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## **Chapter IV: Natural Resources**

### **I. INTRODUCTION**

The Withlacoochee Regional Planning Council (WRPC) derives its name from the Withlacoochee River which transverses through each of the member counties; Citrus, Hernando, Levy, Marion, and Sumter. The Withlacoochee Region is home to some of the largest remaining tracts of quality habitat representative of natural Florida and contains first magnitude springs, caves, and other geological features that are unique to the world.

These features also result in the Region supporting significant wildlife and plant populations, many of which are endemic to Florida. The broad expanse of coastal estuaries, hardwood hammocks, sandhill, and scrub that exist within the Region host viable populations of endangered and threatened species making the region a valuable natural reservoir in light of our rapidly developing state.

The Region also serves as a primary recharge area for the Floridan Aquifer, the principal source of drinking water for the residents of Central and South Florida. The numerous river and lake systems, high permeability of the Brooksville and Lake Wales Ridges, and unique connectivity between the limestone matrix of the Floridan Aquifer and the Region's other surface and groundwater resources makes the Region a valuable asset to the future of Florida.

All of the above factors have played a prominent role in the quality of life of our residents and the development and structure of our culture, economy, and population demographics. It is this premise that supports the need to develop the Strategic Regional Policy Plan (SRPP). It is only through comprehensive planning at the local, regional, and state level that adequate preparation can be made to protect our current resources and quality of life against the adverse impacts of Florida's current rate of growth by identifying the unique features of our natural resources, and assuring that each jurisdiction takes steps to prevent their loss or degradation. Thus, this chapter through its text will identify and discuss the natural resources of the Region. This foundation is then used to develop and support the goals, policies, and indicators by which local governments can assure that our Regions resources are protected or utilized in a sustainable fashion. Finally, the text and goals will be supported by a series of maps that identifies natural resources of regional significance.

### **II. EXISTING PLANNING AND REGULATORY FRAMEWORK**

#### **A. Planning: Federal, State, Regional, Local**

The SRPP is a planning document rather than a regulatory document. The SRPP does not establish regulatory criteria for the Region. It does establish, however, criteria by which local government comprehensive plans and plan amendments will be evaluated. Section 163.3184(b), F.S., provides that for a local government comprehensive plan or plan amendment to be "in compliance" it must be consistent with Chapter 163, F.S., the State Comprehensive Plan, the appropriate strategic regional policy plan, and Rule 9J-5, F.A.C. requires local government comprehensive plan Intergovernmental Coordination Elements to identify all regional and state resources and facilities identified in the State Comprehensive Plan and the applicable Strategic Regional Policy Plans.

Rule 9J-5, F.A.C., also requires that local governments identify regional and state resources within the local government's jurisdiction, the local government's area of concern (defined in Rule 9J-5, F.A.C., as adjacent local governments), and beyond the area of concerns based upon the characteristics or the resources of facility, which could be reasonably expected to be significantly impacted by development activities within the local government's jurisdiction.

Rule 27E-5.002, F.A.C., defines a natural resource of regional significance as "a natural resource or system of interrelated natural resources that due to its function, size, rarity or endangerment, retains or provides benefit of regional significance to the natural or human environment, regardless of ownership." Significant impact is defined in the local government comprehensive plan Intergovernmental Coordination Element to ensure that identified resources and facilities are protected and/or maintained in accordance with the provisions and criteria of the State Comprehensive Plan and the Strategic Regional Policy Plan.

### **III. TRENDS AND CONDITIONS**

#### **A. Historic**

The abundance and diversity of the Region's natural resources has supported human habitation from Florida's earliest history. Significant prehistoric settlements have been documented throughout the region. These settlements utilized coastal, riverine, and upland resources as needed and evidence now indicates that management through the use of fire was practiced in some areas.

When North America was first explored by European adventurers, the Withlacoochee Region was among the first to be visited. Over time, exploration was replaced by colonization and again the abundant natural resources played a role in making the region an early and important part of Florida's history.

Fishing, timber, mining, agriculture and other natural resource based industries served as the foundation of the Region's economic and cultural development, and this trend continues through today. While the form and methodology of our natural resource harvest and utilization has evolved through the years, it is still an indisputable fact that the Region's success and future are dependent on maintaining our environment in a healthy and productive manner.

#### **B. Present Trends**

The direct utilization of natural resources in the form of commercial fishing, timber harvest, mineral resource extraction, and active agriculture still serve dominant roles in the Region's economy. However, secondary utilization of natural resources in the form of recreational fishing, ecotourism/tourism, and recreation have now become significant components of our Region's economy. The areas resources have also served as an attractant to new residents and this has accelerated the impact and loss of our natural areas as lands are converted from natural systems to residential subdivision, commercial, and industrial developments and their supporting infrastructure.

This trend more than any other has placed the Region's natural resources at risk as human impacts increase both directly and cumulatively. As the Region's population grows and demands for services such as roads, water, and wastewater increase, the Region's natural ecosystems are being fractured and losing their ability to function and maintain their biodiversity.

To counteract this loss, tools have been developed to protect and in some cases, restore our natural systems or specific components within them. In most cases, these tools are in the form of governmental action either in the form of regulations or programs financed with public dollars.

Regulations cover a broad spectrum of subjects and exist at different levels (federal, state, regional, and local). They include direct resource control regulations such as

hunting and fishing regulations and water use permits as well as resource impact regulations such as dredge and fill, and drainage modifications.

Another level of regulation is the accomplishment of lawfully exercised (legislative) police power by the local, regional, or state government. Land use regulation is required to balance an individual's right to use his property with the overall need to maintain the health, safety, welfare, and morals of the community. The benefits of good land use planning are that both individual and the community are balanced. In permitting processes (quasi-judicial), the protective measures come in the form of mitigation, seeking to minimize destruction where development rights are vested.

Finally, regulations are intended to protect or restore specific conditions or features. These include such far ranging rules as the Endangered Species Act, Clean Water Act, Clean Air Act, and more specific, environmental regulations targeting defined activities such as wastewater treatment, mining, and solid waste management.

A promising newer strategy is an incentivized form of individual stewardship known as "ecosystem management." This technique is being developed in Florida by the Florida Department of Environmental Protection (DEP) and it allows specialized agreements that combine permitting processes with advanced and enforceable management (stewardship) plans and various less than fee-simple acquisitions.

In the category of programs, land acquisition and public management exist at many levels and in many forms. In broad terms they can be separated into categories.

Public acquisition or management can be designed to protect and maintain lands in their natural state limiting all human activities to only those which will have no adverse impact. Programs of this type include the National Wildlife Refuge System and Florida State Preserve Program.

A second much larger category is public land acquisition or management for multi use. These programs attempt to balance retention/protection of the natural system(s) while allowing sustainable harvest, active/passive recreation and resource extraction such as wellfields. The National Forest system, State Park system, and State forests all fit into this category.

A new innovative approach is the usage of agreements or purchase of development rights to protect resources or natural systems while leaving the land in private ownership. The Wildlife Management area program and the new Green Swamp initiative utilize these approaches.

**1. Current Status of Significant Natural Resources**

a. Groundwater Resources and Aquifer Recharge

(1) Floridan and Surficial

The top of the Floridan aquifer, which stores and transmits underground water, is approximately at sea level throughout the Region, placing it at or near the land surface in Levy, Citrus, much of Hernando and Sumter, and the southwest corner of Marion County. Where the Floridan is not at the surface and relatively impermeable rocks and clays act as confining beds, there is a surficial aquifer of varying thickness, reaching more than 300 feet

in Marion County east of the Ocklawaha River. Recharge, the action of water percolating down to replenish the aquifer, is dependent upon the amount of rainfall and the geology of the land over the aquifer. Much of the Withlacoochee Region is classified as a high aquifer recharge area with a recharge rate of greater than ten inches per year.

(2) Surfacewater and Groundwater Interconnections

Surface and groundwaters of the Region are closely linked. The Suwannee, Withlacoochee, and Ocklawaha Rivers originate primarily from surface runoff but also receive water directly from the surficial and Floridan aquifer through fissures and springs. The coastal rivers and streams of Citrus and Hernando Counties (Crystal, Homosassa, Chassahowitzka, and Weeki Wachee) derive their primary source in springs flowing from the Floridan aquifer. In Levy County, the flow of the Waccasassa River and Otter Creek are influenced by both surface runoff and springs. During droughts, most rivers and streams are sustained by base flow from ground water.

(3) Swamps, Ponds, and Isolated Wetlands

Florida is a recipient of a considerable amount of precipitation annually. Most of this rainfall percolates into the subsoils and ultimately the aquifers in high recharge areas or flows into existing surface waters. However, the undulating contour of Florida and its diversity of soils, creates opportunities where large rain events will overwhelm the soils ability to percolate. During these events, water will sheetflow to depressional areas where it will remain stored until percolation or evaporation removes it. These receipt sites have adapted to this seasonal wet period in the form of swamps, ponds, and isolated wetlands. Both the drainage area and frequency of large rain events play a role in the size and form of these areas and wildlife within the region has evolved to utilize these sites for reproduction and forage.

(4) Sinkholes/ Karst Topography

The predominant geology of the region is termed karst. Karst has been described as "A terrain generally underlain by limestone, in which the topography is chiefly formed by the dissolving of rock, and which is commonly characterized by karren, closed depressions, subterranean drainage, and caves." (Monroe 1970) The underlying rock of the Region's land is soluble limestone, and sinkholes are formed by the solution of near-surface limestone or by the collapse of near-surface materials into underlying solution cavities. Sinkholes are a part of the erosion process analogous to valleys that are carved by rivers in areas underlain by insoluble rocks. Four major types of sinkholes are common to the Region: limestone-solution, limestone-collapse, cover-subsidence, and cover-collapse. The first two occur in areas where limestone is bare or is thinly covered. The second two occur where there is a thick cover (30-200 feet) of material over limestone.

Sinkholes are potential sources of contamination to existing supplies of water because of surface inflow into the sinkholes. The

potential for pollution of the Upper Floridan aquifer through sinkholes or internally drained areas caused by sinkhole has been documented. (Sinclair et al. 1985, 1-2)

(5) Conservation of Aquifer Recharge Areas

The conservation of aquifer recharge areas, especially high aquifer recharge areas, is essential to guarantee a water supply of acceptable quality for the Region. While not all of the high aquifer recharge areas in the Region can be reserved from development, some development controls are prudent in key water recharge areas. Water management district regulations require that post-development runoff volumes equal a site's pre-development runoff volumes, so that, from a water quantity perspective, aquifer recharge rates are not significantly reduced by development.

Much of the high recharge area in the Withlacoochee Region exists because of highly permeable soils, thus there is a greater possibility that contaminants, such as those from stormwater runoff, may not be absorbed before entering the aquifer. In addition, some of the aquifer's geologic formations transmit water faster than others, meaning some groundwater resources are more vulnerable to contamination.

Recharge occurs throughout the Region, except along the Ocklawaha River and around Lake George on the eastern border of Marion County. The existence or permeability of confining beds is one factor in recharge potential. Another is the potentiometric surface, defined as the level to which water will rise in tightly cased wells that penetrate an aquifer. For recharge of the Floridan to be possible, its potentiometric surface must be below the land surface, and below the bottom of any surficial aquifers. If the potentiometric surface is higher than the ground elevation, a well drilled into the Floridan at that point will be artesian.

Areas with high rates of recharge often have well-drained soils of the types favored for development. Increased intensity of land use can reduce both the quantity and quality of water available for recharge. Runoff from paved and other impervious surfaces reduces the amount of rainfall seeping into the ground. This runoff often carries an increased pollutant load and needs special treatment where there is inadequate filtration by highly permeable soils.

(6) Wellfield Protection

Land above portions of the aquifer from which public wells draw their water need special protection, and future wellfields need to be identified and land use controls instituted before incompatible activities nearby make them unusable. In addition to zoning and subdivision controls, protection programs for recharge areas and wellfields can include fee simple purchase, purchase of restrictive covenants and easements, regulation of specific pollution sources such as waste disposal and hazardous materials, and design and management practices such as leakproof sewer lines and improved street sweeping.

(7) Saltwater Intrusion

Fresh water is defined as containing less than 1000 milligrams of dissolved solids per liter. Throughout much of the region, dissolved solids concentrations are less than 250 milligrams per liter. In most places where that level is exceeded, the predominant constituents are calcium and magnesium bicarbonate, causing water hardness. However, along the coast the predominant constituents are sodium and chloride. The wedge of salt water at the coast may be the full thickness of the aquifer, declining inland to zero in the eastern parts of Levy, Citrus and Hernando where the full depth of the aquifer is fresh. There is also a wedge of salt water along the eastern boundary of the Ocala National Forest in Marion County, resulting from deposits made during geological periods when ocean levels were higher.

The relation between fresh water and salt water in an aquifer is a delicate balance. A relatively high potentiometric surface of fresh water will keep salt water from moving inland from the coast or upward from the deep saline geologic formations. Saltwater intrusion into formerly freshwater zones of the aquifer generally caused by one or more of the following: pumping of wells near the coast, pumping from overly deep wells, poor well construction, uncontrolled flowing wells, wells with corroded casings, or drainage from canals along the coast. Coastal areas in particular should practice water conservation, to minimize future conflicts with inland communities arising from overpumping of inland aquifers that serve coastal water users.

(8) Potable Water Supply

The primary source of the Region's water supply is groundwater withdrawn by private wells and public and private water systems from the Floridan Aquifer. Water withdrawal estimates for 1990 indicated that the Region withdrew 73.13 million gallons per day (mgd) of groundwater and 1,461.54 mgd of surface water, almost all of which was saltwater drawn from the Gulf of Mexico used to cool the Florida Power Corporation electric generating station near Crystal River (Florida Statistical Abstract, 1993).

From time to time, jurisdictions to the south (principally, the Tampa Bay area) have looked to the Withlacoochee Region's water as a source of supply. While the Withlacoochee Region does not have any major problem meeting its own current water needs, the Region could experience ecological and economic problems if extensive pumping were to draw down the aquifer and/or surface water bodies such as Lake Rousseau, the Withlacoochee River, the Suwannee River, or the Region's coastal spring-fed rivers. Withdrawals of freshwater from the rivers could increase salinity levels in receiving estuaries and damage delicate coastal habitats. Transfers of ground- and/or surface-water outside the Region would constitute a complete withdrawal of water from the Region's water cycle and could result in long term or even permanent disruptions of natural systems.

The 1990 Census found that just over half of the homes in the Region obtained potable water from a public or community water system while slightly fewer than half got their water from individual wells (Table 2-82). Hernando County, the most urbanized in the Region, was the only county in the Region where the majority of the homes were served by central water systems in 1990 (78%). Individual wells provided water to the majority of homes in Levy County (65%), Sumter County (60%), Citrus County (54%) and Marion County (51%). The trend from 1970 to 1990 was toward increased utilization of central potable water systems. Central water service was available in most cities and towns in the Region and in the newer planned unit developments in rural areas. Agricultural, industrial, and other users are summarized in Table 4-1. In addition to fresh water use, close to 1.5 billion gallons per day of salt water was withdrawn for cooling by the Florida Power Corporation Crystal River Power Plant.

