



Reedy Creek Improvement District
Comprehensive Plan
(Printed 6/5/00)

**CONSERVATION
ELEMENT**

**Part A:
Policies**

INTRODUCTION

The Conservation Element addresses the management of natural resources in the District, including groundwater and surface water, soil and minerals, air, and plant and animal life. The element begins with adopted goals, objectives, and policies (the “Policies” component) addressing conservation issues. The second part of the element is a “Supporting Data and Analysis” component which provides background data on current conditions, and discussions of issues and future conditions.

GOALS, OBJECTIVES, AND POLICIES

GOAL

It is the goal of the Reedy Creek Improvement District to protect and conserve the natural resources of the District.

Objective 1

To maintain the quantity and quality of local groundwater resources.

- Policy 1.1: The District will encourage research and analysis of groundwater recharge conditions in the region. The findings of such research, including the ongoing USGS groundwater study, will be considered in future land use and development decisions. Until more current groundwater maps are available, the District will rely on the most current maps available from the SFWMD or otherwise deemed acceptable by the SFWMD to identify recharge areas.
- Policy 1.2: The RCID shall continue to ensure compliance with Land Development Regulations which specify conditions for construction and development in high recharge areas. These conditions include provisions to minimize impervious surface cover in recharge areas so that recharge potential is maximized, and to regulate land uses within recharge areas.
- Policy 1.3: The RCID shall continue to ensure compliance with Land Development Regulations which specify measures for maintaining water quality in the District’s potable water wells.
- Policy 1.4: Prior to the development of any site larger than five acres, the RCID shall make a determination of the site’s recharge potential and shall specify appropriate measures to minimize the loss of that potential.

- Policy 1.5: The RCID shall continue to cooperate and coordinate with the SFWMD and other agencies and jurisdictions in their efforts to protect groundwater resources in Central Florida.
- Policy 1.6: The RCID shall continue to use locally derived water supplies wherever possible and shall avoid the importation of water from other jurisdictions or watersheds.
- Policy 1.7: The RCID shall maintain standards which require the containment of sludge and hazardous materials so that there will be no impact on groundwater quality.

Objective 2

To protect groundwater recharge functions through the designation of extensive public and private open space areas within the District.

- Policy 2.1: The RCID shall continue to maintain stormwater retention requirements for new development areas and ensure that all retention structures in developed areas are maintained.
- Policy 2.2: The District shall continue to construct capital improvements such as rapid infiltration basins, canals, and reclaimed water mains which provide opportunities for aquifer recharge and help maintain groundwater elevations.
- Policy 2.3: The District shall continue to support the designation of high recharge areas for Public Facility, Conservation, or Resource Management/ Recreation uses on the Future Land Use Map.

Objective 3

To ensure that adopted surface water quality standards are enforced.

- Policy 3.1: The District shall limit the introduction of nutrients into District waterways; establish minimum criteria for surface water discharges; classify receiving waters according to their uses; and prohibit surface water discharges which constitute human health hazards.
- Policy 3.2: All District surface waters and their related improvement programs shall continue to meet the Class III surface water quality standards promulgated in Chapter 62, Florida Administrative Code in effect at the time of Plan adoption.
- Policy 3.3: The District shall continue to maintain a surface water quality sampling program that monitors dissolved oxygen, Ph, total nitrogen, and total phosphorus at least monthly and heavy metals, pesticides, and herbicides at least semi-annually.

Objective 4

To protect potable water wellfields in the RCID from contamination by harmful land uses and to limit potable water withdrawal to 8.552 billion gallons per year unless changed through the plan amendment process.

Policy 4.1 Potable groundwater withdrawal shall be limited to a peak-day flow of 35.6 mgd.

Policy 4.2: The District shall use the following protection criteria around existing and proposed well sites as set forth in the RCID Land Development Regulations:

- (1) *Restrictions Within 200 Feet.* All new development other than water pumping facilities, roads, and parking shall be prohibited within two-hundred (200) feet of a potable water well. Roads and parking may be allowed only if they are more than fifty (50) feet from the well and the drainage is directed away from the well.
- (2) *Restrictions Within 300 Feet.* Wet retention/detention areas shall be prohibited within three hundred (300) feet of each potable water well.
- (3) *Restrictions Within 400 Feet.* The following new development shall be prohibited within four hundred (400) feet of each potable water well:
 - (a) Landfills;
 - (b) Bulk storage of materials on the Florida Substance List;
 - (c) Any activities that require the storage, use, or handling of agricultural chemicals or hazardous wastes;
 - (d) Wastewater treatment plants and facilities, including the disposition of sludge; and
 - (e) Septic tanks.

Policy 4.3: The District shall continue to maintain a groundwater sampling program which, at a minimum includes quarterly sampling of nutrients, metals, and organic compounds.

Policy 4.4: In accordance with Chapter 62 of the Florida Administrative Code, groundwater quality shall continue to be monitored to determine the effect of treated effluent discharge and other activities on the potable water supply.

Policies on water conservation are contained in the Potable Water Subelement of this Plan.

Objective 5

To conserve soil and mineral resources through implementation of the policies shown below.

Policy 5.1: Best Management Practices shall be required for soil erosion and sedimentation control along District canals and lakes.

- Policy 5.2: No mineral extraction, other than that needed on a temporary basis during construction or landscaping, shall be permitted in areas designated on the Future Land Use Map as Conservation, Resource Management/Recreation, or Public Facilities.
- Policy 5.3: All new construction sites shall ensure that the turbidity of the receiving water body does not exceed the current state standards as found in Chapter 62, F.A.C.
- Policy 5.4: Mitigation of any violations that may result from the implementation of Policy 5.3 shall be completed prior to continuing construction on those portions of the project generating the violation.

Objective 6

To implement programs, collaboratively with other jurisdictions and agencies in Central Florida, which ensure that the region's Air Quality Index does not exceed 100, i.e., the top of the moderate range, except during the most extreme atmospheric conditions (such as thermal inversions).

- Policy 6.1: The RCID shall encourage the Florida Department of Environmental Protection to establish air quality monitoring stations in the District in the event that regional air quality conditions deteriorate.
- Policy 6.2: The RCID shall work with its major landowners to promote the use of alternative forms of transportation in the District, such as bike paths, watercraft, monorails, and buses.
- Policy 6.3: The RCID shall require the major landowners to continue the use of parking technologies which minimize carbon monoxide, lead, and nitrogen emissions from idling automobiles.

Objective 7

To ensure the protection of wetlands within the District by maintaining a wetland classification system which establishes appropriate regulations for each class of wetlands.

- Policy 7.1: The RCID Land Development Regulations shall ensure the protection and conservation of all wetlands within its jurisdiction not identified for impact by Long Term Permits (LTPs). Wetlands shall be designated as Class I areas or Class II areas based on the following criteria:
- (1) *Class I Criteria*
 - (a) Any functional wetland currently protected by a conservation easement within the Reedy Creek Improvement District.
 - (b) Any area included within the Wildlife Management/Conservation Area (WMCA) as defined by SFWMD.
 - (c) Any wetland identified by the Florida Game & Fresh Water Fish Commission or U.S. Fish & Wildlife Service as providing critical and essential habitat for

species on either the federal or state list of threatened or endangered species.

- (2) *Class II Criteria.* All wetlands within the District which do not meet the criteria as a Class I wetland and which are not identified for impact by LTPs.

Class I and Class II wetlands are depicted on Figure 6-1.

Policy 7.2: The RCID shall continue to maintain a conservation easement over an undisturbed buffer area along Reedy Creek. The existing buffer area, known as the Wildlife Management Conservation Area (WMCA), extends not less than 550 feet on either side of the centerline of the creek, or 50 feet landward of the jurisdictional wetland boundary, whichever is greater.

Policy 7.3: The protection, conservation, and continued viability of wetlands shall be the principal consideration in the review of all projects affecting wetlands. Development within Class I wetlands shall be prohibited. Removal, encroachment or alteration of Class II wetlands will be allowed only when deemed appropriate and necessary, when the type, extent, and location of an impact is minimized to the maximum extent feasible, when consistent with Future Land Use Policies 3.11 and 3.12, and when all required State and federal permits are obtained.

Policy 7.4: Roadways and utility corridors may be permitted in a Class II area if no other alternatives are feasible and the pre-development hydroperiod is maintained after the completion of construction. In such instances, the provisions of Policy 7.3 and Future Land Use Element Policies 3.11 and 3.12 shall continue to apply.

Policy 7.5: Mitigation shall be required for unavoidable losses of Class II areas. The mitigation must be in accordance with Future Land Use Element Policies 3.11 and 3.12 and may occur anywhere within the Reedy Creek Watershed, within or outside of the District.

Policy 7.6: The RCID shall continue to fulfill its wetland mitigation obligations set forth in the joint planning agreement executed on May 14, 1993 between the RCID, Orange County and the Little Lake Bryan Development Company. These obligations include:

- (1) Review of upland and wetland impacts and enforcement of buffer requirements and wetland mitigation conditions with respect to proposed development activity.
- (2) Conditions and benefits including rights and responsibilities resulting from on-site and off-site impacts and wetland mitigation associated with any conceptual surface water management and dredge and fill permits obtained for the property by RCID.

Objective 8

To ensure that sufficient habitat within the District is conserved to sustain wildlife, particularly rare, endangered, and threatened species.

- Policy 8.1: The District shall designate the most environmentally sensitive areas within its boundaries for “Conservation” and “Resource Management/ Recreation” land uses. The boundaries of these areas should be defined in a manner which preserves natural resource corridors within and across the District. Except as provided for in Future Land Use Policies 1.7 and 1.8, development shall be prohibited in the Conservation area and shall be limited to low intensity recreational uses in the Resource Management/ Recreation areas.
- Policy 8.2: The District shall require the conservation of plant and animal habitat within the designated Conservation Area and shall encourage the enhancement of this habitat to sustain wildlife populations.
- Policy 8.3: The District shall continue its program of stocking native game fish in the lakes and limiting fishing to ensure continued species development.
- Policy 8.4: Until such time as the bald eagle has been deemed fully recovered as a species and has been removed from state and federal protected species lists, the District shall establish primary and secondary management zones around existing bald eagle nests. The following criteria shall apply in these zones:
- (1) *Primary Zone.* The primary zone shall have a radius of not less than 750 feet around the nest. The following criteria shall apply within this zone:
 - (a) Urban development, construction, and the use of herbicides and pesticides are prohibited; and
 - (b) Human entry and aircraft entry are prohibited during the breeding season.
 - (2) *Secondary Zone.* The secondary zone shall extend not less than 750 feet *beyond* the primary protection zone. The following criteria shall apply within this zone:
 - (a) Construction of commercial, industrial, and high density development shall be restricted so as to not interfere with the feeding area;
 - (b) New roads or pathways which facilitate access to the nest shall be prohibited;
 - (c) Use of herbicides and pesticides shall be prohibited; and
 - (d) Minor passive recreational activities shall be permitted.
- Policy 8.5: The District shall ensure that, at a minimum, the requirements of the following laws are met:
- (1) The Bald Eagle Protection Act (16 USC 688-668d) and (50 CFR 22)
 - (2) Section 9 of the Endangered Species Act of 1973 (16 USC 1531)
 - (3) The Migratory Bird Treaty Act (16 USC 703-711)

Policy 8.6: Although the gopher tortoise has been permitted for taking within the District, relocation of the species to sites designated for Conservation, Resource Management/ Recreation, or Public Facility uses is encouraged in the event gopher tortoises are discovered on future development sites.

