CONSERVATION ELEMENT

Data Inventory Analysis

Lake County, Florida

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The purpose of the conservation element is to provide a guide for the conservation, use, and protection of the natural resources located within the County. The element provides a means to protect the beneficial qualities of the natural environment and thereby enhance the public health, safety, welfare and quality of life of its citizens.

The element includes inventories of the quality and quantity of Lake County's natural resource base, and will provide a basis for decision making by County officials as an integral part of the Comprehensive Plan. The element has been developed within the context of the legislative mandate provided by the State.

Lake County has experienced population growth through in-migration caused by the expansion of the Orlando Metropolitan Area. The purpose of the Conservation Element is to seek a balance between accommodating the growth of man-made urban systems and maintaining and improving the rural and natural systems that have traditionally characterized Lake County.

GENERAL LOCATION AND PHYSIOGRAPHY

Lake County lies within the St Johns River Basin region of Central Florida. A portion of the southern and western parts of the County contain the headwaters of the Withlacoochee River, while the extreme southeastern portion of the County contains the headwaters of the Kissimmee River. The Oklawaha and Palatlakaha Rivers drain the majority of the County. The middle of the County is precisely half way between the cities of Ocala and Orlando to the north and south, and Daytona Beach and Tampa to the east and west.

Lake County is comprised of 1,156 square mile areas which consist of ridges, uplands, and valleys. The County is divided into eight major geohydrologic provinces: St. Johns River Valley, Marion Upland, Mount Dora Ridge, Oklawaha Chain of Lakes, Sumter Upland, Lake Wales Ridge, Palatlakaha Upland, and Green Swamp. Land surface altitudes range from near sea level in the St. Johns River Valley to 312 feet above sea level in the Lake Wales Ridge.

There are four river chains of large lakes in Lake County. The County also possesses a tremendous number of small isolated lakes, significant wetlands acreage in the Blackwater Creek and Green Swamp, and substantial sandhill and scrub natural communities located within the Ocala National Forest.

AIR INVENTORY AND ANALYSIS

Introduction

The Florida Department of Environmental Protection (FDEP) and the United States Environmental Protection Agency (USEPA) monitor air quality data in Lake County. Lake County does not have an established program dedicated to monitoring air quality. The data contained in this report is limited to the sampling events, parameters, and reporting limitations associated with those respective agencies.

The air quality monitoring program of the State of Florida provides measures of pollutant concentration levels in ambient air, the portion of the atmosphere near ground level. The Environmental Protection Agency and the State of Florida establish primary standards and legal limitations of pollution concentration levels for ambient air. Amendments to the Clean Air Act have changed the measurement criteria since the 1991 Comprehensive Plan; historic data is no longer comparable and has not been included. Chapter 62-204 of the Florida Administrative Code outlines rules and regulations concerning air pollution.

A geographic area that meets or exceeds the primary standard is called an attainment area. Lake County has attainment status for clean air. This is documented in a letter dated July 15, 2003 from Secretary David B. Struhs of the Florida Department of Environmental Protection. The following information describes the fundamental information for understanding air quality and Lake County's current air quality status.

NON POINT SOURCE AIR POLLUTANT

Attributes and Sources

There are six major air pollutants that can cause health problems if they are at high concentrations in the ambient air. The pollutants are Carbon Monoxide(CO), Nitrogen Oxides(NOx), Ozone(O3), Lead(Pb), Sulfur Dioxide(SO2) and Particulate Matter(PM-2.5 and PM-10). These pollutants are referred to as "criteria pollutants" and a National Ambient Air Quality Standard (NAAQS) has been established for each based on health related criteria and data.

1. **Carbon monoxide, or CO**, is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. Higher levels of CO generally occur in areas with heavy traffic congestion. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust. High levels of CO in the air are poisonous to healthy people. The level of CO can be of major concern to people with heart disease and affects the central nervous system. (USEPA)

2. **Nitrogen oxides, or NOx**, are the generic term for a group of highly reactive gases, which contain nitrogen and oxygen in varying amounts. Many nitrogen oxides are colorless and odorless. Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary sources of NOx are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. Nitrogen oxides contribute to the formation of acid rain and contribute to nutrient overload that deteriorates water quality. (USEPA)

3. **Ozone (O_3)** is a gas composed of three oxygen atoms. This compound is formed by the combination of nitrogen oxides, volatile organic compounds, heat, and sunlight. As a result, it is known as a summertime air pollutant. Ozone has the same chemical structure whether it occurs miles above the earth or at ground level and can be "good" or "bad," depending on its location in the atmosphere. "Good" ozone occurs naturally in the stratosphere approximately 10 to 30 miles above the earth's surface and forms a layer that protects life on earth from the sun's harmful rays. In the earth's lower atmosphere, ground-level ozone is considered "bad." The primary cause of concern is that it can trigger a variety of health problems at low levels and may cause permanent lung damage after long-term exposure. Elevated ozone levels are detrimental to plants and the ecosystem. (USEPA) Many urban areas tend to have

high levels of "bad" ozone, but even rural areas are also subject to increased ozone levels because the wind can carry ozone and pollutants that form it hundreds of miles away from their original sources. Elevated ozone levels are detrimental to plants and the ecosystem. (USEPA)

4. **Lead (Pb)**, a metal which is found naturally in the environment as well as in manufactured products. The major sources of lead emissions have been historically from motor vehicles (such as cars and trucks) and industrial sources. Due to the phase out of leaded gasoline, metals processing is the major source of lead emissions to the air today. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers. Since the 1980's, EPA and it's federal partners have phased out lead in gasoline, reduced lead in drinking water and industrial air pollution, and banned or limited lead used in consumer products, including residential paint.

5. **Particulate matter, or PM-2.5 and PM -10**, the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that individually they can only be detected with an electron microscope. The particles come from a variety of sources such as cars, trucks, buses, factories, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Particulate matter is associated with serious health effects and is a major source of haze that reduces visibility. (USEPA) Particulate matter is categorized by the following sizes:

    1. *Particulate matter 2.5, or PM 2.5,* is the measurement of particulate matter smaller than 2.5 micrometers in size. By comparison, the thickness of a human hair is approximately 90 micrometers.

    2. *Particulate matter 10, or PM 10,* is the measurement of particulate matter smaller than 10 micrometers in size.

Total Suspended Particulate (TSP) was broken into two classifications PM 10 and PM 2.5. The air quality of Lake County will be analyzed based on national ambient air quality standards. Those standards and Lake County's measurable standards are listed in the table below.

Only two criteria pollutants are actively monitored in Lake County, Ozone and PM10. According to EPA Air Data, there were 282 "good" days, 21 "moderate" days, and 1 "unhealthy for sensitive groups" day in 2003. The "unhealthy for sensitive groups" day was attributed to Ozone. The year-to-date three-year running average of Ozone is .077.

Table 1 - US EPA 2004 National Ambient Air Quality Standards

POLLUTANT	PRIMARY STDS.	AVERAGING TIMES	SECONDARY STDS.	LAKE COUNTY
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None	NA
	35 ppm (40 mg/m^3)	1-hour[1]	None	NA
Lead	1.5 µg/m^3	Quarterly Average	Same as Primary	NA
Nitrogen Dioxide	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary	NA
Particulate Matter (PM_{10})	50 µg/m^3	Annual[2] (Arith. Mean)	Same as Primary	**18µg/m^3**
	150 ug/m^3	24-hour[1]		**38 ug/m^3**
Particulate Matter ($PM_{2.5}$)	15 µg/m^3	Annual[3] (Arith. Mean)	Same as Primary	NA
	65 ug/m^3	24-hour[4]		NA
Ozone	0.08 ppm	8-hour[5]	Same as Primary	**0.079 ppm**
	0.12 ppm	1-hour[6]	Same as Primary	**0.090 ppm**
Sulfur Oxides	0.03 ppm	Annual (Arith. Mean)	-------	NA
	0.14 ppm	24-hour[1]	-------	NA
	-------	3-hour[1]	0.5 ppm (1300 ug/m^3)	NA

1 Not to be exceeded more than once per year.
2 To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m3.
3 To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 ug/m3.
4 To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m3.
5 To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
6 (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <= 1, as determined by appendix H. (b) The 1-hour standard is applicable to all areas notwithstanding the promulgation of 8-hour ozone standards under Sec. 50.10. On June 2, 2003, (68 FR 32802) EPA proposed several options for when the 1-hour standard would no longer apply to an area.

POINT SOURCE AIR POLLUTION

The map below shows the permitted point source air polluters (2003) and the locations of the PM10 and Ozone monitors. The number of point source air polluters that report to the EPA declined from 38 to 17 facilities since the 1991 Comprehensive Plan. Listed below, in the table, are the 17 facilities arranged by industry. These facilities are monitored by the FDEP.

Figure 1 – Facility/Monitor Locator Map

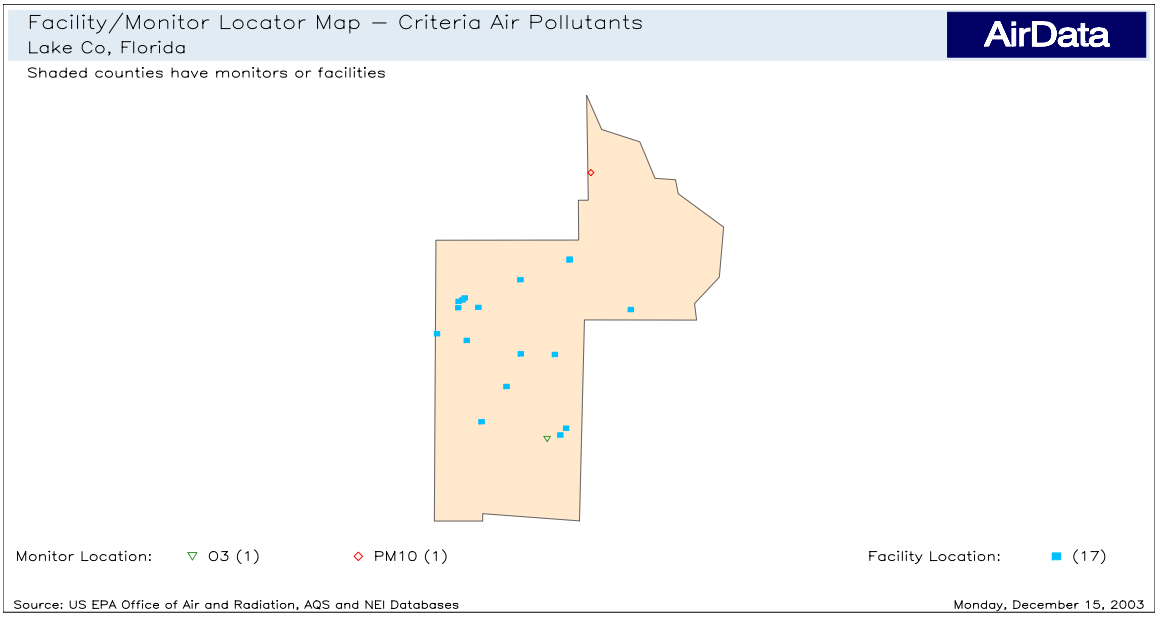


Table 2 - Summary of Permitted Point Source Air Polluters 2004

FACILITY TYPE	NUMBER	PERCENT
Citrus Processing	2	13.3%
Concrete Plants	1	6.6%
Soil Cement Plants	0	0%
Asphalt Plants	4	26.6%
Pathological Incinerators	1	6.6%
Other industries	7	46.6%
Total	15	100%

Emissions data are available for each permitted facility in the Air Quality Index Summary (AQI) Report from the EPA. The AQI report identifies each facility's owner, location, types of emissions, and their estimated and allowable amounts. The report also identifies any emissions tests that have been performed at these facilities.