(9) Groundwater Quality

The land areas contributing runoff to a particular watercourse constitute its "watershed." Land use throughout the watershed can affect the quality of surface water, and in cases where runoff flows into sinkholes, drainage wells, or a surficial aquifer, groundwater can also be impacted negatively.

Water quality is primarily affected by a storm's first flush of the pollutants accumulated in the watershed. Storage of the first half-inch of runoff minimizes the potential impact on surface water bodies. However, in areas where the Floridan aquifer is unconfined and near the land surface, pollutants may still not be filtered out before reaching drinking water. Vegetated swale systems can be constructed that will reduce the volume of runoff and improve water quality. Retention basins can be lined with clay and treatment can be provided by installing a drain system covered with filtration sand. Funding for the construction and improvement of stormwater facilities can be funded through the establishment of a stormwater utility.

In the past, drainage wells were constructed for the purpose of disposing of stormwater underground. In the Withlacoochee Region there have been as many as sixty such wells, mostly in Marion County. Naturally occurring sinkholes also provide a conduit for runoff to flow into underlying aquifers. Existing ones should have vegetative buffers left in place, or planted where necessary to provide treatment of pollutants. The formation of new sinkholes is a threat to ground water because new sinkholes can be triggered to open by the weight of full retention basins, causing their contents of concentrated pollutants to be drained into the aquifer. Several techniques are available to identify areas prone to sinkholes. Shallower ponds that distribute their weight over a larger area are less likely to collapse.

The unconfined Floridan aquifer that occurs in the Region is extremely susceptible to infiltration of pollutants. Contamination can occur as a result of approved activities such as the widespread use of pesticides and herbicides, intentional dumping of toxic wastes, and accidental spills and leaks. Known and suspected

sources of contamination include public and private landfills, industrial sites, and former packing facilities where agricultural pesticides were abandoned. Leaking underground storage tanks have polluted several private wells and at least one municipal wellfield.

a) Hazardous Waste

Hazardous waste is defined by Florida Statute 403.703 as a "solid waste, or combination of solid wastes, which, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or may pose a substantial present or potential hazard to human health or the environment when improperly transported, disposed of, stored, treated, or otherwise managed. The term does not include human remains that are disposed of by persons licensed under chapter 470." There are specific wastes or categories of waste that may exhibit one or more of the characteristics of a hazardous waste but are not legally defined as a hazardous waste, including radioactive wastes, sewage effluent, and household chemicals. Hazardous waste cannot be legally disposed of by land disposal methods (landfill). Special processing is required to neutralize the hazardous quality of the waste which if untreated and disposed of by land could potentially contaminate soil, air, and water.

In 1976, Congress enacted the Resource Conservation and Recovery Act (RCRA) to protect the environment and the public health from the mismanagement of hazardous wastes. Although large quantity generators (LQGs) were primarily fully regulated at that time, small quantity generators (SQGs) became regulated when RCRA was amended in 1986. LQGs generate more than 2200 lbs. per month of hazardous waste; SQGs generate more than 220 lbs. but less than 2200 lbs. per month of hazardous waste; and conditionally-exempt small quantity generators (CESQGs) generate no more than 220 lbs. per month of hazardous waste.

SQGs and CESQGs must manifest (track) their wastes, hire approved transporters, and participate in varying levels of planning and reporting to regulatory agencies. All five of the region's counties have hazardous waste collection centers which will accept CESQG wastes for a reduced fee.

**Hazardous Waste Management Problems.** Many SQGs mismanage their wastes by illegally disposing them in sanitary landfills. These wastes can accumulate creating the potential to transform the landfill into an uncontrolled site. The problems associated with hazardous waste mismanagement can be separated into the following categories:

- Past Mismanagement: Hazardous waste management practices that have resulted in areas where hazardous wastes have been deposited and present the potential for significant environmental and human health concern. These areas are frequently called uncontrolled sites or abandoned dumps.
- On-going Mismanagement: Hazardous waste management practices that can result in contaminated soil, air, and water.

Cleanup and site restoration of uncontrolled sites due to past mismanagement is costly. Prevention of the establishment of new uncontrolled sites can save substantial amounts of money and avoid the adverse environmental and health effects resulting from such mismanagement practices.

Effective solutions to the problems of hazardous waste mismanagement include improved public awareness of proper hazardous waste disposal and lower disposal costs.

**County and Regional Hazardous Waste Assessments.**

Part IV of Florida Statute 403, Resource Recovery and Management mandates each county government, or in lieu of the county and if agreeable, a regional planning council, conduct a hazardous waste management assessment. These assessments are coordinated by the regional planning councils with technical assistance provided by the Florida Department of Environmental Protection (DEP).

Using guidelines established by the DEP, the regional planning councils or county governments are directed to identify within each county: all hazardous waste generators, the types and quantities of waste generated, hazardous waste management practices, facility needs, abandoned dump sites, and operating procedures at sanitary landfills. Also, each county must designate areas where one or more hazardous waste storage facilities may be located. The regional planning councils are also required to select one or more sites for regional hazardous waste storage or treatment.

Florida Statutes Section 403.7234 also establishes an SQG notification program to be administered by county governments. SQGs identified in the County Government Hazardous Waste Assessment are to be notified of their legal responsibilities to manage hazardous wastes and given a list of available waste management alternatives. The small quantity generators must disclose to the county government the types and quantities of waste generated and present management practices. The law also establishes penalties for non-compliance with this requirement.

**County and Regional Hazardous Waste Facility Site Selection.** The law also requires the designation of areas or sites for two types of hazardous waste management facilities -- storage and treatment facilities. It is the responsibility of each county to designate areas within the county in which a storage facility could be sited. A storage facility is a warehouse-type operation where containerized wastes are held for short periods of time, usually less than 90 days. The main purpose of the storage or transfer facility is to consolidate smaller shipments of wastes from individual generators so that economical truckload reshipments can be made to permitted facilities where wastes are treated, recycled, or disposed.

Each regional planning council is responsible for designating one or more sites in the region where regional hazardous waste storage or treatment facilities could be located. A treatment facility processes hazardous wastes to reduce the volume, render wastes non-hazardous, or stabilize waste for safe management. Wastes are removed from storage containers and physically or chemically altered.

State permits are required for the construction, operation, and closure of hazardous waste storage facilities. The standards require a primary containment device designed to prevent leakage and overflow as long as the wastes remain in the storage facilities. An inspection program is required to monitor deterioration in the primary containment system so that it can be repaired or replaced before any hazardous waste is released in the environment; or, failing that, to detect leaks before they become major or result in significant contamination of soil, groundwater, and surface water. Finally, where the primary containment devices are easily damaged or inspection is difficult, secondary containment devices are required for the various types of storage facilities.

The predominant concern regarding the designation of areas or sites for any hazardous waste management facility is public safety. Areas or sites should therefore be designated so that the public safety is maintained. The county storage/transfer facility is essentially a warehouse operation. It operates in a way that is similar to the warehousing component of most industrial plants. Further, the wastes that it stores are similar in terms of hazardous characteristics to the raw materials stored in an industrial plant.

The regional treatment facility operation is more complex than the operation of the storage facility. Therefore, the designation of an appropriate area or site for a treatment facility is more complicated than for a site or area for a storage/transfer facility. The processing or treating of hazardous wastes may, depending upon the type of waste and treatment process, result in greater environmental and

public health risks than the storage of hazardous waste. It is important to designate sites for treatment facilities that are in areas that are typically removed from human activity and are not environmentally sensitive. The site selection process for the regional planning council was completed as part of the regional assessment and plan in 1987. Since the initial designation of the Martel site in Marion County it has been established that existing groundwater contamination would prevent construction at that site. The Withlacoochee Regional Planning Council has expressed a desire to repeat the site selection process in the near future.

It should be recognized that the final approval or permitting of any hazardous waste management facility is dependent upon a site-specific evaluation by DEP. The granting of a construction permit by the DEP means that the proposed facility meets all state regulations concerning the placement, construction, and proposed operation of the facility.

The county storage/transfer facility sites in the Withlacoochee region have been designated. The Martel site in Marion County has been designated as the regional treatment facility site. It should be noted that site designation does not necessarily mean that a facility will be constructed. Facility construction will be dependent upon the demand for these facilities.

**Amnesty Days.** Initially the law established a program known as "Amnesty Days." DEP contracted with the private sector to collect hazardous waste on a one-time basis from homeowners, farmers, schools, state agencies, and other one-time SQGs. There was no charge to the generators for this one-time service. The program was intended to raise public awareness of the need for proper management of hazardous waste as well as to reduce the hazardous waste accumulating throughout the State. The Act scheduled six "Amnesty Days" between May 1, 1984 and December 31, 1986. Collection points were established throughout the State.

"Amnesty Days" have been continued to be held within the Withlacoochee region since 1986. Based on the success of this program in the region counties have continued the program and have established regular collection days on a semi-annual and/or daily basis.

**Hazardous Waste Collection Centers.** To meet the need for managing small quantities of hazardous waste, the Florida Legislature established a grant program to initiate the operation of local or regional hazardous waste collection centers. This program is known as an expanded local hazardous waste management program.

Local collection centers can provide local governments a method for collecting and temporarily storing small

quantities of hazardous waste from households and small businesses. A local government or contracted private concern could be responsible for collecting the waste and assuring delivery to a permitted recycling, storage, disposal or treatment facility.

The maximum grant amount for any local government participating in the development of a local or a regional collection center is \$50,000. Within the region, Citrus, Hernando and Marion Counties have received these grants. Levy County and Marion County received a cooperative collection center arrangement grant in 1992 when Levy County was assisted by Marion County to hold a household hazardous waste collection. Presently, Marion County has a contract with Sumter County for collection and disposal of small quantity hazardous waste, and Levy County has established its own program.

Two or more counties can establish a regional collection center. Each county would be eligible for \$50,000 when applying for the grant. By collectively establishing a permitted regional center, the overall cost of operation may be reduced. More hazardous waste would be collected at one regional location which, in turn, would provide a market for transporter services. In addition, the host county would be eligible for a 3% tax on the gross annual receipts of the facility.

There could be three components to a regional collection network. A household hazardous waste collection center, operated by local government for private home owners use only; a local collection center, operated by a hazardous waste transporter under contract; and a regional collection center which would be a permitted storage facility. Waste from the regional center would be shipped to a multipurpose facility for final treatment and disposal.

**Regulation of Industries Which Generate Hazardous Waste.** Local governments may enact ordinances for industries which generate hazardous wastes, in addition to conducting periodic hazardous waste assessments. Such ordinances may be designed to reduce the occurrence of leaks or spills and require contingency measures in the event such leaks or spills should occur.

Such ordinances might include: incorporating a statement of use or non-use of hazardous materials or generation of hazardous wastes as part of the building permit process; the provision of adequate pretreatment facilities for hazardous waste; the development of spill response plans; and documentation of contracting with a hazardous waste disposal service or provision of in-house disposal, which meets with the requirements of the DEP.

**Strategies for Hazardous Waste Reduction.** There are three primary strategies for hazardous waste reduction

which, in turn, can reduce the demand for hazardous waste storage and treatment facilities.

First, there may be efforts to reduce the volume of hazardous waste being produced; these efforts should be encouraged. This can be accomplished by seeking substitute materials that are less detrimental to the environment.

Second, enhanced waste recycling and waste exchange programs may be instituted. The recycling of used oils, for example, benefits everyone by keeping the contaminant out of the land, conserving a limited energy resource, and producing economical gains from an otherwise useless product. Greater attention may also be given to waste exchange programs such as the Southern Waste Informational Exchange, so that more waste is transferred to become an input material of another manufacturing process.

Third, the establishment of a network of local collection centers and regional treatment sites would serve to eliminate the excess demand for hazardous waste facilities. This network must adequately serve generators by providing a dependable service at an affordable price and be an environmentally-sound operation. Through the hazardous waste management assessments, Household Hazardous Waste Collection programs, and Collection Center Grant program, the State is encouraging the formation of such a network.

(10) Wastewater

Septic tanks are the predominant method of wastewater treatment/disposal due to the rural development patterns of the Region. According to the 1990 Census, 65.5% of the homes in the Region were sewered by individual septic tanks or cesspools. Approximately one-third (33.5%) were serviced by a public or community sewer system. This compares with the state where 73.8% of homes were sewered by public systems and only 25.6% of homes had individual septic tanks. Levy County had the highest percentage of homes sewered by septic tanks (79.8%); followed by Sumter County (76.1%), Citrus County (71.2%), Marion County (62.9%) and Hernando County (57.9%). Conversely, Hernando County had the highest percentage of homes served by central sewer systems (41.6%) followed by Marion County (35.7%), Citrus County (33.5%), Sumter County (22.5%) and Levy County (19.3%). The trend from 1970 to 1990 was toward increased utilization of central sewer systems. According to the 1994 Florida Statistical Abstract, 20.64 million gallons per day are treated by domestic or industrial system within the region.

The quantity of domestic wastewater that must be collected and treated is enormous. Approximately 100 gallons per capita are generated daily. In rural areas this waste is usually disposed of by septic tank-soil absorption systems. Crucial factors for proper septic tank operation are permeability and filtration ability of the

soils, depth to the water table, and susceptibility to flooding. Where pollutants are not adequately eliminated by the soil, ground water will be contaminated. When the drainfield receives more liquid than it can absorb, effluent breaks out on the ground surface and/or backs up in plumbing fixtures. Such system failures can pollute ground water and degrade surface water. Problems are compounded by improper installation, inadequate maintenance by the homeowner, subdivisions and mobile home parks platted with little regard for topography and drainage, and systems constructed close to lakes, rivers and streams. There has been observed degradation of this type in the Region in association with development along the Homosassa River, Lake Weir, Lake Panasoffkee, Suwannee River and Withlacoochee River.

b. Surface Water Resources

The Region's surface water resources are contained in freshwater springs; streams; rivers; canals; ponds; lakes; sinkholes; reservoirs; Gulf coastal estuaries and the wetlands and floodplains associated with these surface features; and, isolated freshwater wetlands. The Region's groundwater resources are contained within the aquifers which underlay the Region. More than fourteen percent of the Region's area is surface water (Table 2-1). The Region is drained principally by four river basins: the Withlacoochee, the Ocklawaha, the Suwannee, and the Waccasassa. The first three are listed among the twelve major rivers in Florida and are considered important sources of surface water in the Region. The Region contains nine (9) of the 25 first-magnitude springs in Florida. These springs are natural overflows from underground reservoirs, and have provided a setting for recreational and tourist activity for more than a century. Rainbow Springs and Silver Springs are believed to discharge the greatest volume of water of any spring in the state while Silver Springs is considered to be one of the largest springs in the United States. The Region also contains over 800 lakes and streams of varying sizes that provide the basis for and often the measurement of ecosystem health, while being valuable assets for recreational, tourist, domestic, and commercial uses. Table 4-2 lists the regionally significant rivers, springs, and lakes of the Withlacoochee Region.

