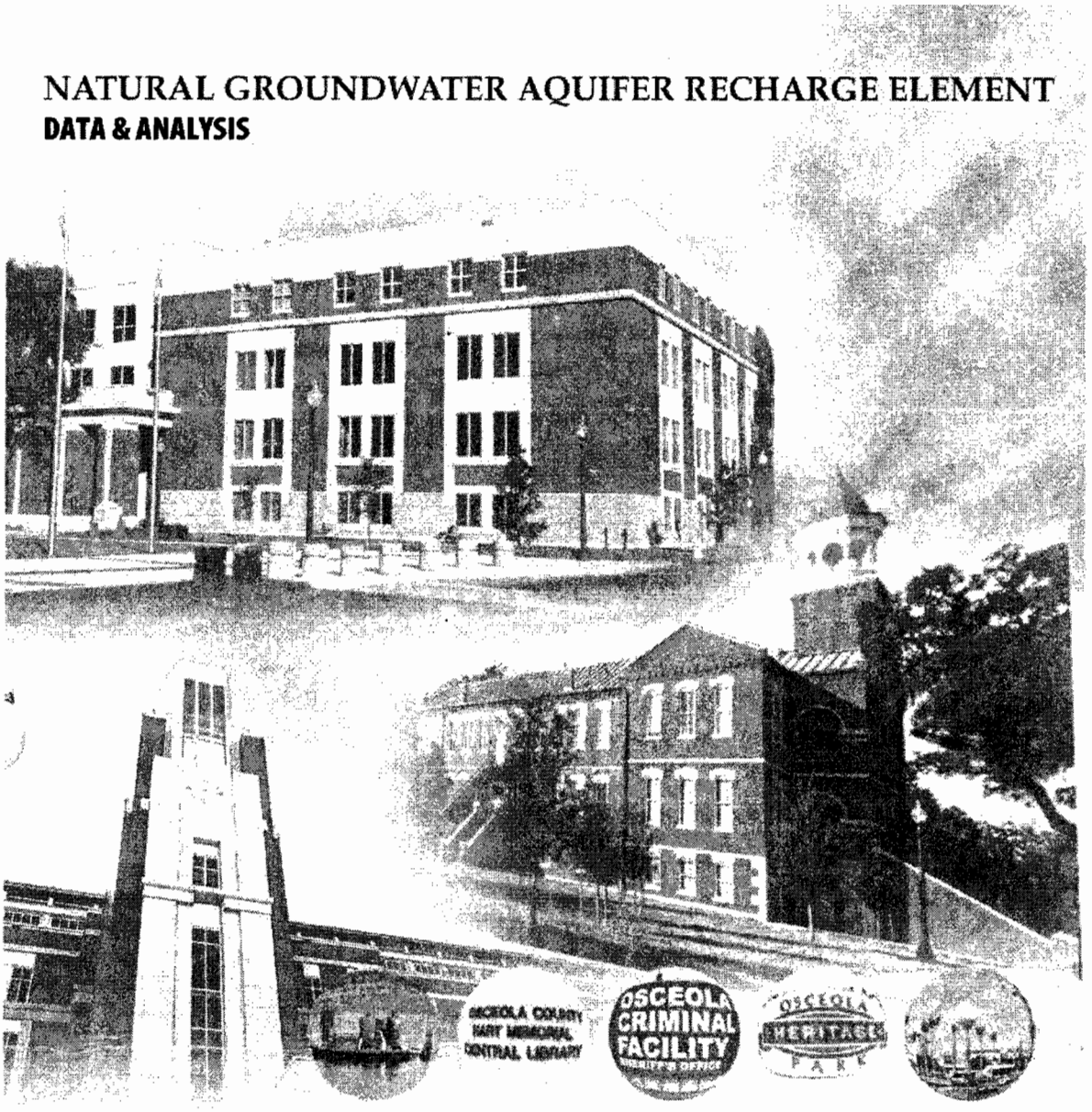
Osceola County Comprehensive Plan

Natural Groundwater Aquifer Recharge Element
Data & Analysis

NATURAL GROUNDWATER AQUIFER RECHARGE ELEMENT

DATA & ANALYSIS



OSCEOLA COUNTY COMPREHENSIVE PLAN 2025

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CHAPTER EIGHT

NATURAL GROUNDWATER AQUIFER RECHARGE ELEMENT
(Section 163.3177(6)(c), F.S. & Rule 9J-5.011, F.A.C)