WATER INVENTORY AND ANALYSIS

GROUNDWATER WELLHEAD PROTECTION

The federal Safe Drinking Water Act (SDWA), as amended in 1986, established a new program for the States to delineate and manage Wellhead Protection Areas (WHPAs) for the protection of public ground water supplies. The Wellhead Protection (WHP) Program is the first resource based approach at the federal level for ensuring that ground water supplies are protected from a wide range of potential contaminating sources. The U.S. Environmental Protection Agency is the principal federal agency for implementing the Wellhead Protection Program with the states.

Wellhead protection areas are the surface and subsurface area surrounding a water well or well field supplying a public water system, through which contaminants are reasonably likely to move toward and reach the water well or well field. Factors to consider in developing wellhead protection include: delineating protection areas around well fields, assessing the locations and threats to the well(s), developing management approaches and educational outreach programs, and regulatory or non-regulatory tools to reduce contamination threats.

WELLHEAD PROTECTION IN FLORIDA

Over 90% of Florida's population depends on ground water as the source of drinking water for public and private wells. Much of this resource is especially vulnerable to contamination because of the karst (an irregular limestone region with sinks, underground streams and caverns.) geology in many parts of the state, a high water table, rapid land use changes, and a growing population. The Florida Department of Environmental Protection has several ground water protection programs which bolster a separate wellhead protection rule; the collective implementation of these programs with the addition of technical assistance to the local governments frames the statewide Wellhead Protection Program. This approach to managing public ground water supplies focuses on preventing contamination from entering the water of supply wells.

The Department of Environmental Protection implements the wellhead rule to provide the most stringent protection to the ground water in close proximity to potable water wells. To heighten attention to the significance of human health issues and threats adjacent to wellhead areas, the Florida Wellhead Protection Program recommends local governments identify potential sources of contamination outside a 500 foot setback from the well. To assist the local governments in this endeavor, the Department provides technical assistance in identifying the five or ten year ground water hydraulic time of travel around the wells. The dimension of the outer zone will be subject to local hydrogeologic conditions and local policies.

GROUNDWATER RESOURCE CONSUMPTION

Meeting long term water supply needs, while protecting water resources, is an important issue for local governments and water supply utilities in the St. Johns River Water Management District. Defining the roles of the various entities involved in the process requires careful consideration.

The District Governing Board is in the process of defining its role in water resource and water supply development, and particularly its role in funding water resource development and water supply development projects.

In order to evaluate the projected impact of the cost of alternative water upon the cost of delivered potable water, the District contracted with Burton & Associates to conduct an analysis of cost impacts for a typical, moderately sized water supply utility. The results of the analysis should be representative of the impact of the cost of alternative water facilities upon the cost of delivered water.

Ground water from the Floridan aquifer is the primary source of water for potable, agricultural and industrial use in Lake County. In 2000, the top five municipalities with the highest rate of water consumption were, in descending order, Leesburg, Mount Dora and Clermont, Eustis, and Tavares. According to 2020 projections, water consumption for Clermont, Eustis, and Leesburg will more than double in the next fifteen years. County wide, projected total water consumption will increase from 23.79 MGD to 49.09 MGD. Lake County Water Resources Game Plan and St. Johns River Water Management District 2020 projections vary.

Table 3 - Lake County Water Use Projections

Source SJWMD

UTILITY PROVIDER	2000 AVERAGE DAILY USAGE (MGD)	CURRENT WATER USE PERMIT (MGD)	SURPLUS OR DEFICIT	2020 PROJECTION (MGD)	SJRWMD 2020 PROJECTION (MGD)
Astor/Astor Park	0.31	0.34	0.03	0.7	0.4
Clermont	**3.95**	6.23	2.28	**8.37**	8.88
Eustis	**2.96**	3.3	0.34	**4.97**	3.97
Fruitland Park	0.77	0.52	-0.25	1.04	0.92
Groveland	0.13	0.4	0.27	1.21	1.9
Howey-in-the-Hills	0.19	0.23	0.04	--	0.31
Lady Lake	0.41	0.56	0.15	0.44	0.45
Leesburg	**6.84**	8.39	1.55	**18.35**	7.19
Utility Provider	**2000 Average Daily Usage (MGD)**	**Current Water Use Permit (MGD)**	**Surplus Or Deficit**	**2020 Projection (MGD)**	**SJRWMD 2020 Projection (MGD)**
Mascotte	0.32	0.37	0.05	0.36	0.84
Minneola	0.60	1.14	0.54	1.5	1.31
Montverde	0.13	0.47	0.34	1	0.29
Mount Dora	**3.95**	4.16	0.21	4.57	4.24
Mount Plymouth Sorrento	--	0.52	--	3.33	--
Tavares	**2.76**	1.97	0.79	2.65	4.68
Umatilla	0.47	0.5	0.03	0.6	0.55
Total	**23.79**	29.1	5.31	**49.09**	35.93

Lake County Division of Water Resource Management samples approximately 45 sites primarily along the Palatlakaha and Ocklawaha chains. A report was issued in 1995 on the results of this sampling and an update is in progress. Lake County also works with the St. Johns River Water

Management District, the Florida Department of Environmental Protection, Lake Watch and other concerned groups in monitoring and sampling various sites within Lake County.

The mission of the Lake County Division of Water Resource Management is to manage, protect, conserve, and restore water resources of Lake County. Water Resources monitors all ground and surface water within Lake County. The Division works closely with the St. Johns River Water Management District for surface and ground water monitoring, and with the Florida Department of Environmental Protection.

The Division also provides hydrological and geological support to the various divisions within Growth Management. Water Resources checks all permitted discharges to surface waters. In addition, the Storage Tank program seeks to protect the waters and soils through appropriate inspections and compliance actions.

Water Resource Division Programs:

- Underground and Above Ground Storage Tanks
- Surface Water Monitoring Program
- Water Quality Laboratory
- Mining Program
- Industrial Waste Program
- Ground Water Monitoring Program
- Golf Course Management Program

Lake County partnered with the Lake County Water Authority and The St. Johns River Water Management District to develop a Water Resource Atlas, a "One-Stop" site for all of Lake County's water resource related data. With the aid of a grant from the Department of Commerce, Lake County contracted with the University of South Florida's Center for Design and Research (CDR) to develop the site, which provides citizens and environmental professionals with current and historical water data and information. The Atlas is a dynamic resource with constant updates to water quality information and is available to and used by the general public and other interested parties.

Atlas Details:

- The atlas is a web-based application allowing for the browsing of spatial data such as aerial photographs, location of water resources, watershed or basin boundaries, recreation sites, boat ramps and other important GIS datasets and local water resource information.
- Provides a mapping interface allowing users to view multiple themes such as hydrography, ecology, wetlands, political boundaries, watershed boundaries and aerial photography.
- Water resource data pages are summarized by topic and displays key indices and parameters to determine the current conditions of a watershed, lake or river.
- Built-in computing tools allow users to determine current water quality of any given water body in the database.
- Built-in graphing tools provide graphs of all data in the database.
- Numerous query components allow users to discern meaning from the data presentations.

Advanced data access tools allow users to query, graph, and download sampling location specific data.

- A document catalog system displays web links and Adobe Acrobat documents related to water resource issues.
- Information and functionality related to Total Maximum Daily Loads program, National Pollutant Discharge Elimination System, stormwater management, and other regulatory programs are integrated into the atlas.

POTABLE WATER DEMAND

The projected demand for potable water for Lake County for the years 1990, 1995, 2000, and 2005. Potable water use was estimated as the product of the projected County population plus seasonal demand and average per capita daily demand coefficients. Based on the estimates of the consulting firm Post, Buckley, Shuh and Jernigan, per capita consumption is expected to decline through the year 2005. The 1986 SJRWMD per capita value of 189 gallons per day will be proportionately reduced over 5 year increments to 150 gallons per day by 2005 as the County changes from an agricultural setting to an urban/suburban setting. Total average annual potable water demand is projected to reach 17.3 billion gallons by the year 2005.

AGRICULTURE WATER DEMAND

According to St. Johns River Water Management District, irrigation accounts for 98.8% of water withdrawn for agricultural purposes. Total daily water use estimates for 2025 in an average rainfall year anticipate 64.01 MGD from ground water, 9.28 MGD from surface, and a total of 73.29 MGD for agriculture use.

Improved pasture accounts for 91.5% of all non-irrigated farmlands. Citrus grove irrigation, on a 2025 estimate of 24,758 acres, accounts for 57.30 MGD, the highest of all crops.

Table 4 - Estimated 2025 Agricultural Water Use

CROP	1995 WATER USE(MGD)			2025 WATER USE(MGD) AVERAGE RAINFALL YEAR				2025 WATER USE(MGD) 1-IN-10 RAINFALL YEAR			ACRES		
	GROUND	SURFACE	TOTAL	GROUND	SURFACE	TOTAL	PERCENT CHANGE	GROUND	SURFACE	TOTAL	1995	2025	PERCENT CHANGE
LAKE COUNTY													
Citrus	33.91	5.07	38.98	49.85	7.45	57.30	47%	62.31	9.31	71.62	18,842	24,758	47%
Fern	1.31	0.15	1.46	1.67	0.19	1.86	27%	2.15	0.24	2.39	550	700	27%
Field Crops	0.25	0.25	.50	0.23	0.23	0.46	-8%	0.28	0.28	0.56	650	585	-10%
Other Fruit and Nuts	0.33	0.01	0.34	0.69	0.02	0.71	109%	0.81	0.02	0.83	552	1,156	109%
Pasture	2.06	0.10	2.16	1.68	0.08	1.76	-19%	1.78	0.08	1.86	1,886	1,535	-19%
Greenhouse/Nursery	4.85	0.23	5.08	9.23	0.44	9.67	90%	9.94	0.47	10.41	1,050	2,000	90%
Sod	0.08	0.49	0.57	0.09	0.55	0.64	12%	0.09	0.56	0.65	250	279	12%

CROP	1995 WATER USE(MGD)			2025 WATER USE(MGD) AVERAGE RAINFALL YEAR				2025 WATER USE(MGD) 1-IN-10 RAINFALL YEAR			ACRES		
	GROUND	SURFACE	TOTAL	GROUND	SURFACE	TOTAL	PERCENT CHANGE	GROUND	SURFACE	TOTAL	1995	2025	PERCENT CHANGE
LAKE COUNTY													
Turf grass	0.11	0.02	0.13	0.19	0.04	0.23	77%	0.20	0.04	0.24	120	202	68%
Vegetables, Melons, Berries	1.01	0.74	1.75	0.38	0.28	0.66	-62%	0.47	0.34	0.81	2,670	995	-63%
Total	43.91	7.06	50.97	64.01	9.28	73.29	44%	78.03	11.34	89.37	24,570	32,210	31%

Source: St. Johns River Water Management District (SJRWMD)
Disclaimer: Please note that the decision to use 1995 as the base year by SJRWMD was based on the availability of suitable regional groundwater flow models calibrated to 1995 conditions.