Policy 8.7: In the event that significant populations of the Florida Scrub Jay are determined to be present on future development sites, the District shall require compliance with Florida Game and Freshwater Fish Commission mitigation requirements if impacts to a scrub jay nest are deemed unavoidable.

Rule 9J-5 Objectives Discussed in Other Elements

Rule 9J-5.005(2)(b)10 is addressed in the Solid Waste Subelement: *Management of hazardous wastes to protect natural resources.*

Table 6-1: Protected Species Observed Within the District, 1998

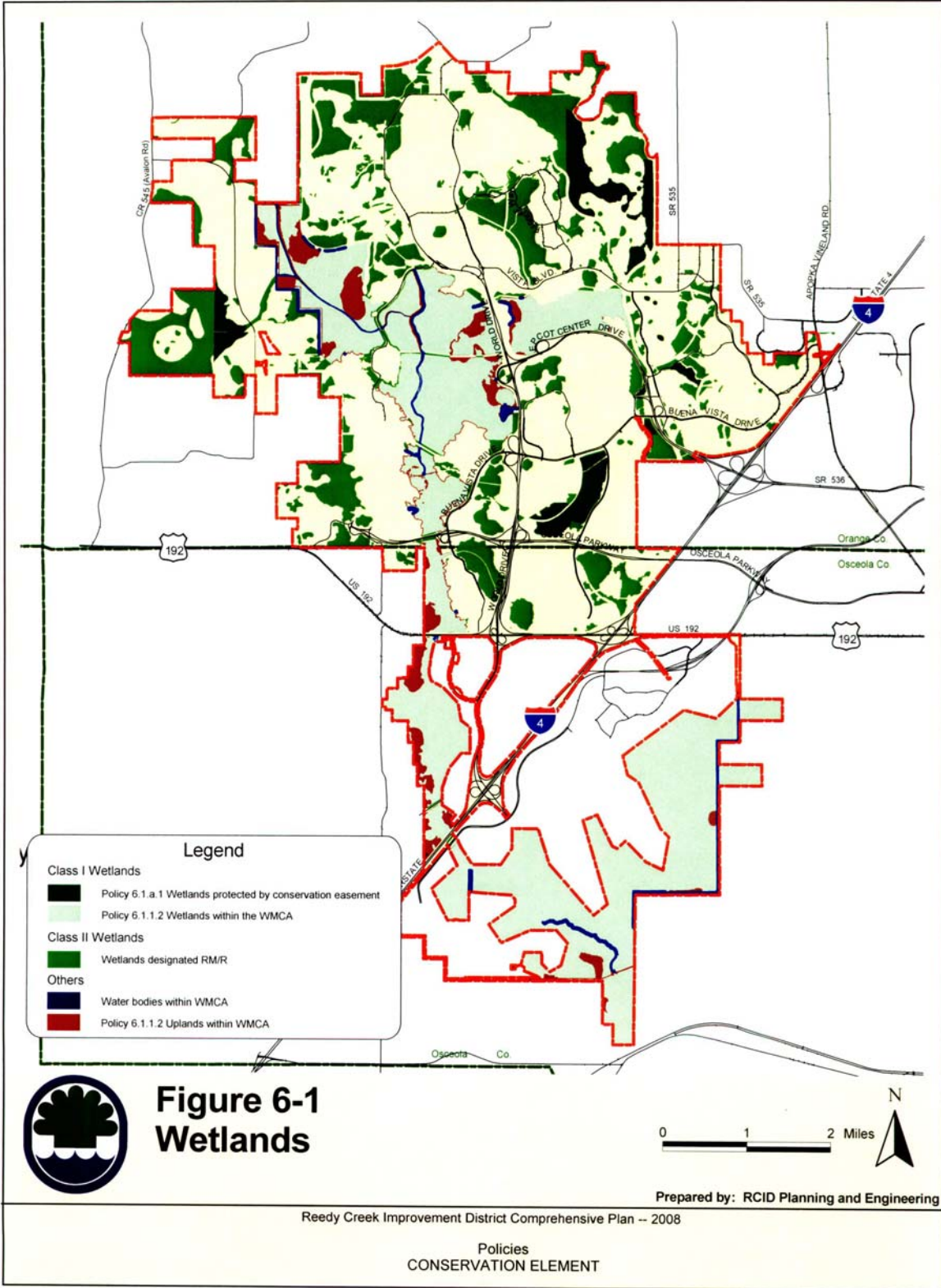
Common Name	1997		Habitat
	USFWS	State	
Birds			
Snowy Egret	--	SSC	Marshes, lakeshores, ponds, ditches, pasture
Little Blue Heron	--	SSC	Marshes, lakeshores, ponds, ditches, pasture
Bald Eagle	T	T	Lake or river shoreline, nesting near water bodies
Florida Sandhill Crane	--	T	Wet prairies, lake margins, pastures; nests in pickerelweed maidencane marshes
White Ibis	--	SSC	Wetlands
Limpkin	--	SSC	Slow-moving fresh water rivers, marshes, and lake shores
Scrub Jay	T	T	Oak scrub with open ground
Wood Stork	E	E	Forage in freshwater and brackish marsh; nest in cypress and mangrove swamps
Mammals			
Black Bear	C2	T	Pine flatwoods, cypress swamps, hardwood swamp, sand pine scrub, mixed hardwoods
Florida Panther	E	E	No longer observed within the RCID
Sherman's Fox Squirrel	--	SSC	Uplands
Florida Mouse	C2	SSC	Sand pine scrub, coastal scrub, scrubby flatwoods, sandhill
Reptiles and Amphibians			
Alligator	T	SSC	Lakes, ponds, sloughs, marshes
Eastern Indigo Snake	T	T	Varied habitat from wet prairie to xeric pineland and scrub
(Eastern) Short-Tailed Snake	C2	T	Turkey oak-longleaf pine, occasionally upland hammock and sand pine scrub
Florida Gopher Frog	C2	SSC	Sandhills, pine flatwoods, sand pine scrub. Needs ephemeral marshes for breedings.
Gopher Tortoise	C2	SSC	Sandhills, sand pine scrub, live oak hammocks, palmetto prairie, pine flatwoods, abandoned grove and pasture.
Florida Pine Snake	C2	SSC	Uplands
Florida Sand Sink	T	T	Rosemary scrub, sand pine scrub, oak scrub, scrubby flatwoods

Source: Azure, Inc., 1997
 Legend: E = Endangered

SSC = Species of Special Concern

T = Threatened

C2 = Candidate for listing, with some vulnerability but for which not enough data exists to support listing.





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**CONSERVATION
ELEMENT**

**Part B:
Supporting Data and Analysis**

PURPOSE

The purpose of the RCID Conservation Element is to:

- identify and analyze the District's natural and man-made environmental resources; and
- promote the conservation, use, and protection of these resources.

The Conservation Element demonstrates the District's intent to continue using natural resources as a foundation for planning and a basis for future land use decisions. It is based on in-depth studies pertaining to water resources, geology, soils, air and water quality, flora, and fauna within and around the District.

This element promotes the protection of the area's natural environment to ensure the health, safety, and welfare of the District's residents, employees, and visitors. In addition to the area's abundant natural resources, the RCID and the major landowners have created environmental features, such as wetlands and lakes, that emulate the function and value of existing natural systems. The continued use of such features in new development areas is encouraged in this element. The element includes an inventory, description, and analysis of the RCID's natural systems. The "Policies" component which precedes this section presents goals, objectives, and policies for effectively managing the ecological balance that must be maintained in the overall planning of the District.

GROUNDWATER AQUIFER RECHARGE

INTRODUCTION

This section of the Comprehensive Plan meets the Florida requirement for a Natural Groundwater Aquifer Recharge Subelement. It addresses the management of subsurface water resources within the District. *The location of potable well cones of influence and associated land use restrictions in those areas is addressed in the Future Land Use Element. That element may be consulted for further detail.*

The quantity and quality of groundwater are directly influenced by the activities that occur on the ground surface. Thus, land use and development must be regulated in a manner which ensures that groundwater is conserved and protected. Groundwater pollution can be avoided through careful planning of land uses in areas with high recharge potential, management of wastewater and runoff, and regular monitoring to detect potential problem areas.

REGULATORY FRAMEWORK

The Federal Safe Drinking Water Act (PL-523), as amended, sets chemical standards for potable water and requires states to ensure the safety of public water supplies. States are required to work with local

governments to map well field areas and develop land use controls to provide long-term protection from contamination in these areas. The federal Environmental Protection Agency (EPA) is required to develop criteria for selecting critical aquifer protection areas; state and local governments are to map the areas and develop protection plans. Upon approval of the plan, the EPA may enter into an agreement with the local government to implement it.

Pursuant to the Florida Safe Drinking Water Act (Chapter 403, Florida Statutes), the Florida Department of Environmental Protection (FDEP) has developed rules classifying aquifers and regulating their use. The FDEP also has established regulatory requirements for facilities that discharge to groundwater and inject materials directly underground. In 1995, the FDEP adopted an aquifer protection rule which limits activities within 500 feet of a potable water well. RCID's standards are stricter than the FDEP standards.

The South Florida Water Management District (SFWMD) is responsible for defining and inventorying groundwater resources and levels, identifying prime recharge areas, and assisting the RCID in aquifer protection. The SFWMD issues permits for wells and other water facilities; manages surface water storage; and regulates withdrawal, discharge, and injection. The RCID Planning and Engineering Department is responsible for ensuring compliance with state and federal regulations.

