or an open understory and a ground cover of ferns, herbs, and grasses. The canopy typically is composed of a mixture of evergreen and deciduous species that can tolerate only occasional periods of inundation.

Characteristic plants are water oak, swamp laurel oak, spruce pine, loblolly pine, red maple, magnolia, sweetgum, sweetbay, swamp tupelo, Florida elm, swamp dogwood, and hornbeam.

These forests usually occur on low flatlands that border streams. Soils are generally a mixture of clay and organic materials. This community rarely burns as a result of the high humidity maintained beneath the dense canopy.

Bottomland forest is associated closely with and often grades into floodplain swamp, hydric hammock, mesic flatwoods, mesic hammock, slope forest, baygall, or wet flatwoods.

Alachua County's best examples are found in the forests associated with the Santa Fe River. Other, smaller tracts are common along the County's smaller streams.

Floodplain Swamp

Floodplain swamps occur on frequently flooded soils along stream channels and in low spots and oxbows within river floodplains. Dominant trees are usually bald cypress and blackgum. Species of ash may be locally abundant. Trees in this community are usually swollen at the base or "buttressed" in response to frequent floods and prolonged inundation. The understory and ground cover are usually sparse.

Soils of floodplain swamps are highly variable mixtures of sand, organic, and alluvial material. Sloughs, oxbows and backwaters may accumulate considerable amounts of peat. Fire is rare in this community.

Characteristic plants are bald-cypress, swamp tupelo, water tupelo, pumpkin ash, green ash, cabbage palm, and red maple.

Characteristic animals include beaver, wood duck, barred owl, red-shouldered hawk, and cottonmouth.

Floodplain swamps often are associated with and grade into bottomland forest or hydric hammock.

The forests associated with the Santa Fe River contain Alachua County's best and most extensive floodplain swamps. Other, smaller tracts are common along the County's numerous smaller streams.

Strand Swamp

Strand swamps are shallow, forested, elongated depressions or channels dominated by bald cypress. They are often situated in troughs in a flat limestone plain. Sloughs occupy the lowest area in the system and are usually dominated by a variety of floating and emergent macrophytes.

Soils are peats of varying depths and sand over limestone, and are inundated 200-300 days per year. Fire occurs in the strand swamp only every 30-200 years, yet is essential to the maintenance of the system. Absence of fire leads to accumulation of peat and invasion of broad-leaved hardwoods.

Characteristic plants are bald-cypress or pond-cypress, swamp tupelo, green ash, pumpkin ash, red maple, sweetbay, swamp laurel oak, coastal plain willow, buttonbush, swamp dogwood, and wax-myrtle.

Characteristic animals are raccoon, river otter, white ibis, barred owl, wood duck, and cottonmouth.

Strand swamp is associated with and often grades into bottomland forest or floodplain swamp.

The strand swamp community, while not common in Alachua County, is typified by that along the River Styx.

Basin Marsh

Basin marsh, or prairie, is characterized as a more or less herbaceous wetland located in a large depression. Often, these depressions are former shallow lakes. The vegetation is usually dominated by floating and emergent macrophytes.

Soils are acidic peats that form as shallow lake bottoms slowly fill with sediments from the surrounding uplands and material from decaying vegetation. Basin marshes usually are inundated for 200 or more days per year. Frequent fires maintain the herbaceous community by restricting invasion by shrubs and trees.

Characteristic plants are maidencane, pickerel-weed, saw-grass, cat-tail, primrose-willow, lotus, water-lily, spatter-dock, etc.

Characteristic animals include river otter, raccoon, round tailed muskrat, wood stork, sandhill crane, white ibis, herons and egrets, rails, mottled duck, blue-winged teal, harrier (marsh hawk), snipe, moorhen, purple gallinule, red-winged blackbird, boat-tailed grackle, alligator, striped mud turtle, stinkpot, chicken turtle, green water snake, mud snake, striped swamp snake, pig frog, Florida cricket frog, and a whole host of small fish species such as the mosquito fish, golden top minnow, pirate perch.

Basin marshes are associated with and often grade into wet prairie or lake communities. Because the vegetation is similar, a small basin marsh may be very difficult to distinguish from a large depression marsh.

Basin marshes in Alachua County are generally restricted to its south-central portion and are exemplified by vast areas of Paynes Prairie State Preserve.

Basin Swamp

Basin swamp is characterized as a large, irregularly shaped basin that is not associated with rivers, and is dominated by trees such as blackgum, cypress, red maple and, occasionally, slash pine. Hydrophytic shrubs such as fetterbush and virginia willow commonly grow on "hummocks" at the bases of trees and herbaceous ground cover varies from dense to sparse.

Soils in basin swamps are generally acidic peats, often overlying a clay lens or other impervious layer. The resulting perched water table may act as a reservoir releasing ground water as adjacent upland water tables drop during drought periods. Soils in this community typically are inundated for 200-300 days per year. The frequency of fire varies and, therefore, influences the character of the swamp. Pine-dominated swamps burn frequently, cypress dominated swamps burn only infrequently, and blackgum swamps seldom burn.

Characteristic animals are raccoon, white ibis, barred owl, prothonotory warbler, and cottonmouth.

Basin swamps often are associated with and may grade into wet flatwoods, hydric hammock, or bottomland forest. Small basin swamps may be difficult to distinguish from large dome swamps.

This community is common in the flatwoods of northern and eastern Alachua County.

Bog

Bogs are characterized as shrub-dominated wetlands that most commonly occur in depressions in flatwoods. The vegetation is often dominated by sphagnum moss, fetterbush, large gallberry, titi, waxmyrtle, virginia willow and other hydrophytic shrubs.

Soils are acidic, deep peats that are usually saturated or inundated. At times of high water, the peat and interwoven roots of shrubs may form a floating island in the depression. Occasional fire maintains the shrubby character of the bog. Absence of fire leads to a tree-dominated condition.

Characteristic plants are sphagnum moss, fetterbush, bamboo-vine, loblolly bay, and sometimes slash pine.

Other plants often present are pond-cypress, swamp tupelo, hooded pitcher plant, and tall blackberry.

Bogs are great escape cover for black bears and support some alligators, frogs, crayfish, etc.

Bogs are associated with and often grade into baygall, wet flatwoods, seepage slopes, basin swamp, and bottomland forest.

Small bogs are common components of the flatwoods in the northern and eastern parts of Alachua County. Large ones, however, are rare. One of the best examples of this community in the County is Santa Fe Swamp, the headwaters of the Santa Fe River.

Depression Marsh

Depression marsh is characterized as a shallow, sometimes round depression in a sandy substrate. This community is similar in vegetation and physical features to, but generally much smaller than, basin marsh. Depression marshes are considered extremely important in providing breeding and foraging habitat for a variety of amphibians and wading birds.

This community type is typical of karst regions where sand has slumped around or over a sinkhole and thereby created a shallow, conical depression filled by rainfall, runoff, and/or seepage from surrounding uplands. Soils are usually acidic sands with deepening peat toward the center. Hydroperiods are variable, ranging from less than 50 to over 200 days per year. Frequent fire maintains the herbaceous character of the system by restricting the invasion of shrubs and trees.

Characteristic plants are Virginia chain fern, redroot, maidencane, pickerel-weed, spatter-dock, St. John's-wort, and yellow-eyed-grass.

Characteristic animals include wading birds, softshell turtle, chicken turtle, striped newt, and a host of salamanders, toads, frogs, and tree frogs that use these wetlands for breeding.

These communities often are associated with and grade into wet prairie, seepage slope, wet flatwoods, mesic flatwoods, dome swamp, or bog. Depression marshes are frequently encountered in the flatwoods of northern and eastern Alachua County.

Dome Swamp

Dome swamps are characterized as shallow, forested, usually circular depressions that generally present a domed profile. These communities are usually dominated by a canopy of pond cypress but blackgum and slash pine are also common components. The understory is composed of shrubs growing on "hummocks" at the bases of trees and a sparse to dense ground cover of grasses and grass-like.

Dome swamps typically develop in sandy flatwoods and in karst areas where sand has slumped over a sinkhole. Soils usually are acidic peats overlying sands. Some domes have a clay lens beneath the peat layer. These communities normally are inundated for 200-300 days per year and often function as reservoirs that recharge the aquifer when adjacent water tables drop during drought conditions. Periodic fires are essential for the maintenance of dome swamps as they restrict invasion of broad-leaved hardwoods and the accumulation of peat. Fire frequency is greatest at the periphery of the dome.

Characteristic trees are pond-cypress, blackgum, and slash pine, with some sweet bay, swamp bay, and/or loblolly bay around the edge. Fetterbush is usually the dominant shrub, and Virginia chain fern, redroot, and maidencane are characteristic ground cover.

Characteristic animals include raccoon, green-backed heron, white ibis, yellow-rumped warbler, banded water snake, glossy crayfish snake, black swamp snake, pine woods snake, dwarf siren, striped newt, southern dusky salamander, and little grass frog.

Dome swamps are associated with and often grade into wet flatwoods, mesic flatwoods, wet prairie, or bottomland forest. This community type commonly occurs in the flatwoods of the northern and eastern portions of Alachua County.

c. Forests

Forests occupy approximately 30% of the world's land surface and 30% of the United States. In most regions, forests have more species than any other kind of ecosystem (Noss and Cooperrider 1994). After European settlement of the U.S., forests rapidly began to disappear. By 1980, 85% of the virgin forests throughout the U.S. had been destroyed, with losses estimated at 95-98% in the lower 48 states. Some forest types today represent only a fraction of their former abundance. For example, longleaf pine, which once dominated the uplands of the southeastern coastal plain, have been reduced by 98% (Noss and Cooperrider, 1994). As a result, more threatened and endangered species are associated with forest ecosystems than anywhere else (Flather et.al, 1994).

Conversion of existing pine flatwoods, second-growth forests to managed plantations in Florida is continuing at about 50,000 acres annually (EAR, 1998). It is estimated that there was a 20% loss of this habitat during an eight year survey cycle (Fed. Reg Vol. 62.[241]:65789). The remaining habitat is often fragmented, degraded, or second-growth forests. When 4% of the timberlands in Alachua County have been converted, for example, to new growth or other types of land use, this represents a loss to existing wildlife communities (EAR, 1998). If harvested timberlands are designated as regenerating timberlands, then a slow recovery of wildlife communities may be expected. Future wildlife communities are expected to have different species elements or relationships with potentially some species loss, i.e. rare, threatened or endangered species formerly using mature timberlands.

Studies by the Sierra Club, the University of Florida, and the Southern Forest Resource Assessment document that logging activities can have devastating impacts on wildlife and habitat. Poorly planned clearcuts and logging roads destroy habitat by removing large stands of trees and surrounding habitat. Logging and the construction of timber roads also cause erosion and degrade water quality. In addition, when roads cut through an ecosystem, further habitat degradation and fragmentation results. Finally, the introduction of roads in the wilderness increases the chance of species being hit by cars or killed by legal or illegal hunting or trapping.

Information on forests in Alachua County is available from the United States Department of Agriculture Forest Service (USDA Forest Service) and from the Florida Department of Agriculture and Consumer Services, Division of Forestry (FDACS Division of Forestry). The USDA Forest Service conducts periodic forest surveys in Northeast Florida. These surveys are a continuing, nationwide undertaking authorized by the Forest and Rangeland Renewable Resources Research Act of 1978. The primary objective of these surveys is periodically to inventory and evaluate all forest and related resources to provide a basis for formulating forest policies and programs and for the orderly development and use of the resources. The focus of data collection is on the extent and condition of forest land, associated timber volumes, and rates of timber growth and removals.

Forest lands in Alachua County are mapped and described in the previous sections on upland and wetland communities. Forest lands are classified by the USDA Forest Service based on the species forming a plurality of live-tree stocking. Results of the 1987 survey of the Northeast Florida region, including Alachua County and 20 counties surrounding it, are published in the report entitled Forest Statistics for Northeast Florida, 1987. According to this report, the primary forest-type groups in the region are as follows:

Inset 14. Description of Primary Forest Types in Northeast Florida

Longleaf-slash pine. Forests in which longleaf or slash pine, singly or in combination, predominate. Common associates include oak, hickory, and gum.

Loblolly-shortleaf pine. Forests in which loblolly pine, shortleaf pine, or other southern yellow pines, except longleaf or slash pine, singly or in combination, predominate. Common associates include oak, hickory, and gum. These forests are found in the North Central Florida region, although not in Alachua County.

Oak-pine. Forests in which hardwoods (usually upland oaks) predominate but in which pines account for 25 to 50% of the stocking. Common associates include gum, hickory, and yellow-poplar.

Oak-hickory. Forests in which upland oaks, or hickory, singly or in combination, predominate, except where pines account for 25 to 50%, in which case the stand would be classified oak-pine. Common associates include yellow-poplar, elm, maple, and black walnut.

Oak-gum-cypress. Bottom-land forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, predominate, except where pines account for 25 to 50 %, in which case the stand would be classified oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

Elm-ash-cottonwood. Forests in which elm, ash, or cottonwood, singly or in combination, predominate. Common associates include willow, sycamore, beech, and maple.

According to survey data, the longleaf-slash pine forest is the predominant forest type in the County and region, with some concentrations of oak-hickory and oak-gum-cypress forests. Alachua County's distribution of forest types is somewhat less diverse than that of the region, with small or non-existent representation of other forest types found in the region generally.

d. Disturbed/altered communities

Inset 15 provides a brief listing and description of disturbed or altered vegetative communities in Alachua County. Although altered by human activities, and therefore no longer considered natural, these vegetative communities still provide important habitat for many species of wildlife, including certain listed and endemic species described in the next section.

Inset 15. Disturbed/Altered Communities in Alachua Community

Old Field Pine Plantation: *Old fields which have been planted with any species of pine.*

Old Field Succession Pine: *Old fields which have been invaded by volunteer pine or have a mature plantation of pine.*

Site Conversion Pine Plantation: *Upland habitat such as a hammock or wetlands such as a basin swamp which have been cleared and then planted with pine.*

Rough Pasture: *This habitat is a pasture which retains some of its native ground cover or which has numerous scattered trees or both.*

Improved Pasture: *Improved pastures are those which are almost completely covered by exotic grasses and lack significant tree cover.*

Cropland: *This habitat consists of row crops, freshly cleared land, or fallow fields.*

Farm Pond: *This is a pond formed by damming a stream or digging.*

Active Mining: *Any area with active mining.*

Mine Pit Lake: *A pond or lake in a mine pit.*

Low Impact Development: *Homes or camp sites which have been allowed to remain wooded are designated low impact.*

High Impact Development: *Any major alteration or construction.*

2. Smaller scale: Species level diversity

a. Vertebrates

The group of animals known collectively as the vertebrates are important elements in the natural ecological systems of Alachua County. Fish, amphibians, reptiles, birds, and mammals make up the vertebrates found here. They show similarities in body structure -- for example, a series of vertebrae that surround a spinal cord and placement of most of the nervous system in the head -- that define them as vertebrates (Romer, 1967). Just like other living organisms, vertebrates show adaptations and specializations to their environment. They play important roles in nutrient cycling, habitat modification, dispersal of plant seeds and control of insect populations, to name a few activities (Willson, 1984).

There is an unusually high diversity of vertebrate species in Alachua County, when compared with other land areas in the United States of comparable size. Because of the relatively warm climate and large numbers of wetland habitats, the "cold-blooded" or ectothermic vertebrate groups (fish, amphibians and reptiles) are represented by many species. There is a high diversity of bird species known from Alachua County, in part because of the diversity of habitats and variety of food sources available here in part because migrant birds on their way to South America or the Caribbean pass through the area and in part because there are different species that spend summers here as opposed to those that winter here. Only the mammals are represented by a lower number of species in Alachua County than in other areas of the United States. Heat stress and parasites are two problems that these fur-bearing animals suffer from in Florida, ultimately causing a reduction in mammal species occurrences.

A total of 417 native species and 21 introduced species of vertebrates are listed in Appendix B, making a grand total of 438 species of vertebrates in Alachua County. Several things can be surmised from the relatively high number of vertebrate species in Alachua County. High diversity often results from a wide variety of habitat types and climatic regions in an area (McFarland et al, 1979). Alachua County is characterized by nearly 40 habitat types as defined by the Florida Natural Areas Inventory. Short term and long term fluctuations in rainfall and temperature are characteristic of the climate in this area (Dohrenweld, 1978). All of this points to a complex natural structure of the County.

In addition, the presence of large numbers of species suggests that there are complex relationships between species that enable coexistence to occur (Jameson, 1981). Tight interdependencies exist in the food chain and in habitat utilization. As a consequence, major changes in habitat structure or extent due to urban development will probably have a far-reaching effect on the natural assemblage of species in this area.

Vertebrates represent a natural resource and a recreational resource that is important to the heritage of Alachua County. Birdwatching, hunting and fishing are popular outdoor activities. Resident game and fur bearing mammals are white-tailed deer, gray and fox squirrels, rabbits, red and gray foxes, wild hogs, bobcats, otters, mink, raccoons, opossum, coyote, skink, nutria, beaver and black bears (FGFWFC, 1984). Resident game birds are bobwhite quail and wild turkey. Migratory game birds are ducks, gallinules, coots, snipe, rails, woodcock, crows, mourning and white-winged doves. Reptiles and amphibians that are not listed as endangered, threatened or a species of special concern may also be harvested. Many game fish are found in the waters of Alachua County.

Such uses create a need for management strategies, environmental education and funding for these efforts. Vertebrate wildlife have other values to society as part of the natural heritage, but not all wildlife serve

functions or have values to society. Many exist in a context unrelated to human activities and have value in the simple fact of their existence.

b. Invertebrates

The invertebrate species of Alachua County include numerous varieties of mollusks, crustaceans, arachnids, and insects. Important populations of two notable species, for example, have been documented for the Say's spiketail dragonfly and the Sugarfoot moth fly. Both species have been proposed as candidates for listing at the federal level. Most of the known specimens, and potentially the largest known breeding grounds, of the Say's spiketail dragonfly are located in the Possum Branch of Hogtown Creek drainage in Gainesville. According to the U.S. Fish and Wildlife Service, the Sugarfoot moth fly is known only from two localities: Gulf Hammock in Levy County and Sugarfoot Hammock in Alachua County. The species is believed to be limited to mesic hardwood hammocks.

In addition, the cave systems in the karst region of the County provide very fragile and critical habitat for specialized endemic species of invertebrates. The known cave passages are but a very small fraction of the total. Terrestrial caves are limerock caves above water, often beginning at the bottom at a sink hole, and sometimes leading to aquatic caves. Caves provide specialized and often critical habitat for bats and some specialized invertebrates. Aquatic caves the cave systems that are submerged in aquifer waters. Where the surface of a terrestrial cave meets an aquatic cave system, there are often populations of highly specialized cave dwelling invertebrates.

c. Plants

There are numerous species of plants, grasses, shrubs, vines, trees, and associated vegetation native to Alachua County. These species are discussed in the natural communities section above. In addition, trees native to Alachua County are identified in the Vegetation Management portion of this data and analysis. Besides providing habitat and food for wildlife, vegetation produces oxygen, removes carbon dioxide, absorbs nutrients in waste, purifies the air, and reduces soil erosion. In Alachua County, native vegetation with intact natural soil surface provides the best medium for aquifer recharge, as well as areas which help provide adequate clean water for human and environmental needs. Many species are essential to the integrity and maintenance of the lands they occupy.

Alachua County has a problem with invasive, non-native plants. Invasive species as those plant species that are widespread in Florida and have the established potential to invade and disrupt native plant communities; they are localized but have a rapidly expanding population or have shown a potential to invade and disrupt native vegetation in other areas or other countries with climates similar to Florida. This type of vegetation wreaks havoc upon the delicate balance of resources native communities depend on. For example, an infestation of melaleuca can devastate wetlands by altering the hydrology of the system. Leaf litter from stands of melaleuca may alter the soil topography, creating new tree islands, and may increase the evapotranspiration rate of the area, eventually drying up the wetland. Similarly, many invasive non-natives, while pleasant enough in their homelands, become especially tough to fight in Florida. Once introduced, non-native species of plants spread rapidly to overtake and crowd out native plants, which significantly alters and degrades the natural system.

d. Listed and endemic species

Species of plants and animals that are nearing extinction are generally referred to as rare, threatened or endangered species. They share the common problem of having a low likelihood of surviving into the future. In Alachua County, this includes over 70 species of plants, 100 species of vertebrates excluding mammals, 12 species of mammals, and 38 species of invertebrates. Three tables that identify the endangered and potentially endangered plants and animals of Alachua County are provided in the following pages (See Table 12 for vertebrates, Table 13 for invertebrates, and Table 14 for plants).

Those species that have legal protection are listed by the CITES, United States Fish and Wildlife Service (USFWS), Florida Department of Agriculture (FDA) and Florida Fish and Wildlife Conservation Commission (FFWCC). The species that are thought to be stressed, but have no state or federal protection, are all others on the FCREPA lists, those proposed by Ward and Perkins (W&P), and those listed by the Florida Natural Areas Inventory (FNAI). It is to be expected that the content of these tables will change over time as new information is obtained that suggests the addition, deletion or change of category of a given species. The ultimate authority for rare, threatened and endangered species in Alachua County will be the current lists provided in the above-referenced publications.

Endemic species are those which occur in the County and nowhere else in Florida or the world. Additional recognition of endemic species of Alachua County should be mentioned here. These are the subspecies and races of plant and animal populations that have adapted to the environmental conditions of an area in north-central Florida that are included within the boundary of Alachua County. Some subspecies may be common while others may be rare or threatened. However, by virtue of the fact that these subspecies or races of flora and fauna are endemic to the County and occur nowhere else in Florida or the world, they are vulnerable to population fluctuations. While some of these organisms do not have state or federally regulated protection, they may be tracked by FNAI or listed by FCREPA as species of special concern. Animal species and subspecies endemic, or nearly endemic, to Alachua County are listed in Table 15.

TABLE 12. Threatened and endangered vertebrate species recorded from Alachua County.

ENDANGERED AND POTENTIALLY ENDANGERED VERTEBRATES OF ALACHUA County

SCIENTIFIC NAME	COMMON NAME	CITES	USFWS	FFWCC	FCREPA	FNAI
Fish						
<i>Acantharchus pomotis</i>	Mud Sunfish					S3
<i>Acipenser o. desotoi</i>	Gulf Sturgeon		T	SSC	T	S2
<i>Ameiurus serracanthus</i>	Spotted Bullhead					S3
<i>Umbra pygmaea</i>	Eastern Mudminnow					S3
<i>Enneacanthus chaetodon</i>	Blackbanded Sunfish				R	S3
<i>Micopterus notius</i>	Suwannee Bass			SSC		S2/S3
<i>Awaous tajasica</i>	River Goby				T	S1/S2
Amphibians						
<i>Ambystoma cingulatum</i>	Flatwoods Salamander		T			S2/S3
<i>Ambystoma tigrinum</i>	Tiger Salamander				S3	
<i>Rana capito</i>	Gopher Frog		UR	SSC	T	S3
<i>Notophthalmus perstriatus</i>	Striped Newt					S2/S3
Reptiles						
<i>Alligator mississippiensis</i>	American Alligator	II		T(S/A)SSC		S4
<i>Clemmys guttata</i>	Spotted Turtle				R	S3?
<i>Crotalus horridus</i>	Canebrake Rattlesnake					S3
<i>Drymarchon corais couperi</i>	Eastern Indigo Snake		T	T	SSC	S3
<i>Gopherus polyphemus</i>	Gopher Tortoise		UR	SSC	T	S3
<i>Macrochelys temminckii</i>	Alligator Snapping Turtle		UR	SSC	SU	S3
<i>Pituophis melanoleucus mugitis</i>	Florida Pine Snake		UR	SSC	SU	S3
<i>Pseudemys concinna</i>	River (Suwannee) Cooter		SSC	T	S3	
<i>Stilosoma extenuatum</i>	Short-tailed Snake		UR	T	E	S3
Mammals						
<i>Eptesicus fuscus</i>	Big Brown Bat				R	S3
<i>Lasiurus cinereus</i>	Hoary Bat				R	SU
<i>Lutra canadensis</i>	River Otter	II				
<i>Lynx rufus</i>	Bobcat	II				
<i>Mustela frenata olivacea</i>	Southeastern Weasel					RS3?
<i>Mustela vison mink</i>	Southern Mink				R	S2
<i>Neofiber alleni</i>	Round-tailed Muskrat		UR		SSC	S3
<i>Plecotus rafinesquii macrotis</i>	SE Big-eared Bat		UR?		R	S3?
<i>Podomys floridanus</i>	Florida Mouse		UR	SSC	T	S3
<i>Sciurus niger shermani</i>	Sherman's Fox Squirrel		UR	SSC	T	S2
<i>Sorex longirostris longirostris</i>	Southeastern Shrew				R	S4
<i>Ursus americanus floridanus</i>	Florida Black Bear		UR	T	T	S2

ENDANGERED AND POTENTIALLY ENDANGERED VERTEBRATES OF ALACHUA County

SCIENTIFIC NAME	COMMON NAME	CITES	USFWS	FWCC	FCREPA	FNAI
Birds						
<i>Ixobrychus exilis</i>	Least Bittern				SSC	S4
<i>Ardea alba</i>	Great Egret				SSC	S4
<i>Egretta caerulea</i>	Little Blue Heron			SSC	SSC	S4
<i>Egretta thula</i>	Snowy Egret			SSC	SSC	S4
<i>Egretta tricolor</i>	Tricolored Heron			SSC	SSC	S4
[<i>Egretta rufescens</i>	Reddish Egret		UR	SSC	R	S2]
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron				SSC	S3?
<i>Nyctanassa violacea</i>	Yellow-crowned Night-Heron				SSC	S3?
<i>Eudocimus albus</i>	White Ibis			SSC	SSC	S4
<i>Plegadis falcinellus</i>	Glossy Ibis				SSC	S2
[<i>Ajaia ajaja</i>	Roseate Spoonbill			SSC	R	S2/S3]
<i>Mycteria americana</i>	Wood Stork		E	E	E	S2
<i>Laterallus jamaicensis</i>	Black Rail				SU	S3?
<i>Rostrhamus sociabilis plumbeus</i>	Florida Snail Kite		E	E	E	S1
<i>Elanoides forficatus</i>	Swallow-tailed Kite		UR		T	S2/S3
[<i>Elanus leucurus</i>	White-tailed Kite				R	S1/S2]
[<i>Caracara plancus</i>	Crested Caracara		T	T	T	S2]
<i>Circus cyaneus</i>	Northern Harrier	II				
<i>Haliaeetus leucocephalus</i>	So. Bald Eagle	I	T	T	T	S2/S3
<i>Accipiter cooperii</i>	Cooper's Hawk				SSC	S3
[<i>Buteo brachyurus</i>	Short-tailed Hawk				R	S3]
<i>Pandion haliaetus</i>	Osprey	II		SSC	T	S3/S4
[<i>Falco peregrinus</i>	Peregrine Falcon	I	E	E	E	S2]
[<i>Falco columbarius</i>	Merlin	II				SU]
<i>Falco sparverius paulus</i>	SE American Kestrel	II	UR	T	T	S3?
[<i>Falco sparverius</i>	American Kestrel	II]
<i>Grus canadensis pratensis</i>	Florida Sandhill Crane	II		T	T	S2/S3
<i>Grus americana</i>	Whooping Crane		XN	SSC	RE	SXC
<i>Aramus guarana</i>	Limpkin			SSC	SSC	S3
[<i>Recurvirostra americana</i>	American Avocet				SSC	S1/S2]
[<i>Sterna nilotica</i>	Gull-billed Tern					SU]
[<i>Sterna antillarum</i>	Least Tern			T	T	S3]
[<i>Sterna maxima</i>	Royal Tern				SSC	S3]
[<i>Sterna caspia</i>	Caspian Tern				SSC	S2?]
[<i>Rhyncops nigra</i>	Black Skimmer			SSC	SSC	S3]
<i>Speotyto cunicularia floridana</i>	Florida Burrowing Owl			SSC	SSC	S3
<i>Picoides borealis</i>	Red-cockaded Woodpecker		E	T	E	S2
<i>Picoides villosus</i>	Hairy Woodpecker				SSC	S3?
<i>Sitta carolinensis</i>	White-breasted Nuthatch				SSC	S2
<i>Aphelocoma coerulescens</i>	Florida Scrub-Jay		T	T	T	S3
[<i>Dendroica kirlandii</i>	Kirtland's Warbler		E	E	E	S1]
[<i>Helminthos vermivorus</i>	Worm-eating Warbler				R	S1]
[<i>Seiurus motacilla</i>	Louisiana Waterthrush				R	S3]
[<i>Setophaga ruticilla</i>	American Redstart				R	S3]
[<i>Passerulus citrea</i>	Painted Bunting					SU]
<i>Aimophila aestivalis</i>	Bachman's Sparrow					S3

[]= non-resident, visitor to Alachua County

TABLE 13. Threatened and endangered invertebrate species recorded from Alachua County.

ENDANGERED AND POTENTIALLY ENDANGERED INVERTEBRATES OF ALACHUA County

SCIENTIFIC NAME	COMMON NAME	CITES	USFWS	FWCC	FCREPA	FNAI
Mollusks						
Aphaostracon chalarogyrus	Freemouth Hydrobe				E	S1
Medionidus walkeri	Suwannee Moccasinshell				T	S?
[Pleurobema reclusum	Florida Pigtoe		E		SSC	S?]
Crustaceans						
Caecitotea hobbsi	Florida Cave Isopod				SSC	S2
Crangonyx grandimanus	Florida Cave Amphipod				SSC	S2
Crangonyx hobbsi	Hobbs' Cave Amphipod		UR		SSC	S2/S3
Palaemonetes cummingi	Squirrel Chimney Cave Shrimp		T		E	S1
Procambarus lucifugus alachua	Light-fleeing Cave Crayfish				R	S2/S3
Procambarus pallidus	Pallid Cave Crayfish				R	S2/S3
Remasellus parvus	Swimming Little Florida Cave Isopod				R	S1
Troglocambarus maclanei	North Florida Spider Cave Crayfish				R	S2
Arachnids						
Phidippus workmani	Workman's Jumping Spider				R	
Sphodros abboti	Blue Purseweb Spider				R	S?
Ummidia spp.	Trapdoor Spider				SU	S?
Insects						
Achalarus lyciades	Hoary Edge				R	
Amblyscirtes aesculapius	Textor Skipper				R	
Aphodius aegrotus	Small Pocket Gopher Scarab				SSC	S?
A. haldemani	Scarab Beetle				Elim.	
A. hubbelli	Broadspurred Pocket Gopher Scarab				SSC	
A. laevigatus	Scarab Beetle				Elim.	
A. troglodytes	Gopher Tortoise Aphodius				T	S?
Arenivaga floridensis	Florida Sand Cockroach				R	
Atanius sciurus	Fox Squirrel Scarab				T	S?
Atrytone arogos arogos	Arogos Skipper				R	
Atrytonopsis hianna loammi	Southern Dusted Skipper				R	
Autochton cellus	Golden-banded Skipper				R	
Bolbocerasoma hamatum	Bicolored Burrowing Scarab				SU	S?
Brueelia deficiens	Florida Scrub Jay Louse				T	S?
Cerotocanthus aeneus	Shining Ball Scarab				SU	S?
Cernotina truncona	Florida Cernotinan Caddisfly				R	S2
Cicindela scabrosa	Florida Scrub Tiger Beetle				R	S?
Copris gopheri	Gopher Tortoise Copris				T	S?
Cordulegaster obliqua fasciata	Arrowhead Spiketail				R	
Cordulegaster sayi	Say's Spiketail		UR		T	S1/S2
Didymops floridensis	Maidencane Cruiser				SSC	S4
Dromogomphus armatus	Southeastern Spinyleg				R	S3
Esthiopterum brevicephalum	Florida Sandhill Crane Lice				T	S?
Eucanthus alutaceus	Mat Red Globe Scarab				SU	S?
Euphyes dion	Dion's Skipper				R	

ENDANGERED AND POTENTIALLY ENDANGERED INVERTEBRATES OF ALACHUA County

SCIENTIFIC NAME	COMMON NAME	CITES	USFWS	FFWCC	FCREPA	FNAI
Euphyes dukesi	Duke's Skipper				R	
Everes comyntas comyntas	Eastern Tailed Blue				R	
Gomphaeschna antilope	Taper-tailed Darner				R	S4
Gomphus cavillaris	Sandhill Clubtail				SSC	S4
Gruimenopon canadense	Florida Sandhill Crane Lice				T	S?
Heleonomus assimilis	Florida Sandhill Crane Lice				T	S?
Hydroptila berneri	Berner's Microcaddisfly				Elim.	
Hypotrichia spissipes	Florida Hypotrichia				SSC	S?
Incisalia nippon nippon	Eastern Pine Elf				R	
Lestes inequalis	Elegant Spreadwing				R	S2/S3
Mycotrupes gaigei	Scarab Beetle				R	S?
Nemopalpus nearcticus	Sugarfoot Fly				SU	S?
Neurocordulia obsoleta	Umber Shadowfly				SU	S1
Nymphalis antiopa antiopa	Mourning Cloak				R	
Onthophagus polyphemi	Gopher Tortoise Onthophagus				T	S?
Peltotrupes profundus	Scarab Beetle				SSC	S?
Pholisora catullus	Common Sooty Wing				R	
Phyllophaga clemens	Clemens' June Beetle				SU	
Phyllophaga elongata	Elongate June Beetle				R	S?
Phyllophaga skelleyi	Skelley's June Beetle				R	
Progomphus alachuensis	Tawny Sanddragon				SSC	S4
Poanes viator zizaniae	Wild Rice Skipper				R	
P. yehl	Southern Swamp Skipper				R	
P. zabulon	Zabulon Skipper				R	
Polyergus sp.	Slave-making Ant				SU	
Polygonia comma	Comma Anglewing				R	
Pomeius verna	Little Glassy Wing				R	
Serica delicatula	Delicate Silky June Beetle				SU	S?
Serica pusilla	Pygmy Silky June Beetle				SU	S?
Satyrium liparops	Striped Hairstreak				R	
Satyrodes appalachia appalachia	Appalachian Eyed Brown				R	
Tachopteryx thoreyi	Gray Petaltail				R	S3
Triaenodes florida	Florida Triaenode Caddisfly				R	S1
Trigonopeltastes floridana	Scrub Palmetto Scarab				R	S?

TABLE 14. Threatened, endangered, and commercially exploited plants recorded from Alachua County.

Scientific Name	Common Name	FFWCC
<i>Adiantum tenerum</i>	brittle maidenhair fern	E
<i>Andropogon arctatus</i>	pinewood bluestem	T
<i>Asplenium monanthes</i>	San Felasco spleenwort; single sorus spleenwort	E
<i>Asplenium pumilum</i>	dwarf spleenwort	E
<i>Asplenium verecundum</i>	delicate spleenwort	E
<i>Athyrium filix-femina</i>	southern lady fern; lowland lady fern	T
<i>Blechnum occidentale</i>	sinkhole fern	E
<i>Brickellia cordifolia</i>	Flyr's brickell-bush	E
<i>Bumelia anomala</i>	Clark's buckthorn; silver buckthorn	E
<i>Bumelia lycioides</i>	buckthorn; mock-orange; ironwood; shittim-wood	E
<i>Callirhoe papaver</i>	poppy mallow	E
<i>Calopogon multiflorus</i>	many-flowered grass-pink	E
<i>Carex chapmanii</i>	Chapman's sedge	E
<i>Cheilanthes microphylla</i>	southern lip fern	E
<i>Cleistes divaricata</i>	spreading pogonia; rosebud orchid	T
<i>Coelorachis tuberculosa</i>	Piedmont jointgrass; Florida joint-tail	T
<i>Ctenium floridanum</i>	Florida toothache grass	E
<i>Epidendrum conopseum</i>	green-fly orchid	C
<i>Forestiera godfreyi</i>	Godfrey's privet	E
<i>Hexalectris spicata</i>	crested coralroot; brunetta	E
<i>Lilium catesbaei</i>	southern red lily	T
<i>Listera australis</i>	southern twayblade; double-leaf orchid;	T
<i>Litsea aestivalis</i>	pond-spice; pondspice; pond bush	E
<i>Lobelia cardinalis</i>	cardinal flower	T
<i>Lycopodium cernuum</i>	nodding club-moss; staghorn clubmoss;	C
<i>Malaxis unifolia</i>	green adder's-mouth	E
<i>Matelea floridana</i>	Florida spiny-pod	E
<i>Matelea gonocarpus</i>	angle-pod	T
<i>Matelea pubiflora</i>	sandhill spiny-pod	E
<i>Osmunda cinnamomea</i>	cinnamon fern	C
<i>Osmunda regalis</i>	royal fern	C

Scientific Name	Common Name	FFWCC
Pecluma dispersa	widespread polypody	E
Pinguicula caerulea	blue butterwort	T
Pinguicula lutea	yellow butterwort	T
Platanthera blephariglottis	white-fringed orchid; plume-of-Navarre	T
Platanthera ciliaris	yellow-fringed orchid; orange plume	T
Platanthera cristata	crested fringed orchid	T
Platanthera nivea	snowy orchid	T
Pogonia ophioglossoides	rose pogonia; crested ettercap	T
Polygonum meisnerianum	Mexican tear-thumb	E
Pteroglossaspis ecristata	wild coco; non-crested eulophia	T
Pycnanthemum floridanum	Florida mountain-mint; horsemint	T
Rhapidophyllum hystrix	needle palm; blue-palmetto; vegetable porcupine	C
Rhododendron canescens	pink azalea	C
Rhus michauxii	Michaux's sumac; false poison sumac	E
Salix floridana	Florida willow	E
Sarracenia minor	hooded pitcher-plant; rain-hat trumpet	T
Spiranthes brevilabris	ladies'-tresses	E
Spiranthes ovalis	lesser ladies'-tresses	E
Spiranthes tuberosa	little pearl-twist; little ladies'-tresses	T
Stenorrhynchos lanceolatus	leafless beaked orchid	T
Thelypteris reptans	creeping fern; walking wood fern	E
Tipularia discolor	crane-fly orchid; elfin spur	T
Triphora trianthophora	three-birds orchid; nodding etter-cap; nodding pogonia	T
Zamia	coontie; wild sago	C
Zephyranthes atamasco	rain-lily; atamasco lily; Easter-lily	T
Zephyranthes treatiae	Treat's zephyr-lily; Florida Easter-lily	T

Table 15. Animal species and subspecies endemic, or nearly endemic, to Alachua County*

Fish	<u>Common Name</u>	<u>End. Status</u>	<u>Fed/State Status</u>
Jordanella floridae	Flagfish	1	N/N
Opsopoeodus emiliae peninsularis	Pugnose Minnow	1	N/N
Micropterus salmoides floridanus	Largemouth Bass	1	N/N
Amphibians			
Notophthalmus perstriatus	Striped Newt	2	N/N
Pseudobranchius striatus axanthus	Narrow-striped Dwarf Siren	1	N/N
Acris gryllus dorsalis	Florida Cricket Frog	2	N/N
Pseudacris nigrita verrucosa	Florida Chorus Frog	1	N/N
Reptiles			
Chelydra serpentina osceola	Florida Snapping Turtle	2	N/N
Deirochelys reticularia chrysea	Florida Chicken Turtle	1	N/N
Eumeces egregius onocrepis	Peninsular Mole Skink	1	N/N
Kinosternon baurii palmarum	Striped Mud Turtle	2	N/N
Kinosternon subrubrum steindachneri	Florida Mud Turtle	1	N/N
Nerodia fasciata pictiventris	Florida Water Snake	2	N/N
Ophedrys aestivus carinatus	Rough Green Snake	1	N/N
Pseudemys nelsoni	Florida Red-bellied Turtle	2	N/N
Pseudemys concinna suwanniensis	Suwannee Cooter	1	N/SSC
Pseudemys floridana peninsularis	Peninsular Cooter	1	N/N
Regina alleni	Striped Swamp Snake	2	N/N
Stilosoma extenuatum	Short-tailed Snake	1	C2/T
Tantilla relicta neilli	Central Fla Crowned Snake	1	N/N
Terrapene carolina bauri	Florida Box Turtle	2	N/N
Birds			
Grus canadensis pratensis	Florida Sandhill Crane	2	N/T
Mammals			
Cryptotis parva floridana	Florida Least Shrew	2	N/N
Lasiurus cinereus	Hoary Bat	2	SU/N
Mustela frenata olivacea	Southeastern Weasel	2	S3
Myotis austroriparius	Southeastern Bat	2	N/N
Neofiber alleni	Round-tailed Muskrat	2	C2/N
Podomys floridanus	Florida Mouse	1	C2/SSC
Sciurus niger shermani	Sherman's Fox Squirrel	1	C2/SSC
Ursus americanus floridanus	Florida Black Bear	2	C2/T

* Summary Report on the vascular plants, animals and plant communities endemic to Florida. 1989. FGFWFC Non-game Wildlife Program. Tech. Rep. No. 7

1 = endemic
 2 = nearly endemic
 T = Threatened
 SSC = Species of Special Concern
 C = Candidate for federal listing
 N = No specific status

E. Protecting biodiversity

1. Federal and state protections

A series of state, federal and international laws has been created in an attempt to protect and preserve threatened and endangered species. Each law includes a list of species faced with extinction, rulings as to how these species and their habitats must be treated and penalties for non-compliance with the law. The federal Endangered Species Act was enacted in 1973. The Convention on International Trade of Endangered Species (CITES) was signed in 1975. Florida's rulings came just a few years later. The Preservation of Native Flora of Florida Act was passed in 1978. The Florida ruling on endangered and threatened species of animals was enacted in 1979. Each state ruling is accompanied by species lists, designations of levels of endangerment and each has been amended at least once since its approval.

In the United States there are several categories to describe the level of endangerment of a species, also called its status. Endangered, threatened, rare, species of special concern, commercially exploited, under review, and status uncertain are but a few of the possible listings. Chapter 68A of the Florida Administrative code, current through January 1, 2000, designates 40 species of wildlife as endangered, 27 species as threatened and 50 as species of special concern.

Endangered means a species which is so few or depleted in number or so restricted in range or habitat due to any man-made or natural factors that it is in imminent danger of extinction. Both the manatee and the Florida panther are among the 40 species on this list.

Threatened means a species which is facing a very high risk of extinction in the future. The Florida sandhill crane, Florida scrub jay, the red-cockaded woodpecker and Florida black bear are four species of the 27 on this list.

Species of special concern are those which are facing a probable risk of extinction in the future. The gopher tortoise, the osprey, and whooping crane are among this group.

These definitions suggest that a species may undergo a change in status, depending on changes in population structure, population sizes and/or changes in environmental conditions. These species will not survive without our attention.

2. Listing process

The processes by which a species is judged to be legally endangered, threatened, commercially exploited or of special concern are similar among the different levels of government. Sufficient data must be presented to a governing body to show that an insufficient number of individuals exist in a particular species to ensure survival. The actual numbers that define endangerment may be different among the species, depending upon characteristics such as reproductive rates (i.e., how many strong, viable organisms can be produced).

The determination of endangerment may also vary among different legislative levels depending on the scale that is used. For example, bald eagles are more abundant in Florida than they are in most of the rest of the United States. By Florida law the species is given a threatened status, whereas by U.S. law it is an endangered species. The problem of consistently identifying species status is not unique to the state or

federal level; there are species that, within Alachua County, are endangered but are classified at a lower level on a statewide or federal basis.

The official "listing" of a species involves a long process of proposals and reviews. Typically, the first information suggesting that a species is potentially endangered comes from an academic, research or conservation group. Such a group might make observations about the species and submit a proposal to the government to include the new species on official lists. In such a case, the species is listed as "Under Review". The listing process can take years before a final decision is made. During that time, the species may receive little or no protection and may be further disturbed.

A statewide inventory of potentially endangered species was initiated in 1975 by the Florida Committee on Rare and Endangered Plants and Animals (FCREPA), an academic group. This group publishes lists and species accounts of the organisms that are considered to be in peril in Florida. The lists include more species than the state or federal lists because the process was based on academic evaluation not hindered by legal delays. In addition, the Florida Natural Areas Inventory (FNAI) maintains a geographical and biological data base on known occurrences of rare species, including all federal- and most state-listed species. These lists are valuable planning tools to predict occurrences of environmentally sensitive areas that may require careful management or special attention.

3. Species v. ecosystem protections

Traditionally, wildlife conservation has focused on species. The Florida Fish and Wildlife Conservation Commission was given the mandate to protect endangered, threatened and species of special concern. It seems a reasonable approach, but is it the best approach?

Habitat is a place containing everything needed for each plant and animal to live there and to reproduce. This place is most often named for the dominant vegetation present. An example would be pine flatwoods. Many species move around throughout their life, alternating between two or more habitats, and depend on all to survive.

If a species has become endangered, what actually happened first? With rare exception, if the species is suffering, it's the habitat that has been compromised. If we protect the habitat, we preserve the wildlife. Even our most ambitious biodiversity conservation law, the Endangered Species Act, takes an incremental, species by species approach to conservation. A species must be judged to be in danger of extinction throughout all or a significant portion of its range, or of becoming in danger of such extinction, to qualify for protection efforts. Even then, the efforts to protect such species are often narrowly focused on that species without broader consideration of the natural system of which it is a part. The net result has been a steady accumulation of species listed as endangered or threatened, a proliferation of species specific recovery plans, and a growing backlog of unmet demand for conservation action. Putting an end to the ever growing list of endangered and threatened species will require new, more comprehensive approaches to the problem.

A wealth of information is now available about those species that are at greatest risk and therefore are in need of concerted conservation attention. But conservation must occur within the context of the ecosystems on which these species depend. It is no accident that habitat destruction is the leading cause of species endangerment. The limitations of species-by-species approaches to conservation have become painfully apparent over the past few decades. While species-level conservation will remain an essential protection strategy, ecosystem scale conservation is increasingly viewed as an important complement.

4. Local strategies: Alachua County

Until 1991 there was essentially no protection of upland natural communities because such communities had not been mapped and were not identified for protection during the development process. It is therefore impossible to quantify impacts to these resources from development, agricultural conversion, and other activity prior to this time. The 1991 Comprehensive Plan adopted, for the first time, some measure of protection for specific communities identified as significant according to a 1986 inventory of uplands in Alachua County. Through the mid-1990s, policies required an assessment of the site at time of application for development, and clustering of permitted development on the non-sensitive portions of the site or, if necessary, on no more than fifty percent of the sensitive portions. Activities not requiring a permit and activities conducted without the benefit of a required permit could still not be monitored before the fact. The continued applicability of these policies came into question in 1996, when a second inventory was completed that was broader in scope and included several new properties.

Although Alachua County has adopted development regulations that include provisions for the protection of eagles and eagle habitats, other species listed by Cox et al. (1994) remain unprotected. Because Alachua County has lacked an overall plan for conservation, attempts to protect resources and habitat have been hit and miss, leading to fragmentation and lack of continuity among existing conservation areas. The County has relied almost exclusively on the state of Florida to implement any conservation efforts and acquire any sensitive lands. Instead of identifying areas for acquisition for resource and habitat protection over the years, Alachua County has chosen to negotiate with each development separately in a piecemeal fashion. The result? Small pockets of acreage, scattered throughout the County, unimproved and not maintained due to budgetary constraints.

In the 1991 Comprehensive Plan, natural communities were addressed in fragmented fashion as uplands, wetlands, wildlife habitat, and other specific resource types. A significant opportunity to revise and integrate currently fragmented County policy in this area is afforded by the 1996 completion of a follow-up ecological inventory of the County. This comprehensive inventory evaluated all privately-owned significant natural ecological communities, both upland and wetland, remaining throughout the County. It offers the opportunity to address multiple County objectives relating to uplands, wetlands, surface water, groundwater, forest resources, floodprone areas, wildlife habitat including listed species habitat, cultural resources, and other resources through a carefully crafted program to protect these resources by acquisition, incentives, public-private partnership efforts, and land development regulations.

New policies in the Conservation and Open Space Element establish an integrated approach to the protection of natural communities and their associated values in Alachua County. Associated values include not only habitat protection and wildlife diversity, but also protection of wetlands function, floodplain function, water quality protection, aquifer recharge, protection of listed species, recreation values, and protection of cultural values, including historic, archaeological, and paleontological. Significantly, all of these values come together in protection of viability of natural communities. The County is in the process of carefully crafting a new program to protect these resources by identification of these resources, acquisition, incentives, public-private partnership efforts, and regulatory mechanisms to protect them.

a. Identification

Science is the basis on which a good conservation program is built. There are naturally occurring ecological areas that can be identified by scientific criteria. A County needs a map that identifies the communities "strategic" lands. Land may be important for a variety of reasons. It may be important for species habitat or functioning farmland with high-value crops. The criteria can vary - and should be defined by any conservation program. Alachua County provides criteria for significant habitat and listed species habitat under Objective 4.9, and for strategic ecosystems under Objective 4.10.

In 2001, the Defenders of Wildlife published a report that addresses the importance of incorporating habitat and ecosystem protection in Florida law. The report, Protecting threatened ecosystems through Florida's growth management system, identifies the Gaps reports, the Statewide Greenways project, and FNAI, supplemented where available with water management district and County data, as the "best available existing data" (p.28) on habitat and ecosystems in Florida. These are used to map important components of biodiversity in Alachua County and are discussed in Inset 16.

The maps in the Conservation Element series are intended to provide guidance to decision makers involved in public land acquisition, land use planning, development regulation, and other conservation efforts. The maps represent our best estimate of those lands within Alachua County that require some form of conservation to ensure that biodiversity is maintained for future generations. However, the maps represent only a snapshot of conservation needs at one time. As a consequence, some areas identified for protection may already be in public ownership or may no longer support the habitat features or species predicted to occur there. The maps have not been incorporated into policy or regulation as inviolate zones in which no development may occur. Rather, the maps are to be used as a layer of information when decisions are made concerning land acquisition, land use planning, and development regulation.

New data are continually being added to the project database as new parcels of land come into public ownership, new records of the locations of listed species become available, and more up-to-date vegetation maps are created. As a result, the latest versions of the project maps actually reside in the computer. Before using the maps in this Element for detailed management decisions, users should contact the ACEPD for the latest information.

Inset 16: Maps of Important Components of Biodiversity in Alachua County

Gaps Reports

The FFWCC in 1994 published a report entitled, Closing the Gaps in Florida's Wildlife Habitat Conservation System, which provides information for the County in a state and regional context. The project was supplemented in 2000 with Habitat Conservation Needs of Rare and Imperiled Life in Florida, and expanded in scope from focal species to all listed species identified of concern by various experts.

Strategic Habitat Conservation Areas

The Gaps project recognizes that Florida's growth management laws, passed in the 1980s, have not provided enough protection for the state's diverse wildlife and habitat, especially with respect to essential upland systems. The Gaps project describes habitat areas in Florida that should be conserved if key components of the state's biological diversity are to be maintained. It recommends that 4.82 million acres, or approximately 13% of the land area in Florida, be designated as Strategic Habitat Conservation Areas to meet minimum conservation goals. These areas are considered essential to providing some of the state's rarest animals, plants, and natural communities with the land base necessary to sustain populations in the future.

