Putnam County

COMPREHENSIVE PLAN
CONSERVATION ELEMENT

EAR-based Amendments

Putnam County
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Putnam County
Conservation Element

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I. Introduction

The purpose of the Conservation Element is to promote the conservation, use, and protection of natural resources. According to Rule 9J-5, the Conservation Element must identify and analyze natural resources in Putnam County. "Natural resources" includes rivers, lakes, wetlands, floodplains, areas of soil erosion, commercially valuable minerals, fish and wildlife including endangered and threatened species, vegetative communities, groundwater, and air quality. The analysis must also include current commercial, recreational, or conservation uses of these resources and known pollution problems, including hazardous waste. The Conservation Element must also address current and future water needs and resources and the quality and quantity of these water resources for the next 10 years. Additionally, the Element must address the conservation, use, and protection of these water resources, including cooperating with adjacent local governments to protect unique vegetative communities, protecting environmentally sensitive lands, and managing hazardous waste.

The Conservation Element identifies all natural resources in Putnam County, including surface water resources (lakes, rivers, etc.) and their quality, groundwater resources (aquifers, water use, recharge areas, cones of influence, etc), wetlands, floodplains, fisheries, wildlife, vegetative communities, environmentally sensitive lands, air quality, areas of soil erosion, and minerals. It also addresses hazardous waste management techniques. Each section is followed by an analysis of any issues related to the preservation, management, and use of these natural resources. The goals, objectives, and policies of the Conservation Element are the means by which any needed improvements identified in the data and analysis are implemented, with the overall goals being to conserve and protect the natural resources of the County and to maintain an acceptable quality of life for its citizens.

There are two major separate physiographic divisions in Putnam County. The eastern two-thirds of the County are within the Coastal Lowlands. This lowland area parallels the coast of Florida and extends inland for some 30 to 60 miles. It consists of ancient marine terraces cut by ocean erosion when sea levels were higher. The western one-third of the County is within the Central Highlands, an area characterized by rolling hills (relic beach dunes) and numerous lakes formed as a result of karst topography (limestone sinks).

The region's climate is temperate, with seasonal changes typical of northern climates although not as severe. Winter and summer temperature extremes are moderated by the Atlantic Ocean and also to some extent by the St. Johns River. Winters generally are mild, with occasional freezes, and summers are hot and humid. Average monthly temperatures range from 56.3 degrees Fahrenheit in winter to 80.8 degrees Fahrenheit in summer. Rainfall averages 55 inches annually with most falling from June through October.

Putnam County contains a wealth of important natural resources including lakes, creeks, rivers, wetlands, mineral resources, aquifer recharge areas, and fish and wildlife. The dominant natural feature in the County is the St. Johns River, which flows through the eastern portion of the County and forms the eastern city limits of Palatka. The St. Johns River is the largest river wholly within

Florida and serves as an important transportation route for industrial barge traffic. It is also an extremely valuable recreational resource, providing many opportunities for fishing and boating.

In 2009, Putnam County adopted its Evaluation and Appraisal Report (EAR). The data and analysis for the Conservation Element is being updated to address the recommendations of the EAR and to amend the short term and long range planning timeframes to 2015 and 2025, respectively. The EAR recommendations for the Conservation Element are as follows:

- Review objectives and policies that are repeated from the Future Land Use Element to determine if the objectives and policies can be consolidated into one element.
- Amend the element to implement the energy conservation regulations contained in HB 697.
- Amend the element in accordance with water supply planning legislation, including water conservation and encourage of programs such as WaterStar, pursuant to Section 163.3177(6)(h), F.S.
- Assess and further address water conservation and reuse practices, pursuant to Section 163.3177(6)(a), F.S.

II. Inventory of Natural Resources

A. Surface Water Resources

1. Lakes and Prairies

Putnam County contains approximately 260 lakes of 10 acres or more plus numerous lakes under this size scattered throughout the County. These lakes cover an area of approximately 47,220 acres (74 square miles) and are especially numerous in the western and southeastern portions of the County. Table E-1 lists named lakes in the County, including size and location by planning district.

Small size, clear water, sandy bottoms, low pH, and low nutrient levels characterize many of the lakes in the western and southeastern portion of the County. In many cases these lakes also have no outlets or tributaries and are in effect landlocked. However, a study of the Etoniah Creek Drainage basin in western Putnam County completed by the St. Johns River Water Management District in 1979 showed that many of these lakes can overflow during extreme rainfall events.

a. Lake Chains

Two major lake chains—Blue Pond and Lake Melrose—were identified in northwestern Putnam County. The Blue Pond chain originates in southwestern Clay County, flowing in a south/southeast direction where it exits Clay County from the outlet of Oldfield Pond. Halfmoon Lake is the first lake in this chain within Putnam County. From Halfmoon Lake water can flow into Wall Lake (Putnam Prairie), then into Goodson Prairie, and finally into Etoniah Creek via numerous drainage ditches. The Lake Melrose Chain is entirely within Putnam County. Lake Melrose forms the headwater lake in this chain with water flowing generally in a north/northeast direction. Other lakes in the Lake Melrose Chain are (in downstream order) Lake Rowan, Lake Suggs, Twomile Pond, Ross Lake, Goose Lake, and Ashley Prairie, which flows into the Blue Pond chain via Putnam

Prairie. During high water many of these lakes and Prairies will overflow and become interconnected through perennial streams, intermittent streams, canals, channelized creeks, or marshes or swamps. These two lake chains ultimately discharge into Etoniah Creek to the east.

b. Lakes

Lakes associated with the St. Johns River include Crescent Lake, Lake George, and Rodman Reservoir (a manmade lake). Crescent Lake covers 17,043 acres (27 square miles) and is the ninth largest lake in Florida. Crescent Lake is drained by Dunns Creek, which begins at the north end of the lake and flows northwest for approximately eight and a half miles.

Table E-1 Named Lakes in Putnam County

I.D. #	Name of Lake	Acres	I.D. #	Name of Lake	Acres
1	Alligator Lake	**3**	38	Deep Lake	**22**
2	Anderson Cue	**11**	39	Dream Pond	**74**
3	Argenta Lake	**18**	40	East Lake	**25**
4	Ashley Prairie	**80**	41	Enslow Lake	**158**
5	Banana Lake	**34**	42	Lake Fanny (Royal Lake)	**101**
6	Barco Lake	**34**	43	Fowlers Lake	**42**
7	Bass Lake	**73**	44	Fowlers Prairie	**651**
8	Bell Lake	**34**	45	Fox Lake	**13**
9	Big Pond (Tucker Lake)	**63**	46	Lake Galilee	**79**
10	Blocker Lake	**123**	47	Georges Lake	**810**
11	Blue Pond (1)	**4**	48	Gillis Pond	**44**
12	Blue Pond (2)	**11**	49	Goodson, Lake	**90**
13	Boll Green Lake	**29**	50	Goose Lake	**195**
14	Boyds Lake	**26**	51	Lake Grandin	**352**
15	Brantley Lake	**443**	52	Grassy Lake (Interlachen Lake)	**107**
16	Bream Lake	**159**	53	Green Pond	**32**
17	Brim Pond	**7**	54	Halfmoon Lake	**142**
18	Lake Broward	**476**	55	Hankley Lake	**30**
19	Bull Pond	**27**	56	Hardesty Lake	**46**
20	Cambo Lake	**19**	57	Hasenqaeger Lake	**28**
21	Castle Lake	**20**	58	Hewitt Lakes	**96**
22	Charlie Morris	**10**	59	Higginbotham Lake	**49**
23	Chipco Lake	**45**	60	Hubbard Pond	**20**
24	Church Lake	**20**	61	Ida, Lake	**121**
25	Clear Lake (1)	**44**	62	Jergans Lake	**21**
26	Clear Lake (2)	**124**	63	Jewel Lake	**68**
27	Clearwater Lake (1)	**37**	64	Junior Lake	**86**
28	Clearwater Lake (2)	**6**	65	Lake Keuka	**58**
29	Clubhouse Lake	**217**	66	Key Pond	**13**
30	Lake Como	**270**	67	Ladys Slipper Lake	**162**
31	Cooper Lake	**24**	68	Lagonda Lake	**54**

Table E-1 Named Lakes in Putnam County

I.D. #	Name of Lake	Acres	I.D. #	Name of Lake	Acres
32	Cowpen Lake	**532**	69	Lak-A-Ana Lake	**38**
33	Crane Ponds	**44**	70	Laura (Cathead Pond)	**3**
34	Crescent Lake	**17043**	71	Little Lake George	**1,416**
35	Cue Lake	**160**	72	Little McMeekin Lake	**24**
36	Darkwater Lake	**76**	73	Little Orange (part)	**818**
37	Davis Lake	**66**	74	Long Lake	**291**
75	Long-Lons Lake	**17**	105	Round Lake	**13**
76	Lake Loyal	**68**	106	Lake Rowan	**262**
77	Lake Margaret	**381**	107	Sand Hill Pond	**16**
78	Mariner Lake	**129**	108	Lake Saratoga	**77**
79	Marvin Lake	**80**	109	Silver Lake (1)	**187**
80	Mason Lake	**77**	110	Silver Lake (2)	**44**
81	McCarthy Lake	**113**	111	Silver Pond	**103**
82	McCloud Lake	**16**	112	Skinner Lake	**47**
83	McMeekin Lake	**104**	113	Smith Lake	**79**
84	Lake Melrose	**412**	114	South Bull Pond	**348**
85	Mirror Lake	**49**	115	South Twin Lake	**23**
86	Morris Lake	**60**	116	Spring Lake	**6**
87	Moss Lee Lake	**129**	116	Star Lake	**235**
88	Mud Lake	**37**	117	Lake Stella	**356**
89	Myra Lake	**8**	118	Sugarbowl Lake	**18**
90	Nettles/English Lake	**NA**	119	Suggs, Lake	**181**
91	Newton Lake	**56**	120	Susan, Lake	**103**
92	North Twin Lakes	**27**	121	Swan Lake	**556**
93	Lake Oklawaha / Rodman (part)	**9093**	122	Trotting Pond	**129**
94	Omega Lake	**5**	123	Twin Lakes	**110**
95	Orange Grove Lake	**5**	124	Twomile Lake	**106**
96	Ox Pond	**42**	125	Twomile Pond	**82**
97	Pace Lake	**27**	126	Unnamed	**126**
98	Penner Ponds	**34**	127	Up and Down Lake	**26**
99	Picnic Lake	**48**	128	Violet Lake	**22**
100	Pine Lake	**8**	129	Wall Lake	**57**
101	Redwater Lake	**247**	130	West Lake	**76**
102	Riley Lake	**44**	131	Whitcomb Lake	**19**
103	Rosa Lake	**109**	132	Lake Winnott	**611**
104	Ross-Adaho Lake	**106**			

Source: Florida Fish and Wildlife Conservation Commission Florida lakes listing. Date: 2008. Additional information can be found at www.myfwc.com and USGS.

Crescent Lake eventually discharges into the St. Johns River south of Palatka. Crescent Lake is a broad shallow lake with depths averaging about 10 feet. The main tributary to the lake is Haw Creek, which enters at the extreme southeastern end. Haw Creek drains the southern half of Flagler County and a small area of north central Volusia County. Land uses in the Haw Creek drainage basin are primarily agriculture and forestry.

Located in south central Putnam County, Rodman Reservoir (Lake Oklawaha) was created as part of the now-cancelled Cross Florida Barge Canal project. A portion of the Oklawaha River and its floodplain were flooded behind a dam, and a channel was dredged through the reservoir to allow deep draft vessels to navigate through the river valley. This reservoir is now a popular recreation area, providing sport fishing and duck hunting along with boating and camping opportunities.

The northern portion of Lake George, the second largest freshwater lake in the state, is in southeastern Putnam County. This lake also offers recreational opportunities and, like the St. Johns River, supports a commercial fishing industry for blue crabs, mullet, and other fresh and saltwater species. A unique feature of Lake George is Drayton Island at the north end of the lake. This is the second largest freshwater island in the state and it is accessed by one of the few ferries still operating along the St. Johns River. Numerous residences are on the island and access is provided via ferry between Georgetown and the north end of the island. Another ferry, connecting the Ocala National Forest with the Fruitland/Welaka area, is located at Fort Gates just north of the first ferry location.

c. Prairies

Numerous shallow and treeless wetlands known as "wet prairies" lie within the Central Highlands region of western Putnam County, as well as in the Crescent City Ridge region in the southeastern section of the County. Among the larger prairies are Levy Prairie, Putnam Prairie, Ashley Prairie, Goodson Prairie, Fowlers Prairie, and Orange Grove Lake Prairie. These prairies are typically very shallow and are covered by herbaceous, non-woody wetland vegetation. Many prairies go dry during the dry season, which is one of the characteristics distinguishing prairies from marshes. Some of these prairies, Putnam Prairie and Ashley Prairie, for example, are associated with lakes, and some form the headwaters of the Etoniah Creek Drainage Basin and are interconnected during high water. These prairies provide important nesting and feeding habitat for many species of animals and are especially important habitat for numerous bird species, including the sandhill crane and the wood stork.

2. Rivers and Creeks

Most of the rivers and creeks in Putnam County—the Oklawaha River and its tributaries, including Orange Creek, Cabbage Creek, and Deep Creek; Dunns Creek; and Rice Creek and its tributaries, including Simms Creek and Etoniah Creek—are associated with the St. Johns River.

The St. Johns River is an important asset to the County for recreation and sport fishing. Putnam County is among the top 25 destinations in the state for sport fishing. The importance of fishing is reflected in the large number of fishing license sales and the level of boat ownership in the County.

Between the Rodman Dam and its mouth at the St. Johns River, the Oklawaha River is relatively pristine; its water quality is enhanced and protected by its adjacent broad riverine swamp floodplain, which is at least a mile wide.

Dunns Creek, which connects Crescent Lake with the St. Johns River south of Palatka, also has a large riverine swamp associated with it. Dunns Creek has over a dozen dead-end canals located

along its right bank for several miles upstream of the U.S. 17 bridge. This area has numerous mobile homes on the creek or on adjacent canals. Most of the canals were dug before State and federal regulations governing such activities were adopted, and apparently no new canals have been dug since.

Rice Creek originates west of Palatka in a large hardwood swamp known as Rice Creek Swamp or Nine Mile Swamp. Rice Creek flows in a northerly direction until it flows under S.R. 100, where it turns to the east, ultimately discharging into the St. Johns River just north of Palatka.

Table E-2 lists all of the named streams, creeks, and rivers in Putnam County excluding the St. Johns River.