A. INTRODUCTION

The protection of recharge areas is critical in locations that rely on aquifers as the sole source of drinking water. Well-drained areas are often subject to alteration by development since these areas are typically prime land for development. Impervious surfaces such as roads, roofs, and parking areas also reduce the area available for percolation, which reduces the quantity of natural recharge into the aquifer. In addition, water recharged into the aquifer may be compromised by the quality of the water that infiltrates into the aquifer. Furthermore, groundwater absorbs contaminants and may transmit them to the aquifer, which may impact water resources used to provide drinking water resources. Solid waste and hazardous waste facilities, underground storage tanks, and septic tanks all have the potential to contaminate the County's groundwater supply.

This element is intended to provide Osceola County with guidelines to protect the quantity and quality of natural groundwater recharges the aquifer. Additional assessment of the quality of the water for drinking purposes is addressed in the Potable Water Element, and the Conservation Element establishes policies to protect natural resources, including recharge areas and water resources. In addition, the Stormwater Management Element evaluates current water quality standards that may affect aquifers, groundwater resources, and surface waters.

1. Regulatory Requirements

Regulations have been enacted to protect existing groundwater resources and to prevent the negative impacts associated with excessive groundwater consumption. Extreme lowering of aquifer levels and surface water flows may adversely impact ecosystems by lowering lake levels and degrading wetlands and other natural systems and habitats. Other related negative impacts may include sinkhole formation. The following is a brief summary of the regulatory requirements that protect aquifer recharge areas:

a. Federal

The Safe Drinking Water Act was enacted in 1979 to ensure safe public drinking water and to protect underground sources of drinking water from contamination by well injection of fluids. The U.S. Environmental Protection Agency (EPA) is responsible for administering the Act and for implementing its various provisions, including the promulgation of drinking water standards.

In 1986, the Federal Safe Drinking Water Act was amended to strengthen the Act's provisions for protecting groundwater. Specifically, the amendments for wellfield protection require the state to work with local governments to map wellhead protection areas and develop land use controls that will provide protection from contamination for these areas. Under the aquifer protection amendments, local and state governments are required to map significant aquifer protection areas based on EPA criteria and to develop and implement EPA approved protection plans.

b. State

Florida Department of Environmental Protection (FDEP) has the responsibility for establishing and enforcing water quality standards for water supplies in the State. In implementing the Florida Safe Drinking Water Act (Chapter 403, F.S.), the FDEP has developed rules classifying aquifers and regulating their use (Chapter 17-22, F.A.C.). FDEP has also established guidelines for facilities which discharge to surface waters (Chapter17-4.245, F.A.C.) and which inject materials directly into the groundwater (Chapter 17-28, F.A.C.). Groundwater within the State of Florida has been classified into four categories in Chapter 62 of the Florida Administrative Code. These classifications and their designated uses are as follows:

- CLASS G-I: Potable water use, groundwater in single-source aquifers that have a total dissolved solids content of less than 3,000 mg/l.

- CLASS G-II: Potable water use, groundwater in aquifers that have a total dissolved solids content of less than 10,000 mg/l unless otherwise classified by the Environmental Regulation Commission.

- CLASS G-III: Non-potable water use, groundwater in unconfined aquifers which has a total dissolved solids content of 10,000 mg/l or greater, or which has total dissolved solids of 3,000-10,000 mg/l and either has been reclassified by the Commission as having no reasonable potential as a future source of drinking water, or has been designated by the Department as an exempted aquifer pursuant to Section 62-28.13(3), F.A.C.

- CLASS G-IV: Non-potable water use, groundwater in confined aquifers that have a total dissolved solids content of 10,000 mg/l or greater.