Orange and Osceola Counties have initiated a number of programs to protect groundwater. Orange County can require that recharge facilities be incorporated in projects located in high recharge areas. These facilities may retain runoff on-site for percolation to the aquifer. Osceola County has been divided into four water districts that regulate the supply and distribution of water and the construction of new water facilities. Each county monitors water quality near landfills, drainage wells, and other areas where the potential for groundwater contamination exists. The RCID conducts groundwater monitoring in areas adjacent to hazardous waste-holding areas and effluent disposal sites, and around potable water wells. There are 10 groundwater monitoring wells at the rapid infiltration basins, and six wells located at various points where treated effluent is used for irrigation. Quarterly monitoring reports are prepared demonstrating compliance with FDEP standards.

RECHARGE CHARACTERISTICS

Characteristics of the Aquifer

There are two main aquifers in the RCID vicinity: a surficial aquifer and the Floridan Aquifer. The two aquifers are usually separated by clayey sands known as the Hawthorne Formation, which ranges from zero to 200 feet in thickness. Some parts of the Hawthorne Formation contain limestone and provide secondary aquifers.

The surficial aquifer lies just below the ground and is contained within the Recent, Pleistocene, and Pliocene rock system. This aquifer may be at or near the surface in wetland areas but is well below ground in the higher elevation areas. It may extend to depths of 200 feet. Because the surficial aquifer is not capped by impermeable rock, its upper level (also called the water table) fluctuates with precipitation. The surficial aquifer is primarily composed of quartz sands, depending on its clay content. It is relatively porous and can store water prior to infiltration to the Floridan Aquifer.

The Floridan Aquifer underlies much of Central Florida, including the District. This aquifer is a formation of permeable rock that absorbs and retains large quantities of water. The Floridan Aquifer provides the agricultural, commercial, and domestic water supply for all of Orange and Osceola counties. Although it contains an abundant quantity of water, the supply is finite and must be constantly replenished. This occurs either naturally through precipitation, or artificially through injection wells or percolation.

The Floridan Aquifer is confined by an impermeable layer that naturally pressurizes water. In some cases, the pressurization is sufficient to bring water to the surface without pumping when wells are drilled. Such wells are classified as Artesian (the elevation to which water is naturally drawn by a well is called the potentiometric surface). Within the Floridan Aquifer, there are two limestone formations that are separated by a semi-permeable layer. The Avon Park Formation is the upper producing zone that lies about 150 to 600 feet below the ground surface and is between 400 and 600 feet thick. The Lake City Formation, the lower producing zone, lies 1,100 to 1,500 feet below the ground surface and may be as thick as 2,000 feet.

The Floridan Aquifer contains numerous cavities, permitting high transmission of water within the system. Water flows continuously throughout the cavities, and moves from formation to formation as water is withdrawn and recharged. Water quality in the aquifer is good; in the RCID, only chlorination is required prior to domestic consumption.

The surficial aquifer generally produces water under non-artesian conditions. These conditions occur where the upper surface of the zone of saturation is not confined and water is free to rise and fall directly in response to variations in recharge and discharge. The water is contained in sediments of quartz sand and the aquifer is irregular in thickness and composition. Wells 20 to 40 feet deep may yield five to ten gallons per minute (gpm) of water. By contrast, wells in the Floridan Aquifer yield up to 3,500 gpm. The surficial aquifer generally is not used for potable water supply.

Several artesian aquifers may exist 40 to 90 feet below the ground surface within the confining beds of the Hawthorne Geologic Formation. In the District, the Hawthorne forms a somewhat impervious barrier between groundwater and the Floridan Aquifer. It may contain pockets of porous materials from which limited supplies of water could be obtained.

Factors Affecting Recharge

Recharge potential is based on the amount of rainfall that occurs in an area; the conductivity, size, and extent of the surficial aquifer; the height difference between the water table of the surficial aquifer and the potentiometric surface of the Floridan Aquifer; the number and extent of sinkholes breaching the Hawthorne Formation; and the conductivity of the Floridan Aquifer. While rainfall amounts are relatively constant in the RCID, the other criteria are more variable. Soil and topographic surveys provide the best indicator of these characteristics and provide much of the basis for distinguishing areas with high recharge potential. High recharge areas include areas of coarse, sandy soils, and sinkholes, with water tables well below the surface. Recharge in the high areas may be up to 20 inches a year.

Recharge may also occur artificially, through injection wells. Artificial recharge also occurs through rapid infiltration basins, which allow highly treated effluent to percolate back to the aquifer from man-made ponds.

Although artificial recharge replenishes the aquifer, its downside is the increased risk of groundwater contamination, particularly where stormwater runoff is injected directly into the Floridan Aquifer.

Sinkhole Potential

A summary of sinkhole potential at the District was performed as part of the application for renewal of the SFWMD Consumptive Use Permit in 1996. The potential for sinkhole formation within the RCID is described in that application as low, and the likelihood that groundwater withdrawal will induce sinkholes is also described as low. No sinkholes have been observed within the RCID during recent years. The rapid infiltration basins are visually inspected weekly for evidence of sinkhole activity.

Recharge Characteristics of the RCID

Although portions of the District have potentially high recharge characteristics, there are no areas within the RCID that have been designated by the South Florida Water Management District (SFWMD) as "prime" recharge zones. The SFWMD published a groundwater recharge potential map for Central Florida in 1996; recharge potential in the District as shown on this map is displayed in Figure 6-2. Areas of moderate to high recharge potential (7-22 inches annually) are highlighted.

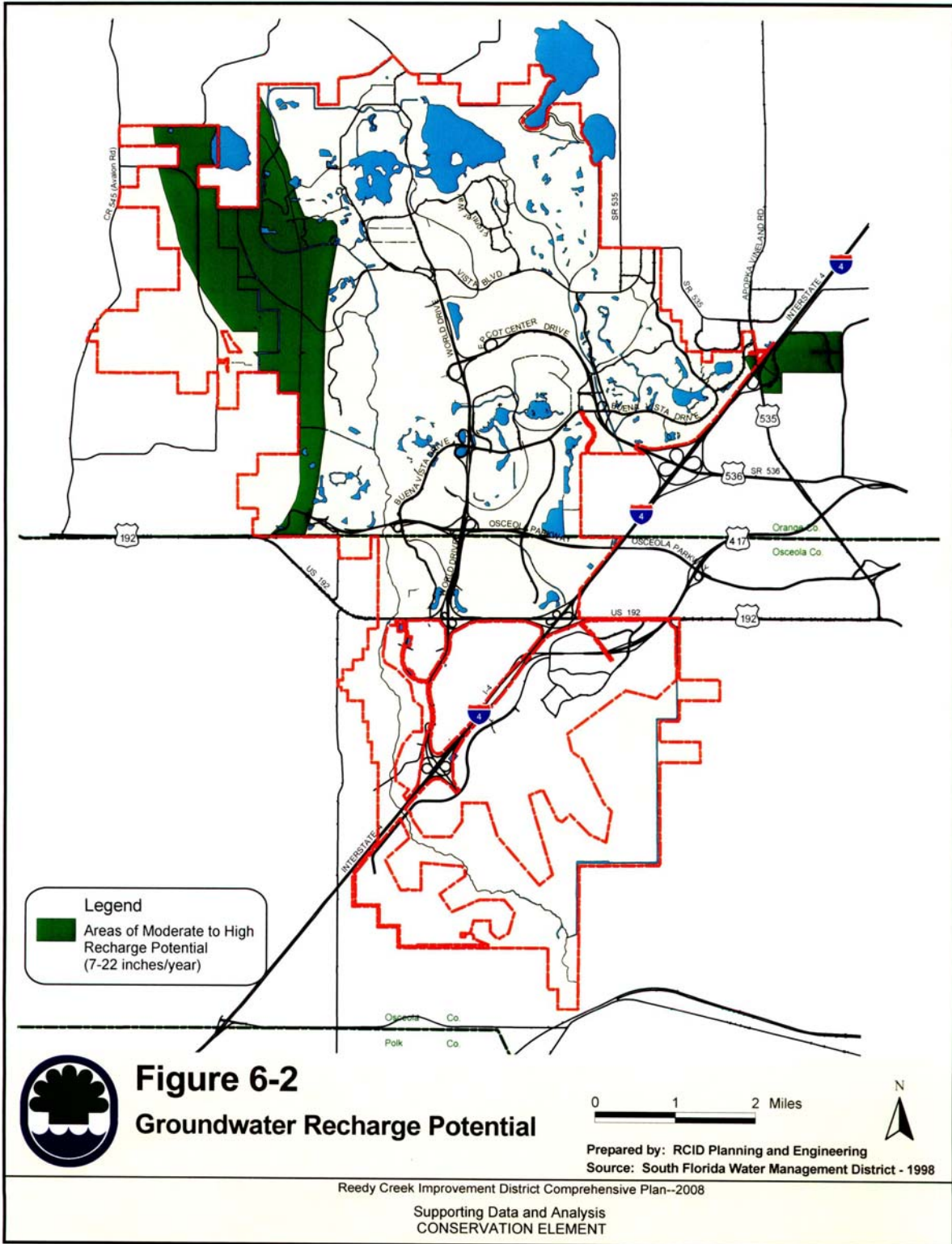
The potential for recharge is highest in the District's sandy, well-drained soils, which are concentrated in the area along Hartzog Road. This area contains the highest surface elevations in the District and has characteristics that allow surface water to percolate to the aquifer. The balance of the District, including the theme parks and resort areas, are dominated by poorly drained soils that have low recharge characteristics. Recharge areas must be sufficiently high in elevation so that surface water can infiltrate against its upward-tending groundwater pressure.

Stormwater retention facilities are also used to accomplish groundwater recharge. The District's entire system of water control structures is designed to retain and maintain shallow groundwater elevations similar to those that existed in pre-development times, but at the same time providing a conveyance and flood control mechanism. In 1991, the District completed 85 rapid infiltration basins on the western side of the District. The basins are located in the area identified on Figure 6-2 as having the highest recharge potential.

WITHDRAWAL CHARACTERISTICS

In Central Florida, groundwater withdrawal is regulated through consumptive use permits from the St. Johns or South Florida Water Management Districts. The RCID is permitted to withdraw up to 8.552 billion gallons a year, or 23.4 million gallons per average day. Actual withdrawal in 1997 was 6.015 billion gallons, or about 16.48 million gallons per average day. This represents about 70 percent of the permitted amount. Additional information on the District's wells and withdrawal patterns is contained in the Potable Water Subelement of the Comprehensive Plan.