Table E-2 Named Streams in Putnam County

Name of Stream	Length (miles)	Flows Into
Acosta Creek	4.0	St. Johns R.
Alligator Creek	6.0	Sweetwater Creek
Bluff Branch	9.0	St. Johns R.
Bruntbridge Brook	3.6	Rodman Reservoir
Cabbage Creek	6.0	Orange Creek
Camp Branch	9.1	St. Johns R.
Cedar Creek	3.5	St. Johns R.
Cow Branch	1.5	St. Johns R.
Deep Creek	4.0	Rodman Reservoir
Dog Branch	1.8	St. Johns R.
Dunns Creek	8.5	St. Johns R.
Etoniah Creek	17.5	Rice Creek
Fish Creek	1.5	St. Johns R.
Gum Creek	4.7	Deep Creek
Hammock Branch	3.0	Dunns Creek
Hickory Branch	2.0	Rice Creek
Jumping Gully Branch	3.0	Lake George
Little Orange Creek	6.0	Cabbage Creek
Mason Branch	3.0	St. Johns R.
Mill Branch	2.0	St. Johns R.
Moccasin Creek	2.5	St. Johns R.
Oklawaha River	75.0	St. Johns R.
Oldtown Branch	5.3	Rice Creek Swamp
Orange Creek	10.0	Rodman Reservoir
Palmetto Branch	3.5	Rice Creek Swamp
Poley Creek	3.1	Deep Creek
Rice Creek (north)	6.4	Etoniah Creek
Rice Creek	16.1	St. Johns R.
Simms Creek	14.8	Etoniah Creek
Sweetwater Creek	10.0	Deep Creek
Tiger Branch	2.5	Lake George

Source: Volume 2 of the Lower St. Johns River Basin Reconnaissance, Surface Water Hydrology - St. Johns River Water Management District. Date: 1992. Additional information can be found at www.sjrwmd.com

and USGS.

3. Water Quality

As is true statewide, the surface water quality in Putnam County varies and is a function of many factors, including adjacent land uses; physiography (coastal plain versus karst topography, etc.); number, type, and location of point sources of pollution; and age of the water body. The Florida Department of Environmental Protection (FDEP) recently published its 2006 Integrated Water Quality Assessment for Florida: 305(b) and 303(d) Report which summarized the conditions of the State's surface waters, trends, causes, and any existing cleanup activities. Surface water quality is sampled at numerous locations within the County by several agencies. Table E-3 shows the locations of these sampling stations along with the sampling agency.

Table E-3 Surface Water Quality Stations in Putnam County

Station Name	Responsible Agency
Orange Creek at SR 21	Corps of Engineers
Rodman Reservoir at Kenwood	Corps of Engineers
Rodman Reservoir at power line	Corps of Engineers
Rodman Reservoir at Paynes Landing	Corps of Engineers
Rodman Reservoir at gas line	Corps of Engineers
Rodman Reservoir at Marker 15	Corps of Engineers
Lake George at CMs 4 & 5	Fla. Fish & Wildlife Cons. Comm.
Crescent Lake S. of Bear Island	Fla. Fish & Wildlife Cons. Comm.
Middle of Crescent Lake	Fla. Fish & Wildlife Cons. Comm.
St. Johns River below Rice Creek	St. Johns River Water Management District
St. Johns River at CM 72	St. Johns River Water Management District
Outlet of Hastings Drainage District	St. Johns River Water Management District
St. Johns River at CM 37	St. Johns River Water Management District
Dog Branch, downstream of CR 2	St. Johns River Water Management District
Dunns Creek at US 17	St. Johns River Water Management District
St. Johns River at Buffalo Bluff bridge	St. Johns River Water Management District
St. Johns River at Palatka (US 17)	St. Johns River Water Management District
Rice Creek at US 17 bridge	St. Johns River Water Management District
Rice Creek at SR 100	St. Johns River Water Management District
Simms Creek near Bardin	St. Johns River Water Management District
St. Johns River at Racy Point	St. Johns River Water Management District
Georges Lake, 200 yards from west bank	St. Johns River Water Management District

Source: SJRWMD, Status and Trends in Water Quality at Selected Sites in the SJRWMD.
Dated: 2004.

The Environmental Protection Agency (EPA) has also published a list of water bodies identified by the State as not meeting water quality standards for their designated uses. Some of these water bodies have been targeted by EPA for Total Maximum Daily Loads (TMDLs) development, which means that the water body is studied further to determine the maximum amount of pollution that it can receive from both point and non-point sources and still meet water quality standards and an allocation of that amount to a pollutant's sources.

A summary of water bodies in the County which, based on information from FDEP and EPA, have water quality problems is provided below.

a. Dog Branch, Mill Branch, and Cracker Swamp Branch

Dog Branch, Mill Branch, and Cracker Swamp Branch drain large areas of agricultural lands, primarily potato and cabbage farms in the East Palatka area. In the late 1980s, the Putnam County Soil and Water Conservation District (SCD), in cooperation with the St. Johns River Water Management District (SJRWMD) and Suwannee River Water Management District (SRWMD), completed a special water quality study of these three watersheds. This study revealed that all three tributaries draining their respective watersheds had poor water quality. The SCD report stated that based on "Trophic State Indices" (Baker et. al. 1981), the St. Johns River is eutrophic (over-enriched) within this area. Nutrient loads were very high and were seen as a potential threat to the St. Johns River. A primary contributor to these high nutrient loads appears to be the vast network of drainage ditches and canals, which conveys runoff directly into the river. This runoff contains fertilizers from cropland in addition to organic nutrients from forestlands.

According to the FDEP 305B Report, Mill Branch still does not meet conventional FDEP water quality standards and has problems with low dissolved oxygen, fecal coliform, and phosphorus levels. The FDEP Water Quality Indicator is 63 with 60 to 90 considered poor. The EPA has established TMDLs for impairments including coliforms, biochemical oxygen demand, nutrients, and dissolved oxygen. The TMDLs were established for Mill Branch in April and May 2004.

Dog Branch partially meets FDEP water quality standards but has problems with low dissolved oxygen, phosphorus, and lead levels. The FDEP Water Quality Indicator is 58 with 45 to 59 considered fair. EPA has targeted Dog Branch as a low priority for TMDLs development but has indicated that the parameters of concern include lead, nutrients, turbidity, and dissolved oxygen.

Cracker Swamp Branch also does not meet all FDEP water quality standards and has problems with low dissolved oxygen. The FDEP Water Quality Indicator is 63, which, as noted above, is considered poor. The EPA has established TMDLs for impairments including biochemical oxygen demand, nutrients, and dissolved oxygen. The TMDLs were established for Cracker Swamp Branch in May 2004.

b. Deep Creek

Deep Creek, which originates in St. Johns County but discharges into the St. Johns River at the north end of Putnam County, has been identified by FDEP as only partially meeting FDEP water quality standards. Problems include biochemical oxygen demand, phosphorus, low dissolved oxygen, and metals including cadmium, copper, iron, lead, and silver. The FDEP Water Quality Indicator is 62, a poor rating. The EPA has established TMDLs for impairments including biochemical oxygen demand, nutrients, dissolved oxygen, and metals including iron and silver. The TMDLs were established for Mill Branch in April and May 2004.

C. St. Johns River

The St. Johns River was rated by FDEP as having good water quality for most of its length in

Putnam County and meets most water quality standards although, depending on where the sampling is conducted, there are some variations. This is partly attributable to the flushing effect of the river, which, in Putnam County, includes a significant tidal flow. Potential sources of pollution to the river include treated sewage effluent, septic tank seepage, stormwater runoff, and industrial and agricultural runoff. A Putnam County ordinance prohibits any new discharges of wastewater effluent into the St. Johns River.

In addition to the potential sources of pollution named above, four package treatment plants discharge their treated wastewater effluent directly into the St. Johns River: (1) Sportsman's Harbor Subdivision in Welaka, (2) Point Buena Vista Mobile Home Park in East Palatka, (3) St. Johns Campground in East Palatka, and (4) Seminole Electric just north of Palatka. Two package treatment plants discharge their treated wastewater effluent into tributaries of the St. Johns River: (1) Putnam Correctional Institute discharges into Mill Creek in East Palatka and (2) St. Johns Riverside Estates discharges into Dunns Creek near U.S. 17.

Samples taken at Federal Point in East Palatka indicate that the river meets FDEP water-quality standards for conventionals but that water quality standards for metals including lead, silver, cadmium, and copper are not being fully met. Water quality at this station has been given a poor Water Quality Index by FDEP of 60. The EPA has established a TMDL for the impairment of the metal Silver. The TMDL was established for the Lower St. Johns River in April 2004.

Above the mouth of Rice Creek, sampling indicates that the river meets FDEP water-quality standards for conventionals but that levels of copper, silver, and lead are not fully meeting FDEP standards. Above the mouth of Dunns Creek, sampling of the St. Johns River indicates the FDEP water quality standards for conventionals are being met but levels of lead and silver are not fully meeting standards. Above the mouth of the Oklawaha River, the St. Johns meets all standards for conventionals except total coliform bacteria.

The only direct discharge of treated municipal wastewater effluent into the St. Johns River within Putnam County is from the 3.0-million gallon per day (MGD) Palatka Wastewater Treatment Plant (WWTP). This facility discharges into a ditch, which in turn enters the river just east of Ravines Gardens State Park. This facility meets all State water quality standards. The Palatka WWTP now has 0.8 MGD of reuse, which diverts some of the effluent to the Palatka Golf Course.

d. Crescent Lake

Water Quality in Crescent Lake is generally fair and it has been classified by FDEP as a Class III water body (Florida Administrative Code Chapter 62.302.400), which means it is designated for use as recreation and for propagation and management of fish and wildlife resources.

As part of the Surface Water Improvement and Management (SWIM) Act, SJRWMD, in conjunction with FDEP, has studied Crescent Lake and its drainage basin to define the extent of the lake's drainage basin, inventory all sources of pollution entering the lake, and recommend ways to restore and preserve the lake's water quality.

The results of this study are summarized in FDEP's 2002 305B report, which indicates that Crescent Lake is "eutrophic" (over-enriched with nutrients). A 1975 EPA study estimated that half the lake's

nutrient pollution came from Haw Creek, which drains a large agricultural area in Flagler County. These studies have shown that other sources of pollution to Crescent Lake include municipal wastewater effluent (Bunnell and Crescent City), agricultural runoff, urban runoff, and septic tanks. FDEP allocated $200,000 towards the upgrading of the Crescent City Wastewater Treatment Plant, with emphasis on the removal of discharges into Crescent Lake through the installation of land treatment technologies. FDEP's 2006 305B Report declared that the lake is currently stable.

In addition, farmers in the Tri-County agricultural area of Putnam, St. Johns, and Flagler Counties in conjunction with the SJRWMD and the County Agricultural Extension Services are experimenting with alternative farming methods through the SJRWMD's "Benchmark Farms" program and through Best Management Practices (BMPs). These programs are working on different techniques for irrigation, fertilization, planting etc., which will ultimately result in the reduction of runoff and pollutant loads from these areas. One technique being employed is subsurface drip irrigation (SDI) for water table control. During the potato growing seasons when SDI was used to irrigate crops, almost 36 percent less irrigation water was applied. Another technique is the use of controlled-release fertilizers and phosphorus to reduce nutrient loadings entering the river system.

Putnam County has also facilitated the construction of two new regional stormwater parks— the Dog Branch-Edgefield Regional Stormwater Treatment Facility and the Deep Creek West Regional Stormwater Treatment Facility—in the agricultural area surrounding Deep Creek, Dog Branch, and the St. Johns River. Each park will help capture and filter excess sediment, nutrients, and pollutants from agricultural runoff in the area.

Crescent Lake flows into the St. Johns River near San Mateo via Dunns Creek at the lake's north end. FDEP rated the water quality of Dunns Creek as good. The creek has substantial development along its north side from the St. Johns River to several miles upstream of the U.S. 17 bridge. Crescent Lake meets all FDEP conventional water quality standards except for dissolved oxygen and meets all standards for metals. The FDEP Water Quality Indicator is 63, with 60 to 69 considered fair for a lake ecosystem. EPA does not list Crescent Lake as a water body targeted for TMDL development.

e. Haw Creek

Haw Creek originates in Flagler County but discharges into the south end of Crescent Lake in Putnam County. As mentioned above, Haw Creek is a major contributor to Crescent Lake's nutrient load and, according to FDEP, recent studies identify agricultural runoff as the main source of the nutrient load. However, the City of Bunnell also discharges its wastewater effluent into a tributary of Haw Creek and this effluent ultimately ends up in Haw Creek and Crescent Lake. Haw Creek does not fully meet FDEP conventional water quality standards, including problems with total coliform bacteria, fecal coliform bacteria, and total organic carbon. Standards for metals are only partially met, including problems with iron, lead, nickel, and silver. The FDEP Water Quality Indicator is 63, which is considered poor. The EPA has established TMDLs for impairments including biochemical oxygen demand, nutrients, dissolved oxygen, and metals including iron, lead, silver, and selenium. The TMDLs were established for Haw Creek above Crescent Lake in April and May 2004.

f. Dunns Creek

Dunns Creek connects Crescent Lake with the St. Johns River just south of Palatka. Most of the creek's shoreline is undeveloped with the exception of some residential development along several miles of the north shore along both sides of the U.S. 17 bridge. The 2006 305B report indicates that the creek fully meets FDEP water quality standards for conventionals and partially for metals, excluding lead, cadmium, and silver. Dunns Creek has been given a Water Quality Index by FDEP of 46, with 45 to 59 considered fair. EPA has not targeted Dunns Creek for TMDL development.

g. Rice Creek

FDEP indicated that a source of pollution to the St. Johns River is Rice Creek, which enters the river on its west bank just north of Palatka. According to FDEP's 2002 report, the primary source of pollution to the creek is effluent from the Georgia Pacific pulp mill (owned by Koch Industries, Inc.). The 2002 305B report indicates that the creek does not fully meet FDEP water quality standards for conventionals, including dissolved oxygen levels, coliforms, turbidity, nitrogen, and biochemical oxygen demand or for metals: iron, lead, silver, and cadmium. Water quality at this station has been given a Water Quality Index by FDEP of 67, a poor rating. The EPA has established a TMDL for impairment of coliforms. The TMDL was established for Rice Creek in March 2006.

Georgia Pacific (Koch Industries, Inc.) supersaturates its effluent with oxygen to improve the dissolved oxygen (DO) levels. Between 1980 and 1987 DO saturation levels increased. According to FDEP, Rice Creek is stable; however, the creek's biological communities are low in diversity, with only a few highly pollution-tolerant species present.

h. Rodman Reservoir

Like most reservoirs, Rodman acts as a sump, collecting large amounts of organics which have to be reduced from time to time to keep it from becoming eutrophic. The U.S. Forest Service maintains the Rodman Dam and 550 acres below the dam. Although there have been plans since 2002 to remove all or a portion of the dam as part of the Ocklawaha River Restoration Project, the State Legislature has not yet funded the project.

In addition, the US Army Corps of Engineers (USACOE) owns a 300-foot buffer zone around the perimeter of the reservoir to help protect water quality. No structures or other disturbances are allowed within this buffer with the exception of campgrounds and boat ramps.