Overall, the potable water provided by the public wells within Osceola County is of good quality and requires minimal treatment for public use. Treatment typically consists of aeration and chlorination. Additional details of the groundwater

treatment processes required for potable consumption is provided in the Potable Water Element.

The five water management districts within Florida have been charged with the task of identifying the nature and extent of groundwater resources. There are two water management districts within Osceola County including, the South Florida Water Management District (SFWMD and the St. Johns River Water Management District. A water management district designates areas that are Priority Water Resource Caution Areas (PWRCA) and Restricted Allocation Areas (RAA). No Restricted Allocation Areas have been identified within Osceola County. However, a PWRCA designation, which is based on projected groundwater consumption through the year 2020, has been placed over a portion of northeast Osceola County within the SJRWMD area (see Map 8-1). This area is a portion of a larger PWRCA area within the SJRWMD that covers southern Lake County, eastern Orange, Seminole, and central Brevard County. The PWRCA designation is based upon the projected impacts of increased groundwater consumption through the year 2020. According to the U.S. Geological Survey Water Resources Investigations Report 96-4181, the Floridan aquifer has experienced decreases in water depths (in feet), based on comparing current and predevelopment conditions. Thus, according to the information in this report, continued development in Osceola County may contribute to the decrease in the depth of the Floridan aquifer. In addition, population growth in the County increases pumping from the Floridan aquifer, which impacts long-term water levels.

In addition to identifying the nature and extent of groundwater resources, the five water management districts implement regulatory programs for managing the water resources of the state. The water management districts regulate and manage groundwater with consumptive use permits (CUPs) for public potable water supplies, industry, and golf course irrigation and dewatering for mining operations. In Osceola County, a CUP is required for average daily withdrawals of at least 100,000 gallons per day (GPD). The water management districts also regulate and issue well construction permits for water wells that are at least six inches in diameter.

The water management districts have also developed water use restrictions for the conservation of water during times of water shortages. Water shortages are defined by degree of severity using criteria such as monthly rainfall and water levels in monitoring wells. The districts enforce a phased water use restriction plan that regulates the consumptive use according to the severity of the shortage. One of the objectives of the Water Shortage Plan is to encourage the reuse of reclaimed water. Reclaimed water systems, such as those delivering treated water in the Cities of Kissimmee and St. Cloud, allow customers to irrigate as needed even in times of water use restrictions. The Water Shortage Plan as specified by the SJRWMD and the SFWMD is the following:

Reduction in Overall Demand Water Shortage Phase

		SJRWMD	SFWMD
I	Moderate Water Shortage	15%	20%
II	Severe Water Shortage	30%	35%
II	Extreme Water Shortage	45%	45%
IV	Critical Water Shortage	60%	N/A

In addition to FDEP state rules, the Florida Legislature has also directed local governments to provide for the protection of aquifer recharge areas in their comprehensive plans, Rule 9J-5.011, F.A.C., requires local governments to map recharge areas and requires policy language in comprehensive plans that protect these areas.

c. Local

Osceola County currently has on-site stormwater retention requirements, which are relevant to aquifer recharge. The County requires development within the prime and high aquifer recharge area, and in all parts of the county, to provide on-site stormwater retention/detention ponds for increased filtration of stormwater runoff into the aquifer.

Water quality is an indicator for assessing the effectiveness of the water resource protection laws. According to the Florida Department of Environmental Protection ("Integrated Water Quality Assessment for Florida: 2004 305(b) Report and 303(d) List Update"): "Ground water quality across the state is remarkably good, considering the state's high population and vulnerable geology, which allows close interactions between surface water and ground water. Water quality is especially good in the Floridian aquifer, which is the major source of drinking water for all but the westernmost and southernmost parts of the state."