Industrial Water Demand

Water use for the County's four major food processors has been held constant. Water use for mining operations is projected to increase in the short term (7% rate) given the proposed local highway projects expected to be built over the next ten years. As manufacturing employment projections for Lake County are unavailable, projections will be based upon a ratio of 38 industrial employees per 1000 population for the County. Total average annual industrial demand is projected to reach 6,173 million gallons by the year 2005.

There are nine large industrial wells located within Lake County. Four of the wells are mining operations, four are food processors, and one is a home manufacturing concern. The food processors use 51% of the groundwater while the mines use 47.8%, with the remaining 1.2% used by the home manufacturing concern. In addition, the Florida Rock Industries mine uses 3.944 MGD of surface water which is equivalent to 25.7% of all water used by these mines at 15.337 MGD.

Summary of Projected Groundwater Demand

The County will probably continue to rely almost exclusively on the Floridian aquifer for future water needs. If not used wisely, the projected demand may exceed the Aquifers capacity. The potential for drawdown of the Floridian aquifer will increase in the next fifteen years.

SURFACE WATER

Point Source Discharges

Point sources generally have a human-made discharge point such as a pipe or channel. These are discharged into water bodies at discrete points. A point source permitting program has been implemented for domestic and industrial wastewater facilities that discharge either to surface or ground water. The Department of Environmental Protection maintains a listing of these permitted point source pollution discharges to surface waters located within Lake County. This list, when combined with the inventory of marinas, use of chemical sprays, traffic activity, acid rain and

other storm water runoff issues give a fairly complete inventory of all surface water pollution sources in the County.

Nonpoint Source Discharges

Land use coverage is a significant indicator of nonpoint source pollution. Nonpoint source pollution is difficult to monitor because of the diffuse and intermittent nature of discharges. The fact that most nonpoint pollution occurs during the "first flush" of rainfall following a storm event adds to the difficulty of nonpoint source monitoring.

Though an exact definition of nonpoint pollution is difficult, it is generally associated with runoff water from the surface which carries with it sediment, organic material, nutrients, and toxins into receiving waters. Under some circumstances ground water can become contaminated by water percolating down through the soil. The nonpoint source discharges in Lake County are from agricultural and urban land uses.

The Department of Environmental Protection, Florida's water management districts, Department of Agriculture and Consumer Services, Department of Health, local governments, and the public implement the State of Florida's Nonpoint Source Management Program. Their goal is to mitigate nonpoint source pollution from new land use activities and to reduce pollution from existing activities. The Nonpoint Source Management Section administers the following programs:

- State Stormwater Management Program Coordination
- State Nonpoint Source Management Program
- Clean Lakes Program

The conversion of many of Lake County's muck farms into restoration areas has helped to lower phosphorous levels, but nutrient-heavy farmland still contributes to the degradation of lakes. Systematic gizzard shad removal has also increased the reduction of algae (see Fisheries section for further data). The restoration process will continue to make progress and continue to decrease phosphorous run off.

Total Maximum Daily Loads (TMDL)

A Total Maximum Daily Loads (TMDL) is the maximum amount of a given pollutant that a water body can absorb and still maintain its designated uses (e.g., drinking, fishing, swimming, shellfish harvesting). Under Section 303(d) of the federal Clean Water Act and the Florida Watershed Restoration Act, TMDLs must be developed for all waters that are not meeting their designated uses and, consequently, are defined as "impaired waters."

Through the TMDL program the following goals are expected to be accomplished. (1) Cleaner water through more collaborative restoration efforts, with increased public involvement. (2) Better use of Science to understand the human activities affecting water resources in specific locations and cumulatively throughout our watersheds. (3) Better Protection for water bodies, as people give more attention to preventing and reducing human impacts on water resources. (4) TMDLs will be developed, allocated, and implemented through a watershed-based management approach (managing water resources within their natural boundaries) that addresses the state's 52 major hydrologic basins in five groups.

Lake County does not currently use TMDL's in the regulatory or land use process. The County is using TMDL's to justify the priority of our basin studies in stormwater. Regulatory changes are being looked at for the future.

Basin Management Action Plan (BMAP)

The Basin Management Action Plan (BMAP) serves as the total maximum daily loads implementation plan. The sole purpose of this plan is for equitable reduction of pollutant loadings to meet the TMDLs established for an impaired water body. The minimum elements of a BMAP which is established for the Upper Ocklawaha River Basin is as follows: (1) Description of the impaired water/identification of pollutants of concern (2) Identification of stakeholders (3) listing of applicable TMDL and allocations for each pollutant of concern (4) Description of loading sources and estimate of loading contributions (5) Listing of structural and nonstructural management actions and where applicable (6) Their estimated load reductions(7) Implementation roles and responsibilities(8) Timetables and funding for implementation of management actions, monitoring, evaluation, and reporting strategy (9) Adaptive management measures.

As far as the BMAP process, Lake County is the first BMAP to be developed in the state. The BMAP has not been adopted by the BCC yet. The anticipated benefit is improved water quality in the Upper Ocklawaha Basin through retrofit projects, improved regulations and public education by the County, the Water Authority and surrounding municipalities.

LAKES

The origin of most lakes in the County is sinkhole related subsidence in the covered karst terrain. The number and type of lakes vary with the geohydrologic area. In the Green Swamp and St. Johns River Valley, depressions are shallow, leading to the creation of swamps rather than lakes. The Palatlakaha Upland contains small shallow lakes that are landlocked at medium and low water stages, and they have good hydraulic connection with the Floridian aquifer. The Lake Wales Ridge has deep sink-lakes that are, for the most part, entirely landlocked and have good hydraulic connection with the Floridian aquifer. Landlocked lakes also predominate in the Sumter Upland and Mt. Dora Ridge, but they are generally deeper due to greater relief. The Marion Upland area has a variety of small, shallow lake types.

Lake levels fluctuate naturally in response to variations in rainfall, evaporation, surface and ground water inflow and outflow. Differences in the magnitude of lake level fluctuations relate primarily to variability in the subsurface thickness and permeability of the watershed. This determines the extent to which rainfall runs off the land surface or percolates down to the water table; it also determines the extent to which water from the surficial aquifer moves down to the Floridan aquifer. Lakes in recharge areas generally fluctuate more widely than lakes in discharge areas. Lake County has 46 lakes whose surface areas are over 200 acres. The county's largest lakes are in three basins:

Table 5 - Largest Lakes per Basin

OCKLAWAHA BASIN	PALATLAKAHA BASIN	MIDDLE ST. JOHNS RIVER BASIN
Apopka	Cherry	George
Beauclaire	Crescent	Dexter

Carlton	Emma	Stagger Mud
Denham	Louisa	Horseshoe Mud
Dora	Lucy	Kimball
Eustis	Minnehaha	Lee
Griffin	Minneola	
Harris	Palatlakaha	
Trout	Susan	
Yale		

All lakes naturally age in a process known as eutrophication. The timeframe for this process may be hundreds or thousands of years. However, increasing the rate at which nutrients and organic matter enter aquatic ecosystems may accelerate this process. The citrus industry has lead to the acceleration of eutrophication.

The Florida Trophic State Index (TSI) is a measure of water quality that uses algae and nutrient content to categorize lakes into four categories (see table listed below).

Surface Water Quality

Lake County maintains the Lake County Water Resources Atlas, available on the Internet at http://wateratlas.co.lake.fl.us/, in which water quality data is given for the county's watersheds, lakes, and rivers. Water quality is measured by the Trophic State Index (TSI).

Table 6 - Trophic State Index

Oligotrophic	Clear waters with little organic matter or sediment and minimum biological activity
Mesotrophic	Waters with more nutrients, and therefore, more biological activity
Eutrophic	Waters extremely rich in nutrients, with high biological productivity. Some species may be choked out.
Hypereutrophic	Murky, highly productive waters, closest to the wetland status. Many clear water species cannot survive.

Source: EPA Lake County Water Resource Management Division ranked lakes in the county using the TSI in 2002 and 2003.

Table 7 - Lake data for the following TSI calculations were obtained from single samples in 2002 and 2003.

RANK	LAKE	TSI VALUE	TSI DESCRIPTION
1	Lake Sellers	15	Oligotrophic
2	Lake Melton	23	Oligotrophic
3	Lake Cooley	28	Oligotrophic
3	Lake Gibson	28	Oligotrophic
3	Lake Schimmerhorn	28	Oligotrophic
3	West Crooked Lake	28	Oligotrophic
4	Lake Moon	30	Oligotrophic
5	East Crooked Lake	31	Oligotrophic
5	Lake Blanchester	31	Oligotrophic
6	Lake Pearl	32	Oligotrophic
6	Plum Lake	32	Oligotrophic
7	Island Lake	33	Oligotrophic
8	Lake Eldorado	34	Oligotrophic
8	South Twin Lake	34	Oligotrophic
Rank	Lake	TSI Value	TSI Description
9	Lake Dalhousie	35	Oligotrophic
10	Lake Beakman	36	Oligotrophic
10	Wildcat Lake	36	Oligotrophic
10	Lake Dixie	36	Oligotrophic
10	Lake Joanna	36	Oligotrophic
11	Lake Arthur	38	Oligotrophic
11	Lake Idamere	38	Oligotrophic
11	Bear Lake (Paisley)	38	Oligotrophic
12	Lake Dexter	39	Oligotrophic
13	Lake Gertrude	40	Oligotrophic
13	Sawgrass Lake	40	Oligotrophic