According to the 2002 FDEP 305B Report, water quality in Lake Oklawaha (Rodman Reservoir) is good and meets State water quality standards. The FDEP Water Quality Index is 46, with 0 to 59 considered good. EPA has targeted Rodman Reservoir as a low priority for TMDL development with the only parameter of concern being mercury. FDEP's 2006 305B Report also classifies water quality in Rodman Reservoir as good and the reservoir is stable.

i. Oklawaha River

Within Putnam County the Oklawaha River flows from the Rodman Dam to its confluence with the

St. Johns River at Welaka. The Oklawaha River above the St. Johns River meets all FDEP conventional water quality standards except for dissolved oxygen and meets all standards for metals. FDEP reports that the overall water quality of this segment of the river is degrading, specifically with regard to color, dissolved oxygen, and dissolved oxygen saturation. The FDEP Water Quality Indicator is 21, with 0 to 44 considered good. EPA has targeted this segment of the Oklawaha River as a low priority for TMDL development with the only parameters of concern being dissolved oxygen and mercury.

j. Sandhill Lakes

Some of the lakes in western and southeastern Putnam County are vulnerable to pollution due to increasing development around their shorelines. Erosion of dirt roads and the resulting sedimentation of lakes are a problem in many areas of western Putnam County. Slopes are quite steep in some of these areas, and roads usually consist of easily eroded sand. As a result, rainfall can cause erosion into adjacent ditches and in some cases into adjacent water bodies, causing turbidity, sedimentation, and pollution problems.

Some sandhill lakes in the Crescent City area are now being used for irrigation and freeze protection by area fern growers. Lake levels are being lowered and residents' complaints have increased. A more detailed discussion of this problem is provided in the Groundwater Section of this Conservation Element.

EPA has not targeted any lakes in Putnam County for TMDL development.

4. Surface Water Improvement and Management (SWIM) Act

In 1987 the Florida Legislature adopted Chapter 87-97 of the Florida Statute entitled the Surface Water Improvement and Management (SWIM) Act. This Act requires each water management district (WMD) to design and implement plans and programs for improving and managing surface waters. In addition, the SWIM Act identified several areas within the State which are especially in need of restoration. One of these areas is the Lower St. Johns River Basin, which runs from the confluence of the Oklawaha River with the St. Johns River near Welaka to Mayport.

In cooperation with FDEP and Florida Fish and Wildlife Conservation Commission (FFWCC), each WMD must prepare a prioritized list of water bodies of statewide or regional importance based on the need for protection and restoration. The SJRWMD has ranked five areas in its district for restoration and/or preservation in order of priority: (1) the Lower St. Johns River Basin, (2) the Indian River Lagoon Basin, (3) the Lake Apopka sub-basin, (4) the Upper Oklawaha River Basin, and (5) the Lake George sub-basin. The Lower St. Johns Basin and the Lake George sub-basin are partially within Putnam County.

Within the Lower St. Johns River Basin, the SJRWMD has further prioritized the 13 sub-basins based on the following criteria: (1) Public Use Potential, (2) Public Importance, (3) Natural and Wildlife Significance, (4) Environmental Potential, and (5) Endangerment and Impairment.

Of the 13 sub-basins within the Lower St. Johns River Basin, five are located partially within Putnam County: Crescent Lake, Etoniah Creek, McCullough Creek, Deep Creek, and the St. Johns River. These five are ranked first, second, eleventh, twelfth, and thirteenth, respectively. As noted

above in the Surface Water Quality section, Crescent Lake is undergoing a special study as part of the SWIM program.

Under the related Save Our Rivers program, the SJRWMD has purchased the Caravelle Ranch at the confluence of the St. Johns and Oklawaha Rivers and several other lesser parcels along the St. Johns River to protect water quality. Several other parcels are being considered, including approximately 26,000 acres by FDEP for the Etoniah/Cross Florida Greenway.

The District has also adopted a water conservation rule requiring reuse of reclaimed water in areas designated as Critical Water Supply Problem Areas unless such reuse is not economically, environmentally, or technically feasible. To implement this rule, the SJRWMD has also adopted a supporting rule regarding Permitting of Consumptive Uses of Water. With these rules in force the SJRWMD will be better able to conserve and protect the water reserves in Putnam County.

5. Analysis of Surface Water Resources

Crescent Lake is a regional resource, which is apparently being polluted by numerous sources including agricultural runoff, urban runoff, and wastewater effluent. Putnam County needs to coordinate with the SJRWMD and the SWIM program, which has been developed for the protection and restoration of water quality in Crescent Lake. In addition, the County should coordinate with the SJRWMD and other involved agencies in implementing SWIM plans for other priority areas within the County, including the Etoniah Creek Basin, the McCullough Creek sub-basin, the Deep Creek sub-basin, and the St. Johns River sub-basin.

The County needs to ensure that development regulations provide for protection of the County's water bodies through such techniques as setbacks, vegetated waterfront buffer zones, zoning, density controls, drainage, and stormwater regulations. The County should prohibit any additional dirt roads within those areas having steep slopes where erosion cannot be controlled.

All waterfront residents need to become more aware of their responsibilities to protect water quality through various land use practices, including proper use of pesticides and fertilizers, maintenance of upland vegetated buffers, and maintenance of littoral zones.

The County should cooperate with and support any efforts by the FDEP and EPA to include surface water bodies in the TMDL program and to manage these watersheds to maintain or improve water quality in the future.

Much effort is being focused on developing alternative water supplies from surface water bodies that have the potential to produce relatively large quantities of water. One water source identified by the 2005 District Water Supply Plan from SJRWMD, which is in Putnam County, is the St. Johns River. Methodology is being developed for protecting priority surface water bodies by implementing Minimum Flows and Levels (MFL). These MFLs will provide an effective tool to assist in sound water management decisions that prevent significant adverse impacts to the water resources of the area.

B. Groundwater Resources

1. Aquifers

As in most of northern Florida, there are three primary aquifer systems within Putnam County: the surficial aquifer, the secondary artesian aquifer, and the Floridan aquifer.

a. Surficial Aquifer

The surficial aquifer is also known as the water table aquifer. This aquifer is unconfined and is in contact with the atmospheric pressure. It consists mainly of sand and sand/clay beds, which vary in thickness from 50 to 130 feet. The base of this aquifer is the top of the confining bed, the Hawthorn Formation, common throughout northern Florida. Recharge to the surficial aquifer occurs primarily from rainfall with minor recharge being contributed from septic systems, agricultural irrigation, and upward leakage from the Floridan aquifer. Discharge from this aquifer occurs by seepage into lakes, creeks, and canals, evapotranspiration, and pumpage. In some areas, downward leakage into deeper aquifers occurs.

Of all aquifers, the surficial aquifer is the most susceptible to pollution in that contaminants can enter the aquifer directly from the land surface. This aquifer may be affected by many uses, including septic tanks, gasoline storage tanks, wastewater percolation ponds, hazardous waste storage areas, and stormwater ponds. All of these potential pollution sources need to be controlled in areas where potable water wells are located within the surficial aquifer. Many domestic wells use the surficial aquifer for potable water.

b. Secondary or Intermediate Aquifer

The second major aquifer is the secondary artesian aquifer or intermediate aquifer. This aquifer consists of water-bearing zones of sand and limestone within the Hawthorn Formation, which are under pressure, hence the term artesian. These zones range in thickness from several inches to six feet. Recharge occurs where the water table is higher than the potentiometric surface of the secondary artesian aquifer and where permeability is conducive to recharge. Discharge occurs from downward leakage into other aquifers and by pumpage.

c. Floridan Aquifer

The deepest and largest aquifer in the County as well as the entire Southeast is the Floridan aquifer. The Floridan aquifer is the primary source of public water supplies throughout northern Florida. Water quality is generally excellent, especially in the upper, less-mineralized zones. This aquifer is confined throughout most of the County and thus is under pressure. The potentiometric surface is defined as the level to which water will rise in tightly encased wells drilled into the Floridan aquifer. Generally, areas where potentiometric highs occur are also areas where recharge occurs.

2. Recharge Areas

In Putnam County potentiometric highs occur in the northwest and in the Fruitland peninsula area in the southeast. These areas are known recharge points for the Floridan aquifer (See Figure E-1). Recharge occurs from rainfall and from lakes and other aquifers that have elevations above the potentiometric surface of the Floridan aquifer. Discharge occurs from lateral groundwater outflow

and by pumpage. Water entering the Floridan aquifer in northwestern Putnam County flows underground to surrounding counties including Alachua, Baker, Bradford, Clay, Duval, Marion, and Union Counties.

Land uses in recharge areas need to be controlled to ensure that groundwater is not contaminated. Such uses as landfills, wastewater treatment facilities, hazardous waste sites, and even uncontrolled stormwater runoff from urban areas can pose hazards to this aquifer. In addition, increased development can reduce the amount of recharge occurring from rainfall absorption into the land.

3. Cones of Influence

The cone of influence refers to the conical-shaped depression that develops in the water table around a well when water is pumped from it. The concern is that pollution may enter the aquifer as a result of this drawdown. The area around a wellhead that must be protected to prevent potential pollutants from entering the aquifer around the well is known as the wellhead protection zone.

There are a number of approaches for defining a wellhead protection zone, ranging from a simple arbitrary fixed radius to a very sophisticated numerical flow/transport model based on well pumping rate, porosity of the aquifer, slope of the topography, and other parameters. Given the rural character and the generally simple hydrogeology of Putnam County, the arbitrary fixed radii approach to wellhead protection will be sufficient for the County to provide wellhead protection for the long-term planning period.

Applying the arbitrary fixed radii concept to wellhead protection in Putnam County, the County established a 500-foot radius around wellheads (Article 6, 6.06.02 of the Land Development Code), which serve the public as the wellhead protection zone. Non-polluting land uses include recreational and conservation land uses and low-density residential land uses of no more than one dwelling unit per five acres. All other uses are presumed to be polluting and are subject to development restrictions in subsection 6.06.03 of the Land Development Code.

4. Contaminated Well Sites

According to information provided by the Putnam County Health Department, there are five areas of the County where private domestic wells have become contaminated from nearby underground petroleum storage tanks that are leaking. Twenty-one wells have been confirmed to be contaminated and filters have had to be placed on these wells to keep out the pollutants.

Two sites, with a total of 14 wells, are in the Johnson area; one site with three wells is located in the Hawthorne area, one site with two wells is in the East Palatka area, one site with two wells is in Palatka, and another site with two wells is in the Florahome area. Underground petroleum tanks are used for home heating oils as well as for commercial uses such as gas stations. New rules require minimum setbacks and containment systems but many of the problem tanks are older and non-conforming.

5. Alternate Sources of Water Supply

As demand on the Floridan aquifer increases, there is the danger of saltwater intrusion into the water

supply. The County must coordinate with the SJRWMD or the SRWMD to identify alternate sources of water for major water users. In addition, the County must take measures to protect the current water sources, including ensuring that unused artesian wells are capped.

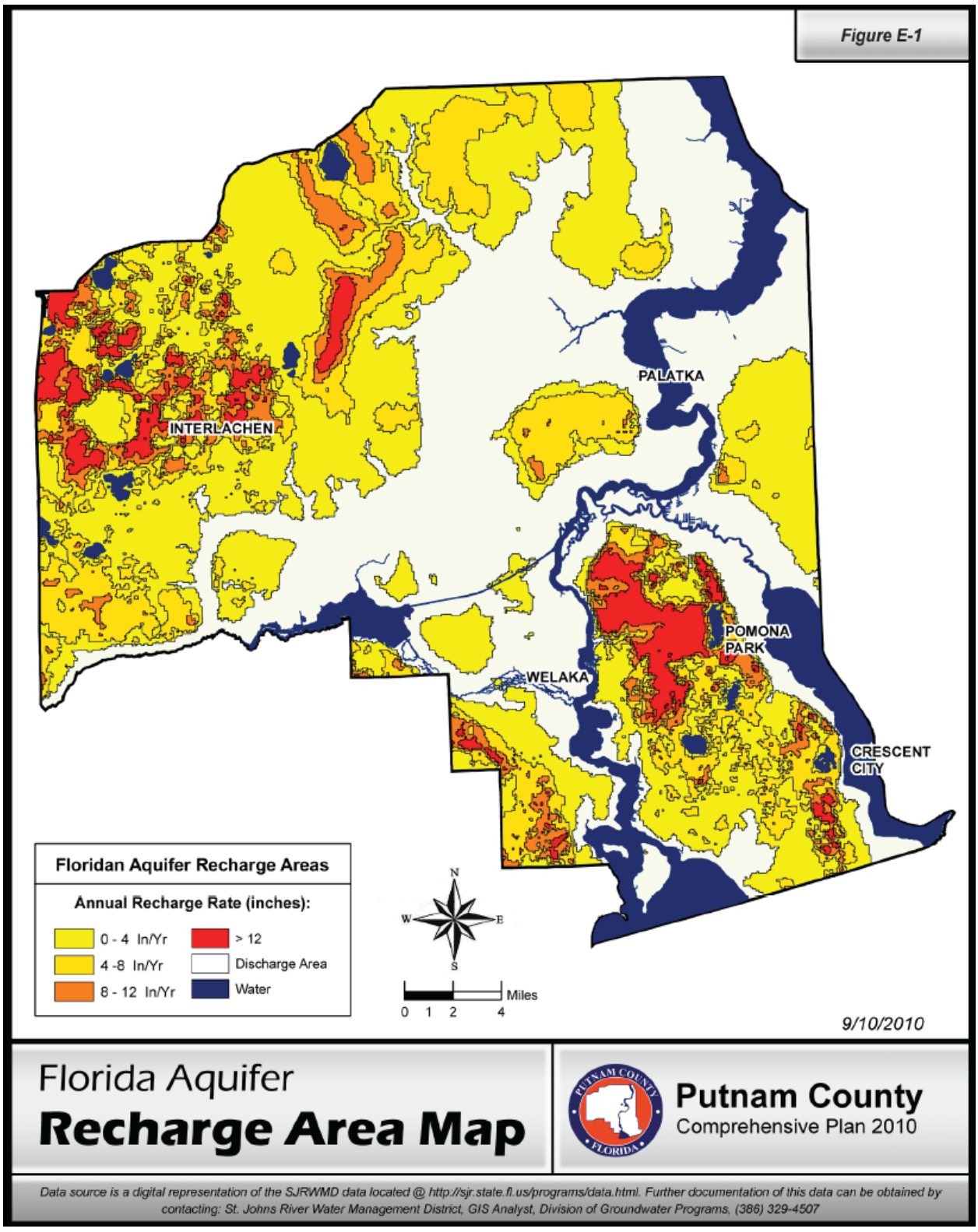


Figure E-1
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
Floridan Aquifer Recharge Areas
Annual Recharge Rate (inches):
0 - 4 In/Yr
4 -8 In/Yr
8 - 12 In/Yr
> 12
Discharge Area
Water
N
W
E
S
Miles
0 1 2 4
9/10/2010
Florida Aquifer
Recharge Area Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the SJRWMD data located @ http://sjr.state.fl.us/programs/data.html. Further documentation of this data can be obtained by contacting: St. Johns River Water Management District, GIS Analyst, Division of Groundwater Programs, (386) 329-4507

6. Water Needs and Sources

The majority of water used in the County is obtained from the Floridan aquifer or surface water sources.

The largest uses of water are for commercial/industrial and domestic self-supply, followed by agricultural/irrigation. This has changed since 1997, when the two largest uses of groundwater were for commercial/industrial and thermoelectric followed by agricultural uses.