Existing water quality programs are assumed to provide sufficient protection for the water quality in this area. Osceola County continues to monitor updates produced by the Florida Department of Environmental Protection (FDEP) Site Investigation Section (SIS). The SIS conducts environmental assessments throughout the State of Florida. These assessments are used to determine the condition of Florida's fragile environment, especially the ground water resources. Currently, only one site in Osceola County is on the list. This site is located off Southport Road and is not in a prime or high aquifer recharge area. The site is no longer active and SIS has completed their report.

B. AQUIFER RECHARGE INVENTORY

Groundwater recharge is the hydrogeologic process by which aquifers are replenished. Recharge is when water infiltrates the land surface and flows into the groundwater aquifer and the recharge areas are the land surface in which the infiltration occurs. Due to geologic processes over time, a recharge area is not always directly above the aquifer it is recharging.

1. Hydrogeology

There are two major sources of groundwater in Osceola County: the Surficial Aquifer System and the Floridan Aquifer System, which are separated by a low-permeability confining layer, the Hawthorn Group, that restricts the vertical movement of water from one aquifer to another. The sections below identify the three hydrogeologic systems. A summary of the three hydrological systems is presented in Table 8-1.

a. Surficial Aquifer System

The Surficial Aquifer System varies in thickness throughout the County from approximately 25 feet near its northwestern limits to about 70 feet in the southeast. Water in this system occurs under unconfined and semi-confined conditions, with water levels fluctuating in response to rainfall, which is the principal means of recharge of the system. Other recharge occurs by seepage from lakes and streams, when the local water table is below the level of the lake or stream surface, as well as by upward leakage from the underlying Floridan Aquifer System. In northwest portions of the County the Surficial System lays directly over the Floridan System and recharge results where the latter's potentiometric surface is above the water table.

Discharge from the Surficial System occurs mainly through evapotranspiration, and through seepage to lakes, rivers and streams, as well as to the Floridan System and via well withdrawals and subterranean flows across the County Line. The Surficial Aquifer System yields adequate amounts of water for small demand domestic (residential), ranching and irrigation use. Seven different areas in the County are shown on Table 8-1 by sediment description and aquifer type, with yields from Areas 1 through 4 in the 15-30 gallons per minute (GPM) range. Local yields from Area 5 run as high as 300 GPM, while water from Area 6 is not suited for general use.

According to SFWMD, water quality of the Surficial System is generally good in all parts of the County, with Areas 1 and 5 rated as excellent, with low chloride and dissolved solids concentrations. Areas 2 and 3 may contain localized iron concentrations causing staining and treatment problems.

b. Intermediate Confining Unit (Hawthorn Group)

Due to its geologic/soils composition, this hydrogeolgic unit does not transmit water very readily. This unit retards downward percolation of water to the Floridan Aquifer, as well as upward movement of water from that unit by acting to confine it under pressure. The thickness of this layer varies from zero in the northwest corner of the County to over 250 feet in the northeast. However, wells tapping isolated water "lenses" within this formation may produce periodic high yields, though the intermittent nature of such a supply limits its importance as a groundwater source.

c. Floridan Aquifer System

The top of the Floridan System is located in the base beds of the Hawthorn Group, which are hydraulically connected to the underlying sub-units of the Ocala Group, Avon Park Limestone, and Lake City Limestone, forming the Floridan Aquifer. Transmissivities from this aquifer system in Osceola County vary from 50,000 to 1,000,000 GPD/ft. in the northern half of the County and 50,000 to 100,000 GPD/ft. in the southern part of the County.

The prime area of aquifer recharge to this system is located in the Lake Wales Ridge area in Polk County and adjacent areas of northwest Osceola County from which water moves eastward via subsurface flow (see Map 8-1). Recharge is most effective where surficial sediments are thin and permeable, the Hawthorne Group is thin or absent and the local water table is above the Floridan potentiometric surface. These conditions exist in the northwestern corner of the County where maximum aquifer recharge occurs. The recharge range in the prime area is considered as 8"-12" annually. The areas with "high" aquifer recharge are located immediately east of the prime recharge area and also further east in the County, just within the SJRWMD. The recharge range in the high areas is considered as 4"-8" annually. Moderate recharge areas generally experience less than 4" of recharge annually and are located primarily in the central portion of the County. Map 8-1 more clearly depicts the County's recharge areas, as defined by the SJRWMD and the SFWMD. Discharge areas mainly occur along both the eastern and western edges of the County, especially in the Kissimmee River Valley.