The species and habitats considered in 1994 are only a small subset of the total biodiversity of Florida. The improved maps of potential habitat developed in the 2000 report, in combination with the maps of potential habitat developed in the 1994 report, allow for a more detailed assessment.

An assessment of important habitat types was made by reclassifying the gap analysis map overlays depicting species richness. More than 84% of the remaining acreage of the sandhill community type coincides with potential habitat for greater than 10 rare species. This community type is thus a top conservation priority almost anywhere it occurs in Florida.

A similar cross-tabulation was made using the species richness map and a map of physiographic regions. Over 24% of the remaining acreage of the Central Florida ridges and uplands region contains greater than ten rare species. Yet, the percentage of conservation land in this region, at approximately 14%, is much less than the statewide average of approximately 21%.

Biodiversity Hot Spots

The Gaps project also generated a separate set of maps, referred to as Regional Biodiversity Hot Spots which convey more detailed information on the known locations of as many components of biological diversity as possible, regardless of whether or not they fall within proposed SHCAs, to help meet the need for conservation information at regional and local levels.

Gaps emphasizes that the importance of conserving locally valuable resources cannot be overstated. Not only do natural areas significantly enhance the quality of life and ameliorate the urban environment, but they can also play a key role in enhancing the overall security of rare plants and animals by helping to maintain a broad geographic distribution of populations.

The map identifies three broad categories of Class 1, Class 2, and Class 3 areas based on the number of focal species that would likely find appropriate habitat conditions in the area. Class 1 lands depict areas where habitat conditions for 3-4 focal species likely occur; Class 2 lands show areas where habitat conditions for 5-6 focal species likely occur; and Class 3 lands show areas where habitat conditions for 7+ focal species likely occur. Class 1 lands are often large forested tracts that have varying degrees of natural quality. Although the number of listed species protected by Class 1 lands may be relatively low, these forest areas often serve vital functions when viewed from a regional perspective. They help buffer more pristine natural areas from encroaching urban and residential development, provide dispersal areas between nature preserves, and maintain air and water quality. In some cases, they may be crucial to species existence.

Class 2 and 3 areas generally provide habitat for wide-ranging habitat generalists as well as species with more specific habitat requirements. Many are absolutely critical to maintaining viable populations of several rare species.

Some highlights for Alachua County include forested areas along the Santa Fe River. Rare species recorded within 100 m of the Santa Fe include canebrake rattlesnake, Suwannee cooter, and Suwannee bass. Portions of wetlands in south Alachua County are included as SHCAs for Florida sandhill crane, southern bald eagle, and several rare wading birds (wood stork, little blue heron, great egret, yellow crowned night heron, and tricolored heron). Terrestrial caves are included as SHCAs for southeastern bats. Other species are listed by major drainage basins.

- Paynes Prairie: round-tailed muskrat, limpkin, gopher tortoise, eastern indigo snake, tiger salamander, and virgin's bower.*
- Levy and Kanapaha Prairies: fox squirrel, southeastern American kestrel, limpkin, gopher tortoise, Florida pine snake, and eastern indigo snake.*
- Orange and Lochloosa lakes: Florida black bear, osprey, limpkin, gopher tortoise, eastern indigo snake, and blackbanded sunfish.*
- Newnans Lake and Lochloosa Creek: southeastern weasel, fox squirrel, osprey, limpkin, gopher tortoise, short-tailed snake, spotted turtle, flatwoods salamander, striped newt, and loose-coiled snail.*

Map 39 identifies FFWCC Biodiversity Hot Spots in Alachua County.

Florida Ecological Network

In 1998, the FDEP funded and prepared, in conjunction with the Florida Greenways Coordinating Council, a report entitled “Connecting Florida’s Communities with Greenways and Trails.” The Florida Statewide Greenways System Planning Project was the result of that endeavor. The Greenways System Planning Project identifies and recommends for conservation specific areas in the Greenways system known as the “Statewide Ecological Network.” The lands identified in the Ecological Network contain many of the same lands identified as SHCAs in the GAPS Report, omitting some areas outside of greenway corridors. The Executive Summary of the Greenways System Planning Project states that the purpose of the Ecological Network is for protection of an integrated state reserve system that could effectively conserve Florida’s biological diversity and other important land resources.... into an updated and completely linked reserve system of statewide significance. The Executive Summary goes on to recommend: “It is essential that the Ecological Network be incorporated into the planning process....” pp. 12-13.

The primary purpose of the Greenways project was to identify lands for acquisition, and the report did not deal with matters of growth management or regulation. However, the science behind the Ecological Network shows that, as with the GAPS Report, there is a compelling state interest in preserving those specifically identified areas critically necessary for providing the minimum protection to enable the survival of Florida’s major ecosystems and biological diversity.

The Greenways project goal was to use a regional landscape approach to design an ecologically functional Statewide Greenways System that: (1) conserves critical elements of Florida’s native ecosystems and landscapes, (2) restores and maintains essential connectivity among diverse native ecological systems and processes, (3) facilitates the ability of these ecosystems and landscapes to function as dynamic systems, and (4) maintains the evolutionary potential of the biota of these ecosystems and landscapes to adapt future environmental changes. This is a cooperative effort of the University of Florida, Florida Department of Environmental Protection, Florida Greenways Commission, and Florida Greenways Coordinating Council.

Map 40 identifies lands within the Statewide Ecological Network in Alachua County.

*More information may be found at the Florida Greenways and Trails Council Web site:
<http://www.geoplan.ufl.edu/projects/greenways/greenwayindex.html>*

Florida Natural Areas Inventory (FNAI)

The Florida Natural Areas Inventory (FNAI) is a private, non-profit program affiliated with the Nature Conservancy and the FDEP. The inventory collects, interprets, and distributes ecological resource information critical to the conservation of Florida's heritage. FNAI maintains a scientific database of more than 26,000 occurrences of rare plant and animal species and high quality natural communities through the state. Started in 1981, the inventory is now well known as the best single source of ecological resource information. FNAI maintains geographic and literature databases to document the status of hundreds of species of flora and fauna. FNAI's effort is a critical one to the conservation of these species and the maintenance of Florida's biological diversity. But the FNAI data, although excellent, is incomplete. Due to lack of coordination between state and local agencies and more so between public and private entities, there are species sightings and public and private conservation lands not listed in the database. Despite FNAI's shortcoming, their two field guides on rare plants and rare animals are valuable tools.

FNAI has developed a map of potential natural vegetation by interpreting recent aerial photography collected by FDOT. Areas of conservation interest (ACIs) were further categorized using 3 criteria: category A lands were natural lands that contained FNAI occurrence records and had been visited by FNAI personnel; category B lands were natural areas that appeared to have high quality conditions in aerial photos, but were not actually visited by FNAI personnel; category C lands appeared to have natural features, but the quality of sites could not be easily determined by aerial photography.

See Map 41 for Areas of Potential Conservation Interest in Alachua County.

County-wide Ecological Inventories

A 1987 inventory of natural ecological communities in Alachua County was conducted by KBN Engineering and Applied Sciences, titled Final Report: Comprehensive Inventory of Natural Ecological Communities in Alachua County. This report identified, generally mapped, and ranked the most important natural upland communities based on a set of factors including vulnerability, rarity, connectedness, completeness, manageability, and potential for nature-oriented human use. Study shortcomings included exclusion of wetland communities, which are intertwined with upland communities in many cases, and generalized mapping, which precluded identification of areas for potential protection on a parcel basis. Because of these shortcomings, there was an expressed need to conduct a follow-up inventory on a more detailed basis.

Privately-owned natural areas were identified in a follow-up inventory of natural ecological communities was performed by KBN, A Golder Associates Company, titled Alachua County Ecological Inventory Project, November 1996. The purpose of the study was to identify, inventory, map, describe, and evaluate the most significant natural biological communities, both upland and wetland, that remain in private ownership in Alachua County and make recommendations for protecting these natural resources. Forty-seven discrete project areas were identified, mapped and ranked for significance using criteria based on vegetation value (species diversity, presence of exotic species), endangered species habitat value (plants and animals), wildlife habitat value generally, hydrology (Floridan aquifer recharge potential; surface water and surficial aquifer resource protection, and flood protection), landscape ecology (community diversity, ecological quality, community rarity, and functional connectedness), and management potential.

Detailed summaries for each site identified and discussed (1) bio-community types, acreage, and quality within the project area; (2) presence and quality of connections to other project areas; (3) site boundary conditions; (4) geologic/hydrologic features; (5) wildlife habitat value; (6) habitat value for listed species; (7) presence of exotic species; (8) restoration and management potential; (9) recommended conservation strategies; and (10) comprehensive plan considerations. A set of site evaluation scores on the ranking criteria was also included with each site summary. The broad scope of the study precluded very detailed site assessments of each site; however, the data and analysis contained in the study is the most comprehensive and extensive information available on the remaining natural areas in the County.

See Map 42 for areas identified in the Alachua County Ecological Inventory Project.

Water Management District Land Use Cover Data

In 1995, to develop a baseline database of wildlife habitat in the entire State, each of the water management districts in Alachua County mapped natural systems and land use cover utilizing GIS analysis of LANDSAT imagery. Map 43 depicts this Landsat data. Areas of significant habitat are mapped where known. However, such areas are difficult to detect on aerial imagery and must, in all cases, be confirmed through site-specific ground-truthing.

FFWCC Habitat Cover

In 1995, the Florida Fish and Wildlife Conservation Commission published coverage of habitat types throughout the state. This provides another useful means to help identify significant habitat in Alachua County. See Map 44 for FFWCC habitat coverage of Alachua County.

b. Acquisition

The best means of preserving natural communities is public acquisition by entities dedicated to protecting the natural functions and conditions of the land. Presently, the primary protection afforded natural communities in Alachua County is through public ownership and management of natural areas as preservation lands. In Alachua County, most public acquisition of land has been by the state or the water management districts since 1990. We still lag behind other neighboring counties, as well as other counties within the region, on conservation purchases. However, with recent voter approval of Alachua County Forever, and aggressive pursuit of jointly funded projects with state, water management district, and local partners, our citizens hope to increase the acreage of environmentally significant lands that are protected for future generations. See the Conservation Strategies portion of this data and analysis for further discussion of this topic.

The advantages of land acquisition programs include paying private land owners rather than regulating land owners or losing habitat, and providing the greatest assurance that ecosystems and wildlife habitat will remain protected into the future. However, the amount of money presently available is insufficient to purchase all areas necessary to conserve the County's biological diversity. Therefore, other complementary strategies are necessary.

c. Regulations

Alachua County will employ a course filter/fine filter approach to conservation that recognizes the complementary nature between ecosystem scale and species scale efforts. Biodiversity policies under Objective 4.9, and wetland policies under Objective 4.7, address protection of upland and wetland habitat generally, as well as the protection of habitat for listed species. Policies for strategic ecosystems under Objective 4.10 are geared to protection at a larger geographical scale. Treating ecological communities – unique assemblages of plants and animals – as targets of conservation efforts provides a means of extending protection efforts to the full array of species, known and unknown, charismatic and obscure. Ecosystems, however, are more than the sum of their parts. Taken as a whole, an ecosystem reflects the complex interactions and mutual dependencies of the biological inhabitants and physical processes within it. For this reason, ecological communities are also worthy of being targeted for conservation in their own right.

Managing for community diversity is a complement to, rather than a replacement for, species-level management. This has been referred to as applying a course management filter (Barnes 1999). The idea is that if we maintain intact functioning ecological communities, the species living in those communities will thrive. It has been estimated that 85-90% of all species can be protected using this course filter approach.

Some suggest that we should focus our species-level management on “keystone” or “umbrella” species. Keystone species are organisms that are disproportionately important compared to their biomass in the community. Umbrella species (like the black bear) are often charismatic species that have large ranges and act as a “flagship” or “symbol” for conservation. These species require vast amounts of habitat in which to live. The argument is that by managing for these species, we can include, by default, less “charismatic” species in the large reserves.

Unfortunately, this approach does not always work, particularly for endemic plants that have a unique and restricted range, and we need to apply a fine filter approach (managing for individual species) in

managing rare or unique species that do not fall under the “umbrella” or “keystone” species of the community management approach. Perhaps the newest element is understanding how these layers fit together to form a landscape.

The time has come to carefully examine traditional management and move to a more holistic management. We must look at the social and economic needs of our citizens and try to provide these within the ecological capabilities of that area. If we accomplish this, the more we can pull everything together, and the more sustainable our ecosystems will be. Managing at the broader, landscape scale is the most reasonable scale for integrating diverse and sometimes competing resource values, for maintaining and conserving biodiversity, and for managing habitats including timber harvesting.

As part of the course filter/fine filter approach, Alachua County aims to protect landscape level resources under policies associated with strategic ecosystems, greenways, and habitat connectivity. Concurrently, the County will protect smaller scale resources as significant uplands and wetland habitat, and species level resources under policies associated with listed species habitat. The purpose of the County’s efforts is to identify and protect natural systems and the systems that comprise them before they are in the “emergency room” at the brink of crisis, when they can still be preserved for the future in healthy form.

Strategic ecosystems

Policy 3.3.1 includes strategic ecosystems within the primary conservation category in recognition of their ecological value, uniqueness and particular sensitivity to human impacts. Strategic ecosystems are defined as outstanding examples of ecosystems that are intact or capable of restoration and that require conservation or management to maintain important reserves of biodiversity at landscape, natural community and species specific levels. Strategic ecosystems are generally greater than 20 acres in size and contain one or more of the natural ecological communities described above. The natural resources that comprise strategic ecosystems are identified through means including, but not limited to: the FFWCC’s “Closing the Gaps in Florida’s Wildlife Habitat Conservation System” (1994), as supplemented with “Habitat Conservation Needs of Rare and Imperiled Life in Florida” (2000); FDEP’s “Statewide Ecological Network,” contained in The Greenways System Planning Project (1998); the Florida Natural Areas Inventory; and Golder’s “Alachua County Ecological Inventory Project” (1996).

In order to plan for the protection of strategic ecosystems, policies under Objective 4.10 call for special area plans to be developed in cooperation with landowners prior to development activities within the system. These resource-based plans will establish specific guidelines and management strategies that protect the integrity of the ecological unit. In follow-up to the Comprehensive Plan update, the County will develop a work program for conducting these special area plans.

If an applicant seeks development prior to the County’s creation of a special area plan for a particular strategic ecosystem, the applicant may conduct a comparable study at the applicant’s expense. Alternatively, if the applicant demonstrates that the ecological integrity of the strategic ecosystem will be sufficiently protected, the applicant may proceed according to the clustering provisions in policies under Objective 6.2 of the Future Land Use Element. Clustering shall be required so that at least 80% of each strategic ecosystem is preserved as undeveloped area.

Existing cluster and planned development regulations will need to be revised to update their applicability and provide regulatory flexibility which facilitates planning across multiple parcels and enhances long-term protection of strategic ecosystems.

The County will work with owners of agricultural and silvicultural lands to retain the ecological value and ecological integrity of strategic ecosystems through management plans and incentives. The County has committed to facilitating landowner participation in forestry certification programs, land acquisition programs, and federal and state cost-share conservation programs. Please see the discussions on Agricultural and Silvicultural Practices, as well as Conservation Strategies, for further details.

Listed species habitat

Listed species habitat is also categorized as a primary conservation area, indicating its relative importance in terms of needed protections. Policies 4.9.4 through 4.9.8 address regulatory protections of listed species habitat and coordination with appropriate management agencies.

Depending on the degree of the threat to a species' survival, various steps may be taken to protect the remaining habitats and populations of endangered biota. These include outright preservation of a threatened or sensitive habitat, and strict regulation of the removal of members of the affected populations. In less serious instances, important habitats may be protected to lesser degrees, with the exploitation of these habitats moderated. Designations such as rare, species of special concern and status uncertain alert local agencies to potential problems of land management, and should be heeded. Because of the difficulties associated with managing endangered or threatened species and their essential habitats, it is wise to take a conservative course of action when dealing with a species that is now declining in number.

Significant habitat

Significant habitat is defined as contiguous stands of natural upland plant communities which have been documented to support, and which have the potential to maintain, healthy and diverse populations of plants or wildlife. Policy 3.1.2 includes significant habitat in the secondary conservation category in recognition that these habitat areas are more pervasive than strategic ecosystems or listed species habitat.

The County will protect significant plant and wildlife habitat in accordance with policy 4.9.2. . A minimum of 25% of the significant habitat that occurs on site must be protected as conservation or preservation areas.

The County will require development in areas known to have particular value for wildlife to be carefully planned and, where possible, located so that the value of the habitat for wildlife is maintained. The County will require adequate buffer zones between construction activities and significant wildlife resources, including both onsite habitats that are purposely avoided and significant habitats that are adjacent to the project site, in order to avoid the degradation and disruption of critical life cycle activities such as breeding and feeding.

In addition, the County will support efforts to avoid the net loss of important wildlife habitat where practicable. Important habitat and habitat components include nesting, breeding, and foraging areas, important spawning grounds, migratory routes, migratory stopover areas, wildlife movement corridors, and other unique wildlife habitats critical to protecting and sustaining wildlife populations. In cases where habitat loss cannot be avoided, the County shall impose adequate mitigation for the loss of wildlife habitat that is critical to supporting special status species and/or other valuable or unique wildlife resources. Mitigation will be at sufficient ratios to replace the function, and value of the habitat that was removed or degraded. Mitigation may be achieved through any combination of restoration, conservation easements, and/or mitigation banking. Conservation easements must include provisions for maintenance

and management in perpetuity. The County will recommend coordination with the U.S. Fish and Wildlife Service and FFWCC to ensure that appropriate mitigation measures and the concerns of these agencies are adequately addressed.

Policy 4.10.8 calls for the County to implement an ordinance that specifically addresses the preservation of strategic ecosystems, significant plant and wildlife habitat, habitat corridors, and vegetative communities, to provide a regulatory framework for the policies described above. Biodiversity cannot be protected by laws alone, but as we enter the next millennium, the rules of society must better reflect environmental values and necessities.

Resource protection standards provided in policies under Objective 3.6 apply to all of these resources. In addition, if development or land use change is proposed, the applicant will be required to conduct a natural resources inventory, pursuant to policy 3.4.1. In order to protect plant and wildlife habitat generally, prior to approval of discretionary development permits, the County requires, as part of any required environmental review process, a biological resources evaluation of the project site by a qualified biologist. The evaluation shall be based upon field reconnaissance performed at the appropriate time of year to determine the presence or absence of significant resources and/or special status plants or animals. Such evaluation will consider the potential for significant impact on these resources and will either identify feasible mitigation measures or indicate why mitigation is not feasible.

Many conservation areas are protected through non-public processes, such as the dedication of conservation easements, designation of conservation areas on plat maps, and as regulated and monitored mitigation areas.

d. Stewardship

Working partnerships

Ecosystems management is a dynamic process and requires a strategy that develops, enhances, and protects the ecological and socioeconomic values of the resources while maintaining private ownership. When landowners combine their private values with responsible stewardship, a landscape-level private stewardship plan can work. Without communication, coordination, and cooperation, it is impossible to know what your neighbors are doing and to engage in long-term planning.

The County will encourage private landowners to adopt sound wildlife and management practices, as recommended by the FFWCC and the U.S. Fish and Wildlife Service. Truly turning around the problem of protecting listed species on private lands will require a fundamental shift in how they are perceived by private landowners. Listed species are now often perceived as a net liability, something that may interfere with economic use of the property. What is needed are incentives that can turn the presence of these species into an economic asset.

Loss of biodiversity is a difficult problem to tackle. It is the ultimate, measurable result of many interacting and mutually reinforcing factors. A successful approach to biodiversity conservation must therefore be integrated.

Forest conservation strategies

Forest conservation strategies include Silvicultural Best Management Practices (2000), published by FDACS, which provide minimum standards necessary for protecting and maintaining the state's water

quality as well as certain wildlife habitat values during forestry activities. BMPs were first established in the mid-1970s in response to the Federal Clean Water Act of 1972 and are periodically revised. Revisions in 1993 included additions addressing water resource features such as sinkholes, smaller lakes, canals, and wetlands; some attention to wildlife habitat values; and an expanded version of Special Management Zones. However, many of the relationships between silviculture activities and impacts to natural resources have not been well quantified. Consequently, periodic BMP compliance surveys conducted by FDACS, which generally report a high level of compliance, cannot be readily evaluated in terms of impacts on natural communities. The Silvicultural Best Management Practices Manual was revised most recently in 2000 to address non-flowing wetlands. Please see the Agricultural and Silvicultural section for more discussion of this topic.

As urbanization reduces and fragments some forest areas, the remaining large forest tracts on public and private lands may increasingly contribute to the conservation of many sensitive wildlife species. Given the importance of landscape structure in determining the suitability of habitats in urban and agricultural areas, maintaining habitat connectivity can enhance ecosystem function in these areas.

Agricultural land is often interspersed with woodlots and other forest habitat. Habitat connectivity, which is often provided by vegetated fencerows, greatly influences the presence of birds and other species in agricultural areas. Isolated forest habitats can serve as ecological traps for some species by focusing populations in small areas along with a high concentration of nest predators.

Eco-tourism

Eco-tourism is one area in which resource protection interests and economic development interests can overlap. Land held in either public or private ownership can be opened to public use and enjoyment in a way which preserves its resource values while providing recreational, educational, cultural, and entertainment values to people. A sensitivity analysis should be conducted to determine what resource values are represented in each designated natural area and how sensitive each of these areas is to human disturbance.

One key element in a resource protection program which has been gaining popularity in the North Central Florida region may be local resource tourism built around recreational trails. Developments demonstrating the draw of these features are the Suwannee River Bicycle Tours, the first year-round bicycle touring company in the state (based in White Springs, now known as Suwannee Bicycle Association, a nonprofit), and the Florida state bicycling program, located within FDOT. Travel and tourism writer Herb Hiller, who writes for numerous magazines and developed both programs listed above, describes heritage tourism as a way of maintaining habitat for wildlife while keeping a sense of original Florida alive for the rest of us.

The linking of greenways and trails can serve both to create a recreational network and to link wildlife habitats within counties, regions, and the state. In so doing, it can also create a critical connection between tourism as an economic sector and tourism as a way to stimulate a shared sense of who we are together in this state. The State Office of Greenways and Trails, located in the Florida Department of Environmental Protection, is currently developing and testing a cost-benefit decision model to assist communities in evaluating the relevant costs and benefits associated with five types of greenways and trails - ecological, recreational, historic/scenic, transportation-bases, and multi-purpose.

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HUMAN-RELATED RESOURCES

One of the basic principles of this document is that the fragile environmental quality of North Florida is not to be significantly altered. Protection of the natural resources of Alachua County are important for the purpose of preserving the environmental quality of the community. The health, safety, and welfare of the community is enhanced by the protection of environmentally sensitive areas which ensure the provision of potable water, healthful air, productive soils, and the maintenance of wildlife habitats.

Alachua County has experienced steady, if not spectacular, growth. According to the U.S. Census Bureau, Alachua County's population more than doubled since 1970, from 104,764 to approximately 218,000 in 2000. The population increased by 20.0% between 1990-2000, just slightly lower than the 23.5% growth rate for the entire state during the same period. Much of what makes Alachua County so attractive to people is what we are most vulnerable to losing. Our natural beauty and wide open agricultural lands give Alachua County a rural character and contribute to its quality of life. We still have many open spaces and native habitats that harbor diverse species of plants and animals. However, a coherent, broad-based plan for their protection is needed.

The specific impacts of growth can be beneficial or harmful to a community depending on varied factors. Decisions made in the planning process are foremost among them (APA 2000). Patterns of development are of particular significance to the interest of rural communities like we have in Alachua County. A growth-related trend or pattern that has become evident throughout Florida and nationwide involves the phenomenon of "sprawl." Sprawl amounts to an overflow of growth characterized by uncoordinated and unconsolidated land uses that are typically only accessible by car. Sprawling patterns of development are inherently inefficient and require the expenditure of excess taxpayer dollars to provide for infrastructure (like roads, water/sewer lines and electric utilities) and public services (like police, fire and emergency medical) outside of municipal boundaries. Such amenities are incrementally more costly the further out they are provided. In a time of growing awareness of the need for energy conservation, they also result in the use of more fuel as well as other natural resources.

Continued growth pressures are now extending the reach of various forms of sprawl-induced development into traditionally rural areas, which not only has adverse impacts on agricultural land, but on the surrounding natural areas as well. Sprawl's effects on environmental quality and the conservation of natural resources are likewise significant with regard to public health, water supply availability, wildlife protection, and outdoor recreation.

One 1998 real estate industry analysis indicates that many low-density suburban communities will suffer lower land values because of poor planning, increasing traffic, deteriorating housing stock, and loss of exclusivity. It states, "there is no greater risk to land values than unrestrained development" (ERE Yarmouth and RERC, 1998).

One of the hallmarks of the nation's best communities is the thought, planning, and community involvement put into creating and delineating an attractively built environment that relates to and incorporates the area's natural environment. A basic objective of this Plan is to retain, and where required, re-establish a sense of community in Alachua County as growth occurs.

In addition, there are less tangible, but nonetheless real, benefits to the practice of conservation in an urban context. In Ian McHarg's now-classic words:

We need nature as much in the city as in the countryside. In order to endure we must maintain the bounty of that great cornucopia which is our inheritance. It is clear that we must look deep to the values which we hold. These must be transformed if we are to reap the bounty and create that fine visage for the home of the brave and the land of the free. We need, not only a better view of man and nature, but a working method by which the least of us can ensure that the product of his works is not more despoliation....It is not a choice of either the city or the countryside: both are essential, but today it is nature, beleaguered in the country, too scarce in the city which has become precious....(McHarg, 1969)

The values to which McHarg refers are represented in Alachua County by the community's expressed desire, incorporated as policy statements in this document, to preserve open space, trees and native vegetation, maintain tree canopy, maintain or create visual buffers between disparate land uses, protect scenic quality, including the quality of the built environment, scenic corridors, and the quality of the nighttime sky, and generally respect sensitive ecological features during the land development process. These values are as important to the quality of life in this county as are the provision of services, such as transportation, water, and sewer, to the citizens of Alachua County.

Natural features such as the limerock outcroppings, native vegetation, the lakes and springs, and wildlife frame Alachua County's special character and sense of place. Which natural features have some intrinsic value, and how much land should be preserved, are questions that county residents wrestle with as they seek to balance the value of growth and the value of preserving natural areas.

As regional and national development trends come to Alachua County, they often bring a standardized appearance to the built environment. The County will need to ensure that the community's desire to incorporate natural features and native materials into commercial and residential development is fulfilled.

HUMAN-RELATED RESOURCES

Energy Conservation

A. Introduction

Alachua County residents and businesses are almost completely dependent on oil and natural gas to meet their primary energy needs. Due to the known finite supply of available fossil fuels and to the continued political volatility of oil rich regions of the world, there has been concern for decades about managing the transition away from our present reliance on fossil fuels.

Although the Growth Management Act and its implementing rule, F.A.C. 9J-5, do not explicitly address the subject of energy conservation in land use planning, such considerations are relevant, and arguably implied, in a number of provisions. The Growth Management Act directs local governments to encourage "the most appropriate use of land, water, and resources, consistent with the public interest..." to plan for "efficient provision of transportation, water, sewerage, schools, parks, recreational facilities, housing, and other requirements and services;" and to "conserve, develop, utilize, and protect natural resources within their jurisdictions (F.S.A. sec. 163.3161(3))." It further calls for the location of public facilities in order to encourage their efficient utilization (F.S.A. sec. 163.3177 (3)(a); planning for bicycle and pedestrian facilities (F.S.A. sec. 163.3177(6)(b); and conservation of natural resources, including air, water, soils, and other natural and environmental resources (F.S.A. sec. 163.3177(6)(b)).

The Growth Management Act implementing rule, F.A.C. 9J-5, echoes the policy language of the statute by calling for conservation and protection of air quality, water resources, native vegetative communities, and natural functions of natural systems, including soils (F.A.C. 9J-5.013). In the area of future land use, local goals and objectives must call for coordination of future land uses with existing topography, soils, and availability of services, prevention of urban sprawl, protection of natural and historic resources, and innovation in land development regulation (F.A.C. 9J-5.006). In the area of transportation planning, local governments must provide for safe, convenient, and efficient transportation systems, including provision for bicycle and pedestrian systems (F.A.C. 9J-5.007). The Housing Element must contain provisions for affordable housing (F.A.C. 9J-5.010). Taken as a whole, these provisions offer support for the need to consider energy conservation in land use planning and building construction at the local level.

B. Energy conservation programs

There is a history of energy conservation awareness at the local governmental level in Alachua County at least since the beginning of the 1980s and at the individual and private sector level for a much longer time. In 1980, then Governor Graham introduced and funded the Local Energy Action Program (LEAP) in Alachua County. The goals of that effort were (1) to develop energy policy recommendations for the Gainesville urban area, and (2) to develop a program for the promotion of community-wide energy conservation efforts. The result of this program was the development over a nine month period of a report containing 166 specific energy policy recommendations designed to help local governmental agencies develop effective energy policy to increase energy conservation and the use of alternative energy sources (Steering Committee, Governor's Local Energy Action Program, 1981).

The LEAP recommendations are grouped into four categories addressing buildings and land use, utilities,

transportation, and government agencies. They are addressed to the Gainesville Regional Utility, City of Gainesville, Alachua County, Regional Transit Authority, Alachua County School Board, University of Florida, major employers in the county, Santa Fe Community College, North Central Florida Regional Planning Council, and every other relevant entity in the county. Most, if not all, of these recommendations are as relevant today as they were in 1981, since the post-recessionary growth years of the middle and late 1980s effectively reduced the drive to modify land planning and site development practices as well as individual lifestyles.

At present in Alachua County, public policy is in a state of flux regarding the use of energy conserving design features. Increasingly, planned unit developments and subdivisions are being required to include design features such as bikeways and pedestrian walkways, and use of canopy trees in landscaping. In addition, housing policies call for performance standards and development regulations encouraging energy conserving site development, as well as passive design features in structures. There are efforts underway to expand multi-modal transportation opportunities throughout the MTPO planning area, consistent with a new vision embraced as the Livable Communities Reinvestment Plan. Please see the Transportation Mobility Element for further discussion of this topic.

The Alachua County Cluster Ordinance, adopted in 1992 (see Alachua County Code, ch. 373), allows clustering of single-family residences on no less than 50% of the required lot area and provides for a density bonus of up to 10% for subdivisions incorporating passive solar design features such as east-west street orientation and certain architectural features.

Energy efficiency in building construction is regulated by the State of Florida through its Energy Efficiency Code for Building Construction ([Florida Statutes](#), Chapter 553, Part VII, as amended). This is a uniform code designed specifically for the Florida climate, which cannot be made more stringent or lenient by individual local governments. Changes to the Code are made through the Administrative Procedures Act process. While the Code is a significant improvement over previously used standard building codes, it has been criticized for not emphasizing passive heating and cooling techniques in building design and construction.

Financial incentives for the installation of energy conserving devices in buildings are available but limited in scope. The Gainesville Regional Utility (GRU) offers free residential and commercial energy audits (informational only), general information on energy conservation, and rebates for natural gas installations that meet certain criteria. In addition, GRU offers two financing assistance programs. The Prime Cash Program, sponsored by the Florida Public Service Commission and promoted by GRU, offers \$500 - \$5,000 reduced interest home loans for energy conserving home improvements. The Commercial Lighting Program, currently being run by GRU as a pilot program for the American Public Power Association, offers GRU customers amortization of lighting efficiency improvements, recommended and installed by GRU, for a period of up to three years. The program is designed just to cover its costs while reducing energy consumption in the commercial sector.

Internally, the county maintains an ongoing energy management program. By rewiring old buildings, installing more energy-efficient devices and other techniques, the county has been able to cut energy consumption at the jail, the courthouse and the administration building by significant amounts over the last decade. The county also adopted Resolution 97-124 establishing a policy for procurement of products with recycled content. A preferred products list is maintained by the Office of Waste Management and Purchasing.

C. Site design utilization of passive energy techniques

One area in which proven planning and design concepts can be utilized to conserve natural resources as well as energy is site design of new development. This approach can save energy in each phase of the land development process: site selection, design/construction, operation, and maintenance. Energy savings are in the form of either embodied energy or end use energy. Embodied energy is the energy consumed during the construction phase of a project, plus the energy consumed in the operation of equipment during that phase. End use energy is that energy consumed during the operation of a completed project, such as heating, cooling, hot water, and lights. (Crandall, 1982)

Embodied energy savings during the site design process include, for example, savings resulting from attention to drainage, grading, roadway or street construction, and structure type. A drainage plan for a development site should allow nature to handle as much of the runoff as possible by utilizing existing drainage courses and water bodies, creating or protecting water impoundment areas over permeable soils, and protecting natural flood plain functions. In this way, the expenditure for drainage piping and ditching can be minimized. Land grading can also be minimized generally by utilizing existing slope conditions for compatible land uses and by preserving natural landscaping. This landscaping, in turn, can affect the heating and cooling requirements of buildings. Embodied energy in roadway design and construction is a significant cost in the development process. Clustering of units can significantly reduce pavement lengths within developments. Some reduction in roadway widths may also be appropriate. Choice of structure type can also affect embodied costs by utilizing common walls and shorter utility extensions and by minimizing necessary grading for foundations.

Once a development site is selected, end use energy savings during the use and operation of individual structures can also be affected through, for example, proper site selection, unit orientation, and roadway layout. Since structure cooling loads in Florida are greater than structure heating loads, minimizing the cooling load should be the main objective in designing new developments to utilize the natural and built characteristics of a given site. Within a development project, individual structure sites should be selected with sensitivity to slopes, angle of solar radiation in relation to slope, vegetation, presence of water bodies, winds, and elevation. Individual units should be oriented to minimize solar incidence (five degrees south, southeast building orientation, with minimal east and west exposure, is preferred) and maximize the potential impact of wind on the structure. Maximum seasonal shading, especially of southern and western exposures, is desirable. Finally, roadway layout can affect end use consumption of structures by allowing for an east-west orientation of structures, minimizing heat build-up through narrower street widths, allowing for structure clustering, and so on.

A significant body of literature is already available on these and related subjects, of which the foregoing is just a sampling. (See Burchell and Listokin, 1982; American Planning Association, 1979; Franklin Research Center, 1979.) However, existing regulations may, in some instances, preclude the application of some of the principles discussed above. For example, existing roadways and lots, coupled with setback requirements, may prevent new structures in existing subdivisions from achieving optimal orientation in relation to the sun. A grid type of street plan maximizes embodied energy in paving materials, while heating the micro-climate and, again, pre-determining the orientation of some units. A flexible site design process, on the other hand, should allow for passive heating and cooling of structures through sensitivity to the site and its natural characteristics, utilizing the principles sampled above.

The Housing Element calls for performance standards in the site plan review process to "encourage innovative approaches for site layout which can reduce costs of land preparation, infrastructure, landscape planting, and energy requirements for homes." Periodic review of development regulations and building codes is directed in order to determine whether modifications are needed to incorporate energy conservation measures in addition to the requirements of the State Energy Code. The Housing Element also calls for consideration of the opportunities offered by passive solar heating and cooling techniques, such as those reviewed above, and consideration of a request for modification of the State Energy Code to credit such techniques. These policies are consistent with conservation policies presented in this element.

HUMAN-RELATED RESOURCES

Open Space

A. Introduction

According to 9J-5, FAC, “open spaces” means undeveloped lands suitable for passive recreation or conservation.” Open space and natural features are an integral part of this Element. A wide range of types and sizes of open space and natural features within the County should provide: diverse plant and animal habitat, visual and spatial breaks from urban uses, places for outdoor education and passive recreation, such as hiking, photography, bird watching, bicycling, jogging, or fishing, a system of trails, greenways, and wildlife corridors that are interconnected, and many other uses. The preservation and enhancement of open space and natural features, and their incorporation into the infrastructure of Alachua County, is a function of this element and related ordinances. Public parks and recreation programs are described in the Recreation Element.

The interaction of land, water, plants, and wildlife through the millennia created a place that attracted - and still attracts - people because of its beauty and natural features. Alachua County is a community that values the area’s natural features and has tried to incorporate natural features in the design of the built environment. Maintaining the natural features and open space in an urban area is a difficult task, and one that becomes more complex during periods of rapid population growth. However, providing open space for the benefit of existing and future residents is important.

Urban sprawl has eliminated large quantities of undeveloped open space throughout unincorporated Alachua County. The potential for increasing urban and rural development impacts is great and will not lessen over the short or long term. Policies require the development of an open space network throughout the County, and provide criteria for open spaces to be provided by both the public and private sector to meet the needs of the growing community. Since open space lands may be either privately or publicly owned and range in character from vacant urban lands to large open spaces and forestlands, methods of protecting these lands are often varied and complex. The open space plan must ensure the protection and proper future use of the natural environment including rivers, state parks and wetlands.

B. Functional categories of open space

When open space was included as part of the Recreation and Open Space Element, open space was described by its function as it relates to land use. This approach recognized that, in many cases, open space areas serve more than one land use. In all cases, open space provides relief from development and maintains the balance necessary to insure a healthy natural environment. Three categories of open space include utility open space, green open space, and corridor open space.

Utility open space is identified as land that is utilized for its capacity to be used for production and storage. These include: resource lands, such as agricultural lands and forests; reserve lands that are set aside for future resource use but may serve as wildlife habitat areas due to limited human disturbance (such as Site Balu); and water management areas, such as lakes, rivers, creeks, wetlands, floodplains, aquifer recharge areas, and stormwater systems areas which are unsuitable for development.

Green open space is land primarily serving as preservation, conservation, or recreation lands. These include activity-based urban and rural park areas, such as neighborhood and community parks, botanical gardens, fairgrounds, zoos, and private recreation sites; urban development open space, which are natural areas that provide relief from the intensity of development; protected areas, such as State parks and preserves, geologic sites, resource-based parks, and scenic areas, which afford limited accessibility to protect the site's scenic and natural resource qualities.

Corridor open space is considered as those areas that provide linkages between various activity nodes. Activity nodes consist of residential neighborhoods, shopping areas, and preservation, conservation, and recreational sites. Examples include: right of way spaces, such as certain scenic streets, railroad lines, and utility easements; and scenic and environmental spaces, which possess scenic and environmental qualities such as creeks, rivers or streams and environmentally sensitive habitats. Another example would be the Gainesville-Hawthorne Rail-to-Trail.

Certain open space areas serve many of the functions described under these open space categories. These areas can be described as multi-use open space. Types of multi-use open space areas include rivers and creeks, significant uplands and forests, 100-year floodplains and wetlands. An example would be the Lochloosa Wildlife Management Area.

C. Open space requirements

As part of the Conservation and Open Space Element, open space is addressed in several ways. First, new policies establish the requirement for the provision of 20% pervious open space in all urban developments. Open space is to be comprised of permeable open surfaces, excluding principal structures and impermeable surfaces. No parking areas are included as open area. In addition, new Conservation policies establish a priority for natural resources to be included as protected open space in all developments. This priority applies to open space in rural clustered subdivisions, addressed in the Future Land Use Element. Finally, Alachua County encourages the creation of an open space network linking environmentally viable natural systems through strategies which will:

- Support the preservation of conservation areas while helping to define the overall future land use pattern of the county;
- Enhance the appearance of the County by providing an open space network that will become a visual and functional organizer of recreational activities, natural resources and other open space areas, including public and private lands and water; passive as well as active recreational areas and conservation areas;
- Protect the health and safety of residents by providing safe recreational opportunities in close proximity to residences;
- Increase recreational access opportunities that support eco-tourism, and reduce the need to develop land for parking;
- Encourage alternative to the automobile to conserve scarce resources, comply with federal air quality standards, and provide for bikeable, walkable, and equestrian friendly communities, consistent with Florida Pedestrian System goals.

Linked open space is not a land use designation, but is a program which enables connections consisting of lands designated as conservation, agriculture, or other land categories between lands identified as conservation, recreation, and residential. Various types of open space links or greenways will be included in the program: ecological or wildlife corridors, which connect conservation areas to allow animal migration and primitive hiking where feasible; small ecological greenways which allow connection of upland areas to preserve high quality native vegetation within urban areas; passive recreational greenways which use drainage maintenance areas and/or right-of-way to connect residential areas with parks and conservation areas; and those which use rows to connect residential areas to parks, urban preserve and other open space features.

To implement these wide-reaching policies, the County will need to review all of the diverse contexts in which open space is used, and develop a comprehensive set of planning and management strategies for these areas. At minimum, a new ordinance will be required to address open space in various types of development, as well as a master management plan for the greenways system, as well as other open space in the County. In addition, the County aims to revise its regulations to provide incentives or encourage developers to preserve natural features as open space. Such changes include but are not limited to the following:

- More flexible subdivision lot and street standards to allow including natural features into the subdivision design;
- Planned development standards that are easier to follow and administer;
- A new cluster subdivision option specifically aimed at preserving natural features;
- Flexible minimum residential density standards on sensitive lands to protect natural features.

HUMAN-RELATED RESOURCES

Scenic Quality

A. Introduction

Scenic quality is a concept that is difficult to define on account of its broad scope. The Federal Highway Administration, for its purposes, calls it “the heightened visual experience derived from the view of natural and manmade elements of the visual environment of the scenic byway corridor,” whereas the Florida Department of Transportation calls scenic resources the “combinations of natural and manmade features that give the visual landscape remarkable character and significance.” More expansively, scenic quality can be considered as the cumulative impact of the elements of our surroundings that have aesthetic dimensions and which affect sense of place and, ultimately, quality of life. These elements include, but are not limited to, urban sprawl, building design, landscape architecture, vegetation, preservation of rare and endangered landscapes, lighting, and roadway beautification. Alachua County’s Comprehensive Plan uses the term “scenic resources” to mean “shared images of what is special or unique about the County’s landscape.”

Scenic quality is important across the state and at all levels of community, as the Florida Constitution, Article II, Section 7 declares it to be state policy “to conserve and protect its natural resources and scenic beauty.” In a report, the Alachua County Comprehensive Planning Team stated, “A strong sense of place is a valuable asset to any community. . . . [P]rotecting the community’s scenery and heritage that contribute to sense of place not only preserves a community’s character and identity, but is also recognized as a factor in maintaining economic well-being.”

Protection of scenic resources is addressed in the Conservation and Open Space Element of the updated Comprehensive Plan. Objective 5.3 of that element provides the County with a mandate to “Protect the natural resources and scenic quality of the community to preserve and cultivate a unique sense of place while maintaining economic well-being.” This broadens the County’s previous policy (Objective 3.4 of the 1991 Comprehensive Plan) by recognizing that scenic quality is important beyond the bounds of the built environment, i.e., the environment that most of the population lives and works in. Scenic quality is important for preserving those environments valued as natural areas distinct from the built environment.

B. Community design considerations

Most communities value and cultivate their sense of identity. Much regulation is fairly uniform throughout the state and nation. This has produced segments of the built environment that render aspects of communities indistinguishable from one another. Community design standards can help identify, protect, and enhance what is unique about a community, and thus contribute to a sense of identity. Generally, Alachua County’s land development regulations have addressed the fundamentals of land development without addressing the visual quality of resulting products in detail. Community design standards and guidelines can address the community’s quality of life through attention to development’s arrangement, appearance, and impact on the built environment. The proposed plan calls for community design considerations in a variety of contexts.

The character of a community’s commercial areas has a strong impact on the perception of the

community as a whole. In most communities, the cyclical and pervasive pattern of strip commercial use often has eroded local character and contributed to deterioration of older development. This detracts from the livability of the community, especially along older corridors. Encouraging better community design by providing incentivized options and flexibility within the land development code which is one way to ensure that new community development is more sensitive to its surroundings. See the Future Land Use Element for more discussion on this topic.

C. Personal Wireless Service Facilities

In an era of increasing dependence on mobile phones and other wireless devices, the siting of telecommunication towers is a controversial issue gaining prominence in many communities. Despite the widespread use of devices, very few people want to have unsightly utility structures within their view. Additionally, tall communications towers have exacted a toll on bird populations, with millions of birds dying from collisions with the facilities every year. This prompted scientists at the 1998 North American Ornithological Conference to adopt a joint resolution calling for more studies of the problem and for cooperative action between government agencies and the communications industry to reduce avian mortality caused by tower collisions.

Siting expert Ben Campanelli cites statistics that predict a need for as many as a quarter of a million new cellular antenna sites to meet U.S. demand when he writes, “As many as half of these sites will require new towers, especially in suburban and rural areas where few suitable tall structures are available to lease as antenna support platforms.” Locally, however, the phenomenal growth of the cellular industry has been addressed by the development of a Wireless Master Plan. The Wireless Master Plan sets forth a comprehensive and innovative “carrots and sticks” approach to siting cellular antennas and other personal wireless service facilities. It is significantly different than the one-size-fits-all technique used in the vast majority of communities.

The most significant differences in the Alachua County plan and most others are that it explicitly discourages tall towers, discourages co-location of personal wireless service facilities (the use of a common mount by two or more wireless carriers, which frequently results in taller towers), and encourages proliferation of shorter, less visible cell sites. The Wireless Master Plan led to Alachua County Code Chapter 366, which regulates personal wireless service facilities in detail, with an emphasis on protection of visual corridors and minimizing impacts through strategic location, camouflaging, and other techniques. New policy language to address the special needs of PWSFs are included in this proposed plan update under the Future Land Use Element. Policy 5.3.2 of the updated Conservation Element also calls for all infrastructure and utility structures, including communication towers and personal wireless service facilities as well as radio and television antennas, water, sewer, and energy facilities, to be designed and located in a way that minimizes “adverse visual impacts on the landscape and avian mortality.”

D. Glare and light pollution reduction

One specific new policy addresses outdoor lighting and glare, and calls for a comprehensive set of outdoor lighting design standards based on conservation principles that include the maximization of energy and cost efficiency, the use of lighting at appropriate intensities and times, and the minimization of offsite lighting impacts. Light pollution is a growing problem for five commonly recognized reasons. Lighting design techniques can be the culprits of glare, light trespass, clutter, energy waste, and urban sky glow.

- Glare has been defined as “unwanted source luminance” (luminance being “the brightness of an object that has been illuminated by a source”) is a safety hazard frequently encountered by drivers (Shaflik, 1997). Glare comes in three levels: discomfort, disability, and blinding.
- Light trespass is lighting which strays from its intended purpose, often resulting in annoyance for those that are trespassed upon.
- Clutter is a general descriptor for the unpleasant effect that wasted light has on the aesthetics of an area. Clutter may result in confusion (i.e., visual distraction).
- Energy waste is an undesirable result of poor lighting design, which, in addition to diminishing our supply of non-renewable energy and contributing to air pollution, the International Dark-Sky Association calculates as costing the U.S. some \$1.5 billion annually.
- Urban sky glow is the macroeffect of light pollution which diminishes the visibility of objects in the night skies. This concerns many citizens and is an increasing problem for astronomers. As the University of Florida hosts one of the largest graduate astronomy programs in the nation, this is an issue that of local concern.

There is often initial resistance by some segments of the public in communities where light pollution policies have been enacted, most often for security reasons. Despite being widely perceived as a tool for crime prevention in residential and commercial areas, studies have found little evidence to support this notion. The National Institute of Justice has said, “Lighting has received considerable attention. Yet, evaluation designs are weak and the results are mixed. We can have very little confidence that improved lighting prevents crime, particularly since we do not know if offenders use lighting to their advantage. In the absence of better theories about when and where lighting can be effective, and rigorous evaluations of plausible lighting interventions, we cannot make any scientific assertions regarding the effectiveness of lighting. In short, the effectiveness of lighting is unknown.” The International Dark-Sky Association points out that there is a difference between efficient, effective lighting schemes designed to deter crime and lighting schemes that use lighting indiscriminately. IDA recommends using well-controlled lighting and careful positioning that reduces glare and waste such as uplighting and scatter as well as motion sensors that activate lighting only as needed.

Although the current land development code has lighting design requirements as part of its zoning restrictions, there is not a comprehensive lighting ordinance for Alachua County. Policy 5.3.7 of the updated Comprehensive Plan requires such an ordinance in order to preserve the ambiance and quality of the nighttime sky and reduce energy consumption while allowing for public safety and security.

E. Beautification of visual corridors

The examination of existing roadway appearance in unincorporated Alachua County and the impacts of future roadways and road reconstruction on established neighborhoods suggests a number of areas of concern. Many of our road rights-of-way are aesthetically unattractive because of lack of buffering and landscaping. This concern covers both neighborhood commercial and residential arterial and collectors. Another concern is the impact of new road construction and existing road reconstruction on established neighborhoods. Residents fear that the intrusion of new roadways and the intensification of existing roadways will be a detriment to the appearance of their communities. The protection of existing roadways that exhibit attractive or scenic characteristics and the improvement of the appearance of existing and future development are also issues that need to be addressed. Visual corridors are discussed below and identified on Map 45.

1. Scenic roads

Alachua County Code Chapter 344 has as its stated objectives “to promote the convenience and enjoyment of public travel on the highways and roadways of the county; to protect the natural and cultural heritage corridors of the county and to enhance their resource values for the enjoyment of future generations; to protect the public investment in roads from activities, land uses, signs, etc., which impair both the integrity of the road, its capacity for traffic, and its visual qualities; to provide safe facilities for leisure driving, hiking, and biking; to provide access to and protect outstanding visual experiences representative of the county’s variety of landscape resources and cultural attractions; to contribute to the environmental and historical appreciation of the county and education of the residents and visitors; to attract visitors to the county by preserving natural beauty along the scenic roadways; and to expose scenic views and vistas along the roadside.”

2. Scenic corridors

With the update of the Conservation and Open Space Element, the County expands its view to protecting more than just roads, and places importance on the aesthetic qualities of all routes of transportation and visual corridors. A scenic corridor is defined as “a visual opening along a traveled route, such as a road, waterway, bike path, or pedestrian trail, that allows either glimpses or extended views of built or natural resources having historical or cultural significance or scenic beauty.” In policy 3.1.2, County-designated scenic corridors are identified as secondary conservation areas requiring protective measures but offering a range of activities consistent with protection. In policy 6.3.1, scenic corridors are recognized as one of several possible components of a greenways system in the County.

As outlined in policy 5.3.9, the scenic corridor designation is viewed as a catalyst and guideline to be used by the public and private sectors to bring about a coordinated effort in improving or maintaining the aesthetic appearance of County designated visual corridors. The purpose of the designation is to provide a framework for future planning and implementation of standards that can be addressed in the development regulations of Alachua County relating to the aesthetic appearance of identified corridors. The actual planning effort should be led by Alachua County with input from citizens organizations, the development community, and private individuals that would be affected by a scenic corridor designation. The implementation can be accomplished through community organizations, developers, or the county, depending on the specific corridor being addressed.