According to estimates made by the SJRWMD, by 2025 total water use in Putnam County will be 89.72 MGD. From 1995 to 2005 the annual water use in Putnam County has decreased by almost 37 percent due to reductions in commercial/industrial, agricultural irrigation, and thermoelectric uses.

a. Heat Pumps

In 1985, water-to-air heat pumps accounted for 2.4 MGD, which was just under the 2.97 MGD used by 18,105 public-supplied water users. This is a substantial amount of water use considering the limited number of persons who use water-to-air heat pumps. Several counties in Florida where heat pumps are widely used are concerned with the large amount of potable quality water being wasted. As a result, ordinances requiring heat pump water return wells are becoming more common. Putnam County may want to consider a similar ordinance if use of heat pumps increases to the point that it begins to affect local water supplies and adjacent domestic wells.

b. Ferneries

The largest user of groundwater in the southeastern portion of the County is the ornamental fern industry. Crescent City is one of two areas in southeastern Putnam County where large ferneries are concentrated. The other area is near Fruitland, which is approximately eight miles to the west near the St. Johns River. A typical fernery irrigation system consists of an eight-inch or larger well equipped with a turbine or centrifugal pump capable of withdrawing 1,500 gallons per minute or more. Each well serves approximately seven-and-a-half acres.

The greatest water use occurs during the winter when water is applied to ferns for freeze protection. During hard freezes pumps may run for an entire day or longer and extract more than 170 million gallons per day. These massive groundwater withdrawals cause problems such as salt water intrusion, temporary losses of water to domestic wells, and increased sinkhole activity.

According to the SJRWMD 2000 Water Management Plan, chloride concentrations from relic seawater which are greater than the State drinking water standard of 250 mg/l occur in the eastern part of the County in the East Palatka area and in the southern part of the County in the vicinity of the Caravelle Ranch and Cross Florida Greenway. Potable water with levels greater than this must be treated before being distributed to users. In general, the deeper the well the greater the chloride concentrations. Relatively shallow domestic wells are not affected as much as the deeper public-supply wells or agricultural wells. However, high chloride levels as well as saltwater intrusion into potable water wells is not as overriding an issue in Putnam County as it is along some of the coastal areas of Florida.

As a result of competition for groundwater, some ferneries have begun to use surface water from lakes in the area to irrigate their ferns during freezes. This practice has resulted in a lowering of lake levels along with an increase in complaints from owners of lakeside property. SJRWMD and SRWMD have been required by law to establish minimum levels for lakes in their regions. Minimum levels are levels considered necessary to ensure that these lakes remain viable and healthy. Minimum lake levels have been adopted by the SJRWMD (Rule 40C-8) for 34 lakes in Putnam County. Thirty of these lakes are in the southeastern portion of Putnam County in the vicinity of Pomona Park, Lake Como, and Crescent City. The remaining four—Lake Grandin, Star Lake, Georges Lake, and Cowpen Lake— are in the western portion of the County. Once levels have been set, a fernery or other water user will not be allowed to lower lake levels below that stage. A complete list of these lakes as well as the minimum levels adopted for each can be found in SJRWMD Rule 40C-8.

c. Priority Water Resource Caution Areas

The SJRWMD has identified areas within its jurisdiction where water supply problems have become critical or are projected to become critical by the year 2025. PWRCAs are areas where existing and reasonably anticipated sources of water and conservation efforts may not be adequate to supply water for all existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems. It is anticipated that all or a portion of the County will be included in a Priority Water Resource Caution Area. PWRCAs are areas where existing and reasonably anticipated sources of water and conservation efforts may not be adequate to supply water for all existing legal uses and reasonably anticipated future needs to sustain the water resources and related natural systems. When that determination is made by the SJRWMD, the County will incorporate those protections into its comprehensive plan.

7. Analysis of Groundwater Resources

Putnam County needs to carefully plan for land uses in those areas designated as "Prime and High Groundwater Recharge Areas to the Floridan Aquifer" by the SJRWMD. Development regulations should ensure that existing recharge functions and groundwater quality are maintained in these areas. Hazardous waste sites and landfills should be prohibited and septic tanks should be carefully controlled. Any abandoned artesian wells in Putnam County should be plugged to protect groundwater resources. In addition, the County should promote the identification of specific cones of influence for all public supply wellfields by the SJRWMD and SRWMD.

Brackish groundwater from the Floridan aquifer is an abundant water source in much of the coastal area of the SJRWMD that is being used to meet current and future water needs. The East Putnam Regional Water Project is a two-phase project that will provide a regional water system to the communities east of the St. Johns River. The East Putnam Regional Water Project will initially include the unincorporated communities of East Palatka and North San Mateo in Phase I. The unincorporated areas north of the East Palatka area and areas to the south, including Dunns Creek, will be served by a Phase II expansion of the Phase I system. The Phase I regional system will serve approximately 4,000 persons and the Florida Department of Corrections Institution with a maximum of 550 inmates. The Phase I system flow is estimated to be 0.48 million gallons per day (MGD) annual average daily flow (AADF). The Phase I total project cost is estimated to be $26,000,000 and

will serve approximately 1,500 equivalent residential connections (ERUs). Construction of Phase I started in November 2007. The well located at the Public Works complex is now operational.

The County should cooperate with the SJRWMD in managing and monitoring water resources and growth. This cooperation will continue to ensure the supply of groundwater for all competing users in the future.

C. Wetlands

1. General Description of Wetlands

Putnam County has an abundance of wetland areas scattered throughout its borders. Wetlands were identified from information collected by SJRWMD as part of a District-wide wetlands identification program and are identified on the "Wetlands Cover" map (Figure E-2). Wetlands have been categorized into forested wetlands and nonforested wetlands. According to SJRWMD Landuse/Landcover data from 2000, wetlands cover approximately 128,200 acres of the County. This represents roughly 24 percent of the total County land area. Many of these wetlands are associated with the St. Johns River and its tributaries. A brief description of some of the larger wetlands associated with the St. Johns River, starting at Lake George and progressing downstream to the north, follows. Following this description, a brief summary of those wetlands in the western portion of the County (which are not associated with the St. Johns River) is provided.

Northeast of Lake George and southwest of Crescent City are extensive wetlands that form the headwaters of Jumping Gully Branch and Tiger Branch. These creeks flow southwest, discharging into Lake George. In addition, Drayton Island contains numerous areas of hardwood swamp and marsh. Within the Ocala National Forest in Putnam County are numerous small wetlands, consisting of bayheads, cypress swamps, and ponds within the pine flatwoods.

Farther downstream along the west bank are the large tidally influenced hardwood swamps of the St. Johns River along with the hardwood swamps within the floodplain of the Oklawaha River. These tidal swamps continue along the west bank of the St. Johns River up to the Town of Welaka. From this point they occupy both banks all the way to Palatka. Dunns Creek also has an extensive amount of hardwood swamps within its floodplain between Crescent Lake and the St. Johns River.

A substantial hardwood swamp occupies the floodplains of Cabbage Creek and Deep Creek, both of which ultimately discharge into Rodman Reservoir. Two other large wetland systems, the Slash and Cow Heaven Bay, are northeast of Rodman Reservoir and south of S.R. 20. These areas consist of pine flatwoods, bay swamp, and hardwood swamp. The Slash drains into Rodman Reservoir via Sweetwater Creek and its tributaries. Cow Heaven Bay drains into the St. Johns River via Camp Branch. According to a report by the USACOE on the natural resources of this area, both of these areas appear to be good habitat for the Florida black bear and possibly the Florida panther. These areas are primarily undeveloped and a portion is now in public ownership as part of the Cross Florida Greenway.

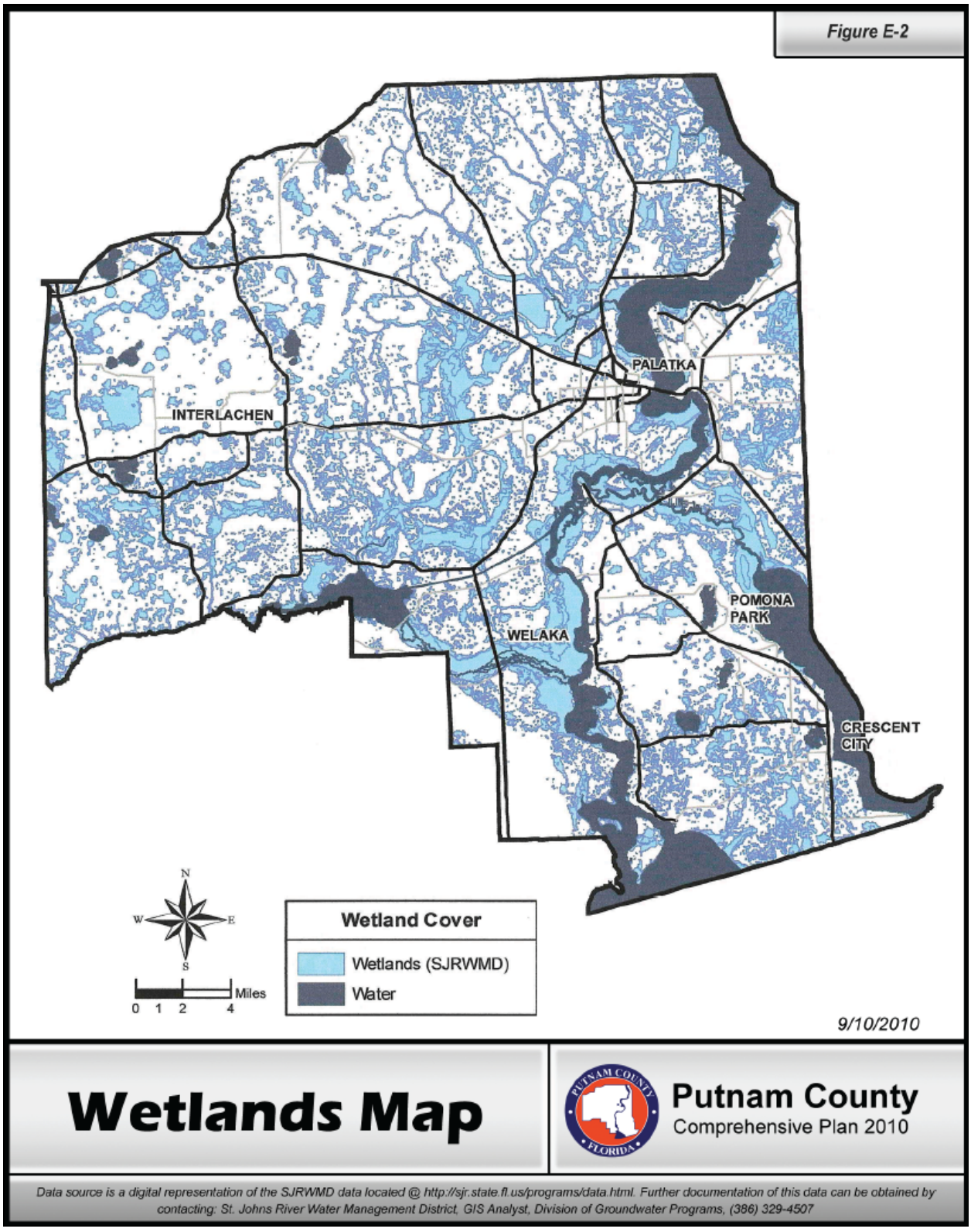


Figure E-2
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
N
W
E
S
0 1 2 4
Miles
Wetland Cover
Wetlands (SJRWMD)
Water
9/10/2010
Wetlands Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the SJRWMD data located @ http://sjr.state.fl.us/programs/data.html. Further documentation of this data can be obtained by contacting: St. Johns River Water Management District, GIS Analyst, Division of Groundwater Programs, (386) 329-4507

One of the largest wetland systems in the County is the Rice Creek Swamp, also known locally as Nine Mile Swamp. This is an extensive area of hardwood swamp several miles west of Palatka, approximately between S.R. 20 and S.R. 100. The swamp serves as the headwaters for Rice Creek. In addition, the floodplains of Rice Creek, Etoniah Creek, and Simms Creeks contain hardwood swamps for most of their length.

Those wetlands not associated with the St. Johns River are primarily the wet prairies within the Central Highlands region of western Putnam County. Among the larger prairies are Levy Prairie, Putnam Prairie, Ashley Prairie, Goodson Prairie, Fowlers Prairie, and Orange Grove Lake Prairie.

These prairies are typically very shallow and are covered by herbaceous wetland vegetation. Many prairies go dry during the dry season, distinguishing them from marshes. Some of these prairies, such as Putnam Prairie and Ashley Prairie, are associated with lakes; some form the headwaters of the Etoniah Creek Drainage Basin and are interconnected during high water.

2. Impacts to Wetlands

According to information provided by the SJRWMD in its "District 2005 Water Management Plan," wetland losses are occurring primarily along the coastal areas and in urbanizing areas as a result of conversion to urban uses. As Putnam County becomes more urbanized, the rate of wetland loss is expected to increase. Agricultural acreage has remained stable in Putnam County for many years and it is unlikely that wetlands have been substantially impacted by this use. Silvicultural acreage fluctuates depending on many factors and drainage practices and clear cutting primarily impact wetlands. The Florida Division of Forestry has developed BMP (Best Management Practice) guidelines for harvesting timber in wetlands; however the amount and extent of impacts to these wetlands are not known.

The location and identification of all good quality (significant) wetlands—those which have had minimal impacts from development, timbering, drainage, etc.—throughout the County are not fully known. Some of these wetlands may be candidates for the Save Our Rivers Acquisition Program administered by the SJRWMD and SRWMD.

Over the past 20 years the SJRWMD has purchased 26,966 acres of environmentally sensitive lands in Putnam County, many of which contain wetland areas. These publicly-owned lands are now protected and have been inventoried in Table E-5 along with all other public and private conservation lands. SJRWMD lands include Dunns Creek, Lake George, Caravelle Ranch, Horseshoe Point, Haw Creek, Seven Sisters Islands, and Murphy Creek. In addition, the State has purchased the Etoniah Creek State Forest (formally the Timber Cover DRI), which also has wetlands associated with Etoniah Creek.

To protect waterfronts and water bodies from surface runoff, it is suggested that a vegetated upland filter or buffer strip be provided. This is an area of planted or indigenous vegetation whose purpose is to remove sediment, organic matter, and dissolved nutrients from surface waters passing through it as well as to provide habitat for wildlife. According to the United States Soil and Conservation Service, an appropriate buffer may range from 15 to 25 feet. The SJRWMD recommends a 25-foot buffer and a 25-foot buffer was approved in the Comprehensive Plan.

3. Analysis of Wetlands

With the assistance of the SJRWMD and SRWMD, the County needs to inventory and evaluate wetlands and identify those which are especially valuable, productive, and/or unique. Putnam County should continue to coordinate with the SJRWMD and SRWMD and other agencies in recommending the acquisition of significant wetlands.

D. Floodplains

1. National Flood Insurance Program

Putnam County participates in the National Flood Insurance Program. This program regulates development in flood-prone areas and ensures the health, welfare, and public safety of the community. To participate, a community must determine the extent of the 100-year floodplain and develop a floodplain ordinance to regulate development within these areas. The Flood Insurance Study for Putnam County was conducted by the Federal Emergency Management Agency (FEMA) to delineate flood areas on Flood Insurance Rate Maps. FEMA has established the 100-year floodplain within Putnam County (Figure E-3). Any development permitted in these areas is subject to the regulations in the floodplain ordinance.