Water quality of the Floridan Aquifer varies through the County, with chloride concentrations highest in northeastern portions of the County. In the central and northwest areas water quality is good, with low concentrations of dissolved solids and chlorides. Small isolated agricultural areas in the extreme eastern portion of the County near Deer Park and south of Crabgrass Creek are considered to be of poor quality. In general, as depth increases, water in the system is more mineralized and of lower quality for potable consumption.

Contamination of the Floridan Aquifer System (FAS) is most likely to occur in areas of high aquifer recharge. This is primarily due to the thinness or lack of a

protective confining layer to separate the Floridan Aquifer from the Surficial Aquifer System (SAS). In these areas, contamination poses a threat to the FAS and the associated public water supplies that are drawn from it. In Osceola, the northwest section of the County represents the highest recharge areas. Currently this area of the County still has some agricultural and low-density use; however, this area has a high potential for development. The Westridge Area Study was created to address some of the ecological impacts of development in this area, including aquifer recharge. Strategic placement and clustering of densities has been a priority to protect the natural resources and the FAS in this area.

C. ANALYSIS OF CURRENT AND FUTURE CONDITIONS

The Floridan Aquifer System provides a supply of freshwater, amounting to approximately 90 percent of all groundwater used in the County, including the public water sources of the Toho Water Authority and the City of St. Cloud, as well as large citrus, ranching and industrial users. For smaller-scale consumers, low-to-moderate yields are provided by wells tapping the Surficial Aquifer System. The urban portions of the County, and areas of future development, are located in this area.

1. Groundwater Demand

The public water supply utilities in Osceola County, listed in Table 8-2, have a combined annual Floridan Aquifer withdrawal of approximately 24,000,000 GPD or 8,000,000,000 gallons per year. These facilities accounted for the majority of the potable groundwater withdrawn within Osceola County. The remainder of groundwater withdrawn for potable water consumption was from domestic wells, private commercial and industrial wells and other private utilities. The locations of the governmental and regional utility wellheads and cones of influence are presented in the Potable Water Element. It is anticipated that potable water demand will increase over the planning period in response to the continuing urban growth in the northern portion of the County. Conservation of groundwater supplies will be critical in maintaining the surface water flows and water levels within environmentally sensitive wetland habitats. In order to protect these groundwater resources of the County, all public water suppliers are required to submit water conservation plans that address the following items:

- Irrigation Hours Ordinance
- Xeriscape Landscape Ordinance
- Ultra-low volume Fixture Ordinance
- Rain Sensor Device Ordinance
- Water Conservation Based Rate Structure
- Leak Detection and Repair Program
- Reclaimed Water Feasibility Analysis
- Water Conservation Public Education Program

In addition to conservation efforts, the groundwater resources are protected by the implementation of wellhead protection regulations. The FDEP, in Chapter 62-521, FAC, requires that a 500-foot radial protection zone be established around all wellheads for public water supply. While this regulation protects the immediate areas surrounding a wellhead, it does not protect the contributing recharge areas. Restriction of the allowable land uses within the highest recharge area provides additional protection for these groundwater sources.

The SJRWMD and CH2M Hill, a consulting engineering firm, prepared the Water 2020 study, a regional analysis of the predicted water supply and demand requirements of the East Central Florida area. The study examined various alternatives to meeting the potable water demand for the year 2020 while protecting natural systems.

Osceola County fell into Work Group Area 1, which also included all of Orange and Seminole Counties, almost all of Lake County, and portions of Marion, Polk, and Sumter Counties. Table 8-3 details the estimated demands for the Osceola County area. Demand estimates for other areas within Work Group Area 1 are contained within the 2020 Study.