The scenic corridor designation may be applied to road corridors determined to have scenic qualities of

local or countywide significance. Roadways that function as connectors or linkages in the scenic corridor system may also be considered for designation even though their present characteristics would not normally warrant the designation. The purpose is to preserve and enhance the aesthetic appearance of such facilities with concern for related buffering, landscaping, and control of non-residential uses. Another purpose of the designation is to begin to form a system of connections between parks and recreational areas of the county. Consideration of bicycle and pedestrian access should be considered as part of the scenic corridor development plan.

3. Scenic US 441

In the spring of 2001, the Florida Department of Transportation designated U.S. Highway 441 as the “Old Florida Heritage Highway,” the culmination of efforts on the part of the Scenic 441 Corridor Advocacy Group and the University of Florida Conservation Clinic to recognize US 441 as a road with remarkable scenic, cultural and natural value. The Scenic US 441 Corridor, with its associated loop/spur roads, totals approximately 47 miles from SR 331 to the Alachua/Marion County line. The route’s Corridor Management Plan states “Scenic US 441’s relative proximity and easy access to Interstate 75 at both ends of the corridor offer a unique opportunity to promote this corridor as a touristic resource for less-hurried travelers. This in turn can support the current trend toward contextually appropriate economic development and eco-tourism exemplified by the growing number of antique and bed and breakfast industries along the roadside communities.”

The designation of U.S. 441 as a scenic corridor is part of a state program that is separate and distinct from the County’s program for scenic roads. While many of the scenic and resource protection concerns are similar for both programs, the means of achieving protection are considered under different frameworks.

4. Gateways

Other roadways not designated as scenic corridors but which have significance as gateways into Alachua County should be considered for application of additional landscaping and street tree planting to enhance their appearance. These roadways may be bordered by a variety of land uses. Additional landscaping and street tree plantings can help unify and improve the aesthetics of gateway roadways. A plan for planting shall be developed by the public sector with input from the community. Currently, the City of Gainesville has identified several roadways as gateway streets. The County may wish to work with other municipalities on similar efforts.

5. Street tree planting of non-scenic corridors

New subdivisions will require the planting of street trees in the right-of-way of local roadways between the street and sidewalk, or if there is insufficient right-of-way, a landscaped buffer should be provided within the front yard setback for this purpose. Street trees will be required in addition to those normally required for planting on the actual building site to provide future shade and other climatic benefits, and to help unify and beautify future neighborhoods. Every attempt to preserve existing trees in the right of way shall be explored. In addition, the County has committed to promoting and protecting the visual characteristics of canopy roads and wildflower areas through tree planting programs and tree maintenance practices, in cooperation with other agencies and private landowners.

HUMAN-RELATED RESOURCES

Vegetation Management

A. Introduction

Community trees and forests, and their associated vegetation, are valuable. Besides providing habitat and food for wildlife, vegetation produces oxygen, removes carbon dioxide, absorbs nutrients in waste, purifies the air, and reduces soil erosion. Native vegetation with intact natural soil surface provides the best medium for aquifer recharge, as well as areas which help provide adequate clean water for human and environmental needs. A visible part of the only sub-tropical area in the continental United States, natural vegetation is a strong attraction for many tourists visiting the state and for permanent residents seeking the alternative life styles available.

Community trees and forests provide a business-generating, and a positive real estate transaction appearance and atmosphere. It makes economic sense for the community to spend money on trees when it is clear that this money will be returned to the municipal coffers with interest in increased property values and a healthy economy. The following paragraphs will present information to support the presence of trees and other landscape plants in our communities, and show, in clear economic terms, that trees are good for the community.

B. Importance of trees

1. Environmental benefits

a. Air quality

Trees are an important part of the local and national fight against air pollution and against the progress of global warming. By removing carbon dioxide and other pollutants from the air and releasing oxygen back into the air, trees improve air quality. Air pollution levels are measured by the amount of particulate matter in the air, high levels of which are irritating to the respiratory system. Trees aid in removing particulate matter from the air by trapping particles on the exposed surfaces of twigs and leaves. Among other pollutants, trees filter out ash, dust, pollen, and smoke.

Looking at the overall effects of trees on air quality, in a study of two streets, a street with trees was found to have 100 to 3,000 dust particles per liter compared to a street without trees, where the concentration of dust particles was 10,000 to 12,000 per liter. Therefore, the lack of trees on an urban street resulted in four to 100 times as much dust being present as was present on a street with trees (Nelson 1975).

Another look at air pollution along freeways found that greenbelts could contribute significantly to air quality. The study found that air pollution along freeways is approximately three times higher than that acceptable to man. A greenbelt one-half mile wide on either side of a highway could readjust this air balance by removing significant pollutants from the air (Nelson 1975). Other studies have also found significant cost savings in health and property impacts by reducing air pollution (Conference on Alternative State and Local Policy 1984, and Ridker and Henning 1957).

Trees clean the air by removing carbon-dioxide, a by-product of combustion. Combustion comes from

many places, for example cars and industrial plant emissions. Carbon makes up half the dry weight of a tree. According to the USDA, "One acre of forest absorbs six tons of carbon dioxide and puts out four tons of oxygen. This is enough to meet the annual needs of 18 people." In addition, the amount of carbon stored in a primary (uncut) forest will almost always be greater than that in a restored forest.

b. Climate control

Research has shown that properly placed trees and landscape plantings can save 20 to 25% on energy use in the home (Heisler 1986). In neighborhoods with large trees, there will be a significant effect on temperature and energy use in buildings, particularly during the summer (Norman 1984, DeWalle 1978).

Without the cooling and moderating effect of trees and green spaces in our urban environments, urban areas grow hotter and dryer – a heat island effect. Approximately five to 10 percent of the current electric demand in cities is spent to cool buildings just to compensate for the heat island effect. In Los Angeles, this translates to \$150,000 per hour and in Washington, D.C., close to \$40,000 per hour during peak times. Nationally, the hourly cost may be as high as \$1 million (Rodbell, et al. 1971).

In addition to the increase in temperature, there is an increase in dryness without trees. In Phoenix, Arizona, for example, the construction of a regional shopping center resulted in a 30% increase in pan evaporation rates. A one percent rise increases outdoor water demand by a corresponding one percent. Thus, as the amount of vegetation in our urban areas is reduced, requirements for water and energy increase (Rodbell et al. 1991).

"According to a recent report by the U.S. Forest Service, trees save city governments and homeowners considerable amounts of money over the long run. In the study, which used Chicago as its model, researchers found that if officials planted 95,000 trees and tended them for 30 years, the city would save \$38 million--or an average of \$402 per tree. The reason: Trees help reduce energy use and pollution damage." (Wexler 1998)

Trees promote energy conservation by creating shade, reducing heat gain in and on buildings and paved areas, and reducing the temperature of the microclimate through evapotranspiration. Trees impede direct solar radiation and can channel wind flow around buildings. Additionally, the evaporation of moisture from leaves can reduce the ambient temperature surrounding a building. Strategic use of trees is estimated to result in annual residential energy savings in the U.S. of up to 25%. The USDA reports, "The net cooling effect of a young, healthy tree is equivalent to ten room-size air conditioners operating 20 hours a day."

Quattrochi and Luvall (1999) found that the few urban forests located throughout Atlanta, Georgia had a significant dampening effect on the urban heat island. This is particularly evident in northeast Atlanta where the residential tree canopy is extensive.

Trees provide protection against severe weather. Trees can serve as windbreaks to reduce the effects of tropical storms. In the winter, trees can have an insulating effect. "A home loses a greater amount of heat on a cold, windy day than on an equally cold but still day. About 1/3 of the heat loss is by transfer through the ceilings and walls (conduction). Wind increases heat loss from the outside surfaces of those same walls and from the roof by sweeping the warm air away (convection). Cold-air infiltration through spaces around windows and doors also increases reliance on costly home-heating systems powered by fossil fuels. The use of windbreaks and foundation plantings can substantially reduce the heat-robbing action of winter winds." (A.W. Meerow and R.J. Black, *Enviroscaping to Conserve Energy: A Guide to*

Microclimate Modification.)

c. Soil

Tree root systems are critical in stabilizing soil and topographic features such as creek banks. They also prevent erosion and slow stormwater runoff, thus contributing to soil conservation and flood control. Additionally, trees contribute to the nutrient load of the surrounding soil. It has been stated that 10,886 tons of soil can be saved annually with tree cover in a medium-sized city. (Coder 1996)

Trees function as both windbreaks and soil stabilizers, minimizing soil erosion. On the average, cropland in the United States loses 4.4 tons of soil per acre annually. The agricultural production problems caused by this erosion are estimated to cost \$2 billion annually. In addition, the runoff of sediment carrying herbicides causes an estimated \$13 billion of additional damage to the ecosystem (Clark et al. 1985).

One study by the Maryland Department of Natural Resources in the Gunpowder Falls Basin shows that forestland produces about 50 tons of sediment per square mile per year; established urban and suburban land contributes 50 to 100 tons; farmland, 1,000 to 5,000 tons; and land stripped for construction, 25,000 to 50,000 tons. This sediment enters the tributaries of the Chesapeake carrying nutrients and pollutants that are slowly killing the Bay (Ebenreck 1988).

d. Water

Trees maintain permeable land areas for surface water filtration and aquifer recharge. Trees are a key link in the hydrologic cycle. Their job is transpiration or giving off water vapor into the air for recycling into clouds and rain. Rain is the only means for recharging the aquifer in south-central Florida. Large trees get the job done much better than small trees.

Trees reduce stormwater runoff, storm and flood damage, and associated costs. "The planting of trees means improved water quality, resulting in less runoff and erosion. This allows more recharging of the ground water supply. Wooded areas help prevent the transport of sediment and chemicals into streams." (USDA Forest Service) Trees decrease the amount of water that runs off a site by breaking the impact of the rain and slowing the flow, allowing time for water to infiltrate soil. For instance, a U.S. Forest Service study showed that, in a one-inch rainstorm over 12 hours in Salt Lake City, trees reduced surface runoff by 11.3 million gallons, or 17 percent (Ebenreck 1988). This reduction has implications for the infrastructure costs of storm sewer capacity, the capacity of sewage treatment plants, flooding of rivers and streams, and the loading of sediment and pollutants into rivers and streams. Trees control erosion and reduce non-point-source pollution of surface waters. Consider these remarkable statistics: 37,500 tons of sediment per square mile per year comes off of developing and developed landscapes; trees could reduce this value by 95%. That results in \$336,000 annual control cost savings with trees. (Coder 1996)

e. Habitat

Trees are living systems that interact with other living things in sharing and recycling resources - as such, trees are living centers where living things congregate and are concentrated. Trees protect and maintain natural habitats for wildlife, birds, game, fish, and other aquatic life, as well as for other vegetation..

Providing tree habitat for wildlife pays dividends. Consider the birds and bats for which trees are a haven: they play an important role in natural pest control. While lowest bird diversity is in areas of mowed lawn, highest is in areas of large trees, greatest tree diversity, high native plant populations, and

brushy areas. Native wildlife needs native habitat. A prime example is the red-cockaded woodpecker. This is a non-migratory bird that thrives in mature pine, especially longleaf pine, forests. It is classified endangered on the Federal level and threatened in Florida.

Trees are also essential for providing the habitat of other vegetation. Epiphytes such as bromeliads and some ferns make their homes in the tree branches, while other plants are reliant on the shade, protection, and leaf litter a tree canopy provides.

2. Human-related benefits

a. Noise reduction

Noise is an insidious but often irritating form of pollution for the urban dweller. Sound can be reduced in intensity either by the distance it travels or by colliding with a barrier that absorbs the sound waves or reflects them in another direction. The degree of transmission of the sound is also based on the humidity of the air, with high humidity resulting in low transmission. Trees function in the sound reduction process by modifying humidity and climate, by absorbing sound, and by deflection and refraction. Trees provide “white noise,” the noise of the leaves and branches in the wind and associated natural sounds, that masks other man-caused sounds.

In a study of the economic effects of expressway noise pollution, Roger Vaughn and Larry Hucking (1975) looked at the decline in property values that could be attributed to the level of noise in a neighborhood in Chicago. The estimates ranged from a high of \$18 million to a low of \$8 million.

Trees provide a buffer and screen against noise pollution. “Some researchers estimate that belts of trees 31-meters (100-feet) wide and 14-meters (45-feet) high can reduce high-way noise by almost 50%. Evidence also suggests that people find noise less annoying when the source is obscured by vegetation.” (U.S. Department of Energy)

b. Light pollution control

Trees can potentially aid in reducing light pollution by blocking and controlling light trespass and scatter. They can also reduce the harsh effects of sunlight on the human eye by being used to shade roads and other outdoor areas people frequent and congregate, such as picnic tables and walkways. Thus, by reducing the bad effects of lighting, trees can contribute to the safety and comfort factor of our surroundings. Trees can solve a variety of light and glare problems in the landscape, although planting a tree that will grow to lock the offending light will not solve the discomfort for some time. However, light effects, both day and night, should be considered before removing trees.

c. Human health and well-being

Trees and green landscapes have a profound effect on our health. Spending a day in the woods or lunchtime in the park can leave us feeling invigorated and refreshed, ready to face the pace of society. Trees and planted or natural areas have the ability to relax us, to lower our heart rate, and to reduce stress. According to Dr. Roger S. Ulrich of Texas A&M University, “In laboratory research, visual exposure to settings with trees has produced significant recovery from stress within five minutes, as indicated by changes in blood pressure and muscle tension.”

In a study of patients in a Pennsylvania hospital, Ulrich (1984) found a marked difference between the

convalescing times of patients with views of a landscaped area and those with views of no landscaping or a brick wall. His results showed that patients with a view of trees spent only 7.9 days convalescing and required less potent painkillers, compared to 8.7 days for those overlooking the non-landscaped area. With 8% fewer days spent in the hospital, the national health cost savings could be as large as several hundred million dollars a year according to Ulrich's figures.

In other tests, Ulrich (1979) found that a group of students feeling stressed by exams felt better after viewing 50 slides of natural scenes, while a control group who viewed slides of urban scenes felt worse.

d. Landmarks

Trees are also culturally important as community landmarks and memorial markers. Old trees are reminders of an area's history, a concept echoed by heritage and champion tree programs, which designate large, old trees as local treasures and recognize the need for their preservation. In the Alachua County Tree Protection Code (Chapter 347 ULDC), champion trees are defined as "those trees that have been identified by the Florida Division of Forestry as being the largest of their species within the State of Florida or by the American Forestry Association as the largest of their species in the United States."

e. Property values

Numerous studies have been done about the value of trees to residential property. The studies show that people are willing to pay more for homes that are surrounded with trees and other landscaping. Dr. Lowell Ponte has stated that "Trees can boost the market value of your home by an average of 6 or 7%."

In Manchester, Connecticut, as much as six to nine percent of the total sales price of a house could be attributed to "good tree cover" (Morales 1980). A total of 50 homes were observed in the study. The homes were between four and five years old, with half of the homes having a substantial amount of tree cover and half with no tree cover. Increases in value attributable to the presence of tree cover ranged from \$2,941 (seven percent) in the least desirable neighborhood to \$2,683 (five percent) in the most desirable neighborhood.

A three to five percent increase in the sales price of single-family houses in Athens, Georgia, was associated with the presence of trees (Anderson and Cordell 1982). The results of this study reflect actual real estate market transactions, in which sellers and buyers negotiated final sales prices. During the period from 1978 to 1980, 800 house sales were analyzed from the local Board of Realtors Multiple Listing Services. In this study, the \$46,972 predicted price of the average house includes \$2,100 for the presence of an average of five trees. Therefore, an average of four percent of the price of the average house was attributable to the presence of trees.

In a study of appraisal values, open land with no trees was appraised at \$1,500 per acre (1973 dollars), while land that was two-thirds wooded was appraised at \$2,050 per acre (Payne 1973). A 12-acre tract of land was selected, and different images of the site with varying numbers of trees were prepared. These images were shown to real estate appraisers who were asked to estimate a per-acre value. On average, trees contributed as much as 27 percent of the appraised land value.

In a survey of residents in a Stevens Point, Wisconsin, subdivision, it was found that the presence of trees was the most important factor in influencing the purchase of their property (Vander Weit and Miller 1986). A majority of homeowners stated that more than 10% of the value of their homes could be attributed to vegetation.

In a story on home renovations in Money magazine (April 1986), it was reported that landscaping has a recovery value of 100 to 200 percent “if it is well done and harmonizes with foliage nearby.” Since not all improvements recover their value, this compares to the recovery value of kitchen remodeling at 75 to 125 percent, bathrooms at 80 to 120 percent, a new deck or patio at 40 to 70 percent, and a swimming pool at 20 to 50 percent.

Clearing versus replanting: All of the statistics given above relate as directly to the development of new residential areas as they do to the sales of existing homes. Developers, however, often find it easier to clear-cut new residential lots rather than to try and deal with the requirements of tree preservation. We have seen that trees and landscaping can add thousands to the sales price of a new home. How does this relate to the added costs of preserving trees on the construction site?

In two studies of developers, one in Amherst, Massachusetts, and one in Athens, Georgia, it was found that preserving trees on site was a sound economical decision (Selia and Anderson 1982). In the Amherst study, conducted in 1977, nine builders reported an average cost of about \$1,000 to clear a heavily wooded lot of trees. If some of the trees were to be saved, the partial clearing costs and protection of the remaining trees was higher, averaging about \$1,700. The nine builders reported that they were always able to recover the extra costs of preserving trees in a higher sales price for the house. In the Athens study, nine builders were surveyed about tree removal and preservation practices for 106 houses they had built. The builders reported that public demand was higher for houses with preserved trees and any extra costs incurred in preserving trees were recovered in the final sales price.

C. Human impacts

When natural vegetation is cleared: wind and water erode the soil; the immediate neighborhood suffers from blown dust and sand and poor air quality; and the noise buffering benefits provided by natural vegetation is lost. Urban development practices frequently remove or alter much of the County natural vegetation. In many cases, this is unnecessary and could be avoided. Many species are essential to the integrity and maintenance of the lands they occupy. The natural communities and their value for the planned future of Alachua County is detailed in the Conservation and Open Space Element. Three particular threats associated with urban development are discussed below.

1. Water use

According to the Florida Springs Task Force, more than nearly half of all water withdrawn for public supply in Florida is used to water lawns. More aggressive programs to encourage native landscaping around homes could make a major difference in water consumption. The Task Force recommends implementation of water conservation programs, such as xeriscape landscaping services, free mobile irrigation labs, and rebate programs for rain sensors, micro irrigation, water efficient plumbing fixtures and appliances.

2. Fertilizers

What we apply to the landscape can get into the aquifer. Nutrients in spring water do the same thing fertilizer does for our lawn and garden - it makes things grow; like algae. Non-native, invasive plants that aren't supposed to be there, thrive on nutrient-rich waters and crowd out native species. It also effects wildlife. When nitrate levels in a spring reach 1 part per million (ppm) - a tenth of the level at which nitrates cause human health problems - the spring ecology changes. Depending on the permeability of the soil and how many years the activity has gone on, fertilizers and other chemicals applied to lawns and gardens could be feeding algae and plants in springs that bubble up near the coast. In some areas in can take up to 20 years for extra nutrients and pollution to work its way through the soil.

Landscaping activities can affect the environment through the release of toxic pesticides and excess nutrients, as well as the destruction of wildlife habitat and ecologically sensitive areas. However, proper landscape design and maintenance can help reduce these environmental impacts and can help minimize the effects of other activities as well.

If planted in suitable soil, native plants require very little maintenance. What is a native plant? According to the Checklist of the Vascular Plants of Florida (Wunderlin et al, 1995): A plant is native to Florida if it was present here in 1513, when Juan Ponce de Leon arrived, or if it arrived after 1513 by non-human means such as air, animal or sea drift. Executive Order 13112 defines native species more broadly, "mean[ing], with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem." Adapted over many centuries to Florida's extremes - heat, humidity, insects, storms, floods, freeze, frost and drought - these plants are "Florida friendly". They commonly re-seed and return year after year.

Why does this matter? Because non-native plants often require much time, effort, topsoil, fertilizer, pesticide, water and mulch. Besides taking more time to maintain and less time to enjoy - these activities are not friendly to Florida's fragile environment. In addition, native plants attract native wildlife. Many native birds and animals require native plants for food (The Right Plants for Dry Places, Suncoast Native Plant Society).

Landscaping focuses on layout, aesthetics, community enhancement, recreational use, etc. It is a significant element in the development process and can be done to be "Florida friendly" - using less water and less polluting fertilizer.

3. Invasive plants

Florida has a problem with invasive, non-native plants. Executive Order 13112, in which the President established the National Invasive Species Council, defines invasive species as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Alachua County's Comprehensive Plan regards invasive species as those plant species that are widespread in Florida and have the established potential to invade and disrupt native plant communities; they are localized but have a rapidly expanding population or have shown a potential to invade and disrupt native vegetation in other areas or other countries with climates similar to Florida. The introduction of non-native species of plants that spread to overtake and crowd out native plants is an enormous headache. Getting rid of established invaders is expensive as well.

The state of Florida spent \$94.5 million and \$127.6 million in 1999 and 2000 respectively to control

invasive non-natives, many of which affect agricultural production. (The Nature Conservancy, Florida Chapter News, Summer 2001. Florida spent \$20 million on melaleuca (paper bark) control in natural areas in the last decade. (Foerste, Eleanor, Orlando Sentinel correspondent, November 24, 2001) Nearly \$20 million each year is required to control hydrilla, an aquatic non-native invasive plant in our lakes. (ibid)

Since 1970 laws have been passed to prevent the spread of these "noxious" plants. Many plants are now illegal to cultivate in Florida. Among them are melaleuca (aka Australian paper bark, punktree, naiouli, cajeput tree, broadleaf paper bark, broadleaf teatree, paperbark teatree, bottlebrush tree), Brazilian pepper, Australian pine, Chinese tallow, air potato, cogon grass and tropical soda apple. Numerous communities statewide have instituted ordinances prohibiting invasive plant species.

Why is it so important to protect our environment from invasive non-native plants? This type of vegetation wreaks havoc upon the delicate balance of resources native communities depend on. For example, an infestation of melaleuca can devastate wetlands by altering the hydrology of the system. Leaf litter from stands of melaleuca may alter the soil topography, creating new tree islands, and may increase the evapotranspiration rate of the area, eventually drying up the wetland.

Many invasive non-natives, while pleasant enough in their homelands, become especially tough to fight in Florida. Cogon grass, for instance, can survive on very poor soils and is now frequently found in areas of the state recovering from phosphate mining. Some scientists believe that the cogon grass found in Florida has become much more shade-tolerant than it was originally and that the rhizomes of the plant may actually contain a substance that inhibits the growth of other plants.

D. Protecting trees

1. Regulations

Whether common pine trees or rarer scrub pines, the natural plant associations of Alachua County create tremendous value, not just in aesthetics and wildlife habitat, but in supplying natural environmental protection through natural functions. The purpose of the Alachua County Tree Protection Code is to protect the trees we already have and to encourage replacement of trees removed during development. New policies place greater emphasis on preserving large shade trees and tree stands as opposed to clearing and replacement of trees.

Preservation of natural vegetation in native upland habitat is not simply a question of providing large preserves for plants and animals. The myriad benefits of preserved upland habitat are especially important in the urban setting. For this reason Alachua County has adopted policies which preserve native upland habitat in place within all development. As a result, we look to a greener future with more diversity and fewer environmental crises.

Tree canopy areas are major existing tree canopied areas within developed or less developed areas of the county which, because of the lower level in diversity of plant species and higher level of past or present disturbances caused by development of various types, are not listed as exceptional upland habitat. However, many of these areas contain a significant population of trees of a size and condition to be considered a resource. The tree canopy benefits -- micro-climate moderation, pollution mitigation, mitigation of noise and glare, and habitat maintenance -- can be nearly as good as those provided by the exceptional upland category. For these reasons, tree preservation generally, and preservation of tree canopy areas particularly, are important components of ecologically sound development policy.

A recent University of Florida study compared tree canopy in the cities of Gainesville and Ocala, which are geographically close and similar in many ways (e.g. climate, culture, industry), yet have differing policies and regulations with respect to tree protection (Jensen, 2000). The study found that the urban forest in Gainesville, the city with more stringent tree removal policies and stricter replanting rules, had much greater tree canopy than Ocala. The UF study concludes that greater tree canopy translates into reduced energy consumption. For example, residences in Gainesville use an average of 935-kilowatt hours per month (R. Bauldree, Gainesville Regional Utility, personal communication, 2000). Conversely, Ocala residences use an average of 1,075 kWh per month (J. Henning Ocala Electric Utility, personal communication, 2000). Using the average rate of \$0.07524 / kWh, this results in a yearly savings of \$126.40 per household. Although other factors could be influencing this such as geographic location, it seems clear that urban forestry plays a role in this savings.

The county will require that new development preserve natural vegetation and tree canopy areas to the maximum extent possible. The County shall promote preservation and management of natural communities by encouraging land owners to follow the habitat management guidelines and to prepare a habitat management plan for their property. Beyond providing habitat for wildlife as addressed in previous sections, Alachua County's native vegetation must be managed to maintain its diversity and health for ecological as well as aesthetic reasons. Policies in this section seek to protect native vegetation resources primarily on private land within the county. The planting of invasive, non-native species is specifically prohibited in new developments and public facilities.

Policy 5.4.3 commits the County to protecting trees based on a species specific hierarchy. Trees shall receive priority for protection based on species, in conjunction with other features including size, age, condition, historic association, and uniqueness. Removal or damage of champion trees is prohibited, and removal or damage of specimen trees is to be avoided or mitigated. Specific protections are to be spelled out in the land development regulations. Trees native to Alachua County are identified in Table 16.

Designating trees for protection is only half the battle. The best standards being implemented by the most sympathetic developer can be undermined in an afternoon of careless construction activities on a site. A small trunk wound inflicted by heavy equipment during construction or at any other time can cause major injury to the tree. Trees cannot replace injured tissue (heal) like animals, therefore injury permanently reduces the trees capacity to fight future stress caused by insects, disease or other factors. In addition, many roots are destroyed as heavy equipment operates over the root system. Even one pass over the root system with a bulldozer, earth scraper or other piece of heavy equipment can cause significant root damage. (Edward F. Gilman, "Dispelling Misperceptions About Trees") Bulldozing near a large tree's roots, digging underground trenches, dumping construction wastes close to a tree - all of these actions can result in de facto removal of a tree that was designated for preservation. The death may be slow but it can be just as sure.

Trees require particular care in order to stay healthy, and it is the need for this particular care that gives rise to the need for specific tree protection standards.

“Unlike trees in the rural forest, the trees in our communities need care to perform their function safely, particularly when they are young. Today, communities often hire urban foresters or arborists to direct the urban tree care program, but property owners, citizens, tree care firms and municipalities must act together as stewards of community trees.” –Edward F. Gilman, IFAS

Our Tree Protection Code should be revised to address four critical impacts that construction activities might have on a tree:

- impact injuries/accidental cutting - construction fences or barricades around a protective perimeter surrounding one tree or groups of trees is an essential requirement
- excavation - tunneling under major tree roots or masses, if necessary, should be preferred to trenching; if trenches are used, roots should be cut with sharp instruments to reduce potential damage
- grade changes - severe grade changes should be restricted to prevent damage to roots by smothering their water and oxygen supplies
- other hazards - other construction hazards such as dumping of toxic substances or setting of fires to clear vegetation should be addressed.

Another important component of eco-planning is the use and preservation of native and low-maintenance vegetation in the development process. Not only does this approach minimize land clearing, with accompanying erosion problems, it generally results in the most pest and drought resistant landscaping plan possible. Thus, both development and long-term maintenance costs are reduced.

With the goal of wise water management in mind, our policies require water conservation through landscaping. The SRWMD offers the following seven principles of water-efficient landscaping:

- planning and design
- soil analysis
- appropriate plant selection
- practical turf areas
- efficient irrigation
- use of mulches
- appropriate maintenance.

A number of steps can be taken during project planning, design, and operation and maintenance to reduce or avoid the generation of landscaping wastes. These techniques include landscape development and alteration, grass-cycling, composting, and mulching. The planting of native and indigenous trees and plants require less attention and maintenance. Grass cycling is a process in which grass clippings are left in place on a lawn after mowing instead of being raked and bagged. This process improves lawn quality by returning important nutrients from the decaying clippings to the soil and lawn. Composting is a process using microorganisms in the presence of oxygen and moisture to break down organic wastes into a humus-like product that makes a superior soil conditioner or mulch suitable for most landscaping and

gardening uses. Using compost will help reduce reliance on phosphate and nitrogen fertilizers that may be detrimental to the surrounding ecosystems.

Mulching is the practice of spreading or mixing organic material, such as wood chips, leaves, or compost, over soil surfaces. Mulch reduces moisture evaporation from the soil surfaces, reduces soil erosion and compaction from heavy rains, moderates soil temperature, provides optimal conditions for soil enhancing organisms, protects young tree trunks, and provides nutrients as it decays. Furthermore, mulch inhibits weed growth, thereby decreasing the need for constant landscaping care and weed disposal.

Certain kinds of mulch, however, are actually threatening to the environment. For instance, our demand for cypress mulch causes so many cypress trees to be cut down that we're endangering wetlands. Rather than cypress mulch, the County encourages use of another mulch - like pine bark, pine needles, grass clippings, eucalyptus or shredded melaleuca (a bad invasive for Florida).

2. Homeowner stewardship

Your yard is the first line of defense for Florida's fragile environment. The culprit is stormwater runoff. Rain falls on yards, roads and parking lots and then washes into streams and bays, carrying pollutants like fertilizers, pesticides and petroleum products. As a result, the natural systems that attracted us all to Florida in the first place are damaged and dwindling. The decisions we make - from developing a homesite to whether we leave any of our yard natural will determine Florida's future.

Do you want a variety of Florida butterflies and birds in your yard? Native plants are the best choice to guarantee their presence. Native plants, when planted properly in correct locations and soil, need less water and less chemicals - thus stormwater runoff from your property becomes cleaner.

"If even a fraction of America's 38 million gardeners turned a quarter of their landscape into a wild garden (only one tenth of an acre each) there would be a measurable impact .. a tremendously positive gain for America's, and the world's, ecology." (Ken Druse, author, *The Natural Habitat Garden*).

3. Landscaping with fire ecology in mind

Unfortunately, trying to plan for the dual goals of human security and ecological integrity sometimes results in conflicts. Perhaps this is most obvious when trying to foster a natural landscape while protecting the built environment from fire. Fire is a natural part of Florida's environment, and many native ecosystems depend on regular cycles of fire to keep them healthy. As "the lightning capital of the world," Florida is naturally prone to fires, but this natural inclination has been supplemented by arson and carelessness to produce occasional headline-grabbing disasters. In recent years, many agencies have taken on the task of educating Florida's residents and visitors to be fire-conscious, even when planning one's residential landscaping. Some of the techniques advocated as a means for keeping buildings protected from brush fires are seemingly opposite to those techniques espoused for eco-friendly yards and gardens. However, a savvy homeowner can emphasize the strategies that intersect and maximize the benefits both systems have to offer. For example, consider cultivating native plants that are less waxy or resinous, and are thus less flammable, like coontie, oak trees and beautyberry.

Table 16. Native Trees of Alachua County

<u>FAMILY</u>	<u>Common Name</u>	<u>Scientific Name</u>
Pinaceae	Sand pine	Pinus clausa
	Slash pine	P. elliotii
	Spruce pine	P. glabra
	Longleaf pine	P. palustris
	Pond pine	P. serotina
	Loblolly pine	P. taeda
Taxodiaceae	Pond cypress	Taxodium Ascendens
	Bald cypress	T. distichum
Cupressaceae	Southern red cedar	Juniperus silicicola
Arecacdae	Cabbage palm	Sabal palmetto
Salicaceae	Eastern cottonwood	Populus deltoides
	Carolina willow	Salix caroliniana
Myricaceae	Wax myrtle, bayberry	Myrica cerifera
Leitneria-ceae	Corkwood	Leitneria floridana
Juglandaceae	Water hickory	Carya aquatica
	Pignut hickory	Carya glabra
	Mockernut hickory	Carya tomentosa
Betulaceae	Hazel alder	Alnus serrulata
	River birch	Betula nigra
	American hornbeam	Carpinus caroliniana
	Eastern hophornbeam	Ostrya virginiana
Fagaceae	Ashe chinquapin	Castanea pumila
	American beech	Fagus grandifolia
	White oak	Quercus alba
	Bluff oak	Q. austrina
	Chapman oak	Q. chapmanii
	Southern red oak	Q. falcata falcata
	Sand-live oak	Q. geminata
	Laurel oak	Q. hemisphaerica
	Blue jack oak	Q. incana
	Turkey oak	Q. laevis
	Diamond-leaf oak	Q. laurifolia
	Overcup oak	Q. lyrata
	Sand-post oak	Q. margaretta
	Black jack oak	Q. marilandica
	Dwarf live oak	Q. minima
Myrtle oak	Q. myrtifolia	

Fagaceae (contd.)	Water oak Willow oak Swamp chesnut oak Running Oak Shumard oak Post oak Live oak	Q. nigra Q. phellos Q. prinus Q. pumila Q. shumardii Q. stellata Q. virginiana
Ulmaceae	Sugarberry, hackberry Planer tree Winged elm American elm Florida elm	Celtis laevigata Planera aquatica Ulmus alata Ulmus americana americana Ulmus americans floridana
Moraceae	Red mulberry	Morus rubra
Magnoliaceae	Yellow poplar, tulip tree Bull bay, southern magnolia Sweetbay	Liriodendron tulipifera Magnolia grandiflora Magnolia virginiana
Annonaceae	Paw paw	Asimina parviflora
Lauraceae	Redbay Swampbay Sassafras	Persea borbonia Persea palustris Sassafras albidum
Hamamelida-ceae	Sweetgum	Hamamelis virginiana Liquidambar styraciflua
Rosaceae	Red haw Parsley haw May haw, apple haw One-flowered haw Jacksonville haw Southern crab apple Chickasaw plum Carolina laurelcherry Black cherry Flatwoods plum	Crataegus spathulata C. marshallii c. aestivalis C. uniflora C. floridana Malus angustifolia Prunus angustifolia P. caroliniana P. serotina P. umbellata
Leguminoseae	Mimosa Red bud Water locust Honey locust Black locust	Albizzia julibrissin cercis canadensis Gleditsia aquatica Gleditsia triacanthos Robinia pseudoacacia
Rutaceae	Common hop tree, wafer ash Hercules club, Prickly ash	Ptelea trifolia Zanthoxylum clava-herculis
Anacardia-ceae	Winged sumac Poison sumac	Rhus coppalina Rhus vernix

Cyrillaceae	Little-leaf titi Swamp titi	Cyrilla parvifolia Cyrilla racemiflora
Aquifolia-ceae	Carolina holly Dahoon holly Large, sweet gallberry Possum haw Myrtle-leaved holly American holly Yaupon	Ilex ambigua I. cassine I. coriacea I. decidua I. myrtifolia I. opaca I. vomitoria
Aceraceae	Florida maple Box elder Red maple	Acer barbatum Acer negundo Acer rubrum
Hippocastanaceae	Red buckeye	Aesculus pavia
Sapindaceae	Florida soapberry	Sapindus marginatus
Rhamnaceae	Carolina buckthorn	Rhamnus caroliniana
Tiliaceae	American bsswood, linden	Tilia americana
Nyssaceae	Water tupelo Swamp tupelo Ogeechee tupelo Ogeechee lime Black tupelo Blackgum	Nyssa aquatica Nyssa biflora Nyssa ogeche Nyssa sylvatica
Theaceae	Loblolly bay	Gordonia lasianthus
Araliaceae	Devil's walkingstick	Aralia spinosa
Cornaceae	Flowering dogwood Stif cornel dogwood	Cornus florida Cornus foemina
Ericaceae	Staggerbush Tree sparkleberry	Lyonia ferruginea Vaccinium arboreum
Sapotaceae	False buckthorn Gum bumelia Tough bumelia	Bumelia lanuginosa Bumelia tenax
Ebenaceae	Persimmon	Diospyros virginiana
Styracaceae	American snowbell, Storax	Styrax americana
Symplocaceae	Common sweet leaf, horse sugar	Symplocos tinctoria

Oleaceae	Fringe tree, old man's beard White ash Carolina ash, pop ash Florida Ash, swamp ash Wild olive	Chionanthus virginica Fraxinus americana Fraxinus caroliniana Fraxinus pauciflora Osmanthus americana
Rubiaceae	Button bush Maiden's bushes	Cephalanthus occidentalis Pinckneya pubens
Caprifolia-ceae	Possum haw viburnum Walter viburnum Rusty black haw	Viburnum nudum V. obovatum V. rufidulum

HUMAN-RELATED RESOURCES

Agricultural&Silvicultural Practices

A. Introduction

Agriculture plays an integral role in the economy, ecology, and culture of Florida's rural areas and the entire state. When conducted in a sustainable manner, farming and forestry activities contribute to maintenance and protection of ecological values and ecological integrity. However, traditional intensive management practices can negatively impact natural resources within farm and forest ecosystems. In addition, Florida is losing agricultural land to development at a rapid rate. Alachua County's approach to agricultural and silvicultural activities has two dimensions: first is protection of farm and forest land from conflicting urban uses, and second is management of farm and forest practices in an ecosystems context that promotes sustainable use of natural resources. Unlike urban planning which focuses on population projections, infrastructure, job growth and housing needs, rural area planning involves balancing economic development with measures to protect the environment and natural resources.

Agriculture has historically been a prime economic mainstay for Florida. Together with tourism and construction, it serves as the foundation for the Florida economy. In terms of direct economic value, agricultural production in Florida resulted in a gross state product of \$3.57 billion for farms and \$6.69 billion for forestry in the year 2000, according to the Florida Statistical Abstract. The impacts are even greater when value-added products and multiplier effects are taken into account. In terms of employment, the job total for Florida's agricultural sector ranks second in the nation. Government statistics indicate that in 1998, of the state's nearly 35 million acres of land, over 27 million acres (roughly 77%) were classified as agricultural.

According to USDA Forest Statistics for Florida, forests were the major land use in Alachua County in 1995, covering 53% of the land area, mostly in the eastern portion of the County. In addition, as of 1997, there were 1,086 farms representing 198,193 total acres of farmland, or approximately 35% of the total land in the county.

Generations of families in Alachua County have worked the land to produce agricultural commodities of value to Floridians and consumers throughout the nation and world. Threats to the long-term viability of agriculture warrant careful attention to this part of our community. The challenge to Alachua County is to maintain current farm and timber production operations without jeopardizing its most valuable natural assets.

B. Importance of agriculture

There are economic, cultural and environmental reasons for keeping land in agriculture. In Alachua County many of our significant environmental areas are part of agricultural lands. The varied topography and textures of the rural landscapes are not only significant to the local and state economy, but contribute to Alachua County's character and help define its sense of place. However, there are numerous issues to consider. Farmers still want to farm, taxpayers realize that tax bills rise as land is converted because it costs more to provide services to residential areas, and landowners want to maintain their right to cash in on the increased value of agricultural lands caused by urban growth.

1. Economic stability

Though not widely known, it is farmland - not residential and commercial development - that contributes the most to a local government's tax base and saves communities money. Agriculture contributes to the economy directly through jobs, sales, and support services, and by supplying lucrative secondary markets such as food processing. Farmland--timber, livestock, crops--add more than 140 million dollars to the Alachua County economy every year. Numerous studies from around the nation have found that such lands contribute more in tax dollars than they demand in tax-supported services. State and federal finance and tax incentives are provided to assist agricultural operations. But, as Alachua County's population steadily increases, current policies are not controlling or balancing the conversion of farmland, forests, and other rural properties to development. As rural areas are transformed into urban and suburban, taxes also rise to support new infrastructure and public services.

The following statistics are from the 1997 Census of Agriculture. Farm income in Alachua County from crops and livestock for 1997 was reported at over \$50 million. John Reynolds, an agricultural economist at UF/IFAS, says the multiplier effect for agriculture in this county is about 1.5. Alachua County is still a net exporter of agricultural products. Of the total market value of agricultural products sold in 1997, nursery and greenhouse crops comprised approximately 62%, while livestock, poultry and their products comprised approximately 38%. Crops range from vegetables such as beans and peas, broccoli, corn, okra, radish, and potatoes, to fruits such as apples and bananas, blackberries cantaloupe, and grapes, peanuts, pecans, and hay, as well as ornamentals including Christmas trees, daylilies, cut flowers, ground covers, and shrubs. Livestock and poultry includes cattle and calves, hogs and pigs, sheep and lambs, as well as chicken.

According to the USDA Forest Statistics for Florida, the value of standing timber in Alachua County as of 1995 was \$218 million, and the value of the harvest in 1996 was \$14 million. In 1995, there were 900 direct employees and 2,430 indirect forestry employees in Alachua County, with payroll receipts totaling \$31 million. The total value of forest manufacturing and forest value added was \$226 million.

2. Environmental values

Rural areas encompass some of the state's most treasured environmental resources. Wildlife habitat, water resources and recharge areas, and pristine open space contribute to Florida's rural heritage. Preservation of such resources helps ensure their availability for future generations while also providing multiple benefits to current residents.

"The mature forest provides many services that don't always get recognized even though they contribute indirectly to the economy. These services include rebuilding soils, concentrating nutrients, protecting watersheds, reducing erosion, providing aesthetic diversity, making habitat for wildlife, providing recreation areas, cleaning the air and storing gene pools for succession and future uses." H. T. Odum et al. 1988. Environmental Systems and Public Policy. Ecological Economics Program, Phelps Lab, University of Florida.

Silviculture has the potential to be among the most beneficial land uses in north Florida. Potential benefits include the provision of clean air, clean water, maintenance of plant and animal diversity, maintenance and enhancement of game and non-game wildlife, sinks for atmospheric carbon, aesthetically pleasing landscapes, and a multitude of jobs in growing, harvesting, and manufacturing wood products.

According to Sedell and others (2000), 80% of the freshwater resources in the United States originate in forests. Therefore, having healthy forests is critical to having clean water. The Southern Forestry Resource Assessment has concluded that undisturbed forests or woodlands generally provide the best protection of land and water from sedimentation and other pollutants. The tree canopy and litter layer dissipate the energy contained in raindrops. Also, a continuous litter layer maintains a porous soil surface and high water infiltration rates; consequently, overland flow is minimized in the forest. Forests slow stormwater runoff and provide watershed stability and critical habitat for fish and wildlife (Sedell and others, 2000).

However, the U.S. EPA identifies a variety of impacts that forestry activities can have on the environment. Sediment concentrations can increase in waterbodies due to accelerated erosion. Water temperatures can increase due to removal of overstory riparian shade. Slash and other organic debris can accumulate in waterbodies, depleting dissolved oxygen. Organic and inorganic chemical concentrations in the environment can increase due to harvesting and fertilizer and pesticide applications. These inputs may reduce stream oxygen levels and later the microhabitat conditions necessary for the survival, breeding, foraging, or resting activities of many organisms.

A major consideration in many ecosystems is the impact of monoculture forestry that simplifies the ecosystem, leaving it vulnerable to disease and other environmental factors. In addition, air quality can be affected by dust from road construction, site preparation, harvesting, and hauling activities and by particulate release from prescription slash burning. The environmental impacts of road construction and management include erosion, soil and vegetation loss, dust generation, stream sedimentation, and habitat fragmentation.

In addition, farm activities such as grazing cause water quality and quantity impacts, destruction or alteration of wildlife habitats, erosion, sedimentation, and soil compaction. Impacts also result from the use of energy and pesticides, as well as herbicides and fertilizers, and from contaminated agricultural runoff. The use of pollution prevention strategies can reduce these environmental effects, and appropriate management can meet environmental objectives. Sensitive areas, including streambeds, wetlands, ponds, and other riparian zones, are of particular concern. For example, sensitive habitats should be identified and excluded from grazing areas, and controlled watering access for drinking should be provided for livestock. Alternative water sources will keep livestock away from streambanks and riparian zones and prevent the destruction of habitat and pollution of surface water by manure solids, nutrients, and bacteria.

To a large degree, management of forests and farms shapes the environmental impacts of these activities. Agriculture uses are not inherently incompatible with wildlife protection and maintenance of numerous other ecological functions. The Defenders of Wildlife, a non-profit organization dedicated to the protection of wildlife, maintains that conservation efforts on many private lands have been excellent and solutions like tax breaks, conservation easements and cooperative agreements should be pursued. Best Management Practices (BMPs) are currently among the most commonly accepted ways of providing basic environmental protections such as water quality and erosion control. Where BMPs are used for pollution control, land used to produce food crops can have far less impact on the environment than urbanization. Beyond BMPs, management in a holistic or ecosystem context is encouraged to maintain sustainable use of resources for future generations.

Environmentalists, farmers and foresters are coming to realize the strong potential for compatibility between their respective goals. Rural property owners who maintain undeveloped land for their personal purposes also benefit the community by providing environmental services such as water resource

protection. With their valuable contributions to our economy and environment, it is essential that policies in the Comprehensive Plan reflect the importance of protecting our farms and forests.

C. Threats to agriculture

There are numerous social, economic, and environmental threats to agriculture. As described in a 1998 report from Washington, factors threatening agriculture include impacts of development and population growth, lack of awareness of the value of local food production, land prices, low profitability, lack of future farmers, regulatory requirements, and global economic pressure. These are summarized below.

- Impacts of development and population growth: development pressure makes less land available for farming. At the same time, population growth in the county has created conflicts between suburban and rural residents and their farming neighbors. Complaints about farm smells, noise, dust, or conflicts between domestic and farm animals detract from community support farmers feel they once had and make it difficult to market products and pursue farming activities.
- Lack of awareness of the value of local food production: food is so basic to life that many of us are not aware of what is behind the production of the food on our tables. The global food system has resulted in separation from the food we eat and the farms that grow it.
- Land prices: many farms are now more valuable as potential residential or commercial lands. At today's prices most new farmers cannot afford to acquire good farmland, and existing farmers feel economic pressure to sell their land and get out of the farming business.
- Low profitability: most farmers agree it has become difficult to make a living as a farmer. Small-scale farmers are hard pressed to compete with large corporate farms that can sell products on a very large scale at low retail prices. Difficulty finding farm labor and in keeping family members interested in working on the farm also contribute to reduced profitability of farming.
- Lack of future farmers: the high cost of land and low profitability of farming discourage young people from pursuing farming as a career and lifestyle. As farmers retire, it is increasingly likely that rural land will be bought by those who can afford it but have no interest in sustaining commercial agriculture.
- Regulatory requirements: farmers must comply with environmental, health, labor, and building regulations. Compliance can be costly and can discourage efficient farming practices.
- Global economic pressure: multinational corporations control most of the world's food supply making it difficult for small-scale farmers to compete in the conventional marketplace. Both domestic and international trade agreements, whether intentionally or inadvertently, have often strengthened corporate farming at the expense of family operated farms.
- Climatic variability: climatic variability (floods, droughts, extremes of heat and cold) has always been an uncontrollable factor, and is perhaps increasingly significant given the vulnerability of the agricultural industry to the other threats cited.

According to the American Farmland Trust (AFT), nearly every city and large town in America is spreading out onto farmland that is important to our food production system. A 1999 report by the USDA documents the loss of U.S. farmland. During 1992-1997, they found that some 14 million acres of

farmland were taken out of production - nearly 320 acres every hour. The report singled out sprawl development as the prime culprit. AFT attributes this trend to an array of factors echoing those described in the Washington report, and identifying the pressures of growth as the underlying force which creates a formidable challenge to preserving the rural landscape.

The Southern Forest Resource Assessment, which has recently documented and analyzed the many factors affecting the forests of 13 southern states, forecasts that the South will lose 12 million forest acres (8%) to developed uses between 1992 and 2020. The rate at which rural land (both forest and farms) has been developed for urban and industrial uses in the south increased from about 667,000 acres per year between 1982 and 1992 to about 1.1 million acres per year between 1992 and 1997. Urbanization is forecast to continue at the rate of 1.1 million acres per year through the year 2020. The source of new urban uses is both farm and forest land. An additional 19 million forest acres in the south are forecast to be converted to developed uses between 2020 and 2040, with losses concentrated in Florida among other key locations.

One of the fastest growing states in the nation, Florida is ranked fourth for developing its farmland, forests and open spaces, with nearly one million acres converted over a five-year period (USDA's National Resources Inventory 1992-1997). Rural lands constitute the majority of the state, and these areas are particularly subject to the pressures of fast-paced growth. According to Enterprise Florida, between 1990 and 1997 rural population grew by 20% as compared to the state average of 13.4%. As residential development consumes established one-acre lots in the rural area, they are replaced by larger lots, consuming five or more acres of agriculture land for each residence. Growth impacts the environment, local economies and the quality of life for communities. For rural areas, it particularly affects agricultural lands and the viability of agricultural operations.

As urbanization advances into outlying areas, increasing property values encourage the conversion of uses and subdivision of large tracts of land for development. Moreover, the pressure at the edge of the urban cluster to add land for urban uses continues. Our challenge is to accommodate various lifestyle choices while preserving rural character, and to protect our limited natural resources using sustainable practices and smart growth principles to determine when, where, and how growth should occur. Central to this discussion is how to fairly balance concerns for development demands, property rights, rural land value, and viability of family farming operations with the quality of the environment, economy, and rural community.

Because of sprawl, agricultural land is being consumed at a rate higher than the demand created by population growth would suggest. This type of development frequently has adverse impacts on the surrounding natural areas as well. By contrast, well-planned development that is consistent with the character and needs of rural areas can be a welcome form of support. Random development and uncontrolled growth compromise the very qualities of rural towns and areas that local residents and landowners often value most. In addition, farmland loss raises local taxes, as residential land uses pay less in local tax revenues than it costs local government to provide services to their properties. Sprawl-related growth in rural Florida impacts the status of local economies, the tax burden of area residents, and alters what many appreciate as the "rural lifestyle."

Paving farmland limits future options to deal with social, economic, food security, and environmental problems. Scattered development in farming areas removes agricultural land from production both directly and indirectly. Development directly removes the agricultural productivity on which it is built. Indirectly, it has impacts to farming operations which may force them out of production. Traffic, trespassing, pilferage by non-farm residents, complaints about dust, smells, sprays, and noise, a general

rise in land values, and higher property taxes - all may contribute to decreased viability. Much of this scattered development is on important agricultural land, whose physical characteristics are generally excellent for building.

The American Planning Association recommends that agricultural land be protected and preserved in large contiguous blocks in order to maintain a “critical mass” of farms and agricultural land. Saving our farmland is an investment in community infrastructure. The critical mass will enable farm support businesses to remain profitable and sustain local and regional agricultural economies.