Putnam County has adopted Article 6, Section 6.05, of the Land Development Code, which requires any new development or expansion of an existing development to occur outside the 100-year flood plain. It also identifies the areas of special flood hazard as being A, AO, AH, A1 through A30, and A-99 on the latest Flood Insurance Rate Map.

According to information provided by FEMA, 100-year floodplain cover approximately 199,000 acres in the County.

2. Drainage Basins

Drainage in Putnam County can be divided into three major drainage basins, which are further divided into sub-drainage basins. Each sub-basin represents a geographic area developed around a central drainage feature such as a stream or lake. See Figure E-4 for a depiction of drainage basins as delineated by the SJRWMD.

The northern and eastern halves of Putnam County lie within the St. Johns River Drainage Basin with those areas west of the St. Johns River draining generally south and east towards the St. Johns River. Those areas east of the St. Johns River drain generally towards the west with the exception of those areas of the Fruitland peninsula, which drain east into Dunns Creek and Crescent Lake. Sub-basins within the St. Johns River Basin are (1) Crescent Lake; (2) Etoniah Creek, the largest sub-basin in the County; (3) Deep Creek; and (4) St. Johns River. A portion of southwest Putnam County roughly south of S.R. 20 and west of U.S. 17 is within the Oklawaha River Basin, which drains south and east. Sub-basins within the Oklawaha Basin are (1) Sweetwater Creek, (2) Rodman Reservoir, and (3) Orange Creek. Extreme southeast Putnam County drains south toward Lake George.

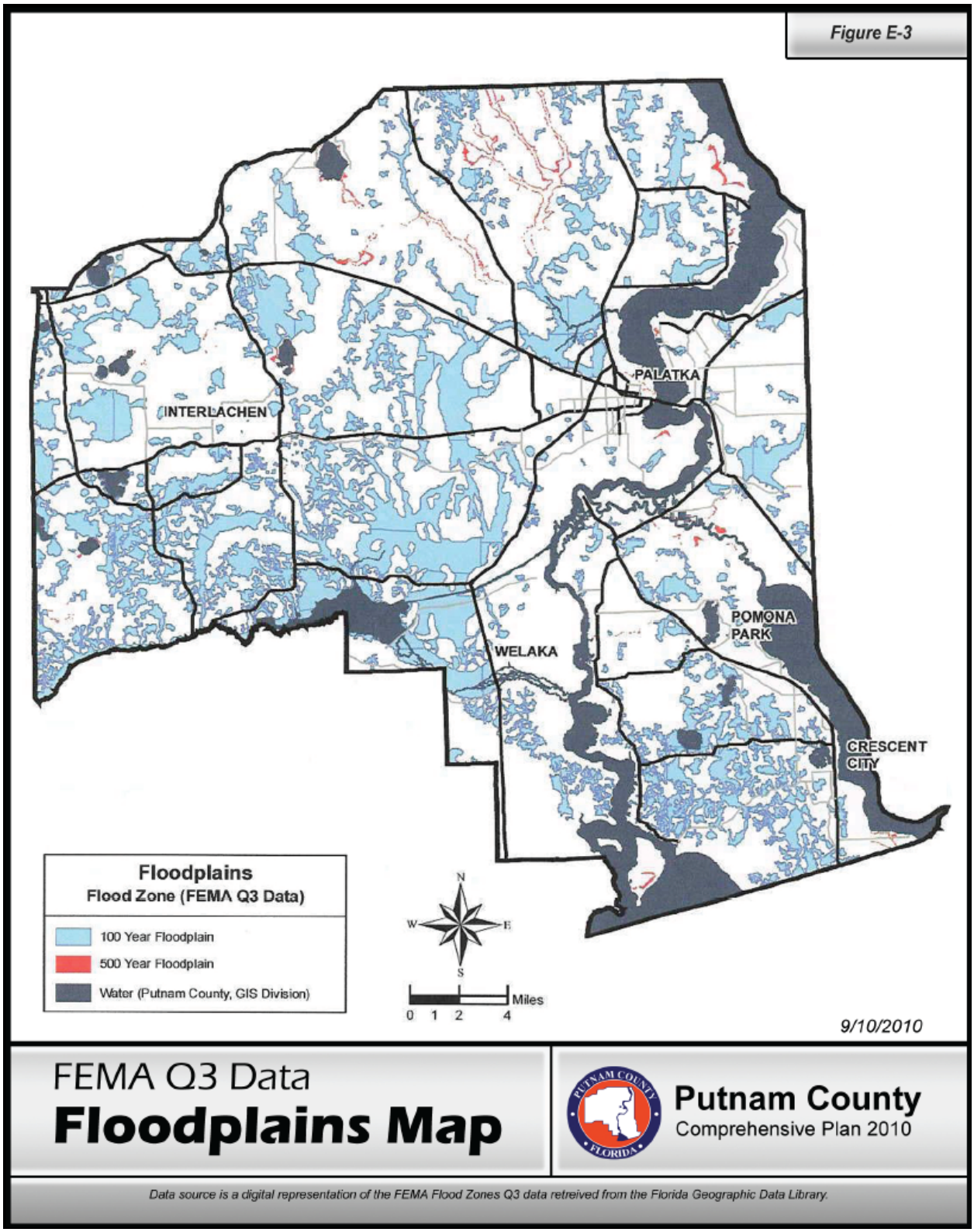


Figure E-3
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
Floodplains
Flood Zone (FEMA Q3 Data)
100 Year Floodplain
500 Year Floodplain
Water (Putnam County, GIS Division)
N
W
E
S
Miles
0 1 2 4
9/10/2010
FEMA Q3 Data
Floodplains Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the FEMA Flood Zones Q3 data retreived from the Florida Geographic Data Library.

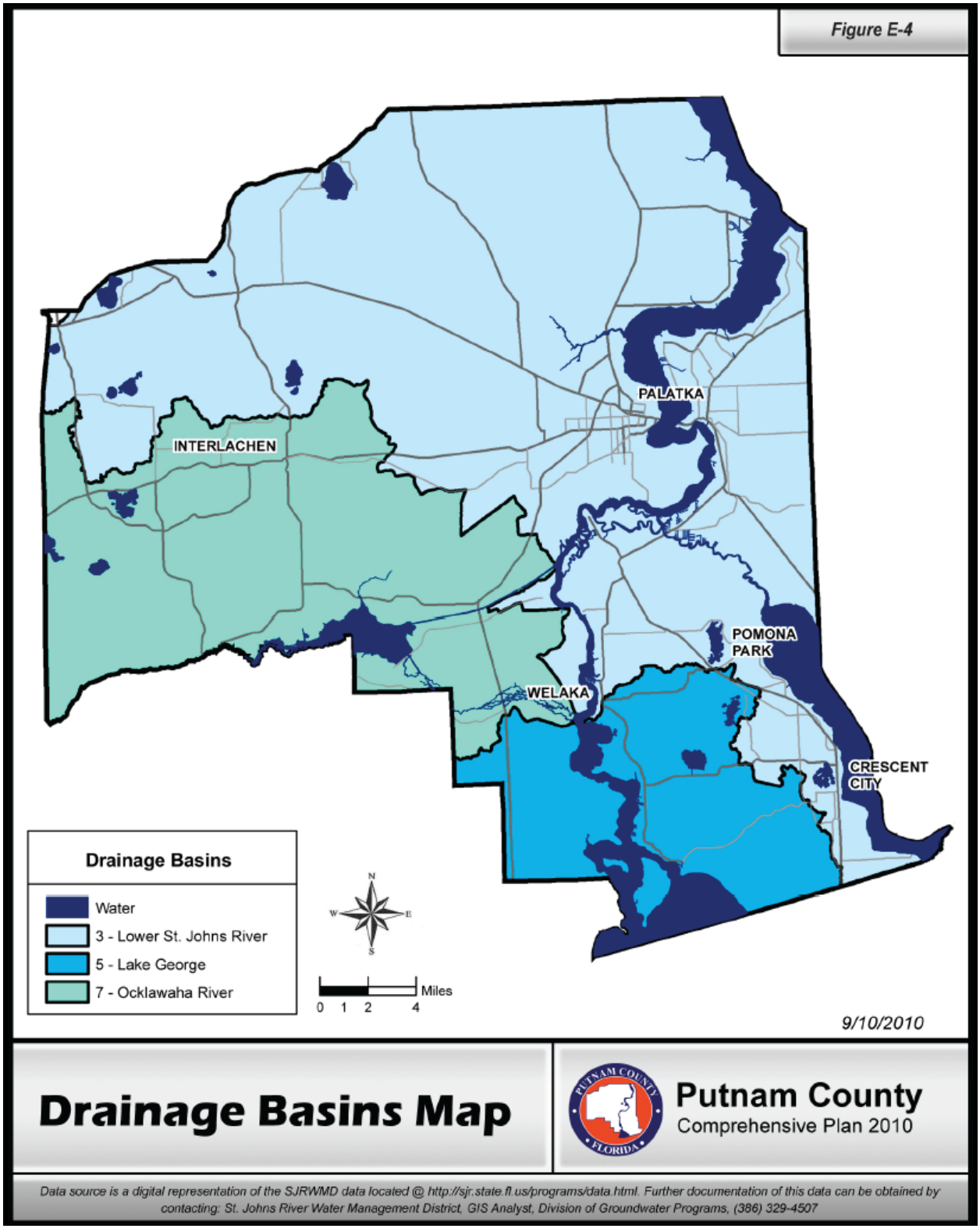


Figure E-4
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
Drainage Basins
Water
3 - Lower St. Johns River
5 - Lake George
7 - Ocklawaha River
N
W
E
S
0 1 2 4
Miles
9/10/2010
Drainage Basins Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the SJRWMD data located @ http://sjr.state.fl.us/programs/data.html. Further documentation of this data can be obtained by contacting: St. Johns River Water Management District, GIS Analyst, Division of Groundwater Programs, (386) 329-4507

The Hastings Drainage District is the only drainage district in Putnam County. It is located in the Hastings area and includes the potato and cabbage agricultural areas of eastern Putnam County north of East Palatka. Drainage districts have taxing authority and were formed primarily to alleviate flooding problems by creating and maintaining drainage ditches or channelizing streambeds.

3. Flooding

Floodplains which include lakes, rivers, and wetlands are important to Putnam County for providing drainage, controlling surface water levels, filtering pollutants, providing flood storage during flooding, promoting groundwater recharge, and providing wildlife habitat. Floods are a natural occurrence and only become a hazard when the natural floodplains are altered through urbanization and development. As development in the low-lying areas increases, property damage and loss of life increase due to flooding. Flooding is a problem in several areas of Putnam County where development has occurred within floodplains. Many of these areas were developed before the County floodplain ordinance and the Land Development Regulations, which require floor elevations to be above the 100-year flood elevation, were established.

Periodic flooding has been documented within the northwestern portion of the County in the vicinity of Putnam Hall and Halfmoon Lake. Flooding occurred in 1964, 1965, and 1973 as a result of heavy summer rains preceded by above-normal rainfall throughout the year. According to the Putnam County Master Stormwater Plan dated September 2006, performed by Ayres Associates, many drainage culverts in the Lower St. Johns River basin are non-functional. These obsolete structures (clogged with sediment) are contributing to the flooding in the northwestern part of Putnam County.

The 1964 flood occurred in the vicinity of Putnam Hall after Hurricane Dora. Water was above flood stage for three weeks, causing damage to residences and commercial establishments and causing the closing of S.R. 26 due to inundation. This same situation occurred the summer of 1965 due to above-normal rainfall. In 1973, above-normal summer rains again flooded the Putnam Hall area and many homes around Halfmoon Lake. Undersized culverts under S.R. 26 and S.R. 100 exacerbated this flooding. In some cases overgrown vegetation and debris caused by lack of maintenance-obstructed culverts and other outlets. Another area that experiences periodic flooding is the Dunns Creek Subdivision, a mobile home subdivision on the north bank of Dunns Creek between U.S. 17 and the St. Johns River. Flooding here is a result of a combination of high tides, above-normal rainfall, and development within the 100-year floodplain below the base flood elevation. Much of this area is developed at an elevation of five feet and the base flood elevation is at six feet. In addition to the Dunns Creek Subdivision, many other areas in the vicinity of Dunns Creek and San Mateo also have flooding problems associated with development within low-lying areas. One such area is the north side of Dunns Creek east of U.S. 17.

East Palatka also has pockets of low-lying areas which experience periodic flooding, such as along Elsie Drive near Pico Road and the East Palatka Boat Ramp, which has flooding problems associated with high tides and rainfall.

Another area with flooding problems is known locally as the Mondex Subdivision, which is south of Palatka and north of the Barge Canal between S.R. 19 and Stokes Landing Road. This area consists of low-density residential development with numerous privately owned dirt roads and flooding is a recurring problem here. Finally, in the Interlachen area there are many miles of dirt roads and

ditches and culverts that require continual maintenance due to erosion from heavy rains. This erosion also contributes to sedimentation and degradation of water quality in area lakes.

4. Analysis of Floodplains

Since floodplains so often involve wetlands, additional attention should be paid to land use permitted in floodplain areas not only to protect citizens and their property from flood hazards but also to protect the substantial wetlands in the County from adverse impacts originating in adjacent areas.

The County should continue to ensure that development, including roads, is restricted within the 100-year flood zones and that the local floodplain ordinance is enforced to ensure that all structures are built to code, including the construction of all floors above the base flood elevation through either elevation or fill. As development occurs, natural drainage systems need to be protected from surface water runoff and erosion. The County should ensure that areas known to experience periodic flooding have adequate drainage systems, including properly sized culverts and maintained ditches.

A stormwater management ordinance is in place for development (Article 7, 7.08.03), which requires that post-development runoff be equal to or less than pre-development runoff.

As part of the Countywide Stormwater Master Plan, the County has identified areas which experience repetitive flooding and erosion and developed a plan to reduce or eliminate these problems through efforts by the Putnam County Public Works Department and identify funding sources to accomplish this including capital improvement or grants or a combination of the two.

E. Fisheries, Wildlife, Marine Habitats, and Vegetative Communities

1. Fisheries

The St. Johns River supports a variety of fresh and saltwater fish species—e.g., black bass, bream, speckled perch, shell cracker, catfish, striped bass, mullet, shad, shrimp, and blue crabs—due to its tidally influenced brackish water. Even sharks are spotted in the river from time to time during the dry season when salinity levels are higher. Species harvested commercially include blue crab, shrimp, and mullet. The St. Johns River is also home to the sturgeon, which has become extremely rare due to loss of habitat and overfishing. The St. Johns River and Rodman Reservoir are both popular bass fishing areas with tournaments held annually. Sport fishing plays an important role in the County's economy, bringing in many out-of-county as well as out-of-state anglers.

2. Vegetative Communities

Putnam County has a diverse physiography, ranging from the low coastal plain in eastern Putnam County to the rolling hills of the central highlands in western Putnam County. This has resulted in a variety of terrains, soil types, and vegetative communities. Based on the latest land cover estimates, there are approximately 97,500 acres or 152 square miles of wetlands and 166,900 acres or 261 square miles of forested uplands and scrub in the County (see Figure E-5).

The types of vegetative communities and the listed species found in them are described below.