RANK	LAKE	TSI VALUE	TSI DESCRIPTION
13	Lake Dorr	40	Oligotrophic
14	Trout Lake (Clermont)	41	Oligotrophic
15	Lake Grasshopper South	42	Oligotrophic
16	Lake Lucy	43	Oligotrophic
16	Big Creek	43	Oligotrophic
16	Loch Leven	43	Oligotrophic
16	Lake Nellie	43	Oligotrophic
16	Lake Saunders	43	Oligotrophic
16	Lake Hiawatha	43	Oligotrophic
16	Stagger Mud Lake	43	Oligotrophic
16	Lake Akron	43	Oligotrophic
17	Cherry Lake	44	Oligotrophic
17	Pine Island Lake	44	Oligotrophic
17	Lake Holly	44	Oligotrophic
17	Lake Emma	44	Oligotrophic
17	Lake Minnehaha	44	Oligotrophic
18	Lady Lake	45	Oligotrophic
18	Palatlkaha River @ CR48	45	Oligotrophic
18	Palatlkaha River @ SR50	45	Oligotrophic
18	Lake Ella	45	Oligotrophic
19	Lake Catherine (Groveland)	46	Oligotrophic
19	Lake Irma (Eustis)	46	Oligotrophic
19	Lake Woodward	46	Oligotrophic
19	Lake Wilson	46	Oligotrophic
20	Lake Mack	47	Oligotrophic
20	Lake Sumner	47	Oligotrophic
20	Lake Norris	47	Oligotrophic
20	Lake Swatara	47	Oligotrophic
21	Lake Louisa	48	Oligotrophic
21	Lake Kirkland	48	Oligotrophic
21	Little Creek	48	Oligotrophic
21	East Lake (Umatilla)	48	Oligotrophic
22	Lake Umatilla	49	Oligotrophic
23	Silver Lake	50	Mesotrophic
23	Lake Gary	50	Mesotrophic
24	Lake Minneola	51	Mesotrophic
25	Sawmill Lake	52	Mesotrophic

RANK	LAKE	TSI VALUE	TSI DESCRIPTION
26	Johns Lake	53	Mesotrophic
26	Cresent Lake	53	Mesotrophic
26	Lake Lulu (Paisley)	53	Mesotrophic
26	Lake Bracy	53	Mesotrophic
26	Lake Hancock	53	Mesotrophic
27	Indianhouse Lake	54	Mesotrophic
27	Lake Francis	54	Mesotrophic
28	Dixie Lake	55	Mesotrophic
29	Lake Seneca	56	Mesotrophic
Rank	Lake	TSI Value	TSI Description
29	Sunset Pond	56	Mesotrophic
30	Lake Florence	58	Mesotrophic
31	Lake Glona	59	Mesotrophic
32	Lake Unity	60	Mesotrophic
32	Lake Harris	60	Mesotrophic
33	Trout Lake (Eustis)	64	Eutrophic
33	Lake Yale	64	Eutrophic
34	Lake Hammond	66	Eutrophic
35	Lake Eustis	67	Eutrophic
36	Lake Griffin	73	Hypereutrophic
37	Lake Beauclair	75	Hypereutrophic
38	Lake Dora	79	Hypereutrophic

High phosphorous levels, which make a water body conducive to algae growth, have been of primary concern. The Ocklawaha Basin, according to recent data, has seen remarkable improvement in many of its lakes, with phosphorous levels close to established by the Department of Environmental Protection.

Lake Griffin has made the biggest improvement, and will soon reach target levels (see Fisheries section for further data). The phosphorous concentration for Lake Apopka is 80 parts per billion, which is less than half of the 175 parts per billion averages from 1991 to 2000. Lake Beauclaire has also achieved a significant decrease, reporting less than half its 1991-2000 phosphorous levels. Still, at more than 75 parts per billion, there is still work to do to reach the target 32 parts per billion.

Lake Yale and several other lakes are still posting phosphorous levels higher than from 1991-2000. Lake Harris has also had increased phosphorous levels, but has seen a decrease in chlorophyll levels. A spike in phosphorous levels, due to the deluge of storm water following hurricanes Charley, Francis, and Jeanne, is expected.

The Clermont Chain of Lakes

The Clermont Chain of Lakes - consisting of Lakes Louisa, Susan, Crescent, Minnehaha, Winona, Palatlakaha, Hiawatha, Minneola, Wilson, Cook, Cherry, Stewart, Lucy, and Emma, and the waterways that connect these lakes were designated as Outstanding Florida Waters (OFW). The chain is connected by the Palatlakaha River and is a Zone of High Recharge for the Floridian Aquifer.

The designation as an OFW prohibits the issuing of permits which would allow the degradation of the water's quality. Any new pollutant discharge would be subject to requirements that must be met for direct and indirect discharges. New direct pollutant discharges must not lower existing ambient water quality. New indirect pollutant discharges (discharges to waters which influence OFW's, although not placed directly into an OFW) must not significantly degrade nearby Outstanding Florida Waters.

Aquatic Plant Management

Lake County Mosquito and Aquatic Plant Management (LCMAPM) assumes the responsibility of managing invasive aquatic plants within Lake County. Aquatic plant management activities are performed on approximately 78,700 acres of public waters. The St. John's River, including Alexander Springs Run and Lake George, are under the jurisdiction of the U.S. Army Corps of Engineers. However, management activities for minor invasive aquatic plants on the residential canals off the St. John's River located within Lake County are the responsibility of LCMAPM. Aquatic plant management on Lake Apopka and the Apopka-Beauclair Canal up to the water control structure are the responsibility of the St. John's River Water Management District. Figure 1 shows a map of all sovereignty water bodies located within Lake County.

Aquatic plant management activities performed by LCMAPM are separated into three programs. The Florida Department of Environmental Protection's Cooperative Aquatic Plant Control Program (Chapter 62C-54, F.A.C.) provides state funding for the management of major exotic and invasive aquatic plants on water bodies that meet strict eligibility requirements. The Major Exotic and Invasive Aquatic Plant Management Program (Chapter 62C-20, F.A.C.) is funded at the County level for the management of major exotic and invasive aquatic plants on public water bodies that do not meet the requirements for inclusion in the Cooperative Program. The County also funds the Minor Exotic and Invasive Aquatic Plant Management Program and management activities are performed primarily on residential canals.

Cooperative Aquatic Plant Control Program

Water hyacinths, water lettuce, hydrilla, minor exotic and invasive aquatic plants that interfere with navigation or adversely impact the ecological diversity of natural aquatic flora are considered for management activities under the Cooperative Program. Only those water bodies that meet the eligibility requirements as defined in Chapter 62C-54, F.A.C. are included in this program. The cost of management activities performed on inter-county water bodies are reimbursed at 100% from the State while those on intra-county water bodies are reimbursed at 50%.

A severe drought during FY1999-2000 and FY2000-2001 significantly lowered water levels. Aquatic plant growth declined and the total treated acres were less than previous years. Increasing water levels during FY2001-2002, FY2002-2003, and FY2003-2004 stimulated aquatic plant growth and management activities intensified.

Table 8 - Cooperative Aquatic Plant Control Program: Total acres treated and associated costs for inter-county water bodies located in Lake County, Florida. All costs are 100% reimbursed from the State.

	FY1999-2000		FY2000-2001		FY2001-2002		FY2002-2003		FY2003-2004	
Water Body	**Acres Treated**	**Cost**	**Acres Treated**	**Cost**	**Acres Treated**	**Cost**	**Acres Treated**	**Cost**	**Acres Treated**	**Cost**
Apopka-Beauclair Canal	*	65.93	1.00	921.36	15.88	2,451.48	13.41	2,152.97	32.00	3,763.74
Bugg Springs Run	3.25	430.29	8.00	1,365.79	2.00	884.44	11.00	1,281.33	10.00	491.20
Cherry Lake	0.12	185.88	*	239.51			0.62	700.73	15.50	1,846.44
Cook Lake	*	53.63					2.00	208.62	3.13	367.82
Crescent Lake	7.55	5,689.70	*	62.74	*	66.96	0.50	98.22	*	18.29
Dead River	6.17	3,172.22	1.50	700.63	4.44	2,163.69	3.28	2,386.09	9.52	1,414.67
Dora Canal	1.40	664.83	0.60	620.88	0.59	828.51	4.77	981.52	4.43	725.39
Haines Creek	19.97	2,972.59	5.69	1,786.24	9.82	2,431.11	7.56	1,829.78	32.41	3,525.15
Water Body	Treated	Cost	Treated	Cost	Treated	Cost	Treated	Cost	Treated	Cost
Helena Run	0.75	315.91	3.87	1,504.12	4.00	1,324.65	15.60	6,437.11	18.66	2,123.57
Johns Lake	15.81	2,475.01	*	234.18	148.66	15,587.59	167.92	15,412.62	302.37	17,247.03
Lake Beauclair	2.00	221.36	*	414.73	0.75	621.53	2.87	747.25	9.60	1,119.92
Lake Carlton	1.00	118.65	*	71.97	*	341.98	*	122.27	*	116.99
Lake Denham	*	54.61	1.00	191.11	14.00	2,159.86	7.49	1,320.75	0.25	103.03
Lake Dora	4.37	643.96	*	481.12	4.00	981.45	1.10	747.25	0.14	293.18
Lake Ella	2.00	1,168.30	*	278.09	*	194.62	0.24	522.84	3.90	383.70
Lake Emma	*	72.94	*	194.61	*	255.72				
Lake Eustis	18.08	6,417.10	13.38	4,360.38	18.24	8,467.42	19.40	8,548.96	542.08	22,320.31
Lake Griffin	26.79	6,159.68	22.91	8,195.03	73.59	15,815.09	128.68	36,639.92	519.48	44,681.71
Lake Harris	13.88	6,867.41	5.25	3,273.95	11.17	11,362.40	99.24	14,523.81	301.67	29,399.76
Lake Hiawatha	1.75	515.96	1.00	485.35	*	53.52	32.63	3,491.95	1.25	316.79
Lake Holly	0.10	361.18	*	167.55	*	218.18	*	273.47		
Lake Louisa	*	175.03	*	302.25	*	277.62	39.38	5,016.28	158.33	11,065.98
Lake Lucy	*	72.94	*	134.74	*	255.72				
Lake	*	145.85	*	335.05	*	267.83	38.00	4,708.10	12.00	1,411.36

	FY1999-2000		FY2000-2001		FY2001-2002		FY2002-2003		FY2003-2004	
Water Body	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost
Minnehaha										
Lake Minneola	*	145.85	0.50	632.73	*	111.06	7.62	816.73	20.50	2,103.70
Lake Norris	9.12	1,506.97	*	105.81	1.00	725.36	6.00	1,093.41	*	92.34
Lake Palatlakaha	0.87	383.48			0.31	325.33	5.62	1,280.90	12.13	537.64
Lake Susan	*	212.97	*	49.94			10.00	1,611.37	1.50	240.22
Lake Wilson	*	80.43					4.12	269.38	0.88	331.78
Lake Winona	*	57.51	*	261.54	*	69.76	5.25	974.17	9.50	919.92
Lake Yale	5.52	1,447.86	11.75	2,044.04	25.95	4,453.77	17.70	3,860.90	7.14	1,851.57
Palatlakaha River	7.56	4,284.78	2.98	1,492.73	18.13	7,868.56	42.21	6,211.69	29.58	4,017.96
Sellers Lake	*	182.71	*	33.73	*	379.44	*	262.02		
Trout Lake	3.30	907.52	7.34	2,708.41	18.40	4,057.11	18.00	3,430.70	7.72	1,355.23
Totals	151.36	48,231.04	86.77	33,650.31	370.93	85,001.76	712.21	127,963.11	2,065.67	154,186.39

* No treatment acres reported. Cost is for survey activities only.