D. Management concerns

The traditional approach to management of agricultural lands has at times resulted in damage to some of the County’s most precious natural resources. This is typically the result of management objectives which are oriented towards maximizing agricultural or silvicultural production, rather than the maintenance of other resources such as abundant fish and wildlife resources. Florida’s forests and farmlands are increasingly being valued for non-traditional functions. The following discussion of management concerns is based largely on the Southern Forest Resource Assessment and agricultural fact sheets from the U.S. Environmental Protection Agency.

1. Conversion of native habitat

Clearing natural areas for the planting of crops disrupts the ecological values and ecological integrity of natural systems. In fact, Closing the Gaps identified agriculture as being the single largest land use involving clearing, draining, plowing, cultivation, and altering of wildlife habitat across the state (Cox et.al. 1994). Agricultural and silvicultural operations, by definition, affect the structure and distribution of vegetation and forest conditions. The degree and permanency of the disruptions depend on how farming and forestry operations are conducted, or managed.

Livestock grazing can change the species composition of native ecological communities and significantly impact riparian areas. Grazing strips the banks of rivers and streams, which in turn leads to erosion and degradation of aquatic ecosystems. Harvesting in new areas leads to changes in local forest conditions that can have significant adverse effects on wildlife habitat and landscape aesthetics.

Many bird species that depend on open habitats such as grasslands, prairies, savannas, glades, and barrens are now in serious decline in the eastern United States. Declines are partially explained by the conversion of pastureland to cultivated row crops, the switch to “clean pastures” dominated by non-native, cool-season grasses and the loss of fencerows as new agricultural technologies favor bigger fields.

Across the south, the area of natural pine has declined from about 72 million acres in 1953 to about 35 million acres in 1999. Planted pine has increased from about 2 million acres in 1953 to more than 32 million acres in 1999. Data for the 1980s and 1990s show that new pine plantations come from land that was previously hardwood or mixed pine-hardwood forests (47%), natural pine forests (28%), and agricultural fields (25%). The Southern Forest Resource Assessment forecasts the area in pine plantation to rise to approximately 54 million acres of southern forests in 2040.

According to a recent IFAS study, the area of pine plantations (4.6 million acres, or 32% of all forestland) continues to increase in Florida, consistent with regional trends. In fact, Florida contains the highest proportion of pine plantations of any southern state. In the last 10 years, area of natural pine stands decreased by 20% to 2.8 million acres, with most reductions in longleaf pine (IFAS 1999).

Longleaf pine ecosystems, also known as the sandhill community, once covered about 20% of the original Florida landscape, including much of the panhandle and the northern two-thirds of Florida's peninsula (Cox et.al. 1994). As of 1994, only 851,000 acres remained in all of Florida. Our once common sandhill have been reduced to several disparate patches covering less than 10% of their former area. Nationwide, longleaf forests occupy only 2% of their original range today. The herb layer of these forests is one of the most diverse in the world. They are home to several threatened or endangered species, such as the red-cockaded woodpecker, gopher tortoise, fox squirrel, pocket gopher, pine snake, and gopher frog, and several species with high rates of endemism. Conversion to other pine species, as well as removal of original stands followed by fire exclusion, are among the major causes of loss and decline in these systems..

The Southern Forest Resource Assessment highlights the prevalence and importance of endemism with respect to aquatic species, in which a species' range is limited to a narrow geographic area. Northern Florida has a concentration of rare reptiles, amphibians, snails, and crayfish which are predominantly endemic. These are areas where aquatic ecosystems are especially susceptible to structural changes in aquatic and adjacent terrestrial ecosystems. As a result, local actions can have substantial impacts on local species persistence, so that in some cases altering even small amounts of habitat can have significant adverse effects. This potentially disproportionate impact of small actions places a high value on disseminating information on the locations and natural histories of endemic species.

Landscape configuration and fragmentation at fine scales may be critical for some species, especially amphibians, even in heavily forested areas. Where the persistence of certain species requires access between terrestrial habitat and ponds or wetlands, roads and certain kinds of management practices can isolate these two habitat components. Spatial configuration of forest habitat is also an important factor in the recovery of the black bear subspecies of conservation concern in Florida.

2. Management intensity

From 1988 to 1998, agriculture has been identified as the primary source of water quality impairment in the South (Southern Forest Resource Assessment 2001). In addition, agriculture historically has been the major factor in wetland loss and degradation. Although the passage of the Food Security Act of 1985 "Swampbuster" provision prevented the conversion of wetlands to agricultural production, certain exempted activities performed in wetlands can degrade wetlands:

- harvesting food, fiber, or forest products;
- minor drainage;
- maintenance of drainage ditches;
- construction and maintenance of irrigation ditches;
- construction and maintenance of farm or forest roads;
- maintenance of dams, dikes, and levees;
- direct and aerial application of damaging pesticides; and
- ground water withdrawals.

These activities can alter wetlands hydrology, water quality, and species composition. Excessive amounts of fertilizers and animal waste reaching wetlands in runoff from agricultural operations can cause eutrophication.

a. Toxic compounds

Irrigation ditching can increase contamination of wetlands receiving irrigation drainage water, particularly

where soil is alkaline or contains selenium or other heavy metals (Deason 1989). Pesticides and fertilizers used during silvicultural operations can enter wetlands through runoff as well as through deposition from aerial application. Fertilizers may contribute to eutrophication of wetlands, and toxic compounds may bioaccumulate in fish and other aquatic organisms (Kennish 1992).

b. Grazing

Grazing livestock can degrade wetlands that wildlife use as a food and water source. Urea and manure can result in high nutrient inputs. Cattle traffic may cause dens and tunnels to collapse. Overgrazing of riparian areas by livestock reduces streamside vegetation, preventing runoff filtration, increasing stream temperatures, and eliminating food and cover for fish and wildlife. As vegetation is reduced, streambanks can be destroyed by sloughing and erosion. Streambank destabilization and erosion then cause downstream sedimentation (Kent 1994b). Sedimentation reduces stream and lake capacity, resulting in decreased water supply, irrigation water, flood control, hydropower production, water quality, and impairment of aquatic life and wetland habitat (USEPA 1993b).

The economic losses attributed to the reduced quality and quantity of water and habitat from overgrazing of riparian wetland vegetation is more than \$200 million nationwide (USEPA 1993b). The depletion of vegetation from riparian areas causes increased water temperatures and erosion and gully formation, prevents runoff filtration, and eliminates food and cover for fish and wildlife (USEPA 1993b). If stocking of livestock is well managed, grazing can coexist with wetlands, benefiting farmers and increasing habitat diversity.

c. Forestry

The South as a region produces more wood products than any other single nation. According to the University of Florida, North Florida has the world's largest concentration of intensively managed plantations of southern pines (2000). In 1997, an estimated 543 million cubic feet of timber was harvested in Florida, of which 87% was softwoods (including pine, cypress, and cedar), and the remainder was hardwoods such as oak, maple, gum and poplar. Approximately 368 million cubic feet of longleaf slash pine was harvested throughout the state (UF 2000).

Forest structure in plantations differs from that found in naturally regenerated stands. Their management is designed to focus site potential to maximize the growth of trees of a single species, and trees are spaced to maximize fiber production over a 20 to 30 year period.

A large watershed study was conducted in north central Florida in the slash pine flatwoods, an ecosystem where much commercial forestry is practiced (Riekerk 1989). This study sought to determine the hydrological and water quality impacts of two harvesting and site preparation methods of varying intensities. The high intensity system consisted of machine harvesting, including stump removal, followed by slash burning, windrowing, disking, bedding and machine planting without regard to buffer zones. The low intensity treatment consisted of manual harvesting followed by slash chopping, bedding, and machine planting only outside of buffer zones. The hydrology of these two treatments was compared to that of an undisturbed forest that went unharvested.

The study showed that silvicultural practices significantly affect the hydrology of pine flatwoods (Riekerk 1989). Water table levels rose and daily runoff increased in the first year, somewhat in proportion to the size of the clear-cut in each watershed. This was due to the reduction in evapotranspiration following forest harvesting. In addition, the more intensive treatment removed all vegetation, reduced infiltration

and increased storm flow. This effect lasted a decade or more after harvesting. The forest operations resulted in smaller, more temporary effects on water quality. Suspended sediment levels increased more with the more intensive harvest and site preparation methods, as did nutrient levels, returning to normal within two years after treatment. IFAS suggests that the significant hydrological effects can be managed by partial cutting rather than clearcutting, or by clearcutting smaller areas each year within the watershed (Moore 1999).

Another impact of forest management practices on the water resource is an indirect one resulting from soil compaction. The use of heavy machinery for harvesting and site preparation activities can increase surface runoff by compacting surface soil. This soil compaction reduces soil pore space, which lowers the internal movement of water, decreases the amount of soil water storage, and decreases infiltration. The excess water which cannot infiltrate the soil will puddle or run off. Excessive puddling will inhibit vegetation regrowth following harvesting, and increased runoff can contribute to downstream flooding.

If BMPs are used and careful monitoring occurs, silviculture and timber removal may only minimally affect some wetland functions. Habitat and community structure, however, still may be seriously degraded.

Drainage, clearing, haul road construction, rutting, and ditching of forested wetlands, all may affect wetlands in some way, although the impact may only be temporary. Adverse effects of timber harvest can include a rise in water table due to a decrease in transpiration, soil disturbance and compaction by heavy equipment, sedimentation and erosion from logging decks, skid trails, roads, and ditches, and drainage and altered hydrology from ditching, draining, and road construction (Shepard 1994). By utilizing BMPs, hydrology and biogeochemical processes of wetlands may be altered for only one to three years following timber harvest (Shepard 1994).

The Southern Forestry Resource Assessment has concluded that the intensity of forest management has various effects on wildlife suitability. Timber harvesting, especially clearcutting, as well as afforestation of agricultural fields restarts successional processes. Depending on management decisions such as density of stocking, use of herbicides, and prescribed burning, these actions can disrupt, benefit, or have little effect on wildlife. Low intensity management can result in increased species richness and species diversity during the first few years after planting. Many wildlife species, such as migratory birds, thrive in these early successional communities when insects and seeds are abundant. After canopy closure, plant diversity generally decreases and wildlife use declines. Uneven aged management that encourages several age classes of trees can sustain benefits for many, but not all wildlife species due to the resulting stratified forest canopy. Very dense stocking and use of herbicides can limit vegetative diversity throughout the entire rotation, which correlates to low value for wildlife habitat.

Gauging the effects of forest management on mobile wildlife populations requires insights into the overall landscape structure of forests within the region. Although this type of analysis is relatively new, several studies have examined the effects of forest fragmentation on wildlife species, especially birds. The Southern Forestry Resource Assessment summarizes some of these effects:

- o Studies have documented declines in migratory bird species from isolated forest patches, especially where agricultural and urban uses represent substantial components of the landscape. However, in heavily forested areas-70% or more forest-these negative effects do not occur.
- o Forest fragmentation and negative edge effects are most prevalent where agriculture and development dominate the landscape. In these areas, forest operations may impact fragmentation effects on wildlife.
- o In heavily forested areas, forestry practices may provide important benefits for forest breeding bird species through provision of early successional habitats. This is especially true for areas where existing hardwood forest structure is dominated by closed canopy stands and sparse understories or where dense pine stands and fire suppression exclude pine specialists.

Large woody debris, such as branches or leaves which fall from trees along streams, is very important in many aquatic ecosystems. It forms pools and traps floating leaves to provide shelter and deep pools for fish and other aquatic organisms. Leaf detritus derives from floating leaves and needles, which fall from the plants, trees, and shrubs alongside streams, rivers and lakes. Many organisms feed on leaf detritus as well as use it for shelter in aquatic habitats.

Natural stream systems have an optimum range of organic matter inputs to which the stream organisms and the stream function are adapted. Inputs of large woody debris can be substantially increased if harvesting occurs on the bank immediately adjacent to a stream channel, or if logging slash is dropped into a stream. This can interfere with stream channel flow, both velocity and amount, cause stream bank erosion, and drastically alter habitat conditions.

Increased organic matter, whether large woody debris or leaf detritus, can also affect dissolved oxygen levels. When these materials are introduced into a stream, increased decomposition by microorganisms requires oxygen. This depletes the oxygen available for a healthy stream habitat. On the other hand, when stream banks are harvested and most of the vegetation is removed right up to a stream bank, the source of natural organic matter inputs disappears. This will have a negative impact on stream biological health, eliminating a source of food and shelter for aquatic organisms.

E. Stewardship strategies

1. Management solutions

Adverse effects on water quality, hydrology, wildlife, habitat, and other aspects of the environment can be minimized or eliminated by careful management of farm and forestry operations. Management techniques described below include best management practices, wildlife enhancement, ecosystems management, sustainable agriculture, and adaptive management strategies.

a. Best Management Practices

One of the fundamental and most widely accepted ways to ensure that agriculture and forestry operations will protect environmental quality is adherence to agricultural and silvicultural BMPs. Numerous federal and state agencies have published BMPs on a variety of topics. They include BMPs targeted primarily at water quality for agrichemical handling and farm equipment maintenance, and cow/calf operations, as well as broader conservation BMPs for silviculture and croplands. See Insets 17 and 18 for a general overview of Silvicultural BMPs and select agricultural BMPs.

b. Wildlife enhancement

As reported in a recent IFAS publication on vegetation management, low-intensity site preparation-- combinations of herbicides, low-cost mechanical treatments, and/or fire-- can have several advantages for wildlife (IFAS 1998). The stumps and unburned logging debris that remain scattered on the land rot, providing food and habitat for many insects, reptiles, amphibians, and small mammals, all of which are also prey for birds and other animals. Mushrooms and other fungi that grow on the rotting wood are food for larger wildlife. Residual hardwoods can be left standing (all would be knocked down during intensive mechanical site preparation) to provide homes for cavity-dwelling wildlife. There is even the option of leaving a few living oaks or other mast-producing hardwoods as a perennial source of food for wildlife. However, landowners still might have to make special efforts to protect these individual trees or shrubs from broadcast herbicide treatments and prescribed fires (IFAS 1998).

Farm and forest management can be augmented with techniques to directly enhance wildlife habitat. Forestry techniques include: leaving mature trees in a stand to enhance structural diversity, application of streamside management zones to retain landscape diversity, and retention of snags to provide nesting habitat. In addition to following BMPs, additional wildlife benefits may be obtained with natural regeneration techniques such as seed-tree cuts and shelterwoods, and with management practices such as mid-rotation thinning and prescribed burning. BMPs that reduce sedimentation and maintain streamside vegetation are especially important in protecting species that depend on streamside habitats, such as crayfish, amphibians, snails, and insects. Conversely, forest practices or other activities that disturb habitats along streams can have a significant adverse impact on certain aquatic species.

Although forestry herbicide use has increased dramatically, on some tracts satisfactory stand establishment can be achieved without herbicides or mechanical site preparation. On cutover sites with little competing vegetation, a pre-planting burn--a hot summer fire to minimize stump sprouting--may be all the site preparation that is necessary. In other situations, even with only a minimal investment in site preparation, crop trees may be able to establish themselves adequately without using herbicides. Crop tree growth in such cases is, nonetheless, generally slower than it would have been with the correct application of herbicides as a site preparation treatment or release treatment.

Inset 17: Description of Silvicultural Best Management Practices (2000)

The most fundamental way to ensure that forestry operations will protect water quality is to follow the Silviculture Best Management Practices described in a manual published by the Florida Department of Agriculture and Consumer Services, Division of Forestry (2000). This manual establishes practices that are designed as “the minimum standards necessary for protecting and maintaining the State’s water quality as well as certain wildlife habitat values, during forestry activities. As such, they represent a balance between overall natural resource protection and forest resource use.”

Florida’s first BMP manual for silviculture was published in 1979 in response to the Federal Clean Water Act of 1972. Those original BMPs were designed exclusively to protect Florida’s streams and lakes from potential sources of pollution associated with forestry activities. In 1993, the BMPs were substantially revised to include new provisions for protecting wetlands, wildlife habitat, and overall ecosystem integrity. Most recently, in the 2000 revision, a new BMP has been added to recognize wetlands that have a flow component, and to treat the wetland flow-way similar to a stream.

*The BMPs recognize that the area immediately adjacent to streams, lakes and other waterbodies is especially important in the overall strategy to protect water quality during silviculture operations. To mitigate adverse effects, the **Special Management Zone (SMZ)**, also known as a buffer zone, applies to all streams, sinkholes, and lakes two acres and larger. This is an area along a stream or other waterbody, which may be selectively harvested with certain restrictions, but may not receive mechanical or chemical site preparation activities. This area therefore continues to capture nutrients, provide stream bank stability, shade, large woody debris and leaf detritus, and dissipate the energy of surface water flow into the stream.*

The purpose of the SMZ is to reduce or eliminate forestry-related inputs of sediment, chemicals, logging debris, nutrients, and water temperature changes. These buffer zones were found to be particularly effective and important in protecting water quality attributes (Ahtiainen 1992, Shaffer 1995, Wang 1996). In Florida, the SMZ has three principal components: the Primary Zone, the Secondary Zone, and the Stringer.

*The **Primary Zone** applies to perennial waters and varies in width from 35 to 200 feet per side depending on the type and size of waterbody. There are significant timber harvesting restrictions in this zone. The purpose of the Primary Zone is to maintain streamside shade and reduce disturbance to ground cover and litter. This ensures that surface water will infiltrate into the naturally porous undisturbed forest soil, which acts as a biological filter.*

*The **Secondary Zone** applies to all intermittent waterbodies and also may serve as an add-on to a Primary Zone in some cases. It is always at least 35 feet wide and may be wider depending on the local soil type and slope percent. This zone has no timber harvesting restrictions, however no mechanical site preparation is permitted. The purpose of the Secondary Zone is to minimize upslope site disturbance.*

The **Stringer** applies only to intermittent streams and consists of mature trees left on or near the banks. These trees serve to help minimize heavy equipment operations near the waterbody and reduce the risk of sedimentation and bank damage. The 1993 manual of Silviculture Best Management Practices (listed under References) should be consulted for more detail. You can call your county forester or the Division of Forestry at (850) 488-4090 to get this manual.

BMPs, which specifically pertain to hydrologic impacts of forest management practices, include the BMPs for roads, wetlands, and wet weather operations. These BMPs address actions, which will avoid impounding or diverting normal water flow, and will help prevent soil compaction. Compaction can be reduced by limiting heavy equipment operations to times when conditions are dry in other words, suspend logging during wet weather. In wetlands, compaction can be reduced by concentrating designated skid trails to as small an area as possible. Wet soils are much more susceptible to damage from logging equipment than well-aerated dry upland soils.

Forest roads produce most of the sediment from forestry operations, even when well maintained, so the BMPs emphasize their careful placement and management, with broad base dips and roadside ditch turnouts that divert runoff to porous forest lands, and frequent culverts.

These impacts can be prevented by applying BMPs to forestry operations, including limiting heavy equipment operations in buffer zones and to dry conditions, taking adequate steps to minimize chemical or nutrient contamination of runoff, and preventing runoff from entering waterways. By practicing responsible forest management, understanding the processes and planning in the landscape context, detrimental impacts can be minimized. Maintenance of water quality will support high quality habitat for aquatic organisms and help protect the water resources of Florida.

Inset 18: Description of Agricultural Best Management Practices

BMPs for Agrichemical Handling and Farm Equipment Maintenance (1998)

The purpose of this document is to familiarize farmers, farm managers, and farm workers about Best Management Practices (BMPs) and pollution prevention actions that can be implemented at farm maintenance areas to further protect the environment and improve the efficiency of the farm. Farm maintenance areas are those sites where pesticides are mixed and loaded into application equipment; tractors and other pieces of farm equipment are serviced; or pesticides, fuel, fertilizer, and cleaning solvents are stored. These are the areas of the farm where accidental pollution of soil, surface water, or ground water is most likely to occur. Proper handling and disposal practices at these sites can help avoid serious environmental problems, protect the farm's water supply, reduce exposure of the owner to legal liability for contamination and cleanup (including penalties and fines), and foster a good public image for agriculture.

This document recognizes that, in addition to all of the crop-based factors, users of agrichemicals need to consider the soil's susceptibility to leaching, the distance to the water table, the slope of the land, and the distance to surface waters, especially sinkholes, which provide a direct pathway to ground waters.

Certain kinds of management practices, implemented at these farm maintenance areas, can prevent the contamination of soil, surface water, and ground water by the materials stored and handled at these sites. This document describes a number of "Best Management Practices" (BMPs) which can be put into practice through proper design and operation of the maintenance facilities and equipment. However, while this document covers a number of specific BMPs, it cannot address each and every situation that may have the potential for causing pollution. Three guiding principles are provided to help the individual landowner develop BMPs for their own situation.

1. **Isolate** all potential contaminants from soil and water.
2. **Do not** discharge any waste material onto the ground or into surface water bodies.
3. Develop and implement a **Conservation Plan** and an **Integrated Pest Management (IPM) Program** to maximize efficient use of irrigation, fertilizers, and pesticides. Seek the assistance of your county extension agent or independent consultant and the USDA NRCS to develop specific plans for your farm.

Water Quality BMPs for Cow/Calf Operations (1999)

In 1997, the Florida Cattlemen's Association began the process that resulted in this manual, which describes the water quality BMPs for cow/calf operations in Florida. The practices are designed to meet state water quality standards, but expressly do not address other resource issues such as protection of wetlands or water conservation.

CORE4 (1998)

In January 1998, the NRCS through the National Conservation Buffer Initiative sponsored a Conservation Buffer Conference in San Antonio, Texas. During this conference several national experts expressed concern about the long-term functioning of conservation buffers without a systems approach to address nutrients, pesticides, and sedimentation.

The CORE4 concept was established by the Conservation Technology Information Center (CTIC) and supporting organizations as an information and marketing plan to promote the voluntary approach to conservation emphasizing conservation tillage, pest management, nutrient management, and conservation buffers. These key practices significantly reduce nonpoint sources of pollution from cropland as well as provide opportunities for many other conservation benefits when applied as a system. These few practices do not, however, exclude consideration for other practices or systems designed to protect the natural resources related to cropland agriculture.

CORE4, to a large degree, is the result of a public survey and a series of public forums designed to capture the opinions and suggestions of farmers and ranchers, as well as other groups with a vested interest in reducing nonpoint sources of pollution on a voluntary basis. The concept is presented as a "common-sense" approach, meaning an easily understood system of conservation practices that solve many of the natural resource concerns associated with cropland agriculture.

NRCS is supporting the CTIC/CORE4 marketing plan in a cooperative effort with many other conservation partners. The objective is to focus on cost-effective systems that can be planned and installed with limited technical and financial assistance. In addition to improving water quality, these practices can improve soil quality, air quality, wildlife habitat, and aesthetics. Carbon sequestration is another benefit expected from the widespread application of these practices. Although written from a national perspective, where appropriate, the guidance should be tailored to fit local conditions.

When one of the landowner's objectives is wildlife management, the goal may be to increase game species to be hunted or simply to provide habitat for as many wild animals as possible. In either case, vegetation management includes favoring those plants and plant communities that provide wildlife habitat--including food, water, nesting places, and cover.

In the view of the landowner who wants a forest that supports an abundant and diverse wildlife population, many plants other than pine trees are "crop" plants. A variety of food sources should be available in each season. The following practices tend to favor wildlife (UF 2000):

- Plan and plant small, elongated or irregularly shaped harvest areas rather than large, contiguous ones. Wildlife utilize the abundant foraging opportunities of recently cutover areas, but may not venture far from the cover of adjacent forested terrain.
- Retain several living mast-producing hardwoods (oaks, hickories, southern magnolia, etc.) on each acre during site preparation and stand establishment. This may entail marking some merchantable trees so that loggers do not cut them.
- Retain hardwood or mixed hardwood and pine stands on some upland areas. These are valuable mast production areas and also provide nesting sites and cover for wildlife.
- Use herbicides to kill some hardwoods that remain after a stand is harvested but leave them standing to serve as nesting and foraging sites for birds, reptiles, amphibians, and small mammals.
- Apply different understory control treatments to different pine stands to encourage a variety of wildlife food plants. For example, a herbicide treatment in one stand might control understory hardwoods and encourage grasses, forbs, and smaller shrubs such as blueberries and blackberries. Frequent (every 2 to 3 years) cooling season prescribed burns in another stand would produce an understory with many small hardwoods, resprouting from rootstocks not killed by the fire. This tender new growth is attractive to and accessible to wildlife. Less intensive vegetation management in nearby areas or parts of the same stand allows development of wildlife cover and a midstory of hardwoods important to some bird species.
- Manage pines so that some sunlight, water, and nutrients are available for the growth of understory plants. That is, thin the pine stands as early as possible within budget and time constraints. The response in growth of wildlife food plants will be especially good if an understory burn precedes or follows the thinning.
- Plan for longer rotations with one or more thinnings. Do not use whole-tree chipping at harvest, but instead leave branches and tops on the site where they will host mushrooms, other fungi, insects, and small vertebrates.
- Take advantage of road and power line right-of-ways where more sunlight reaches low-growing plants. High-nutrient forage plants for wildlife can be seeded here.

Even where there is need for maximum economic yield of pine timber from a property, conditions favorable for many wildlife species can be maintained by having more, smaller stands of different ages rather than a few large stands nearly the same age. Even though the habitat diversity within any given

stand is lower than it would be in a natural pine community, hardwood hammock, or mixed pine hardwood stand, the between-stand diversity will favor many wildlife species. The interface or "edge effect" between contrasting environments will also be important for wildlife that need a variety of habitats for food and cover.

c. Ecosystems management

A good solution to slowing or halting the documented species and community declines is to implement an ecosystems approach to management at the landscape level to limit further habitat fragmentation. The following discussion is based on "An Ecosystem Approach to Natural Resources Management" (Barnes, 1999). Various terms have been coined to describe this new management philosophy, including managing for biodiversity, ecosystems management, holistic management, or an ecological approach to management. The ultimate goal of managing land at the landscape level is to provide for sustainable use of our natural resources. This means that the desired ecological conditions or flow of benefits from the land can be maintained over time, recognizing a fundamental need to sustain high quality soils, pure air and water, and vigorous native plant and animal populations.

The U.S. Forest Service has been a leader in the emergence of the ecosystems management concept, with a focus on multi-use management dating back to the 1950s. The essential elements of the most recent policy shifts have been summarized as follows:

- the maintenance and enhancement of biodiversity;
- a wider spatial and temporal scale used for the protection and enhancement of ecosystem integrity;
- management using landscape attributes, including habitat connectivity, avoidance of fragmentation, protection of waterways, and identification and protection of critical habitats;
- more intensive planning and coordination, and cooperation, with partners, more spatially detailed data obtained through GIS programs, and more sophisticated silvicultural techniques (low-impact logging);
- a shift in species composition to mature forest benchmarks;
- development of older forest stands or extensive units of mature forest that will have few, if any, roads;
- providing for larger populations of scarce creatures, such as top-level carnivores (bears and panthers), forest or grassland interior species (migrant songbirds), and species that require old growth forests (red-cockaded woodpeckers).

The focal point of this new system is examining and understanding the interdependent relationship of plants, animals, and ecological processes (such as gene flow, fire, etc.) that link them with the physical environment and the needs of people.

Historical definitions of an ecosystem excluded human beings. We now know that both natural processes and human activities over time shape the diversity and productivity of any ecological system. An

ecosystems approach recognizes that humans, as part of ecosystems, need to be included in the decision-making process. This means we must forge partnerships to create opportunities for public participation and work more effectively with diverse audiences, other agencies, and non-governmental organizations in their attempts to manage ecosystems that cross land ownership and jurisdictional boundaries.

The funding required for government to own and protect all natural resources and to afford both public and private benefits does not exist and will never exist. When landowners combine their private values with responsible stewardship, a landscape-level private stewardship plan can work. Effective conservation often requires collaboration, giving rise to multiple-owner consortiums.

The time has come to carefully examine traditional management and move to holistic management. There are no simple answers, but ecosystems management is a dynamic process and requires a strategy that develops, enhances and protects the ecological and socioeconomic values of the resource while maintaining private ownership. For this system to work, it will require a variety of tools.

d. Sustainable agriculture

The concept of sustainable agriculture was formulated to integrate the goals of agricultural productivity and efficiency with maintaining and enhancing both the natural resource base and the quality of life. While farmers have always considered impacts on the environment and quality of life in their decision-making processes, sustainable agriculture provides a focus and a framework where holistic production decisions can be developed and evaluated. The evaluation of production decisions within a sustainable framework includes indices not normally accounted for in traditional agriculture research and education programs, such as the quality of life, human health, maintenance of resource base (including biodiversity), off-site environmental effects, and long-term natural resource viability. While still evolving in concept and practice, sustainable agriculture research and education can provide information to guide farmers, consumers, and policymakers in decision-making (Jordan, 2001).

Sustainable agriculture does not refer to a prescribed set of practices. Instead, it challenges producers to think about the long-term implications of practices and the broad interactions and dynamics of agricultural systems. A key goal is to understand agriculture from an ecological perspective - in terms of nutrient and energy dynamics, and interactions among plants, animals, insects, and other organisms in agroecosystems - then balance it with profit, community, and consumer needs. Farming methods that improve the sustainability of one farm may not be appropriate to a different farm or region. Each practice must be evaluated in a given farming system for its ability to achieve a set of economic, social, and environmental goals.

However, there are some common sets of practices among farmers trying to take a more sustainable approach, in part through greater use of on-farm or local resources. Each contributes in some way to long-term profitability, environmental stewardship, and rural quality of life. These include: Integrated Pest Management, rotational grazing, soil conservation, water quality/wetlands, cover crops, crop/landscape diversity, nutrient management, agroforestry, and marketing.

Since 1988, the Sustainable Agriculture Research and Education (SARE) program has been the USDA's primary means of studying and spreading information about sustainable agriculture. The program has funded hundreds of projects that help advance knowledge about sustainable practices and systems nationwide. In each of its first ten years, the program has divided approximately \$11 million among four regions of the U.S. SARE administers a wide variety of grants that cover the breadth of sustainable agriculture.

The state university and land grant system has established sustainable agriculture programs. Numerous non-governmental efforts are also focused on sustainable agriculture. For example, AFT works to prevent loss of farmlands and to promote sustainable practices.

A broad array of policy options and programs can be identified that affect sustainable agriculture. However, one major area must be addressed before all of the individual efforts can be truly effective: there exists an incompatibility between sustainable agriculture and “industrial agriculture” (Jordan 2000). Until the costs that intensively managed, industrial agriculture imposes on the environment and rural people are recognized, agriculture will not be a sustainable enterprise in Alachua County.

e. Adaptive management

Adaptive management planning is another approach which may be combined with a best management practices approach to increase the likelihood that management can achieve complex objectives like ecosystem sustainability. Where “best” management practices presumes that one practice, or suite of practices, is most suited to every site, adaptive management presumes that not enough is known to identify a single best practice. In fact, there may be several to many best practices, depending on the adequacy of existing knowledge and whether objectives are open to multiple interpretations.

An over-simplified description of adaptive management is learning while doing, where feedback is used to adjust subsequent decisions. The rate of learning depends on the relative proactiveness of the feedback mechanism. In passive approaches, learning is advanced when the questions and anticipated outcomes are clearly defined and monitoring plans are written before management begins. This approach requires patience to allow sufficient time for learning. Scientists and citizens continue to offer criticism from outside; they may also help to frame questions, anticipate outcomes, and help design and implement a monitoring plan. However, when a commitment to monitoring wanes, the strategy reverts to a reactive one, in which change is driven by forces external to the management system, including Congress, lawsuits, public reactions, and research findings. Crisis management tends to emerge, and creating and maintaining a long-term strategy becomes extremely difficult.

Concepts of best practices can be combined with active adaptive management when sets of best practices can be distributed across comparable stands or landscapes in ways that we can learn from them in order to manage sustainably. Examples are pilot studies in Oregon and Florida which are being conducted to compare suites of best practices, prescriptions, or policies - all thought to work well - by managing under an experimental design. Management experiments become the focus of monitoring and evaluation, and create incentives to continue monitoring over time to help avoid slipping back to a reactive mode. Such studies are undertaken in Alachua County in conjunction with the University of Florida.

This approach, while contributing to the advancement of science and our understanding of ecological processes, does risk harm to the environment due to the nature of experimental uncertainty. In some cases, more intensive and riskier treatments, are performed in Alachua County. This requires balance in our natural resource protection goals.

When the principal objective is growing timber across diverse landscapes, existing knowledge (e.g., site index, thinning response) seems generally acceptable for most sites. As more complex objectives are identified such as sustaining ecosystems that include people, wildlife, plants, ecosystem processes, and their interactions, the adequacy of knowledge and certainty of applicability to individual sites decreases exponentially. Adaptive management may provide an alternative if best practices can not be safely based

on existing knowledge and assumptions of generality. However, this alternative must be explored in a sustainable context while minimizing significant adverse impacts to natural resources.

On a more direct level, through day-to-day observations and occasional consultations with foresters, wildlife biologists, and other natural resource management professionals, landowners gain a working knowledge of the tradeoffs involved with each management decision. They learn how to tailor each operation, including vegetation management, to fit the conditions of a given stand, and the multiple objectives for which the entire holding is managed. It is challenging and educational, and can reward the landowner emotionally as well as financially, to gain, apply, and refine this knowledge of complex ecological interrelationships. The astute landowner blends years of first-hand observation with technical specialists' knowledge to develop a deep understanding of the life of the land and its relationship with human society.

2. Incentives and stewardship programs

A number of stewardship programs have been established to promote good land-use practices, proactive thinking on the part of companies and private landowners with regards to ecosystems management and sustainable agriculture, and financial incentives for participation.

USDA has initiated several programs that rely on education, financial assistance, and technical assistance to encourage farmers to adopt environmentally benign practices. Four of these are described below.

- EQIP (Environmental Quality Incentives Program) - Encourages farmers and ranchers to adopt practices that reduce environmental and resource problems. Producers who enter into 5- and 10-year contracts are offered technical assistance, education, cost sharing, and incentive payments.
- WHIP (Wildlife Habitat Incentives Program) - Provides cost sharing to landowners for developing habitat for upland wildlife, wetland wildlife, threatened and endangered species, and fish and other types of wildlife.
- WRP (Wetland Reserve Program) - Provides easement payments and restoration cost-shares to landowners who return previously converted, or presently farmed, wetlands to wetland conditions.
- CRP (Conservation Reserve Program) - offers annual rental payments, incentive payments for certain activities, and 50% cost-share assistance to establish approved trees and vegetative cover on eligible cropland to improve soil, water, and wildlife resources. Contract duration is 10-15 years.

In addition, the NRCS provides conservation technical assistance to farmers for planning and implementing soil and water conservation and water quality practices. Extension education provides landowners and farm operators with information and recommendations on soil conservation and water quality practices.

Voluntary forest incentive programs that subsidize tree planting have a long and successful history in the south, and recent programs focus on multiple values produced from forests. Several conservation programs specific to forestry are summarized below. However, future funding of forest incentives is likely to vary depending on shifts in state and federal priorities.

- FRIP (Florida Reforestation Incentives Program) - this program provides reimbursement for a maximum of 60,000 pine seedlings.
- FIP (Forestry Incentives Program) - incentives for planting, natural regeneration, and timber stand improvement; 65% cost-share per practice not to exceed \$10,000 per year
- ACP (Agricultural Conservation Program) - incentives for tree planting, site preparation for natural regeneration, and timber stand improvement; 65% cost-share per practice not to exceed \$3,500 per year
- Forest Legacy Program - offers conservation easements and land purchases to protect forest lands of national or state importance that are considered to be threatened
- Florida Stewardship Program - provides technical assistance to help non-industrial landowners develop natural resources management plans to protect and enhance their timber, fish and wildlife habitat, water quality, wetlands, and recreational and aesthetic values of their property.

3. Forestry certification programs

Forest certification is a means of determining, based on different criteria, the sustainability and environmental well-being of a forest and its lands. Increasing public awareness of environmental issues has kindled extensive public involvement in resource management decisions and policies. A key component of the response to public concerns in the 1990s was the development of programs by government agencies, nongovernment organizations, and industry or landowner associations to encourage and verify sustainable management of forest resources.

Five voluntary programs now exist in the United States, each with a different method for assessing and certifying that forests are managed sustainably with environmentally responsible practices. Certification is usually based on a set of standards to which a landowner's management practices and systems are compared. The Florida Forestry Association's Forest Certification Task Force has researched the five certification programs and developed a comprehensive matrix to compare the components of the programs. This matrix is attached as Table 17. In addition, some notable features of these programs are described below.

a. Forest Stewardship Council (FSC)

The Forest Stewardship Council is a not-for-profit, non-governmental organization created in 1993 by certifiers, forest products businesses, and environmental groups to monitor certification and prevent a confusing proliferation of standards. FSC does not perform certifications, rather, it accredits third-party certifiers and endorses regional forest certification standards. To serve as a guiding framework for the development of regional standards, the FSC approved in 2001 global Principles and Criteria for Forest Management, a set of thresholds for environmentally appropriate, socially beneficial, and economically viable forest management.

The Forest Management Trust and Tall Timbers Research teamed in 1996 for the development of Forest Certification Standards for the Southeastern U.S. and has recently been engaged in the process of harmonizing its indicators and verifiers with those in the national standards. This process began with the invitation of approximately 3600 stakeholders to three sub-regional information meetings. The regional Working Group that developed the standards was formed from stakeholders elected at the sub-regional information meetings and others selected from under-represented interest groups and/or sub-regions based on the results of the elections. The 18-member Working Group included non-industrial private landowners, foresters, ecologists, social scientists, forestry professors, environmental activists, a geographer, a soil scientist, and a certifier. After publication of the national standards, the Working Group worked to make its draft standards consistent with the national standards. As of the summer of 2001, the harmonized draft standards have been reviewed and approved by the national office of the FSC, and released for public comment. Some representative principles and policies are shown in Inset 19.

As a follow-up to developing the Forest Certification Standards for the Southeastern U.S., the Trust has developed a regional handbook and four regional workshops on forest certification. The purpose of these efforts is to educate landowners, resource managers, forest product companies, and other stakeholders on the certification process and the certification standards for the Southeast. In addition to describing the certification process, the handbook describes the benefits and costs of certification, as well as ways to minimize the costs of certification (e.g., group certification, resource manager certification).

b. Sustainable Forestry Initiative (SFI)

The American Forest and Paper Association (AF&PA) recently began a stewardship initiative to incorporate the protection of natural resources. The forest and paper industry's national trade association, AF&PA represents more than 250 companies and related associations that engage in or represent the manufacture of pulp, paper, paperboard and wood products. AF&PA requires all member companies to comply with the SFI program, which specifically targets water-quality improvement by implementing BMPs, approved State water-quality programs, and adherence to state and federal water protection laws.

The County recognizes this program as a major step towards achieving BMPs compliance. However, in comparison with FSC, SFI offers fewer wildlife habitat protection and ecosystems and landscape-level safeguards. For example, program rules allow an average of 120 acres (the size of 116 football fields) to be cut clear of trees. Under FSC, clear cuts larger than 40 acres are discouraged. The industry's rules also put no constraint on the use of timber management chemicals such as herbicides, while FSC rules call for minimal to no use of chemicals. Nevertheless, the SFI initiative indicates a very positive, fundamental shift in the way timber companies do business by pushing for certification.

Inset 19: Examples of FSC Principles and Criteria

FSC Principle 6: Environmental Impact

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and integrity of the forest.

- 6.2 *Safeguards shall exist which protect rare, threatened and endangered species and their habitats (e.g. nesting and feeding areas, dens). Conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources.*
- 6.3 *Ecological functions and values shall be maintained intact, enhanced or restored, including:*
- 1) *Forest regeneration and succession.*
 - 2) *Genetic, species, and ecosystem diversity.*
 - 3) *Natural cycles that affect the productivity of the forest ecosystem.*
- 6.3.1 *Landscape level ecological issues should be addressed in the management plan, consistent with the scale of the operation. The following is an example of a way to verify compliance with the indicator:*
- * Ecological connections and/or corridors to adjacent properties are maintained or improved. Cooperation with adjacent landowners is in place where possible.*
- 6.3.2 *Forest management should restore a range of age-classes in uneven-aged stands in accordance with management objectives. The retention or development of old/large trees is encouraged.*
- 6.3.6 *Clearcutting shall not be used in primary and natural forests.*
- 6.3.8 *Clearcutting may be employed in plantations, degraded semi-natural forests, and other forests lacking the characteristics of native ecosystems. The maximum size of clearcuts in these forest areas shall be 40 acres....*
- 6.3.10 *Forest management activities shall maintain species and ecosystem diversity.*
- 6.3.12 *Locally threatened ecosystems or communities (i.e. prairies and isolated wetlands) shall not be adversely affected by conversion of non-forest land to forest.*
- 6.4 *Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources.*

- 6.5 *Written guidelines shall be prepared and implemented to: control erosion; minimize forest damage during harvesting, road construction, and all other mechanical disturbances; and protect water resources.*
- 6.6 *Management systems shall promote the development and adoption of environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides.*
- 6.10 *Forest conversion to plantations or non-forest land uses shall not occur, except in circumstances where conversion:*
- 1) *entails a very limited portion of the forest management unit; and*
 - 2) *does not occur on high conservation value forest areas; and*
 - 3) *will enable clear, substantial, additional, secure, long term conservation benefits across the forest management unit.*

FSC Principle 9: Maintenance of High Conservation Value Forests

Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

FSC Principle 10: Plantations

Plantations...should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

- 10.2 *The design and layout of plantations should promote the protection, restoration and conservation of natural forests, and not increase pressures on natural forests. Wildlife corridors, streamside zones and a mosaic of stands of different ages and rotation periods, shall be used in the layout of the plantation, consistent with the scale of the operation. The scale and layout of plantation blocks shall be consistent with the patterns of forest stands found within the natural landscape.*
- 10.6 *Measures shall be taken to maintain or improve soil structure, fertility and biological activity. The techniques and rate of harvesting, road and trail construction and maintenance, and the choice of species shall not result in long term soil degradation or adverse impacts on water quality, quantity, or substantial deviation from stream course drainage patterns.*

c. American Tree Farm System

A nationwide community of 66,000 non-industrial private forest landowners, the American Tree Farm System is the oldest certifier of sustainable forests in the United States. Its members are joined in their commitment to excellence in forest stewardship. The Tree Farm System is a program of the American Forest Foundation, a non-profit organization that develops, funds and administers programs which encourage the long-term stewardship of our natural resources.

In 2000, the AF&PA and American Tree Farm system formally recognized each other's respective standards for sustainable forest management. In a Mutual Recognition Agreement, AF&PA recognizes Tree Farm as a credible standard for sustainable forestry on smaller ownerships, including non-industrial forest landowners, and the American Tree Farm System recognizes the SFI program as an independent standard for the forest products industry, larger ownerships and licensees. The Mutual Recognition Agreement acknowledges that the intent, outcome and process of both the SFI program and Tree Farm are substantively equivalent and that the credibility and reputation of each program will be maintained by the programs' respective systems already in place. The Agreement allows Tree Farm and the SFI program to collaborate further to broaden the practice of sustainable forestry on private lands and to educate non-managing landowners about the benefits and support for practicing sound forestry.

d. Forest Stewardship Program (FSP)

The USDA Forest Service initiated a Forest Stewardship Program, similar to the SFI program, that provides educational and technical assistance to landowners interested in active management of their forests for multiple resource benefits. Another program, the Stewardship Incentive Program (SIP), provides cost-share support for nonindustrial private forest landowners to help them develop and implement Forest Stewardship Plans. Funding through SIP is based on landowner adherence to the plan for a minimum of 10 years. Technical and planning assistance by natural resource professionals is available through the program.

e. Green Tag Forestry

Green Tag Forestry is a "third-party" certification that was developed by the National Forestry Association in cooperation with the Association of Consulting Foresters and the National Woodland Owners Association. It is national in scope and the only program that is intended solely for use by private forest landowners. The program complements those sponsored by American Tree Farm and FSC. It is also similar in some respects to the forest industry's SFI and state/federal Forest Stewardship Incentive Programs.

Green Tag Forestry has ten criteria that outline its approach to forest management. There are forty-six indicators that define successful conformance within each criteria. The ten criteria include forest planning and management; forest health, inventory, and natural diversity; logging, post-harvest evaluation and reforestation; road construction, stream crossings, and protection of special sites; product utilization and aesthetics; chemical utilization; community and social relations; economic viability; record keeping and tracking; and commitment to sustainability.

A Green Tag Forest is a woodland whose stewardship has been certified as incorporating good forestry practices that assure a balance of natural diversity and sustainable forest productivity. Green Tag certification is available in all fifty states. The program provides recognition to landowners who practice responsible and sustainable woodland stewardship. This recognition may bring a market premium as a “green-certified” forest product.

4. Changing ownership and strategies

Management of public land includes protecting biodiversity through ecosystem or landscape-level management. About 11% of the South’s forests are in a public ownership, and these areas tend to be concentrated in mountainous areas (Southern Forest Resource Assessment, 2000). For some rare communities, public lands are critical to conservation. Often, however, rare plant communities and critically imperiled species do not occur on public land. The management of private forests, therefore, will have a substantial impact on the persistence of many species of concern in the South.

The search for workable methods to achieve conservation takes place in an era of great change in the way Americans own and manage land. Changing patterns of land ownership affects both farm and forest lands and their management in the 21st century. America’s forests, for example, are now in the hands of almost 10 million owners, with almost 94% owning 100 acres or less. Recent surveys show that the fastest growing segment is the 10 acre to 100 acre sizes.

It is clear that one-on-one technical assistance programs, as well as many of the past cost-sharing programs, may be increasingly inappropriate to the situation. The small landowners are too numerous, too inattentive to forest management, and too scattered for limited public programs to reach, and the big owners either don’t need or won’t use them. This makes it difficult to speculate on how ecosystem wide consideration can be applied to a watershed full of ownerships averaging 17 acres.

Getting either of these audiences to use professional technical assistance, to prepare and implement plans for their own operations that are reasonably consistent with the needs of the whole watershed or landscape in which they exist, and to follow reasonable rules of conduct, looks increasingly beyond the capacity of a voluntary system whose supply of assistance is set by political priorities rather than by consumer demand.

Shrinking agency professional ranks coupled with rapidly increasing numbers of small landowners, increasing concentration into huge production units, and growing public demand for more effective control of off-site environmental impacts simply does not add up. Farm and Forest (1998) predicts that, in the 21st century, the consumer demand will be established by the community rules set down by general government, and the response to that demand will be by private businesses who can grow and shrink in response to the market.

Table. 17 Florida Forestry Association’s Comparison of Forest Certification Programs

	American Tree Farm System	Sustainable Forestry Initiative^a (SFI)	Forest Stewardship Council (FSC)	Green Tag Forestry	Forest Stewardship Program (FSP)
Developed By	American Forest Foundation	American Forest and Paper Association (AF&PA)	Forest Stewardship Council (341 members in 51 countries) established policies and guidelines	National Forestry Association (NFA) in cooperation with the National Woodland Owners Association and Association of Consulting Foresters.	National Association of State Foresters in conjunction with U.S. Forest Service (USFS).
Date of Inception	1941	1994	1993	1998	1990
Type Organization	Nonprofit educational foundation	Independent not-for-profit trade organization	Self-appointed, independent not-for-profit organization.	Independent not-for-profit	Government.
Funding Sources	Contributions, grants, magazine sales, logo item sales.	The members fund individual programs and provide support to statewide and national activities.	Government and foundation grants, accreditation fees, membership fees	Fees for auditing services.	Federal and state funding.
Focused On	Nonindustrial private forests in the United States.	Industrial forests primarily; promotes sustainable forestry practices on nonindustrial forests in the United	Small woodlands, industrial forests, and public forests on a worldwide basis.	Nonindustrial private woodland owners in the United States.	Nonindustrial private landowners in the U.S.
Mission Statement	To ensure sustainable forests in the U.S. To provide outreach to landowners with information, education, and voluntary verification of sustainable practices.	To promote sustainable forestry principles that constitute the AF&PA’s members’ commitment to sustainable forestry and the measures by which the public can benchmark this commitment.	To improve forest practices through market-based incentive programs.	To identify and recognize landowners whose stewardship incorporates good forestry practices that assure a balance of natural diversity and sustainable forest productivity.	To assist private forest landowners to more actively manage their forests by providing technical assistance, educational assistance, and recognition for their efforts.
Objectives	A Tree Farm is a privately owned forest dedicated to producing renewable and sustainable crops of forest products while protecting the soil, water, range, aesthetic, recreation, wood, fish and wildlife resources. Multiple-use management approach to the growing of renewable forest resources while protecting environmental benefits. Strive to increase public understanding of all benefits of productive forestry.	To practice sustainable forestry to meet the needs of the present without compromising the ability of future generations to meet their own needs. Accomplished by practicing a land stewardship ethic which integrates the reforestation managing, growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water quality, fish and wildlife habitat, and aesthetics. Support for research, promotion, and education as part of the continuous improvement process. In this way AF&PA will perceptibly improve the performance of member companies, and will set new standards for the entire forest industry as well as for	Market-driven program that uses higher and more rigorous standards and a certification assessment process that is more rigorous than other programs. Emphasis is on natural forest management. Supports environmentally appropriate, socially beneficial, and economically viable management of the world's forests by evaluating and accrediting forest management capacity worldwide.	To provide private landowners recognition of their responsible and sustainable woodland ownership. Such designation may bring a market premium as “green certified forest products.” The program complements those sponsored by the American Tree Farm and the International Forest Stewardship Council. Emphasis on quality logging practices.	To encourage management for multiple resources, increase public awareness of the importance of forestlands, and improve cooperation among natural resource agencies to meet state conservation and management needs and opportunities.
Key Elements of Program	Broaden the practice of sustainable forestry, reforestation, water quality, wildlife habitat, forest aesthetics, protect special sites, biodiversity, slash disposal and utilization, prudent use of chemicals, outreach, public reporting, public involvement.	To use responsible practices; to protect forest health and productivity; to protect special sites; to continuously improve the practice of forest management.	Compliance with laws and FSC principles; tenure and use rights and responsibilities; indigenous peoples' rights; community relations and worker's rights; benefits from the forest; environmental impact; management plan; monitoring and assessment; maintenance of natural forests; plantations.	Forest security, general management and planning, tree harvesting, road construction, skidding/forwarding, post harvest evaluation within one year, product utilization, chemical applications, community relations, employee relations, economic viability, optimizing forest potential, record keeping and tracking.	Timber growth and harvesting, fish and wildlife habitat enhancement, soil and water conservation, recreation and aesthetic enhancement. Woodland livestock grazing may also be included as one of a landowner's management objectives if a portion of the property is used for that purpose.