Figure E-5 depicts the general locations of the vegetative communities. Listed species are those plants and animals that are in danger because of loss of habitat and/or exploitation by man. These species are listed by several agencies, including the Florida Game and Freshwater Fish Commission and the U.S. Fish and Wildlife Service. Species are listed in increasing order of endangerment as (1) Species of Special Concern, (2) Threatened, or (3) Endangered.

a. Wetland Communities

(i) Hardwood Swamp

This community typically is associated with the St. Johns River and its tributaries including the Oklawaha River, Orange Creek, Cabbage Creek, Deep Creek, Dunns Creek, Rice Creek, Simms Creek, and Etoniah Creek. This community is submerged or saturated for part of the year. Typical tree species are deciduous and include bald cypress, elm, red maple, black gum, water tupelo, and Carolina ash. Understory plants are sparse due to a lack of sunlight and include bluestem palmetto, dahoon holly, buttonbush, royal fern, cinnamon fern, and lizards tail.

The following listed species of plants and animals may be found here:

Plants: Dwarf spleenwort, hanging club moss, and harpers beauty.
Mammals: Florida black bear, Florida panther.

(ii) Cypress Swamp

This community occurs along lakes and rivers and in depressions within the pine flatwoods throughout much of the County. Water is at or above the surface for much of the year. Bald cypress is the dominant tree found along rivers and lakes; pond cypress is the dominant tree found in the cypress ponds of the flatwoods. Black gum is commonly associated with cypress swamps along with red maple and willow. Understory plants include buttonbush, wax myrtle, bluestem palmetto, cinnamon fern, royal fern, pickerel weed, and wild pine.

The following listed species of plants and animals may be found here:
Mammals: Florida black bear, Florida panther.
Birds: Bald eagle, wood stork.

(iii) Bayhead

This community occurs throughout the County, primarily within depressions in the pine flatwoods but also as linear strips adjacent to some hardwood swamps. These areas are usually maintained by seepage from adjacent higher lands. Dominant trees are the loblolly bay, sweetbay, and red bay with secondary trees being slash pine and black gum. Understory plants include gallberry and fetterbush.

The following listed species of plants and animals may be found here:

Mammals: Florida black bear, Florida panther.
Plants: Chapman's rhododendron.

(iv) Wet Prairies

Western Putnam County has some of the most extensive areas of wet prairie in Florida. This

includes Levy Prairie, Putnam Prairie, Ashley Prairie, Goodson Prairie, Fowlers Prairie, and Orange Grove Lake Prairie. There are also numerous small unnamed prairies in the Fruitland peninsula area of southeastern Putnam County. Prairie communities differ from marshes by having shallower water and a greater fluctuation in water levels. Prairies typically go dry during low rainfall periods. Plants are usually herbaceous and include sawgrass, maidencane, cordgrasses, spike rush, beak rush, and St. Johns wort. Wet prairies are valuable wildlife habitat.

The following listed species of animals may be found here:

Birds: Sandhill crane, Wood stork.
Reptiles: American alligator.

b. Upland Communities

(i) Pine Flatwoods

This is the most common community occurring within Putnam County, as it is in all of Florida. This community occurs throughout the eastern two-thirds of the County on nearly level land. During the rainy season, the water table will be at or above land surface as a result of poor drainage characteristics and little relief. The most common tree species is the slash pine; live oak is also common. Understory plants include saw palmetto, gallberry, fetterbush, wax myrtle, blackberry, dog fennel, broomsedge, bracken fern, and deer tongue.

The following listed species of plants and animals may be found here:

Mammals: *Florida black bear, Florida panther, fox squirrel.*
Reptiles: *Eastern Indigo snake, gopher tortoise.*
Birds: *Southeastern kestrel, red-cockaded woodpecker, Florida sandhill crane, bald eagle.*
Plants: Chapman's rhododendron, Bartrams Ixia.

(ii) Sand Pine Scrub

This unique community that occurs nowhere else in the world is found throughout the County in small, scattered areas. It is found in the central highland portion of western Putnam County, in the Fruitland peninsula portion of southeastern Putnam County, and within the Ocala National Forest portion of the County. Soils here are sandy and drain excessively and only drought-resistant plant and animal species can survive in this community. The dominant tree species is the sand pine with secondary trees including bluejack oak, chapman oak, myrtle oak, and sand live oak. Understory plants include rosemary, dwarf huckleberry, prickly pear, saw palmetto, cat greenbriar, and deer moss.

The following listed species of plants and animals may be found here:

Mammals: *Florida mouse, Goff's pocket gopher.*
Reptiles: *Blue-tailed mole skink, sand skink, Short-tailed snake.*
Birds: *Florida scrub jay.*
Plants: Four-petal pawpaw, pygmy fringetree, curtis milkweed, dancing lady orchid.

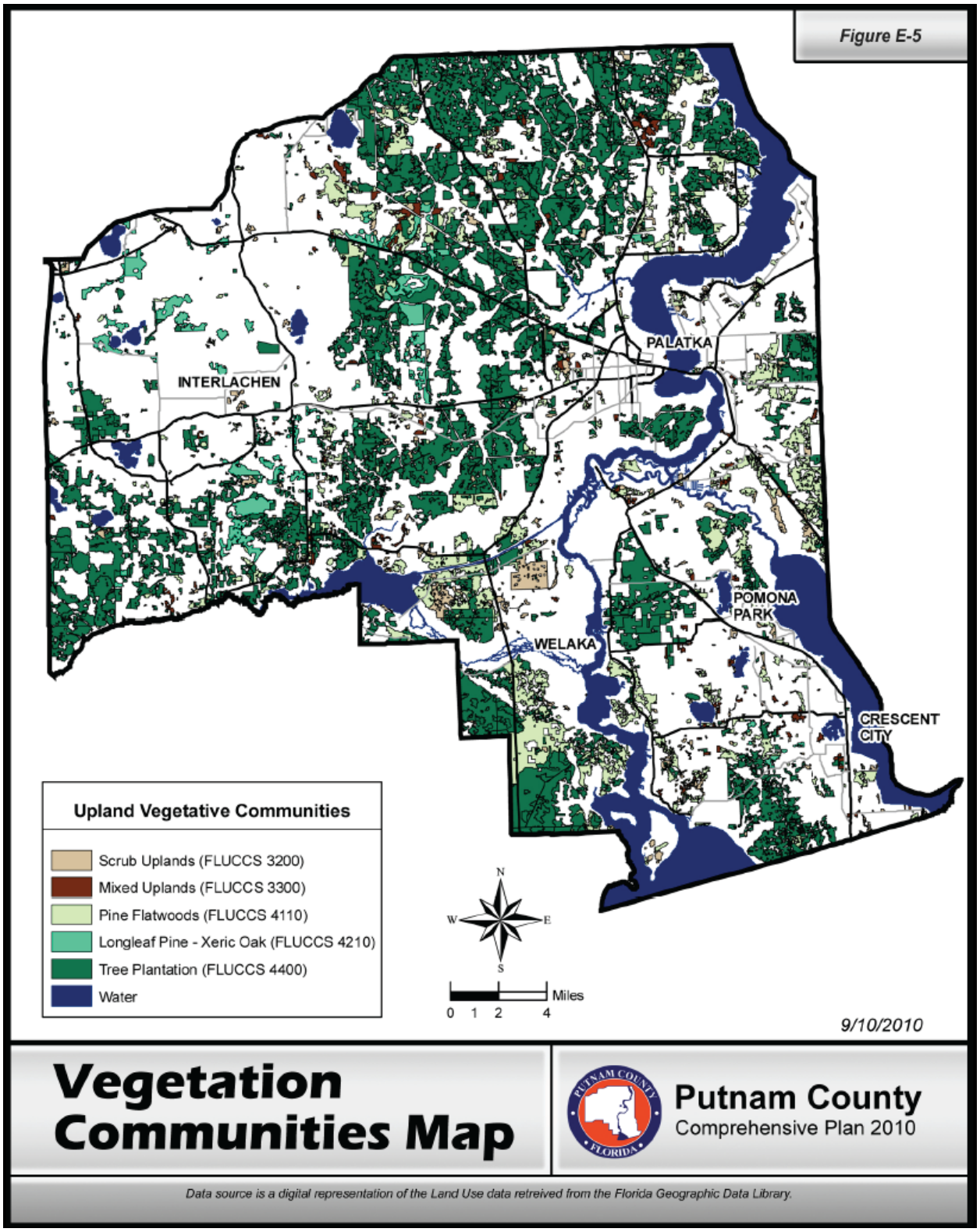


Figure E-5
INTERLACHEN
PALATKA
POMONA PARK
WELAKA
CRESCENT CITY
Upland Vegetative Communities
Scrub Uplands (FLUCCS 3200)
Mixed Uplands (FLUCCS 3300)
Pine Flatwoods (FLUCCS 4110)
Longleaf Pine - Xeric Oak (FLUCCS 4210)
Tree Plantation (FLUCCS 4400)
Water
N
W
E
S
Miles
0 1 2 4
9/10/2010
Vegetation Communities Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the Land Use data retreived from the Florida Geographic Data Library.

Longleaf pine - turkey oak (sandhills):

This community generally occurs in the same areas of the County as the sand pine scrub community. It is most common in the central highlands region of western Putnam County and in the Fruitland peninsula area. This community is also a drought-adapted community occurring on rolling hills with excessively drained soils; however, soil moisture is slightly higher than the sand pine scrub community. This community is often important as a recharge area to the Floridan aquifer. Dominant tree species are the longleaf pine and the turkey oak with other trees including bluejack oak and live oak. Understory plants include saw palmetto and wiregrass.

The following listed species of plants and animals may be found here:

Mammals: *Florida mouse, fox squirrel.*
Reptiles: *Blue-tailed mole skink, Short-tailed snake, gopher tortoise, Eastern indigo snake.*
Birds: *Southeastern kestrel, red-cockaded woodpecker.*
Plants: *Florida coontie, Godfrey's blazing star.*

(iii) Hydric Hammock

This transitional community generally occurs on slightly higher areas next to the hardwood swamps where water tables are high and/or soils are subject to seepage from adjacent upland areas. Trees are typically evergreen and include cabbage palm, laurel oak, water oak, live oak, red bay, red maple, sweetbay, sweetgum, and magnolia. Understory plants include wax myrtle, saw palmetto, wild grape, cinnamon fern, and royal fern.

The following listed species of plants and animals may be found here:

Mammals: *Florida black bear, Florida panther.*

(iv) Upland Hardwood Hammock

This community occurs on rolling terrain throughout the County and is considered to be a climax community. It makes up a small portion of the County and many of these areas have been developed. Relic examples of this community are evident throughout Palatka, Crescent City, and Welaka. This community is characterized by a variety of hardwood tree species including American Beech, American holly, black cherry, dogwood, live oak, laurel oak, magnolia, hickory, and sweetgum. The understory is sparse due to the shading and low sunlight conditions.

The following listed species of plants and animals may be found here:

Mammals: *Florida black bear, Florida panther.*
Reptiles: *Eastern indigo snake.*
Plants: *Needle palm.*

(v) Oak Hammock

This community occurs throughout Putnam County in small scattered locations. The dominant tree species are live oak and laurel oak with the understory being composed mostly of saw palmetto. An example of this community occurs where S.R. 100 passes through Florahome just west of Palatka.

The following listed species of plants and animals may be found here:

Mammals: *Florida panther.*
Reptiles: *Short-tailed snake.*
Plants: *Florida coontie.*

3. Environmentally Sensitive Lands

To consider the designation of appropriate areas of the County as Conservation on the Future Land Use – 2007 Map, the County inventoried environmentally sensitive lands as defined in Policy E.1.4.1. The environmentally sensitive lands study included an assessment of the occurrence of native vegetation within the County addressing the type, location, distribution, and amount and identifying the environmentally sensitive lands listed in Policy E.1.4.1.

a. Environmentally Sensitive Lands Descriptions

The descriptions provided below are from the *Guide to Natural Communities of Florida* prepared by the Florida Natural Areas Inventory and FDEP, February 1990, and also from the results of the environmentally sensitive lands inventory completed in 1999.

(i) Scrub (synonyms: sand pine scrub, Florida scrub, sand scrub, rosemary scrub, oak scrub)

Scrub occurs in many forms, but is often characterized as a closed to open canopy forest of sand pines with dense clumps or vast thickets of scrub oaks and other shrubs dominating the understory. The ground cover is generally very sparse, being dominated by ground lichens or, rarely, herbs. Open patches of barren sand are common. Where the overstory of sand pines is widely scattered or absent altogether, the understory and barren sand are exposed to more intense sunlight. Typical plants include sand pine, sand live oak, myrtle oak, Chapman's oak, scrub oak, saw palmetto, rosemary, rusty lyonia, ground lichens, scrub hickory, scrub palmetto, hog plum, silk bay, beak rush, milk peas, and stagger bush. Typical animals include red widow spider, scrub wolf spider, oak toad, Florida scrub lizard, blue-tailed mole skink, sand skink, six-lined racerunner, coachwhip, ground dove, scrub jay, loggerhead shrike, yellow-rumped warbler, rufous-sided towhee, Florida mouse, and spotted skunk. Scrubs of the Lake Wales Ridge are notable for the large number of narrowly endemic plants and animals that occur in them.

Scrub occurs on sand ridges along former shorelines. Some ridges originated as wind-deposited dunes, others as wave-washed sandbars. Some scrub soils are composed of well-washed, deep sands that are brilliant white at the surface; some scrubs occur on yellow sands. The loose sands drain rapidly, creating xeric conditions for which plants appear to have evolved several water-conservation strategies.

Scrub is essentially a fire-maintained community. Ground vegetation is extremely sparse and leaf fall is minimal, thus reducing the chance of frequent ground fires. As the sand pines mature, however, they retain most of their branches and build up large fuel supplies in their crowns. When a fire does occur, this fuel supply, in combination with the resinous needles and high stand density, ensures a hot, fast-burning fire. Such fires allow for the regeneration of the scrub community that might otherwise succeed to xeric hammock. The minerals in the vegetation are

deposited on the bare sand as ashes, and the heat of the fire generally facilitates the release of pine seeds. As discerned from the life histories of the dominant plants, scrub probably burns catastrophically once every 20 to 80 years or longer.

Scrub is associated with and often grades into sandhill, scrubby flatwoods, coastal strand, and xeric hammock. Some xeric hammocks are advanced successional stages of scrub, making intermediate stages difficult to classify. Scrub occurs almost exclusively in Florida, although coastal scrubs extend into adjacent Alabama and Georgia.

Because scrub occurs on high dry ground and is not an aesthetically pleasing habitat, at least to the uninitiated, this ecosystem and its many endangered and threatened species are rapidly being lost to development. Scrub is also readily damaged by off-road vehicle traffic or even foot traffic, which destroys the delicate ground cover and allows the loose sand to erode. Ground lichens may require 50 years or more to recover.

As Figure E-6 shows, this community is found in northwestern and southeastern Putnam County. The Florida Natural Areas Inventory (FNAI) has identified three sites in Putnam County: one within the Etoniah Greenways CARL project and two within Etoniah Creek State Forest. The FNAI does not identify the amount of acreage that these three areas cover. Another source used as a cross reference to identify the location of scrub is the land cover map produced by the SJRWMD, which indicates that the majority of this community is located within the Ocala National Forest. Small remnants of this community are found in the southwest portion of the County south of Interlachen and several small areas of scrub uplands are identified in the vicinity of the Dunns Creek parcel owned by FDEP. There is also one isolated area of this community along S.R. 100 between Palatka and Carraway. According to information provided by the SJRWMD, scrub covers approximately 7,734 acres in the County.