As a result of rapid development, groundwater withdrawal has increased both in the District and in the surrounding region. In the RCID, annual consumption rose from 3.5 billion gallons in 1986 to about 5.0 billion gallons in 1990 and over 6 billion gallons in 1997. The rate of growth in groundwater withdrawal has slowed



As a result of the growing use of reclaimed water (treated effluent) for irrigation purposes. Nonetheless, continued rapid growth in the region will place increased pressure on the aquifer and could create problems where the rate of withdrawal exceeds the rate of recharge. The problem may be compounded by the increasing reliance of coastal Florida cities on inland water supplies because of saltwater intrusion into coastal well-fields. Brevard County is already importing water from well fields in Orange County. The combined effects of growth and saltwater intrusion make the need for water conservation programs especially important.

Although the District's groundwater has not experienced saline intrusion, there may be increased competition for that water as coastal communities turn inland for their water supplies.

The RCID has taken a number of proactive measures to reduce the rate of withdrawal and increase the rate of recharge. Implementation of the treated effluent reuse program, described in the Potable Water Subelement, has resulted in lower potable water requirements for new development and has reduced the rate of growth in groundwater withdrawal. A net reduction in groundwater withdrawal may be possible as the reclaimed water is extended into previously developed areas. At the same time, the rate of recharge has been augmented as a result of the rapid infiltration basins. The RCID basins are located in an area with high recharge potential and offer significant environmental benefits. Extensive hydrological and geological tests have been carried out to ensure that treated effluent is sufficiently filtered by the time it reaches the aquifer. Groundwater monitoring wells have been drilled in this area to ensure that aquifer water quality is maintained in the vicinity of the basins.

WATER QUALITY CONSIDERATIONS

Certain land uses and activities are potential sources of contamination and can pose a threat to groundwater under certain conditions. Industrial uses, such as manufacturing and processing plants, may use liquids and solids that can mix with water if not properly disposed of or contained. Percolation from retention ponds or borrow pits adjacent to these uses may transport diluted hazardous wastes to the aquifer. Similarly, absorption of pesticides in agricultural areas may result in groundwater contamination. Both kinds of risks can be minimized through sound land use planning and management guidelines defined by the U.S. Soil Conservation Service (Best Management Practices).

Groundwater problems have been rare in the Orlando metropolitan area, but increased urbanization creates potential new risks. The potential sources of groundwater pollution in the RCID, namely the construction landfill, underground storage tanks, septic tanks, hazardous waste holding areas, and industrial (support service) areas, are all managed in a manner that minimizes potential risks. The District's development has generally occurred in areas with low recharge potential. The semi-confining sedimentary formation between the surficial aquifer and Floridan Aquifer further reduces the potential for contamination.

As development continues in the District and the surrounding area, conservation of groundwater and protection of groundwater quality will remain an important priority of the RCID. The District has defined cones of influence around its wells and its land development regulations ensure that the activities that occur in these areas do not conflict with water quality objectives. All development except water pumping facilities, roads, and parking are prohibited within a 200-foot radius of potable water wells. Retention and detention ponds are prohibited within a 300-foot radius and septic tanks, landfills, hazardous materials, and wastewater plants/

sludge are prohibited within a 400-foot radius. Variances from these standards are only permitted if appropriate mitigation measures (such as underdrains and concrete berms) are implemented.

Groundwater quality will continue to be monitored at various locations around the District to guarantee the safety of the local drinking water supply and ensure that groundwater levels are maintained. Finally, the District's continued efforts toward improving surface water quality (through advanced wastewater treatment and retention ponds) will provide groundwater quality benefits because of the high transmissivity between surface water bodies and the aquifers.

SURFACE WATER AND WATER QUALITY

SURFACE WATER CHARACTERISTICS

The RCID lies in the northern tributary sub-basin of Reedy Creek, which is part of the Kissimmee River Drainage Basin. Major tributaries to Reedy Creek are Whittenhorse, Davenport, and Bonnet Creeks. Cypress Creek is a northern tributary to Bonnet Creek. Within the District, Bonnet Creek (C-1 Canal) and Reedy Creek are the major drainage basins (see Figure 6-3). These sub-basins collect stormwater runoff from the eastern and western portions of the District, respectively.

The Reedy Creek Basin is characterized by low, undulating hills; relatively flat uplands; wide, swampy valleys; man-made canals; and lakes. The lakes and swamps retain large quantities of runoff, overflowing across wide, shallow marshes during the normally wet summer months and other periods of heavy rainfall. The Bonnet Creek Basin is characterized by similar upland terrain, but has less water entering the wetlands and more diverted into canals. The Bonnet Creek system is controlled at several locations by man-made structures, whereas the Reedy Creek system uses natural characteristics of the existing riverine section south of the L-405 Canal to control flow.

Since 1967, drainage in the District has been improved with canals, levees, culverts, and automatic flow-control structures. Drainage is characterized by relatively slow runoff rates and a high proportion of storage in lakes, ponds, and wetlands. The stormwater storage capacity in the District includes a portion of the Conservation area located along Reedy Creek north and south of I-4. The RCID operates water-control structures intended to simulate the actual hydrologic conditions that would occur without these structures. Other surface water features in the District are listed in Table 6-2 and include Bay Lake, Seven Seas Lagoon, World Showcase Lagoon, Village Lake, Lake Buena Vista, Club Lake, and ponds and borrow pits. There are approximately 1,527 acres of surface waters in the RCID.

The water levels of the Magic Kingdom waterways, Bay Lake, Seven Seas Lagoon, Club Lake, Village Lake, and Lake Buena Vista are regulated by water-control structures. Bay Lake, which is connected to Seven Seas Lagoon, has controlled outlets to the headwaters of both Bonnet and Reedy Creeks. Lakes tributary to Bonnet Creek include South Lake, Lake Mabel, Village Lake, Club Lake, and Lake Buena Vista. An extensive canal network provides conveyance of excess flow from these lakes to both Reedy and Bonnet Creeks. Lake Buena

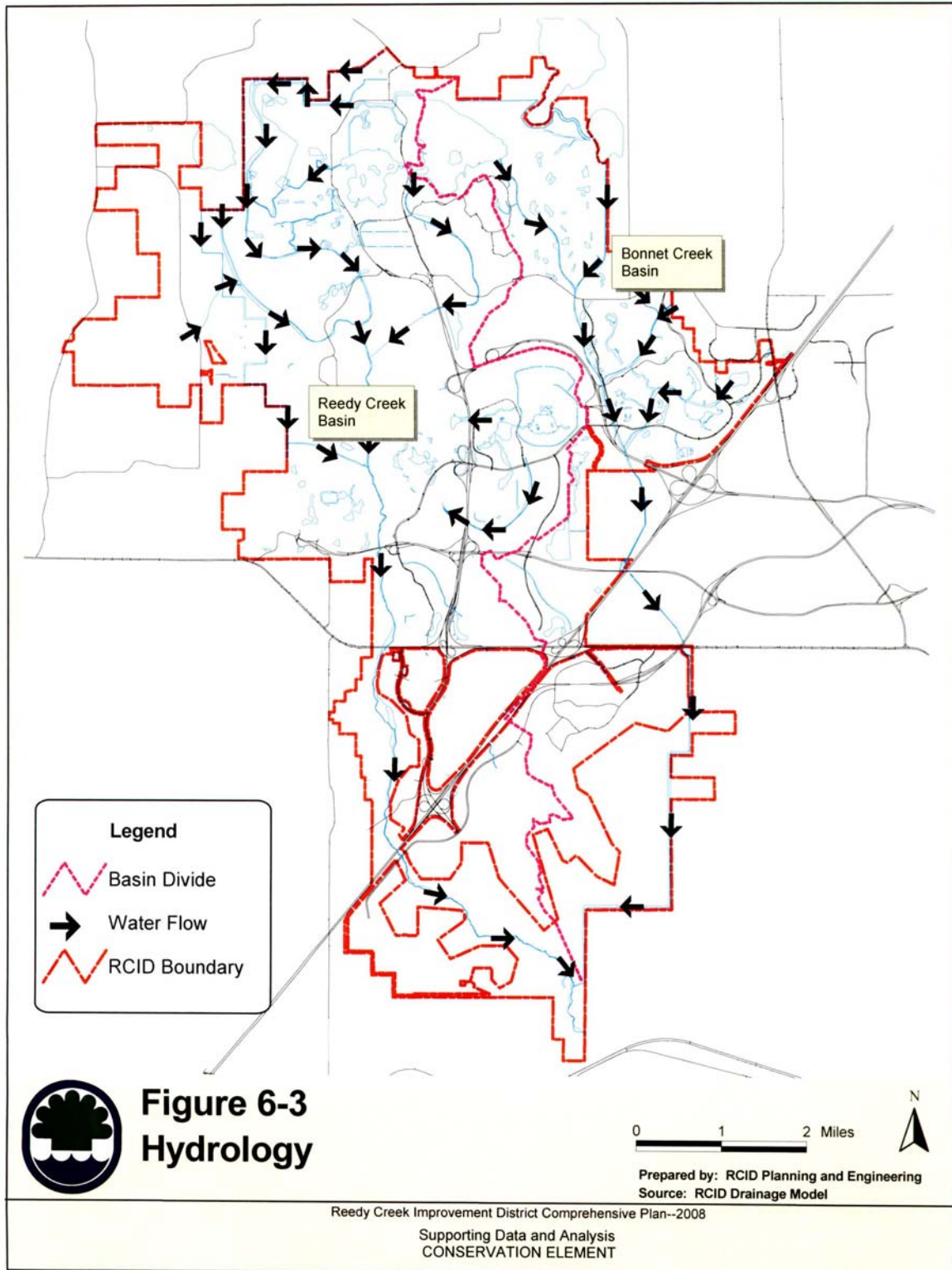


Table 6-2: Major RCID Surface Waters

Name	Surface Area (acres)	Surface Elevation
Bay Lake	406	94.5
Seven Seas Lagoon	185	94.5
World Showcase Lagoon	40	94.0
Village Lake	35	90.0
Lake Buena Vista	23	94.3
Club Lake	12	90.0
Magic Kingdom Waterways	12	94.0
Reedy Lake (part)	5	94.0
Canals, ponds, borrow pits, creeks, etc.	809	67.0-94.5
TOTAL	1,527	

Source: RCID Planning and Engineering, 1998

Vista supplies surplus water to Club and Village Lakes. Lake Buena Vista is a natural lake with fluctuations in water level dependent on rainfall, evapotranspiration, and groundwater inflow.

Reedy Creek's existing natural drainage systems require continued maintenance. Clearing and snagging of debris in streambeds, in lieu of channelization, is used wherever possible by the District to increase the flow rate. At the inception of the District, a reclamation plan was developed to maintain, as nearly as possible, natural ground and surface water levels within the framework of flood protection during periods of extreme rainfall. To accomplish this, a system of canals, water-control structures, and levees was designed in accordance with state laws governing water control plans.