Compared to other areas in Florida, the surface water bodies of the Withlacoochee Region have not suffered the degree of pollution and exploitation that many other areas have experienced. Nevertheless, there are numerous examples of negative impacts to the Region's water resources that have been observed:

- Lake levels have been lower than average for the past ten years, attributable to reduced rainfall and increased pumping of groundwater. Control structures on some lakes to reduce the fluctuations in water levels have had unintended negative consequences on water quality.
- Nutrient loading, from agriculture and urban runoff, into lakes and rivers has increased the rate of eutrophication. Eutrophic systems encourage the growth of algae and other aquatic plants that can reduce the attractiveness of the water body for recreational uses while favoring fish populations which are capable of surviving under

the changed conditions. Water bodies where this is occurring include the Withlacoochee River, Lake Weir, Little Lake Weir, Lake Kerr, Lake Panasoffkee, and Tsala Apopka Chain.

- Pollution of surface waters and aquifers from agricultural and urban runoff has rendered groundwater in some areas unfit to drink. For example, Marion County has delineated 21 areas where groundwater is contaminated to the degree that the surficial aquifer must be bypassed for domestic wells.
- Invasive exotics, both plants and animals, are competing against native plants and animals in many water bodies. Hydrilla and water hyacinths, exotic water weeds, have clogged numerous lakes and rivers, and are spreading in many areas.
- Dams and weirs on some rivers have curtailed the natural movement of fish and other aquatic animals. For instance, the Rodman Dam has all but eliminated the once abundant mullet in Silver Springs. Reduced freshwater flow to estuarine systems, as observed in the Weeki Wachee River, is a serious threat to the important estuarine spawning grounds that are the basis for much of the Gulf's sealife.
- Septic tanks in floodplains along the coast and along some rivers have contaminated adjacent waters with nutrients and bacteria. Waters off Citrus County have shown increased levels of bacteria which could be an impediment to development of a shellfish aquaculture industry. Ninety-nine percent of the septic tanks in the Town of Suwannee were discovered to be polluting the nearby river.

The opportunity exists to correct and lessen these problems if local governments and individuals work to reverse various forms of pollution, nutrification, and over-exploitation. These corrections may take the form of regulations, best management practices, and educational campaigns. Through these types of cooperative efforts the protection of aquatic ecosystems may be achieved.

(1) Floodplains

Protection of surface water systems requires preserving the ability of floodplains to fulfill their natural functions of water storage and conveyance, water quality enhancement, and wildlife habitat. It also involves maintaining the natural patterns of runoff from more upland parts of the watershed. In the absence of development, runoff and flooding are normal occurrences that cause few problems. Vegetation protects the soil from erosion with a covering of leaves, plant material, and a network of roots so that flowing

water is slowed, filtered, and absorbed. Downstream areas depend on upriver vegetation and soils to reduce the volume and improve the quality of runoff they receive.

When wetland and floodplain functions are damaged by filling, or groundwater is withdrawn below levels necessary to sustain the wetlands, or impervious surfaces replace upland vegetation, stormwater runoff peaks faster and at higher levels, reducing the opportunity for filtration. Buildings and fill that are placed in the floodplain diminish the volume available for storage and conveyance of floodwaters, increasing flood height and velocity. The increased velocity and volume of water occurring from both floodplain encroachment and upland alterations in surface water flows erode banks, scour stream bottoms and dislodge bottom dwelling organisms. Flood peaks may be doubled, but because groundwater has not been adequately recharged, streams may cease to flow during dry periods, and downstream systems that depend on a flow of fresh water may be disrupted.

Many floodplain protection regulations indirectly encourage the placement of fill to elevate structures above flood levels. The placement of fill can alter or redirect flood and stormwaters resulting in lateral expansion of the floodplain or increases in flood levels.

Structural controls such as dams, weirs, levees, and channels further alter surface water flows by storing and redirecting flow. This can result in increased flooding somewhere else and in the destruction of floodplain values and functions, including harm to aquatic ecosystems that depend on periodic fluctuations in water level.

Non-structural floodplain management minimizes interference with the beneficial functions of floodplains. Guidelines include preventing fill and other obstructions to the flow of surface waters on these lands, retaining the natural vegetation, restricting buildings and roads from the most frequently flooded areas, and requiring the bottom floor of structures in less frequently flooded areas to be above the expected flood level. The National Floodplain Insurance Program requires elevation of the lowest floor to be at or above the level of the 100-year flood, the flood with a one percent probability of being equalled or exceeded in a given year.

Because riverine systems cross jurisdictional boundaries, coordination is needed among local governments and other agencies to develop floodplain management plans. These plans should recognize and protect floodplains and wetlands as natural stormwater management areas, and direct the location and design of development to take advantage of the natural drainage system. Management plans developed by water management districts for water bodies under the Surface Water Improvement Act (SWIM) present strategies for restoration or conservation of water quality that should be addressed in plans, ordinances and regulations of other governmental units. The management plan for St. Martins Marsh Aquatic Preserve, which contains parts of three rivers (Salt, St. Martins, and Homosassa) in Citrus County, describes the

interface between the objectives for the Preserve and the programs and activities of other agencies.

(2) Freshwater Wetlands

Wetlands are areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support vegetation typically adapted for life in saturated soil conditions, and include swamps, marshes, bogs and similar areas. Wetlands are an important source of wildlife habitat and are an integral component of natural surface water drainage and filtration systems. "Contiguous" wetlands are those associated with waters of the State, riverain, and coastal areas. "Isolated" wetlands are depressional areas in locations predominately classified as uplands.

Fundamental to the protection of natural systems is the maintenance and restoration of wetlands. Wetlands adjacent to surface waters provide a purifying buffer, stabilize the shoreline, reduce erosion, and serve as habitat for many species. Isolated wetlands are also a part of the hydrologic regime and perform water storage and purification functions and provide significant habitat both individually and cumulatively.

The population of some birds that are dependent on wetland communities has been greatly reduced due to drainage, dredging, and filling. Repeated nesting failures have been caused by inadequate food supply and nest predation, both of which result from changes in the water regime. A reduction in the period of time an area is inundated shortens the time available to fish, and an increase in the water level can cause the birds' food supply to be too dispersed. Where marshes are destroyed, the birds have fewer nesting and feeding sites and may have less food in the remaining marshes. The endangered wood stork is particularly affected by a reduction in the total quantity of fish since their feeding technique requires greater concentrations of fish than are needed by other waders. Maintaining small, isolated wetlands that provide fluctuating water levels is essential to their survival.

Many animals require more than one type of habitat for food supply, cover, and/or reproduction. During the breeding season, gopher frogs travel from their homes in gopher tortoise burrows in the sandy uplands to congregate in cypress heads and other ephemeral ponds. Many terrestrial mammals forage in the aquatic food chain, and black bears, which must have access to different vegetative communities, range widely through wetland areas.

In addition to type and variety of vegetation, habitat size and isolation are critical. Bears, panthers, and bobcats require large territories in order to prevent inbreeding. Connecting isolated habitat islands via forested corridors promotes genetic interchange and maintains the full array of plant and animal species in all the fragments. Riverain corridors are rich in species number and diversity, and function as interconnected wildlife thoroughfares.

The Florida Game and Freshwater Commission publication "Closing the Gaps In Florida's Wildlife Habitat Conservation System" identifies approximately 404,339 acres of wetlands within

the Withlacoochee Region. These wetlands are listed by County in Table 4-3.

a) Ecological Freshwater Wetland Communities

**Freshwater Marsh** - Freshwater marshes are associated with low areas occurring on poorly drained soils where shallow freshwater remains for much, if not all, of the year. These marshes are also found along the shores of many rivers and lakes. The predominant plant growth consists of cattails (*Typha*), pickeral weed (*Pontederia*), duck potato (*Sagittaria*), maiden cane (*Panicum*), and willows (*Salix*) though diverse number of other grasses, herbs, shrubs, and trees also occur. Much like their estuary counterparts, these marshes regularly receive rain carried nutrients and provide an important feeding ground and nursery for many aquatic life forms.

Freshwater marshes are highly vulnerable to development oriented disturbance both by direct means (draining or channelling) and indirect (alteration to drainage patterns or diversion of water sources.) Besides their importance as a nursery for commercial and recreationally important fish and wildlife, freshwater marshes can play an important role as a safety valve for storm swollen rivers or lakes.

**Cypress Swamps and Domes** - The cypress tree (*Taxodium*) often colonizes low, poorly drained areas within many upland habitats. Cypress swamps commonly line slow moving rivers and creeks, and are interspersed with any other water hardy hardwoods including blackgum, sweetbay, sweetgum, and red maple. Cypress domes are typically much smaller with the trees tightly spaced and covered with Spanish moss and other epiphytes. These domes are often dry during much of the year and support various ferns, shrubs, and grasses. Since the domes are often the only open water source for their surrounding upland habitat, they become an important gathering point for many amphibians, reptiles, and birds for both water, food, and breeding purposes.

Cypress domes are vulnerable to the same damage as freshwater marshes. Cypress domes, beside being critical to the survival of many animals and plants, are important recharge areas for the Floridan aquifer and if properly managed, can be an important source of renewable timber and other wood by-products.

**Shrub Swamps** - This swamp community is dominated by dense low growing trees and shrubs. Shrub swamps often occur when environmental change such as drought, fire, or siltation have altered the site creating an opportunity for early successional species to colonize or expand. Common plant species in these areas include willows, wax myrtles, buttonbush, maples, and bays.

Shrub swamps are often fire-maintained and expand into lake or pond beds when water levels drop due to drought or site alternation.

**Hardwood Swamps** - Located on river flood plains, these swamps are dominated by gum, tupelo (*Nyssa*), and sweetbay (*Magnolia virginiana*) often intermixed with cypress (*Taxodium*), redbay (*Persea*), and red maples (*Acer*). The understory is typically dense and populated by smaller trees and shrubs tolerant of poorly drained soils and seasonal flooding. The overstory provides important nesting sites for bald eagles (T), ospreys, and herons, and the understory is utilized by many amphibians, reptiles, and other wildlife. This habitat was also utilized at one time by the very rare Florida panther (E) and potentially extinct Ivory Billed woodpecker (E).

River swamps provide important filtering of stormwater and flood waters and can be an important source of renewable timber and wood by-products if properly managed.

b) Estuaries

Estuaries are found where fresh water meets and mixes with salty ocean water. The numerous high volume springs discharge millions of gallons of fresh water into coastal rivers and streams which slowly mixes with the saltwater gulf. This mixture supports one of the most productive ecosystems in nature and the many bays, lagoons, inlets, and flats provide shelter, feeding grounds, and nurseries for thousands of species.

Estuaries are often considered "the cradle of the ocean" because of their productivity. Over 70 percent of Florida's recreational and commercially important fish, crustaceans, and shellfish spend all or part of their lives within estuaries. Salt marsh estuaries are low energy environments, that is, there is no significant or constant wave action. The sifting of tides and fluctuations of freshwater flow result in constant changes in water depths, salinities, and nutrient levels. Different plants and animals exploit the different conditions and variations resulting in a composite that teems with life.

While much of the variety lies in plants, microscopic organisms, and plankton, the larger, more obvious life forms also appear in bountiful numbers. Coastal birds feed throughout the estuaries and form rookeries on coastal islands. Schools of both fresh and salt water fish abound within the estuarine creek and bays, and many mammals including the rare manatee and sleek bottlenose dolphin, routinely visit estuaries for food and shelter.

The thick vegetative cover of salt grasses, marsh plants, and salt tolerant trees and shrubs provides an effective buffer during storms. The plants disperse the wave and

wind energy, and the thick root base prevents erosion. In fact, mangroves help create new land by catching mud and sediments among their aerial roots providing new ground for other plants.

**c. Coastal Resources**

The coast of the Withlacoochee Region forms the southern section of the Big Bend, one of the few relatively intact coastal ecosystems remaining in Florida, and dubbed Florida's Nature Coast by the state in 1992. The coastline begins at the mouth of the Suwannee River and extends southward along Levy, Citrus and Hernando Counties. Home to bald eagles, black bears, and manatees, it is also one of the Gulf's most biologically productive marine fisheries. While there are scattered small islands off the coast, the long strings of barrier islands that protect Florida's Atlantic shores are absent here. Rather, it is the vast shallow area created by the continental shelf that breaks the velocity of the waves, providing the low-energy environment necessary for salt marshes and mangrove swamps that comprise the shoreline.

Salt marshes form along low energy shorelines and the mouths of rivers and estuaries where sediment carried by rivers and streams can drop out of suspension and carpet the bottom. As this sediment builds to near the water's surface, salt tolerant grasses take hold and trap more suspended particles, which become compacted as mud. As the grasses spread, interconnected creeks form which allow seawater to flood the inner reaches of the marsh. This tidal action distributes nutrients to the plants and washes away the minute fragments resulting from their decay. Some of this detritus is eaten directly by animals such as mollusks that live in the marsh creek inlets. Much of it is carried to open water where bacteria, worms, and aquatic insects decompose it, freeing nutrients needed by plankton. Many of Florida's marine fisheries species spend the early part of their lives protected here, where the shallow water excludes larger fish.

(1) Ecological Coastal Communities of the Region

**Mangroves** - The Withlacoochee Region is located at the northern edge of Florida's coastal mangrove forests and are regularly killed back by winter freezes. Therefore, mangroves along our coast typically show a stunted growth pattern and are dominated by the more freeze resistant Black mangroves (*Avicennia germinans*) though the Red mangrove (*Rhizophora mangle*) is also found. The mangrove's prop and aerial roots trap sediments and nutrients from tidal flows and also provide a base for algal and mollusk growth. This protective environment is exploited by both marine and freshwater aquatic life forms and is an important feeding ground for many wading birds including Little Blue herons, Snowy egrets and Louisiana herons as well as brown pelicans and alligators. The mangrove overstory is also utilized by many bird species as roosts and rookeries for their young.

**Salt Marsh** - Salt Marshes are found where freshwater rivers and creeks gradually empty into the Gulf resulting in shallow waters of varying salinities and nutrient levels. Due to the extensive riverine system within the Region, these marshes are quite common along our coast.

Florida's dominant salt marsh species include: black needlerush (*Juncus roemerianun*), a grayishrush occurring along higher marsh areas; saltmeadow cordgrass (*Spartina patens*), growing in areas that are periodically inundated; smooth cordgrass (*Spartina alterniflora*) found in the lowest areas that are frequently inundated; and sawgrass (*Cladium Jamaicense*) which is actually a freshwater plant that sometimes grows along the upper edges of salt marshes. These marshes are transected by numerous creeks, channels, and coastal hammock islands providing a diverse and fertile home for many species.