(ii) Xeric Hammock: (synonyms: xeric forest, sand hammock, live oak forest, oak woodland, oak hammock)

Xeric hammock is characterized as either a scrubby, dense, low canopy forest with little understory other than palmetto, or a multi-storied forest of tall trees with an open or closed canopy. Several gradations between these extremes exist. Typical plants include live oak, sand live oak, laurel oak, turkey oak, blackjack oak, red oak, sand post oak, staggerbush, saw palmetto, sparkleberry, pignut hickory, southern magnolia, redbay, American holly, wild olive, black cherry, fox grape, beautyberry, bluejack oak, Chapman's oak, persimmon, and yaupon. Typical animals include barking tree frog, spadefoot toad, gopher tortoise, worm lizard, fence lizard, black racer, red rat snake, hognose snake, crowned snake, screech-owl, turkey, blue jay, eastern mole, gray squirrel, and eastern flying squirrel.

Xeric hammock is an advanced stage of scrub or sandhill. The variation in vegetation structure is predominantly due to the original community from which it developed. In all cases, however, the soils consist primarily of deep, excessively drained sands that were derived from old dune systems. The scarcity of herbs and the relatively incombustible oak litter preclude most fires from invading xeric hammock. When fire does occur, it is nearly always catastrophic and may revert xeric hammock into another community type. Xeric Hammock only develops on sites that have been protected from fire for 30 or more years. They are often associated with and grade

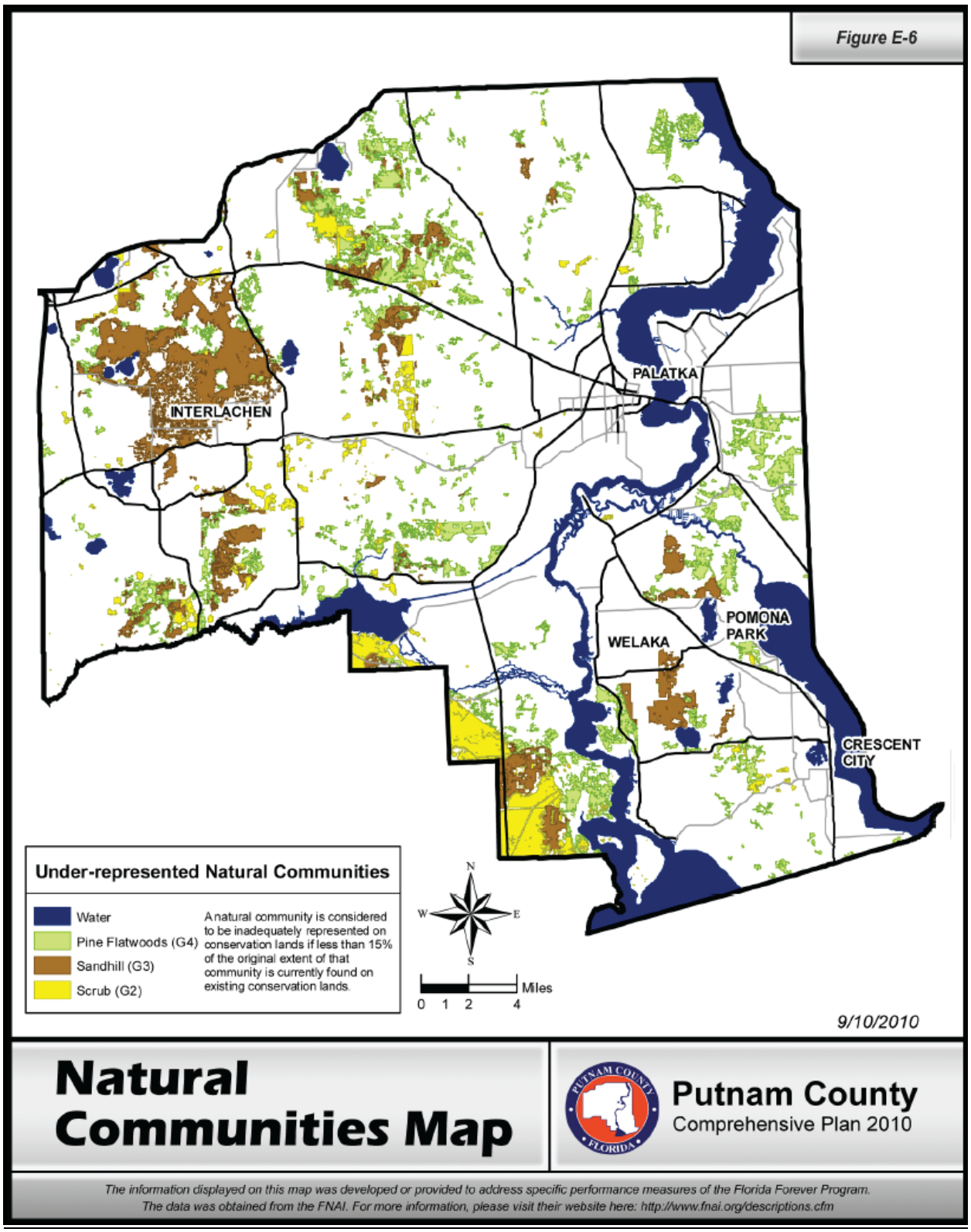
into scrub, sandhill, upland mixed forest, or slope forest. The species composition of xeric hammock is also often similar to prairie hammock and maritime hammock. Xeric hammock is often considered the climax community on sandy uplands.

Xeric hammock occurs generally as isolated patches that rarely cover extensive areas. Mature examples are rare, and scrub-derived types have always been scarce. Because of its general location on high ground with big trees, xeric hammock is prime residential property, especially when near the coast. Remaining tracts of xeric hammock require protection from fire and development.

This community is scattered throughout the County; however, no sites have been identified by FNAI. Although the land cover map produced by the SJRWMD does not use the term *xeric hammock*, this community would be found in proximity to the "Mixed Upland Forest" land cover type identified on the SJRWMD land cover map (Figure E-5).

(iii) Slope Forest: (synonyms: ravine forest, bluff forest, mesic hammock, hardwood hammock, steepheads, mixed hardwood and pine, climax hardwoods, southern mixed hardwoods, mixed mesophytic forest)

Slope forests are characterized as well-developed, closed-canopy forests of upland hardwoods on steep slopes, bluffs, and ravines. The combination of densely shaded slopes and cool, moist microclimate produces conditions that are conducive to the growth of many species which are more typical of the Piedmont and Southern Appalachian Mountains, including black walnut, basswood, wild hydrangea, sweet shrub, strawberry bush, wild ginger, bluebell, maidenhair fern, Solomon's seal, liverleaf, doll's eyes, bellwort, bloodroot, snakeroot, false hellebore, lousewort, wild comfrey, rattlesnake plantain, bladder nut, and leatherwood. Other typical plants include southern magnolia, American beech, spruce pine, white oak, laurel oak, mockernut hickory, American holly, southern red cedar, pignut hickory, sand hickory, sweetgum, sourwood, partridgeberry, saw greenbrier, sarsaparilla vine, trilliums, silverbell, Christmas fern, witchhazel, redbud, mountain laurel, Carolina laurelcherry, Sebastianbush, fringe tree, big leaf snowbell, tulip poplar, live oak, flowering dogwood, horse sugar, silky camellia, Florida yew, Ashe magnolia, pyramid magnolia, and torreya tree. Typical animals include southern dusky salamander, three-lined salamander, slimy salamander, mud salamander, red salamander, spring peeper, box turtle, five-lined skink, broadhead skink, ground skink, gray rat snake, eastern king snake, rough green snake, eastern garter snake, coral snake, southern copperhead, red-tailed hawk, turkey, woodcock, mourning dove, yellow-billed cuckoo, screech owl, great horned owl, common night hawk, ruby-throated hummingbird, red-bellied woodpecker, yellow-bellied sapsucker, downy woodpecker, pileated woodpecker, crested flycatcher, eastern phoebe, eastern kingbird, blue jay, tufted titmouse, Carolina chickadee, nuthatches, Carolina wren, hermit thrush, robin, brown thrasher, cedar waxwing, white-eyed vireo, red-eyed vireo, yellow-throated warbler, palm warbler, ovenbird, summer tanager, cardinal, rufous-sided towhee, white-throated sparrow, orchard oriole, opossum, gray squirrel, eastern woodrat, golden mouse, raccoon, gray fox, bobcat, and white-tailed deer.



Slope forests occur on areas with substantial topographic relief. Soils are generally composed of

sands, sandy clays, or clayey sands with substantial organics and occasionally calcareous components near the bottom of the slope. Sandy soils are generally well drained, but clayey soils may shed much of the rainfall and exhibit significant surface water runoff. Thus, soil erosion is often a combination of seepage erosion, which occurs largely from the valley floors up, and surface erosion, which occurs largely from the hilltops down.

Slope forests are mesic communities with relatively moist and cool microclimates that vary, however, with topographic location. Although the preponderance of deciduous trees creates a thick mulch of leaf litter, which helps retain soil moisture, the higher elevations with deep sandy soils and thinner leaf mantles may exhibit nearly xeric soil conditions. Lower elevations on the slopes near cool streams or where seepage is prevalent tend to be cooler, and moister soils may be nearly hydric. In addition, slight changes in soil moisture are often reflected by different plant species. For example, star anise tends to be associated with the lower seepage slopes and other wet sites, while mockernut hickory tends to be associated with well-drained, drier upper sites. Furthermore, north-facing slopes receive less sunlight in winter, which tends to lower surface temperatures and allows many northern species that require a substantial winter chill to survive in southern slope forest refugia.

Slope forests exhibit one of the highest species diversities in the state, largely because of their admixture of northern temperate and subtropical elements. Several endemic species also occur in slope forests. Tree density is relatively high, inducing much competition for space, water, sunlight, and nutrients. Succession is generally restricted to areas where trees have fallen and created openings in the canopy.

Slope forests are climax communities that may be very difficult to distinguish from upland hardwood forest or upland mixed forest because they share many species. Slope forests generally have steeper slopes than other upland communities, and they frequently have plants that appear to be specifically adapted to slopes, such as oak-leaf hydrangea and torreya tree. Slope forests are often associated with the grade into upland pine forests or sandhills at their upper elevations and bottomland forest, seepage slope, or floodplain communities at their lower elevations. Seepage streams commonly occur along the valley floors of slope forests, while bluff communities may occur where the slope is unstable or precipitous.

Slope forests are very sensitive communities whose delicate microclimate can be easily disturbed by timber harvests, which open the canopy, or by hydrological manipulations which affect seepage and surface water sources. Their steep slopes quickly erode when unvegetated or scarred by facilities development or by foot or vehicular traffic. Unsightly dumps are frequently found in slope forest ravines or steepheads. Dumped refuse not only disturbs or buries the delicate vegetation, but also could impact water quality. Impoundments of slope forest ravines are also common. They destroy the unique microhabitats and lotic environments, which occur on the lower slopes. Additionally, the unique assemblage of plants and animals attracts many hobbyists and professional collectors whose uncontrolled activities could significantly impact some species. Because of their biological and geological characteristics, slope forests should be protected diligently from human-related disturbances.

(iv) Sandhill Upland Lake: (synonyms: sand-bottomed lake, silt-bottomed lake,

oligotrophic lake, sandhill lake)

Sandhill upland lakes are generally characterized as shallow rounded solution depressions occurring in sandy upland communities. They are generally permanent water bodies, although water levels may fluctuate substantially and they may become completely dry during extreme droughts. They are typically lentic water bodies without significant surface inflows or outflows. Instead, water may be largely derived from lateral groundwater seepage through the surrounding well-drained uplands and/or from artesian sources via connections with the underlying limestone aquifer.

Vegetation may be largely restricted to a narrow band of hydrophytic grasses and herbs along the shore or a dense shrub thicket depending, on fire frequency and water fluctuations. Shallow, gradually sloping shorelines may have much broader bands of emergent vegetation with submerged aquatic plants occasionally dominating much of the water column; floating plants sometimes cover much of the surface. Typical plants include panicums, rushes, bladderwort, water lilies, sawgrass, pickerelweed, fragrant water lily, water shield, St. John's wort, arrowheads, beak rush, yellow-eyed grass, hatpins, meadow beauty, sundews, and spikerush.

The substrate of sandhill upland lakes is primarily composed of sands with organic deposits increasing with water depth. Sandhill upland lakes characteristically have clear, circumneutral to slightly acidic, moderately soft water with varying mineral content. They may be ultra-oligotrophic, with extremely low nutrient levels, seldom becoming eutrophic unless artificially fertilized by human-related activities.

Sandhill upland lakes are frequently extremely important breeding areas for terrestrial amphibians, including the threatened gopher frog, as well as many unusual or endemic insects. They are also important watering holes for many mammals and birds inhabiting the surrounding xeric communities. Wading birds and ducks may also use these lakes as feeding areas.

Sandhill upland lakes are extremely vulnerable to hydrologic manipulations. Excessive municipal, industrial, or agricultural withdrawals of groundwater could lower regional water tables and, thus, induce successional responses in the lake basin. Groundwater pollution, especially from misapplication of chemicals on the surrounding well-drained uplands, could significantly alter the nutrient balance and produce devastating effects on the fauna and flora. Furthermore, because they frequently have direct or indirect connections with the aquifer, sandhill upland lakes often function as aquifer recharge areas and, thus, should be diligently protected from chemical pollution. Invasion by exotic species is also an important concern in these communities.

As shown in Figure E-6, sandhill upland lakes are concentrated in the western portions of the County, followed by areas in the southeast portion of the County within the sandhill vegetative communities. The FNAI has identified three sites in northwestern Putnam County, two in the vicinity of the Swisher/Ordway Preserve (Newton Lake, Clubhouse Lake and Trotting Pond) and one site in southwestern Putnam County (Gillis Lake).

(v) Seepage Stream: (synonyms: steephead stream, clear brook, swift brook, hammock stream)

Seepage streams are characterized as perennial or intermittent seasonal watercourses originating

from shallow groundwater that has percolated through deep, sandy, upland soils. Seepage streams typically have clear to lightly colored water maintained at fairly constant temperatures of around 70 degrees F., and are relatively short, shallow, and narrow. Although a stream may be classified as a seepage stream along its entire length, seepage streams also form the headwaters of many alluvial and blackwater streams. After large sediment loads are picked up or after drainage through extensive swamps, water clarity is diminished and the stream is then classified as alluvial or blackwater.

Because they are generally sheltered by a dense overstory of broad-leaved hardwoods that block out most sunlight, seepage streams most often have depauperate aquatic floras. Filamentous green algae occur sporadically within the stream, while mosses, ferns and liverworts may grow in clumps at the water's edge. In the lower, broader reaches where insolation levels are sometimes greater, narrow bands of spatterdocks, golden club, spikerush, and pondweeds may occur along the shorelines, and tape grass and pondweed may grow in the streambed. Typical animals include sailfin shiner, creek chub, speckled madtom, brown darter, blackbanded darter, amphiuma, Alabama waterdog, southern dusky salamander, two-lined salamander, mud salamander, southern red salamander, bronze frog, snapping turtle, loggerhead musk turtle, rainbow snake, redbelly watersnake, and brown watersnake.