The RCID Plan of Reclamation was approved in 1966, and a major portion of the improvements were constructed and in operation by 1971. The South Florida Water Management District periodically issues permits for the continued operation of water control facilities.

Previous studies by the RCID have documented the quantity and quality characteristics of incoming surface water and the surface water discharged downstream, together with intensive investigations of shallow and deep water aquifers. Because these studies are expected to continue in the future, the District will be able to effectively plan its water related facilities to avoid or mitigate adverse impacts on the environment.

Furthermore, the reports provide valuable data relative to the effects of growth and development on water resources.

WATER QUALITY

The District maintains water quality in its surface waters to meet Class III (Recreational Use) standards. Most of the recreational lakes are of higher quality than the Class III criteria. The District has a state-of-the-art environmental laboratory, the staff of which regularly monitors surface water and groundwater quality conditions. The monitoring program for drinking water has been certified by the Florida Department of Environmental Protection. Monitoring is done by RCID's Environmental Services Department, in coordination with the Planning and Engineering Department. An annual report summarizing water quality data is submitted to the RCID Board of Supervisors.

Reedy Creek is sampled weekly for measurements of dissolved oxygen, Ph, total phosphorus, and total nitrogen. Heavy metals, pesticides, and herbicide conditions are sampled semiannually at various location throughout the District. Macro-invertebrates are sampled quarterly in Reedy Creek and in other locations as needed.

As development occurs in the Reedy Creek drainage basin, the potential for surface water pollution increases. Water quality is affected by both point and nonpoint sources. Until the early 1990s, the principal point source in the District was the wastewater treatment facility, since that facility once discharged treated effluent into Reedy Creek and adjacent wetlands. The shift in wastewater effluent disposal from an Aoutfall≡ type system to rapid infiltration basins and effluent recycling, and the upgrade from secondary to tertiary treatment, have decreased nitrate concentrations in Reedy Creek and its wetlands. The principal nonpoint pollution source is stormwater runoff. Runoff impacts on surface waters are somewhat mitigated by the use of retention/detention ponds to capture and filter runoff adjacent to developed areas. The District continues to explore and implement new programs to reduce pollution of surface waters from urban runoff.

FLOOD PLAIN

The District conducts regular mapping of the 100-year flood plain in the Bonnet Creek and Reedy Creek drainage basins north of the S-40 control structure. A drainage model is used to simulate the impacts of a 100-year storm. The model is periodically updated to reflect increases in impervious surface coverage and changes to the drainage system.¹ Figure 6-4 indicates the boundaries of the flood plain as of 1997. These boundaries encompass 10,656 acres.

Growth management is particularly important in the flood plain to protect public safety and minimize potential property damage. Flood plain conservation also aids in maintaining the natural drainage system in the District and preserving ecologically sensitive areas that are periodically inundated. At the present time, the 100-year flood plain consists of portions of the Fort Wilderness campground and nearby golf courses, and large areas that are undeveloped and managed for conservation. These areas contain relatively few structural improvements.

¹ *A more detailed description of this analysis is found in the Drainage Subelement.*

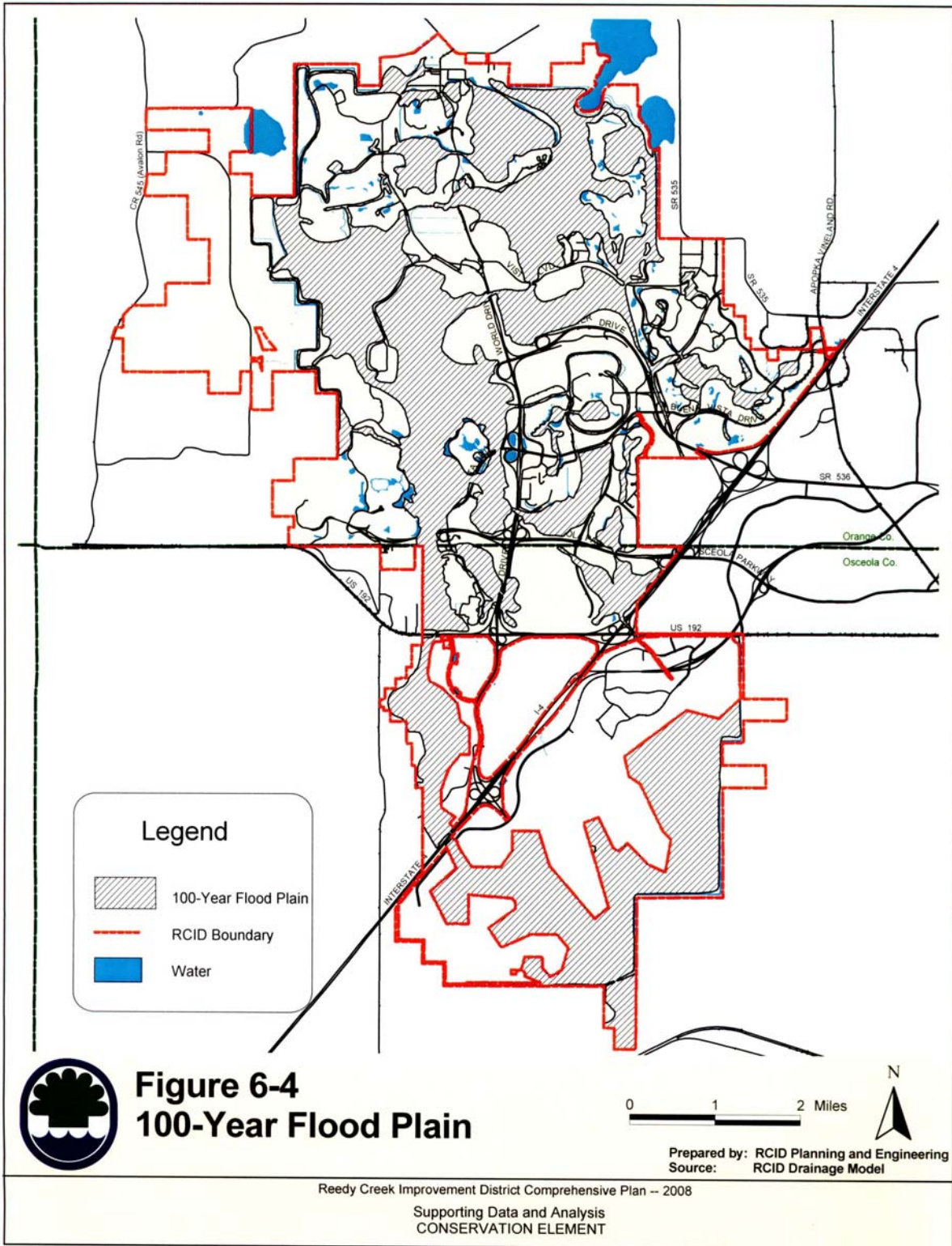


Table 6-3: Summary of RCID Water Resources

Rainfall Characteristics	Rainfall Amount (in inches)	Annual Water Yield (billions of gallons)
Annual Evapotranspiration	36.9	25.0
Runoff & Infiltration	10.5	7.1
Natural Groundwater Recharge	5.3	3.6
Annual Rainfall	52.7	35.7

NOTE: Formula for Yield: rainfall in feet x acreage x gallons per acre-foot.

SOURCE: Gee & Jenson, E.A.P., Inc., and Reedy Creek Energy Services, Inc., 1990, updated based on 1998 District boundaries

PRECIPITATION

The average annual rainfall in the District is 52.7 inches or 35.7 billion gallons of water. Approximately 36.9 inches of the total annual rainfall, or 25 billion gallons, is returned to the atmosphere through evaporation from land and water surface and through plant transpiration. Another 10.5 inches, or 7.1 billion gallons, of the annual rainfall is discharged through runoff into the District's streams and water control system. Generally, the remaining 5.3 inches (3.6 billion gallons) percolates into the soil to replenish the groundwater supply. Rainfall characteristics are summarized in Table 6-3.

GEOLOGY, SOILS, AND MINERALS

GEOLOGY

General surface elevations in the District vary from a minimum of 65 feet above sea level to a maximum of 135 feet above sea level (see Figure 5-7). From surface and subsurface samples, the geology appears to consist of approximately 20 to 60 feet of Pleistocene sands overlain on 40 to 90 feet of Miocene (Hawthorne Formation) fine sands, with occasional clay layers. The Pleistocene sands are fine or fine-to-medium grained and are somewhat silty or clayey. They may be overlain by organic materials at the surface. Along the west boundary of the District, there are sand dunes believed to be relic shoreline features from sea level fluctuations during the Pleistocene epoch.

SOILS

Soils with similar profiles constitute a soil series. All the soils of one series are similar in thickness, arrangement, and other important characteristics. Soils of one series may differ in texture of the surface layer

and in slope, or some other characteristic that affects use of the soil. On the basis of such differences, a soil series is divided into phases. The name of the soil phase indicates a feature that affects land use management, such as slope. This information can be used to evaluate sites for roads, buildings, and other structures, and to determine the suitability of the soils for agriculture, recreation, or industry, and groundwater recharge.

The general characteristics of soils in the District are described below. Figure 6-5 identifies the location of the major soil types.