Table. 17 Florida Forestry Association’s Comparison of Forest Certification Programs

	American Tree Farm System	Sustainable Forestry Initiative^a (SFI)	Forest Stewardship Council (FSC)	Green Tag Forestry	Forest Stewardship Program (FSP)
Benefits of Certification	Free visits every five years by professional resource managers, <i>Tree Farmer</i> magazine, state and local workshops, state newsletters, national convention. Feedback on forest management practices. Signage provided as recognition for good forest stewardship on private lands.	To meet the needs of humanity for essential wood and paper products while protecting and enhancing other forest values. Affiliation with internationally recognized environmental program. Recognition for good forest stewardship.	Independent review of operations, improvement of management over time, marketplace access and differentiation in the market place as an environmentally responsible company, empowerment of consumer to choose environmentally sensitive product.	Independent review of operations, improvement of management over time, marketplace access and differentiation of product (based on aspects of production), empowerment of consumer to choose environmentally sensitive product. Keep nonindustrial lands in a productive and healthy condition for present and future owners to increase the economic and environmental benefits of the land. Signage provided as recognition for good forest stewardship on private lands.	Keep nonindustrial lands in a productive and healthy condition for present and future owners to increase the economic and environmental benefits of these lands.
Types of Certification	Forest Certification only---Pioneer and Certified	Forest Certification only	Forest Certification and Chain-of-Custody Certification for processing facilities	Forest Certification and Chain-of-Custody Certification for processing facilities	Forest Certification only
Program Requirements	Voluntary, must have at least 10 acres and be willing to harvest trees to participate.	Required of all AF&PA members, open to nonmembers as well.	Interested landowners and companies that manage forestlands or produce forest products.	Must be member of the National Woodland Owners Association.	Individuals and noncommercial landowners with at least 25 acres who agree to actively implement the management plan for at least ten years.
Audit Mechanism	Third-party. Certified Tree Farms require onsite inspections.	Companies can choose between first, second, or third-party verification. Under the optional Voluntary Verification Process, companies can choose to apply a rigorous and internationally consistent self-verification approach to document conformance to SFI standards.	Independent, accredited third-party against published standards. Onsite inspection required.	Onsite third-party audits are conducted by specially trained consulting foresters.	Third-party. Forest Stewardship Plan prepared and implementation monitored by state forester designee with field program reviews by USFS.
Number of Certified Forests to Date	70,000 nonindustrial private landowners.	> 135 forest products companies participating	> 550 certification certificates issued to forest companies, state and local public forests, small private landowners, and wood products manufacturers and retailers.	21 woodlands as of 12-99.	123 certified Forest Stewardship Landowners as of 3-00 in Florida
Acreage in Certified Forests	25 million acres.	56 million acres representing 90% of U.S. industrial timberlands	4.6 million acres in United States, 40 million acres total in 30 countries	51,116 acres in seven states.	97,938 acres in Florida

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Standards Setting Process	Periodic review by independent third party of forest conservation experts. Report presented to national operating committee. Standard creation of modification is proposed through working groups within the national operating committee. Working group's proposals presented to all state leadership and other stake-holders during series of regional meetings. Consensus is reached at the regional level and presented to national operating committee. Standards crafted into final form and distributed to all state programs.	The SFI standards apply only to members of the AF&PA. The requirements of the Initiative are recommended by the SFI Task Group, composed of members of the AF&PA, and accepted and approved by the association's board of directors.	Multi-stakeholder, open, transparent and consensus-based process. Principles and Criteria for Forest Management developed by diverse group including landowners, professional resource managers, forest ecologists, forest products companies, and representatives from the environmental and community organizations. Processes occur at the international, national, and regional levels.	Developed by the association's membership, in cooperation with the National Woodland Owners Association and in consultation with individual members of the Association of Consulting Foresters. The original certification criteria were formulated by a national team of foresters and resource specialists. Designed as a U.S. program, Green Tag Forestry interacts with the Canadian Federation of Woodlot Owners and the Pan European Forest Certification.	Basic policy and appropriations authority set in the 1990 Farm Bill. National standards and guidelines developed by USFS in consultation with state foresters. Further implementation measures developed by individual state committees. State committee membership stipulated by federal guides to include: USFS, Natural Resource Conservation Service (NRCS), Farm Service agencies and Extension Service, local governments, soil and water conservation districts, consulting foresters, environmental non-government organizations, forest products industry, forest landowners, land trust organizations, conservation organizations, state fish & wildlife agencies, others as deemed appropriate.
Monitoring and Assessment	Foresters and other trained natural resource professionals audit member Tree Farms on a five-year basis. Management plan is reviewed with landowner. Property is physically inspected in accordance with program standards, guidelines, and performance measures.	Each member organization establishes its own policies and procedures for complying with the Principles and Implementation Guidelines. The CEO of the member organization must annually stipulate that their organization is in substantial compliance with the SFI. At that time, the organization is required to submit its data to the Association for the annual SFI Progress Report. The SFI Expert Review Panel, a group of independent forestry experts, reviews the annual report, evaluates the program, and makes recommendations to the board of directors for changes that clarify and improve the program.	Accredited certifiers verify organization's compliance on the ground to international/regional (if available) standards for forest management and against organization's forest management system. For chain-of-custody, production process monitored to ensure no contamination of noncertified wood into the certified production process.	NFA accredits individual foresters to certify against the standard. Landowner must seek professional advice at appropriate times. Post-harvest evaluation required. Green Tag recognizes six forest management regions in the U.S.	Agency representative or consultant contacts the State Forest Stewardship Coordinator to request a certification inspection. Inspection team consists of the Florida Division of Forestry (DOF) and Fish & Wildlife Conservation Commission (FWC) Stewardship Coordinators. Representatives from the NRCS or Cooperative Extension Service may be involved if a significant portion of the landowner's management program involves correcting soil erosion or water quality problems, woodland grazing, or some alternative resource. The landowner is encouraged to participate.
Marketing Opportunity	No product labeling	No product labeling at this time, can use SFI logo on company materials.	Yes, FSC logo on promotional materials. On-product and off-product labeling permitted dependent upon percentage of certified wood in final product. Labeling monitored by certifier.	Yes, Green Tag logo on promotional materials. On-product and off-product labeling permitted dependent upon percentage of certified wood in final product. Labeling monitored by Green Tag	No product labeling

Table. 17 Florida Forestry Association’s Comparison of Forest Certification Programs

	American Tree Farm System	Sustainable Forestry Initiative^a (SFI)	Forest Stewardship Council (FSC)	Green Tag Forestry	Forest Stewardship Program (FSP)
Cost of Certification	No charge for certification by professional forester volunteers. \$15 subscription to Tree Farmer magazine is required.	Membership in AF&PA is on a graduated scale based on the type of organization and the size of the organization within the type. For example, nonindustrial forest landowners do not have the same dues structure as industrial forest landowners. Costs for AF&PA SFI State Implementation Committees, Best Management Practices training, logger training programs, etc., are supported by member contributions to the state programs.	Membership fees : Northern individual--\$75; Non-governmental Organization (NGO) \$150, for-profit organization with >15 employees \$300; for-profit with <15 employees \$150. Southern individual \$38; NGO \$75; for-profit with <15 people \$75; for-profit with >15 people \$150. Certified operations pay annual program fees to FSC for use of the logo. Certifiers pay annual accreditation fees to FSC. Highest cost to landowner due to effort involved in meeting the higher certification standards and the costs associated with third-party assessment team. Possible to group several small landowners together to minimize costs.	\$150 one-time registration fee paid to NFA. The review cost is estimated by the Green Tag certifying forester with the landowner before field examinations are conducted, and are payable directly to the certifying forester. These costs range from @ \$0.10 to \$1.25/ac., depending on number of acres and completeness of forest management plan, maps, and records. Small tracts (20-75 acres) may be higher. Periodic accreditation fees at time of recertification.	Cost share variable depending on who/how plan prepared. Other implementation costs borne by landowner. Administration, audit, etc. borne by government.
Duration of Certification	A five-year management history is accepted minimum. Tree Farms are reinspected every five years to verify adherence to standards.	SFI is not a certification program. The membership must reevaluate their compliance annually. The owner/CEO must stipulate each year that the organization was in substantial compliance with the program during the previous operating year.	Certificates are in place for five years, with annual audits.	Five years. Periodic audits required.	Established by state committees.
Dispute/Resolution Process	Appeals process through state committees.	Contact AF&PA directly or the SFI State Implementation Committee.	Initial complaint addressed to certifier by complainer; if unresolved it moves to the Secretariat; if still unresolved it moves to board; if still unresolved to Dispute Resolution Committee for final decision.	Initial complaint addressed to evaluating forester. If unresolved, complaint goes to National Forestry Association.	Forwarded to USFS for exceptions
Standards	Performance measures only. Ten standards and guidelines reviewed and approved in 1998. Places few limitations on landowners to achieve goals. States can develop standards more specific than national standards.	Combination of a performance program and environmental management system. Sustainable Forestry Initiative is based on a set of seven principles and a series of implementation guidelines consisting of 12 objectives and 29 performance measures last updated in 1998. The guidelines are suitably flexible to accommodate the wide variety of forest types, soil conditions, and other natural features across the U.S. Each participant will define its own policies, programs, and plans to implement and achieve the SFI Principles and Objectives. More protective of landowners rights to manage on a sustainable basis.	Combination of an environmental management system and performance measures. Ten principles of sustainable forestry. Standards go beyond general principles and criteria to include 56 specific indicators of good forest management. Standards emphasize both management plans and field performance. Address a variety of environmental, social, and economic issues. Places more limitations on landowners than other programs.	Combination of a performance program and environmental management system. Ten Principles, with specific objectives and performance measures to recognize regional silvicultural differences.	The plan is essentially an environmental management system. Minimum standards are established in six resource areas, with specific requirements based on whether the resource area is a primary or secondary objective of the landowner. To qualify for cost sharing, landowners must meet certain performance standards.

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	American Tree Farm System	Sustainable Forestry Initiative^a (SFI)	Forest Stewardship Council (FSC)	Green Tag Forestry	Forest Stewardship Program (FSP)
Management Plan	Must have a written and active forest management plan. Includes management recommendations for five- and ten-year planning horizons.	Must have a written forest management plan	Must have a written management plan that is implemented and up-to-date. The long-term objectives and the means of achieving them shall be clearly stated. Management plan shall be periodically revised to incorporate the results of new scientific or technical information, as well as to respond to changing environmental, social, and economic circumstances.	Landowner states personal management objectives in a written plan. Management plan covers ten years of future management and must be updated periodically. A complete and current forest inventory is maintained.	Must have a written forest management plan that includes the landowner's chosen objectives (primary or secondary) for the major resource areas. Landowners do not have to wait for certification until they have performed all practices described in their Forest Stewardship Management Plans.
Sustainability	Promote the growing of renewable forest resources while protecting environmental benefits.	Ensure long-term forest productivity and conservation of forest resources through prompt reforestation, soil conservation, afforestation, and other measures.	The rate of harvest of forest products shall not exceed levels which can be permanently sustained.	Landowner accepts responsibility as ultimate steward of the land. Good forest management is based on the premise that degradation should not occur as a result of land management activities.	Landowners must practice active multiple-use forest management based upon their own objectives as described in their Forest Stewardship Plan. Every benefit does not have to be obtained from every acre. Some areas may provide only one benefit, while other areas may provide many uses. When the property is considered as a whole, however, the landowner must demonstrate active management for each of the stated objectives.
Reforestation	Prompt restocking of harvested areas and idle areas where tree growing is the land use objective by natural seeding, sprouting, or replanting. Site preparation should assure that regeneration is successful by removing residual or competing vegetation. Must achieve satisfactory restocking within five years following harvest.	Reforest after final harvest by planting or direct seeding within two years, or by planned natural regeneration methods within five years.	Tree planting methods should avoid soil damage while providing for seedling survival. A percentage of the forest management area (ranging from 10-20% depending on size) shall be maintained or restored to a natural forest cover.	Site is regenerated within two years or less.	Regeneration planned in advance of timber harvest and completed within three years after final harvest unless there is to be a land-use change. Proper stocking levels established at the time of regeneration. Tree species favored and managed that are best adapted to specific sites. Encourage cost-effective treatments which minimize site disturbance and destruction of wildlife habitat.
Protection	Forest practices must protect from fire, diseases, insects, and destructive grazing.	Protect forests from damaging agents such as wildfire, pests, and diseases to maintain and improve long-term forest health and productivity.	Make effort to prevent illegal and unauthorized activities. Paint and post boundaries, use gates, make periodic inspections. Safeguards shall exist which protect rare, threatened and endangered species and their habitats.	Boundary lines are known and marked. Landowner holds clear title and has considered easements.	Active protection of all stands from wildfire and major outbreaks of insects or disease. Cooperate with state agencies responsible for the prevention and control of illegal hunting or fishing and other detrimental practices or influences. Litter controlled, unsightly areas eliminated, and steps taken to neutralize any hazardous materials that may be present on the site.

Table. 17 Florida Forestry Association’s Comparison of Forest Certification Programs

	American Tree Farm System	Sustainable Forestry Initiative^a (SFI)	Forest Stewardship Council (FSC)	Green Tag Forestry	Forest Stewardship Program (FSP)
Water Quality	Must follow state Best Management Practices (BMPs) and other practices required by local, state, or federal regulations.	Protect the water quality in streams and lakes by implementing riparian protection measures based on soil type, terrain, vegetation, and other applicable factors. Must follow state BMPs or other practices required by local, state, or federal regulations.	Written guidelines to control erosion and minimize forest damage during harvesting and road construction to protect water resources. Must follow state BMPs or other practices required by local, state, or federal regulations.	Must follow state BMPs. Wetlands are identified and respected. Roads are planned and constructed to minimize loss of productive land without degrading nonforest areas. Roads and landings are "put to bed" with drainage and seeding. Appropriate size culverts are used. Stream bank grades are rocked.	Follow BMPs on forestlands to maintain water quality and minimize soil erosion. Construct firebreaks and access roads so as to minimize soil erosion. Maintain adequate cover to minimize soil particle detachment and transport. Protect areas prone to erosion from destructive silvicultural operations that would damage the ground cover and treating areas which have sustained previous damage.
Wildlife Habitat	Management practices must protect and enhance fish and wildlife habitat while considering floral and faunal diversity.	Enhance the quality of wildlife habitat by developing and implementing measures that promote habitat diversity.	Where nonforested land serves as exceptional wildlife habitat, conversion to forest cover is discouraged.	Appropriate retention of wildlife den trees and perch sites. Recreation and wildlife trails left free of debris following harvest.	Enough suitable habitat deliberately created, maintained and improved to support suitable populations of desired species. Natural diversity and abundance of nongame wildlife species achieved and maintained. Some provision made on some part of the property for species dependent on mature timber and/or cavity trees.
Forest Aesthetics	Follow forest practices that demonstrate concern for the aesthetic effects of forest activities.	Minimize the visual impact of clearcutting and other forest operations.	No specific requirement for forest aesthetics.	Effort made to achieve good utilization. Appropriate concern for vistas.	Contribute to the overall aesthetic appearance of the surrounding landscape as a whole. Retain large attractive specimen trees and trees with good fall colors. Plant or maintain native flowering trees, shrubs and wildflowers that are best adapted to
Protect Special Sites	Recognize and protect recreational, historical, biological, archaeological and geological sites of special interest.	Manage company lands of ecological, geologic, or historic significance in a manner that recognizes their special qualities.	All sites and features of special cultural significance should be identified and protected. Representative samples of existing ecosystems shall be protected in their	Native American heritage sites are respected. Conservation easements may be used, if appropriate.	Identify and protect unique archeological or historical sites. Identify and maintain scenic areas and unique geological features such as rock outcrops, sinkholes, small ponds,
Biodiversity	Management practices must enhance the health and productivity of the woodland while considering biodiversity on a landscape or watershed basis. Acceptable forest management practices includes the range of even and/or uneven age management	Contribute to biodiversity by enhancing landscape diversity and providing a variety of plant communities.	Forest management practices shall maintain species and ecosystem diversity. Uneven-aged natural stands shall not be converted to even-aged stands. Forest conversion to plantations or nonforest land shall not occur except under limited conditions.	Recognition of a balance between productivity and natural diversity. Inventory of significant flora and fauna is completed. Special attention to rare or endangered species, if present.	Unique plant communities protected and maintained. This includes periodic prescribed burning of fire-dependent vegetation communities and use of native plants favored over nonnatives.

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Slash Disposal and Utilization	Utilize in an environmentally and/or economically sound manner all severed and/or damaged materials on a harvest site. Consider harvest contract wording that addresses utilization and slash hazard reduction	Employ appropriate forest technology, and harvesting and manufacturing processes to minimize waste and ensure efficient utilization of trees harvested.	Forest management should minimize waste associated with harvesting and onsite processing operations and avoid damage to other forest resources.	Residual material either laid down or chipped.	No requirement
Use of pesticides and fertilizers	Use of herbicides, pesticides, and fertilizers must meet all applicable label requirements, laws, and regulations.	Continue prudent use while following all applicable label requirements, laws, and regulations.	Promote the use of environmentally friendly nonchemical methods of pest management and strive to avoid the use of chemical pesticides. If chemicals are used, ecological structures, functions, and components of a forest's diversity must be maintained.	Encourages use of nonchemical methods of pest and herbaceous control. Maintain records of chemical applications. Label guidelines and approved applications are followed.	Apply nutrients and pesticides according to label recommendations. Limit pesticide use and nutrient additions to the amounts and types necessary to protect water quality and the integrity of all forestland resources. Minimize off-site effects from pesticides and nutrients applied on the landowner's property. Harvest pine straw no more often than once every four years from the same stand, or every two years if fertilization is applied.
Forestry Contractors	Ensure that contractors are made aware of special requirements. Encourage using contractors having completed training, are insured, and comply with all state and federal regulations.	Encourage BMP training for operational contractors. Supportive of logger education.	Local contractors are given opportunities to provide services and supplies. Employment conditions are the same for local and nonlocal employees doing the same job. Contractors are appropriately skilled. Forest management must comply with all state and federal labor laws.	Landowner must seek professional forestry advice at appropriate times. Certified chemical applicators used when required.	The DOF makes available lists of forestry contractors (logging, tree planting, etc.) for landowners use.
Clearcutting/Timber Harvest	Harvesting practices must maintain or improve forest productivity, health and growth while protecting the associated resources. Harvest practices should be prescribed based on tree conditions, tree types and anticipated reforestation method, and desired species. Clearcutting, shelterwood cuts, thinnings, improvement cuts, and precommercial thinning are all acceptable practices as long as they are implemented properly.	Minimize the visual impact by designing harvests to blend into the terrain by restricting clearcut size and/or by using harvest methods, age classes, and judicious placement of harvest units to promote diversity in forest cover. Average size of clearcuts limited to 120 acres. Replant and wait three years or until trees are 5' tall before clearcutting adjacent stands.	Minimize damage to the forest during harvesting and other operations. Clearcutting is strongly discouraged, but allowed as long as it is on a scale that maintains a diversity of physical structures in the forest, responds to the silvicultural needs of dominant species, and does not compromise a forest's ecology. Clearcutting is limited to 40 acres (some exceptions are possible up to a maximum of 80 acres). Clearcutting not allowed in natural forests	Clearcuts are used only when the most appropriate silviculture. Certified loggers are used when available. Minimize soil disturbance and damage to residual trees. Leave trees are clearly marked and protected. Professional forester oversees harvest including a final harvest inspection before releasing logging bond. Post-harvest site inspection required 1-3 years following harvest.	Timber harvests conducted in a manner that enhances other resources. Size and shape of harvested areas compatible with other objectives. Rotation age can be defined, or determined in the future. Stands thinned as needed to maintain vigor. Timber is harvested before biological maturity of the stand but with some provision made on some part of the property for species dependent on mature timber and/or cavity trees.
Indigenous Peoples' and Workers' Rights	No requirement	No requirement	Forest management shall not threaten or diminish, either directly or indirectly, the resources or tenure rights of indigenous peoples. Must recognize and respect the interests and rights of workers and local communities.	No requirement	No requirement

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	American Tree Farm System	Sustainable Forestry Initiative^a (SFI)	Forest Stewardship Council (FSC)	Green Tag Forestry	Forest Stewardship Program (FSP)
Information Available to Public		Monitor, measure, and publicly report progress in fulfilling commitment to sustainable forestry. SFI annual progress report aggregates information for all participants.	Public summary reports for each certified forest.	Forest records are private information, and may be available for public review at the discretion and choice of the landowner. Landowners have option of listing the availability of their timber in the nationwide Green Tag Forestry database.	The DOF considers forest records public information. There have been no requests to date for any landowner's information under the FSP.
Public Involvement	Encouraged to increase public understanding of all benefits of productive forestry.	Encourage landowners to reforest following harvest and use BMPs by providing information on the environmental and economic advantages of these practices. Recommend communications with local communities regarding practices. Encourage landowners to use qualified resource professionals and trained loggers. AF&PA encourages public participation and reporting of questionable practices by toll free number	Notification to potentially affected adjacent landowners or communities should be given prior to commencement of significant forest operations.	Landowners are fully informed of their rights and responsibilities as forest stewards. Communication maintained, as appropriate, with community officials. Encourage participation in forestry and landowner organizations.	There is no requirement to notify adjacent landowners about significant forest operations. DOF provides information to help landowners find and use locally experienced forestry consultants, wildlife biologists, loggers, and tree planting contractors.
Website	www.treefarmssystem.org	www.afandpa.org	www.fscus.org (U.S.) www.fscoax.org (International) www.foresttrust.org (Southeast U.S.)	www.greentag.org (website under construction)	www.sfrc.ufl.edu/extension/ffws/fsp.htm
Contact	American Forest Foundation Washington, DC 888-889-4466	American Forest and Paper Association Washington,DC 202-463-2700	Forest Management Trust Gainesville, FL 352-846-2240	National Forestry Association Vienna, VA 888-50-FOREST	Florida Dept. of Agriculture Division of Forestry 850-414-9907
Other websites:	www.fscfacts.com www.sfcw.org				

F. Regulatory framework

1. State approach

a. State Comprehensive Plan

Planning decisions, policies and approaches at the state, regional and local levels all affect Florida's rural areas. At the state level, the Florida Department of Community Affairs (DCA) has lead responsibility for planning matters, including implementation of the Growth Management Act adopted by the Legislature in 1985. Responsibility for the State Plan rests with the Governor's office along with other broad duties in planning and growth management. Local governments develop and implement local comprehensive plans (pursuant to the Growth Management Act) and regulations.

F.S. 163.3177(10(b)) requires each local government to review the state comprehensive plan goals and policies and to address those which are relevant to the circumstances or conditions within its jurisdiction.

The State Comprehensive Plan is set forth in Chapter 187, F.S., and includes 25 state-level goals plus corresponding policies. It establishes the goal to protect and acquire unique natural habitat and ecological systems, such as wetlands, virgin longleaf pine forests, and to restore degraded natural systems to a functional condition. Policies include the promotion of agricultural practices which are compatible with the protection of wildlife and natural systems, as well as the conservation of forests and wildlife to maintain their environmental, economic, aesthetic, and recreational value, and the encouragement of the multiple use of forest resources, to provide for timber production, recreation, wildlife habitat, watershed protection, erosion control, and maintenance of water quality. The State Comprehensive Plan also espouses the goal to maintain and strive to expand food, agriculture, ornamental horticulture, forestry, and related industries in order to compete in the national and international marketplace. One of the specific policies associated with this goal is to conserve soil resources to maintain the economic value of land for agricultural pursuits and to prevent sedimentation of state waters.

b. Right to Farm Act

A recent amendment to the Florida Right to Farm Act [823.14(6), F.S.] expressly prohibits a local government from adopting any ordinance, regulation, rule or policy to prohibit, restrict, regulate, or otherwise limit an activity of a bona fide farm operation on land classified as agricultural land pursuant to 193.461 F.S., where such activity is regulated through implemented best management practices developed by FDEP, FDACS, or the water management districts and adopted under Chapter 120 as part of a statewide or regional program. There is currently uncertainty about which activities fall within the scope of the preemption.

c. Silvicultural Best Management Practices

Applicability

The Silvicultural BMPs manual establishes practices that are designed as “the minimum standards necessary for protecting and maintaining the State’s water quality as well as certain wildlife habitat values, during forestry activities. As such, they represent a balance between overall natural resource protection and forest resource use” (FDACS 2000).

As indicated in the foreword to the 2000 revision, BMPs were developed specifically for silviculture and are intended to be applied on all such operations. However, they are not intended for use during tree removal or land clearing operations associated with development or other activities that have non-forestry objectives.

The BMPs are intended for implementation on all silvicultural operations regardless of whether or not the operation is subject to other regulatory standards or permits. “Anyone who desires to conduct silviculture activities that are not in compliance with this manual must necessarily seek and obtain a permit from the appropriate local, state, and/or federal government agency prior to conducting the operation. In addition, the maintenance of state water quality standards is required during all silviculture operations.”

Implementation of silviculture BMPs is primarily done through an educational format, designed to transfer BMP technology to forest practitioners through workshops and field demonstrations. Currently, DOF personnel conduct 10-15 workshops annually, involving approximately 500 participants per year. In addition, DOF provides BMP training directly to loggers through the Florida Forestry Association’s Master Logger Program. To date, over 600 loggers have become Master Loggers, and over 200 of those have completed an additional six-hour BMP Continuing Education Course.

Compliance with BMPs

Since 1981, biennial monitoring has been conducted to determine compliance with BMPs. In 1999, the DOF completed its tenth statewide compliance survey. The survey is conducted throughout the state, on a random sample of recent forestry operations. Evaluations are conducted in the field by the County Forester, with oversight by the DOF’s Watershed Specialist. County Foresters were responsible for contacting landowners prior to visiting each survey site to authorize access and solicit their participation during the survey process.

Through 1997, over 1500 individual forestry operations have been evaluated, with an average statewide compliance of 92% (DOF, 1999). The 1999 survey included 199 sites: 117 sites on private non-industrial forestland, 72 on industrial forest land, and 10 on public forest lands. The range of compliance scores was 57% to 100% statewide. Nine instances of noncompliance constituted a significant risk to water quality. These were associated with stream crossings, timber harvesting, SMZs, site preparation, waste disposal, and wet weather operations. Recommendations for bringing these sites into compliance with BMPs were adhered to based on follow-up site evaluations by DOF.

Historically, the most chronic and long-term sediment problems associated with silviculture are directly attributable to forest roads. According to the 1999 survey, the most common incidence of noncompliance in this category was failure to stabilize fill material associated with the crossing. In addition, most noncompliance with respect to timber harvesting and site preparation was associated with harvesting

practices within SMZs and with pushing logging debris into wetland edges. The installation of windrows in wetlands has also been identified as an area of concern.

Each of the types of non-compliance identified in the 1999 compliance survey has been observed in Alachua County and has been reported to ACEPD in the form of complaints from citizens, even if not directly observed during biennial compliance audits.

Although the state reports generally high rates of implementation, compliance rates vary depending on the ownership and BMP category. The Southern Forest Resource Assessment has found that overall BMP compliance tends to be highest on public and industrial private land and lower on nonindustrial private land. Direct landowner assistance improves proper BMP implementation.

Further, activities that fail to follow BMPs potentially have adverse environmental effects on soils, water quality and quantity, native vegetative communities, and wildlife, comparable to effects of many traditional development activities. For example, the major potential non-point source pollutant resulting from silvicultural activities is sediment from roads and skid trails. Other impacts on water quality include increases in peak flows during storms, increases in nutrient concentrations (primarily nitrogen and phosphorus), increases in herbicides/fertilizers and derivative products, and thermal pollution (increased stream temperature). Elevated levels of organics and nutrients may result from leaching of disturbed or exposed soils. Fertilizer applications may alter stream chemistry in managed forests, depending on the type of fertilizer used and how it is applied. Forest cover, riparian habitat, and streambank management are vital to maintaining and increasing water quality (Southern Forest Resource Assessment, 2001).

Effectiveness of BMPs

The importance of BMP compliance is clear. Many states have studied the effectiveness of BMPs and found their use significantly improved stream water quality. Effectiveness measures included such attributes as protection of nitrate and suspended sediment levels, water temperatures, and aquatic habitat conditions.

A BMP effectiveness study has recently been completed in Florida. Four sites were selected across northern Florida, and each site was associated with a stream adjacent to intensive silviculture treatment. A stream bioassessment was conducted before and after treatments which included clearcut harvesting, intensive mechanical site preparation and machine planting. All applicable BMPs were followed, including a primary special management zone along the treatment section of the stream. Treatments were conducted on only one side of the stream within the treatment area at each site. According to the BMP manual, roads, primary skid trails, clearcut harvesting, and mechanical site preparation were prohibited within the primary SMZ. Timber harvesting was limited to 50% of the stand, with no harvesting of trees in the streams or on the immediate stream banks.

One year after the first bioassessments and following the treatments, no significant difference in the stream condition index was observed that could be attributed to treatments using BMPs. However, because only one post-treatment bioassessment was conducted, less than a year after treatments, there is some question about BMP effectiveness over longer periods. The study has been extended to include additional bioassessments at 2 and 3 years beyond the initial sampling, and possibly some additional treatments. The primary SMZ is considered the most crucial BMP for protecting water quality and ecosystem health. Specifically, harvesting timber without observing a primary SMZ would likely result in elevated water temperatures, increases in sediment delivery and turbidity, and altered inputs of detritus and woody debris (Adams et al., 1995).

The study concluded that where BMPs were properly applied, water quality, aquatic habitat, and overall stream ecosystem health were protected. As stated in the forward, although many of the relationships between silviculture activities and impacts to natural resources have been well quantified, many others have not (FDACS 2000).

2. Local approach: Alachua County

A varied menu of policy tools is available to Alachua County to address these issues. Selecting the most effective and efficient set of tools for a specific issue should be an ongoing process. However, in view of the state mandate, ignoring agricultural activities and their potential impacts to the environment is not an option. With loss of natural systems functions comes loss of agricultural viability. Comprehensive Plan policies are designed to provide minimum standards for protection of water quality and quantity, native vegetative communities, wildlife and habitat, as well as sustainable agriculture.

Recognizing that agricultural and silvicultural activities are so integral to the economy as well as to the environmental quality of Alachua County, a specific objective and set of policies on agricultural and silvicultural activities have been created. The County seeks to encourage the sustained productive use of farm and forest lands as a means of maintaining economic balance, conserving natural resources, and providing open space within the County.

Policies under Objective 5.5, in conjunction with policies under Section 6 of the Future Land Use Element, seek to protect the County's agricultural resources by encouraging productive use of farm and forest land, carefully managing the farm and forest ecosystem, protecting farm and forest resources, discouraging the development of land uses that conflict with farm and timber land management, and encouraging participation in various certification and conservation programs. In addition, policies require BMPs and encourage environmental stewardship through a combination of strategies such as participation in voluntary certification programs, land acquisition, and education and outreach.

The choice between regulatory or voluntary programs is a difficult one. Agriculture and forestry have traditionally depended on voluntary programs based on education, technical and financial assistance. A voluntary approach avoids the problems inherent in regulating potential non-point sources. However, voluntary change is most effective when it produces significant personal economic benefits. Adoption of practices that do not significantly improve profitability or solve management problems will be modest, at best, in a voluntary program (Smith 2000).

Farm and Forest predicts that much of the role of encouraging good conservation management will shift to local general government and its land use regulations in the 21st century. Consistent with this forecast, the Southern Forest Resource Assessment points out that, although direct regulation of forestry is limited in the rural south, a proliferation of local regulations affects land use and forest management in urbanizing areas. According to the report, local regulations nearly doubled between 1992 and 2000, and the number of regulations affecting forest treatments are expected to continue to expand in high growth areas. USDA's technical and financial assistance programs are overwhelmed by the sheer numbers of owners involved, and all indications point to a worsening situation in that regard.

Ownership trends in Alachua County mirror national trends in loss of medium sized ownerships. From 1992 to 1997, the number of small farms (less than 50 acres) has increased in Alachua County from 607 to 629, while the number of large farms (greater than 50 acres) has decreased from 482 to 457 (1997 Census of Agriculture). In Alachua County, nonindustrial private landowners are the most numerous and own the largest forest area at 57%, while industrial owners own 41%, and public land comprises 2% of

the forest ownership as of 1995 (IFAS, 2000). Landowner studies show convincingly that, as plot sizes get smaller, management attention wanes and the use of professional management advice declines (Farm and Forest, 1998).

A landscape comprised of fragmented ownership patterns is a complicated setting in which to achieve any kind of coordinated land management strategy. According to Farm and Forest, we may have the science to understand what needs to be done, but we clearly lack the social institutions needed to apply what is known. Both soil and water conservation and private land forestry need a new strategy for the 21st century.

The policies proposed in this plan consider development impacts to the functions of existing natural systems supporting farmlands that go beyond the boundaries of a particular piece of property. If the County, through its permitting function cannot anticipate the costs of clean air, soil characteristics and water, then it should not permit activities that do not replace or repair lost functions. In essence, this is a “level of service” or “concurrency” concept applied to the rural and open spaces of our County - the “green” infrastructure. Proper stewardship of the resources supporting farming is the responsibility of the entire community. The land provides a greater value to the community as a whole than simply the crops produced. Thus, the community must address how the land is used and preserved for both individual economic growth and the well-being of the entire community.

The County will continue to work with various agencies and landowners to promote ecosystem management and preservation activities. Specific strategies are discussed below. These include intergovernmental coordination, working partnerships, BMPs compliance and effectiveness, education and outreach, technical assistance, enforcement of existing County regulations, certification and incentives, and farmland protection strategies.

a. Intergovernmental coordination

The County should take steps to improve coordination with agencies that are already involved in the regulation of agricultural and silvicultural activities in order to eliminate duplication while at the same time addressing local concerns. Relevant agencies may include the state Department of Agriculture and Consumer Services (FDACS), Division of Forestry (DOF), Department of Environmental Protection (FDEP), water management districts, Army Corps of Engineers (COE), Natural Resources Conservation Service (NRCS), and other appropriate agencies.

To this end, the County will officially request and encourage the water management districts, as well as state and federal agencies, to give notice to and coordinate with the County on any pending, contemplated, or proposed actions regarding agricultural and silvicultural activities in Alachua County. The County will request to be copied automatically on permit applications, approvals, compliance and enforcement issues, and other significant contact with these agencies, in a timely manner which affords the County an opportunity to provide meaningful and constructive input regarding activities affecting natural resources within Alachua County. The County will encourage state and federal agencies to address adverse impacts on citizens and communities of the County, including environmental, health, safety, private property, and economic impacts.

The County will coordinate with agencies involved in the regulation of farming and timber harvest operations to ensure that County conservation goals are achieved. This includes participating in compliance audits, site visits and inspections conducted by DOF, DEP, FFWCC, and the water management districts in Alachua County. It is hoped that, through this participation, we may cultivate a

dialogue that includes information-sharing on local natural resources concerns. In addition, the County will look to these agencies as preliminary sources of information when questions arise as to particular activities on a given site in Alachua County.

The County will work closely with agencies involved in the management of forest ecosystems and coordinate with state and federal agencies, private landowners, and private conservation groups in habitat preservation and protection of listed species, to ensure consistency in efforts and encourage joint planning and development of areas to be preserved.

b. Working partnerships

The County must take steps to develop working partnerships with owners and operators of farm and forestry lands and associated products businesses in Alachua County. Both formal and informal mechanisms should be developed to exchange information on local issues and concerns and create solutions that are supportive of farming and forestry while being protective of natural resources within Alachua County over the long term.

The Alachua County Forestry and Agricultural Coalition has already taken significant steps to reach out to the community and embrace the partnership concept. The Coalition is a consortium of agricultural and silvicultural land owners, operators, and resource personnel that formed in the spring of 1999 in response to a local land clearing issue. Members include the Alachua County Farm Bureau, Alachua County Cattlemen's Association, Florida Forestry Association, Rayonier, Inc., Loncala, Inc., The Timber Company, Natural Resource Planning Services, Inc., F&W Forestry Services, Inc., and numerous individual farmers and foresters.

The Coalition was one of four groups of stakeholders that participated in the Alachua County Consensus Project in the spring and summer of 2000 as part of the Comprehensive Plan Update process. As part of the Consensus Project, staff provided assistance to each of the four emergent stakeholder groups and asked them to consider policies contained in a series of six Issue Papers. The Coalition met together for long hours over several months, working through their concerns, and presented findings for their group in writing. Staff later met with the Coalition to clarify information, ask questions, and collect the ideas presented by the participants. The results identify stakeholder positions and ideas.

The diverse ideas emerging from the issue paper phase of the Comprehensive Plan update offer staff new perspectives and possibilities. Moreover, the potential exchange between the Coalition and other stakeholder groups, representing environmental, development, and social concerns, provides an opportunity for deeper understanding of what is best for the community as a whole. This is especially true when the discussion extends beyond special interests and the bureaucratic process.

The Coalition's continued participation in the Comprehensive Plan update, and willingness to work with County staff and other members of the community in a new forum, represents a tremendous step towards transforming a potentially adversarial climate into one where participants can seek creative solutions to the issues facing Alachua County. We hope to continue to build this partnership in follow up to the Comprehensive Plan update. As one certain step, we will proactively seek input from a broad range of members in the agricultural and silvicultural communities during the drafting of local environmental and land development regulations.

c. BMPs compliance and effectiveness

The County should take steps to improve compliance with and effectiveness of BMPs in Alachua County. For example, the County should request that BMPs workshops be held regularly in Alachua County on a periodic basis. By encouraging attendance of landowners, farmers and loggers who work in Alachua County, and targeting local issues for presentation, we can help owners and operators help themselves, and improve stewardship of natural resources in the process. We should also ensure through certification that loggers have appropriate skills and training to comply with Silvicultural BMPs, and prevent bad actors who knowingly fail to comply with BMPs from conducting business in Alachua County. Along similar lines, we can recommend that logging contracts contain damage liability clauses and requirements to conform to BMPs.

Another avenue to pursue will be participating in meetings and field visits of various BMPs technical advisory committees. Although, for instance, the silvicultural technical advisory committee meets only every two years, the meetings still afford the opportunity to provide input regarding local issues the County may feel are inadequately addressed in the statewide BMPs.

Finally, the County will work with the FDACS, as well as other agencies and landowners to continue to evaluate the effectiveness of BMPs with regard to farming forest management practices, such as clearcutting, that have potential visual and environmental impacts; use of prescribed burning; protection of biological, soil, and water resources; and protection of old growth forests in Alachua County. If the BMPs are determined to be inadequate, we will collaborate on strategies to address inadequacies.

d. Education and outreach

One challenge to the County, in implementing these policies, is to educate and inform the public concerning the benefits of conservation through a direct education and outreach program. While the County can't force people to take advantage of educational opportunities, it remains obligated to make the information available to people in an easily understandable format. Although it contains policies focusing on public participation, the Comprehensive Plan adopted in 1991 makes little reference to the need for public education and information, a necessary antecedent to meaningful input. Proposed policies in section 2 of the Conservation Element address this concern.

There are numerous outreach efforts that have an established track record in Alachua County, such as the County Extension Office, IFAS, DOF, and the county and state Farm Bureaus. These entities offer educational and outreach programs, as well as technical assistance, that are intended to enhance environmental quality. We aim to coordinate with and participate in these established efforts.

Stewardship management plans and multi-resource practices can help enhance forest and ecosystem health across the entire landscape. According to the USDA, the 9.9 million non-industrial private forest landowners control 48% of the nation's forests, but less than 10% of them have a written management plan. As part of our efforts to develop partnerships and cooperative efforts, the County will encourage forest owners to consult with professional foresters in the management of their forests. Consulting foresters provide technical assistance on all phases of forest management for a specified fee or under contract. Lists of individual consultants, consulting firms, and forest industry consultants are available. In addition, County extension agents are foresters and agricultural experts who provide educational programs for landowners, answer forestry questions, distribute publications, and refer landowners to other forestry related services and industries.

e. Existing County regulations

Existing County regulations incorporate four basic concepts of a program that addresses silvicultural activities and natural resources protection:

- Mandatory compliance with statewide BMPs as the minimum standard.
- Signed agreement to comply with statewide BMPs on file for wetlands activity.
- Forest management plan required subject to County review.
- Notice of activity required prior to harvesting, site prep, land clearing.

This approach incorporates procedures aimed at addressing local concerns with BMPs implementation. Rather than prescribing additional technical standards other than those included in BMPs, the focus on BMPs compliance and effectiveness fills temporal and spatial gaps in, rather than duplicating, statewide compliance and effectiveness efforts. Where statewide compliance is evaluated every two years, audits are conducted on less than a handful of sites within the north central Florida region, and the technical advisory committee meets every two years to discuss BMPs effectiveness, Alachua County may address local concerns which affect natural resources in Alachua County as the concerns arise.

Tree removal or land clearing operations associated with development or other activities that have non-forestry objectives, for which BMPs are not intended, are considered development activities subject to the policies in this element and applicable land development regulations.

In working with landowners on BMPs, the County may wish to discuss techniques that are recognized as preferred or suggested within the BMPs for attaining natural resource protection goals. For instance, there are higher levels of protection recognized in the BMPs for special management zones and forested wetlands. Certain sites may have such special resource characteristics that harvesting using alternatives to clearcutting is required in order to protect the resource.

f. Certification and incentives

The County will encourage and support conservation programs on private farms and forests, to the extent that these programs remain viable, funded options in Alachua County. The County will facilitate and encourage qualified landowners to enroll in various certification and conservation programs, including the TDR program. The County will discourage the development of land uses that conflict with agricultural and silvicultural activities.

The County will also take proactive steps to create enhanced opportunities for private service providers. As opposed to public programs, where the supply of assistance is set by political decisions in a highly competitive public policy setting, private supply can respond to increased demand and higher prices. Where local forestry and erosion and sediment control legislation demands a plan prepared by a qualified professional, private consultant businesses will thrive. Those demands aren't likely to be filled by NRCS technicians and state foresters, whose numbers couldn't begin to respond to the need.

The Forest Management Trust in Gainesville is in the process of preparing a proposal that would have the County (and possibly other public and private partners) fund a "scoping study" for FSC certification of all public lands within Alachua County, and may allow for private landowners to piggyback onto this effort for a modest fee. The results of this scoping should be an analysis of potential benefits, as well as a checklist of what each landowner would need to do to be eligible for FSC certification and how much the direct and indirect costs of doing so might be.

g. Farmland protection strategies

State and local governments have taken the lead in encouraging farming and protecting farmland for more than 40 years. All states provide property tax relief for owners of agricultural land and protection from nuisance lawsuits for farmers. Many states have additional programs that are designed to prevent farmland conversion and improve the economic viability of farms. In most jurisdictions, agricultural uses are allowed by right in virtually any land use or zoning district, provided minimum lot or acreage requirements are met. Some local communities also use comprehensive land use planning and farm-friendly zoning ordinances to control growth in agricultural areas. Some counties and towns also have purchase of agricultural conservation easement (PACE), agricultural districts, and other programs to protect farmland.

Some farmland protection tools rely on regulations. The advantage of regulatory strategies is that they can be put in place relatively quickly, and do not require governments to spend a lot of money. But new land use regulations are often controversial, and laws can always be changed--they don't guarantee that farmland will be protected in the long term.

Other programs give farmers economic incentives to keep their land in agriculture. These programs are voluntary, and they are usually more popular than regulations. But they may also be more expensive, and they may not be able to protect large blocks of land. For an overview of the different farmland protection tools and techniques, see Inset 20.

The rural area encompasses unique farmlands and wetlands. It is to be preserved primarily for agricultural use if possible. If not, it may be developed only at low residential densities. To preserve the area for agricultural use, several programs are offered, including unique development options targeted to achieve the goal of farmland protection and agricultural perpetuation. It is through this combination of public action and private development that a viable program for the protection of farmlands and the perpetuation of agriculture will occur.

Identification of prime farmland

As described in several locations in this data and analysis, much of the area in Alachua County is used for agriculture, and agriculture is the most significant industry in the region. Though the importance of farmland and farmland protection is recognized by federal and state law, local planning and zoning has in the past neglected the issue of prime agricultural land and the conflicts that arise between expanding development and successful farming.

The USDA defines prime farmland as the land best suited to food, feed, forage, fiber, and oilseed crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment. The County *Soil Survey* not only contains yield data for crops and pasture, but also specifically identifies soils considered prime farmland. Consequently, the county *Soil Survey* provides a preliminary definition of prime agricultural land.

However, problems created by direct and indirect effects of development indicate that, within the context of land use planning and zoning, the definition of prime agricultural land must be based on more than the traditional measures of soil productivity and crop yields. Instead, prime or select farmland should be defined by a combination of productivity and location. In the rural and urban fringe areas of today, the distance to residential development is becoming an increasingly important spatial characteristic affecting production.

Prime agricultural land differs from other agricultural land designations in that it generally consists of highly productive soils. However, moderate and low productivity soils should be designated prime if such soils lie within, or are surrounded by contiguous areas identified as prime farmland. The inclusion of these soils may act to discourage development on the less productive or sloping soils of an otherwise prime agricultural area. Should such development occur, remaining prime agricultural land may no longer satisfy the requirements of a prime designation. Productivity is also a secondary factor when considering prime land designations in a rural area with confined feeding operations. Furthermore, "unique" farmland within metropolitan areas can be considered prime if it provides a community with demanded farm produce (often higher-valued crops such as fruits and vegetables), open space, scenic values, or related amenity benefits. Such benefits are important in a planning and zoning context since they are public goods and can contribute to a community's "quality of life."

The Earth Resources section of this data and analysis contains discussion of the identification of important agricultural soils in Alachua County, as well a maps of these soils. These include prime agricultural soils, as identified by the U.S. NRCS, and important agricultural soils, as determined by soil capability classes in combination with soil potential.

Regulatory strategies

While zoning is the primary method used to influence urban land use, relatively little zoning is practiced in rural and urban-fringe areas. Current planning and zoning practices provide only a weak device for retaining land in agriculture. Fortunately, unconventional zoning methods such as urban growth boundaries and clustering do exist to preserve prime agricultural land.

A comprehensive plan can form the foundation of a local farmland protection strategy by identifying areas to be protected for agricultural use and areas where growth will be encouraged. Policies in the Future Land Use Element of this plan provide for an urban growth boundary, designed to conserve natural resources and provide affordable housing and adequate public services.

Today, Alachua County joins the ranks of the many Florida counties looking for innovative planning measures to encourage cluster development and avoid the proliferation of five-acre ranchettes across the rural landscape. The conventional approach to development results in an entire development parcel being covered with house lots and subdivision streets. Clustering allows a substantial portion of every development tract in the rural area to be preserved as productive farmland or unbuilt open space, without decreasing the development potential for both landowner and developer.

Policies in the Future Land Use Element, as well as the Conservation Element, require clustered development approaches in order to facilitate the location of homes and associated buildings on specific portions of a geographic area or site, while leaving the remaining land for agricultural use, natural resource protection, or open space. Resource planning must occur early in the process to avoid sprawl and unintended inefficiencies in resource use. See the Future Land Use Element for further discussion of this topic.

Incentives

Public and private programs which provide landowners with voluntary incentives to maintain rural lands in low intensity agriculture and preserve natural communities need to be continued and expanded to encourage the participation of both small and large landowners. Many programs are not well promoted, involve burdensome paperwork and processing, and do not provide the monetary compensation necessary

to attract land owners. Incentive programs should target ecologically important areas, and information about the array of programs available, and how to navigate through them, should be made more widely and easily available to land managers.

Inset 20: Incentives for Farmland Protection

Tax Incentives

Differential assessment laws direct local governments to assess agricultural land at its value for agriculture, instead of its full fair market value, which is generally higher. Differential assessment laws are enacted by states and implemented at the local level. With a few exceptions, the cost of the programs is borne at the local level.

Differential assessment programs help ensure the economic viability of agriculture. Since high taxes reduce profits, and lack of profitability is a major motivation for farmers to sell land for development, differential assessment laws also protect the land base. Finally, these laws help correct inequities in the property tax system. Owners of farmland demand fewer local public services than residential landowners, but they pay a disproportionately high share of local property taxes. Differential assessment helps bring farmers' property taxes in line with what it actually costs local governments to provide services to the land.

Right-to-Farm Laws

Right-to-farm laws are a state policy assertion that commercial agriculture is an important activity. The statutes also help support the economic viability of farming by discouraging neighbors from filing lawsuits against agricultural operations. Beyond these protections, it is unclear whether right-to-farm laws help maintain the land base.

A local right-to-farm ordinance can serve as a formal policy statement that agriculture is a valuable part of the county or town economy and culture. Some require that a notice be placed on the deed to all properties in agricultural areas, cautioning potential buyers that they may experience noise, dust, odors and other inconveniences due to farming and ranching operations. Local ordinances help educate residents about the needs of commercial agriculture and reassure farmers that their communities support them.

Rural Land Stewardship Areas

In 1995, the Legislature created a section of state law dealing with "innovative planning and development strategies" (S. 163.3177, F.S.). That law was expanded in the 2001 Legislative Session to provide for the designation of Rural Land Stewardship Areas. Under this program, FDACS is authorized to test a new concept involving clustering development in rural areas and using the purchase of development and density rights to preserve the land around the development. The method referred to in the legislation involves the use of transferable rural land use credits. These credits can only exist inside a designated Rural Land Stewardship Area.

A local government may apply to the Department of Community Affairs for the establishment of Rural Land Stewardship Areas. Five such areas are authorized to be designated under this pilot program. Those approved will be subject to a joint agreement between the DCA and the local government.

According to the law, a stewardship area shall not be less than 50,000 acres and shall not exceed 250,000 acres in size. Designation of the receiving areas will take place by way of Local Comprehensive Plan amendments which will also be reviewed by the Department of Community Affairs.

One of the stated purposes of this legislation is to acknowledge the problem inherent with scattered development by attempting to use both innovative planning tools and transferable development rights to stop sprawl or spot development. The pilot is further aimed at exploring the potential for protecting environmentally sensitive lands and better preserving agricultural areas through this approach. The market will in large measure determine how successful it may be from a land preservation standpoint.

Among the unknowns of this new concept is what effect existing federal or state land conservation programs will have on the stewardship areas. No county has requested such a designation at this time, but Alachua County will investigate participation among its farmland protection strategies..

Transferable development rights (TDRs)

In addition to zoning, a county or local government can utilize transferable property rights to provide a more lasting means of preserving prime or select agricultural land. A program for transfer of development rights (TDR) allows landowners to sell their development rights to a developer. In turn, the developer may use them to develop qualified lands at higher densities than allowed under existing zoning laws. A TDR program allows local governments to steer development to desirable areas (such as those with sufficient infrastructure) while assuming little financial burden.

Purchase of development rights (PDRs)

Under a similar program for purchase of development rights (PDR), landowners can sell conservation easements to governmental agencies or nonprofit organizations. PDR involves the purchase of a deed restriction on qualified farmland that restricts the future use of the land to agricultural or open space uses, either permanently or for a specified period of time. While the farmer retains the right to sell or transfer the land, it remains subject to the deed restriction precluding any future development or activities that may negatively impact its agricultural viability. An owner of agricultural land may also donate a conservation easement to a governmental agency or charitable organization and receive a charitable deduction (see 26 U.S.C.. § 170 (h)(4)(A)).