The study developed a set of six viable water supply alternatives that would meet the anticipated water demands for the area. The study included alternatives that assumed fresh ground water supply sources, brackish ground water, and surface water supply sources. Five of the six alternatives required significant amounts of surface water from the Kissimmee, St. Johns and Ocklawaha River basins to meet demands. Finally, the study concluded that water supply planning must proceed on a regional scale to meet future potable water demands.

2. Development Impacts

The most extreme alteration of recharge area has taken place in the northwestern portion of the County, with the exception of the extreme northwest where urban development has not fully occurred. The most significant problem in this area, identified in the 305b Water Quality Inventories and Sites List prepared by the FDEP, was localized contamination of the water table from a local landfill and animal clinic.

The extreme northwestern portion of the County has been identified by the SFWMD, U.S. Geological Survey, and the FDEP as having geological characteristics favorable to high aquifer recharge. Further, possibly as a result of a substantial portion of the area devoted to urban residential densities and tourist-oriented development activities, the water quality for the area is considered generally good and recharge surface areas have not been significantly altered at this time. The most significant challenge facing this area is its potential for development.

D. CONCLUSION

For the northwestern portion of the County, emphasis may be placed on identifying, mapping and managing areas with the greatest aquifer recharge potential. High recharge areas that have been identified by the Soil and Water Conservation District and the water management districts must be recognized as important natural resources. The County must endeavor to implement a GIS mapping database of the highest recharge areas to aid developers and reviewers in determining the impacts to development on the natural recharge characteristics of the land.

Management activities for the resources may include restricting land use activities known to cause groundwater contamination in recharge areas; demonstration by development that the land use activity will not negatively impact the aquifer; allowing for recharge of the aquifer through drainage structures and the re-use of treated effluent; and requiring water conservation practices. Additionally, the County may continue to participate in studies such as the Four Corners Area Public Service Study in an effort to provide the most efficient public services possible while minimizing impacts to the natural groundwater resources. Efforts to establish maximum percentages of impervious cover and minimum percentages of open space for new developments would aid in preserving the high recharge areas contained within this portion of the County. Future Land Use Element policies encouraging verticality and higher densities, while maintaining high percentages of open space, would also aid in this cause.

Table 8-1: Aquifer Systems within Osceola County and their Characteristics

Aquifer Name	Formation Name	Thickness (Feet)	General Lithology	Water Bearing Properties
Surficial	Marine Deposits	0-150	Quartz with clay and shell layers	Low to moderate
	Undifferentiated	0-100	Sand, shell, silty clay	Small yields
Intermediate	Hawthorn Group	0-250	Clay, silt, sand and limestone	Generally poor except for secondary aquifers
Floridan	Ocala Group	0-225	Limestone	Generally large
	Avon Park	150-700	Limestone, dolomite	Large locally
	Lake City	100-500	Limestone, dolomite and dolomitic limestone	Variable
	Oldsmar	+/-800	Hard dolomite gypsum anhydride	Increasingly mineralized

Source: Adapted from SFWMD, modified from Planert and Aucott, 1985

Table 8-2: Actual Water Use of Public Water Supply Providers in Osceola County

Utility	Actual Water Use (MGD)
Toho Water Authority	13.54
City of St. Cloud	2.21
Florida Water Services	2.27
Florida Government Utility Authority	1.74
Other	4.4