Salt marshes function as a buffer between uplands and freshwater or marine systems. Urban and agricultural runoff pose a threat to water quality because they often carry fertilizer, pesticides, gasoline, oil, litter, chemicals, soil, and animal wastes from the land into adjacent lakes, streams, and estuaries. Wetlands capture chemicals transported from upland drainage basins and prevent them from entering aquatic systems. Runoff is stored and distributed to the estuarine system, and helps to maintain the flow of rivers during droughts. Tidal water is also stored, reducing fluctuations in salinity.

It should be noted that salt marshes also provide an important nursery for many commercially important marine species and a protective buffer against hurricane induced storm surges.

(2) Seagrass Beds

The shallow shelf of the Big Bend Region of the Gulf Coast is extensively colonized by seagrasses. Seagrass beds are one of the most productive inshore marine habitats within the state. Seagrasses modify current patterns and sediment rates and serve as feeding, breeding, and nurseries for many species.

Seagrasses are flowering plants living underwater where water clarity allows sunlight to penetrate. Seven species occur within Florida of which four predominate. Within the Region, turtle grass (*Thalassia testudinum*) is the most common. Turtle grass has a deeper root structure which stabilizes the sea bottom against wave action and erosion. Manatee grass (*Syrinodium filiforme*) is also commonly found and is recognized by its cylindrical leaves. Widgion grass (*Ruppia maritima*) can be found in both fresh and saltwater systems while Shoal grass (*Halodule wrightii*) occurs in shallow zones or is an early colonizer of disturbed areas.

Seagrass beds are vulnerable to human impacts such as pollutants or excess nutrients carried by runoff. Seagrasses are also vulnerable to boat propeller damage and the recent increase in popularity of inshore recreational fishing has resulted in the cutting of lanes and pathways through many of the beds.

(3) Protection of Coastal and Marine Resources

Dredge and fill activities can drastically alter coastal ecosystems. Dredging navigational channels and creating access canals can alter circulation systems of estuaries, damage coastal marshes, seagrass beds, and fish and shellfish populations. Improper disposal of dredge spoil can cause siltation, turbidity, and lower dissolved oxygen levels in receiving waters. Shoreline modifications can have adverse effects far beyond the area directly altered for development. Erecting seawalls out into the water and placing fill material on the landward side of the structure is often ineffective, while also being destructive to the marine environment.

Marinas can also negatively impact coastal ecosystems. Site preparation and the construction of facilities often destroys shoreline vegetation and lowers the productivity of the adjacent area. Wastes discharged from boats or from shore-side facilities degrade water quality and may cause harm to marine organisms. Discharge may include liquid wastes (petroleum byproducts and domestic sewage) and solid wastes such as cans, plastics, foam, and other synthetic products. Wood preservatives can leach from pilings and biotoxins can leach from anti-fouling paints. Fish offal from recreational fishing and commercial packing houses can increase the biological oxygen demand and contribute to aesthetic blight. Fuel spills and spills of toxic materials have a deleterious effect on the coastal flora and fauna.

Nutrient loading from such sources as fertilizer, sewage treatment plant discharge and septic tank leaching aggravates the already existing aquatic weed problem of the coastal streams. The use of septic tanks requires soils that will absorb and treat the effluent, but much of the coastal area is characterized by soils that percolate it rapidly into adjacent waters. High coliform counts often build up in canals that receive minimal flushing.

Location of landfills in coastal areas causes water pollution when flooding occurs, in addition to the problem of toxic leachates entering ground water. Solid waste can be incinerated, but air pollution may result, and there is the remaining contaminated ash to be disposed of. Recycling can significantly reduce the volume of waste.

As part of their normal operating cycle, electrical power generating stations utilize water for cooling. When water from open systems such as the coastal facilities of the Florida Power Corporation in Crystal River is used, mitigation of the thermal discharge is needed to prevent environmental damage. Where any unmitigated thermal discharge does occur, effects known include: altered growth rates of animals, disruptions in migration patterns, alterations of behavior, and physiological changes including disease. Die-offs of marine organisms can result from the planned or accidental shut-down of powerplants, which suddenly subject organisms that have acclimated to the warmed discharge to cooler temperatures. Florida Power Corporation has completed construction and implementation of helper cooling towers to mitigate for thermal discharge.

Possible hazards to the environment in the event of an offshore oil discovery were examined in a report prepared by the WRPC in 1983. The Department of the Interior ranked the offshore area of the Withlacoochee Region as having low potential for economic extraction of oil and gas. Should a commercially valuable find occur, a service base would be the only facility anticipated on the coast. An analysis of possible sites identified the Barge Canal Terminus as the least detrimental, but with a potential for harm to commercial fisheries and seagrass ecosystems.

The Region has an abundance of fishery resources along its coastal zone, and in its numerous inland lakes and rivers. In 1991, almost nine percent of the shellfish taken in Florida were harvested off the Region's coastline. Fish and shellfish landings data is presented in Table 2-4. Landings have fluctuated in recent years as a result of limits on species such as redfish which had been severely overfished. Shellfishing bans have also been imposed from time to time because of seepage of coliform bacteria into coastal waters, presumably from inland residential septic tanks. In 1995, a constitutional amendment banned the use of gill nets in all Florida waters and the use of any net larger than 500 square feet in inshore and nearshore waters. It will be a couple of years before the results on the marine environment of the net ban will be known.

(4) Access in Coastal Areas

Residents of the Gulf Coast must be concerned about natural disasters, with the greatest hazard being a storm surge, an abnormally high tide accompanied by heavy wave action. Marshes, swamps, hammock islands, and offshore islands are important buffers against storms. They absorb the enormous energy of storm waves and act as a reservoir for coastal storm waters, thus reducing damage further inland.

Another hazard to development in the area is shoreline retreat. Sea level has risen at an average rate of 16 inches per 1000 years over the past 3000 years. The rate seems slow, but since the slope of the continental shelf and coastal zone is so low (1:6667), a slight rise in sea level can cause a rapid disappearance of the shore. In the period 1914-1980, sea level rose at three times the long-term geologic rate, and through the 1980s and early 1990s the rate of rise has accelerated. Predictions of future rates range from a direct extrapolation of the tide gauge rate to a catastrophic ten-fold increase attributable to global warming caused by the greenhouse effect. In either case, drowning of the coast will most likely occur fast enough to have a significant effect on coastal property in a single lifetime (probably faster than 1.5 feet per year).

Because of extensive wetlands, physical access to the coast is generally restricted to small parks, boat ramps, and fishing piers. Visual access is diminishing with the increase in residential and commercial development. The public could be provided opportunities to enjoy the coastal marshes and swamps by means of nature trails and walkways constructed to minimize damage the

vegetation. Combined with educational displays, this type of access can improve understanding of the importance of maintaining these wetlands in their natural state.

d. OFWs, Aquatic Preserves, SWIM Waterbodies, Class II Waterbodies

Waters of exceptional recreational or ecological significance may be designated Outstanding Florida Waters (OFW). The Withlacoochee, Ocklawaha, Crystal, Homosassa, Hall's, Chassahowitzka, Rainbow, and Silver Rivers currently have OFW status. It prohibits the issuance of permits for direct discharge that would lower existing water quality or indirect discharge that would significantly degrade it. Permits for dredging and filling must be clearly in the public interest. Effects on fish and wildlife and their habitat must be considered in the determination of public interest.

Aquatic preserves, comprised of state-owned submerged lands and their associated waters, have been designated in three areas of the region: 1) along the coast of Levy County (part of Big Bend Seagrasses), 2) along the coast of Citrus County between the towns of Inglis and Homosassa Springs (St. Martins Marsh), and 3) Lake Weir, the Ocklawaha River and the Rainbow River in Marion County (Rainbow Springs). The intent of the designation is to maintain these areas essentially in their natural condition and restore degraded areas, while not interfering with traditional uses such as swimming, fishing, and boating. Dredging and filling, shoreline construction, and the discharge of wastes are limited. Drilling of oil and gas wells is prohibited.

To help accomplish the major objectives of the aquatic preserve program, a management plan is prepared by DEP for each preserve, and a field office established to implement its policy guidelines. St. Martins Marsh has a completed plan, with a manager stationed in Crystal River. Big Bend's plan is in preparation. Rainbow Springs, the region's most recent addition to the system, does not have a management plan; however, staff at the preserve station in Dunnellon are actively addressing the problems of the river, including the need for a sewage system, setbacks, and a year-round idle speed, no-wake zone.

Class II waters are those waters that meet the definition of F.A.C. 17-302.400 and are designated for shellfish, propagation or harvesting. Surfacewater is rated according to its designated use; Class I is of the highest quality for use as potable water supply, and Class V is of lesser purity being designated as suitable for navigation, utility and industrial use. Class I, II, and III water standards are established to protect recreation, and the propagation and maintenance of a healthy and well-balanced population of fish and wildlife.

The region benefits from having Class II waters designated on its coastline with productive fisheries, and aquaculture propagation. Currently 834 acres of Class II waters have been designated on the region's coast (Levy County) where there is a healthy aquaculture industry producing restaurant quality clams.

e. Upland Resources

Though Florida does not have a wide range in elevation, the presence of highly porous soils has created a number of upland habitats which have limited or no ready source of surface water. This factor, in combination with the high temperatures of the region, create a harsh environment to which certain unique animals and plants have adapted.

Besides the lack of available surface water and harsh climate, the frequent occurrence of lightning has resulted in some of the ecosystems adapting to fires. Pines, grasses, and forbs specifically evolved to promote low intensity burns, maintain dominance over other normally successional species which are killed by the flames.

Florida is second only to Hawaii in biodiversity within the United States. This is due in large part to the number of plants and animals which have adapted to Florida's unique combination of upland and wetland habitats.

In addition to type and variety of vegetation, habitat size and isolation are critical. Decreasing forest size and increasing isolation of the remaining forest patches appear to be a cause in the dramatic decline in breeding birds. The continued segmentation of present habitat by the spread of suburbs, citrus groves, and pastures creates small isolated populations that are easily eliminated.

Connecting isolated habitat islands via corridors promotes genetic interchange and maintains the full array of plant and animal species in all the fragments. This is especially true of upland species that cannot utilize water bodies for travel. Public acquisition programs now utilize this approach to maximize species diversity and genetic health.

f. Ecological Communities Native to the Region, Including Sand Pine Scrub, Longleaf Pine-Turkey Oak Hills, and Hardwood Hammocks

(1) Scrub

Scrub occurs on well drained sterile sands that were originally deposited as sand dunes by prehistoric sea action. The Withlacoochee Region has two varieties of scrub; Coastal scrub, a more modern scrub habitat which is typically composed of an overstory of sand pine and an understory of xeric scrub oak such as sand line oak, myrtle oak, and Chapman's oak. Since scrub is maintained by fire and sand pines are not fire resistant, sand pine scrub is usually represented by a single year class of sand pines. Where sand pines are absent, scrub oak assume the dominant plant role. A second more ancient scrub is the Lake Wales scrub. This habitat is well represented in Marion County within the Ocala National Forest and differs from coastal scrub by supporting a higher number of species. Lake Wales scrub is arguably the oldest upland habitat in Florida and often reflect species endemic to Florida or more commonly associated with the Western United States.

(2) Sandhills

Sandhill is a fire adapted community which once covered much of the south. With an overstory dominated by the fire resistant longleaf pine, and a ground cover of the fire adapted wiregrass, sandhill is still well represented in the Region. Because sandhill occurs on well drained sands and have an open canopy, animals and plants have adapted to deal with frequent fire, lack of surface water, and hot, ambient temperatures.

(3) Xeric Oak Scrub

Where fire is suppressed or does not occur frequently, the well adapted xeric oak species soon dominate the environment evolving into a xeric oak scrub. The oaks often form single specie clumps interspersed by wiregrass and other ground cover species. Xeric oak scrub typically develops a heavy leaf mat which provides some protection from low energy fires but severe fire events usually return the site to the former sandhill or sand pine scrub communities.

(4) Mixed Hardwood/Pine Hammock

This ecosystem represents the climax community for the southern coastal plain. Typically associated with clay soils, this habitat has a diverse overstory of assorted pines and southern hardwoods including oaks and hickories. The hammocks also have a significant understory of broadleaves including redbud, hollies, and dogwoods and a ground cover of palmettos, beautyberries, and viburnums.

Mixed hardwood/pine hammocks typically have a pronounced leaf litter which retains moisture that supports life and suppresses fire. Animals and plants, most often associated with the Appalachians and Piedmont, frequent this habitat in Florida.

(5) Pine Flatwoods

This ecosystem typically occurs on flat sandy terrain with a high or perched watertable. Like sandhill, pine flatwoods are fire dependent with fire adapted slash pines, saw palmetto, and gallberry dominating. Lower depression areas are often occupied by pond cypress or pond pines forming seasonal ponds or wetlands that play an important role to amphibian, reptile, and wading bird populations.

g. Special Natural Resource Features Within The Region

(1) Springs

The Withlacoochee Region contains some of the largest and highest concentration of springs in the world. Supported by the influence of the Green Swamp High on the Floridan aquifer, numerous first magnitude springs occur both inland and along the coast. These

springs serve as a permanent source of freshwater to the extensive inland wetlands and coastal estuaries. A list of the first magnitude springs and spring groups within the region is listed in below.

Chassahowitzka Springs	Crystal River Springs
Homosassa Springs	Weeki Wachee Springs
Fanning Springs	Manatee Springs
Rainbow Springs	Silver Glen Springs
Silver Springs	

Source: after Rosenau et. al. (1977)

(2) Sinkholes

The karst geology of the area results in a number of sinkholes of various sizes and depths to exist within the region. Large sinkholes present a topographic condition unusual for Florida normally flat terrain by displaying slopes more associated with the Appalachian foothills. These slopes, combined with a more stable climate and protection from fire due to its depressional contour, provides a micro-habitat for plants and animals normally found further north.

When a sinkhole has exposed limestone, ferns, lichens, and other specialized plant life prospers. Sinkholes and old phosphate mines within the region contain some of the rarest and most diverse fern populations within the continental United States.

(3) Caves

Caves are also prevalent in the region, again a result of karst geology. Caves provide protection from the elements and a stable temperature that makes them attractive roosting sites for bats. In fact, a number of caves within the Region serve as important congregate maternity caves for several species of bats.

Wet caves, those directly or indirectly connected to the aquifer, also provide habitat to several forms of aquatic animals that have evolved to this no light environment. These species are especially vulnerable since the caves can typically support only small populations, some of which are isolated.