Generalized Soil Types

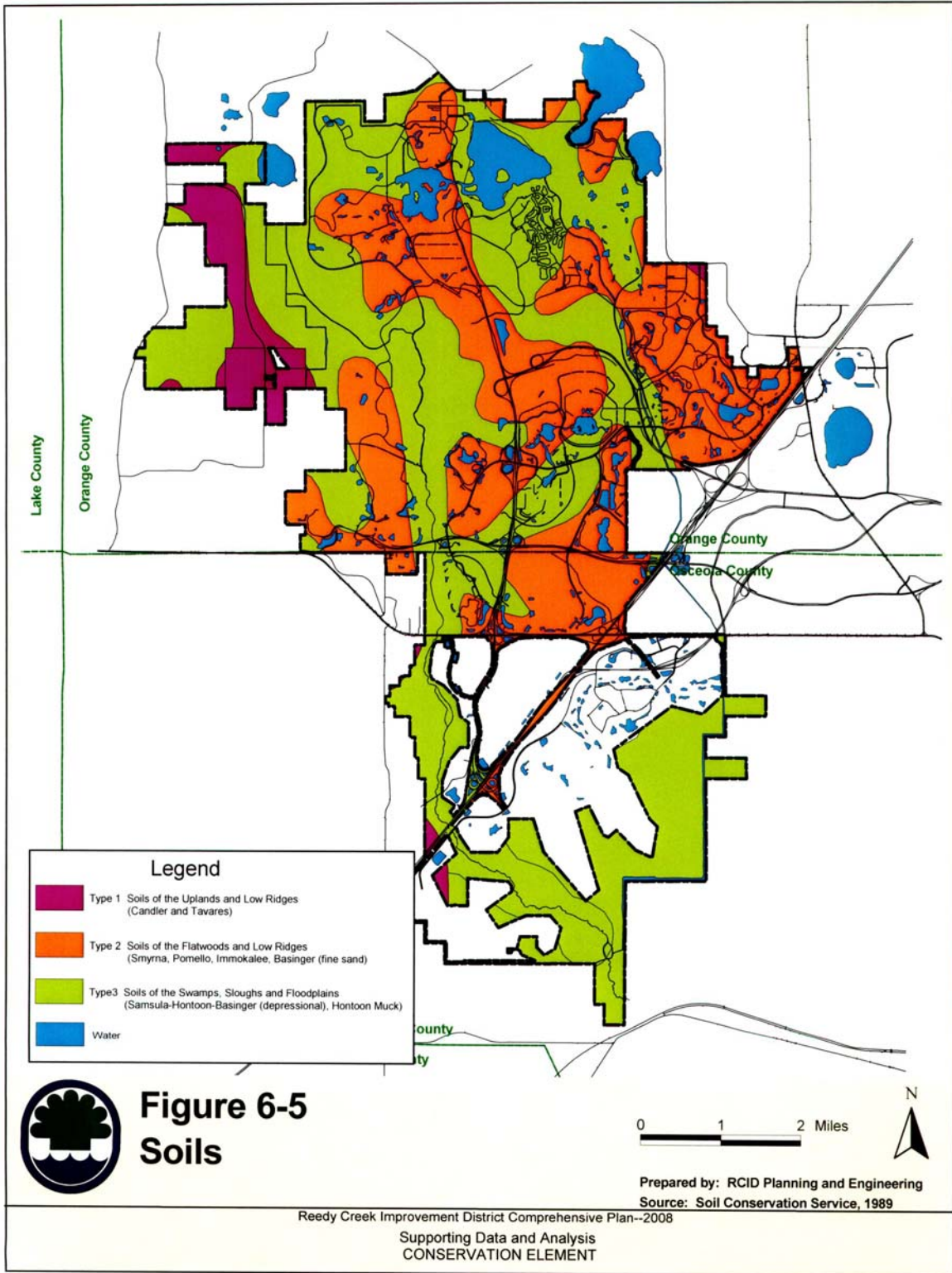
Soils of the Uplands and Low Ridges. This category includes the Candler and Tavares soil series found in the northwest part of the District. The soils are nearly level to gently sloping and are excessively drained. They are located on upland areas and are sandy and highly permeable throughout. A seasonal high water table is located at a depth of more than 80 inches. The soils are typically used for citrus crops or pasture. Candler soils require little or no corrective measures when developed. In the RCID, the Candler and Tavares soils have been developed with rapid infiltration basins.

Soils of the Flatwoods and Low Ridges. These are the predominant soil types in the urbanized portions of the District. They occur in broad flatwood areas interspersed with low ridges and knolls. Representative soils include the Smyrna, Pomello, Myakka, and Immokalee Series, as well as Basinger Fine Sand. These soils are nearly level and poor to moderately well drained. In many areas, the water table is close to the surface for several months of the year. The natural vegetation on these soils consists of longleaf and slash pine.

The upper layers of these soils are typically sandy. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Some of the soils are considered well suited for citrus crops and pasture. Due to the wetness of the soil and high water table, and the high sand content, these soils have a number of limitations for road and building construction. Water control measures and stabilization are typically required to accommodate urban development. Consequently, within developed areas, many of the soils in this association have been overcovered or mixed with other soil types through fill and earthmoving operations.

Soils of the Swamps, Sloughs, and Flood Plains. This category includes the Samsula, Hontoon, Floridana, Riviera, and Terra Ceia soil series, and Basinger depressional soils. Most of these soils correspond to freshwater swamps and marshes or low-lying flood plain areas. The soils are nearly level and are poorly to very poorly drained. The soils may be flooded for long periods after heavy rains and typically have a water table within 10 inches of the surface for more than half the year. The areas may be ponded for several months of the year.

Under natural conditions, these soils have many limitations for agricultural and urban uses. Flooding and wetness limit their suitability for urban uses, and major flood control facilities are typically required before these soils may be developed. In some locations, drainage improvements have altered the natural conditions on some of these soils and reduced some of the naturally occurring development constraints.



Classification System

The capabilities and limitations of soils are used as a planning guide in selecting desirable development sites or road corridors and as a basis for further investigations. In no way do the general classifications described in the Comprehensive Plan eliminate the need for on-site detailed studies and testings involved in the planning, design, and construction of a specific project. Soil limitations are classified as slight, moderate, severe, and very severe.

Drainage and Recharge

The drainage and recharge capabilities of each soil type in the District are described below. Soils with essentially the same characteristics have been grouped together to form the following four categories:

Excessive Drainage, Prime Recharge. These soils are excessively drained, with the water table usually five feet or more below the surface. Recharge of the Floridan Aquifer most likely occurs in these areas. The Candler and Tavares series (see Figure 6-5) fall in this category. Land uses that accommodate recharge and minimize risks to groundwater quality should be planned in these areas.

Moderate Drainage, Secondary Recharge. These soils are moderately drained, with the water table two to five feet below the surface. High water loss from evapotranspiration makes aquifer recharge somewhat less likely than in prime recharge areas.

Poor Drainage, Poor Recharge. The water table of the soils in this category is at or near the surface during much of the year. While surface sands are permeable, underlying confining beds have a high clay content, thus allowing only minimal aquifer recharge.

Very Poor Drainage/Swamp, Very Poor Recharge. These soils are inundated for much of the year. In many of these areas, no recharge to the Floridan Aquifer can occur under natural conditions.

Soil Erosion

Soil erosion is effectively managed and monitored by the District. Erosion by wind and surface runoff is reduced to a minimum through the use of: (1) Best Management Practices during construction; (2) a well-managed and maintained water control system; and (3) retention of natural vegetation in undeveloped areas.

During construction, exposed sites are watered frequently, natural windbreaks are left in place, and detention ponds are used to cleanse surface runoff prior to discharge off-site. Temporary outfall locations are protected with filter fabric fencing and hay bales.

The District policy of retaining land in its natural state prior to development greatly reduces wind and water erosion. The District water control plan requires maintenance of canals and, as conditions warrant, all canals are dredged to remove silt deposits. Canal slopes are also maintained through periodic reshaping and monthly mowing.

MINERAL DEPOSITS

The District contains an abundance of sand. Its degree of purity and consistency is of no commercial value other than as a source of fill dirt for construction and highway purposes. There are a number of excavation sites in the District where sand has been extracted for construction.

AIR QUALITY

The District does not currently monitor air quality. Orange County operates two sampling stations at which all federal air quality standards are monitored. The location nearest to the RCID is located in Winter Park, about 20 miles to the northeast. Carbon monoxide, nitrogen oxides, ozone, sulfur dioxide, PM₁₀, wind speed, and wind direction are measured at this location. More limited air pollution data is collected at other locations in the region. The closest location at which ozone is measured is the Kissimmee station, located about four miles from the Magic Kingdom.

A summary of 1996 data from the Winter Park station is shown in Table 6-4. Air quality readings in the Orlando area are well within federal standards. Ozone is the major pollutant of concern, although the federal standard of 0.120 ppm has never been exceeded. The highest reading during 1996 was 0.109 ppm.

Orange County also monitors an AAir Quality Index≅ daily at eight locations throughout the county. The Index includes a combination of the ozone measurement and the particulate matter measurement. An Index number of 50 to 100 indicates moderate air quality while an index of 0-50 is considered good. The historical data show that the Index is usually below 50 and did not rise above 70 on any day during the most recent year of record.

Table 6-4: Orange County Air Quality Measurements, 1996

Parameter	Standard	Measurement	1996 Average
Total Particulate Matter	50	Micrograms per cubic meter in 24 hr. period	20.0
Ozone	120	parts per billion in one hour	24.0
Carbon Monoxide	35	parts per million in one hour	0.75
Sulfur Dioxide	20	parts per billion in one hour	2.0
Nitrogen Dioxide	0.053	parts per million in one hour	0.013

SOURCE: 1996 Orange County Air Quality Summary

FLORA AND FAUNA

The natural vegetative communities of the RCID fall into two general categories: forested uplands and wetlands. The forested uplands consist primarily of coniferous forest, hardwood forest, and mixed forest. Wetland communities include forested wetlands, mixed wetlands, and marshland. The District's ecological communities are categorized according to the Florida Land Use and Cover Classification System.

PLANT COMMUNITIES

Forested Uplands

Forested uplands (shown in Figure 6-6) include the drier areas of the District. They have a tree-crown density of 10 percent or more and consist of trees capable of producing timber or other wood products. The following communities are represented:

Coniferous Forest. Any natural forest whose canopy is at least two-thirds dominated by coniferous species is classified as a Coniferous Forest.. At approximately 693 acres, this is the largest vegetative community of uplands in the District. It is primarily composed of pine flatwoods, slash pine, and upland pond pine.

- ∃ **Pine Flatwoods.** This plant community represents most of the District's coniferous forest acreage. It is dominated by longleaf pine on the drier sites and slash pine on the wetter ones. Typical understory includes saw palmetto, wiregrass, wax myrtle, fetterbush, and gallberry. Fire and water create major stress conditions; when they are non-existent, a successional move to hardwoods will result. This community has good wildlife values and is well suited to deer, raccoons, squirrel, quail, and many songbirds.
- ∃ **Slash Pine.** This is a transitional vegetative community including pine flatwoods with successional hardwoods in the understory. These occur in relatively small areas, mainly adjacent to wetlands. There are just over 200 acres of slash pine forest within the District.
- ∃ **Upland Pond Pine.** Upland pond pine communities are typically located on the fringes of wetlands. The pond pine is relatively fire resistant and is particularly successful in reestablishing itself after a fire. It occurs in association with sweetgum and pond cypress.
- X **Other Pine Communities.** Smaller areas within the District are vegetated with longleaf pine/ xeric oak, sand pine, and mixed pine forest.

Hardwood Forest. A hardwood forest has a dominant tree crown of hardwood species as a result of natural seeding. As shown in Figure 6-6, this area is primarily located north of Disney's Wide World of Sports and west of Animal Kingdom. Hardwood forest represents just over one percent of the District's naturally vegetated area. Xeric oak is the dominant community and is described below.