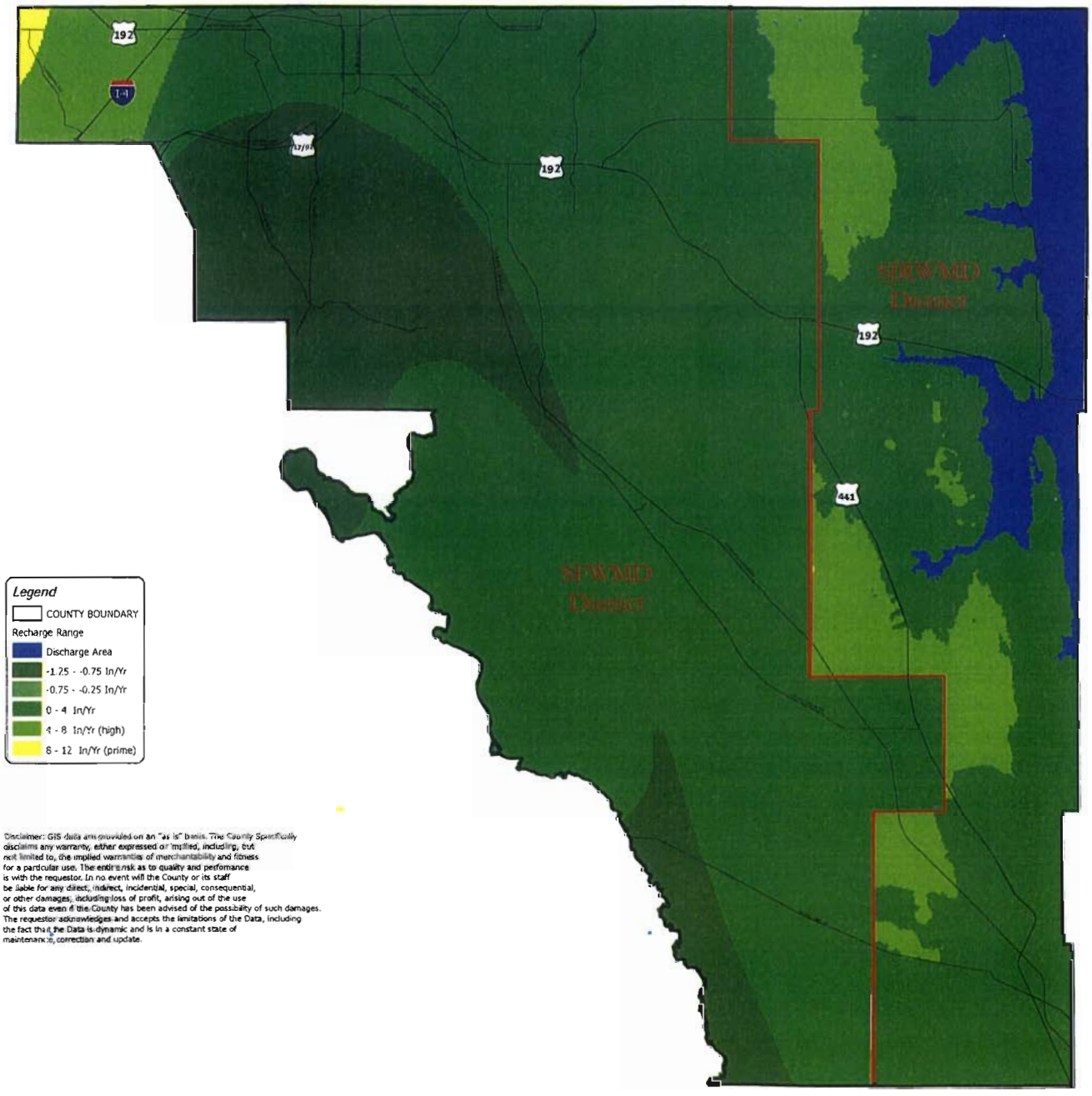
Source: Kissimmee Basin Water Supply Plan, April 2000

Table 8-3: Water Demand for 2020

Water Management District	Category	1995 Actual Water Use (MGD)	2020 Water Use (MGD)	Percentage Change
Osceola County				
SFWMD	Public Supply	21.20	38.87	83
	Agriculture	41.22	39.96	-3
	Commercial/Industrial	0.18	0.18	0
	Total	62.60	79.01	26
SJRWMD	Agriculture	1.73	1.69	-2
	Commercial/Industrial	0.04	0.04	0
	Total	1.77	1.73	-2
SWFWMD	Agriculture	0.24	0.23	-4