Table 9 - Cooperative Aquatic Plant Control Program: Total acres treated and associated costs for intra-county water bodies located in Lake County, Florida. All activities are funded at a 50/50 cost share between the State and Lake County

	FY1999-2000		FY2000-2001		FY2001-2002		FY2002-2003		FY2003-2004	
Water Body	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost
Grasshopper Lake	*	142.94	*	179.93	*	200.88	*	475.26	*	61.56
Lake Dalhousie			*	119.75	*	229.42	*	139.75	*	46.17
Lake David					*	45.96	*	58.56	*	103.53
Lake Dorr	*	145.85	1.12	926.94	0.25	581.98	2.00	775.09	0.50	170.21
Lake Umatilla	*	45.79	*	172.02	*	195.94	*	60.24	*	75.66
Wildcat Lake	*	142.94	*	263.89	*	234.37	*	445.10	*	61.56
Totals	0.00	477.52	1.12	1,662.53	0.25	1,488.55	2.00	1,954.00	0.50	518.69

* No treatment acres reported. Cost is for survey activities only.

Major Exotic and Invasive Aquatic Plant Management Program

Public water bodies that do not meet the eligibility requirements for inclusion in the Cooperative Program are considered for the Major Exotic and Invasive Program. Only water hyacinths and water lettuce are managed to prevent possible infestation to other water bodies and to promote

the growth of desirable native aquatic vegetation. Hydrilla management is excluded due to the costs associated with these activities. Lake County assumes all expenses. Table 10 summarizes the acres treated and associated costs for this program.

Table 10 - Major Exotic and Invasive Aquatic Plant Management Program: Total acres treated and associated costs for public water bodies located in Lake County, Florida. Lake County encumbers all costs for management activities under this program

	FY1999-2000		FY2000-2001		FY2001-2002		FY2002-2003		FY2003-2004	
Water Body	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost
Big Bear Lake							0.50	200	34.66	13,864
Dukes Lake							1.75	700		
Lake Catherine							0.25	100		
Lake Erie							0.10	40	4.75	1,900
Lake Joanna							1.25	500		
Water Body	Treated	Cost	Treated	Cost	Treated	Cost	Treated	Cost	Treated	Cost
Lake Junietta	0.50	200							1.50	600
Lake Lulu					0.125	50				
Sawgrass Lake							33.00	13,200		
Totals	0.50	200	0.00	0	0.125	50	36.85	14,740	40.91	16,364

MINOR EXOTIC AND INVASIVE AQUATIC PLANT MANAGEMENT PROGRAM

Duckweed, salvinia, pennywort, and other minor exotic and invasive aquatic plants that interfere with navigation or potentially create flooding situations are considered for management activities under the Minor Exotic and Invasive Program. These activities are conducted on residential canals connected to public water bodies and on navigational channels. In FY1992-93, state funding for this program was discontinued. Lake County continues to fund this program to maintain lake access and reduce potential flooding. Table 11 summarizes the acres treated and associated costs for this program.

Table 11 - Minor Exotic and Invasive Aquatic Plant Management Program: Total acres treated and associated costs for public water bodies located in Lake County, Florida. Lake County encumbers all costs for management activities under this program

	FY1999-2000		FY2000-2001		FY2001-2002		FY2002-2003		FY2003-2004	
Water Body	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost
Apopka-Beauclair Canal			0.12	48	2.00	800	5.25	2,100	10.09	4,036
Crescent Lake							2.25	900		
Dead River	6.27	2,508	1.59	636	13.82	5,528	23.31	9,324	11.82	4,728
Dora Canal	0.77	308	2.00	800	0.25	100	2.77	1,108	0.89	356

	FY1999-2000		FY2000-2001		FY2001-2002		FY2002-2003		FY2003-2004	
Water Body	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost	Acres Treated	Cost
Haines Creek	5.56	2,224	1.00	400	6.82	2,728	10.05	4,020		
Helena Run	17.31	6,924	5.71	2,284	6.32	2,528	2.00	800	0.50	200
Lake Dora	0.06	24							0.50	200
Lake Eustis	97.42	38,968	44.19	17,676	65.57	26,228	108.72	43,488	52.58	21,032
Lake Griffin	6.40	2,560	5.38	2,152	24.44	9,776	60.83	24,332	15.08	6,032
Lake Harris	8.65	3,460	1.88	752	14.02	5,608	26.89	10,756	8.24	3,296
Lake Hiawatha	1.00	400					4.00	1,600	1.00	400
Lake Holly	1.00	400								
Lake Idamere							0.06	24		
Lake Louisa	0.60	240					3.00	1,200	5.75	2,300
Lake Minnehaha							4.00	1,600		
Lake Minneola							3.00	1,200	2.25	900
Lake Susan							1.25	500	0.16	64
Lake Winona							4.75	1,900	1.00	400
Lake Yale	1.00	400			1.38	552	11.88	4,752	4.50	1,800
Palatlakaha River	3.50	1,400			0.25	100	2.66	1,064	2.25	900
St Johns River			54.95	21,980	50.93	20,372	41.43	16,572	24.67	9,868
Trout Lake	2.25	900	5.02	2,008	4.50	1,800	5.54	2,216	7.25	2,900
Totals	151.79	60,716	121.84	48,736	190.30	76,120	323.64	129,456	148.53	59,412

Projected Trends for Aquatic Plant Management in Lake County

Growth of water hyacinths, particularly on Lake Louisa and John's Lake, significantly increased during FY2002-2003 as compared to the three previous fiscal years. Management activities were targeted for those water bodies with the greatest potential for infestation and water hyacinth populations started declining toward the end of FY2003-2004. Survey results for hydrilla indicate expanding populations in Lakes Harris, Griffin, and Eustis. Management activities were scheduled for these three lakes in FY2003-2004 and will continue in FY2004-2005.

Minor exotic and invasive aquatic plant management will continue in residential canals. Salvinia has shown some resistance to previously used herbicides in certain locations. However, this problem has been resolved by using different herbicide formulations, but the cost has increased accordingly. A less dominant species of duckweed (*Landoltia* spp.) has emerged in certain residential canals due to a lack of competition from previously managed more dominant species. *Landoltia* spp. is not affected by currently available herbicide formulations. Consultation with research institution staff and technical representatives on appropriate management strategies will continue.

SPRINGS INVENTORY AND ANALYSIS

Spring flow occurs at points where the potentiometric surface of the Floridian aquifer is above the land surface and where the confining bed overlying the aquifer has been breached. According to the FDEP, the major issues impacting the health of the springs include population growth, urban sprawl, growing demand for groundwater, and introduction of fertilizers, pesticides, and other pollutants to the spring sheds. Lake County has a total of thirty-three springs. The table below shows the historic and 2004 mean spring flows for Lake County's eight largest springs.

Table 12 - Historic Spring Flows

NAME	USGS ID NUMBER	MEAN SPRING FLOW FOR PERIOD OF RECORD (FT3/S)	MEAN SPRING FLOW FOR 2004 (FT3/S)
Alexander Springs	02236095	106	104
Apopka Springs	283400081405100	38	33
Seminole Springs	02235250	35	40
Messant Springs	02235255	15	18
Bugg Springs	02237322	11	12
Holiday Springs	02237400	3.8	4.5
Blue Springs	284455081494100	3	2.8
Camp-La-No-Che Springs	285702081322400	0.9	1.1

Source: Summary Statistics of Spring flows, USGS, 2004

FLORIDA AQUIFER VULNERABILITY ASSESSMENT (FAVA)

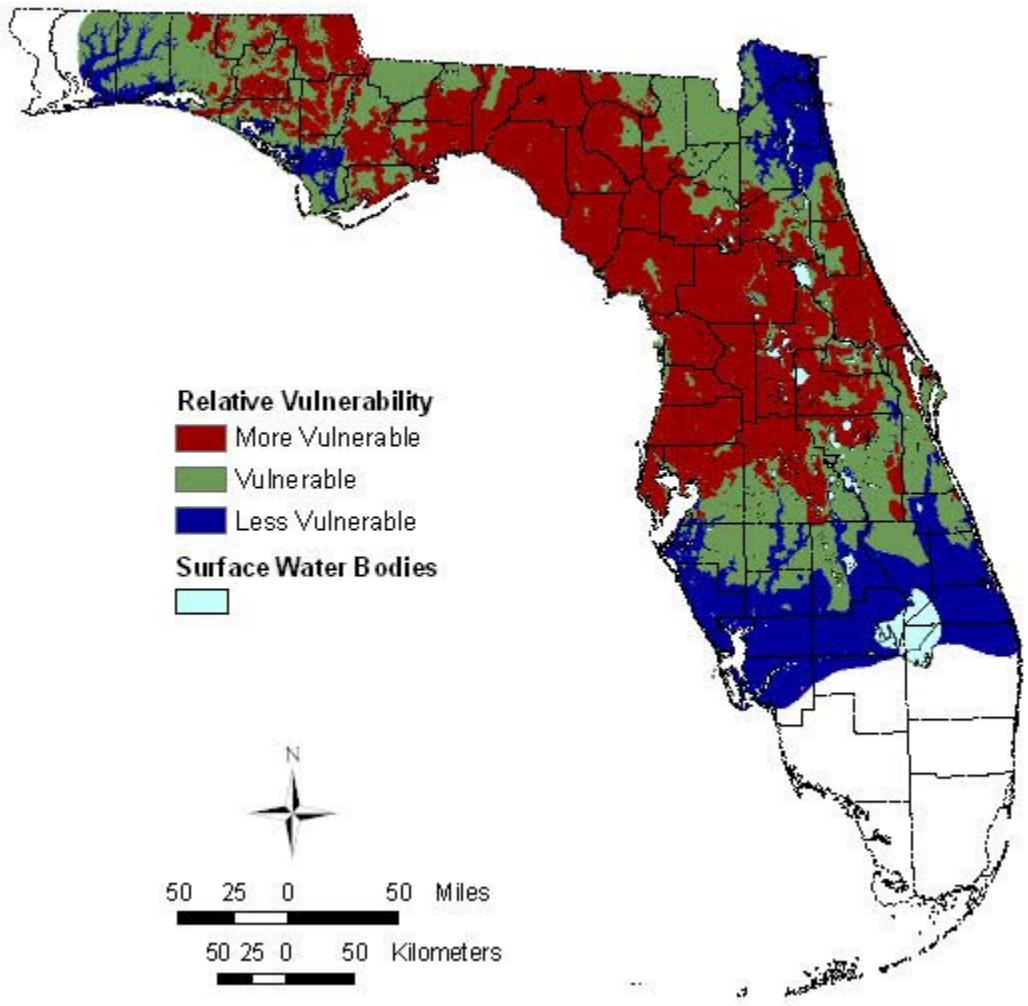
An analytical method adapted for GIS-based mineral-potential mapping has been applied to assess contamination potential of Florida's aquifer systems. The method, known as Weights of Evidence (WofE), combines evidence from known occurrences of a phenomena with spatial data to calculate a predictive response based on Bayesian theory with an assumption of conditional independence. Prior probabilities are calculated by dividing the number of known occurrences (training points) by the study area producing a probability of occurrence without the benefit of relevant data. Weights are calculated for independent GIS data coverages (evidential themes) based on the spatial relation between each evidential theme and training points. Results are reflected as posterior probabilities on an output map known as the response theme.