Acquiring the financial resources needed to purchase development rights is the greatest hurdle for implementing a PDR program. Importantly, a planning commission/ordinance committee must carefully establishment criteria from which to determine a farm's eligibility for participation in the program. Criteria should specifically target key parcels that would preserve the county's agricultural potential and open space amenities.

Cooperative state-local PACE programs have some advantages over independent state or local programs. Cooperative programs allow states to set broad policies and criteria for protecting agricultural land, while county or township governments select the farms that they believe are most critical to the viability of local agricultural economies, and monitor the land once the easements are in place. Involving two levels of government generally increases the funding available for PACE. Finally, cooperative programs increase local government investment in farmland protection.

Conservation easements

Agricultural conservation easements are designed specifically to protect farmland. Grantors retain the right to use their land for farming, ranching and other purposes that do not interfere with or reduce agricultural viability. They hold title to their properties, and may restrict public access, sell, give or transfer their property, as they desire. Producers also remain eligible for any state or federal farm program for which they qualified before entering into the conservation agreement. Conservation easements limit land to specific uses and thus protect it from development. These voluntary legal agreements are created between private landowners (grantors) and qualified land trusts, conservation organizations or government agencies (grantees). Grantors can receive federal tax benefits as a result of donating easements. Grantees are responsible for monitoring the land and enforcing the terms of the easements.

Easements may apply to entire parcels of land or to specific parts of a property. Most easements are permanent; term easements impose restrictions for a limited number of years. All conservation easements legally bind future landowners. Land protected by conservation easements remains on the tax rolls and is privately owned and managed. While conservation easements limit development, they do not affect other private property rights.

Agricultural conservation easements are a flexible farmland protection tool. Private land trusts and other conservation organizations educate farmers about the tax benefits of donating easements, and state and local governments have developed programs to purchase agricultural conservation easements from landowners. In addition, agricultural conservation easements can be designed to protect other natural resources, such as wetlands and wildlife habitat.

Florida Rural Family Lands Act

The Florida Rural and Family Lands Protection Act was approved by the 2001 Florida Legislature as a state-level voluntary program aimed at offering financial payments to landowners for conservation agreements or easements. The purpose of the program is to prevent agricultural land from inappropriately converting to a development land use category. Environmentalists support the program as a means of protecting open space, fish and wildlife habitat. The agricultural community supports it as a way to preserve agricultural land and to help support farmers. The program, although authorized by law, has not yet been funded.

Once funded, landowners will be able to receive financial payments for one of the following arrangements: a protection easement lasting in perpetuity, a 30-year protection easement, or a 5-10-year protection easement. The easements are attached to the landowner's property deed. The easements may restrict the construction of buildings, roads, billboards, other advertising, or utilities; subdividing the property; dumping; or any activities that adversely affect the hydrology of the land, soil conservation, fish or wildlife habitat. The Act also requires that the landowner grant the state an option to purchase the property at the conclusion of the agreement or an extension of up to five years with the right to purchase attached.

The program is created through F.S. 570.70 and 201.15. The FDACS is given the responsibility for implementing the program. However, until funding is provided, FDACS is not prepared to enter into any agreements, although rule development is underway.

Voluntary agricultural districts

A landowner friendly form of exclusive agricultural zoning is the voluntary creation of agricultural districts. Agricultural districts are voluntarily designated areas where farming is the primary land use and other uses are discouraged or restricted. The benefits which farmers obtain by voluntarily joining an agricultural district may include differential assessment, protection against nuisance ordinances, and limits on public investments for nonfarm improvements.

This strategy stabilizes the agricultural land base by keeping large tracts of land relatively free of non-farm development. This can reduce the likelihood of conflicts between farmers and their non-farming neighbors. Communities can use agricultural districts to conserve a "critical mass" of agricultural land, enough to keep individual farms from becoming isolated islands in a sea of residential neighborhoods. Maintaining a critical mass of agricultural land can ensure that there will be enough farms to support local agricultural service businesses. By restricting the development potential of large properties, agricultural districts limit land speculation and help keep land affordable to farmers and foresters. Finally, agricultural districts help promote orderly growth by preventing sprawl into rural areas, and benefits farmers and non-farmers alike by protecting scenic landscapes and maintaining open space.

Mitigation ordinances

Mitigation ordinances are a new farmland protection technique. In 1995, city officials in Davis, Calif., enacted an ordinance that requires developers to permanently protect one acre of farmland for every acre of agricultural land they convert to other uses. Generally, developers place an agricultural conservation easement on farmland in another part of the city, although mitigation may also be satisfied by paying a fee. While most of the regulatory farmland protection techniques restrict the property rights of farmers, the Davis mitigation ordinance makes developers pay for farmland protection.

HUMAN-RELATED RESOURCES

Wildfire Mitigation

A. Introduction

During the last half of the 20th century, several growth-related issues have severely impacted the threat of wildfire on the public and its improved properties as well as wildland areas. As the population of Florida increased due to the migration of people from other areas, new development pushed into agricultural and native vegetation areas of our state. This happened not only because more space was needed for urbanization, but also because these new residents wanted to live among Florida's year round natural green foliage. Prescribed fire activities to manage natural fuels in these areas became unpopular as new residents did not understand the importance of fuels management and fire in Florida's ecology. New residents appreciated neither the smoke from natural or prescribed fire or the initial appearance of newly burned areas. The result was an approach to more often extinguish natural fire quickly and minimize the use of prescribed fire. We now have a large developed area of Florida with a "wildland/urban interface", where improved properties meet the natural environment (wetlands, grasslands, brushlands, and woodlands) and each is threatened (urbanization by wildfire, and wildlands by the increased opportunity for ignitions and destruction). The current interface exposure and wildfire potential far exceed the capabilities of local government and wildland fire agencies to both control and suppress wildfire while simultaneously protecting interface structures and residents.

B. Wildfires of 1998

In 1998 the threat of wildfire devastation hit home when wildfires in the vicinity of Waldo burned some 7,000 acres. This was one in a month-long array of firestorms that swept northeast Florida in June and July, causing hundreds of injuries and damaged homes, thousands of evacuations, and total damages of approximately 640 million dollars throughout this part of the state. FEMA declared Waldo and many other areas in northeastern Florida "disaster areas," making funds available to assist with fire fighting and response costs. Every year since has seen significant wildfire events in various parts of the state, as an extended drought has led to dry fuels that ignite easily and are difficult to extinguish.

Both FEMA and the Florida SDEM have offered that beginning in the near future disaster monies in the aftermath of severe community destruction will be available only to communities who have developed the Local Mitigation Strategy (LMS) and have begun mitigating the hazards. The wildland/urban interface is one of the most significant hazards in Alachua County and continues to grow along with new development and the urban sprawl that places humans and structures closer to forested wildlands.

C. Local approach: Alachua County

1. Local Mitigation Strategy

During 1998 and 1999, Alachua County spearheaded a cooperative effort with five of nine participating municipalities to develop a county-wide LMS. Participating municipalities were the Cities of Alachua, Archer, Hawthorne, Micanopy, and Waldo. The completed LMS was delivered to DCA on October 31, 1999.

The LMS identified as one of eight mitigation strategies the need to address the wildland/urban interface to prevent a replay of the wildfires of 1998. In follow-up, the County has begun a series of initiatives to mitigate the wildfire and interface problem through the implementation of Firewise principles, natural fuels management, and public education and information practices.

2. Firewise

New policies in the Comprehensive Plan require the application of Firewise principles in the planning, design, construction, and future maintenance of new development. These principles are intended to provide “passive” protection for homes and improved properties through the use of setbacks, firewise landscaping, structure design, exterior construction materials, structure siting on the property, and the maintenance of these features for the long-term protection of residents and property.

In the summer of 2002, the DOF is expected to complete a statewide wildfire hazards mapping and modeling project. This project will determine where moderate to high wildfire hazard areas exist based on features such as plant community type and development stage, canopy cover, hydrology, soils, slope, aspect, and elevation. Alachua County will use this information as the foundation for our mapping and ranking of wildfire hazard areas within the County. Firewise principles and land use controls will be applied in these areas in order to mitigate the potential wildfire hazard.

3. Natural fuels management

Wildfires will always be a natural phenomenon where there is frequent lightning and vegetation capable of igniting, and Florida certainly has ample quantities of both. We know that fire is a very important component of maintaining the health of natural systems. For thousands of years, wildfires have shaped the ecology of Florida. In addition to mimicking natural ecological processes, prescribed burning reduces the risk and severity of wildfire by replicating the frequent surface fires that once eliminated fuel build-up in the forests.

Although Florida is a national leader in prescribed burn acreage, the number of acres of private forest lands that are burned has been declining. Contributing factors include forestry economics, liability concerns, landscape fragmentation, regulatory process, fuel buildup, and loss of traditional knowledge. The Florida Prescribed Burning Act of 1990 provided liability protection for approved prescribed burning. However, this has not proved to be a sufficient incentive to increase prescribed burning on private forest lands.

In Alachua County, we do not attempt to prevent fire completely, and we recognize that not all wildfires are bad. The County has set the example to all by taking on natural fuels management on County lands, and by providing assistance to private land-owners and the commercial sector with appropriate practices to control the accumulation of natural fuels through prescribed burning, mechanical reduction/removal, and other appropriate measures.

4. Public Education

In addition, the County seeks to maintain a long term public education and information program for the public about the benefits of Firewise principles and the use of prescribed fire to the public both in terms of personal and home safety and the environment. On October 4, 2001, the County co-sponsored a “Firewise Communities in Florida” workshop in cooperation with the Florida Division of Forestry. This workshop brought together local policymakers, growth planners, developers, builders, financial institutions, citizens, and fire officials to discuss fire safe planning and development in the interface. The County will continue with similar outreach and education efforts to people who live and work in hazard areas.

D. Sources of information on wildfire in Florida

FireWise: the National Wildland Urban Interface Fire Protection Program: <http://www.firewise.org/>

Prescribed Fire Information from Florida Division of Forestry's Fire and Forest Protection Bureau: <http://flame.fl-dof.com/Env/fire.html>

Florida **Fire Weather** from Florida Division of Forestry's Fire and Forest Protection Bureau: http://flame.fl-dof.com/fire_weather/nws/

Florida Division of Forestry's **Wildland Fire Information:** <http://www.fl-dof.com/fire2001/index.html>

Florida Division of Forestry's **Wildfire Season Forecast:** http://flame.fl-dof.com/fire_weather/lr_outlook/seasonal.html

"**Fight Fire with Fire!**" is a web site designed for Floridians to learn how to protect themselves and their homes from the threat of wildfire. <http://www.prescribed-fire.org/>

A Guide for Prescribed Fire in Southern Forests, USDA, Forest Service Southern Region, 1989; Tech. Pub. R8-TP 11 by Dale D. Wade, Southeastern Forest Experiment Station; and James D. Lunsford, Fire Management, Southern Region, USDA Forest Service: <http://flame.fl-dof.com/Env/RX/guide/>

USDA **Forest Service's** Fire site: <http://www.fs.fed.us/fire/>

National Interagency Fire Center's site (all federal agencies responsible for fire management . Bureau of Land Management, Bureau of Indian Affairs, US Fish and Wildlife Service, National Park Service, US Forest Service, National Oceanic and Atmospheric Administration, Office of Aircraft Services, and National Association of State Foresters): <http://www.nifc.gov/>

Fire in Florida's Ecosystems: A fire ecology instructional package for Florida educators (training and materials) <http://pandionsystems.com/FIFE/>

Woods on fire (from the Why Files): This edition of The Why Files examines the role of fire in natural systems, and the role of science in understanding wildfires. http://whyfiles.org/018forest_fire/

Tall Timbers Research Station the originators of fire ecology research & education. Check out their Fire Ecology Literature Database! <http://www.talltimbers.org/>

For the latest KBDI (the Keetch Byram Drought Index . an index of fuel moisture): http://flame.fl-dof.com/fire_weather/kbdi/

HUMAN-RELATED RESOURCES

Hazardous Materials

A. Introduction

In 1983, the Florida legislature enacted the Water Quality Assurance Act to protect the state's water resources. One problem threatening these resources was improper management of hazardous wastes. This legislation required each county to conduct a local hazardous waste assessment. Alachua County responded with a report entitled Hazardous Waste Management Assessment for Alachua County, prepared in May 1987. Issues related to hazardous waste management at that time included the following: (1) improper management of wastes, estimated at 23% of all wastes, by improper landfilling, dumping or burying, disposal in a public sewer or septic tank; (2) the need for facilities for treating, storing, or transferring hazardous wastes generated by small quantity generators, including recycling and educational opportunities; (3) the presence of 29 identified abandoned dump sites, most of which were once used for municipal refuse; (4) known contamination sites with groundwater monitoring efforts in place; (5) other known and potential contamination sites identified by FDOT, FDEP, and ACEPD, including both petroleum and non-petroleum sites; (6) five existing sanitary landfills, only one of which is currently active (the Southwest Landfill).

Alachua County has taken an aggressive approach in responding to these issues over the last decade through the establishment and implementation of the Alachua County Hazardous Materials Management Code, the development and administration of the facility inspection program, state tanks compliance and petroleum remediation programs, the household hazardous waste collection program, and the brownfields program, and the cultivation of a coordinated interdepartmental approach to hazardous materials and solid waste in Alachua County.

B. Hazardous Materials Management Code

The Alachua County Hazardous Materials Management Code (HMMC) sets the framework for regulation of hazardous materials in Alachua County. The HMMC was initially adopted on April 15, 1991 and revised on January 25, 2000. The primary objectives of the HMMC are to:

- * Regulate the management of hazardous materials to prevent discharges to the environment.
- * Provide uniform standards for the proper storage, handling and monitoring of hazardous materials on a county-wide basis.
- * Provide Alachua County with legal authority to establish environmental monitoring, remediation, and closure requirements for contaminated sites.

The first two objectives are currently being achieved through an active enforcement and inspection program for the storage, management and disposal of hazardous materials. The third objective has been achieved through ACEPD's role in the monitoring, remediation, and closure of contaminated sites, as discussed later in this section.

Basic provisions of the HMMC include: siting prohibitions, construction standards, and management standards. The HMMC is applicable to all facilities within the county that transport, handle, or store hazardous materials. Facilities are classified according to their type of business. There are currently six classes within the HMMC (AA, A, B, C, D, T). There are over 1,000 regulated facilities in Alachua County (See Map 46).

The HMMC applies to commercial and governmental facilities only and does not apply to residential properties with the exception of the hazardous materials release reporting and remediation requirements. Residential underground fuel tanks are not regulated by this code. Before use of natural gas and electric heat pumps became common, homes were heated with kerosene or No. 2 fuel oil. As homeowners converted to other forms of heating, their fuel-containing tanks may have been improperly abandoned, creating a potential source for groundwater contamination. ACEPD has been unsuccessful in attempts to obtain funding for a Household Fuel Oil Recovery Program.

1. Facility Inspection Program

Current compliance with the HMMC is enforced through an on-going facility inspection program and response to citizen complaints. Inspections are performed at private, local, state, and federal facilities with the exception that the HMMC is currently not enforced at the University of Florida campus due to university officials’ claim of exemption. Inspection frequency is determined on size and complexity of operation. Future and potential hazardous materials compliance issues are identified through the participation of ACEPD staff in Alachua County and City of Gainesville development review processes.

Alachua County through the ACEPD has integrated the state required Small Quantity Generator (SQG) inspection and reporting program into the HMMC inspection program. Currently our database includes 1,0250 CESQG (Conditionally Exempt Small Quantity Generators), 47 SQG (Small Quantity Generators), and 8 LQG (Large Quantity Generators). Approximately 40% of the generators are inspected annually. Representative amounts and types of wastes generated by large and small quantity generators are listed in Tables 18 and 19 below.

Table 18. Hazardous Wastes Reported Amounts By LQGs in Alachua County (1995)

Generator	Pounds*
Eveready Battery Company, Inc.	3,012,209
PCR, Inc.	960,749
Beazer East, Inc. (Cabot Carbon/Koppers)	394,630
University of Florida	160,464
Bear Archery, Inc.	72,289
Hunter Marine Corp.	66,970
Metal Container Corp.	43,659
Farchan Laboratories, Inc.	37,708
Gainesville Raceway	26,853
US Dept. of Agriculture	2,626
Perma-Fix of Florida, Inc.	636

Source: FDEP Database

* Includes production and service process waste, cleanup waste and pollution control waste.

Table 19. Reported Amounts By Waste Types For SQGs in Alachua County (1996-1997)

Code	Description	Facilities	Pounds	Percent
A0	Toxic pesticide wastes d,u list	6	1,533	0.01
B0	Pesticide waste mixtures/waters	22	81,990	0.49
C0	Empty pesticide containers D, U listed	26	4,162	0.02
D0	Wastewaters with tc organics - e.g. benzene	14	49,648	0.30
D1	Condensate h2o from dry-cleaners	1	801	0.00
D2	Petroleum contact waters- pcw	5	203,070	1.22
E0	Sludges & solids with tc organics -also soils	13	59,575	0.36
F0	Dust and solids with heavy metals	24	1,699	0.01
G0	Wash, rinse & other wastewater w heavy metals	22	15,037	0.09
* G1	Spent anti-freeze w/ low lead (< 5 ppm)	184	* 614,282	3.69
H0	Sludges with heavy metals	3	67	0.00
I0	Waste ink-flashpoint<140 f and heavy metals	3	1,117	0.01
I1	Waste inks - flashpoint < 140 f	8	19,243	0.12
I2	Waste inks - contains heavy metals	1	315	0.00
	Ignitable paint wastes - flashpoint < 140 f	64	101,716	0.61
J1	Used paint thinner	44	16,269	0.10
K1	Paint stripper- > 10 % methylene chloride	4	425	0.00
L0	Spent solvents (Mix/other)	44	84,733	0.51
L1	Halogenated solvents-contains chlorine or fluoride	8	2,562	0.02
L2	Non-halogenated solvents-e.g. mineral spirits	30	14,627	0.09
L3	Mineral spirits-parts cleaner	273	178,585	1.07
L4	Spent acetone	12	26,510	0.16
L5	Spent methyl ethyl ketone(mek)	1	369	0.00
L6	1,1,1 trichloroethane or methylene chloride	4	8,466	0.05
M0	Solvent distillation bottoms	6	8,317	0.05
M2	Dist. Bottoms-non-halogenated	2	8,306	0.05
M3	Perchloroethylene still bottoms	12	10,392	0.06
M4	Absorbents with halogenated solvents	1	120	0.00
M5	Absorbents with listed non halogenated solvent	329	749,560	4.50
M6	Absorbents contaminated w/oil	10	8,420	0.05
N0	Dry cleaning filters	23	11,086	0.07
N1	Used perchloroethylene	1	203	0.00
O0	Reactive wastes - with cyanides or sulfides	5	287	0.00
O1	Cyanide wastes	2	52	0.00
O2	Sulfide wastes	1	0	0.00
P0	Acidic or alkaline wastes - ph<2 or ph>12.5	207	231,759	1.39
Q0	Spent plating wastes-from metal-plating, etc.	1	1	0.00
R0	Discarded gasoline, diesel or other fuels	24	49,520	0.30
S0	Photographic wastes-prim.fixant solution	210	168,745	1.01
S1	Photographic silver recovery cannister	3	115	0.00
T0	Other ignitable wastes - not I0,J0,L0 or R0	6	3,342	0.02

V0	Discarded unused or off-spec commercial chem	9	4,923	0.03
* W0	Lead-acid batteries	343	* 2,447,905	14.69
W1	Mercury oxide batteries	1	250	0.00
W2	Rechargeable batteries: pb-acid or nicads	4	4,625	0.03
W3	Fluorescent lamps	6	356	0.00
* Y0	Used oils & other lubricants	519	* 2,946,844	17.68
Y1	Metalworking (cutting) oils	1	30	0.00
* Y2	Crushed oil filters	384	* 8,504,762	51.04
Y3	Hydraulic oil	10	9,045	0.05
Y4	Used oil contaminated w/ halogenated haz waste	1	76	0.00
Z1	Carburetor cleaner	8	1,530	0.01
<u>Z2</u>	<u>Benzene, toluene, or xylene - spent</u>	<u>2</u>	<u>5,670</u>	<u>0.03</u>
TOTALS			16,663,042	100.00

Source: ACEPD SQG Database

* Predominantly recycled wastes.

2. On-Call Program

Alachua County, through the staff of the ACEPD, maintains a 24-hour a day, 7-day a week capability for notification of hazardous materials incidents. ACEPD has on-site response capabilities related to environmental concerns to provide technical assistance in the event of chemical and fuel spill incidents. This capability is primarily directed toward assuring that the appropriate clean-up of spills occurs through contact with principle responsible parties and insurance companies and environmental consultants. Cleanup costs are handled directly by the responsible party. For large spills and discharge incidents, ACEPD coordinates with and seeks the assistance of the FDEP Emergency Response Team, which assumes primary responsibility for clean-up and containment of large hazardous materials discharges. ACEPD staff responds to an average of 40 incidents each year. Most of these incidents were caused by traffic accidents involving commercial vehicles and usually involved spills of automotive fuel (diesel or gasoline).

Alachua County maintains good working relations with appropriate State and Federal environmental regulatory agencies. The ACEPD continues to maintain an active role in coordinating with state agencies and enforcement of state environmental regulations through referrals to FDEP and contractual agreements with FDEP for specific functions.

C. State Tanks Compliance and Petroleum Remediation Programs

Two programs of particular importance to the protection of the county's groundwater resources which have continued and increased in importance since 1991 are the enforcement and remediation requirements of the State Tanks Program and the Petroleum Contaminated Sites Remediation Program. These programs are funded by annual appropriations by the state legislature. The recent funding level for the State Tanks program has been stable in the last few years. The tanks program deals with the enforcement of construction and monitoring standards for existing and new underground tanks primarily for petroleum products. State funding for the petroleum cleanup(remediation) program was drastically reduced beginning in 1995 but has since stabilized at a lower funding level. The remediation program deals with cleanup of soils and groundwater that have been contaminated by petroleum products.

1. State Tanks Compliance Program

Alachua County through the ACEPD is contracted with the State of Florida to enforce Florida Administrative Code (FAC) Rules 62-762 and 62-761, governing regulated tank systems. This includes aboveground tank systems greater than 550 gallons and underground storage tank systems greater than 110 gallons that contain regulated substances, including petroleum product (gasoline, diesel, kerosene), oil of any kind, ammonia, chlorine, pesticides and derivatives thereof, and hazardous substances as defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

The focus of both rules is to prevent the release of regulated substances into the environment by providing standards for the construction, installation, maintenance and removal of the regulated storage tank systems. All new underground storage tank systems (tanks and associated piping) are required to be provided with secondary containment (primarily in the form of double walled construction) in order to improve the detection and containment of a release. All existing systems within the state and county are required to have been replaced with a double walled system as of December 31, 1998, unless the system is constructed of corrosion resistant materials, whereas replacement is not required until December 31, 2009.

All new aboveground tanks and underground integral piping are also required to be provided with secondary containment. Existing systems are required to have provided secondary containment as of December 31, 1999.

The rules prohibit the installation of a tank system within 50 feet of any potable water supply well. Additionally, effective July 13, 1995, pursuant to FAC Rule 62-521, no new storage tank system is allowed to be installed within 500 feet of a community water system or non-transient non-community water system. Before a system is closed, replaced or otherwise provided with secondary containment, a closure assessment must be performed to determine if a release has occurred by sampling soil and groundwater in locations where a release is most likely to have occurred. There is an obligation to report releases once they are discovered and undertake certain corrective actions following criteria found in FAC, Rule 62-770.

ACEPD inspects each facility at least one time per year and is onsite during installation and closure activities as well as during investigations of releases. There are approximately 275 facilities in Alachua County regulated by the state tank rules, as shown on Map 47.

2. Petroleum Contaminated Sites Remediation Program

Alachua County through the ACEPD is also under contract with Florida Department of Environmental Protection Bureau of Petroleum Storage Systems (FDEP) to manage the assessment and remediation of petroleum contaminated facilities in accordance with the requirements and provisions of Sections 376.3071 through 376.3073, F.S., and Chapters 62-770 and 62-771, F.A.C. Primary responsibilities include project management, review of hydrogeological and engineering related documents, analysis/interpretation of scientific and technical data, contract procurement, and fiscal support for the various FDEP petroleum cleanup programs. In addition, two subcontractors have been procured to perform cleanup activities for the state-administered cleanup program.

The number of reported petroleum contaminated sites has grown statewide and is anticipated to continue to do so, as more contaminated facilities are identified. Contaminated sites in the state program are scored based on several factors including the extent of contamination and potential endangerment to drinking water and other critical natural resources. Priority for clean-up actions is given to those sites with the highest scores on a statewide basis. Currently, there are approximately 310 petroleum contaminated sites in Alachua County - up from the original 60 sites reported - in all phases of cleanup. Since the establishment of the petroleum program in the County in 1988, seventy-eight facilities have been cleaned up, and 104 facilities have been prioritized for clean up. The number of facilities being cleaned up has been increasing steadily with time, and with the program heading in the direction of risk based corrective actions and natural attenuation, the number is expected to continue to increase.

Due to the more aggressive inspection and enforcement provisions of the County's HMMC and the increased identification and reporting of contaminated sites generated by the implementation of the state's Petroleum Contamination Cleanup Program, the number of petroleum contaminated sites within Alachua County has *increased* since 1991. Again this increase is not due to more pollution occurring within the county but due to a higher level of reporting and enforcement.

Updated locations of known petroleum cleanup sites are shown in Map 48.

D. Non-Petroleum Sites

In addition to the petroleum based contamination sites, several other several other contamination and potential contamination sites have been identified by FDEP and ACEPD in Alachua County. These fall under the non-petroleum based category of sites. Abandoned dump sites that are known to be contaminated are described below. Existing landfills and construction and debris landfills are discussed as sources of potential contamination. Additionally, ACEPD monitors the cleanup of contaminated dry-cleaning facilities under the FDEP Drycleaning Solvent Cleanup Program. The location of non-petroleum based cleanup sites is shown in Map 49.

For more information on these sites the ACEPD has background data and reports which give detailed accounts of each site. This information is available on request.

1. Abandoned Dump Sites

Dump sites are considered abandoned if they do not meet the FDEP requirements contained in Chapter 62-7 Florida Administrative Code. These sites are publicly or privately owned and were typically in use before enactment of federal or state regulations for hazardous waste management.

Information regarding abandoned dump sites was obtained from various sources. These included County staff (Public Works, Codes Enforcement, and Planning Departments and County Commissioners), County special use zoning permit files, the FDEP Sites List, citizens' reports, the FDEP Groundwater Pollution Source Inventory files and FDOT.

A total of twenty-nine dump sites have been identified in Alachua County. Many of these sites were used for landfilling by small municipalities such as Alachua, Archer, Waldo, Hawthorne, Newberry, High Springs, LaCrosse, Windsor, Orange Heights, and Arredondo. Although these sites have not been extensively investigated, they are generally less than ten acres in size and were used primarily for municipal refuse. The potential for industrially generated hazardous waste is felt to be minimal. Municipal refuse may contain unregulated hazardous waste in the form of commercial products (i.e., household pesticides, paints, or solvents). Groundwater or surface water monitoring is not currently being conducted at these sites. Also, several "old dump" sites are used by residents of Alachua County and the City of Gainesville. After cursory inspections, these old dumps appear relatively small in size and were used primarily for municipal refuse.

There are numerous sites that have some type of groundwater monitoring program in place or underway. Many of these sites are under investigation by the FDEP. Some have conducted groundwater monitoring and are presently under enforcement action by the DEP. Several sites are currently on the Department of Environmental Protection Sites List.

Many small dump sites are located throughout the County. ACEPD receives information regarding dumping primarily in the form of complaints. These small dump sites are primarily a litter problem. County staff inspect the sites and usually refer them to codes enforcement. The owner of the dump site property is responsible for cleaning up the site.

For more information on these and other sites the ACEPD has background data and reports which give more detailed accounts of each site. This information is available on request.

2. Existing Sanitary Landfills

A total of five solid waste facilities were permitted for operation in Alachua County. One site, the Southwest Landfill near Archer, is active. The Southwest Landfill is designed to accept only non-hazardous waste. Three of the four remaining sites are former county landfills which are now closed. All four of the county landfills have groundwater monitoring plans approved by FDEP. The fifth site is an inactive industrial landfill owned by Gates Energy Products (formerly General Electric Company).

More detailed information on solid waste operations, disposal and recycling can be found in the Alachua County Solid Waste Element.

3. Construction & Demolition Debris Landfills

The FDEP has established standards for the construction, operation, and closure of public and private solid waste management facilities to minimize their threat to public health and the environment. These standards are contained in Chapters 62-701 through 62-722, FAC, implementing various sections of Ch. 403, Florida Statutes. Rule 62-701.730, FAC, contains standards and permitting requirements applicable to disposal and recycling of construction and demolition (C&D) debris. C&D debris is defined broadly as discarded materials generally considered to be not water soluble and non-hazardous in nature resulting from renovation, demolition, and construction activities. Thus, these facilities are not required to construct liners or leachate collection systems. FDEP requirements for C&D landfills were originally adopted in 1989 and amended in 1993, 1996, and 1997. Recent amendments tightened the requirements for C&D operations. New C&D operators may no longer operate under a general permit but must obtain a specific permit. Current operators must submit a groundwater monitoring plan and a hydrogeological investigation, have trained spotters on site, provide financial assurance, and meet other requirements. Any operators found to be accepting C& D debris after 4/1/98 must comply with these new requirements. FDEP inspects facilities approximately three times a year to enforce these regulations.

Current C&D operators that do not want to comply with the new State C&D regulations may restrict their operations to acceptance of “clean debris,” defined as “any solid waste which is virtually inert, which is not a pollution threat to ground water or surface waters, is not a fire hazard, and is likely to retain its physical and chemical structure under expected conditions of disposal or use. The term includes brick, glass, ceramics, and uncontaminated concrete including embedded pipe or steel.” (The term “uncontaminated” is not defined in the rule.) Clean debris is not considered solid waste and is not regulated by the State of Florida. As a result of these recent amendments, it appears that many private C&D operators may opt to receive only those wastes classified as clean debris.

Alachua County has also regulated C& D landfills since at least 1980 (Alachua County Code, sec. 393.13, last amended in 1992). The ordinance requires a Special Use Permit for any excavation and/or filling of land in the unincorporated county, with specified exceptions. Filling is allowed with construction and demolition (C&D) debris, as defined in the ordinance. Excavation & fill operations are generally not allowed in Conservation areas, defined generally as wetlands, floodplains, surface waters, and areas adjacent to water bodies. Land use guidelines are otherwise very general, favoring location in rural/agriculture areas and discouraging location adjacent to existing residential areas. Maximum depth of excavation areas is 15 feet above the Floridan Aquifer in areas where the aquifer is unconfined. Design and operation standards also apply. Inspections are carried out weekly by the Office of Codes Enforcement to determine compliance with SUP conditions but not to conduct environmental (for example, soil or water) testing of any kind. A substantial revision of the county’s C&D ordinance was proposed in 1994, but was not adopted.

E. Household Hazardous Waste Collection Program

The County has taken a proactive approach to hazardous waste management with the development of a Household Hazardous Waste (HHW) Collection Program. Household Hazardous Waste (HHW) is any discarded, useless or unwanted chemical, material, substance, or product that is or may be hazardous or toxic to the public or the environment, and is commonly used in or around households. In general, HHW is waste produced through the use of household products that are either ignitable/flammable, explosive/reactive, corrosive, or toxic. These types of wastes, when generated through household use, are not regulated by the EPA as hazardous wastes and can therefore be combined with other solid waste for sanitary landfilling. These wastes, however, are often identical to wastes generated by area businesses, which are prohibited from sanitary landfilling and are regulated stringently by EPA. Because of the large volume of hazardous wastes generated annually by homeowners, it can present acute or chronic health hazards and have a negative impact on the environment, particularly if improperly disposed of.

The purpose of the County's program is to minimize the amount of HHW entering the solid waste stream to reduce the environmental hazards associated with local landfills and to prevent the release of hazardous materials to the soils, air, groundwater, or surface water in the County. Public education and resource conservation through beneficial reuse and recycling of collected materials are also important program goals.

In 1986, Alachua County initiated its Household Hazardous Waste Collection Program with a three-day collection event called "Amnesty Days." Another collection event was held in 1988 and funding was obtained from Florida Department of Environmental Regulation to establish permanent collection sites. Starting in 1990, semi-annual, three-day collection events were instituted during the months of September and April. An average of over 4,100 cars were served and 292,000 pounds of materials were collected annually through the program for the 1991-1999 period.

This program has grown such that the county established a permanent HHW Collection Center at the Leveda Brown Environmental Park and Solid Waste Transfer station site in October 1999. The center, located at 5125 NE 63rd Avenue is open Tuesday thru Friday from 8:30am to 5:30 pm and Saturday from 8:00am to Noon. The HHW collection center was established to provide convenient, efficient, and environmentally protective mechanism for the collection, disposal and re-use/recycle of household chemicals and hazardous wastes generated by residents and small businesses. Materials collected at the center include: poisons, flammable liquids, corrosives, used motor oil and filters, brake fluid, transmission fluid, automotive batteries, antifreeze, gas, paints and other surface coatings, aerosol containers, dry cell batteries, fluorescent lamps, cleaning products, pool chemicals, propane tanks and end of life electronics (e-scrap). Alachua County manages HHW at the Household Hazardous Waste Collection Center and at five Rural Collection Centers (shown on Map 50). Hazardous materials collected at the RCC are limited to fluorescent lamps, used oil, oil filters, paint, batteries, flammable liquids, e-scrap and aerosol cans. Additionally, selected items can be disposed at several local businesses.

In the first two years of operation at the HHW collection center, the HHW program provided services to over 26,000 customers. This includes over 7,800 drop-off customers, 600 small businesses and 1,100 re-use/recycle customers at the HHW Collection Center and over 17,000 customers at the five RCCs. Over 1,348,000 pounds of hazardous waste, recyclables, reuse products and solid waste were processed and properly disposed during that time period.

Additional HHW program services and functions include: 1) Collection and processing of HHW from the five Rural Collection Centers (RCCs), 2) mobile HHW collection events in the County's smaller cities and neighborhoods, 3) operation of a re-use/recycle area for household chemicals and paint, 4) a recycled latex paint give-away program, 5) community outreach events and 6) assistance to neighboring counties for HHW collection events. For additional discussion on the County Household Hazardous Waste Management Program and Small Business Hazardous Waste Management, consult the Solid Waste Element, or contact the ACEPD.

HHW received through the County's program is managed in accordance with federal and state hazardous waste regulations and the Department of Transportation (DOT) requirements. ACEPD staff involved with Hazardous Materials have a 40-hour OSHA training and 8-hour annual refresher. Businesses meeting EPA's definition of Conditionally Exempt Small Quantity Generators (CESQG) are encouraged to use the HHW Collection Center. The businesses are charged a fee for disposal costs, and are provided a waste disposal receipt as required by state and local environmental laws.

Since 1993, Alachua County has also been serving as a host County for Gilchrist, Dixie, and Lafayette Counties under Florida's cooperative collection center grant program. Columbia County was added to the program in 2000. Per interlocal agreement, Alachua County receives HHW from each of these counties and is reimbursed for its expenses by Florida Department of Environmental Protection (75%) and the benefitting county (25%). ACEPD has also received competitive matching grant funding for three unique and innovative projects. The first involved an educational campaign and establishment of collection sites for fluorescent lamps and mercury-containing devices. The second focused on the collection of canceled, suspended, and unusable pesticides from the agricultural community. The third was for the collection, processing and de-manufacturing of end-of-life electronic equipment (e-scrap).

F. Brownfield Initiatives

"Brownfields" is a term coined to describe parcels of land where known or suspected contamination presents a barrier to reuse and redevelopment. Recent federal legislation is removing many barriers to redevelopment due to the threat of environmental liability. In 1997, the Florida Legislature passed a brownfields incentive program to encourage the redevelopment of contaminated properties. This program does not provide significant state funding for local brownfield sites except on a demonstration project basis. However, incentives include tax breaks and regulatory relief for qualified sites.

The County's involvement with brownfield sites is currently focused on one site. ACEPD is involved in an advisory and technical oversight role in the East Gainesville Sprout Project (EGSP), a City of Gainesville economic redevelopment effort focused on the rehabilitation of the Depot Avenue/South Main Street/Downtown corridor. This project has received funding from the U.S. EPA and the State of Florida as a brownfields pilot project.

As part of this EGSP effort, a cooperative electronic database / GIS system has been developed by the University of Florida Geoplan Center. The GIS compiles environmental data about the East Gainesville Sprout Project area from ACEPD, FDOT, SJRWMD, FDEP and City of Gainesville sources into a single information bank for inventory and analysis purposes. Additionally, this information resource is to provide summary economic development information over the Internet for all interested parties.

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RECREATION ELEMENT DATA AND ANALYSIS

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INTRODUCTION

The information presented in this Element identifies the current recreation sites within Alachua County that are available to the public. Examination of these sites including types of facilities, availability to the public, demand for additional recreation sites and existing undeveloped recreation

Recreation Element....iii

acreage were used to project future needs and to provide guidance for adopting the proposed Goals, Objectives and Policies.

The recognition of recreation as an integral part of a community's quality of life has led Alachua County to pursue the completion of a County-wide Recreation Master Plan. This master plan will present the existing conditions of parks and recreational facilities and programs, identify the need for new facilities, develop a capital improvement plan for new and existing parks, and identify the programming needs for new and existing facilities. Phase I of the master plan will be presented, for approval, to the Alachua County Commission on March 26, 2002. Phase II is scheduled to be completed by the end of (calendar year) 2002. A comprehensive county-wide master plan for recreation will produce the vision for achieving a high quality and sustainable community with prime recreational resources.

EXISTING RECREATION RESOURCES

The recreation site inventory is organized according to two primary factors, the location and type of facilities. Alachua County can be divided into two regions characterized by the intensity of development and land use. Specifically, these are urban Alachua County and rural Alachua County as shown in the maps (Recreation Sites: Urban and Recreation Sites: Rural). The Recreation sites included in this Element are organized by their location with respect to these areas. Site types and facilities are described according to the following classification.

Recreation Site Classification

Recreation sites are classified according to the type of recreational opportunities they provide the users. The site types considered here are resource-based and activity-based.

Resource-based sites are those that provide recreational opportunities to the user dependent upon the components offered by the natural resources at the site. Examples of resource-based sites include springs, lakes, rivers, forests, etc., that provide opportunities for swimming, boating, fishing, camping, hiking, etc. Activity-based sites provide recreation that is user-oriented independent of location or the natural environment. Examples of activity-based sites include parks that provide such facilities as softball complexes, tennis courts, soccer or football fields, and fitness trails.

Park types are described by the capacity and function in which they serve the recreational needs of the communities of Alachua County. A classification system of parks is provided in Table 1 which represents the types of recreation sites found in Alachua County. These recreation site types are based on recommended guidelines for parks and recreation sites provided by the Florida Department of Environmental Protection and the National Recreation and Parks Association as applied to the unique characteristics of Alachua County. These park types provide the general framework to classify each site in the inventory.

The following list provides a brief description of the various park types:

Neighborhood Park - a park that provides local activity-based recreational activities for a neighborhood area; centrally located to the population of the neighborhood, within walking and bicycle access; often developed in conjunction with school sites; types of facilities include ballfields and courts, playgrounds, picnic areas.

Community Park - a park which provides larger organized activity-based recreational activities for several neighborhoods; accessible to neighborhood areas primarily by collector and minor arterial roads with bicycle and walking trail access desirable; provides larger recreation facilities such as softball complexes, pools, football and soccer, picnic areas and exercise trails.

Regional Park - an area that provides diverse activity-based and resource-based recreational activities for all county residents; access should be provided by major collector roads but can vary dependent upon the location of the resource; typical activity-based facilities would be oriented toward team spectator sports including softball, soccer, football, etc.; typical resource-based activities include natural, cultural, and historical studies, trails for hiking or horseback riding, camping, and swimming areas; trail connections to overall park system and state parks desirable.

Regional Preserve - the preserve is oriented toward protection of critical habitat areas for plant and wildlife communities; its primary function is to serve as a wildlife refuge; secondary functions may include facilities typical of the regional resource park such as nature study, hiking, swimming, boating, camping and horseback riding; the preserve also serves as an area for field research for various studies such as wildlife patterns and behavior and relationship to environment. Regional Preserves are not proposed to be included in the level of service for concurrency purposes.

Nature Park - a resource-based recreational area designed to provide public access to environmentally sensitive and/or unique natural areas; primary function is to provide nature study through nature trails and interpretive exhibits; other facilities present may include picnic areas, observation towers and boardwalks.

Special Use Parks - these parks provide a wide range of recreational activities that are designed to the specification or limitations of the recreational activity itself; access is variable; Special Use parks are categorized as Special Use-A for activity based and Special Use-R for resource based; examples of Special Use-A parks include golf courses, stadiums, tracks and shooting ranges; examples of Special Use-R parks include botanical gardens, historic sites, boating facilities and fishing piers.

SITE TYPE	TYPICAL SERVICE AREA	TYPICAL SIZE (ACRES)	AVG POPULATION SERVED	EXISTING LOS* AC/1000 PERSONS	TYPICAL AND CHAR
Neighborhood Park	1/2 Mi Radius (May be larger in the rural area due to low pop density)	5 to 15	up to 5,000	0.14/1,000	Local activity-based recreation facilities such as a ballfield, courts, playgrounds, picnic areas, trails; location adjacent to residential areas

Community Park	3 Mi Radius (May be larger in the rural area due to low pop density)	15 to 75	up to 25,000	.053/1,000	Active recreation facilities for several neighborhoods for organized events such as soccer, softball, football, tennis, etc.; access by collector or minor arterial roads; access to bicycle trails desirable.
Nature Park	Variable	10 to 300	Variable	1.95/1,000	Resource-based passive recreation designed to provide access to unique natural areas; facilities include nature trails and picnic areas; access depends on location of the resource.
Regional Park	Countywide	Greater Than 100	Greater Than 100,000	2.09/1,000	A site of diverse recreational activities, provides access to natural resource areas such as springs, rivers or other regionally significant areas including State Parks and supplies active recreation facilities such as multi-use fields and courts; Access should be provided by major roads.
Special Use Activity Park	Variable	Variable	Greater Than 25,000	0.0	An area that provides a specific function associated with one recreation activity; examples of active special use parks include golf courses, stadiums or tracks; access is dependent on site location.
Special Use Resource Park	Variable	Variable	Greater Than 25,000	1.23/1,000	An area that provides a specific function associated with one recreational activity; examples of resource special use parks include boat ramps and fishing piers, botanical gardens and historic sites; access is dependent on resource location.

*Existing level of service figures correspond to developed acres of each of these park types.
Source: Alachua County Department of Public Works.

Recreation Site Inventory

As part of the Recreation Master Plan, an inventory of existing public and private recreation sites and facilities that serve the unincorporated areas of Alachua County has been organized according to site type and region. For purposes of gathering data, the County was divided into twelve (12) planning areas based on public school district zones. This not only indicates the need and desire to establish a community-based approach to recreational facility planning and programming, but also highlights the potential for partnership with the School Board of Alachua County.

Alachua County has twenty-five (25) parks throughout the unincorporated area. Four parks, Jonesville, SE 35th Street, McCall, and Lake Kanapaha are undeveloped. There are twelve (12) Special-Use facilities, five (5) Community parks, three (3) Neighborhood parks, four (4) Nature parks and one (1) Regional park. The map titled Alachua County Parks Inventory shows the location of parks and recreational

facilities throughout the County, as well as public school sites.

County-wide, in addition to Alachua County parks, there are more than 112,000 acres of land in public ownership. State parks account for 30,540 acres, the Suwannee River Water Management District has 5,540 acres and the St. John’s River Water Management District has 78,190 acres. Most of these lands offer resource-based recreational activities or serve as open space.

Table 2 provides a summary of recreation sites by ownership. This information was gathered in preparation of the County-wide Recreation Master Plan.

RECREATION NEEDS ANALYSIS

Recreation Planning Areas

As previously stated, for purposes of the Recreation Master Plan process, the County was divided into twelve planning areas based on public school district zones. This was a recommendation from the Recreation Master Plan Steering Committee. With the exception of four of the planning areas, each one has a municipality at its center. The City of Gainesville is split between two planning areas and there are two other areas covering only unincorporated portions of the County. The planning areas are listed as follows:

- | | |
|--------------------------------|---|
| Planning Area 1 - High Springs | Planning Area 7 - Western Suburban |
| Planning Area 2 - Alachua | Planning Area 8 - West Gainesville |
| Planning Area 3 - LaCrosse | Planning Area 9 - East Gainesville |
| Planning Area 4 - Waldo | Planning Area 10 - Rural East Alachua Co. |
| Planning Area 5 - Newberry | Planning Area 11 - Hawthorne |
| Planning Area 6 - Archer | Planning Area 12 - Micanopy. |

Table 2. Recreation Site Inventory Summary Total Acreage by Recreation Site Type							
Ownership	Neighborhood	Community	Nature	Regional/ State	Regional Preserve	Special Use-r	Spec Use-
Alachua Co.	14.0	389.55	729.53	202	0.0	170.4	
Alachua	5.42	25.84	0.0	0.0	0.0	0.0	
Archer	12.22	9.75	0.0	0.0	0.0	0.0	
Gainesville	167.12	123.57	350.66	74.88	0.0	200.07	1
Hawthorne	1.27	32.73	0.0	0.0	0.0	0.0	
High Springs	6.94	24.79	0.0	0.0	0.0	0.0	

LaCrosse	5.08	0.0	0.0	0.0	0.0	0.0	0.0	5.08
Micanopy	0.5	9.07	0.0	0.0	0.0	0.0	0.0	9.57
Newberry	0.7	49.7	0.0	0.0	0.0	0.0	0.0	50.4
Waldo	11.61	0.0	0.0	0.0	0.0	0.0	3.6	15.21
State	9.83	0.0	0.0	2,272.42	56,562.32	275.78	195.63	59,315.98
Private/ Non Profit	37.29	107.41	0.0	0.0	0.0	207.3	0.0	352
Total	271.98	772.41	1080.19	2549.3	56,562.32	853.55	392.68	62,482.43

Source: Alachua County County-wide Recreation Master Plan (Draft); 1/02.

Population & Demographic Analysis

Population and demographic data from the University of Florida Bureau of Business and Economic Research (BEBR) was used for the purposes of this analysis. The County-wide population estimate for 2000 is 216,249; the unincorporated area population estimate for 2000 is 96,353. Projections of County-wide population are 237,057 and 253,628 for 2005 and 2010, respectively. Projections of unincorporated area population are 106,191 and 114,251 for 2005 and 2010, respectively. This information was used to determine recreation needs and as guidelines for establishing levels of service for each park type and facility.

Existing Level of Service for Parks & Facilities

Table 3 shows the current level of service for Alachua County based on the adopted standards of 0.5 developed acres/1,000 unincorporated area population for activity-based recreation and 5.0 developed acres/1,000 unincorporated area population for resource-based recreation. As indicated in the information presented in the table, the County is exceeding its current level of service standards.

Current & Future Recreational Needs Determination

The Recreation Master Plan proposes to identify service gaps by considering the existing conditions and applying level of service criteria

(based on a service area radius) for neighborhood and community parks. In analyzing the County's future recreational needs, information gathered from user group and public surveys was included. An important factor in the analysis of current and future recreational needs is the extent to which public school facilities will be utilized for public recreation.

Table 4 shows projections of acreage needed for the years 2005/06, 2010/11, 2015/16 and 2020/21 based on the adopted level of service standards (separate standards for activity-based and resource-based recreation). As indicated, in order to meet an activity-based level of service standard of 0.5 developed acres/1,000 unincorporated population, no new acreage is needed for activity-based recreation through 2020. Some additional acreage will be needed for resource-based recreation. Certain lands acquired through the *Alachua County Forever* land conservation initiative are expected to be made publicly accessible and counted toward the resource-based level of service, thereby meeting future needs.

Table 3. County-owned Park Development

	PARK	PARK TYPE	ACRES	% DEVELOPED	ACTIVE DEVELOPED	RESOURCE DEVELOPED
1	CELLON OAK	NA	3.74	95.00%		3.55
2	COPELAND	N	5.00	100.00%	5.00	
3	E.P. POWERS	SU-r	10.90	100.00%		10.90
4	FOREST	C	24.70	70.00%	17.29	
5	CELLON OAK	N	4.00	100.00%	4.00	
6	HIGH SPRINGS BOAT RAMP	SU-r	0.25	100.00%		0.25
7	HOLDEN	SU-r	5.00	100.00%		5.00
8	JONESVILLE	C	98.00	0.00%	0.00	
9	KANAPAHA BOTANICAL GARDENS	SU-r	49.57	80.00%		39.66
10	KANAPAHA	C	22.95	90.00%	20.66	
11	LAKE ALTO	SU-r	22.33	36.00%		8.04
12	LAKE KANAPAHA	NA	453.37	0.00%		0.00
13	LOCHLOOSA	SU-r	1.32	100.00%		1.32
14	McCALL	NA	78.42	0.00%		0.00
15	M.K. RAWLINGS	SU-r	12.08	61.00%		7.37
16	MELROSE BOAT RAMP	SU-r	0.25	100.00%		0.25
17	MONTEOCHA	N	5.00	100.00%	5.00	
18	POE SPRINGS	R	202.00	100.00%		202.00
19	SAN FELASCO	NA	194.00	95.00%		184.30
20	SANTA FE LAKE	SU-r	24.98	100.00%		24.98
21	S.E. 35th STREET	C	27.00	0.00%	0.00	

22	SQUIRREL RIDGE	C	16.90	80.00%	13.52	
23	OWENS-ILLINOIS	SU-r	21.57	12.00%		2.59
24	WALDO CANAL	SU-r	10.15	100.00%		10.15
25	WATERMELON POND	SU-r	12.00	70.00%		8.40
	TOTAL		1305.48	5.01%	65.47	508.75
LEVEL OF SERVICE (0.5 Developed Acres per 1000 Unincorporated Population for Active; 5.0 Developed Acres per 1000 Unincorporated Population for Resource)					0.68	5.28
Unincorporated Population:		96,353				

- N - Neighborhood Park
- C - Community Park
- R - Regional Park
- NA - Nature Park
- SU-r - Special Use Resource Park

	2005/06	2010/11	2015/16	2020/21
Unincorporated Population*	106,191	114,251	120,959	127,401
Activity-based (LOS Standard: 0.5 acres/1,000 unincorporated population)	53.09	57.13	60.48	63.7
Additional Activity-based Acres Needed	0.00	0.00	0.00	0.00
Resource-based (LOS Standard: 5.0 acres/1,000 unincorporated population)	530.95	571.25	604.79	637.01
Additional Resource-based Acres Needed	22.2	62.5	96.0	128.25

*Population Estimates based on projections by UF-BEBR.