- X **Xeric Oak.** Generally located on well-drained upland sands, this forest area is dominated by xeric oak. Typical species are live oak and turkey oak. This is a relatively small community that occurs on low ridges within depressed topographical areas.
- ☐ **Other Hardwood Communities.** Other hardwoods in the District include upland hardwood forest, wax myrtle-willow, live oak, cabbage palm, and mixed hardwoods. These areas represent a combined total of less than 50 acres. Trees within these areas include holly, flowering dogwood, laurel oak, live oak, sweetgum, and willow. Understory vegetation includes American beautyberry, sparkleberry, wax myrtle, aster, greenbriar, wild grape, yellow jessamine, blackberry, and panicum. This type of vegetation makes a good habitat for deer, turkey, squirrels, raccoons, and many songbirds.

Mixed Forest. As shown on Figure 6-6, a few areas of mixed forest occur in the District. These areas consist of forested areas in which neither coniferous nor hardwood species dominate. Native vegetation includes turkey oak, live oak, longleaf pine, wiregrass, gallberries, and saw palmetto. The largest mixed forest areas are located on the edges of the Magnolia Golf Course.

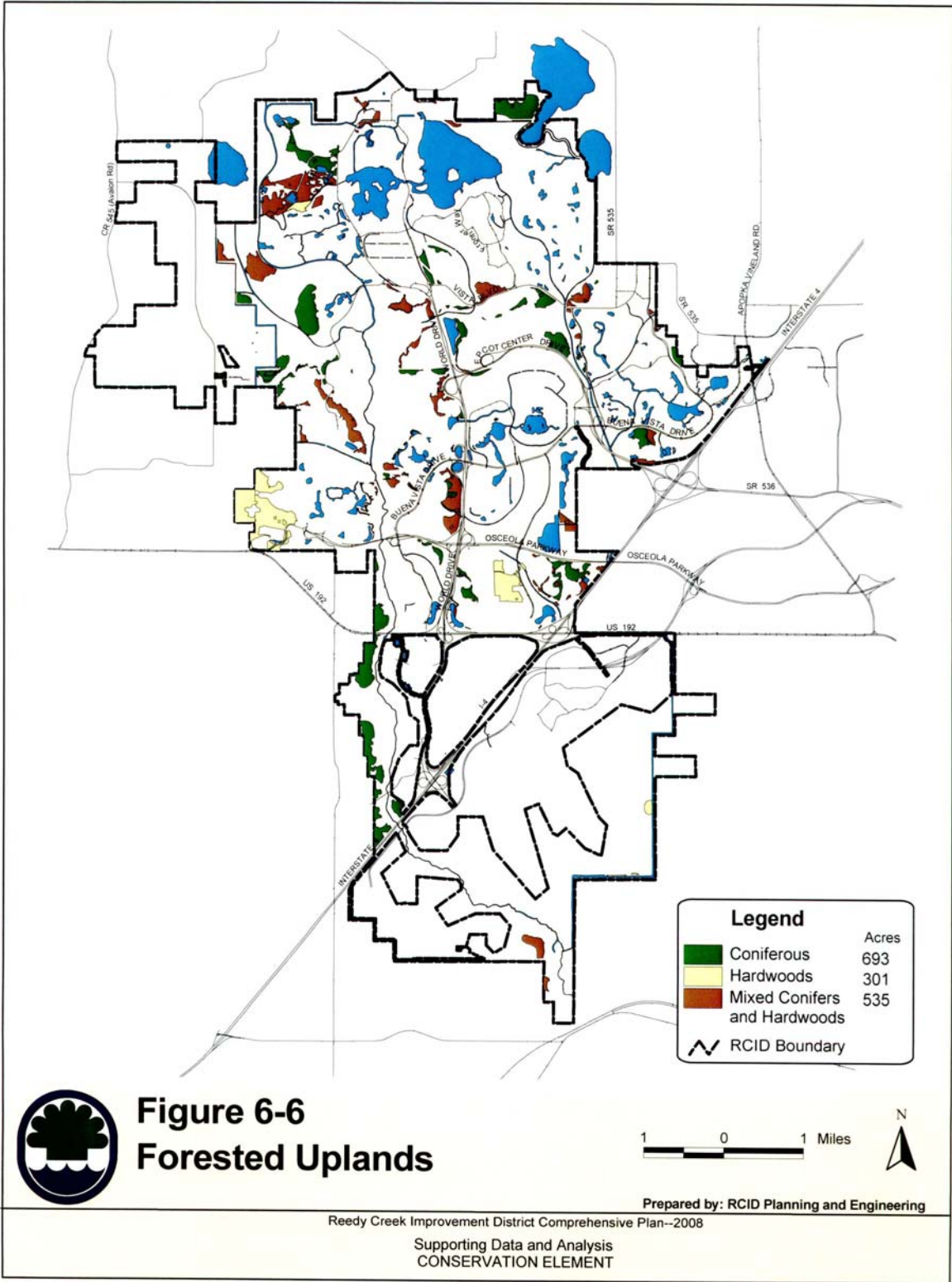
Wetlands

There are approximately 10,471 acres of wetlands in the RCID, representing 42 percent of the District's total area and more than 87 percent of its naturally vegetated areas. Wetlands are divided into three major categories; forested wetlands, mixed wetland, and marshland. Contiguous wetland areas of more than ten acres are shown on this Figure 6-1. Shallow areas of water with submerged vegetation are classified as water and not included in this category. At the current time, the FDEP has made binding jurisdictional determinations over 90 percent of the District's wetlands and has asserted dredge and fill jurisdiction over 10,600 acres, including canals, borrow pits, and other artificially created water bodies.

Within wetland areas, the water table is at, near, or above the land surface for significant portions of most years. Soils are very poorly drained and are high in organic and mineral content. The quality of wetlands within the District varies, with those located south of US 192 generally considered to have higher ecological value. Many of the northerly wetlands have been disturbed or partially disturbed as a result of drainage improvements and adjacent development. The RCID has raised water control elevations on some of the canals to restore impacted wetlands, but full restoration has proven to be difficult on a large scale basis.

Forested Wetlands. A forested wetland is any wetland with a significant component of woody vegetation. About 95 percent of all wetlands in the District fall into this category. Plant communities include cypress, pond pine, wetland hardwoods, bay swamps, shrub wetland, slash pine, stream and lake swamps, titi swamps, and wetland forested mixed.

- X **Cypress Wetlands, Pond Pine Wetlands, and Slash Pine Wetlands.** These three wetland types are found primarily in the Reedy Creek swamp south of US 192. A large cypress swamp is located within District boundaries to the east of Celebration. Typical plants in the cypress swamp are bald cypress, pond cypress, black gum, and maple. Understory plants include buttonbush, wax myrtle, cinnamon fern, greenbriar, and narrowleaf sawgrass. Pond pine dominates the small wetlands in the southern part of the District west of Reedy Creek, mostly on wet, flat land with low pH soils.



A narrow band of Slash Pine wetlands is located just north of EPCOT Center. The submerged and saturated condition of the soils of pine wetlands and the general absence of fires reduces competition from hardwoods and keeps the communities from successional change.

Coniferous wetlands are a valuable resource. They provide water storage areas by holding excess water and slowly releasing it into the water table. By absorbing nutrients from the water, cypress swamps enhance water quality. Fluctuation of the water table is needed for natural regeneration. Drastic changes in the water table or a stabilized water level may change the plant community. Important as a wildlife refuge area, these wetlands are well suited for waterfowl, wading birds, and aquatic animals. Permanent residents of cypress swamps may be relatively few; however, much of the wildlife of other ecosystems is dependent on these areas for breeding. The most common animals found are deer, raccoons, alligators, frogs, turtles, and water snakes. Many birds are found in this habitat, including anhinga, ibis, egrets, herons, and wood duck.

X **Shrub Wetland.** Shrub Wetlands are located to the south and east of Celebration, just south of the Cypress Swamp area. These wetlands are characterized by a predominance of evergreen shrubs such as sweet pepperbush, large gallberry, and wax myrtle. Pond pine and slash pine may also be present. Water levels are often high, although the surface of these wetland areas may dry during drought periods. An abundance of fruits and shrubs attracts many birds and mammals.

☐ **Wetland Hardwoods.** Areas of wetland hardwood forest occur west of Animal Kingdom, south of Blizzard Beach, and east of Celebration. As a result of natural seeding, hardwoods dominate the crown closure. Characteristic vegetation includes red maple, pond cypress, black gum, bald cypress, water hickory, and willows. Buttonbush, dahoon holly, cinnamon fern, royal fern, and lyonia are typical understory plants. Wildlife in these areas are adapted to wet conditions. Periodic flooding is essential to maintain this system. Hardwood areas are of great value for wildlife and for maintaining good water quality. The community is highly sensitive to changes in the water cycle and will change if the water table is lowered. These areas improve water quality and act as natural storage areas for floodwaters.

A large variety of wildlife is found in the wetland hardwood community. Typical wildlife includes squirrel, raccoon, otter, wood duck, owls, warblers, woodpeckers, and Carolina wren. Undisturbed areas provide good travel routes for all forms of wildlife.

X **Bay Swamps, Stream and Lake Swamps, and Titi Swamps.** These three wetland communities are actually subsets of the wetland hardwood community. Bay swamps are so named because bay trees such as loblolly bay, swamp bay, and sweetbay predominate. Bay swamps are dominated by evergreen trees and shrubs and typically occur in depressions. Soils are kept moist by seepage from adjacent uplands, providing a refuge for plants and animals and providing highly organic soil often overlain by peat. Such areas are located to the north and east of Bay Lake, northwest of the Magic Kingdom, and in the Reedy Creek Swamp south of Celebration. Titi swamps are a variety of Bay swamps dominated by titi (an evergreen shrub) but sometimes also containing slash pine or pond pine.

A small Titi swamp is located southwest of Animal Kingdom. Both Bay and Titi swamps have a dense understory of shrubs. Stream and lake swamps are located along the bottomlands of streams and are characterized by hardwoods like tupelo, water ash, red maple, and sweetgum. These trees are essential to the swamp ecosystem, providing food and shelter for a variety of animals. A Stream and Lake Swamp area is located along both sides of Reedy Creek between US 192 and I-4.