The Florida Aquifer Vulnerability Assessment (FAVA) applies the WofE method to the three principal aquifer systems in Florida through the use of the Arc Spatial Data Modeler within the ArcView 3.x platform. This extension facilitates assessment of spatial datasets, conditional independence, response theme uncertainty and validation, and provides other modeling techniques and statistical tools.

In FAVA models, training points consist of data from wells reflecting background water quality. Parameters used in the models to reflect known occurrences of aquifer vulnerability in the natural hydrogeologic system include dissolved oxygen and total dissolved nitrogen. Evidential themes include combinations of several improved or newly created statewide coverages: depth to water table, hydraulic head difference, thickness of confinement, distance to karst features, soil

permeability, and aquifer system overburden. To maximize scientific defensibility of the response themes (relative vulnerability maps), models were validated using independent training data sets, training-point subsets and by demonstrating lack of correlation between land use and posterior probability.

Aquifer vulnerability maps are an important resource for planners, developers, resource-management professionals and policy makers to facilitate protection of Florida's ground-water resources.



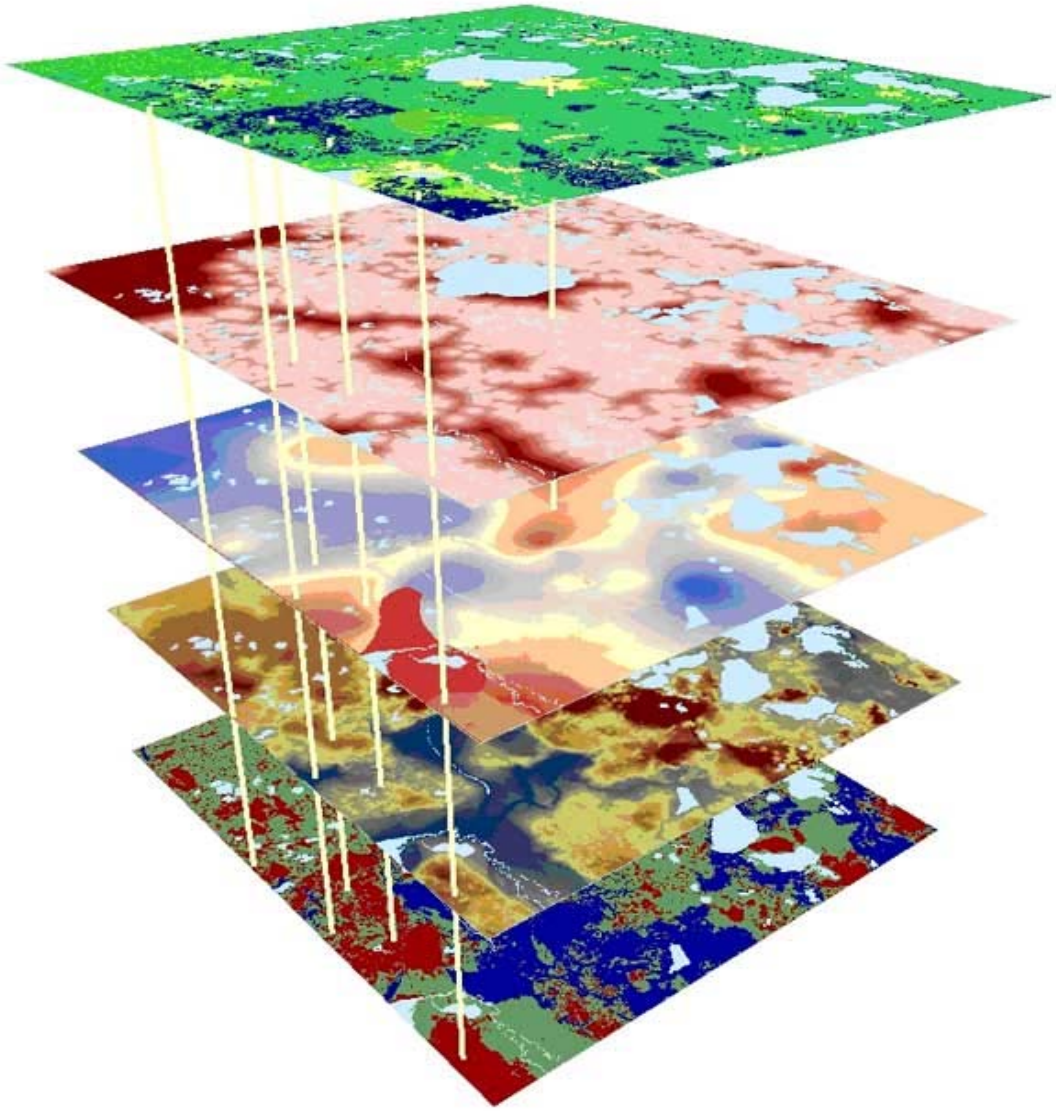
WEKIVA AQUIFER VULNERABILITY ASSESSMENT (WAVA)

The hydrogeology of the Wekiva River study area is characterized by moderate to no confinement and a multitude of karst features. Groundwater recharges the Floridan Aquifer System (FAS) by infiltration through these sediments or directly through sinkholes. The Wekiva River Coordinating Committee Final Report identifies numerous studies by Florida's water management districts and the United States Geological Survey (USGS) that clearly demonstrate contamination attributable to changes in land use. Therefore, the FGS was authorized under the Springs Initiative and the Wekiva River Coordinating Committee to identify zones of aquifer vulnerability, for the Floridan Aquifer System, within the Wekiva River study area.

The Wekiva Aquifer Vulnerability Assessment (WAVA) is a model that uses existing geographic information system data for the prediction of vulnerability zones and is based on the weights of evidence (WofE) modeling technique used in the statewide Florida Aquifer Vulnerability Assessment (FAVA). Use of WofE requires the combination of diverse spatial data which are used to describe and analyze interactions and generate predictive models. Additional information about the WofE technique can be found in FGS Bulletin 67, Florida Aquifer Vulnerability Assessment: Contamination potential of Florida's principal aquifer systems (in preparation).

In WAVA the spatial data is composed of a training point theme and evidential themes. The training point theme consists of locations of known occurrences. In WAVA these are wells that exceed a certain concentration of dissolved oxygen. Wells with high dissolved oxygen concentrations are indicative of areas where a good connection exists between the top of the aquifer and land surface. The evidential themes include soil permeability, buffered effective karst features, Intermediate Aquifer System (IAS) thickness and head difference between the Surficial Aquifer System and the Floridan Aquifer System. These themes act as evidence in the model by either protecting the aquifer from contamination or allowing contamination to move quickly from land surface to the top of the aquifer system (i.e., areas of thick IAS sediments versus areas of thin IAS sediments). The WofE technique quantifies relationships between these evidential themes and the training point theme in order the predict zones of vulnerability. These zones are classified into a primary protection zone, a secondary protection zone and a tertiary protection zone. These protection zones will be used in decision making, development of rules, or policies regarding environmental conservation, protection, growth management and planning.

Figure 2 – Wekiva Conceptual Model



Wekiva Conceptual Model:

Vertical lines are training point wells. Spatial geologic layers from top down include soil permeability, proximity to karst, thickness of confinement, and head difference between the water table and the Florida Aquifer potentiometric surface. The bottom layer is the response theme or relative vulnerability model output.

RIVERS AND STREAMS

Lake County contains three river basins: the St. Johns, the Kissimmee, and the Withlacoochee. The St. Johns River basin contains both the Oklawaha and Palatlakaha river basins. Almost one-half of the County is drained by the Oklawaha River basin, which extends across the center of the County. The northeast portion of the County drains into the St Johns River basin either directly or by way of Blackwater Creek and the Wekiva River. The remaining one-sixth of the County is drained by the headwaters of the Withlacoochee and Kissimmee Rivers.

There are a total of six rivers within or along the boundaries of Lake County. Listed below are the rivers:

3. St. Johns River is the largest river in the County and is located along the northeastern boundary. The river flows north from St. Lucie County to the Atlantic Ocean near Jacksonville.

4. The Oklawaha River originates from Lake Apopka and Lake Harris. It is the principal tributary of the St Johns River and drains the Florida central valley. It has been designated an Outstanding Florida Water.

5. The Palatlakaha River is a water course connecting a series of lakes rather than a true river. It originates in Lake Lowery in Polk County and flows north through the Clermont Chain of Lakes before entering Lake Harris near Okahumpka.

6. The Wekiva River begins at the confluence of Wekiva Springs Run and Rock Springs Run and flows into the St. Johns River. The river constitutes about eight miles of Lake County's eastern border. Much of the river has been protected as a state aquatic preserve and is designated an Outstanding Florida Water.

7. The Withlacoochee River's headwaters are located in the Green Swamp, in the southwest corner of Lake County. The Withlacoochee has been designated an Outstanding Florida Water west of State Road 33.

8. The Kissimmee River's headwaters are located in the southeastern portion of Lake County, in the Sawgrass Marsh area.

FLOODPLAINS

Floodplains are areas inundated during a 100-year flood event, as determined by the Federal Emergency Management Agency's (FEMA) flood insurance rate maps. The 100-year flood has been adopted by the Federal Insurance Administration (FIA) as the base flood for purposes of floodplain management. Floodplains slow the velocity of storm water run-off and are valuable as wildlife habitats and groundwater recharge zones.

Flooding may occur throughout the year, but it is most common during the rainy season, from June to October. The potential for the most severe flooding is from rainfall associated with hurricanes and tropical storms or when the ground has been saturated from previous rainfall. The worst flooding in Lake County occurs on closed lake basins that depend on subsurface drainage.

Statistical analyses are used when estimating the rainfall associated with 100-year floods. Within the duration of 1 day approximately 12 inches of rain, 3 days has approximately 13.6 inches and 31 days has 21 inches.

Most floodplains occur within wetlands and around surface waters. Therefore, they are substantially protected from development. Lake County also has a floodplain ordinance that requires development in the 100-year flood plain to use strict construction standards and site plan guidelines.

Control structures are in place to regulate stream flows and are monitored by comparing the monthly mean discharges on Haines Creek and the Palatlakaha River. The pattern of daily discharges indicates that the base flow of the regulated streams is reduced.

COMPREHENSIVE PROTECTION OF WETLANDS

Lake County's total wetland acreage is 166,144 acres, or 22.3% of the total land area. The areas of the County with the greatest extent of wetlands include: the Green Swamp, the lower Palatlakaha River Basin, the Blackwater Creek Basin, the Okahumpka Swamp, the St Johns River valley, Emeralda Marsh, and the Double Run Swamp.

Wetlands are defined as transitional land between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water. They provide habitat for many species of birds, fish, and animals, and contain Aquifer Recharge Zones that allow the groundwater to be replenished. Wetlands are protected by local, regional, state, and federal regulations because of the numerous benefits they provide.