Source: Water 2020 Study, SJRWMD & CH2M Hill

Aquifer Recharge



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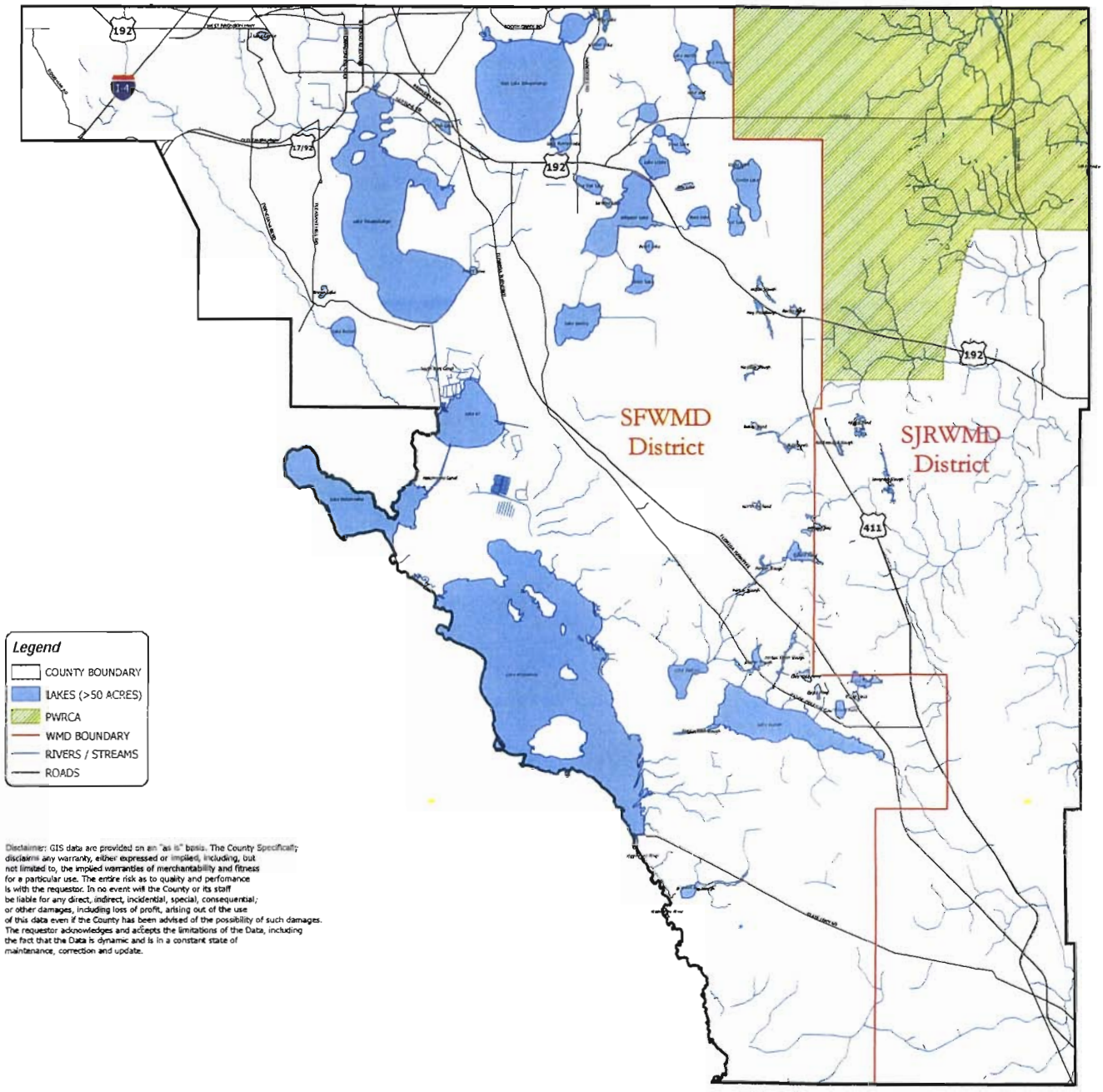
Aquifer Recharge data provided by St Johns River Water Management District (2005) and South Florida River Water Management District (1995)

Priority Water Resource Caution Area (PWRCA)



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Priority Resource Caution Area data provided by St Johns River Water Management District