(4) Hammocks

Both wet and mesic hammocks are found in the Withlacoochee Region. Hardwood hammocks (mesic) are characterized as well developed, closed canopy forests of upland hardwoods on rolling hills. These forests occur on rolling hills that often have limestone or phosphatic clays near the surface and occasionally as outcrops. Although the topography and clayey soil layer would normally increase surface runoff water such is not the case due to the hardwood hammock's absorption properties attributable to its characteristic densely closed canopy and a thick layer of leaf mulch

which retains moisture. Air movement and light penetration are minimal thus high humidity conditions are present and therefore these areas rarely burn. Vegetative species include: southern magnolia, pignut hickory, sweetgum, Florida maple, devil's walking stick, American hornbeam, redbud, flowering dogwood, Carolina holly, American holly, eastern hophornbeam, spruce pine, loblolly pine, live oak and swamp chestnut oak, gum bumelia, hackberry, persimmon, red cedar, red mulberry, wild olive, redbay, laurel cherry, black cherry, bluff oak, red mulberry, palm, basswood, winged elm, Florida elm, sparkleberry, Hercules' club, slippery elm, beautyberry, partridgeberry, sarsaparilla vine, green brier, trillium, beech drops, passion flower, bestraw, strawberry bush, silverbell, caric sedges, fringe tree, horse sugar, white oak and blackgum. Typical animals include slimy salamander, Cope's gray treefrog, bronze frog, box turtle, eastern glass lizard, green anole, broadhead skink, ground skink, red-bellied snake, gray rat snake, rough green snake, coral snake, woodcock, barred owl, pileated woodpecker, shrews, eastern mole, gray squirrel, wood rat, cotton mouse, gray fox and white-tailed deer. (FNAI and FDER 1990, 17)

The hardwood hammocks of the Withlacoochee Region are part of the larger southern hardwood forests of the United States. A unique condition to the region is that the southern-most extent of these forest lands in the United States is in Hernando County in the Annatteliga Hammock.

Wet hammocks (hydric) are also characterized by well developed hardwood and cabbage palm forest with a variable understory often dominated by palms and ferns. Typical plants include cabbage palm, diamond-leaf oak, red cedar, red maple, swamp bay, sweet bay, water oak, southern magnolia, wax myrtle, saw palmetto, bluestem palmetto, needle palm, poison ivy, dahoon holly, myrsine, hackberry, sweetbum, loblolly pine, Florida elm, swamp chestnut oak, American hornbeam, Walter viburnum royal fern, peppervine, rattanvine, yellow jessamine, and Virginia creeper. Typical animal species include: green anole, flycatchers, warblers, and gray squirrel.

As common to the hardwood hammock, limestone may be near the surface and frequently outcrops. These wet hammocks occur in patches in the variety of lowland situations and are often in association with springs or karst seepage, and in extensive forests covering lowlands just inland of coastal communities.

Soils are sand with considerable organic material that is usually saturated but remain inundated only for short times after heavy rains. The normal hydroperiod is seldom more than sixty days. Hydric hammocks also rarely burn. The maintenance of a normal hydroperiod in these wet hammocks is critical as they will transform to mesic hammocks if drained. (FNAI and FDER 1990, 28).

(5) Silviculture and Agriculture

The Withlacoochee Region has abundant forest resources, although nearly all of the Region's formerly extensive longleaf pine canopy

and hardwood hammocks have been replaced with more quickly growing pines such as slash- or sand pine. Table 2-3 summarizes the type and quantity of forest products harvested in 1991, when almost 32% of the hardwood saw logs harvested in Florida came from the Withlacoochee Region as did almost 20% of the softwood saw logs.

Much of the forested land in the Region is in public and commercial forests. Approximately 75% of the Ocala National Forest is located within the Region. The combination of publicly-owned forests (the Ocala National Forest, the Withlacoochee State Forest, and the Goethe State Forest) and commercial forests comprise about ten percent of the state's total forest lands.

In 1992, the Census of Agriculture counted 3,546 farms in the Region with a combined acreage of 871,816 acres; the average farm size was 246 acres. Although the quantity of land in agricultural uses fluctuated over the past five censuses, the 1992 acreage continued the downward decline of land in farms, nevertheless, in 1992, almost one-third (31.13%) of the Region's land area was in farms. In 1992, the number of farms ended its pattern of increasing and posted a 4.52% decline, but the average farm size increased from 238 acres in 1987 to 246 acres in 1992.

Cattle ranching remained the primary agricultural activity in the Region in 1992. Watermelons were the primary crop with 6,271 acres harvested in 1992, up from 5,999 acres in 1987. Levy County lead the Region with 2,594 acres in watermelons harvested. Other crops grown at a much smaller scale included sweet peppers, squash, cucumbers, cantaloupes and sweet corn. Sumter and Marion Counties had the largest and most diverse vegetable crops in 1992.

Prime farmland is land with the best combination of physical and chemical characteristics for producing crops. It has the soil quality, growing season and moisture supply needed to produce sustained high yields. Unique farmland is land other than prime that is used for production of high value crops. It has the special combination of soil quality, location, growing season and moisture needed to produce sustained high quality and/or high yields of specific crops when treated and managed appropriately. Locally important farmland is land other than prime or unique that is deemed by local agencies to be of particular local importance for agriculture. These special farmlands have been identified for part of the Region by the Soil and Water Conservation Districts in conjunction with local governments and the U.S. Soil Conservation Service. By using local criteria and the Land Evaluation and Site Assessment framework of the Soil Conservation Service, a system can be developed for evaluating the importance of keeping particular lands in long-term agricultural use. Small areas of prime farmland have been identified in south-central Citrus County and in northwest Marion County.

h. Public and Conservation Lands

Public means of protecting sensitive land and water systems include outright acquisition and tax incentives. Acquisition asserts direct public control over

the quality of the land and associated waters. In most cases the land can be put to more than one use, possibly including floodwater storage, groundwater recharge, erosion control, water filtration, preservation of unique or fragile resources- habitats, species and bio-diversity, protection of fish and wildlife, recreation, and timber production.

Land acquisition programs are used rather extensively in Florida. Criteria for selection under the Conservation and Recreation Land (CARL) program include location and adjacent population size, outstanding features, recreation potential, cost and willingness of the owner to sell, and public support. Water Management Districts under the Save Our Rivers Program acquire lands "necessary for water management, water supply, and the conservation and protection of water resources."

Development rights to environmentally sensitive lands can be transferred by the owner to the county or to the Board of Trustees of the Internal Improvement Trust Fund in exchange for a lower tax assessment. Land which qualifies must be declared environmentally endangered by the county and must have "unique ecological characteristics, rare or limited combinations or geological formations, or features of a rare or limited nature constituting habitat suitable for fish, plants, or wildlife" (193.501, Florida Statutes).

Publicly owned land and water areas are included in the areas of regionally significant habitat depicted on Map 4-7.

i. Listed Species and Endangered Habitats/Ecosystems

(1) Manatees

One of the region's most unique and critically endangered species is the West Indian (Florida) manatee, the only herbivorous marine mammal that inhabits the waters of the United States. Although only about 2,200 manatees currently exist in the southeastern U.S., this population is one of the world's largest for the species. Adapted only to semi-tropical temperatures, in winter months they are restricted mainly to peninsular Florida south of Cumberland Island, Georgia, on the east coast and the Suwannee River on the west coast, relying on the warm water of natural springs and industrial effluents for survival.

This region's coast, known as the South Big Bend, plays an important role in the protection of the species by supporting over 300 individuals, or approximately twenty-three percent (23%) of all manatees on Florida's west coast. The area is particularly important because of its abundance of natural warm water springs and diversity of marine and freshwater aquatic plants. In the winter the Crystal River subpopulation, as this group of manatees is known, aggregate around the constant 72 degrees Fahrenheit springs at the headwaters of the Crystal and Homosassa Rivers as Gulf water temperatures drop below 68 degrees Fahrenheit. In summer they disperse throughout the coastal estuarine areas and riverain systems between the Weeki Wachee and Suwannee Rivers. Crystal River and Kings Bay are federally designated "critical habitat", defined in the Endangered Species Act as "specific areas...on which are found those physical and biological features essential to the conservation of the species and which may require special management considerations or protection."

Manatees have a very low reproductive rate that makes the species vulnerable to extinction. Despite protection efforts, the number of verified watercraft kills has risen in recent years throughout the State. This increase in human-caused mortality could result in the extinction of the Florida subspecies in the wild if not curtailed. Although it has been low in this region, watercraft mortality is of major concern because of the escalation of boat traffic in critical habitat areas and the regions sea grass beds.

The federal Manatee Recovery Plan and state-approved plans for Citrus and Levy Counties' Manatees provides guidelines for their long-term well-being in South Big Bend. Essential to their survival are a plentiful supply of marine and freshwater plants, secluded areas for calving, and safe travel routes. Clean water and access to warm water refugia must be maintained and the use of aquatic herbicides monitored and regulated. Docking facilities need to be located where the overlap of boat traffic and manatee habitat will be minimal. Regulations preventing harassment and excessive boat speeds must be enforced, and the public better informed about manatee needs.

Manatee habitat:

Critical habitat: Crystal River and its headwaters known as Kings Bay

Significant Warm Water Winter Refugia: federal refuges, Homosassa and Crystal Rivers, their springs, Three Sisters and Magnolia, and the Crystal River Power Plant

Summer Habitats: Weeki Wachee, Chassahowitzka, Homosassa, Crystal, Withlacoochee, Waccasassa, and Suwannee Rivers; their adjacent estuaries and seagrass beds; and connecting routes

A State boat operator licensing program could provide needed education in marine resource conservation. The possibility of losing their operator's license would offer a deterrent to repeat violators of boat speed limits and other regulations of aquatic activities. Enforcement assistance can be provided by the Fish and Wildlife Service where protection of manatees is identified as a purpose of the regulation. Local governments with speed zone ordinances for areas frequented by manatees but specifying only public safety as their objective should amend their ordinances to include manatee protection.

The manatee helps to keep waterways clear of aquatic vegetation. Each species plays an important part in its ecosystem, yet numerous plants and animals face the threat of extinction. A primary reason is habitat alteration, fragmentation and destruction by development or pollution.

(2) Other Species

For species that can co-exist with humans there are ways of reducing the negative impacts of development. However, many

species require isolation, especially during reproductive stages. Human disturbance can often result in egg or chick loss. For bald eagles, brown pelicans, white ibises and others the presence of humans can disrupt breeding, prevent ibis colony formation, cause abandonment of the colony site or the nest, flush startled birds from the nest with the possible consequence of eggs or young being crushed, and cause premature fledgling. For such species, buffer zones free from human intrusion are necessary.

Many endangered species have adapted to specific habitat conditions that make the population vulnerable to habitat loss or alteration. Many of Florida's listed species are animals and plants that have adapted to the dry fire maintained scrub and sandhill.

These dry uplands are often targeted for development or agricultural conversion to citrus or pasture. Though direct loss is the predominant threat, residential intrusion often results in fire suppression that results in the succession of the land to oak hammock that is unsuitable for certain plants and animals. This is particularly true for the Florida Scrub Jay which is dependent on open sand spacing for foraging and the Red-cockaded Woodpecker which requires open park-like mature pine forests for successful nesting and foraging.

If populations of such species are to be maintained in the region, measures must be taken to offset habitat loss through adequate mitigation. One way of providing for the acquisition and preservation of land to replace habitat lost to development is for local governments to enact wildlife impact fees. The amount could be based on the population increase expected from the development, assuming a demand for wildlife observation similar to a demand for parks and other forms of recreation. An alternative basis for the amount of compensation could be the type and quality of the habitat lost, with values assigned to different types of vegetative community and to factors indicating quality.

In Table 4-4, letters in the columns indicate the status of plants and animals on the State list of endangered and potentially endangered species (LE for Endangered, etc.). The classifications used are defined in Florida law as follows:

Endangered Species - any species of fish and wildlife naturally occurring in Florida, whose prospects of survival are in jeopardy due to modification or loss of habitat; over- utilization for commercial, sporting, scientific or educational purposes; disease; predation; inadequacy of regulatory mechanisms; or other natural or manmade factors affecting its continued existence.

Threatened Species - any species of fish and wildlife naturally occurring in Florida which may not be in immediate danger of extinction, but which exists in such small populations as to become endangered if it is subjected to increased stress as a result of further modification of its environment.

Species of Special Concern - species, subspecies, or isolated population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species; may already meet certain criteria for designation as a threatened species but for which conclusive data are limited or lacking; may occupy such an unusually vital and essential ecological niche that should it decline significantly in numbers or distribution other species would be adversely affected to a significant degree; or has not sufficiently recovered from past population depletion.

Endangered Plants - species of plants native to the State that are in imminent danger of extinction within the State, the survival of which is unlikely if the causes of a decline in the numbers of plants continue, and includes all species determined to be endangered or threatened pursuant to the Federal Endangered Species Act of 1973 as amended, Public Law No. 93-205 (87 Statute 884).

Threatened Plants - species native to the State that are in rapid decline in the number of plants within the State, but which have not decreased in such number as to cause them to be endangered.

Commercially Exploited Plants - species native to the State which are subject to being removed in significant numbers from native habitats in the State and sold or transported for sale.

All species and habitats listed in Table 4-4 are considered to be both Regionally Significant Resources and Natural Resources of Regional Significance.

j. Mineral Resources

Seven minerals or mineral compositions are currently being mined at fifty-two different locations in the Withlacoochee Region (DEP, 1993). Marion County has the most diverse group of minerals being mined and the largest number of active sites; Hernando County has the greatest number of acres being mined. The extraction of mineral resources in the Withlacoochee Region has occurred since the late 1890's with the establishment of the Hardrock Phosphate District in portions of Levy, Marion, Citrus, and Hernando Counties. Today, limestone and sand extraction are the leading industries; in the region fuller's earth and other clay, lime, peat and colloidal phosphate rock are also being mined in lesser amounts as growth and development place additional demands on the production of raw materials for construction of roads, building, and other construction by-products, the demand and value of these mineral resources will continue to increase. It is anticipated that mining operations throughout the region will continue and potentially increase over the planning period.

Because the majority of minerals mined in the Region can only be obtained through open pit methods, safeguards in accordance with Federal, State, and local mining regulations must be followed to maintain the environmental resources of the region.

If a mining operation becomes insolvent and shuts down, the mined land can be left in an unusable and unsafe state. Assurance from the mining company of adequate financial resources to complete the reclamation plans will be a key element in achieving reclamation standards. The form and amount of these assurances should be established prior to final approval of the project.

Historically, when proper extraction and reclamation methods required by Federal, State, and local regulations are followed, open pit mining has had little or no significant impact to adjacent natural resources. Improper mining techniques however can degrade both surface and groundwater, alter surface drainage patterns, and affect characteristic vegetation and wildlife populations. Effluent discharge to streams and water bodies can alter the ecological and hydrological stability of existing systems, and cumulative impacts can become environmentally and regionally significant.

Each mineral resource must be examined by its own unique set of characteristics in relationship to its environment of deposition, techniques for mining and processing, methods of waste disposal, methods for reclamation, and impact on other resources. The diversity of natural environments and minerals found within this Region increases the complexity of natural resource protection. Each of these mineral resources poses special difficulties for protection and the way protective measures must be afforded. However, all mining operations share a common feature, the ability to produce undesirable impacts on other natural resources unless properly managed.