Water Quality Enhancement is provided through a natural filtration process where sediments, nutrients, agricultural and stormwater runoff and other pollutants are assimilated by the wetland vegetation, resulting in an improved water quality and shoreline protection.

Water Quantity Management is accomplished through absorption and storage of water during wet seasons and during flood conditions. Wetlands reduce flooding by providing for the slow release of stored waters into natural surface water bodies and maintaining the hydrologic balance between aquatic and terrestrial ecosystems.

WETLAND CLASSIFICATION SYSTEMS

Florida uses the Florida Land Use and Forms Classification System (FLUCCS) for classifying wetland types FLUCCS is written for all land uses. All wetlands as described in the FLUCCS can be further described using the U.S. Fish and Wildlife Classification System once detailed field visits are made.

WETLAND DEVELOPMENT

Changes in wetland quality may be brought about from natural succession, enhancement through conservation and restoration programs, or degradation through development activities such as excavating (dredging), filling, ditching/draining, clearing or edge encroachment, and peat mining. Off-site activities that cause indirect effects upon wetlands include the discharging of

wastewaters and the artificial alteration of runoff flow in areas near wetlands. Edge Effects result from the lack of protective buffer areas between developing uplands and adjoining wetlands.

Wetland types vary in their ability to accept development activities without diminishing wetland functions. For this reason the compatibility of development impacts must be defined in terms of wetland type, function and significance. The compatibility of each development impact is determined by comparing the effects of the activity on each wetland function and type.

Channelization or ditching of wetlands for the purpose of surface drainage improvements can dewater the wetland. Another form of physical alteration of wetlands is mining or excavation. This process alters wetland biological functional values by replacing vegetative communities with open water. This can lead to degradation of water quality as the filtration processes of the wetland are removed. There has been significant excavation activity throughout the County in the form of peat mining and the creation of man-made lakes.

HABITAT AND DESIGNATED SPECIES PRESERVATION

Natural communities provide a variety of important ecological functions and provide many benefits to human society. They are a distinct population of plants, animals, fungi, and microorganisms that are naturally associated with their environment and each other, serve as noise barriers, reduce pollutants, provide habitat, and provide resources for recreation and scientific research. They are named for their most characteristic biological or physical feature.

The forms of development on Lake County's natural areas include the subdivision and development of land for residential and other urban uses, the filling and draining of wetlands and floodplains for agricultural production, mining, and timber harvesting.

Table 13 - Natural Community Acreage, Lake County

NATURAL COMMUNITY	ACREAGE	PERCENT OF TOTAL COUNTY ACREAGE
Xeric Oak Scrub	803	.011%
Sand Pine Scrub	1,712	.024%
Sandhill	1,591	.023%
Dry Prairies	1,563	.023%
Mixed Hardwood-Pine Forests	2,042	.030%
Hardwood Hammocks and Forests	813	.012%
Pinelands	5,174	.075%
Freshwater Marsh and Wet Prairie	4,928	.072%
Shrub Swamp	1,700	.025%
Bay Swamp	367	.005%
Cypress Swamp	2,520	.037%
Mixed Wetland Forest	3,012	.044%
Hardwood Swamp	5,816	.085%
Open Water	9,632	.140%

NATURAL COMMUNITY	ACREAGE	PERCENT OF TOTAL COUNTY ACREAGE
Natural Community	Acreage	Percent of Total County Acreage
Shrub and Brush land	3,104	.045%
Grassland	13	.0002%
Bare soil/ Clear-cut	852	.012%
Improved Pasture	8,398	.122%
Unimproved/Woodland Pasture	417	.006%
Citrus	3,026	.044%
Row/Field Crops	2,941	.043%
High Impact Urban	5,858	.085%
Low Impact Urban	680	.010%

FISHERIES

Lake County contains two fish management areas located in Lake Griffin and the Clermont Chain of Lakes. The Florida Fish and Wildlife Conservation Commission annually samples fisheries within Lake County to evaluate water quality and trends.

CLERMONT CHAIN OF LAKES

The fifteen lakes within the Clermont Chain of Lakes range in size from 3, 634 to 20 acres. Lake Minneola, located in the center of the chain, is the only lake that regularly has clear water.

In 1991, there was a large fish kill and the Clermont Chain of Lakes fishery collapsed. It has taken over a decade for the chain to recover, but tests have shown encouraging signs of improvement and evidence that reducing phosphorous levels and other pollutants within Lake County's numerous lakes and streams enable the fish population to increase.

Bass, bluegill, shellcracker, an abundant supply of channel catfish, and various other fish can be found within the chain. Many of the lakes have fish attractors attached to buoys to facilitate fishing.

OCKLAWAHA CHAIN OF LAKES

The Ocklawaha Chain of Lakes includes lakes Apopka (the headwater lake), Beauclaire, Carlton, Dora, Eustis, Griffin (headwater for the Ocklawaha River), Harris, Little Lake Harris, and Yale.

Lakes Apopka and Griffin were two of Central Florida's main fisheries through the early 1940s. The effects of nonpoint source pollution (agricultural stormwater runoff), with high levels of plant nutrients, became evident in the late 1940s. Shoreline marshes were diked and drained for vegetable farms on the rich muck soils. Excess stormwater with high levels of phosphorous was pumped into the lakes, causing algal blooms. The dying algal blooms reduced the water's oxygen and destroyed the fish population, which affected all of the lakes within the chain. These conditions favored increases in rough fish and a decrease in game fish.

The St. Johns River Water Management District, following the enactment of the 1985 Lake Apopka Restoration Act and the 1987 Surface Water Improvement and Management (SWIM) Act, was directed to find "environmentally sound and economically feasible" means to restore the water quality of the Ocklawaha Chain of Lakes in cooperation with other state and local governments and resource management agencies. Improvements include:

- Removing phosphorous runoff from farms and decreasing algal blooms, which will allow more light to reach the lake bottom
- Planting beneficial vegetation in appropriate areas
- Fluctuating lake levels to encourage natural establishment of desirable vegetation, which helps to stabilize sediments and improve water clarity
- Constructing marsh flow-ways to filter suspended sediment and phosphorous from circulated lake water
- Harvesting rough fish, thus reducing phosphorous recycling and re-suspension in the water from their feeding activities.

Since 2002, the St. Johns River Water Management District has harvested more than 1.25 million pounds of gizzard shad from Lake Griffin, reducing the cycling and re-suspension of phosphorous-laden sediments associated with the feeding behavior of these fish. Further more, there is now a fourteen-inch minimum when catching game fish. This new law has helped increase the number of large fish in the chain.

Lake Apopka began showing signs of improvement in 1995, and by 2003 there was a 30% reduction in phosphorous levels. Beginning in 2000, Lake Griffin began showing signs of improvement in water quality and a decrease in phosphorous and aquatic vegetation, with significant and sustained improvements in 2002. Lakes Beauclaire, Dora, and Eustis have also shown signs of improvement. Lakes Eustis, Yale, and Harris have the highest percentage of shoreline in good shape, and had the largest fish yields during the 2004 electro-fishing tests.

Table 14 - LMB results (CPUE in fish per minute) 2004 electro-fishing samples. Indicates high fish yield in Lakes Eustis, Harris, and Yale

LAKE	*MEAN TOTAL CPUE (S.E.)*	MEAN CPUE > 20CM (S.E.)	MEAN HARVESTABLE CPUE (S.E.)
Apopka	0.34 (0.06)	0.33 (0.06)	0.14 (0.03)
Beauclaire	0.44 (0.07)	0.32 (0.07)	0.16 (0.04)
Carlton	0.94 (0.11)	0.71 (0.12)	0.38 (0.08)
Dora	0.89 (0.08)	0.69 (0.07)	0.31 (0.04)
Eustis*	2.77 (0.22)	1.50 (0.09)	0.50 (0.04)
Griffin	0.96 (0.10)	0.59 (0.06)	0.23 (0.04)
Harris*	1.62 (0.14)	1.28 (0.11)	0.67 (0.07)
Yale*	2.69 (0.30)	1.13 (0.12)	0.17 (0.03)

MANAGED AREAS

Managed Areas are managed and/or regulated by various local, state and federal agencies for recreation and conservation purposes. The Lake County Recreation and Open Space Element provides a detailed inventory of the recreational aspects of these facilities. This section will discuss the conservational aspects of the major areas.

OCALA NATIONAL FOREST

The 383,573 acres Ocala National Forest is located in Lake, Marion, and Putnam Counties. Approximately one-fourth of the forest is situated north of SR 42 in northern Lake County. Lakes found in the Lake County portion include: Dorr, Sellers, Schimmerhorn, Wildcat, North and South Grasshopper, Beakman, Stagger Mud, Dexter, and George. A wide variety of vegetation thrives in the Forest, as well as the vast majority of Sand Pine Scrub, Sandhill and Pine Flatwoods Natural Communities.

The U.S. Government has banned phosphate mining in the National Forest. Most of the forest is designated as a Wildlife Management Area. A large area surrounding Alexander Springs and parts of Silver Glen Springs is closed to hunting. A designated species management plan has been established for the red-cockaded woodpecker in upland yellow pine vegetative communities

Table 15 - Other Designated Species in Ocala National Forest

FLORA	FLORA ACREAGE	FAUNA	HABITAT ACREAGE
Harper's Beauty	Not Available	Florida Black Bear	17,731
Ocala Vetch	Not Available	Florida Manatee	Not Available
Curtis Milkweed	Not Available	Grey Bat	Not Available
Flora	Flora Acreage	Fauna	Habitat Acreage
Florida Bonamia	Not Available	Florida Mouse	3,281
Ashe's Savory	Not Available	Florida Burrowing Owl	7,700
Star-Anis	Not Available	Sherman's Fox Squirrel	4,816
Small Lewton's Milkwort	Not Available	Wood Stork	6,042
		Bald Eagle	3,721
		Florida Sandhill Crane	1,755
		Scrub Jay	172
		Southeastern Kestrel	686
		American Alligator	18,039
		Eastern Indigo Snake	25,746
		Short-tailed Snake	1,382
		Sand Skink	Not Available
		Bluestripe Shiner	Not Available
		Shortnose Sturgeon	Not Available

WEKIVA

Lower Wekiva River State Preserve

Lower Wekiva River State Preserve is located in Lake and Seminole counties and contains almost 18,000 acres of environmentally significant land bordering six miles of the St. Johns River, the lower four and one-half miles of the Wekiva River and four miles of Blackwater Creek. The Preserve has a variety of plant and animal communities that provide great species diversity and biological richness.

The Florida Department of Environmental Protection, Division of Recreation and Parks manages the Preserve. Management programs involve ecological burning, removal of exotic species of plants and animals, reforestation of pine and cypress, and elimination of man-caused disturbances to the greatest extent possible.

Wekiva River Aquatic Preserve

The Office of Coastal and Aquatic Managed Areas manages the Wekiva River Aquatic Preserve (WRAP). The WRAP totals 19,000 acres and includes one mile of Rock Springs Run, three miles of the Little Wekiva River, the Wekiva River, the lower portion of Blackwater Creek, and 20 miles of the St. Johns River. The aquatic preserve supports a productive and diverse array of aquatic and upland natural systems and is a refuge for many endangered, threatened and rare species.