- X **Wetland Forested Mixed.** This is the largest plant community in the District and the predominant wetland plant community. It includes most of the Reedy Creek flood plain as well as extensive areas north of EPCOT, west of the Magic Kingdom, southeast of Disney/MGM Studios, west of Hartzog Road, and around the Eagle Pines Golf Course. The community includes a mix of hardwoods and conifers; however, neither the hardwoods or conifers achieve the two-thirds crown dominance in these areas. The area contains broadleaf deciduous and evergreen trees, needle-leaf trees, and a variety of plants adapted for flood plain conditions. These areas are richly endowed with animal life to match their plant species diversity.

Marshlands. A very small number of fresh water marshes and wet prairies occurs in the District. These are vegetated, but non-forested, wetlands. Usually confined to level areas, uniform identification of this category is difficult because long-term drought or high rainfall can change the wetland area. The largest freshwater marsh is located west of World Drive north of EPCOT Center Drive.

Sawgrass, cattail, and wet prairie species are the predominant vegetation of a freshwater marsh. They appear as open expanses of grasses, sedges, and other herbaceous plants, such as blue flag, pickerelweed, and pennywort.

Marshes are excellent habitats for many wildlife species, including a variety of birds and waterfowl. Animals common to the area are otter, raccoon, marsh rabbit, deer, salamander, frogs, turtles, snakes, alligator, herons, egrets, ibis, limpkins, and hawks. Serving as a filter system, marshes protect rivers and lakes from eutrophication and retain water during drought. As a community, they become highly endangered as variations in water patterns change the plant diversity and productivity.

Wetlands Management

Long Term Permits. Due to the sensitive nature of wetlands and their important ecological functions, wetland alterations are subject to extensive regulatory controls. Permits from state and federal agencies are required before wetlands may be filled and extensive mitigation is mandatory. Mitigation may be undertaken on a project-by-project basis, or on a cumulative (or Abanked≡) basis according to a long range development and conservation plan. The latter approach is often more effective, as it results in large-scale wetland restoration rather than Apocket≡ wetlands being set aside or created on individual development sites. The latter approach requires issuance of ALong Term Permits≡ by several agencies.

In 1992, certain wetlands within the RCID (excluded from the acreage figure above and not mapped on Figure 6-1) were approved for impact and mitigation through Long Term Permits. The impacted wetlands were limited to those within future development sites outside the District's Conservation Area. They represented about six percent of the total wetland acreage in the District and were generally small areas with lower habitat value than the contiguous wetlands in the Reedy Creek flood plain.

The issuing agencies and permit numbers for the Long Term Permits are as follows:²

<u>Agency</u>	<u>Permit Number</u>
South Florida Water Management District	#48-00714-S
Florida Dept of Environmental Protection	#48, 49 & 532039239
Army Corps of Engineers	#199101901 (IP-GS)

Through the permits, the District and its major landowners agreed to extensive on-site and off-site mitigation to offset the impacts of development on 729 acres of on-site wetlands. On-site, the size of the Conservation Area was increased to 8,325 acres. A 410-acre wetland north of EPCOT Center that had been degraded by diversion of Bonnet Creek was restored by raising the water elevation several feet. Off-site, the District's major landowners acquired and are restoring the 8,480 acre Walker Ranch, located 13 miles south of the RCID in Osceola and Polk Counties. The ranch is within the Reedy Creek drainage basin and includes xeric, mesic, flatwood, hydric, and aquatic plant communities. Approximately 1,673 acres of wetlands and 912 acres of uplands on the site are being restored or enhanced.

The Long Term Permits also require that a number of practices and policies be adopted by the District to further protect wetlands from development impacts. These are included in the Future Land Use Element of this Plan and have also been codified in the Land Development Regulations. A two-tiered system was set up to classify wetlands. A Class I wetlands,≡ generally those with the highest ecological value, include those wetlands which are within the District's Conservation Area, covered by conservation easements, or which provide habitat for protected species. All other wetlands are defined as A Class II.≡ Figure 6-1 identifies the location of Class I and II wetlands.

The District's policies and development regulations further require that wetlands are protected by an undisturbed upland buffer at least 15 feet wide (and averaging 25 feet wide), and that adjacent development not adversely affect either the wetland or the buffer. Development is not permitted in Class I wetlands. Class II wetlands may be used for passive recreation (i.e., trails) and, in special circumstances, for access and utility corridors. The loss of wetland acreage is strongly discouraged and must be mitigated according to the policies set forth in the Land Use Element and Land Development Regulations. The Land Use Element may be consulted for further detail on mitigation requirements.

² In 1995, the wetland regulatory programs of the FDEP were combined with those of the SFWMD into one program called the Environmental Resource Permit (ERP). The ERP combines the wetland impact review criteria of the FDEP with the surface and stormwater management regulations of the SFWMD. The District must still notify FDEP and SFWMD when an on-site wetland is impacted. However, due to the Walker Ranch mitigation program, a permit is not required for wetland fill. The District's 1992 Corps of Engineers and FDEP permit has a 20-year lifespan; the SFWMD permit has a two-year lifespan and automatically rolls over at the end of each period.

RCID Review of Wetland Mitigation in the Deannexed Little Lake Bryan Area. A 300-acre area in the southeast quadrant of I-4 and SR 535 known as Little Lake Bryan was deannexed from the RCID to Orange County in 1992. The area is being developed as a mixed use planned community. An interlocal joint planning agreement was executed on May 14, 1993 between the RCID, Orange County and the Little Lake Bryan Development Company. The area is subject to the RCID operational permit approved and permitted by the South Florida Water Management District (SFWMD), Permit #48-00009-5.

RCID has a continuing interest and responsibility with respect to the upland and wetland impacts, buffer requirements, and wetland mitigation associated with development activity on the property, even though it has been deannexed. The RCID has an interest in assuring that development activity on the property does not have an adverse effect or consequence on the conceptual surface water management and dredge and fill permits obtained or their corresponding mitigation plans.

The joint planning agreement sets forth that subsequent to the deannexation of Little Lake Bryan from RCID, no development permits or approvals for the area may be issued by Orange County until and unless RCID approves the upland and wetland impacts, buffer requirements, and wetland mitigation conditions with respect to such proposed development activity. The agreement sets forth that the owner establish a covenant incorporating this condition (running with title to the property and enforceable by RCID) for any future development in the deannexed area.

RARE, ENDANGERED, AND THREATENED SPECIES

Since 1970, the RCID has conducted ongoing programs to inventory all plant and animal species within the District. More than 500 species of flora and nearly 300 species of fauna have been identified and/or observed. These species are listed in tables in appendices to this Plan. About 20 of the identified animal species have been identified as threatened, endangered, or species of special concern by the Florida Game and Freshwater Fish Commission or the U.S. Fish and Wildlife Service..

Table 6-1 (*located in the Policies component at the beginning of this element*) lists endangered or threatened species, and species of special concern observed in the District. A **Endangered** ≡ refers to a species that is, or soon may be, in immediate danger of extinction unless the species or its habitat is fully protected and managed. A **Threatened** ≡ refers to a species that is very likely to become endangered in the near future unless its habitat is fully protected and managed. A **Species of special concern** ≡ is one that warrants special protection because: 1) due to pending degradation or human disturbance, it may become threatened unless protective management strategies are employed; 2) it cannot be classified as threatened until its status is more fully understood; 3) it occupies such an essential ecological position that its decline might adversely affect associated species; or 4) it has not sufficiently recovered from a past decline.

The mix of wetlands, uplands, pine flatwood, and xeric oak habitats creates high quality habitat in much of the RCID. Most of the wetland communities, and some of the forested uplands, have been designated for non-development uses to ensure that they continue to function as viable wildlife habitat. The bald eagle, Florida scrub jay, and gopher tortoise are among the species of greatest concern in these areas. Wood storks,

sandhill cranes, egrets, herons, and limpkins are also sighted with some frequency in the wetland areas, as are alligators. Black bears are very rare, and the Florida panther is believed to be no longer present in the vicinity.

A bald eagle nesting area exists within District boundaries in the Reedy Creek swamp southeast of Celebration. Detailed surveys conducted in 1998 confirmed the location of two bald eagle nests, including one in active use and one which was maintained but not occupied. Both nests are in the Conservation Area and are more than 1,500 feet from the edge of Celebration. The eagle is most vulnerable to disturbance early in the nesting period, October 1 through mid-May. Disturbance during this critical period may lead to nest abandonment and death of the young. Human activity near a nest at any time can cause premature development of the young, often resulting in their death.

The District maintains a 750-foot primary protection zone around the bald eagle nest and a 750-foot secondary protection zone beyond the primary zone. No development activity, including tree cutting, logging, construction, or mining is permitted in the primary zone. The use of toxic chemicals in this zone is prohibited and human entry and aircraft entry is prohibited during the breeding season. In the secondary zone, strict limitations on construction apply and several land uses are prohibited. Although future construction in the secondary zone around the two existing nests is unlikely since the nests are well within the Conservation Area, the requirements would apply in the event that nests are discovered closer to the perimeter of the Conservation Area in the future. An existing interlocal agreement with Osceola County ensures that the County would also maintain these zones in the event an eagle's nest was discovered near the District perimeter. These protection zones will no longer be required if the bald eagle is deemed fully recovered as a species and is removed from state and federal threatened species lists.

A family of threatened scrub jays was relocated from the District to the Archibold Biological Station in the early 1990s. Although no other scrub jays have been observed within the District, suitable habitat is present. The District continues to require pre-development wildlife surveys and will require consultation with the Florida Game and Freshwater Fish Commission regarding appropriate mitigation measures in the event that proposed development may impact a scrub jay nest.

Several areas within District boundaries provide suitable habitat for the gopher tortoise. However, the District is permitted to remove gopher tortoises under a 1991 ~~Atake~~ permit issued by the Florida Game and Fresh Water Fish Commission. Mitigation for habitat loss is being provided through the Walker Ranch habitat restoration program described above. As a matter of course, the District continues to relocate gopher tortoises to suitable habitat when they are encountered on new development sites. The tortoise is typically found in pine flatwoods, xeric oak, and abandoned pasture land.

There are also 29 threatened plant species within the RCID. Although plants are not protected from development impacts by state or federal law, the District and its major landowners routinely conduct botanical surveys and encourage site plans and construction practices which minimize harmful impacts. To this end, the District is currently engaged in a number of plant conservation projects. These include:

- X restoration of an old orange grove (in the vicinity of the rapid infiltration basins) to its original sand hill ecosystem;

- X a propagation and establishment program for the scrub lupine, a critically endangered plant, on the sand hill restoration site; and
- X micropropagation of selected threatened and endangered plants, including the scrub plum, scrub lupine, Britton's bear grass, Paper-like nailwort, and Carter's mustard.

Note: Hazardous waste is covered in the Solid Waste Subelement of this Plan.