Environmental problems may occur in any, or all three basic phases of mining activity: the preparation of the land, the actual mining of the resource, and abandonment of the site if reclamation is not instituted or required. The key to protection of the environment is pre-operational planning of mitigation, mandatory implementation of recommended best management practices and realistic, consistent, and coordinated regulation during all phases of mining. The technologies and practices to be used in the particular environment involved should be determined prior to final approval of the operation.

k. Historical and Archaeological Resources

The Withlacoochee Region has a rich history that dates back to pre-Colombian times when paleolithic Indians hunted, fished, and farmed and left behind shell middens and other artifacts such as those on display at the Crystal River State Archaeological Museum. The Region was crossed by Spanish explorers and later settled by Spanish Missions, but disease and slavery devastated the indigenous population. Key skirmishes of the Seminole Wars occurred in the Region in the Nineteenth Century and a major battlefield is preserved at the Dade Battleground Historic Memorial near Bushnell in Sumter County. Also of historical interest is the site of the discovery of hardrock phosphate in Florida near Dunnellon in Marion County; it spurred a major industry that lasted from the late 1880's until the outbreak of World War I; the water filled pits of the former mines still pock the Region's landscape. Associated with the post-Civil War development of the Region are historically significant public and private buildings, some in sufficient concentration and preservation to warrant the establishment of historical districts as in Ocala, Dunnellon, and McIntosh.

According to the Florida Department of State, Division of Historical Resources (DHR), there are more than 4,000 historical sites/properties (mostly archaeological) listed on the Florida Master Site File for the Withlacoochee Region. Due to the rural and largely vacant character of the Region, there are certainly many more undiscovered archaeological sites and uncataloged historical sites and properties in the Region.

(1) Sites of the Region Listed on the National Register of Historic Sites and Places

Historic sites and properties in the Withlacoochee Region listed on the National Register of Historic Places include the following:

Citrus County

- Crystal River Indian Mounds
- Mullet Key
- Fort Cooper
- Yulee Sugar Mill Historic Memorial
- Old Citrus County Courthouse
- Floral City Historic District

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Hernando County

None.

Levy County

- Island Hotel, Cedar Key
- Cedar Keys Historic and Archaeological District

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Marion County

- Coca-Cola Bottling Plant, Ocala
- Mount Zion A-M-E Church, Ocala
- Ritz Historic Hotel, Ocala
- Marion Hotel, Ocala
- McIntosh Historic District, Town of McIntosh
- Ocala Historic District
- E. C. Smith House, Ocala
- Tusawilla Park Historic District, Ocala
- Orange Springs Church, Orange Springs
- James W. Townsend House, Orange Springs
- Dunnellon Boomtown Historic District, Dunnellon

- Dade Battleground Historic Memorial, Bushnell

(2) Sites Listed on the Florida Master Site File

The Florida Master Site File is a clearinghouse administered by the Bureau of Archaeological Research, Division of Historical Resources of the Florida Department of State for data regarding historical structures, archaeological sites and field surveys. Solely an archival resource, it is a central collection of data about state history and archaeology with the intent of fostering the continued gathering and promulgation of such data for research, preservation and educational projects. For the purposes of this Plan, sites listed in the Florida Master Site File are defined as areas and sites of local and regional concern since these have already been surveyed, located and registered with state authorities.

I. Air Resources

The major source of air pollution in the Withlacoochee Region is the combustion of fossil fuel in powerplants and automobiles. All five counties in the region are classified as being in attainment of air quality standards. Hernando County, as part of the "marginally non-attaining" Tampa/St. Pete SMSA is presently excluded from that area's airshed plan.

None of the 53 Florida air quality monitoring stations listed in the Department of Environmental Regulation's report "Comparison of Air Quality Data with the National Air Quality Standards, 1992," were located within the five counties of the Withlacoochee Region. Florida's air quality standards set indices for the second highest 24-hour value for PM-10 particulates at 150 micrograms per cubic meter (not to be exceeded more than once per year) with a PM-10 annual mean not to exceed 50 micrograms per cubic meter. Sampling stations near the Withlacoochee Region showed relatively low levels in Gainesville (24-hour value: 20) to higher levels in Hillsborough County (24-hour value: 64).

In order to protect clean air from being degraded, there is a federal program in effect called Prevention of Significant Deterioration. Maximum increases have been set for the concentration levels of certain air pollutants. These allowed increments of pollution are smallest in and near certain national parks and wilderness areas designated as Class I. Two areas of the region have been designated as Class I areas: Citrus County by the Crystal River Power Plant and the area near the Chassahowitzka National Wilderness Area in Citrus and Hernando Counties.

m. Energy Resources

Every natural and man-made system requires energy to function, and it is the efficiency with which the system captures, stores, utilizes, and disposes of energy that determines its success. The twentieth century has seen an unprecedented increase energy consumption, particularly of fossil fuels, such as coal, oil and natural gas, and this Region is not unique in its energy patterns (including reliance on outside sources) when compared to other areas of the state and nation with similar climates. The next century will see increased use of renewable energy sources, particularly direct solar energy and solar photovoltaic. Florida is well situated to exploit solar technologies as they become feasible, particularly when fossil fuels become more scarce and expensive. Direct solar energy can be used for residential and

commercial heating and cooling, particularly water heating. Photovoltaic systems, which convert light directly into electricity, are becoming economical in an ever increasing range of applications. It is important not to foreclose options for the use of renewable energy in the future through short-sighted decisions made today.

(a) Conservation

Energy conservation measures fall into the following major categories: building codes, land use controls, capital improvements programming, transportation management, and load management.

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Building Codes. The State of Florida has an Energy Efficiency Code (Code) for buildings. Under State law, all new or renovated buildings, with certain exemptions, must be constructed in accordance with the energy efficient building standards in the Code. The Code includes such items as: exterior and interior design criteria, ventilation criteria and heating and cooling design criteria. The intent of the Code is to "regulate the design of building envelopes for adequate thermal resistance and low air leakage and the design and selection of mechanical, electrical, and illumination systems and equipment which will enable the effective use of energy in new building construction."

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Land Development Regulations. Land development regulations can reduce transportation energy demand by regulating the density of development, the contiguity of the development pattern, and the mix of residential and employment opportunities. Land use controls can increase the energy efficiency of new building construction by regulating the use of multifamily structures, which are more energy efficient, the orientation of buildings, and the use of landscaping. Although energy conservation measures are not a mandatory section of local comprehensive plans, Florida law does not preclude measures such as specific use regulations, density regulations, setback and yard requirements, height restrictions, clustering and planned unit development.

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Capital Improvements Programming. The location of roads, sewer lines, airports, civic centers, municipal office buildings, hospitals, and other public facilities has a major impact on transportation energy consumption. The placement of these capital facilities is in fact a prime determinant of the location of new development. Extending a road or sewer line into a previously undeveloped area nearly guarantees that development will spring up alongside the facility, unless the development leapfrogs to more distant territory slated soon to receive capital facilities of its own. Although roads and sewers probably influence the location of development more than does any other kind of public facility, the locations of civic centers, hospitals, or community colleges can also induce development in surrounding areas. Such facilities can have a particularly severe energy impact when placed in isolated, fringe areas since they generate considerable traffic.

Faced with rapidly increasing population pressures and with the fiscal burdens that governments must shoulder when they provide services to inefficiently located residents, many localities have begun to use their power to furnish, withhold, or govern the location of capital facilities to shape the pattern of growth. In those localities where governments are trying to promote more efficient development patterns through their capital facilities programs.

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Transportation Management. In urban areas, the number of intersections and their operating characteristics significantly influence the efficiency of traffic flows. Traffic operation improvements such as installing computerized traffic control systems or adding turn lanes are among the most cost effective measures to promote energy efficiency. The phasing of traffic signals (amount of time for green, yellow, and red signals) should be periodically reviewed and readjusted to account for changes in traffic flow patterns and volumes. Proper phasing of traffic signals can significantly improve the progression of traffic on a facility and reduce energy consumption from idling, acceleration, and deceleration at intersections. Traffic operations improvements, such as signalization, require comprehensive coordination among state and local governments. Such coordination may require specific agreements which clearly establish contractual obligations and responsibilities, especially for maintenance of traffic signals.

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Load Management. "Load management" refers to methods that electric utilities can employ to reduce the peak electrical demand of their subscribers. Four methods are commonly used:

- Agreements between the utility and large industrial users to curtail consumption during peak demand periods;
- Appeals through the media to customers asking for voluntary reductions in power consumption;
- "Peak load pricing," which is charging more for electricity consumed during periods of daily peak demand than for that used during the off-peak hours; and,
- Remote control devices operated by the utility which can shut off certain appliances, usually water heaters or air conditioners, for short periods of time when peak loads are experienced.

#### IV. NATURAL RESOURCE GOALS, POLICIES, AND INDICATORS

##### A. GROUNDWATER RESOURCE PROTECTION

**Goal 4.1 Maintain groundwater and surfacewater at levels no lower than the minimum seasonal levels necessary to maintain natural system functions and prevent saltwater intrusion into the aquifer.**

Policy 4.1.1 Provide infrastructure and approve development permits only for new developments that have identified a specific long-term supply of water that is both adequate for the increased population associated with the development and that will not diminish the ability to provide adequate water for the local government's projected population or the water needed by natural systems.

Policy 4.1.2 Consider pumpage of water outside the region only when the following factors have been met :

a. The receiving community has exhausted all legally available alternative sources including, but not limited to desalinization, effluent reuse, and mandatory conservation measures;

b. A detailed study of the proposed impacts to water sources has demonstrated the proposed pumpage will cause no adverse environmental and economic impacts or the impacts can be mitigated through practices including, but not limited to, the re-hydration of wetlands and recharge areas within the region.

Policy 4.1.3 Design new development in high aquifer recharge areas to minimize impacts on aquifer recharge.

Policy 4.1.4 Adopt comprehensive programs and plans for protection of current and future public water supplies. Each plan and program should require, at a minimum: scientific delineation of zones of contribution for wellfields and protection of these areas from incompatible land uses and activities, analyses of supply and demand that are based on population projections and the location of uses indicated on future land use maps (series), and the maintenance and restoration of natural systems.

Policy 4.1.5 Limit groundwater withdrawals to locations and quantities that will not result in additional salt water intrusion.

Policy 4.1.6 Use consistent policies and data from the water management districts' (WMDs) "Needs and Sources Studies" and WMD "Water Resource Plans", and similar studies by water supply authorities in formulating local government comprehensive plans and water supply policies.

Policy 4.1.7 Support the development of local water sources first, prior to any import of water from outside the region.

Policy 4.1.9 Minimize environmental impacts from water withdrawals by keeping water pumpage below levels that would cause significant harm to native communities, spring flow, or water quality.

Policy 4.1.11 Curtail or cease pumping whenever adverse environmental impacts are observed.

- Indicators:
- (A) Groundwater levels below those established as minimum levels by the Water Management District's minimum flows and levels studies and water resource assessment project studies.
  - (B) Measurable impacts to surface water bodies and natural systems such as lakes, springs, estuaries, saltwater marshes and wetlands.
  - (C) Local ordinances protecting water resources.

**B. WATER CONSERVATION**

**Goal 4.2 Reduce per capita use of groundwater and surface water.**

- Policy 4.2.1 Use rate structures and other incentives to encourage the efficient use and re-use of water.
- Policy 4.2.2 Encourage the use of water-efficient plumbing fixtures and devices in new construction and renovation through building codes and other means.
- Policy 4.2.3 Cooperate with water management districts in water conservation education, leak detection, and plumbing retrofit programs.
- Policy 4.2.4 Require efficient irrigation practices in all new development.
- Policy 4.2.5 Create incentive programs that reward installation of plumbing systems in new construction that will immediately use gray water systems or will facilitate the use of future gray water systems.
- Policy 4.2.6 Use treated wastewater effluent for irrigation, instead of freshwater, where it is feasible, environmentally sound, and safe.
- Policy 4.2.7 Adopt minimum landscape ordinances incorporating the use of drought-resistant native plants and assigned preference to the preservation of native vegetation on site.
- Policy 4.2.8 Use water-conserving and water re-use processes and techniques in mining and other industrial processes.
- Policy 4.2.9 Formulate water shortage contingency plans that are consistent with the plans of the water management district.
- Policy 4.2.10 Consider waste to energy plants for the purpose of powering desalinization facilities.
- Policy 4.2.11 Seek technical assistance from water management districts and regional planning councils in formulating and implementing water conservation plans.

Indicators: Reduction in groundwater withdrawal per capita .

**C. WATER QUALITY**

**Goal 4.3 Prevent further degradation and restore ground- and surface-water quality.**

- Policy 4.3.1 Protect ground- and surface-water quality through the regulation of land use activities which may cause water pollution. Siting criteria and containment requirements should be established for: landfills, stormwater, wastewater, agricultural, and

industrial impoundments, land application of wastewater sludge and effluent, use and disposal of pesticides, herbicides, fertilizer and other hazardous materials, and underground storage tanks.

- Policy 4.3.2 Cooperate to adopt and implement watershed management programs for surface water basins which:
- a. Ensure consistency among the program and local comprehensive plans and land development regulations, Department of Environmental Protection's aquatic preserve programs and water management district's surface water plans/programs;
  - b. Provide for stormwater master plans that identify existing problems and solutions which promote pollutant load reductions through such methods as wastewater and stormwater reuse and retrofitting, and promote best management practices in agriculture and silviculture;
  - c. Give high priority to the protection of native vegetation, fish, and wildlife populations;
  - d. Provide for public education regarding non-point source management and watershed protection;
  - e. Address coordinated land acquisition for regionally significant floodplains;
  - f. Promote the establishment of centralized sewer systems in identified septic tank problem areas; and,
  - g. Provide for a dedicated funding source, such as a stormwater utility, for management projects.
- Policy 4.3.3 Require new development to locate and construct impervious surfaces, buildings, lawns, and sewage facilities so that they do not adversely affect the quality of nearby surface waters.
- Policy 4.3.4 Require all development activities that create stormwater runoff to treat the water to meet state water quality standards before discharge.
- Policy 4.3.5 In new developments and redevelopment projects, design stormwater treatment systems to protect ground water as well as surface water.
- Policy 4.3.6 Retain vegetated buffer strips along the banks of regionally significant surface waters. Buffers should be of sufficient width to prevent erosion, trap the sediment in runoff, and filter out nutrients. Buffer width and vegetative material should be defined by local governments with assistance from the WMDs and DEP.
- Policy 4.3.7 In areas prone to sinkholes, protect groundwater from contamination through additional treatment of stormwater. Design surface water management systems in karst areas to avoid the collapse of retention and detention ponds. Prohibit untreated stormwater runoff from entering drainage wells and sinkholes directly connected to the Floridan aquifer.
- Policy 4.3.8 Include provisions in stormwater master plans for: reducing contaminant loads, treating runoff from areas where on-site retention is infeasible, improving systems that do not meet current standards, and maintaining the efficient operation of stormwater facilities.