AREAS OF ECOLOGICAL SIGNIFICANCE

THE WEKIVA RIVER PROTECTION AREA

The Wekiva Basin is an area of biological transition between the northern limits of numerous tropical plants and the southern limits of temperate zone plants. The extensive wetlands in the basin provide habitat for many designated species. The Wekiva River is designated as an Outstanding Florida Water, and the lower three miles have been designated a Scenic and Wild River.

In 1988 the legislature enacted the Wekiva River Protection Act, providing for review of local comprehensive plans, land development regulations, and certain development. The Act declared the Wekiva River Protection Area a natural resource of state and regional importance. The following flora is considered rare and endangered: Butterfly Orchid, Cardinal Flower, Cinnamon Fern, Royal Fern, Hand Fern and Needle Palm. The listed fauna is considered rare and endangered: Bluenose Shiner Fish, American Alligator, Limpkin, Little Blue Heron, Snowy Egret, Tricolored Heron, White Ibis, Southeastern American Kestrel, Florida Sandhill Crane, Bald Eagle, Wood Stork, Least Tern, West Indian Manatee and the Florida Black Bear.

WEKIVA PARKWAY

In 2002, Governor Bush created the Wekiva River Basin Coordinating Committee to find an expressway route that connects SR429 to I-4 with the least disruption to the Wekiva Basin. In August, 2003, the committee established the Wekiva Study Area that includes land areas that contribute surface and ground water. The committee eliminated the NW Extension of SR 429,

which would have extended 429 through the Wekiva Basin and into northeast Lake County, and replaced it with the Apopka Bypass—which extends Maitland Boulevard west to link SR 429 and US 441—and the SR 46 Bypass—which brings SR 46 around the communities of Mt. Plymouth and Sorrento.

Governor Jeb Bush signed the Wekiva Parkway and Protection Act in June of 2004. The Act approved a plan to complete the Orlando Beltway, connecting State Road 429 in Apopka with Interstate 4 in Sanford. The legislation requires the State to preserve thousands of acres of wildlife habitat in Lake, Orange, and Seminole Counties and protect regional waterways.

Each local government within the Wekiva Study Area will be required to develop a master storm water management plan, an up-to-date 10-year water supply facility work plan to serve new and existing developments, and, where central wastewater facilities are not available, a wastewater facility plan, an infrastructure work plan, and a financially feasible schedule of improvements.

Local governments will also be required to establish a water reuse and irrigation program to minimize groundwater pumping. It is recommended that this program include improved conservation efforts and better utilization of resources.

Local governments will help reduce nitrogen in the Wekiva Basin to levels required by the Department of Environmental Protection (DEP) by phasing out existing on-site septic tank systems where central facilities are available and up-grading facilities elsewhere. The communities of Sorrento and Mt. Plymouth are of concern due to the large number of pre-1982 septic tanks in use, which are more prone to polluting; however, moving to central sewer and water may be difficult as the area is already developed. The potential for getting grants to enable residents to up-grade their systems will be included in the initial assessment Lake County Department of Health will send to the state office in Tallahassee. Lake County Environmental Services is already pursuing Federal assistance to replace older septic systems currently along the river.

Local governments will establish strategies that optimize open space and protect recharge areas, karst features and sensitive natural habitats, and they should require the use of best management practices for landscaping, construction, and golf course siting, design, and management. A model landscape code is currently being developed in Lake County, in conjunction with SJRWMD.

Comprehensive plan amendments required by the Wekiva legislation will be exempt from the two amendments per year rule and funding will be limited to $125,000. Comprehensive plan amendments recommended by the Committee shall be adopted by January 1, 2006, and land development regulations shall be adopted by January 1, 2007.

THE GREEN SWAMP AREA OF CRITICAL STATE CONCERN

The Green Swamp is a 560,000-acre region that lies in portions of Lake, Polk, Sumter, Pasco, and Hernando counties. It is the headwater for the Hillsborough, Withlacoochee, Ocklawaha, and Peace rivers, which provide most of the area's water supply, and has a diverse ecological environment containing numerous plant species and 330 animal species, of which 30 are either threatened or endangered. In 1974, the Florida Legislature designated 187,000 acres of the Green Swamp as an Area of Critical State Concern. Lake County contains 106,000 acres of the Green Swamp, of which 104,000 are protected.

The Floridian Aquifer is close to the surface in the Green Swamp, allowing water to easily percolate through the sand and porous rock. Pressure caused by the high groundwater elevation—Florida's highest—forces water throughout the aquifer, dispersing it underground for hundreds of miles preventing saltwater intrusion and sustaining the four major rivers in the region, streams, various springs, ponds, and lakes. Because of the Green Swamp's elevation, the water table remains higher than the Floridian Aquifer's potentiometric surface (The altitude at which water in the aquifer stands) throughout the year, supplying recharge to the area.

EMERALDA MARSH

There are 6,779 protected acres in the Emeralda Marsh Conservation Area. The area provides habitat for rare and endangered species such as the bald eagle, limpkin, and snowy egret, and many other species of plants and animals. Emeralda Marsh also has one of the highest alligator populations in Central Florida. Emeralda Marsh was purchased and is managed by the St. Johns River Water Management District, which plans to restore and protect floodplain and upland ecosystems.

ROCK SPRINGS RUN STATE RESERVE

Rock Springs Run State Reserve borders more than 12 miles of the Wekiva River and Rock Springs Run. The Reserve is comprised of nearly 14,000 acres of a variety of plant communities representative of central Florida's original domain. These communities include sand pine scrub, pine flatwoods, bayheads, hammocks, and swamps. The river system is formed from the discharge of several artesian springs together with the tannic runoff from the surrounding watershed. The wetlands and uplands provide habitat for a variety of rare and endangered species native to Florida. The Florida black bear, Florida scrub jay, wood stork, Florida sandhill crane, indigo snake, and a variety of more common species are often seen throughout the Reserve. Rock Springs Run State Reserve is located within parts of Lake and Orange Counties

The Reserve is managed under a cooperative agreement between the Department of Natural Resources, Game and Fresh Water Fish Commission, the Department of Agriculture's Division of Forestry, and the St. Johns River Water Management District. The DNR Division of Recreation and Parks is the agency providing on-site resource management and protection.

LAKE GRIFFIN STATE PARK

Lake Griffin State Recreation Area is over 460 acres located approximately 3.5 miles north of Leesburg. It offers a picnicking and interpretive program area situated in a mature live oak hammock. The park has 40 campsites and a public boat ramp providing access to Lake Griffin via a canal and the Dead River.

Lake Griffin SRA contains elements of sandhill, upland hardwood forest and bayhead swamp plant communities. Floating islands of peat sometimes form in the lake, often acquiring a carpet of rooted plants. The park has a 50 acre tract of sandhill habitat in its northern section.

Wildlife species which have been noted at the park include: white-tailed deer, gray fox, fox squirrel, raccoon, glossy ibis, anhinga, common moorhen, least bittern, black-crowned night heron, belted kingfisher, boat-tailed grackle, gopher tortoise, coral snake, and American alligator. The park contains no known archaeological or historical sites.

MINING AND BORROW PITS

As of 2004, Lake County has approximately 46 active mining operations, including five peat mines, sixteen hydralic sand mines, and twenty-five clay pits.

Mining operations must follow certain procedures in order to obtain approval from the County before beginning operations. During the permitting process, Lake County staff reviews the proposed mining operation and its feasibility is projected. As part of this procedure the following items must be submitted: mining site plan, reclamation plan and approval by the BCC. The hydraulic sand mines and the peat mines leave a man-made lake to reclaim the mine area. The applicants for mining operations must address many factors, including the following:

1. Ground and surface water level

2. Slopes and runoff

3. Maintenance of natural drainage patterns after reclamation

4. Reclamation of vegetation

5. Waste contamination

6. Ground water quality and recharge capability

A bond valued at 100 percent of the cost of the proposed reclamation plan must be posted for small operations. This bond is forfeited in case of non-compliance, allowing the County to undertake the reclamation of the site.

Requirements in the Lake County Zoning Ordinance define and limit mining operations. The County mining ordinance was adopted on May 8, 1990. This revised ordinance instituted more stringent standards regarding the operations and reclamation requirements of a given mine.

The life expectancy of a mine operation is dependent upon both the size of the property and the viability of the market for the product. Slow production would extend the life of the mine. In an extreme instance of low demand, the life of the mine could last indefinitely.

MINERALS

There are three commercially valuable minerals utilized in Lake County: sand, clay and peat. A large amount of fill dirt is also removed.

Lake County has extensive deposits of clay and sand that cover the majority of Lake County and major deposits of peat located near lakes Apopka, Griffin and Minnehaha and the Okahumpka Marsh. These deposits were utilized as muck farms, but they have since been purchased for conservation or urban development. The County possesses two limestone deposits along its western border at Okahumpka and the Green Swamp Area of Critical State Concern. There are also substantial phosphate deposits in the far northern portion of Lake County along Lake George. However, the Ocala National Forest has land use policies that strictly forbid the mining of phosphates in the Forest.

HUMAN SYSTEMS

Soils

There are 41 soil types in Lake County, twenty-five of which are hydric (wetland) soils and are unsuitable for development. There are six soils that are floodable and another thirteen that tend to pond. It is possible to build on these soils; however, it is more expensive to do so because of its wetness.

Other soils in the county tend to be droughty and are sometimes unstable when weight is added to their surface. Droughty soils or soils with steep slopes allow water to pass through them rapidly, and thus they do not function well with septic tanks or nitrification fields due to the possibility of contamination to groundwater or nearby lakes and streams.

The SCS has developed a hydrological classification system for soils that can be used to estimate runoff and soil erosion potential. The classification system is as follows:

Table 16 - SCS Soil Classification System

SOIL CLASS	DESCRIPTION
Group A	Low runoff potential
Group B	Moderately low runoff potential
Group C	Moderately high runoff potential
Group D	High runoff potential
Group A/D	Group D soil converted to Group A by drainage

The majority of soil types in Lake County are group D soils and account for 237,151 acres, or 43 percent of lands outside the Ocala National Forest. These soils are either hydric or are associated with flood plains.

Soil Erosion

Soil erosion is not a significant issue in Lake County with the exception of areas where large areas are prematurely cleared for development. The SCS Office has identified only isolated patches of hill erosion in the area South of Howey-in-the-Hills. Most of the hills are composed of coarsely grained sandy soils (Group A) covered with vegetation. These soils are well drained, sometimes excessively so, and have high aquifer recharge rates.

Slopes of more than 10 percent are considered unsuitable for septic tank drain fields. These slopes generally correspond with the ridge and upland regions of the County, where the soils have some potential for erosion when denuded of vegetation and are usually classified in Group A.

The 1991 Lake County Comprehensive Plan identified the loss of organic soils in muck farms as the most significant soil conservation issue. Muck farm acreage has since declined from 11,360 Acres in 1988 to the current 960 Acres.