Proposed Strategy for the Future

The completion and subsequent adoption of the Recreation Master Plan will provide a definitive strategy for meeting the recreational needs of the people of Alachua County. Some preliminary recommendations include the following:

1. Develop a comprehensive 'Mutual Use Agreement' and utilize public elementary and middle schools for neighborhood and community recreation needs;
2. Develop a 'best practices' maintenance manual for use by all recreational providers in the County addressing regular maintenance schedules and minimum standards for facility maintenance;
3. Complete an inventory of existing and planned greenways and trails for the entire County;
4. Establish park planning areas based on public school zones and develop performance-based land development regulations wherein proposed developments would address the impact of development on recreation;
5. Create partnerships between the School Board and recreation providers when selecting sites for new schools and parks;
6. Adopt a level of service standard based on service area radiuses for different park types;
7. Establish specific criteria for prioritizing park needs emphasizing the equitable distribution of parks throughout the County;
8. Develop a marketing campaign to generate support for a referendum to provide funding for new parks and recreational facilities.

TABLE 1. RECREATION SITE CLASSIFICATION FOR COUNTYWIDE PARK SYSTEM

SITE TYPE	TYPICAL SERVICE AREA	TYPICAL SIZE (ACRES)	AVG POPULATION SERVED	EXISTING LOS* AC/1000 PERSONS	TYPICAL FACILITIES AND CHARACTERISTICS
Neighborhood Park	1/2 Mi Radius (May be larger in the rural area due to low pop density)	5 to 15	up to 5,000	2.30/1000 (includes Public School facilities)	Local activity-based recreation facilities including a ballfield, courts, playgrounds and picnic areas; access central to neighborhood by local streets and trails; location adjacent to school desirable.
Community Park	3 Mi Radius (May be larger in the rural area due to low pop density)	15 to 75	up to 25,000	.65/1000	Active recreation facilities for several neighborhoods for organized events such as soccer, softball, football, tennis, etc.; access by collector or minor arterial roads; access to bicycle trails desirable.
Nature Park	Variable	10 to 300	Variable	1.79/1000	Resource-based passive recreation designed to provide access to unique natural areas; facilities include nature trails and picnic areas; access depends on location of the resource.
Regional Park	Countywide	Greater Than 100	Greater Than 100,000	1.06/1000	A site of diverse recreational activities, provides access to natural resource areas such as springs, rivers or other regionally significant areas including State Parks and supplies active recreation facilities such as multi-use fields and courts; Access should be provided by major roads.
Regional Preserve	Regional Area	Greater Than 1000	Greater Than 200,000	151.5/1000**	An area that provides protection for valuable wildlife habitat areas; it can provide limited access to the public for nature study and may include similar resource-based facilities to the Regional Park in isolated areas; access is variable.
Special Use Activity Park	Variable	Variable	Greater Than 25,000	.26/1000	An area that provides a specific function associated with one recreation activity; examples of active special use parks include golf courses, stadiums or tracks; access is dependent on site location.
Special Use Resource Park	Variable	Variable	Greater Than 25,000	.55/1000	An area that provides a specific function associated with one recreational activity; examples of resource special use parks include boat ramps and fishing piers, botanical gardens and historic sites; access is dependent on resource location.

*Existing level of service figures correspond to developed acres of each of these park types.

**Regional Preserves are not proposed to be included in the level of service for concurrency purposes.

Note: Standards and Park Types Based on 1983 National Recreation and Parks Association Recommended Standards, 1987 Florida Department of Natural Resources Recommended Guidelines and Current Conditions in Alachua County.

Source: ACDPD Date 5/10/90

INTERGOVERNMENTAL COORDINATION ELEMENT DATA AND ANALYSIS

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Alachua County Public Schools in Unincorporated Area

INTRODUCTION

Intergovernmental Coordination Element.....i

The Intergovernmental Coordination Element identifies and analyzes intergovernmental relationships in the context of the Alachua County Comprehensive Plan. Relevant federal, state, regional and local agencies including adjacent counties, cities in Alachua County and utility providers are identified. A variety of intergovernmental coordination mechanisms are reviewed and specific existing coordination mechanisms are analyzed, in terms of their effectiveness in addressing issues with intergovernmental implications.

Planning and development activities which occur within the County can significantly affect and be affected by government units at different levels, school boards, independent special districts, water management districts and agencies or units of government providing services but not having regulatory authority over the use of land. The purpose of the Intergovernmental Coordination Element is to identify and improve the processes of coordination between the County and these various authorities to create compatible, efficient and effective relationships.

Data and Analysis requirements for the Intergovernmental Coordination Element are set forth in Rule 9J-5.005(2) Florida Administrative Code.

DATA & ANALYSIS

I. Inventory of Existing Coordination Mechanisms

The following table (Table 1) provides an inventory of the federal, state, regional, and local entities with which Alachua County must coordinate and a brief description of the activities and areas of coordination for those entities.

Table 1. Inventory of Entities	
Federal Agencies	Federal Emergency Management Agency(FEMA) - Administers the National Flood Insurance Program and is involved in development review in terms of regulating the development of lands in flood prone areas.
	Environmental Protection Agency (EPA) - Lead agency for implementing the National Environmental Policy Act, the Clean Air Act, the Safe Drinking Water Act and the Water Pollution Control Act. EPA also administers a hazardous waste site clean-up program and issues hazardous materials restrictions and guidelines.
	United States Army Corps of Engineers(Corps) - Regulates the development and maintenance of the nation’s water and related land resources and has permit authority to regulate activities involving discharges of dredged or fill material in all waters of the United States.
	United States Fish & Wildlife Service (FWS) - Establishes regulations and development guidelines for the protection of endangered/threatened species, has an inventory of wetlands, and acquires habitat areas and recreation and wilderness areas.
	United States Geological Survey (USGS) - Provides topographic, geologic, and hydrologic maps used to identify areas of concern.

Table 1. Inventory of Entities

	<p>United States Department of Agriculture(USDA) - Provides information regarding the suitability of soils for septic tank use, subsidizes farmers for retaining land in agriculture, and provides rural credit programs in the areas of housing, farming, community facilities, water and waste disposal, and rural business and industrial development.</p>
	<p>United States Department of Transportation (DOT) - Reviews and approves federally funded highway projects and has responsibility for highway safety programs.</p>
	<p>Federal Aviation Administration (FAA) - Regulates the nation’s aviation system through licensing airports and providing funding for maintenance and enhancement of commercial airline service airports.</p>
	<p>United States Bureau of the Census - Provides demographic and economic data.</p>
	<p>United States Department of Labor - Provides economic development assistance and economic data.</p>
	<p>United States Department of Housing & Urban Development (HUD) - Provides block grant funds to the State of Florida/DCA to implement the Small Cities CDBG Program. Also administers FHA which provides mortgage insurance on loans for low/moderate income home-buyers.</p>
	<p>AMTRAK - Provides north/south passenger rail service for Alachua County from the depot in Waldo.</p>
	<p>Veterans Administration (VA) - Provides medical services, home loans, and other benefits to veterans, and the VA Medical Center in Gainesville employs about 1,500 persons serving as one of the County’s major employers.</p>
<p>State Agencies</p>	<p>Florida Department of Community Affairs (DCA) - Reviews local government comprehensive plans for compliance with the Growth Management Act and consistency with the Comprehensive Regional Policy Plan and the State Comprehensive Plan. DCA also provides data and promulgates guidelines and standards for developments of regional impact. The DCA, through the Florida Housing Finance Agency, administers the State Housing Initiatives Partnership (SHIP) Program which funds affordable housing programs serving low and very-low income households within Alachua County.</p>
	<p>Florida Department of Transportation (FDOT) - Responsible for the planning, construction, maintenance and access to the state highway system, as well as the State Rail Plan and the Florida Aviation System Plan. FDOT also controls access points and regulates drainage and stormwater runoff as they pertain to the drainage system of State roads.</p>
	<p>Florida Fish & Wildlife Conservation Commission (FWCC) - Responsible for wild animal life and fresh water aquatic life resources and provides enforcement for regulations regarding littering and illegal dumping.</p>
	<p>Florida Department of Children & Families (DCF) - Licenses mobile home parks, group homes and nursing homes; regulates septic tank and drainfield installation; provides programs for children, youth, families, and the aging.</p>
	<p>Florida Department of Agriculture & Consumer Services (ACS) - Responsible for forest management assistance and provides fire protection to woodland areas; also responsible for soils information and suitability.</p>
	<p>Florida Department of Environmental Protection (DEP) - Permitting agency for environmental quality; administers federal guidelines and requirements for air and water quality; monitors water quality and stormwater quality through the Water Management Districts.</p>
	<p>Florida Department of Management Services (DMS) - Responsible for the siting, construction and maintenance of state buildings for various departments within state government.</p>

Table 1. Inventory of Entities

	<p>Florida Department of Business & Professional Regulation - Licenses apartment complexes, motels, hotels, transient lodges, and restaurants, and businesses and other entities to sell alcoholic beverages.</p>
	<p>Florida Department of Education - Sets capacity standards for local school boards, provides funds to build or renovate local schools, and offers services for the blind, migrant programs and vocational education.</p>
	<p>Florida Department of Labor & Employment Security - Provides job training and vocational rehabilitation.</p>
	<p>Florida Department of Corrections - Manages the State's penal institutions and provides probation and parole services.</p>
	<p>Florida Department of State, Division of Historical Resources - Maps and inventories archeological and historical resources in the State and provides matching grant programs for protection, restoration and acquisition of historic resources.</p>
	<p>Florida Division of Emergency Management - Alachua County has entered into a statewide catastrophic mutual aid agreement which allows Alachua County Emergency Services to respond to jurisdictions outside of Alachua County during times of disaster.</p>
	<p>University of Florida (UF) - A major landholder and employer for Alachua County. BEBR provides population estimates and projections and employment and economic data. IFAS provides research into agriculturally-related issues and assistance to the farming community.</p>
	<p>Santa Fe Community College (SFCC) - Offers two-year Associate of Arts transfer degrees and vocational training courses in a variety of fields.</p>

Table 1. Inventory of Entities

<p style="text-align: center;">Regional Agencies</p>	<p>North Central Florida Regional Planning Council (RPC) - Comprised of eleven counties, the RPC is charged with the preparation of a Comprehensive Regional Policy Plan providing regional issues, goals, policies, and standards which further the goals and policies of the Stat of Florida Comprehensive Plan. RPC maintains a regional database, reviews DRIs and determines the positive and negative effects of proposed developments; reviews applications for federal domestic assistance; and can act as facilitator to an informal mediation process to resolve conflicts relating to local comprehensive plans.</p>
	<p>North Central Florida Health Planning Council (NCFHPC) - The designated local health council for HRS District III evaluates local needs and formulates community health plans.</p>
	<p>St. Johns River/Suwannee River Water Management Districts (WMDs) - Responsible for water resource planning and permitting, floodplain and wetlands management and wellfield protection requirements.</p>
	<p>Alachua County Library District - An independent special taxing district, whose board is comprised of two City Commissioners and three County Commissioners, created to provide public library system services, programs and facilities to citizens in Alachua County.</p>
	<p>Gainesville/Alachua County Regional Airport Authority - Manages and operates the Gainesville Regional Airport and other airport facilities. It is comprised of one County Commissioner, three members appointed by the Governor, and the five Gainesville City Commissioners.</p>
	<p>Alachua County Housing Authority - Administers public housing programs with housing units in the unincorporated area and some of the municipalities, excluding Gainesville.</p>
	<p>Gainesville Housing Authority - Administers public housing programs within Gainesville City limits and part of the unincorporated area.</p>
	<p>Metropolitan Transportation Planning Organization (MTPO) - Responsible for carrying out the urban transportation planning process, developing the planning work programs, transportation plan and transportation improvement plan. It consists of the five Alachua County Commissioners and the five Gainesville City Commissioners.</p>
	<p>School Board of Alachua County - Operates and administers all public schools in Alachua County and approves and adopts a district-wide school building program.</p>
<p style="text-align: center;">Adjacent Counties</p> <p>*The Alachua County Library District has entered into an inter-local agreement with each adjacent county. This agreement allows citizens of adjacent counties to use branch libraries in Alachua County.</p>	<p>Bradford - Located north of Alachua County, Bradford and Alachua Counties share road facilities (US 301, and County Roads 200A, 231, 237, and 1475), the Floridan aquifer system and the Santa Fe River drainage basin.</p>
	<p>Clay - Alachua and Clay Counties share the Floridan aquifer system and the Santa Fe River drainage basin.</p>
	<p>Columbia - Alachua and Columbia Counties share the Floridan aquifer system, the Santa Fe River drainage basin, O'Leno State Park, Interstate 75, US 441, and US 27.</p>
	<p>Gilchrist - By inter-local agreement, Gilchrist County uses the Alachua County Solid Waste facility. In addition to sharing SR 26 and a number of County Roads, Alachua and Gilchrist Counties share the Floridan aquifer system and the Waccasassa River and Santa Fe River drainage basins.</p>
	<p>Levy - Forming the southwest border of Alachua County, Levy and Alachua Counties share US 41/27 and State Roads 24 and 121 as well as a number of County Roads and Watermelon Pond. Alachua and Levy Counties share the Floridan aquifer system and the Oklawaha and Waccasassa River drainage basin.</p>
	<p>Marion - Shared facilities with Marion County, south of Alachua County, include Orange Lake, Lochloosa Wildlife Management Area, I-75, US 301, US 441 and other County roads. Alachua and Marion Counties also share the Floridan aquifer system, the Oklawaha drainage basin, and the rural center of Evinston.</p>

Table 1. Inventory of Entities

	<p>Putnam - East of Alachua County, Putnam County shares Santa Fe Lake and Little Orange Lake as well as SR 20, SR 26, and CR 234. Alachua and Putnam also share the rural center of Melrose, the Floridan aquifer system, and the Santa Fe River, Etonia Creek and Oklawaha drainage basins.</p>
	<p>Union - The Santa Fe River forms the boundary between Union and Alachua Counties. SR 121 and CR 241 are shared road facilities. Alachua and Union share the Floridan aquifer system and the Santa Fe River drainage basin.</p>
<p>Cities*</p> <p>*Each municipality coordinates with Alachua County to receive DEP funding for a joint recycling program grant.</p>	<p>Alachua - Located in Northwest Alachua County, Alachua contains portions of I-75, US 441, SR 235, and County Roads 235A, 241, and 2054. The San Felasco State Preserve lies along the southern border of this city. The County provides building inspection and solid waste services. Also through inter-local agreement, fire protection services are augmented by the County.</p>
	<p>Archer - Portions of US 41, SR 24 and County Roads 241 and 346 are within Archer, located in Southwest Alachua County. The County provides law enforcement, building inspection services and animal control. Through inter-local agreement, fire protection services are augmented by the County and the County provides solid waste services as well. Archer has its own potable water facility serving a portion of the unincorporated area.</p>
	<p>Gainesville - The county seat of Alachua County, Gainesville is surrounded by an unincorporated urban area for which it provides water, wastewater, electricity and gas services (through GRU). Fire services are shared in the urban area as well. A number of State, County and City roads are shared. Traffic signalization, intersection improvement, and mass transit services are provided by Gainesville to the urban area. Joint boards include the Metropolitan Transportation Planning Organization (MTPO), Cultural Affairs Board, RTS Advisory Board, and Public Recreation Board.</p>
	<p>Hawthorne - Located in the Eastern part of Alachua County, Hawthorne contains portions of US 301, SR 20 and CR 2082, and Little Orange Lake is partially within the city limits. The County provides fire protection, emergency, solid waste, building inspection and animal control services. Hawthorne has its own potable water facility and serves some customers outside its corporate limits.</p>
	<p>High Springs - Portions of US 27, US 41, US 441, SR 25, and County Roads 25B, 236 and 340 are within High Springs, located in Northwest Alachua County. The County provides solid waste, fire protection, emergency, building inspection, and animal control services. High Springs has its own potable water facility and serves some customers outside its corporate limits.</p>
	<p>LaCrosse - The County provides LaCrosse with fire protection, emergency, building inspection, animal control and solid waste services. Portions of State Roads 121 and 235 are within LaCrosse and CR 237 is just west of LaCrosse.</p>
	<p>Micanopy - Shared facilities include portions of US 441 and County Roads 25A, 234 and 329, and a portion of Lake Tuscahulla is within Micanopy. The County provides emergency services, solid waste, building inspection, and animal control services. Micanopy has its own potable water facility and serves some customers outside its corporate limits.</p>
	<p>Newberry - Located in the Western part of Alachua County, Newberry contains portions of County Roads 235 and 337, US 41 and SR 26. The County provides fire protection, emergency, law enforcement, building inspection, solid waste and animal control services. Newberry has potable water and sanitary sewer facilities and serves locations outside its municipal limits.</p>
	<p>Waldo - Portions of County Road 1475, US 301 and SR 24 are within Waldo, located in Northeast Alachua County. The County provides animal control and solid waste services. Through inter-local agreement, fire protection services are augmented by the County. Waldo has its own potable water facility and does not serve customers outside its corporate limits.</p>

Table 1. Inventory of Entities	
Utilities	Alltel Telephone - Provides telephone service to areas within Alachua County.
	BellSouth Telephone & BellSouth Mobility - Provides telephone and internet services to areas within Alachua County.
	Central Florida Electric Cooperative, Inc. - A rural electric cooperative serving the City of Archer, has about 740 meter connections in Alachua County as of December 2001.
	Clay Electric Cooperative, Inc. - A rural electric cooperative serving 19,224 customers in Alachua County.
	Cox Communications, Inc. - This entity provides cable television service in Alachua County.
	Florida Power Corporation - Provides electrical utility services in Archer, High Springs, LaCrosse, Micanopy, and unincorporated area of Alachua County. Florida Power has about 4,691 meter connections in the unincorporated area.
	Florida Power & Light - Provides electrical utility service in the City of Hawthorne and surrounding area with approximately 1,000 meter connections in Alachua County.
	Gainesville Regional Utilities (GRU) is a combined system providing electric, water, wastewater, natural gas and communication service to Gainesville and parts of unincorporated Alachua County. As of September 2001, GRU provided electric service to 83,356 customers; natural gas customers numbered 28,847; 58,842 water customers; and 52,260 wastewater customers.

Source: Alachua County Office of Planning & Development.

II. Effectiveness of Coordination Mechanisms

The table provided in Appendix A is excerpted from the Evaluation & Appraisal Report of the Alachua County Comprehensive Plan, which was adopted in September 1998. The table summarizes the relationships and assessment of effectiveness for the federal, state, regional and local agencies with which Alachua County coordinates on various issues.

III. Intergovernmental Coordination Issues

A. Joint Planning

An amendment to the Alachua County Charter was approved by referendum on November 7, 2000. This amendment allows the County to enter into interlocal agreement with its municipalities to provide for joint planning in those parts of the unincorporated area that are not designated as reserve areas for another municipality. The actual language from the charter amendment is found in Appendix B. Also, the Municipal Leaders Steering Committee has as its objective to develop a more coordinated approach for Alachua County and its municipalities to engage in joint planning on land use and infrastructure issues associated with annexations.

B. University of Florida Campus Master Plan

The Campus Master Plan (CMP) was adopted in 1996 and updated in 2001. The CMP includes provisions for coordination with Alachua County on the use and development of its satellite facilities located in the unincorporated area. Information is provided in Appendix C concerning the University's satellite facilities which are located in the unincorporated area of Alachua County.

C. School Concurrency

Intergovernmental Coordination Element Policy 6.5 sets the framework for the extension of concurrency requirements to public schools. The County would be required to create a Public Schools Element in collaboration with the School Board of Alachua County and the municipalities. Appendix D presents a summary of Sections 163.3177(12) and 163.3180, Florida Statutes which provide guidelines for establishing concurrency for public schools. A map of public schools in the unincorporated area is included in this document.

D. Alachua County/City of Gainesville Fire Rescue Merger

In July 2001, at a combined meeting of the Board of Alachua County Commissioners and the Gainesville City Commission, action was taken to proceed with efforts to merge the two emergency services agencies into a single "All Hazards Emergency Services Special Independent District". Subsequently, a special "Transition Board" was appointed (three Commissioners each from the City and County Commissions, and one elected representative from the Alachua County League of Cities) to provide the leadership to accomplish the merger. Additionally, the County and City of Gainesville, through an interlocal agreement, committed to fund and support the initiative with their various staffs and to functionally merge the two departments by October 1, 2002.

The Transition Board is planning to include a "straw ballot" in the November 2002 election for the public to indicate whether they favor: 1) a single emergency services department providing emergency medical response and transport, fire protection, emergency management, and Enhanced 911 Addressing, Mapping and Database Management; and 2) the creation of a new independent taxing authority to support a single emergency services district/department.

In terms of the anticipated impact of a merged emergency services department on other municipalities and independent volunteer fire departments, discussions have included considerations for other local jurisdictions within Alachua County to have the continuation of similar partnerships and contracts as they currently have with the County, and to offer opportunities for one or all to merge into the larger single emergency services agency.

E. Intergovernmental Coordination Issues by Element

The following table (Table 2) provides a summary of specific issues within each of the comprehensive plan elements and the intergovernmental coordination mechanisms for addressing them.

Table 2. Issues by Element		
Comprehensive Plan Element	Issue/Subject	Means for Addressing Issue
Future Land Use	Annexations & Joint Planning	A County Annexation Team has been formed to review annexation proposals for consistency with State law and County policies. The Municipal Leaders Steering Committee is comprised of representatives of Alachua County and municipal commissioners which has initiated a joint planning and visioning process to address planning issues associated with annexations.
	Urban Reserve/Service Areas	The Alachua County Boundary Adjustment Act (BAA) contains procedures for establishing municipal reserve areas and setting priorities for cities within Alachua County to designate such areas. See Map of Urban Reserve & Extra-territorial Reserve Areas.
	Public School Siting	Pursuant to legislative changes, Alachua County has amended its FLUE to meet requirements that proposed new sites for public educational facilities be consistent with local comprehensive plans and land development regulations and to encourage the collocation of public schools with parks and libraries.
	Library Siting	The Library District has relied upon informal discussion as its coordination mechanism for site selection. There are currently no plans for siting new branches.
Transportation Mobility	Shared Roadway LOS/Concurrency	Alachua County has policies requiring Transportation System Management and Transportation Demand Management strategies of all developments. The City of Gainesville is requiring TSM and TDM strategies for projects within their Transportation Concurrency Exception Area.
Housing	State Housing Initiatives Partnership (SHIP) Program	Alachua County provides down-payment assistance and housing rehabilitation services for the unincorporated area and all municipalities, except Gainesville. The County and the City of Gainesville provide training for first-time home-buyers and jointly administer the Special Needs portion of the SHIP Program

Table 2. Issues by Element		
Comprehensive Plan Element	Issue/Subject	Means for Addressing Issue
Potable Water & Sanitary Sewer	Potable Water & Sanitary Sewer Provisions and Concurrency	Currently, GRU verifies capacity, in terms of concurrency management, on items in the County's development review process.
Potable Water & Sanitary Sewer	Coordination of Capital Plans for Centralized Potable Water & Sanitary Sewer Systems	The coordination mechanism for addressing this issue has to be developed. The County does already review and comment on updates to the GRU master plan.
Solid Waste	Solid Waste LOS/ Concurrency	After the closure of the Southwest Landfill facility, the County negotiated new inter-local agreements with the City of Gainesville and Gilchrist County to allow wastes from the City of Gainesville and Gilchrist County to be brought to the environmental solid waste management park and transferred out-of-county. Other municipalities arrange their own methods of collection and disposal of solid waste.
Stormwater Management	Mitigation Strategy	Alachua County has had and enforced a Flood Hazard Area Ordinance since 1982. Improvements to the County mapping systems within the last few years have enhanced the County's ability to enforce the Ordinance. All applications for development approval, including routine building permits, are checked to determine if development is proposed within flood hazard areas with all development within those areas being designed to mitigate development impacts.
Conservation & Open Space	Protection of Environmentally Sensitive Lands	The voter-approved funding of the "Alachua County Forever/Legacy Lands" initiative establishes a land conservation program for the County.
Recreation	Countywide Recreation Needs	A county-wide Recreation Master Plan is currently being finalized (2001/02) to provide recommendations for a comprehensive approach to recreation by Alachua County, its municipalities, the School Board and private providers.
Economic	Economic Development Funding	There is currently no identified source of funding for economic development other than the general fund. The County continues to seek state and federal grants in support of economic development.

IV. Comprehensive Plans of Adjacent Counties & Municipalities

Rule 9J-5, F.A.C. requires that Alachua County coordinate its Comprehensive Plan with the plans of municipalities within its boundaries and adjacent counties. To this end, Alachua County has invited the participation of the municipalities in the community forums and public hearings conducted during the comprehensive plan update process. The County also sent information to the municipalities, adjacent counties, the Metropolitan Transportation Planning Organization and Florida Department of Transportation on the issue of changing the level of service for roads. The County has also drawn population projections from information provided in the comprehensive plans of various municipalities within the County. The following list provides information on growth and development issues of municipalities within the County that are being addressed as the County's comprehensive plan is being updated in 2002.

The **City of Gainesville** and the County are jointly developing a SW 13th Street Area Plan. Also, upon completion of its Comprehensive Operational Analysis, the Regional Transit System (RTS) and Alachua County will coordinate on mass transit services to unincorporated urban areas.

The **City of High Springs** and Alachua County continue to coordinate on industrial uses and surface water issues.

Alachua County coordinates with all of its municipalities - **Alachua, Archer, Gainesville, Hawthorne, High Springs, LaCrosse, Micanopy, Newberry and Waldo** - through the Municipal Leaders Steering Committee on joint planning issues.

The **Metropolitan Transportation Planning Organization (MTPO)** adopted its Liveable Communities Reinvestment Plan, which seeks to focus development in downtown areas and promote a multi-modal approach to addressing transportation needs. Alachua County supports the objectives of the plan. An opportunity for further coordination is the Plan East Gainesville project initiated in 2002. The outcome of this process could result in amendments to both the City of Gainesville and Alachua County comprehensive plans.

V. Comparison with North Central Florida Strategic Regional Policy Plan

The North Central Florida Regional Planning Council (RPC) is one of the agencies which reviews the Alachua County Comprehensive Plan and any subsequent amendments to the Plan. The RPC provides comments to DCA regarding consistency of the plan or plan amendments with the Strategic Regional Policy Plan and identifies areas of potential conflict between the two plans. Growth and development proposals in the Alachua County Comprehensive Plan are compared with the goals, policies and standards of the Strategic Regional Policy Plan.

The Alachua County Board of County Commissioners receives and considers the RPC review before adoption and may revise the draft plan or amendment, as necessary, in order to resolve potential conflicts. Once adopted, the plan or amendment is again submitted to the RPC for a determination of overall consistency with the Strategic Regional Policy Plan.

VI. Areas of Critical State Concern

There are no areas of critical state concern located within the unincorporated area of Alachua County.

Achua County Charter Amendment

Section 1.5., Land Use Planning, is added to the Achua County Charter to read:

Each municipality shall be responsible for land use planning within its respective boundaries and the county shall be responsible for land use planning in the unincorporated area. Notwithstanding the foregoing, the county and any municipality may enter into an interlocal agreement to provide for joint planning in portions of the unincorporated area not located within any area designated pursuant to general or special law as a reserve for annexation by another municipality or in portions of the area within such municipality.

University of Florida Campus Master Plan Update

University of Florida Satellite Parcels in Alachua County	
Satellite Facility	Total Acreage
TREEO	5
Austin Cary Memorial Forest	2040
Beef Research Unit	1138
Dairy Research Unit	1100
Millhopper Road Horticultural Unit	549
Wall Farm	65
Boston Farm/Santa Fe River Ranch Beef Unit	1640
Lake Wauberg	92.55
Newnan's Lake	81
WRUF Tower	60
WUFT Tower	12

Source: University of Florida Master Plan Update; June 2001.

**SUMMARY OF LEGISLATIVE REQUIREMENTS FOR
ESTABLISHING CONCURRENCY FOR PUBLIC SCHOOLS**

Per Chapter 163.3180, Florida Statutes

- Concurrency would be established on a district-wide basis including all public schools within the district (whether located in a municipality or an unincorporated area).
- All local governments within the county shall adopt the necessary plan amendments and an interlocal agreement. These would be transmitted to the state land planning agency for a determination of compliance.
- The minimum requirements for school concurrency are:
 - The local government shall adopt and transmit to the state land planning agency a comprehensive plan amendment which includes a **public schools facilities element**.
 - An **adopted level of service standard** at which public facilities are expected to operate.
 - A designation of **service areas** within which the level of service will be measured.
 - The Capital Improvements Element of the comprehensive plan shall establish a **financially feasible public school capital facilities program**, established in conjunction with the school board, which demonstrates that the adopted level of service standards will be achieved and maintained.
 - An **availability standard** whereby a local government may not deny a development permit for residential development on the basis of failure to achieve and maintain the level of service standard for public school capacity where adequate school facilities will be in place or under actual construction within three (3) years after permit issuance.
 - The local government shall satisfy the requirements for **intergovernmental coordination** as set forth in s. 163.3177(6)(h)1, including an adopted Intergovernmental Coordination Element showing coordination of the comprehensive plan with plans of the school board and other units of local government, with comprehensive plans of adjacent municipalities, adjacent counties or the region, and with the state comprehensive plan.
 - The local government must enter into an **interlocal agreement for school concurrency** acknowledging the school board's constitutional and statutory obligations to provide a uniform system of free public schools and the land use authority of local governments.

**CAPITAL IMPROVEMENTS ELEMENT
DATA AND ANALYSIS**

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EXECUTIVE SUMMARY

Capital improvements are physical assets constructed or purchased to provide, improve or replace a public facility and which are large scale and high in cost. The cost of a capital improvement is generally nonrecurring and may require multi-year financing. For the purpose of this element, physical assets which have been identified as existing or projected needs in the individual comprehensive plan elements shall be considered capital improvements.

The purpose of the Capital Improvements Element (CIE) is : (1) to evaluate the need for public facilities as identified in the other Comprehensive Plan Elements; (2) to estimate the cost of the improvements for which Alachua County has some or all of the fiscal responsibility; (3) to analyze the fiscal capability of the County to finance and construct improvements; (4) to adopt financial policies to guide the funding of improvements; and (5) to schedule the funding and construction of improvements in a manner necessary to ensure that capital improvements are provided when required based on needs identified in the other Comprehensive Plan Elements.

The overall goal of Alachua County Capital Improvement Element is:

Provide and maintain in a timely and efficient manner, adequate public facilities for both existing and future populations consistent with available financial resources.

A CIE objective supporting the conservation policies of the plan requires, “Limit capital improvements where such improvements may directly or indirectly, through accompanying development, degrade environmentally sensitive areas or other natural resources important to health, safety and welfare of the citizens and environment of Alachua County. These resource include but are not limited to: aquifer recharge areas, potable water wellfields, wetlands, significant uplands, and habitat for threatened or endangered species.”

The key policies in the Element to implement this and other objectives include: a statement of level of service; priority rating criteria for evaluating capital projects; and the components of the County's concurrency management system (development monitoring and financial feasibility).

I. INTRODUCTION

Purpose and Overview

Chapter 163 Florida Statutes (FS) and Rule 9J-5, Florida Administrative Code (FAC) provide the statutory and administrative rule requirements for local governments to adopt a Capital Improvements Element (CIE) as an Element of their Comprehensive Plans. The purpose of the Capital Improvements Element is: (1) to evaluate the need for public facilities as identified in the other Comprehensive Plan Elements; (2) to estimate the cost of the improvements for which Alachua County has some or all of the fiscal responsibility; (3) to analyze the fiscal capability of the County to finance and construct improvements; (4) to adopt financial policies to guide the funding of improvements; and (5), to schedule the funding and construction of improvements in a manner necessary to ensure that capital improvements are provided when required based on needs identified in the other Comprehensive Plan Elements.

The inventory and analysis section addresses the requirements of 9J-5.016(1)&(2) F.A.C. Areas discussed include existing revenue sources and funding mechanisms, local practices guiding the timing and location of capital improvements, projected capital improvement costs based on other elements of the Comprehensive Plan, fiscal implications of public facility needs, alternative funding sources and recommendations based on the inventory and analysis.

Over and above the purposes set out in Rule 9J-5.016, the Capital Improvements Element can provide the County with additional opportunities to: increase coordination of existing County capital improvement programs for transportation, solid waste, parks, public buildings, and other facilities with land use plans; increase coordination of capital improvements planning with other agencies such as Gainesville Regional Utilities, Florida Department of Natural Resources, School Board of Alachua County, and Florida Department of Transportation with County improvements and land use plans; and, investigate and implement innovative methods to maximize use of limited revenue sources to provide facilities and services to serve both existing and future citizens of Alachua County.

There is an inverse relationship between percent of property on tax rolls and levied millage rates. The average peer county has 26% more property on the tax rolls and 26% less average and countywide millage levy than Alachua County (Source: Budget Workshop). Alachua County taxes are distributed among five government institutions: county (33%), libraries (7%), water management districts (2%), school board (40%), and MSTU (18%).

(http://www.acpafl.org/annual_reports/2001_reports/2001_report/yourdollar_2001.htm)

Relationship of the CIE to the Capital Improvements Program

The Capital Improvements Element includes the data and analysis, goals, objectives, and policies, and the Capital Improvement Program, indicating the five year schedule of projects to implement the element. The goals, objectives, and policies and Capital Improvement Program are the sections which must be adopted by the Board of County Commissioners. The Capital Improvement Element contains facility types as required by Rule 9J-5 with adopted level of service standards to be used for evaluating development orders to meet the requirement that adequate facilities be available concurrent with the

impact of that new development. These facility types are: 1) transportation mobility; 2) sanitary sewer; 3) potable water; 4) solid waste; and 5) stormwater management. In addition, the element addresses other facility types and capital needs, and sets level of service guidelines to be used for purposes of planning the full range of capital improvement needs. These additional facility types include fire and rescue services, administrative buildings, sheriff, correctional facilities, preservation lands, and other capital improvements needed by both constitutional officers and general government. The Alachua County Capital Improvements Program (CIP) allowed as part of the Concurrency Management Plan addresses those projects for which the County has fiscal responsibility needed in the next 5 years to address LOS/Concurrency needs.

Relationship of the CIE to Elements of the Comprehensive Plan

The intent of the CIE is to ensure the public sector's implementation of the public infrastructure needs and standards identified in the comprehensive plan, just as the future land use element and land development regulations are intended to guide private sector development in a manner consistent with the comprehensive plan. This section will summarize the key areas of the CIE addressing the general comprehensive plan goals:

Future Land Use. Integration of the Future Land Use and CIE is vital to the success of the Comprehensive Plan. Directing new development to areas where infrastructure capacity exists or is programmed for the future can maximize the benefit of public infrastructure investment.

Transportation Mobility. Maintaining adopted levels of service for roads is a primary function of the CIE. New quality of service standards for bicycles are provided for a transportation alternative.

Sanitary Sewer, Solid Waste, Stormwater Management, and Potable Water. Maintaining adopted levels of service for infrastructure and County services is a primary function of the CIE.

Conservation. The Conservation and Open Space Element addresses protection, conservation, and appropriate use of the natural resources of the county. Implicit in the requirements for the objectives and policies for this element is the understanding that natural resources perform functions beneficial to the health, safety, and welfare of society, and perform those functions without cost to the citizenry. Protection of resources such as groundwater, floodplains, wetlands and surface waters today minimizes expenditures in the future. Preservation of sensitive lands through direct purchase or other methods is considered as a capital expenditure but not needed for Concurrency Management.

Recreation. The recreation objectives and policies must ensure that parks and recreation facilities are adequately and efficiently provided; and establish level of service standards for recreation and correct or improve deficiencies in existing parks.

Intergovernmental Coordination. The intergovernmental coordination element requires Alachua County to coordinate the comprehensive plan with the plans of the School Board of Alachua County, other units of local government providing services but not having regulatory authority over the use of land, and with the comprehensive plans of adjacent municipalities and adjacent counties; and ensure coordination in establishing level of service standards for public facilities with other entities having operational and maintenance responsibilities. Numerous opportunities exist for orchestration of capital improvements between different agencies. Examples include: coordination of school, library, and neighborhood park planning; and, combining Conservation and Recreation Lands (CARL) and Water Management District

land purchases with local trail, park, and open space programs.

The University of Florida, with extensive facilities throughout the county, has a major impact on development, and Alachua County participates in the Campus Master Plan process. The University facilities are tax exempt.

EVALUATION AND APPRAISAL REPORT

On September 14, 1998, the Board held a preliminary public hearing on the Capital Improvements Element. The Board provided direction on the recommendations forwarded by the LPA for the final public hearing on September 28, 1998. The recommendations adopted by the Board of County Commissioners are included in the CIE policies and Capital Improvements Program.

II. DATA AND ANALYSIS

1. Local Practices Guiding Timing and Development of Public Facilities (9J-5.016(2)(a))

This section reviews, by facility type, current local practices guiding the timing and development of public facilities. Three different capital improvement programs are in operation in the county. There are separate programs for transportation facilities and solid waste facilities and a general capital improvement program for all other improvement categories. The Comprehensive Plan, Zoning Regulations, Subdivision Regulations, and budget policies also influence the capital improvement program process.

Management of public facilities is guided through three distinct processes. The Concurrency Management System (CMS) monitors development activity of available capacity of supporting facilities or service through the monthly monitoring report. Programming of funding for identified needs is in accordance with the annual Public Meeting Process, which culminates in the annual adopted County Budget. These two processes cover management of facility increases. Decreases in public facilities, (such as road jurisdiction transfers) occur because of municipal annexations. The management of this process is presented in the Intergovernmental Coordination Element in the policies which address the Alachua County Boundary Adjustment Act.

Transportation Facilities

The Alachua County Transportation Needs Plan is a planning document that identifies transportation system needs and funding requirements to assist the public works staff in recommending the most cost-effective expenditure of available transportation funding resources to meet the goals of the County Commission. The needs list is organized within the categorical areas of Multi-Modal, Efficiency, Maintenance and Capacity.

This plan is an important element in the development and updating of the Five-Year Transportation Modification Program, which is transmitted to the Florida Department of Transportation (FDOT) annually. Planned transportation projects are shown in Table 1: Concurrency Related Road Improvements and Table 2: System Management Modifications and Safety Improvements, FY 2001/2002 to 2005-2006.

An analysis of the Concurrency-related road improvements within the next five-year period has been completed. The total cost to implement this plan is slightly more than 20.8 million dollars with an estimated cost to the County being slightly more than 11.9 million dollars. Additional funding comes from the Campus Development Agreement and a grant from the Florida Department of Transportation.

The CIE includes new Quality of Service standards for bicycles, not a Concurrency requirement. The Alachua Countywide Bicycle Master Plan, June 2001 evaluated bicycling conditions using the Bicycle Level of Service Model. This plan also includes a section on possible revenue sources for implementing the Bicycle Quality of Service standards.

Recreation Facilities

The Recreation Element of the Comprehensive Plan requires the completion of a Recreation Master Plan,

which is underway in early 2002. During the planning process, the Parks Coordinator at the Department of Public Works develops park plans and cost estimates. The Recreation and Open Space Advisory Committee (ROSCO) prioritizes park projects. In presenting capital improvement recommendations to the BoCC based on all facility needs, staff evaluates and makes recommendations on the list of park projects in conjunction with all other projects. Several park projects are unfunded, and recently three park playgrounds were closed due to CCA contamination of the equipment. The Comprehensive Plan proposes changing the LOS for recreation to 0.5 improved acres per 1000 population for activity-based recreation and 5.0 improved acres per 1000 population for resource-based recreation. No acreage is needed to meet the proposed activity-based recreation level of service standard thru 2020. As for resource-based recreation, 22 acres will be needed in 2005, 62.5 needed by 2010, 96 needed by 2015 and 128.5 needed by 2020. Acquisitions through the Alachua County Forever Land Conservation Program, funded through a 1 mil ad valorem property tax assessment, are expected to meet those needs.

Conservation and Open Space

As noted above, the Alachua County Forever Land Conservation Program, approved by voter referendum, began in 2001. The first acquisitions were approved by the BoCC on February 26, 2002. The prioritization process is detailed in the COSE.

Solid Waste

Solid Waste disposal is performed through the County's Public Works Department, Office of Waste Management, and the plan establishes the LOS as 0.73 tons per capita. As discussed in the Solid Waste Element, the Leveda Brown Environmental Park and transfer station should have adequate capacity to serve both Alachua and Gilchrist Counties well beyond 2020. The transfer station and other structures within the park are of high quality and are expected to last a minimum of thirty years. The capital cost of the buildings at the facility are amortized over thirty years.

Stormwater Management

There are no publicly funded stormwater projects which are required to maintain the proposed level of service standards included in the Capital Improvement Program. Required LOS Standards for stormwater facilities must be met by new developments as they receive development approval. Stormwater management is provided through the Concurrency process since post-development runoff cannot exceed pre-development runoff. A list of capital improvements needs to address localized existing deficiencies associated with existing development has been developed as detailed in the Stormwater Management Element.

Potable Water and Sewer

Potable water and sanitary sewer projects have historically not been included in the County's Capital Improvements Program since the County does not currently operate any central systems. Extensions of municipal central water and sewer systems into the unincorporated County must be approved by the Board of County Commissioners.

Other Facilities

Other capital improvements for the departments and constitutional officers are programmed through the

Capital Improvement Program. This program is updated annually and contains a first year Capital Budget and a five year schedule of capital improvements. This is not related to Concurrency Management. Map 1 shows the location of Fire and EMS Stations.

The cost of the funded FY 2002-2006 CIP totals \$2,575,964. Funded improvement categories areas are represented as follows: Transportation Improvement Program projects (\$394,750); Solid Waste (\$261,720), Administrative Services(\$1,919,494).

An infrastructure sales surtax was approved by voter referendum in November 2000 to fund a new \$26 million criminal courthouse. The 1 cent for 1 year sales tax will pay for the new judicial complex/parking facility. The 2002 budget workshop reported Traffic Court Service Fees are \$400 thousand less than anticipated.

2. Use of Timing and Location of Capital Improvements to Support Efficient Land Development (9J-5.016(2)(e))

Efficient land development is that which avoids extensions of infrastructure to serve "leapfrog" development or isolated new development which requires major investments in new infrastructure in order to allow that isolated development to tie in economically or socially with an existing developed area. The Future Land Use Element delineates the urban service line so as to provide for the efficient development of land through the extension of infrastructure within designated areas. The timing and location of infrastructure is incorporated into the capital improvement program by examination of the Future Land Use Map.

The County budget process is the mechanism to implement the capital improvements program. Alachua County Comprehensive Plan policies establish the priorities for facility improvements. Alachua County shall set the relative priorities for improvement projects within types of public facilities as:

- A. Capital improvements to be funded with a funding source other than impact fees shall be evaluated in accordance with the criteria listed below. Projects eligible for the use of impact fees shall be evaluated consistent with Policy 1.8.2.

Priority 1 - The repair, remodeling, renovation, or replacement of obsolete or worn out facilities that contribute to achieving or maintaining adopted LOS standards.

Priority 2 - New public facilities and improvements or modifications to existing public facilities that eliminate public hazards:

Priority 3 - New public facilities and improvements or modifications to existing public facilities that are needed to maintain health, safety, and welfare.

Priority 4 - New public facilities or improvements to existing public facilities that are required by contractual obligation or legal mandates.

Priority 5 - New and expanded facilities that reduce or eliminate deficiencies relative to LOS

standards for existing demands. Projects to address deficiencies to serve existing development or approved vested development in urban service areas designated in the Future Land Use Element shall have priority within this category.

Priority 6 - New or expanded facilities, including land acquisition, that are needed to maintain adopted LOS for new development and redevelopment during the next five years. Projects to serve new development within urban service areas designated in the Future Land Use Element shall have priority within this category.

In the event that capacity of public facilities is insufficient to serve all applicants for development orders, the priorities shall be as follows:

1. Capital Improvements to serve DRIs and vested (i.e., where development has commenced and is continuing in good faith) final development orders issued prior to plan adoption. Criteria to rank the following shall be established in the Concurrency Ordinance: Projects subject to development agreements. Final development orders not vested. Non-final development orders. Other categories of development based on the Comprehensive Plan policies.

Analysis of Priorities for Facility Improvements

First priority for Capital Facility Improvements is now related to LOS standards, which strengthens the link between the CIE and land use. Impact fees as allowed by Policy 1.8.2. can address priorities 1 and 6.

Policies for Urban Development- Current and Proposed Practices to Assist Efficient Land Development

The Comprehensive Plan designates the Urban Cluster as an area for urban development, which includes residential densities ranging from one unit per acre to 24 units per acre or greater, non-residential development, and is generally served by urban services. In order to phase development for the Urban Cluster and promote efficient use of land and infrastructure and minimize sprawl, an urban services line is designated in the Future Land Use Map series. This line identifies the limits of the area within the Urban Cluster within which phased development shall be promoted through the year 2010. Beyond this line, using a variety of growth management tools such as limitations on the density or intensity of development through zoning and limits on capital improvements, urban type development is prohibited or strongly discouraged.

Analysis of Policies for Urban Development

Dr. James Nicholas of the University of Florida completed a review of a report submitted to the County by the Gainesville Builder's Association. The GBA report was entitled "Growth and Infrastructure in Alachua County: Does Conventional Development pay it Share of Public Costs?" While the Homebuilders Association economic analysis might be used to indicate their industry's contribution to the state and local economy, it is inappropriate for the Association to further claim that development pays for the cost associated with local government expenditures related to infrastructure. Dr. Nicholas points out that revenues from local development, which the report implies is available to offset costs of local infrastructure in reality is collected by the state and generally not redistributed to local governments.

Major commercial development is directed to activity centers. An innovation in the new plan is the concept of Village Centers, allowing small scale mixed use areas in residential neighborhoods to promote pedestrian life. The Comprehensive Plan supports the MTPO Livable Cities Reinvestment Plan in the policy framework.

The tax impacts of land use policies has a direct impact on the provision of capital improvements. In 1989, a Urban Land Institute report estimated a \$48,000 per house sprawl “premium” for providing services to a three unit per acre development located ten miles from central facilities and employment centers. By contrast, the same costs for a home in a 12-unit per acre development, located closer in, with an equal mix of residential uses (townhouses, garden apartments and single family) would be 50 percent lower (CNU).

Policies for Rural Development-Current and Proposed Practices to Assist Efficient Land Development

The updated plan requires clustering of all rural residential subdivision development and maintains the Rural Clusters for limited commercial development.

Analysis of Policies for Rural Development

In general, rural development policies have been successful in restricting commercial uses in rural areas. The allowance of one dwelling unit per five acres in rural residential areas is not conducive to maintenance of rural and agricultural land uses and may, in the future, create competition between rural and urban areas for limited capital improvement funding for roads and other facilities. The plan requires clustered subdivisions in the rural area to minimize this and ensure maximum utilization of infrastructure. In *Growing Greener* (November 1997), Randall Arendt states that “property assessments on (rural cluster) conservation subdivisions should not differ, in total, from those on conventional developments. This is because the same number of houses and acres of land are involved in both cases (except when part of the open space is owned by a public entity, which is uncommon). Although the open space in conservation subdivisions is taxed low because easements prevent it from being developed, the rate is similar to that applied to land in conventional subdivisions where the larger houselots are not big enough to be further subdivided.”

Cluster Development is a pattern in which uses are grouped or clustered through density transfer within a parcel, rather than spread evenly throughout a parcel as in conventional lot-by-lot development. Cluster zoning is favored by many communities and developers since it allows protection of open space lands, creates less monotonous designs, and saves money by requiring fewer streets and shorter utility lines.

Currently the zoning regulations provide for clustering through PUDs. A major change in the proposed plan is a requirement for clustered subdivisions for the rural/agricultural land use. The County will update the existing cluster ordinance.

Protecting agricultural land in Alachua County is important, in addition to the quality of life and economic diversity concerns, because of the tax base benefits. Although not widely known, farmland, not residential and commercial development, contributes the most to a local government's tax base and save communities money. Numerous studies from around the nation have found that such lands contribute more in tax dollars than they demand in tax-supported services. Several of many examples include (Source: 1000 Friends of Florida):

- Hebron, CT: Farms required \$0.43 in services for every dollar they generated in taxes. In contrast, residential properties required \$1.06 in services for every dollar contributed in taxes.
- Minneapolis-St. Paul, MN: In three nearby rural communities, farms drew an average of \$0.50 in services for every tax dollar paid. Residential properties required an average of \$1.04 in services for every tax dollar.
- Dunn, WI: Farms required \$0.18 in services for every tax dollar; residential development cost taxpayers \$1.06 for every tax dollar collected.¹²
- Frederick County, MD: Residential property cost local government \$1.14 in services for every tax dollar collected, resulting in a net deficit. Farmland and open space required only \$0.53 in services for every tax dollar paid, thereby subsidizing residential land.

One (Virginia) study showed that for every dollar of tax revenue collected from residential land, \$1.25 is spent on public services. For each dollar generated from an open space tax, 19 cents is spent on services. (EPA, 1997, Community Based Environmental Protection, p. 3-26)

State and federal finance and tax incentives are provided to assist agricultural operations. But current policies are not proving adequate to deter the widespread conversion of farmland, ranges, forests and other rural properties to development. As rural areas are transformed to urban and suburban, the taxes on area residents also rise to support new infrastructure and public services.

2. **Public Health and Educational Facilities (9J-5.016(1)(b) & 9J-5.016(2)(d))**

Geographic service areas and location of Public Education and Public Health Systems

- Public Health Facilities: There are three major acute care facilities in the County, a veteran's administration hospital and numerous smaller specialty hospitals serving specific groups. The three acute care facilities in Alachua County are Shands at U.F., Shands at Alachua General Hospital (A.G.H.), and North Florida Regional Medical Center. Shands at U.F. and Shands at A.G.H. are private non-profit facilities, while North Florida Regional Medical Center is owned by Hospital Corporation of America. See Map 2 for the location of the public hospitals. The data on number of beds is located in Table A.

Table A. Existing and Planned Hospital Beds in Major Hospitals in Alachua County (excluding the Veteran's Administration Hospital)

Hospital	Ownership	Beds	Planned Beds	Total
Shands/Alachua Gen.	Non-profit	367		
North Fla. Regional	Proprietary	254		
Shands/UF	Non-profit	570	48	618
Shands Rehab	Non-profit	40		
Shands/Vista	Non-profit	81		
Total		1,312	48	1,360

Source: North Central Florida Health Planning Council, Inc. Hospital Data Report 2000.

Special population government hospitals in Alachua County are the 17-bed Tacachale-Dahlia Hospital on Waldo Road and the 255 bed Malcolm Randall VA Medical Center on Archer Road. These facilities are not required to receive Certificates of Need prior to expansion.