- Policy 4.3.9 Use master plans for sewage treatment and disposal to identify sewage treatment plants in need of upgrading, package plants that need to be replaced by central sewer, and areas where septic systems should be replaced or not allowed. These plans should also link the development of water supply facilities to the capacity for wastewater disposal, and require development approval to be contingent on the availability of adequate facilities of both types.
- Policy 4.3.10 Require protective devices to prevent construction activity from causing increased sediment in surface waters or wetlands.
- Policy 4.3.11 Cooperate with water management districts in implementing land use and stormwater plans that support the achievement of pollutant loading targets where established by the water management districts or the Department of Environmental Protection.
- Policy 4.3.12 Septic systems should be located a sufficient distance from wetlands to prevent biological contamination and nutrient loading.
- Policy 4.3.13 Initiate programs or utilities to monitor existing septic systems for proper functioning. Operating and maintenance instructions should periodically be given to builders and home owners using such systems.
- Policy 4.3.14 Avoid installation of traditional septic systems within 100-year floodplains and hurricane flood zones in new developments. The minimum distance required between the bottom of the drainfield and the water table should be increased where necessary to provide treatment of effluent adequate to protect the groundwater. Replace traditional systems with non-traditional wastewater treatment systems providing a higher level of treatment in areas of the 100-year floodplain where traditional septic systems have failed; use incentives to encourage higher level onsite treatment systems in coastal and other environmentally sensitive areas.
- Policy 4.3.15 Prohibit landfill cells in 100-year floodplain and hurricane surge and flood zones.
- Policy 4.3.16 Remediate unlined landfills or leachate collection systems when contamination of groundwater is detected.
- Policy 4.3.17 Protect underground chemical storage tanks with secondary containment systems and/or continuous leak detection systems as required by state law.
- Policy 4.3.18 Require new or expanding marinas to have sewage pumpout facilities for boats, and a means of effluent disposal that will ensure ground and surface waters are not contaminated.
- Indicators: (A) Number of ground and surface water quality violations reported within the region.  
(B) Percent of watersheds in the region for which master plans for water supply, sewer, and stormwater are being implemented.

#### **D. FLOODPLAIN PROTECTION**

##### **Goal 4.4 Maintain the integrity and natural value of floodplains, and manage floodplains through non-structural means.**

- Policy 4.4.1 Utilize natural drainage and floodplain functions in new development and redevelopment; prohibit significant interference of floodplain functions.

- Policy 4.4.2 Acquire development rights to relatively undisturbed floodplains in order to preclude uses which would permanently degrade the floodplain's functional values.
- Policy 4.4.3 Ameliorate flood damage within 100-year flood zones through local government membership in the National Flood Insurance Program and compliance with its requirements.
- Policy 4.4.4 Require new developments to maintain the same rate and volume of runoff for post- and pre-development.
- Policy 4.4.5 Follow natural hydrologic patterns for land drainage; prohibit land from being "reclaimed" by means of drainage activities.
- Policy 4.4.6 Adopt and enforce stormwater management ordinances which ensure that pre- and post-development runoff have the same volume, rates of flow, and quality, based on a design storm-frequency consistent with stormwater permitting standards of the water management district.
- Policy 4.4.7 Prohibit construction of new buildings, paved parking lots, agricultural processing, and industrial operations exclusive of shipping and port operations in navigable waters, in the 10-year floodplain as mapped by water management districts or other cognizant sources. Facilities associated with passive recreational activities may be allowed within the 10-year floodplain.
- Policy 4.4.8 Require that new or re-built habitable structures have the lowest floor elevated above the 100-year flood level.
- Policy 4.4.9 Make structural alterations to natural bodies of water only where necessary to restore natural system functions.
- Policy 4.4.10 Cooperate with the water management districts in establishing and maintaining the seasonal ranges of water flows and levels necessary for the viability of aquatic ecosystems.
- Policy 4.4.11 Limit dredging to maintenance of existing channels, and retention and detention ponds. Do not dispose of dredged material in wetlands unless it is for the purpose of restoring an altered system, or in sensitive vegetative communities. Require restoration or mitigation where dredge and fill regulations have been violated.
- Policy 4.4.12 Consider the modification or removal of water control structures which, by controlling the stage, flow, or course of a water body, interfere with its natural functions. Where public safety would be endangered by removal of structural controls or where removal alters natural hydroperiods, the water body should be managed to approximate natural hydroperiods.
- Policy 4.4.13 Limit incremental increases in the withdrawal of water to amounts which will leave adequate supplies for the healthy functioning of natural systems.
- Policy 4.4.14 Require new development to manage the rate, volume, timing and quality of wastewater and stormwater discharges to surface water and wetlands such that the ecosystem functions are maintained.
- Policy 4.4.15 Consider the establishment of a stormwater utility to provide facilities for flood protection and stormwater treatment while equitably recouping the costs.

Indicators: Percent reduction in new development and redevelopment which interfere significantly with natural drainage and floodplain functions.

#### **E. COASTAL RESOURCES**

##### **Goal 4.5 Maintain and restore coastal resources and the natural functions of coastal ecosystems.**

- Policy 4.5.1 Construct water-dependent facilities and activities, including aquaculture, only where coastal and marine resources will not be adversely affected. In such locations, these facilities should have priority over other uses.
- Policy 4.5.2 At new or expanding marinas follow operating procedures that prevent the degradation of water quality. Plan for and provide facilities to perform fuel spill containment, and sewage pump-out and disposal service.
- Policy 4.5.3 Limit dredging to the maintenance of existing channels and to projects which enhance or restore ecosystem functions.
- Policy 4.5.4 Mitigate the loss of native coastal vegetation destroyed during maintenance dredging by replanting.
- Policy 4.5.5 Do not rely upon shoreline stabilization structures for protection of development. If shoreline stabilization structures must be used minimize their impact to coastal resources.
- Policy 4.5.6 Retain or create buffers of native coastal vegetation adjacent to coastal wetlands, tidal marshes, and streams.
- Policy 4.5.7 Acquire development rights and scenic easements to preserve the natural functions and the scenic beauty of the coastline.
- Policy 4.5.8 Adopt and enforce standards for signs along scenic coastal roads and shores to preserve the visual amenities of the area.
- Policy 4.5.9 Assess sites proposed for development that are near existing archeological sites for historical or archaeological significance; important properties and resources should be protected, unless restoration or mitigation can be accomplished.
- Indicators: (A) Water quality of estuarine waters.  
(B) Percentage of the coast line that is maintained in a natural condition.

#### **F. MARINE RESOURCES**

##### **Goal 4.6 Protect marine habitats from the adverse impacts of new development and redevelopment.**

- Policy 4.6.1 Maintain the volume, velocity, and timing of river and stream flows into the Gulf of Mexico within long-term seasonal ranges by non-artificial means unless alterations are restorative.
- Policy 4.6.2 Design and build new local, state, and private roads, bridges, and causeways so as not to interfere with surface water flows, and with appropriate protective measures to avoid degrading water quality.

- Policy 4.6.3 Unless antiquated vested platted lots have dimensions or conditions which prohibit innovative systems, serve new development within the coastal storm surge area with existing capacity of central sewer systems, or with innovative septic type systems that are proven to provide a lower potential for pollution, a higher level of organic digestion, and an effluent less nitrified.
- Policy 4.6.4 Require construction sites to be managed to prevent sediment from becoming suspended in adjacent water bodies.
- Policy 4.6.5 Treat stormwater before it enters coastal marsh ecosystems.
- Policy 4.6.6 Where unregulated industrial discharge of heated water occurs, do not cause substantial damage or harm to the aquatic life or vegetation in the receiving body of water or interfere with the beneficial uses designated for the classification assigned to those waters.
- Policy 4.6.7 Require new docks, piers, and other shoreline structures be designed and built to avoid or protect seagrass beds.
- Policy 4.6.8 In boater education programs stress the value of estuarine vegetation and the destruction caused by boat propellers in shallow waters.
- Policy 4.6.9 In a cooperative state and local action, establish boat speed limits in waterways where wakes would cause erosion and damage shoreline vegetation.
- Policy 4.6.10 Prohibit Outer Continental Shelf oil and gas exploration and production and onshore service facilities where marine or estuarine ecosystems would be threatened by routine operations or accidental occurrences.
- Indicators: Percent reduction in new development, redevelopment, and recreational activity which adversely impact marine and estuarine resources.

**Goal 4.7 Provide public access to the coast in areas where environmental degradation can be minimized.**

- Policy 4.7.1 Acquire undeveloped upland areas to provide public access to the Gulf and to coastal rivers and springs.
- Policy 4.7.2 Maintain existing public visual access to the Gulf and to coastal rivers and springs .
- Policy 4.7.3 Design access to coastal wetlands that functions to both preserve the wetland(s) and increase public awareness of wetland's benefits.
- Indicators: Percent increase in the number of access points compatible with non-degradation of the environment.

**G. WETLANDS**

**Goal 4.8 Avoid adverse impacts to the natural functions of the region's wetlands or surface water systems from development and redevelopment.**

- Policy 4.8.1 Coordinate regulatory programs to ensure that the ecological functions of the region's river systems are not degraded. Develop or enhance intergovernmental coordination strategies that will result in a cooperative approach toward the management,

preservation, and protection of the region's wetlands and waterways, with special emphasis on those which cross jurisdictional boundaries.

- Policy 4.8.2 Map wetlands to approximate wetlands' lateral extent as defined by the State's uniform wetlands definition.
- Policy 4.8.3 Ensure that plans, regulations, and management decisions consistently protect and enhance the following functions of the region's wetlands: open space, wildlife habitat, floodwater retention, and water quality enhancement.
- Policy 4.8.4 For new structures that can only be built in wetlands or within protective buffer areas of wetlands, establish design criteria that maintain wetland functions, such as: piling foundations above the 100-year flood elevation; and wastewater disposal by non-traditional onsite septic systems such as those described in policy 4.6.3 or central systems.
- Policy 4.8.5 Prohibit new interference to the functions of coastal and riverain wetlands as integrated natural systems. Restore ecological functions of wetland systems where they have been degraded or destroyed.
- Policy 4.8.6 Design new transportation and utility facilities to avoid interference with the natural operation of wetlands, and in a sufficient size and height to accommodate the movement and migration of wildlife through the area.
- Policy 4.8.7 Incorporate small isolated wetlands into surface water management systems where doing so would facilitate their preservation.
- Policy 4.8.8 Design those stormwater and wastewater treatment systems that incorporate wetlands to mimic the hydroperiod necessary to support an undisrupted vegetative community and to match the wetlands' capacity to assimilate nutrients.
- Policy 4.8.9 Harvest timber in wetlands in such a way that the wetland's hydrologic and ecological functions are not impaired.
- Policy 4.8.10 Require restoration where wetlands have been illegally impaired by drainage, dredge and fill, or other activities to provide an overall net environmental benefit.
- Policy 4.8.11 Reserve an upland buffer zone adjacent to wetlands, lakes, rivers, streams, springs and sinks as a water quality, quantity, and habitat protection buffer within which primary and secondary impacts to the wetland from activities such as drainage, filling, pesticide application, excavation, and construction are restricted. Define these buffer zones and the limits of all impacts to each feature's and buffer's function in a coordinated effort lead by local governments with assistance from the water management districts and the Departments of Environmental Protection and Community Affairs.
- Policy 4.8.12 Cooperate at intergovernmental levels to establish and maintain minimum seasonal stream and spring flows, minimum and maximum estuary inflows, and lake levels based on ecosystem water needs.
- Policy 4.8.13 Cooperate at intergovernmental levels to implement plans to improve and maintain water quality in lakes.

- Policy 4.8.14                    Manage new increments of sewage effluent and storm water runoff so that they do not degrade the water quality of adjacent water bodies. Consider advanced treatment of wastewater to avoid accelerating the eutrophication of the receiving water body.
- Policy 4.8.15                    Cooperate with the water management districts in restoring natural stream beds and native vegetation along the region's rivers.
- Policy 4.8.17                    Control new development to prevent reduced floodway conveyance and increased flood elevations, velocity, sediment, and pollution load of 100-year flood waters.
- Policy 4.8.18                    Design new public and private roads so as not to impede the natural flow of water.
- Indicators:                    The percentage of new developments and redevelopments which adversely impact wetlands and surface water systems.

## **H.                    BIODIVERSITY AND ECOSYSTEM MANAGEMENT**

### **Goal 4.9            Maintain and enhance the habitat and populations of native species of plants and animals.**

- Policy 4.9.1                    Preserve and protect areas of fish and wildlife habitat of sufficient diversity, size, and linkages to maintain viable populations of the indigenous species.
- Policy 4.9.2                    Design roads and bridges to incorporate design features that facilitate the free passage of wildlife so as to avoid vehicle and animal collisions.
- Policy 4.9.3                    Use development and redevelopment opportunities to design, construct, and maintain facilities in a manner that preserves or restores existing native vegetation, including understory and ground cover, except where non-native vegetation is necessary to provide a fire-resistant buffer zone around buildings.
- Policy 4.9.4                    Encourage the use of native plants for landscaping.
- Policy 4.9.5                    Use alternatives to pesticides and herbicides for control of insects and exotic plants except where deemed ineffective or cost prohibitive.
- Policy 4.9.6                    Discourage the propagation of invasive exotic plants, as listed by the Florida Department of Agriculture. During the course of development or redevelopment activities, require the removal of invasive exotics from the site.
- Policy 4.9.7                    Provide information on landscaping with native plants and enhancing habitat for the less abundant native species of wildlife to the general public.
- Policy 4.9.8                    Limit the new construction and expansion of multi-slip docking facilities and boat ramps to locations where there is quick access to deep, open water, where the associated increase in boat traffic will be outside the areas of high manatee concentration, and where wetlands supporting manatee habitat will not be disturbed.
- Policy 4.9.9                    In communities where manatees frequent local waters, adopt a manatee protection plan designed to address cumulative impacts.

- Policy 4.9.10 Acquire additions to publicly owned preserves and refuges where needed to protect the quality and safety of summer and winter manatee activity centers and connecting travel routes.
- Policy 4.9.11 Adopt slow or idle speed zones, with or without channel exemption as appropriate, in areas frequented by manatees. Improve enforcement of speed limits.
- Policy 4.9.12 Avoid the injury or disturbance of manatees by aquatic commercial and recreational activities through the use of education and enforcement. Cooperate with regional, state, and federal level agencies in disseminating and displaying educational materials on coastal and marine resource conservation, and manatees in particular, to boaters near areas where both manatees and humans congregate.
- Indicators:
- (A) Net change in the number of sustainable populations of native plant and animal species.
  - (B) Number of local governments with landscape ordinances that protect natural plant communities.
  - (C) Number of living manatees in the region.
  - (D) Initiation and expansion of land acquisition and less than fee-simple programs to acquire, manage, and improve the viability of native habitats and species.
  - (E) A lack of additions to the endangered, threatened, or species of special concern lists within the region.