Alachua County is home to a world-class medical community. The area supports six hospitals with more than 1,800 beds, including the Gainesville Veterans Affairs Medical Center, North Florida Regional Medical Center, and SHANDS Healthcare System. An estimated 2,000 doctors and 135 dentists work in

patient care, research, service and education positions at area health-care facilities.

Gainesville Veterans Affairs Medical Center is a five-story, 480-bed hospital on Archer Road dedicated to the treatment of veteran patients. Affiliated with the University of Florida's J. Hillis Miller Health Science Center, the hospital is a general medical, surgical and psychiatric facility that provides primary, secondary and tertiary care for veterans in North Florida and South Georgia. Twenty-five different medical specialties are represented on the staff and extensive research is carried out in cancer, cardiology, alcoholism, psycho-physiology, nuclear medicine and ophthalmology.

The Gainesville VA Medical Center is one of the most active hospitals in the Department of Veterans Affairs, caring for more than 10,000 veterans each year. The hospital totals more than 130,000 out-patient visits each year.

The Santa Fe Health Care System Satellite Campus Hospital is a private health care facility in Alachua County. The Campus Hospital will at the completion of its 30 year plan, provide a total of 1,360,000 square feet of building area, of which there will be an 83 bed Psychiatric Hospital (52,295 square feet) and a 40 bed Rehabilitation Hospital (33,363 square feet). Ten percent of the Campus Hospital external trips are estimated to either originate or end outside of Alachua County, with the remainder distributed within the County. Analysis results have shown that the Campus will have little impact on adjacent roadway systems.

These facilities are expanded from time to time and the urban locations take advantage of existing infrastructure. HRS recently opened a Children's Medical Center next to the VA Hospital in Gainesville which is projected to treat 30 to 40 patients daily. This location also took advantage of existing infrastructure.

Central water and sewer systems, solid waste facilities, mass transit and transportation facilities are the public facilities most likely to be impacted by hospital expansions. A general hospital generates approximately 15 trips per bed while a University hospital generates roughly 37 trips per bed.

b. Public Education Facilities

Maps 3 and 4 and show the location of public school facilities. The Enrollment Projection and Capacity Analysis proposed for the June 26, 2001 Capital Outlay Workshop of the School Board of Alachua County reported the district enrollment for February 2001 full-time equivalents to be 27,727 students, with a projected enrollment of 27,140 students for 2003/04. This enrollment capacity information for public education facilities is detailed in the report.

The Comprehensive Plan requires the County shall collocate public facilities such as parks, recreational areas, libraries, and community centers with schools to the extent possible. School districts are shown on Maps 5-7. Joint planning between the School Board, Alachua County and the municipalities can help facilitate programming of adequate road facilities to serve existing and planned schools, linkage of all schools to surrounding residential areas via a safe system of sidewalks and bikeways, development of neighborhood park sites in conjunction with school sites, and provision of other infrastructure such as central water and sewer, if available, and fire and emergency medical facilities. The mechanisms to provide for coordination of School Board and County planning are detailed in the Intergovernmental Coordination Element.

Alachua County also contains private educational facilities, however, the impact on infrastructure associated with the facilities has not been assessed.

3. Intergovernmental Coordination Issues

The two Water Management Districts with jurisdiction in Alachua County plan to update the mapping of prime aquifer recharge areas. The NCFRPC SRPP Evaluation and Appraisal Report (December 2000) notes that Regional Policy 4.3.1. calls for coordination between water management districts in the mapping of high aquifer recharge areas to prevent map inconsistencies near District boundaries, but this has not been implemented to date. Alachua County is bisected by the St. John's River and the Suwannee River Water Management Districts. Each district has used different methodologies and assumptions in preparing the maps of high aquifer recharge areas. The regional planning council report states that a threat of a lawsuit could result if a map beyond the jurisdictional limits of the St. Johns River Water Management District is applied county-wide. Alachua County staff have some technical concerns with the SRWMD mapping model as well. As noted by Sloan and Chandwani (ASCE, 1997, p. 12) some of the dangers in ground-water modeling include misconceptualization of the physical system, over-simplification, over-calibration, misapplication of the code, and unrealistic expectations.

4. Existing Revenue Sources and Funding Mechanisms Available for Capital Improvement Financing [9J-5.016(1)(c)]

The County's 5 year Capital Improvement Program is updated each year in conjunction with development of the budget and preparation and review of the Annual Concurrence Status Report. Priority projects are classified according to categories and process identified in the Capital Improvements Element. Revenue sources and funding information is updated annually as part of the budget process. Information is available from the :Alachua County Office of Management and Budget, 2002. *Annual Budget for FY02 and FY03 and Capital Improvements Program for FY02 through FY06.*

5. Analysis of Existing Deficiencies

Unfunded projects in the Capital Improvement Program FY02-FY06 are not required for concurrency management.

6. Estimated Cost of Correcting Existing Deficiencies

Estimates for unfunded projects in the Capital Improvement Program FY02 are included in the adopted County budget. An impact fee ordinance and other strategies are under consideration.

7. FISCAL ANALYSIS (9J-5.016(2)(f))

This section provides a preliminary assessment of the County's ability to finance capital improvements based on anticipated revenues and expenditures for FY 2002 through FY 2006. The fiscal analysis requirements of Rule 9J-5.016(2)(f) are detailed in Alachua County Office of Management and Budget, 2002. *Annual Budget for FY02 and FY03 and Capital Improvements Program for FY02 through FY06.*

Cost estimates for those capital improvements identified in individual Elements as needed to support the Future Land Use Element come from a variety of sources. All concurrency related areas for which the County has capital responsibility are under the administration of the Department of Public Works. Public Works has the in-house ability to generally estimate project costs for roadways, parks and stormwater management improvements. Estimates are reviewed by OMB during the budget process and then a project budget is set with the County Commission. These budget estimates guide the County in determining whether sufficient funds are available to call for bids and implement the project.

A report to Alachua County on Tax Increment Financing for Rural Heritage Districts was prepared by the UF Conservation Clinic. In addition a case study of Cross Creek was performed to assess the value of using tax increment financing in rural areas. This case study of tax increment financing in Cross Creek is based on the computed tax increment revenues over the next thirty years. The total increment revenue in the study is \$4, 525, 243.93.

The capital improvements element shall be reviewed on an annual basis and modified as necessary in accordance with s. [163.3187](#) or s. [163.3189](#), except that corrections, updates, and modifications concerning costs; revenue sources; acceptance of facilities pursuant to dedications which are consistent with the plan; or the date of construction of any facility enumerated in the capital improvements element may be accomplished by ordinance and shall not be deemed to be amendments to the local comprehensive plan. All public facilities shall be consistent with the capital improvements element.

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**ECONOMIC ELEMENT
DATA AND ANALYSIS**

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INTRODUCTION

Economic Development in Alachua County will be guided by the Strategic Plan for Sustainable Economic Development. The Alachua County Commission appointed an Economic Development Advisory Committee (EDAC) in February 1999. Their directive was to develop a Strategic Economic Development Plan and to develop criteria by which economic development projects, seeking County assistance, shall be evaluated.

The plan was adopted by the Alachua County Commission in July 2001 and comports with the Economic Element of the Comprehensive Plan. The key issues in the Economic Element of the Comprehensive Plan can be summarized under three headings as follows:

- 1) Poverty Alleviation
- 2) Revenue and Economic Diversification, and
- 3) Compatibility of Growth With Environmental Preservation

Other issues of importance to the Commission are: living wages and the process for funding economic development organizations.

I. Poverty

The 1990 and 2000 census data indicate that the poverty rate for Alachua County is higher than that of the rest of the state. The figures are as follows:

Table 1: Comparison of Poverty Rates: Alachua County & Florida		
Year	Alachua County	Florida
1990	23.5%	12.73%
2000	18.3%	14.4%

Source: United States Bureau of the Census, 1990 & 2000.

The distribution of poverty is also a major concern. Most of the poverty is concentrated in urban East Gainesville particularly in Census Tracts 2, 6 and 7 which have been designated distressed communities by the United States General Accounting Office.

While the unemployment rate for the County fell to a record low of 2.1 percent, the poverty rate remains higher than the rest of the state at 18.3%.

Under employment is another persistent problem. The Lockwood Green Study was commissioned by the Council for Economic Outreach and reported their findings in March 2001. The study concluded that Alachua County had an underemployment rate of 23.6%.

The December 2001, *Evaluation and Appraisal Report Proposed Amendments of the North Central Florida Planning Council* contains very detailed data on the employment and poverty conditions of Alachua and all the other counties in the North Central Florida Regional Planning area. The report, like many other analyses on poverty in Alachua County, seems to suggest that the simultaneous occurrence of low unemployment and high levels of poverty is due to the predominance of service jobs in the local economy and the lack of industrial jobs.

An economy that has services as its economic base, as Alachua County is, should not necessarily be a low wage economy. The trend in economic development is that services are employing more people. The challenge is to develop the skills that are needed in the community and that pay a higher wage. The Economic Element stresses improving workers' skills.

II. Revenue and Economic Diversification

According to Alachua County's Office of Management & Budget, 48% of the property in the County is off the tax role. With an increasing demand for services, the County must find ways to increase and diversify its revenue sources. One way to do so is to increase the number of businesses operating in Alachua County.

The Economic Element of the Comprehensive Plan and the Strategic Plan for Sustainable Economic Development each place great emphasis on local business development. Both plans stress the development of businesses that use the County's resources.

The training institutions - the University of Florida and Santa Fe Community College - are two of the County's greatest resources. The Economic Element stresses collaboration among the institutions, potential employers and the County.

The commercialization of technology developed by the University of Florida is also a potentially important source of economic growth. The Gainesville/Alachua County Technology Enterprise Center (GTEC) was constructed in 2000 at a cost of \$3.6 million to help in this technology commercialization process. The City of Gainesville and Alachua County each contributed nearly \$500,000 to the development of this center.

The economy of Alachua County is very dependent on services and the retail sector. According to the Florida Statistical Abstract, the breakdown of employment by industry is as follows:

Table 2: Alachua County Employment by Industry	
Industry	Percentage of Workforce
Agriculture	1.8

Mining	.01
Construction	6.1
Manufacturing	7.33
Transportation/Communications	3.12
Wholesale	3.02
Retail	28.6
FIRE	6.82
Services	42.6
Other	.25

Source: Florida Statistical Abstract - 2000; University of Florida Bureau of Business & Economic Research.

Services and retail (with the exception) of the professional services have historically paid low wages. The economic element attaches a lot of importance to vocational training and entrepreneurship development to try to diversify the County’s economy, reduce poverty, and reduce the relative importance of retail and service jobs.

III. Compatibility of Growth With Environmental Preservation

Both the Economic and the Strategic Plan for Sustainable Economic Development stress the importance of ensuring that growth occur in harmony with economic development. The County Commission’s directive to the Economic Development Advisory Committee was to develop a consistent set of criteria for evaluating projects which are seeking financial assistance from the County. The equal weight is given to the project’s social, economic and environmental impacts.

IV. Inventory of Economic Development Organizations

The following represents an inventory of organizations within Alachua County whose primary focus is economic development. A brief description of each organization is also provided.

East Gainesville Development Corporation is a non-profit community development organization. Its primary purpose is to create new growth, development and investment in east Gainesville. The organization also provides a multitude of services to residents and businesses in eastern Alachua County.

Enterprise North Florida Corporation (ENFC) works with emerging growth technology

companies to accelerate commercial success and prepare for capital investment. ENFC manages the North Florida Venture Capital Network, which provides access to early-stage investors, and the Technology Enterprise Center in Jacksonville - the region's first technology "accelerator."

Gainesville/Alachua County Technology Enterprise Center is technology incubator that seeks to promote the growth and development of new enterprises by providing flexible space at affordable price and a variety of supportive services. The main goal of the incubation program is to produce successful graduates –financially viable client that graduate from the incubator to become independent companies.

The Gainesville Area Chamber of Commerce is an advocacy Organization for the business and professional Community. The Chamber provides a forum for business to grow through a wide array of member services including networking and marketing opportunities and community involvement.

Gainesville Area Innovation Network is a network of investors , entrepreneurs, business people, professionals, investors, professors and service providers who share ideas energy and talents.

Gainesville Council for Economic Outreach is the primary economic development organization for Gainesville and Alachua County . CEO assist companies considering Alachua county as a possible location for new facility and existing companies considering an expansion.

The Gainesville Sports Organizing Committee brings tourists to the Gainesville Alachua County area by organizing sporting events and by recruiting sporting events to the area. The organization gets most of its funding from the County's 3% hotel bed tax.

North Central Florida Regional Planning Council assists businesses with financing through the Small Business Administration's 504 Loan Program. Business financing assistance is available throughout their twelve-county service area that includes Alachua County. The 504 Loan program is an economic development program that provides fixed interest rate and low down payments on real estate and equipment financing for businesses that would preserve and create new jobs.

Service Core of Retired Executives is a volunteer group of retired and active business executives who assist new and existing businesses through planning and counseling. In addition to free and confidential advisory work, SCORE offers seminars and workshops, at nominal fees on such subjects as: How to Start Your Own Business, Marketing, Administration, Public Relations, Sales and Foreign Trade for Small Business.

Sid Martin Biotechnology Development Institute is a biotechnology incubator that provides services to technology-based start-ups. Working closely with the University of Florida faculty and graduate students, the BDI supports business development through seminars and programs designed to link investors with business and financial leaders.

United Gainesville Community Development Corporation serves five counties in North Central Florida and is primarily focused on providing technical assistance to small and minority business.

The agency also administers the Gainesville/Alachua County Enterprise Revolving Loan Fund and Small Business Administration Micro-Loan Program. Qualified businesses can receive \$2,000 to \$50,000 in loans for starting or expanding a small business.

University of North Florida Small Business Development Center serves Alachua , Bradford, Dixie , Gilchrist and Levy Counties and is part of a national outreach program of the United States Small Business Administration that is partly funded through the states university system. The organization provides free and confidential services to business owners and prospective business owners.

V. Economic Issues in the Community

A. Living Wage

The County and the City of Gainesville are currently studying the issue of a living wage. The living wage is intended to raise the wages of the lowest level employees. The economic impact goes well beyond raising the wages of the lowest paid. The lowest paid are generally the least skilled. Those immediately above the lowest paid who are more skilled will also seek wage increases, and those immediately above the second lowest paid group will seek an increase – the compression effect. Businesses that contract with the County will also be bound to pay their employees a living wage. Implementation of a living wage directed at 200 of the lowest paid workers could cost the County millions of dollars.

B. Process for Funding Economic Development Organizations

The Strategic Plan for Sustainable Economic Development recommends that groups which are involved in economic development utilize a formula for how the funds allocated to economic development shall be distributed. The County has allocated \$75,000 for Economic Development for FY 01-02.

HISTORIC PRESERVATION ELEMENT DATA AND ANALYSIS

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Introduction

Scope and Purpose

Historically significant properties and resources are required to be addressed by the Future Land Use

Hist Pres Element....iii

and Housing Elements under Florida's Local Government Comprehensive Planning and Land Development Regulation Act (Chapter 163, Florida Statutes). The Future Land Use Element requires that "land use maps or map series shall identify and depict historic district boundaries and shall designate historically significant properties meriting protection." The Housing Element requires the "provision for relocation housing and identification of historically significant and other housing for purposes of conservation, rehabilitation, or replacement. If Historic Preservation is addressed as an optional element, the statute requires the element to "set out plans and programs for those structures or lands in the area having historical, archeological, scenic or similar significance."

The Historic Preservation Element serves to preserve and protect historic resources and properties within the county. The element contains objectives and policies to establish a Historic Resources Preservation Plan, strategies for the preservation of historic resources and properties, and to promote the use of historic resources for heritage tourism.

I. Benefits of Historic Preservation

Economic Benefits

Historic preservation or rehabilitation helps to create economic vitality in communities by increasing local labor demands and business for local suppliers, providing a cost-competitive approach to new construction and often leading to additional rehabilitation in surrounding neighborhoods. In 1994, there was \$44 billion worth of rehabilitation in the United States. New construction that year amounted to \$167 billion for total construction activity (with rehabilitation) to \$211 billion. Rehabilitation accounted for slightly more than one-fifth of total national construction (Listokin, Listoken and Lahr, 1998). Historic preservation is more labor intensive than new construction, with approximately 60 to 70 percent of the total costs going to labor instead of half as in new construction (Rypkema, 1999). In the state of Florida, every \$1 million spent rehabilitating an older building creates 36.9 jobs - twenty in the construction industry and seventeen elsewhere in the economy, which is two more jobs than the same amount spend in new construction (Rypkema, 1999).

Heritage Tourism

Heritage Tourism can be defined as "traveling to experience the places and activities that authentically represent the stories and peoples from the past" (Ohio Division of Tourism and Travel, 1997-1999). It includes historic, cultural and natural attractions and is one of the fastest growing segments of tourism around the world. Curiosity about the world, attributed to rising education levels, the proliferation of travel options and advances in global communications have all created new opportunities for heritage attractions. More than half of the states, including Florida, have established statewide heritage or cultural tourism programs, compared to virtually none a decade ago. The Travel Industry Association ranked heritage tourism Number 3 behind shopping and outdoor activities for domestic travel (Florida Times Union, 2001). Public visits to historic buildings and places promotes cultural diversity and provides economic benefits to the community.

Neighborhood Preservation

Neighborhood preservation or historic districts are established for a variety of reasons. Some communities create them to protect significant historic properties or to protect against a specific threat of development. Other communities create them to encourage development in an older area or as a tool for maintaining property values (Tyler, 2000). Historic districts have become a strategy to stabilize and reinvigorate urban neighborhoods. Declining neighborhoods mean loss of tax revenues for local government and the departure of skilled, educated and the employed. Neighborhoods characterized by blight see increased crime, underutilized public infrastructure and declining property values. Both the public and private sector suffer economically when residential neighborhoods decline (Rypkema, 2001).

Environmental Benefit

Sprawl can be defined as poorly planned, low density, auto-oriented development that spreads out from the edges of communities (Moe, 1999). Sprawl devastates older cities and town as well as older suburbs, where historic buildings and neighborhoods are concentrated. Historic preservation is a valuable tool in the preservation and protection of farmland and open space. No new land is consumed when a building is renovated and the rehabilitation of historic buildings into residences reduces the demand for new subdivisions. Restoring abandoned buildings in areas already served by infrastructure and services also saves tax payer money by reducing the cost of providing new roads, fire protection, schools and other infrastructure to previously undeveloped areas when an existing building could be reused.

II. Legislation

Federal

The **National Historic Preservation Act of 1966** (Public Law 89-665 16 U.S.C. 470-470m) authorizes the Secretary of the Interior to maintain a National Register of Historic Places and to grant funds to states for statewide historic surveys. The National Register is an inventory of the United States' historic resources and is maintained by the National Park Service. The inventory includes buildings, structures, objects, sites, districts, and archeological resources. The listed properties are not necessarily significant nationally, rather most are significant primarily at the State or local level. In addition to honorific recognition, the listing of a historic property in the National Register results in eligibility for federal tax benefits. Section 106 of the Act requires federal agencies to allow the Advisory Council on Historic Preservation an opportunity to comment on all projects affecting historic properties either listed in or determined eligible for listing in the National Register. The Advisory Council oversees and ensures the consideration of historic properties in the federal planning process and consideration in planning for federal and federally assisted projects.

The **Historic Sites Act of 1935** (Public Law 74-292) declares a national policy to preserve historic sites, buildings, antiquities, and objects of national significance, including those located on refuges. The Act gives the Secretary of the Interior the power to provide procedures such as surveys and investigations for designation, acquisition, administration, and protection of such sites.

Section 4(f) of the **Transportation Act of 1966** (Public Law 89-670 23 U.S.C. 138) provides that the Secretary of Transportation not approve any program or project which requires the use of any land from an historic site of national, state or local significance as determined by the Federal, State or local officials having jurisdiction thereof unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such historic site resulting from such use. This section applies to all activities of the Department of Transportation including the Federal Highway Administration, the Federal Aviation Administration, the Coast Guard, the Urban Mass Transportation Administration and the Federal Railroad Administration among others.

The legislation of the **National Environmental Policy Act of 1969** (Public Law 91-140 42 U.S.C. 4321 et. seq. 1970) obligates federal agencies to prepare an environmental impact statement for every major federal action affecting the natural and human environment. The environmental impact statement must address the impacts on the natural environment as well as the impacts on the quality of the urban environment, historic and cultural resources and recommend alternatives to avoid these impacts. The Department of Interior and the Advisory Council on Historic Preservation comment on the impact statements and assess the effects to historic resources.

The **Archaeological Resources Protection Act of 1979** (Public Law 96-95) applies to all lands the fee title to which is held by the United States and Indian lands which are held in trust by the United States. The purpose of the statute is to provide for the protection of archaeological resources on federal and Indian lands by establishing the terms and conditions for the granting of permits to excavate or remove archaeological resources on public or Indian land. The Act is also intended to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources and data.

State of Florida

The **Florida Historical Resources Act** (Chapter 267, Florida Statutes) is Florida's primary historic preservation legislation and promulgates goals and objectives for State action concerning historic preservation. The Act creates the Division of Historical Resources within the Department of State as the agency responsible for coordinating and overseeing the State's historic preservation activities and lists the responsibilities for each State agency, paralleling the National Historic Preservation Act of 1966.

The **Local Government Comprehensive Planning and Land Development Regulation Act** (Chapter 163, Florida Statutes) requires that historic resources be addressed in the Comprehensive plan elements of land use, housing and coastal management in conformance with State planning requirements.

Although the **Offenses Concerning Dead Bodies and Graves Act** (Chapter 872, Florida Statutes) was not originally intended to be a historic preservation law, it provides penalties for persons who willfully and knowingly destroy, mutilate, deface, injure, or remove any tomb, monument, gravestone, burial mound, earthen or shell monument containing human skeletal remains or associated burial artifacts or who willingly and knowingly disturbs the contents of a tomb or grave.

The **Unmarked Human Remains** legislation (Chapter 872.05, Florida Statutes) applies to all human burials, human skeletal remains, and associated burial artifacts not otherwise protected under other state laws and found upon or within any public or private land in the state, including submerged lands. This section requires that any person who knows or has reason to know that an unmarked human burial is being unlawfully disturbed, destroyed, defaced, mutilated, removed, excavated, or exposed shall immediately notify the local law enforcement agency with jurisdiction in the area where the unmarked human burial is located. If an unmarked human burial is discovered other than during an archaeological excavation authorized by the state or an educational institution, all activity that may disturb the unmarked human burial shall cease immediately, and the district medical examiner shall be notified. Such activity shall not resume unless specifically authorized by the district medical examiner or the State Archaeologist.

Local

The optional Historic Preservation Element (CPA 11-1) consolidates and expands upon historic preservation policies from the Future Land Use, Housing and Conservation and Aquifer Recharge elements of the currently adopted 1991 Comprehensive Plan. The new element of the Comprehensive Plan 2001-2020 includes specific policy language which extensively incorporates Evaluation and Appraisal Report (E.A.R.) recommendations. After adoption, as mandated by Section 163.3194, Florida Statutes, all development undertaken by, and all actions taken in regard to development orders by, the County shall be consistent with the Historic Preservation element and all other elements of the Comprehensive Plan.

Following the adoption of CPA 11-01, Alachua County staff will begin drafting a Historic Preservation ordinance, to be adopted in conformance with the Alachua County Updated Comprehensive Plan. The ordinance will include provisions and procedures for site plan review and development projects as related to historic resources as well as measures to protect these resources.

III. Inventory of Historic Resources in Alachua County

Florida Master Site File

The Florida Master Site File is a paper file archive and computer data base of all known historical structures and archaeological sites in Florida. It is maintained by the Bureau of Archaeological Research of the Division of Historical Resources, Florida Department of State, in Tallahassee. The Site File is organized alphabetically by county and sites are assigned numbers sequentially as they are recorded. Copies of survey reports are also maintained for use by researchers. There are currently more than 106,000 historical structures and archaeological sites listed on the site file. These properties are not required to meet any minimum level of historical or scientific importance, but usually are at least fifty years old, and adequately located and documented. These sites represent the known physical remains of Florida's prehistoric and historic cultural heritage. Information about a site is submitted by individuals and organizations to the Florida Bureau of Archeological Research on the historic or archeological Site File form for review. The Site File application requires information about the site including name, historic context, location, history, a description of the structure or site and some type of location map (Division of Historical Resources, Florida Master Site File Official website).

National Register of Historic Places

The National Register of Historic Places is part of a national program, authorized under the National Historic Preservation Act of 1966, to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed in the Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, and culture.

Criteria for Evaluation

Ordinarily cemeteries, birthplaces, graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

- a. A religious property deriving primary significance from architectural or artistic distinction or historical importance; or
- b. A building or structure removed from its original location but which is primarily significant for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or
- c. A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his or her productive life; or
- d. A cemetery which derives its primary importance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or

- e. A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or
- f. A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or
- g. A property achieving significance within the past 50 years if it is of exceptional importance.

Generally, properties eligible for listing in the National Register are at least 50 years old. Properties less than 50 years of age must be exceptionally important to be considered eligible for listing. Another criteria required for National Register eligibility is historic integrity. Historic integrity is the establishment of the authenticity of a property's historic identity, characterized by physical characteristics that existed during the property's historic period. There are seven aspects that the national Register recognizes that define historic integrity: location, design, setting, materials, workmanship, feeling and association.

1. Location is the place where the property was constructed or where the historic event occurred.
2. Design is the combination of elements that create the form, plan, space, structure, and style of property.
3. Setting is the physical environment of a historic property.
4. Materials are the physical elements that were combined during a particular period of time and in a particular pattern or configuration to form a historic property.
5. Workmanship is the physical evidence of the crafts of particular culture or people during any given period in history or prehistory.
6. Feeling is a property's expression of the aesthetic or historic sense of a particular period of time.
7. Association is the direct link between a historic event or person, and a historic property.

Significant districts, sites or buildings need to possess at least two of these seven aspects of historic integrity for eligibility and provide an overall sense of past time and place (National Register Bulletin 15: How to apply the National Register Criteria for Evaluation).

Benefits of National Register of Historic Places Listing

The listing of a historic property in the National Register provides recognition that the property is deemed by the federal and state governments to be significant in our history at the national, state and/or local levels. Most properties are significant because of their local significance. Although the listing is primarily honorary, it ensures consideration in planning for federal, federally licensed, and federally assisted projects that may effect the property. Section 106 of the National Historic Preservation Act of 1966 requires that Federal agencies allow the State Historic Preservation Office

and the federal Advisory Council on Historic Preservation an opportunity to comment on all projects affecting historic properties either listed in or determined eligible for listing in the National Register. A similar review takes place under state law for state or state-assisted undertakings. The listing of a property may make a property eligible for a federal income tax credit. An income producing property that undergoes some type of rehabilitation may be eligible for a 20 percent income tax credit equal to 20 percent of the cost of rehabilitation. In addition to this tax credit, ad valorem tax relief may be available to owners of properties that are listed or eligible for listing in the National Register of in a local district. This credit is available to both income and non-income producing properties. The listing on the National Register also exempts properties from certain Federal Emergency Management Act (FEMA) and eligible for some American Disabilities Act (ADA) and building safety code adjustments. Listing properties also receive preference in state preservation grant awards due to their significance.

Paleontological Resources

Paleontology is the study of prehistoric animal and plant life through the analysis of fossil remains. Objective 4 of the Historic Preservation element directs Alachua County to evaluate and where appropriate, conserve, protect or acquire sites and areas of paleontological significance.

Archaeological Resources

In May 2001, a report titled *An Archaeological Survey of Unincorporated Alachua County, Florida (Phase I)* was conducted by Southeastern Archaeological Research, Inc. (SEARCH) for the Alachua County Board of County Commissioners. The purpose of the survey was to inventory the archaeological sites in unincorporated Alachua County to assist the County in developing a comprehensive historic preservation program as recommended by the County's Evaluation and Appraisal Report. The results of the survey will be used to determine if regulatory protection is needed for archaeological resources in the County. All work was performed in accordance with the Florida Division of Historical Resources (FDHR) recommendations as well as all applicable terms and agreements of the Historic Preservation Grant Award Agreement between the Florida Division of Historical Resources and the County (Southeastern Archaeological Research, Inc., p.3).

As of December 2000, a total of 668 prehistoric and historic archaeological sites were recorded in the Florida Master Site File for Alachua County. A total of 72 sites are listed as being in the unincorporated areas, while 562 sites do not specify whether they are in the unincorporated area or within a municipality. The remaining 34 sites are located within municipal boundaries (Southeastern Archaeological Research, Inc., 2001).

The most common type of site in the county is artifact scatters. These sites typically are scatters of ceramic sherds and lithic tools and manufacturing debris. Most are believed to be short-term campsites related to hunting and gathering activities, although some may be more permanent village areas. Other types of archaeological sites in Alachua County include lithic scatters, mounds, quarries and historic sites such as post Indian-European contact.

Table 1. Archaeological Sites Listed in the National Register of Historic Places

Site Name	Site No.	Address	Year	Year Listed
Newnansville Town Site	8AL149	SR 235	1826	1975
Lake Pithlachocco Canoe Site	8AL4792	Newnans Lake	500-5000 years old	2001

Source: Southeastern Archaeological Research, Inc., 2001

There are currently only two archaeological sites listed in the National Register of Historic Places. Newnansville Town Site was established in 1826 and is located 1.5 miles northeast of the City of Alachua on SR 235. Newnansville was an important military and frontier outpost in the early years of Florida's statehood. The earliest settlement consisted of a block courthouse, a block house tavern, some log structures, Fort Gilleland and a cemetery. By 1900, the town ceased to exist due to its bypassing from the Florida Railway, which went through the nearby town of Gainesville. The only clues to the town's original layout are in glass fragments and other debris and lines of planted trees (Southeastern Archaeological Research, Inc., 2001).

The Lake Pithlachocco Canoe Site consists of over 100 canoes, which range in date from 500 to 5000 years old, that were exposed along the banks of Newnans Lake. The canoes were exposed due to drought conditions and historically low water levels around the lake and is the largest find of prehistoric canoes in North America (Southeastern Archaeological Research, Inc., 2001).

Table 2. Potentially Eligible Archaeological Sites for Listing in the National Register

Site Name	Site No.	Site Type
Old Pecan Grove	8AL257	Village
Burnett's Lake	8AL437	Archaic lithic scatter
Woody Woodpecker Site	8AL2325	Archaic lithic scatter
No Name	8AL2910	Lithic scatter
No Name	8AL2915	Lithic scatter
Scorpion Site	8AL3517	Not stated
Haufler Site	8AL286	Mission settlement
Dudley Farm Prehistoric Site	8AL2612	Lithic scatter-Quarry site
151 st Terrace Site	8AL2613	Not stated
Pine Hills Estate Site	8AL2881	Quarry
Timberlodge	8AL2905	Quarry, Paleoindian- Woodland
Prairie View	8AL2927	Multiple prehistoric occupations
Blues Creek	8AL2936	Lithic scatter
Bartram's Mound	8AL11	Mound
Camp Mounds	8AL44	Mound
Cameron Mound	8AL46	Burial Mound

Tucker Mound	8AL51	Burial Mound
Jackson Mound	8AL65	Burial Mound
Bryant Mound	8AL118	Burial Mound
Neal Mound	8AL120	probable Burial Mound
San Felasco Mound	8AL129	Sand Burial Mound
Myers Village Site	8AL215	Village
Myers Mound	8AL214	Sand Burial Mound
No Name	8AL266	Mound-Alachua Tradition
Henderson Mound	8AL463	Mound-Alachua Tradition
Lake Jeffords Mound	8AL2476	Mound
Ogden Pond Mound A	8AL3067	Mound
Ogden Pond Mound B	8AL3068	Mound
Fox Pond (San Francisco de Potano Mission)	8AL272	Historic Mission, Year 1606
No Name	8AL296	Seminole Site
Fort No. 12	8AL542	2 nd Seminole War Fort Site
Fort Newman	8AL3525	Seminole Site

Source: Southeastern Archaeological Research, Inc., 2001

Of the sites assessed for National Register eligibility or potential eligibility, many have been destroyed or damaged since their evaluation. However, many sites that may have been presumed to have been destroyed by developments, may have intact subsurface components, and some of these may be worthy of protection and management.

Architectural Resources

The *Historic Structures Survey of Unincorporated Alachua County* was conducted by Quatrefoil/Anderson Consulting in June 2000, as directed by Alachua County and the Alachua County Historical Commission. The scope of the project was to locate and document historic resources in the unincorporated area. The survey was funded by Alachua County with assistance from the Florida Department of State, Division of Historical Resources (Grant No. S0047) (Quatrefoil/Anderson, 2000). No previous formal surveys had been conducted in the unincorporated areas of the County and most of the historic buildings had been undocumented.

As of June 2000, there were 977 historic sites and buildings listed on the Florida Master Site File for unincorporated Alachua County. There are currently only five properties in unincorporated Alachua County listed on the National Register of Historic Places (Quatrefoil/Anderson, 2000).

Table 3. Architectural Properties Listed in the National Register of Historic Places

Site Name	Site No.	Address	Year Built	Year Listed
Rochelle School	8AL466	off SR 234	c1885	1973
Rawlings House	8AL479A	SR 325	c1890	1970
Evinston Post Office/General Store	8AL2556	CR 225	c1883-1884	1989
Kelly-Neilson House	8AL468	SR325	c1885	1973

Source: Quatrefoil/Anderson, 2000

The Rochelle School is a two-story school house built about 1885. The building has a central hall, a cloak room, two large classrooms downstairs, a large music room upstairs, a balcony and a bell tower. The town of Rochelle was originally known as Perry Junction after Governor Madison Starke Perry and the Rochelle School was name after his daughter Martha Perry until 1935.

The Rawlings House or the Majorie Kinnan Rawlings State Historic site was built circa 1890. The house was occupied by author Kinnan Rawlings who moved to Cross Creek in 1928. There she wrote the American classic novels Cross Creek and The Yearling, which won the Pulitzer Prize. The structure was originally a four room cracker house with a narrow open front porch, with a wing on the back of the house containing the dining room and the kitchen which was connected by a breezeway. The structure is of a wood frame construction with wide porches. The use of porches and cross ventilation of many windows typifies vernacular architecture for warm climates.

The Evinston Post Office/General Store was established in 1882 and is still operating. The building is constructed of heart pine and is located near the northern extremity of Orange Lake. The town of Evinston is named after John H. Evans, a former captain in the confederate army, and was a shipping station on the Florida Southern Railroad. The area prospered by shipping fruits and vegetables to markets in New England by rail until the great freeze of 1894-1895 causing settlers to relocate further south, leaving the settlement to shrink.

The Kelly-Neilson House is a large two story house which represents the stick style, a coherent preference for the irregular over the regular as described in “Architecture of County Homes” by Andrew Downing. It is a mortise-and-tenon system of wood frame construction with a somewhat irregular floor plan particularly in its system of porches and verandas. The wood frame house has a central hall running the length of the building, with a porch extending around the north and the west sides. The roof is steeply pitched with a decorative shingle patterned in a branch design. The land, located in Windsor, was originally sold to R.H. Kelly out of the Arrendondo Grant in 1885. The town of Windsor was originally an old cotton plantation, settled by cotton planters. The town prospered until the citrus trees were killed by the great freeze of 1894-1895 and the town never recovered from economic disaster.

The Kanapaha (Haile) Plantation was built circa 1860 and by Thomas Evans Haile. The property is believed to have consisted of 1595 acres and aside from the main house, the plantation consisted of a kitchen, smokehouse, cistern, barns and eighteen cabins for slaves. The cotton plantation was one of the largest in Alachua County and was strategically placed north of the Cedar Key-to-Fernandina Beach rail line. The house faces south and contains wide verandas on both the north and south facades. The interior walls were plastered and each room contained a fireplace. The one and a half story building is classically symmetrical and characterized by brace-frame construction with pegged mortise-and-tenon joinery. The structure represents a classic example of an antebellum cracker style plantation house that represents a former era of life in the South.

Potentially Eligible Historic Sites for Listing in the National Register

In addition to the historic properties listed on the National Register, there are several properties which may be eligible for listing. The survey of historic resources yielded 39 possible eligible structures. This number includes structures where limited access prohibited a complete evaluation but based on estimated age and visible architectural style and detailing, the potential for Listing on the National Register exists. A complete evaluation for architectural and/or historical significance to determine eligibility should be completed.

Table 4. Potentially Eligible Architectural Historic Sites for Listing in the National Register

Site Name or Address	Site No.	Year Built	Potential District
Buchholz House	8AL3789	c1925	Yes
Hodor Farm	8AL3858	c1900	Yes
19715 SW 30th Avenue	8AL3878	c1880	Yes
J. Zetrouer-Jenkins House	8AL475	c1885	Yes
Rochelle Church	8AL478	c1893	Yes
Waits House, SR 26	8AL4120	c1895	Yes
Island Grove Methodist Church, SE 219 Ave	8AL4712	c1885	Yes
Island Grove School, SE 205th Terr	8AL4722	c1910	Yes
Dupree-Crosby House, SE 203rd St	8AL4725	c1885	Yes
Brice-Barns House	8AL2326	c1890	Yes
Barron-Johnson House	8AL4143	c1885	Yes
Evinston United Methodist Church	8AL4148	1909	Yes
Evins-Wood House, 8414 SE 182nd Ave	8AL4149	c1885	Yes
Grace-Welch House, 7726 SE 179th PI	8AL4152	c1890	Yes
7019 +/- SE 183rd PI	8AL4155	c1900	Yes
5915 US 441	8AL4158	c1925	Yes
Lochloosa United Methodist Church	8AL4171	c1885	Yes
Ernest Nelson House, SE 199th St	8AL4201	1918	Yes
Camp-Tillman House, 1512 NE 191st Terr	8AL4262	c1880	Yes
Providence United Methodist Church	8AL4299	c1885	Yes

Lewis-Phifer House, SE 9th Place	8AL4302	c1850	Yes
Windsor Baptist Church	8AL4307	c1880	Yes
509 CR 234	8AL4308	c1885	Yes
Hainesworth Farms, 8912 SR 235	8AL4404	c1890	Yes
Stephens-Glazer House, 19802 Old Bellamy Rd	8AL4422	c1885	Yes
21315 NW 138th Ave	8AL4455	c1880	Yes
16429 NW 110th Ave	8AL4468	c1900	Yes
Traxler House, 23505 Old Bellamy Rd	8AL4475	c1910	Yes
Traxler Commissary, Old Bellamy Rd	8AL3654	c1885	Yes
House on Old Bellamy Road	8AL4483	c1900	Yes
St. Johns United Methodist Church, CR 239	8AL4507	c1880	Yes
26524 CR 241	8AL4515	c1900	Yes
Forest Grove Baptist Church, NW 94th Ave	8AL4522	c1885	Yes
333 SW 202nd St	8AL4538	c1870	Yes
16225 US 27/41	8AL4561	c1925	Yes
16407 US 441	8AL4579	c1870	Yes
18025 Whiting St	8AL4581	c1890	Yes
17820 SW 179th Ave	8AL4588	c1885	Yes
House on SW 114th Ln	8AL4591	c18900	Yes
4600 US 441	8AL4592	c1925	Yes
Singleton House, NE 192nd Ave	8AL4596	c1890	Yes

Source: Quatrefoil/Anderson, 2000

Districts Listed in the National Register of Historic Places

Table 5 Districts Listed in the National Register of Historic Places

District Name	Address	Year Listed
Melrose Historic District	Roughly bounded by Seminole Ridge Rd, Grove St, South St, Quail St and Melrose Bay	1990
Newnansville Town Site	State Road 235 near Alachua	1970

Source: Quatrefoil/Anderson, 2000

There are currently two districts listed on the National Register of Historic Places. The Melrose Historic District, located in northeastern portion of Alachua County consists of 7 contributing properties. The district has a local level of significance and the most prominent architectural style of the district is frame vernacular with buildings contributing periods of historic significance ranging from 1875 to 1949. The other Registered Historic District is the Newnansville Town Site near the city of Alachua which is described in the archaeological resources section of this report.

Potentially Eligible Historic Districts for Listing in the National Register

According to the *Historic Structures Survey*, there are several historic districts potentially eligible for listing on the National Register. Potential historic districts include:

- Rochelle
- Grove Park
- Island Grove
- Evinston

Windsor
Clark
Campville
Old Bellamy Road including Traxler

IV. INCENTIVES

Tax Incentives

Historic Preservation easements are voluntary legal agreements that protect a significant historic, archaeological, or cultural resource and may qualify a property owner to substantial tax benefits. Under easement terms, a property owner usually grants a portion or all property rights to historic preservation organization. Once recorded, the easement becomes part of the property's chain of title and runs in perpetuity with the land binding not only the current owner but future owners as well.

The **Federal Historic Preservation tax incentives programs** rewards private investment in rehabilitating historic properties such as offices, rental housing and retail stores. Current tax incentives for preservation, established by the Tax Reform of 1986, include a 20% tax credit for the certified rehabilitation of certified historic structures and a 10% tax credit for the rehabilitation of non-historic, non-residential buildings built before 1936.

The **Federal Low-Income Housing Tax Credit** was enacted as part of the Tax Reform of 1986 and is a vehicle by which the federal government funds the construction of new rental housing and the acquisition and rehabilitation of existing rental housing for low-income households. A 9% tax credit per year for 10 years for each unit of low income housing acquired, constructed or rehabilitated without other federal subsidies and a 4% tax credit per year for 10 years for units involving federal subsidies or tax exempt bonds.

In 1996, the Board of County Commissioners passed the **Ad Valorem Tax Exemption for Historic Properties** (Ordinance No. 96-9) which grants tax exemptions for improvements to historic properties located anywhere within the incorporated or unincorporated areas of Alachua county. Qualification requirements for the exemption are defined as listed on the National Register for Historic Places, a contributing property to a Nation Register-listed district or designated as a historic property, or as a contributing property to a designated historic district, in accordance with a local historic preservation ordinance. At this time, Alachua County has not acquired Certified Local Government (CLG) status and therefore, all applicants must first apply for Certificate of Appropriateness from the State. If the State Division of Historical Resources recommends approval, the property owner can then enter into a 10 year covenant with the Alachua County Board of County Commissioners, approved by resolution.

Mutual Covenants are prohibitions or agreements among adjacent property owners to subject each participating property owner's land to a common system of property maintenance and regulation. A covenant may be attached to a deed and could, for example, prohibit the development of an area of open space or demolition of a structure.

The **Purchase of Development Rights** involves the acquisition by a local governmental agency of the right to further develop a historic property. The value of the property is defined as the difference

between the property's market value and its use value. By acquiring the development rights, the land remains in private ownership but provides permanent protection from further development. Funding for this type of program typically relies on local bond issues or real estate transfer taxes.

The **Transfer of Development Rights** is similar to the purchase of development rights in that the right to further develop the property is sold. However, in this case, the right to further develop the property is sold to another private entity rather than a governmental agency. The private entity can in turn develop their own parcel of land at a density above the zoning limits, eliminating pressure to further develop in the historic area.

Florida's Community Contribution Tax Credit Program was created by the Florida Legislature to encourage private corporations and insurance companies to participate in revitalization and preservation projects. This program enables any corporation paying Florida corporate income tax or insurance premium tax to receive a tax credit equal to 50% of the donation to an approved community development or historic preservation project of up to \$2000,000 per year.

Revolving Funds are normally administered by a non-profit or governmental unit and establish a monetary basis on which property can be bought, improved, maintained and sold. Revolving fund monies can be subsequently returned and reused and act to create a new economic and social force in the community.

Achieving **Certified Local Government (CLG)** status from the National Park Service (NPS) can help local governments strengthen historic preservation efforts. Benefits of the CLG status include eligibility for special grants, technical assistance and training, and participation in the national Register nomination process for local properties. Requirements for local governments to participate in the CLG program are the adoption of a historic preservation ordinance; the appointment of a historic preservation commission for design review, a system for survey and inventory of historic resources; adequate public participation in the local historic preservation program; and that these efforts can be satisfactorily performed.

Tax increment financing (TIF) is a tool used by cities and counties to finance certain types of development costs. The public purposes of TIF are the redevelopment of blighted areas, construction of low- and moderate-income housing, provision of employment opportunities, and improvement of the tax base. It allows for the use of increased property taxes of a neighborhood starting from a base year to finance improvements within a TIF district. With TIF, a city "captures" the additional property taxes generated by the development that would have gone to other taxing jurisdictions and uses the "tax increments" to finance the development costs.

Renewal Community Designation benefits include tax credits, tax exemptions and grant preference.

Housing Rehabilitation Programs

The Alachua County Local Housing Assistance Plan (LHAP) details the program activities and management plan for the use of funds among public and private for-profit and not-for-profit entities to produce and preserve affordable housing in Alachua County. The plan includes the State

Housing Initiatives Partnership (SHIP) program and the Community Development Block Grant (CDBG) program. The SHIP program provides down payment, closing cost, and rehabilitation assistance to eligible home buyers of eligible homes. The maximum award for the SHIP Down Payment Assistance program is \$3,500 per unit for down payment and closing cost assistance and \$6,000 for rehabilitation per unit. The SHIP Single Family Housing Development program funds emergency repairs, housing grants Community Development Block Grant (CDBG) leveraging and housing rehabilitation. The maximum SHIP subsidy per unit is not exceed \$15,000. The Community Development Block Grant program (CDBG) is a federal program that provides funding for housing and community development. CDBGs monies focus on repair of all Minimum Housing Code Violations and Building Code violations with work often focusing on major structural repair and replacement of plumbing, electrical, and heating systems. The maximum award for CDBG assistance is \$26,000 per unit.

Grants

The **National Trust for Historic Preservation** has several grant opportunities including the *Preservation Services Fund* which provides matching grants ranging from \$500 to \$5000 to nonprofit organization and public agencies to encourage preservation at the local level by providing seed money for preservation projects. Funding is typically awarded to consultant services, education programs, and preservation conferences. The *Johanna Favrot Fund* for Historic Preservation provides nonprofit organizations and public agencies grants ranging from \$2,500 to \$10,000 for projects that contribute to the preservation. Funds may be used for professional advice, conferences, workshops and education programs. The *National Preservation Loan Fund* provides loans to establish or expand local and statewide preservation revolving funds; to acquire and/or rehabilitate historic buildings, sites, structures and districts; to purchase easements; and to preserve National Historic Landmarks. The *Inner-City Ventures Fund* finances the rehabilitation of historic buildings that serve the economic and community development needs of low, moderate, or mixed-income neighborhoods.

The **Florida Department of State Division of Historical Resources** historic preservation matching grant program awards grants to assist in the identification, excavation, protection, and rehabilitation of historic and archaeological sites in Florida, to provide public information about these important resources and to encourage historic preservation in smaller cities through the Florida Main Street program. Most grant awards range from \$5,000 to \$25,000 with a maximum matching grant award of \$40,000. Alachua County has received grants from the Division of Historical Resources in the past.

V. PRESERVATION STRATEGIES

Historic Resources Preservation Plan

Policy 1.1 of the Historic Preservation element designates Alachua County to create a Historic Resources Preservation Plan that addresses comprehensively responsible stewardship of historic resources and properties. It is intended that the plan shall be implemented through appropriate land

development regulations. The plan will include, at a minimum:

- a. Identification of a lead agency to manage the plan.
- b. Mechanism for coordination of the Alachua County Historical Commission, Departments of Growth Management, Environmental Protection, and Public Works for the preservation of historic resources and properties.
- c. Consideration by Alachua County to become a Certified Local Government for Historic Preservation.
- d. Mechanism for pursuing state and federal grants and other funding.
- e. Establishment of a methodology to qualify a historic resource or property as significant based on National Register of Historic Places and/or local criteria.
- f. Maintain an inventory of historic resources and properties.
- g. Creation of a Historic Preservation Ordinance to provide regulatory protection of historic resources and properties, including prohibition and enforcement regarding vandalism, and avoidance, minimization, and mitigation of development impacts. (Historic Preservation Element, Policy 1.2)

Historic Preservation Ordinance

After the formal adoption of the Historic Preservation element, Alachua County staff will begin drafting a Historic Preservation ordinance, to be adopted in conformance with the Alachua County Updated Comprehensive Plan. The ordinance will include provisions and procedures for site plan review and development projects as related to historic resources as well as measures to protect these resources. Many property owners fear that the designation of a property or a district will limit their right to alter or profit from their investment. A historic preservation ordinance does establish an objective and democratic process for designating properties and protects the integrity of designated historic properties by requiring design review. A historic preservation ordinance does not restrict the sale of a property, require improvements, changes, or restoration of property or prevent new construction within historic districts (Anderson, 2000).

According to the Florida Department of State, Division of Historical Resources, every ordinance should be tailored to fit the local situation but should contain: a statement of purpose; definitions, establishment of a review body; survey plans for the identification and evaluation of historic resources; procedures for reviewing any alteration, demolition, or new construction of any structure within a historic district or of similar activities affecting any individually significant archaeological site or historic property; and an appeals procedure (Division of Historical Resources. p.41).

Achieving Certified Local Government (CLG) Status

The Certified Local Government (CLG) Program was created from 1980 amendments to the National Historic Preservation Act of 1966. The objective of the program is to encourage direct local government participation in federal and state historic preservation programs. The National

Park Service requires that 10% of the federal annual apportionment to each state be awarded to Certified Local Governments (Division of Historical Resources, 1996). Policy 1.1.c of the Historic Preservation element provides for consideration by Alachua County to become a Certified Local Government for Historic Preservation. This status would entitle the county to funds earmarked for the exclusive use of so-designated local governments and would include eligibility for special grants, technical assistance and training, and participation in the national Register nomination process for local properties.

Design Guidelines

Design guidelines for historic preservation are a set of standards used by an appointed review board in reviewing the appropriateness of proposed changes to historic resources. They are intended to work in conjunction with a historic preservation ordinance. The guidelines provide detailed information and direction to property owners, County staff and the appointed review board in making recommendations about changes to historic properties. If changes are approved, review boards generally issue a document called a Certificate of Appropriateness. Changes involving new construction, reconstruction, alteration and major maintenance usually require this certificate. This document certifies that the proposed changes are consistent with design guideline and do not prevent ordinary maintenance or repair of any structure provided that it does not result in a conspicuous change to the external visual appearance of the structure.

Heritage Tourism

Objective 5 of Historic Preservation element promotes the use of historic resources for heritage tourism as part of the County's economic development efforts. This goal can be realized through cooperative efforts between business, non-profit, and governmental interests. Heritage tourism and public education, including historical tours and open-house events, continue to be sponsored by various organizations and communities within the county (Alachua County E.A.R., Chapter IX, p. 58). Several privately managed historic sites including Dudley Farm State Historic Site, Kanapaha (Haile) Plantation and the Marjorie Kinnan Rawlings State Historic Site have been open to the public on a controlled basis.

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