**Goal 4.10 Reduce or mitigate the loss of habitat for endangered or threatened species in the region.**

- Policy 4.10.1 Identify potential habitat for endangered or threatened plants and animals through cooperative efforts with the water management districts, the Florida Natural Areas Inventory, state agencies, and local conservation organizations.
- Policy 4.10.2 Examine sites proposed for development for the presence of listed species' habitat. Where members of such species are present, consult appropriate agencies and adopt plans that provide for the preservation of habitat, or appropriate mitigation, adequate to maintain existing and viable populations, as a condition for development approval.
- Policy 4.10.3 Assist in the protection of habitat of threatened and endangered animals and plants with strategies and techniques that provide overall net benefits such as the transfer of development densities and flexible mitigation techniques. The taking of threatened or endangered species shall not be allowed unless this taking is mitigated by the preservation of a higher quality or larger size habitat area.
- Policy 4.10.4 Use public and public-private partnerships to acquire, through purchase, donation, or voluntary conservation easements, the properties which contain important habitat for listed species. Extend appropriate incentives for such private sector initiatives to preserve habitat in a manner consistent with state and federal laws.
- Policy 4.10.5 Confer with the Florida Natural Areas Inventory, the Florida Game and Freshwater Fish Commission, and the U.S. Fish and Wildlife Service when revising land use plans that might affect the habitat of threatened or endangered species of plants and animals.
- Indicators: Net change in threatened and endangered species populations, population viability, acres of habitat, and acres of native vegetative communities which support listed species.

**Goal 4.11 Reduce the number of new development and redevelopments which adversely affect the environmental quality, physical character, or natural function of the region's exceptional geographic features and environmentally sensitive areas.**

- Policy 4.11.1 In cooperation with agencies and organizations with expertise, identify and map natural resources of regional significance, and the environmentally sensitive areas and ecological communities within jurisdictional boundaries .
- Policy 4.11.2 Natural resources of significance, exceptional geographical features and environmentally sensitive areas should be identified, and priorities and means of protecting them established consistent with this plan and plans of other regional and state agencies.
- Policy 4.11.3 Identify and preserve ecologically intact systems in a prioritized manner through public ownership and/or public-private partnerships.
- Policy 4.11.4 Encourage owners of environmentally sensitive land to utilize best management practices, or to voluntarily convey conservation easements to local, regional, or state agencies, or to non-profit conservation groups, in exchange for lowered tax assessments based on the restricted use, consistent with Florida Statutes governing conservation easements.
- Policy 4.11.5 Development adjacent to preservation and conservation areas should be compatible with the purposes of those areas. Where needed, the more recent development should provide buffers for previously existing land uses.
- Policy 4.11.6 Restrict the use of motorized vehicles on environmentally sensitive public lands. Consider motor-free days on rivers and lakes.
- Policy 4.11.7 Attempt to locate future development and transportation systems so as not to inhibit prescribed burns in regionally significant fire-maintained plant communities such as those in the Ocala National Forest, Withlacoochee State Forest, Cedar Key Scrub State Preserve and privately and publicly owned pine flatwoods and pine plantations.
- Policy 4.11.8 Use management plans for public and private lands to allow for and promote prescribed burning as a management tool to enhance fire-maintained ecosystems.
- Indicators: (A) Reduction in the number and impact of new developments and redevelopments which adversely affect exceptional geographic features and environmentally sensitive areas.  
(B) Number of acres of fire dependent plant communities which are maintained within the parameters of their management plans.

**I. RECREATION AND ECOTOURISM**

**Goal 4.12 Ensure that the recreation needs of the population are met through an increase in the number, variety, and quality of recreational facilities.**

- Policy 4.12.1 Prioritize lands to be considered for public acquisition such that a high priority is given to potential recreation sites in rapidly developing areas.
- Policy 4.12.2 Include resource-based and/or activity-based recreational areas as part of open space requirements.

- Policy 4.12.4 Encourage the owners of land appropriate for outdoor recreational purposes to make the land available to the public through the use of conservation easements or covenants with State or local governments in exchange for a reduced tax assessment based upon the restricted use value of the property.
- Policy 4.12.5 Maintain reasonable public access at major lakes and rivers; choose new boat ramp locations that will minimize environmental disturbance.
- Policy 4.12.6 Manage the recreational use of parks and preserves to allow for compatible uses that do not adversely affect the natural resources.
- Policy 4.12.7 Consider flood-prone areas for recreational use as an alternative to more intensive development.
- Policy 4.12.8 Consider utility line rights-of-way and abandoned railroad rights-of-way for nature trails, bicycle paths, and wildlife passageways.
- Policy 4.12.9 Retain public ownership and control of the Cross-Florida Greenway and use it for recreation, wildlife habitat, and for public purposes compatible with the foregoing.
- Policy 4.12.10 Cooperate with other local governments, regional, and state agencies, and non-profit trail organizations to develop a region-wide hiking and bike path system that connects urban areas with rural recreational areas.
- Policy 4.12.11 In cooperation with regional and state agencies, evaluate, recommend, and designate portions of the region's rivers and streams as canoe trails where motorized boats are restricted.
- Policy 4.12.12 Consider the management plans of public lands when amending future land use plans and land development regulations to avoid a negative impact to existing parks and recreational areas.
- Policy 4.12.13 Local governments should regulate land use around springs and spring runs to maintain their environmental and recreational benefits.
- Policy 4.12.14 Adopt and enforce boat speed limits in areas where wakes cause erosion of banks and where there are conflicts between boating and other water sports.
- Policy 4.12.16 Encourage and consider the utilization of innovative land use control mechanisms such as "greenlining" to protect parks, recreation and eco-tourism facilities and lands from the negative impacts of adjacent incompatible land uses.
- Indicators: Increase in the amount and usage of parks and recreation facilities and lands suitable for recreation and eco-tourism.

## **J. AGRICULTURE AND SILVICULTURE**

- Goal 4.13 Make maximum utilization of appropriate best management practices and conservation methods by agricultural and forestry management units, as determined by Natural Resource Conservation Districts, the Division of Forestry, the Department of Environmental Protection, and water management districts.**

Policy 4.13.1	Encourage technical and financial assistance to assist farmers utilization of appropriate best management practices.
Policy 4.13.2	Cooperate with farmers and ranchers to encourage the use of best management practices in silviculture and agriculture to enhance wildlife habitat, conserve water, reduce erosion, and reduce the amount of pollutants entering the environment.
Policy 4.13.3	Cooperate with forest owners and managers in providing for multiple use of forest resources, in part by following best management practices for streams, wetlands, watersheds and wildlife.
Policy 4.13.4	Encourage federal and state cost-share programs to promote the utilization of the most effective conservation techniques by agriculture.
Policy 4.13.5	Encourage technical assistance to facilitate adoption by farmers and foresters of integrated pest management techniques and efficient fertilizer application practices that minimize the use of chemicals.
Policy 4.13.6	Encourage the utilization of biological pest controls to further the reduction in reliance on chemical controls.
Policy 4.13.7	Ensure the availability of an adequate and dependable supply of water for agriculture through encouragement of the use of irrigation methods best suited to particular crops and conditions.
Policy 4.13.8	Encourage the utilization of reclaimed wastewater for irrigation of appropriate crops where feasible and where its use will not threaten groundwater quality.
Policy 4.13.9	Encourage the establishment of best management practices and design criteria for aquaculture to promote this activity.
Indicators:	(A) Increase usage of appropriate best management practices and conservation methods.
	(B) Increase in policies, programs and incentives promoting best management practices and other conservation techniques.

**K. AIR QUALITY**

**Goal 4.14 Maintain the region's concentrations of all air pollutants for which standards have been established at levels less than the maximums allowed by state and federal standards .**

Policy 4.14.1	Consider the cumulative effects of development on air quality during project review; implement mitigation measures where needed to avoid deterioration of the ambient air.
Policy 4.14.2	In urban and urbanized areas provide sidewalks and bicycle lanes on new and existing roads and roadway widening projects in accordance with a plan to provide , walking and bicycling as alternative modes of transportation.
Policy 4.14.3	Adopt tree preservation ordinances and plans for the planting and maintenance of vegetative buffers for air purification .
Policy 4.14.4	Do not use incinerators to dispose of waste that can be recycled, composted, or disposed of in a manner which minimizes impacts to air quality .

Policy 4.14.5 Continue to allow prescribed burning to reduce the danger of wildfire, improve and manage wildlife habitats, and maintain fire-dependent vegetative communities provided that safeguards are taken to ensure roadway visibility and notification is given in advance to nearby residents.

Indicators: Number and severity of air quality violations within the Region.

**L. ENERGY CONSERVATION**

**Goal 4.15 Attain per capita renewable energy consumption rates in the region that equal or exceed state averages.**

Policy 4.15.1 Use renewable energy sources wherever feasible.

Policy 4.15.2 Set criteria for building design, new construction, and setback requirements that prevent interference with solar devices.

Indicators: Increase in direct solar energy usage within the region.

**Goal 4.16 Achieve a rate of per capita electrical energy consumption no greater than state averages.**

Policy 4.16.1 Encourage energy efficient building techniques, and enforce the Florida Energy Efficiency Code.

Policy 4.16.2 Encourage electrical utilities to implement load management strategies to reduce the peak electrical demand of their customers, and energy efficiency programs to reduce the overall energy consumption of customers.

Policy 4.16.3 Encourage tree-planting and landscaping to reduce urban heat build-up.

Indicators: Per capita electrical energy consumption within the Region.

**Goal 4.17 Reduce the per capita gasoline consumption in the region .**

Policy 4.17.1 Cooperate with the Florida Department of Transportation to implement energy saving transportation practices, such as the synchronization of traffic signals.

Policy 4.17.2 Coordinate and encourage the development and improvement of ridesharing and other commuting options.

Policy 4.17.3 Include provisions for multi-use (planned unit development) in local land development regulations. Use local government comprehensive plans to discourage energy inefficient urban/suburban sprawl.

Indicators: Per capita gasoline consumption in the Region.

**M. HAZARDOUS WASTE**

**Goal 4.18 Manage, treat and dispose of all hazardous wastes generated in the region in accordance with applicable local, state and federal regulations.**

- Policy 4.18.1 Institute or maintain "Amnesty Day" programs and offer incentives such as the collection of "conditionally exempt small quantity generator" wastes for a reduced fee.
- Policy 4.18.2 Develop public awareness programs on the definition of a hazardous waste and types of hazardous waste management practices.
- Policy 4.18.3 Encourage the development of environmentally safe hazardous waste treatment, storage, and disposal facilities.
- Indicators: (A) Number of hazardous waste violations reported within the Region.  
(B) Number of pounds of hazardous waste collected and properly disposed of.

**N. SOLID WASTE**

**Goal 4.19 Reduce the per capita amount of solid waste per capita generated, and disposed of in landfills within the region.**

- Policy 4.19.1 Institute solid waste recycling and yard waste composting programs to reduce the waste stream and to extend the life of existing landfills.
- Indicators: Reduction in the per capita amount of solid waste disposed in landfills within the Region.

**O. WASTEWATER**

**Goal 4.20 At all wastewater treatment plants maintain an appropriate level of wastewater treatment quality, consistent with standards established by the Florida Department of Environmental Protection and the Environmental Protection Agency.**

- Policy 4.20.1 Remedy any wastewater treatment plant deficiencies identified by DEP or EPA.
- Policy 4.20.2 Provide incentives such as rebates or rate reductions based on reduced capacity requirements for customers who utilize effective wastewater reduction devices.
- Policy 4.20.3 Eliminate the discharge of inadequately treated wastewater into ground and surface water bodies.
- Policy 4.20.4 Identify and develop alternative methods of wastewater treatment, disposal, and reuse of wastewater to reduce degradation of water resources.
- Policy 4.20.5 Identify areas where septic tanks are inappropriate, and implement strategies to improve the treatment level of wastewater.
- Indicators: Percentage of wastewater treatment plants that meet or exceed established wastewater treatment quality levels.

**P. MINING**

**Goal 4.21 Use permitting requirements to reclaim lands disturbed for mineral extraction.**

- Policy 4.21.1 Reclaim land to be compatible with adjacent land uses and consistent with the local future land use designation. If reclaimed area is not scheduled for development, reclamation into native ecosystem(s) is preferable.

Policy 4.21.2 Require all mine operators to submit conceptual excavation and reclamation plans which demonstrate compliance with local mining ordinances and regulatory agency rules and ordinances.

Policy 4.21.3 Carry out reclamation activities in a manner which minimizes impacts on surface and groundwater resources, wildlife, and adjacent lands.

Indicators: Percentage of the total acreage of mined land that has been reclaimed.

**Goal 4.22 To coordinate the regulation of the region's natural resource extraction activities to be comprehensive in scope and coordinated among local, regional, and state agencies.**

Policy 4.22.1 Transmit copies of applications and permits, and vested rights determinations to state and local agencies involved with mining regulation (presently the counties, the water management districts, and the Department of Environmental Protection) for mutual review.

Policy 4.22.2 Establish standards for setbacks and buffer areas to promote land use compatibility.

Policy 4.22.3 Require mining operators to provide financial assurance against the estimated costs of reclamation activities.

Policy 4.22.4 Issue an approval to commence excavation activities only after all agency permits with supporting documentation have been submitted and a final local development order has been issued.

Policy 4.22.5 Owners of abandoned mining sites where reclamation is not required should be offered incentives to carry out reclamation plans.

Policy 4.22.6 Require existing mining operations to adopt techniques for noise and vibration control to the extent that they shall be in conformance with the general noise and vibration levels established within their respective counties.

Policy 4.22.7 Use buffers to minimize the effects of resource extraction.

Policy 4.22.8 An environmental assessment shall be conducted and evaluated as part of the mining permit process.

Policy 4.22.9 Mining may be allowed in areas other than those addressed in Goal Cluster 23 when permitted and mitigated in compliance with applicable federal, state and local regulations.

Indicators: Number of final development orders issued under a coordinated process of comprehensive mining regulation.

**Goal 4.23 To use land use planning to protect significant regional resources from the adverse effects of resource extraction.**

Policy 4.23.1 Resource extraction shall not be allowed in areas of habitat known to support viable populations of threatened and endangered species.

Policy 4.23.2 Resource extraction shall not be allowed in any rivers, streams, lakes, or springs which cannot be restored. In addition, resource extraction shall not be allowed in wetlands contiguous to regionally significant rivers, streams, lakes, or springs.

"Restoration is defined as restoring the type, nature, and function of the ecosystem in existence prior to mining.

- Policy 4.23.3 Resource extraction shall not be allowed in "other affected areas" where mitigation or restoration cannot be accomplished. "Other affected areas" are defined as wetlands (other than those identified in policy 4.23.2), floodplains, and habitat of species of special concern.
- Policy 4.23.4 Investigate sites proposed for resource extraction for the presence of significant archeological resources. If present, make provisions for either protection on-site or mitigation (salvage) before mining activities are permitted.
- Policy 4.23.5 Encourage the development of mining of land containing important economically-recoverable mineral reserves that are consistent with the respective county's comprehensive plans and that are locations consistent with policies 4.23.1, 4.23.2, 4.23.3 and 4.23.4.
- Policy 4.23.6 Pursue cooperative acquisition or other options between local governments, the water management district and the state, to allow for the preservation of environmentally significant regional resources that may be impacted by mining activities.
- Indicators: Number of final development orders for resource extraction where significant regional resources are protected or successfully mitigated.