Percolation through deep soils slows the release of rainwater, filters the water, and buffers temperature extremes. Thus, seepage streams often exhibit perennial, slow flow rates of clear, cool, unpolluted water. Seepage streams generally have sandy bottoms, although clays, gravel and limestone may be prevalent along stretches where formations composed of these sediments are exposed. Additionally, deep organic deposits may accumulate near stream bends and in other low areas where the leaf litter is not washed away by currents.

Seepage streams are generally confined to portions of the state where topographic relief is pronounced, especially in northern Florida. They are often associated with seepage slope and slope forest near their headwaters, and bottomland forest, Floodplain Forest and Swamp Forest near their mouths. Seepage Streams are readily distinguished from other Florida stream communities by their small magnitude, lack of a deep aquifer water source, and the absence of extensive swamp lowlands surrounding their headwaters.

A unique type of seepage stream, the steephead stream, develops by a rather unusual geologic process. Rainfall percolates through the deep sandy soils capping the surrounding uplands until it encounters impermeable clays or other non-porous sediments. Water then travels laterally until it reaches the surface and produces a seepage area along a slope or a spring. The seepage waters begin to erode the hill's base and cause the overburden to slump. Thus, the steephead stream valley is largely a product of seepage erosion, which begins primarily at the bottoms of valleys instead of at their tops. Consequently, the gradient of steephead streams is generally much lower than that of other upland streams in similar topography, because the head of a steephead stream is already near the bottom of a valley.

Seepage streams may be threatened by various activities. Applications of fertilizers or biocides on the surrounding uplands or dumping of hazardous wastes and other refuse within the drainage basin could pollute the shallow groundwater that feed the seepage streams. Deforestation of the surrounding slopes could increase surface erosion and cause excessive sedimentation of the

stream valley and increase insolation levels and cause the stream to become overgrown with shrubs or emergent herbaceous species. Impounding the stream would destroy much of the lotic habitat and restrict the upstream movements of aquatic animals. Because they are unique natural features of limited distribution within the state, seepage streams should be diligently protected from significant disturbances.

(vi) Spring-run Stream: (synonyms: calcareous stream, spring, or creek)

Spring-run streams are characterized as perennial watercourses, which derive most, if not all, of their water from artesian openings in the underground aquifer. Waters issuing from the aquifer are generally clear, circumneutral to slightly alkaline (ph = 7.0 - 8.2), and perennially cool (66 - 75 degrees Fahrenheit). These conditions saturate the water with important minerals, allow light to penetrate deeply, and reduce the limiting effects of environmental fluctuations, all of which are conducive for plant growth. Thus, spring-run streams are among the most productive aquatic habitats. Typical plants include tape grass, wild rice, giant cutgrass, arrowheads, southern naiads, pondweeds, and chara. Typical animals include mollusks, stoneflies, mayflies, caddisflies, simuliids, chironomids, American alligator, alligator snapping turtle, Suwannee cooter, loggerhead musk turtle, rainbow snake, red-belly watersnake, brown watersnake, and many fish species.

Spring-run streams generally have sand bottoms or exposed limestone along their central channel. Calcareous silts may form thick deposits in quiet shallow zones, while leaf drift and other debris collect around fallen trees and quiet basins. The latter, along with limestone outcrops and rock debris, form important aquatic habitats for many small aquatic organisms. When undisturbed, submerged aquatic vegetation clothes most of the spring-run stream bottom and provides shelter and an abundant food source for the extensive web of life.

The water emanating from the aquifer is generally clear because of the filtering and absorbing actions of the soils and aquifer limestones through which the water percolates and flows. When the water is deep, it may appear bluish because of light-refraction characteristics that are similar to those which cause the sky to be blue on clear days. If the water sources for the aquifer are substantially influenced by nearby swamps or flatwoods, the spring-run stream may temporarily become stained with tannins and other dissolved organics during or following periods of heavy rains. When extensive underground cavities connect the spring caverns with nearby sinks and swallow holes, the spring-run stream may become turbid with suspended particulates during and following heavy rains and floods. Conversely, during periods of low rainfall, the aquifer can become supersaturated with calcium, carbonates, and other ions. These chemicals readily precipitate when the water reaches the surface, causing the spring head or boil to appear milky.

Human activities affect flow rates by withdrawing water from the aquifer through deep wells. When withdrawal is substantial within the recharge area, spring flow is reduced or, in some cases, ceases entirely. Normal flow rates may return when excessive withdrawals are eliminated.

People can also substantially affect the quality of spring waters. Agricultural, residential, and industrial chemicals and pollutants may readily leach through soils, especially when they are improperly applied or disposed of. If polluted groundwater infiltrates the deep aquifer feeding a spring-run stream, recovery may not be possible. Applications of herbicides to control aquatic

plant growth are also detrimental, because their use often induces eutrophication of the stream.

Other human-related impacts to spring-run streams include the destruction of aquatic vegetation by overuse or misuse and the introduction and proliferation of exotic plants and animals. Both of these impacts may be very difficult to control. Overuse is likely to increase because of the limited number of publicly-owned springs and the desires of an increasing population to enjoy their clean, cool, aesthetic qualities and unique recreational opportunities. Exotic species are often severely detrimental to native species, and they may also disrupt recreational activities. A delicate balance between recreation and preservation must be sought.

FNAI has only officially identified one spring-run stream on its inventory (Mud Spring), located within the Welaka State Forest. However, as part of this inventory, seven known springs and associated spring runs have been identified within the County: (1) Whitewater Springs in Ravines State Gardens in Palatka, (2) Satsuma Spring approximately 2 miles north of Welaka, (3) Nashua Spring immediately south of Satsuma Spring, (4) Welaka Spring just outside the north Town limits of Welaka, (5) Mud Spring in the Welaka State Forest, (6) Forest Springs approximately 2 miles south of Welaka, and (7) Beecher Springs several miles southeast of Welaka. All of these springs discharge into the St. Johns River.

(vii) Floodplains

Floodplains are included in the definition of *Environmentally Sensitive Lands* and are described in a previous section.

(viii) High Recharge Areas

High Recharge Areas are included in the definition of *Environmentally Sensitive Lands* and are described in a previous section.

(ix) Wetlands

Wetlands are included in the definition of *Environmentally Sensitive Lands* and are described in detail above. As part of the Environmentally Sensitive Lands Study, a recommendation has been made to designate three of the largest wetland prairies in Putnam County—Levy's Prairie, Goodson Prairie and Fowlers Prairie—as Conservation.

b. Private and Public Conservation Lands

An inventory of public or private conservation lands within the County has also been completed. Table E-5 lists 115,858 acres of publicly owned conservation lands in Putnam County: a national forest, a Navy bombing range, three State Forests, Cross Florida Greenways, lands owned by the Trustees of the Internal Improvement Trust Fund, U.S. Fish and Wildlife Service lands, lands owned by the SJRWMD and land owned by Putnam County. Figure E-7 displays the Publicly-Owned Open Spaces in Putnam County.

Table E-4 Putnam County Public Conservation Lands

Name of Conservation Area	Owner	Acres
Publicly-Owned Conservation Land		
Welaka National Fish Hatchery	US Fish & Wildlife Service	405

Table E-4 Putnam County Public Conservation Lands

Name of Conservation Area	Owner	Acres
Walton Parcel	St. Johns River Water Management District	10
Welaka State Forest	Trustees of the Internal Improvement Trust Fund	2,248
Rodman Bomb Target	US Navy	2,410
Seven Sisters Islands	St. Johns River Water Management District	277
Ocala National Forest	US Forest Service	23,798
Palatka-Lake Butler State Trail	Trustees of the Internal Improvement Trust Fund	275
Murphy Creek Conservation Area	St. Johns River Water Management District	1,714
Carl Duval Moore State Forest and Park	Trustees of the Internal Improvement Trust Fund	306
Dunns Creek Conservation Area	St. Johns River Water Management District	3,228
J. A. Ginn Jr. Parcel	St. Johns River Water Management District	48
Marjorie Harris Carr Cross Florida Greenway State Recreation and Conservation Area	Trustees of the Internal Improvement Trust Fund	26,097
Rice Creek Conservation Area	St. Johns River Water Management District	4,370
Haw Creek Preserve State Park	Trustees of the Internal Improvement Trust Fund	7
Edgefield Parcel	St. Johns River Water Management District	239
Lake George Conservation Area	St. Johns River Water Management District	8,306
Crescent Lake Conservation Area	St. Johns River Water Management District	82
Caravelle Ranch Wildlife Management Area	Trustees of the Internal Improvement Trust Fund	5,969
Ordway-Swisher Biological Station	University of Florida Foundation	9,095
Dunns Creek State Park	Trustees of the Internal Improvement Trust Fund	6,252
Etoniah Creek State Forest	Trustees of the Internal Improvement Trust Fund	8,815
Horseshoe Point Conservation Area	St. Johns River Water Management District	2,674
Caravelle Ranch Conservation Area	St. Johns River Water Management District	6,661

Table E-4 Putnam County Public Conservation Lands

Name of Conservation Area	Owner	Acres
Ravine Gardens State Park	Trustees of the Internal Improvement Trust Fund	154
Levy's Prairie	St. Johns River Water Management District	2,029
SJRWMD Conservation Easements	St. Johns River Water Management District	364
Tanglewylde Center	Putnam County	25
	TOTAL	**115,858**

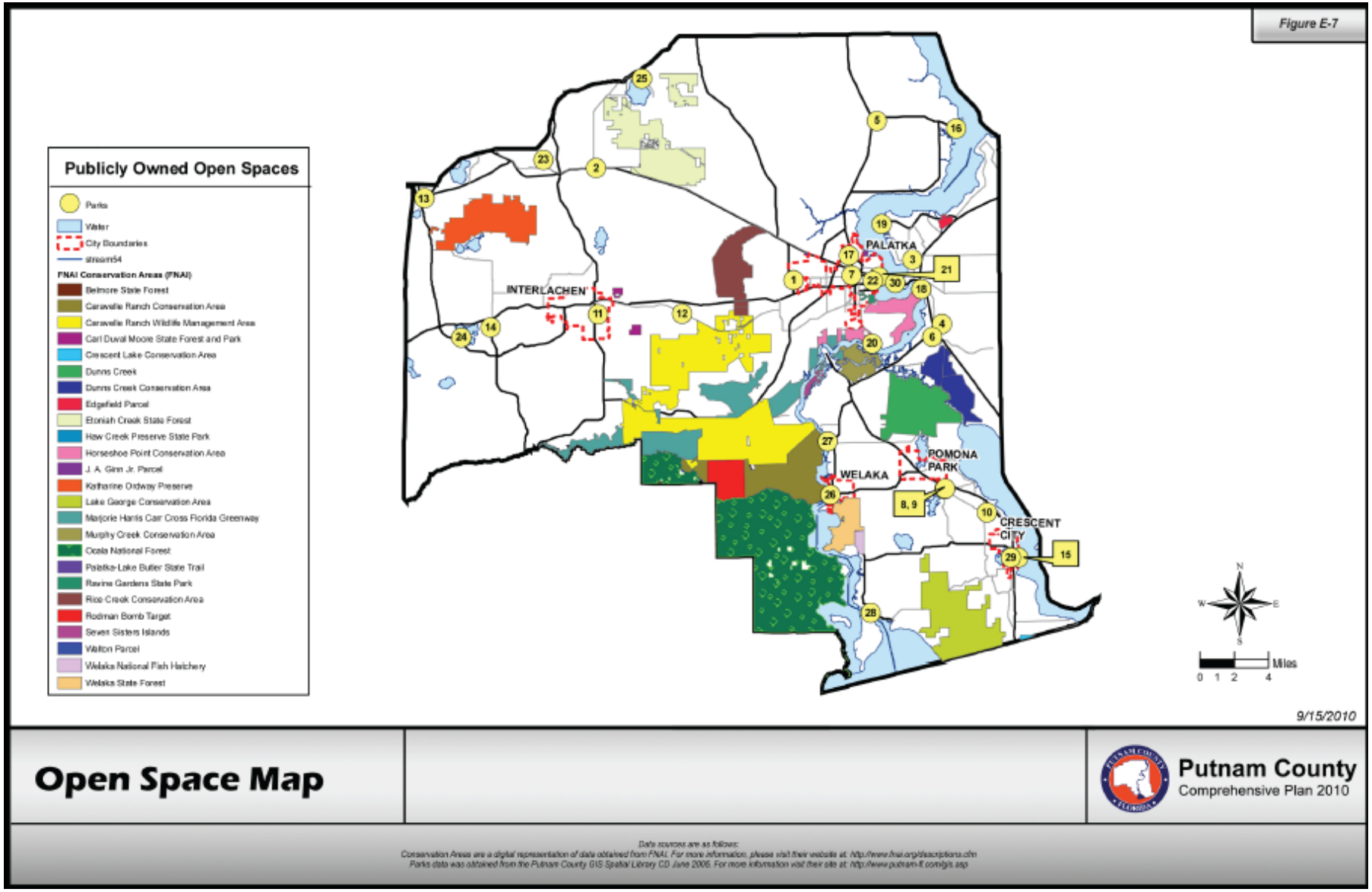
Source: FNAI (Florida Natural Areas Inventory) 2007 and Putnam County

According to the 2009 Putnam County Future Land Use Map there are 126,788 acres of total conservation land in the county (public and private). The Putnam County future land use map shows there are several areas of private conservation lands throughout the County. FNAI did not have any private lands inventoried. This explains the 11,000+ acre difference between FNAI and Putnam County records.

The Putnam Land Conservancy (PLC) is a new nonprofit private land trust which formed less than two years ago to help preserve water and land for the wildlife and citizens of Putnam County. One of the ways land trusts help protect lands is by writing grants for municipalities and counties to purchase land. PLC secures land through gifts and bequests, direct purchase and bargain sale, and conservation easements. By these means they aim to enable landowners to safeguard in perpetuity the places that define the special character of the region. The PLC does not own any property in Putnam County but is working with citizens and the County to acquire lands for wildlife corridors and greenways.

The Trust for Public Land (TPL) is a national nonprofit land conservation organization that conserves land for people to enjoy as parks, community gardens, historic sites, rural lands, and other natural places, ensuring livable communities for generations to come. In October 2006 TPL unveiled plans to create a comprehensive St. Johns River Greenprint. This includes a detailed conservation plan that will identify key natural sites within the St. Johns watershed and establish priorities for which sites to save and how they should be used and managed. The TPL has not yet purchased property in Putnam County for the Greenprint plan, but activities are currently in process in the south Putnam area near Georgetown.

Figure E-7


Publicly Owned Open Spaces
Parks
Water
City Boundaries
stream54
FNAI Conservation Areas (FNAI)
Belmore State Forest
Caravelle Ranch Conservation Area
Caravelle Ranch Wildlife Management Area
Carl Duval Moore State Forest and Park
Crescent Lake Conservation Area
Dunns Creek
Dunns Creek Conservation Area
Edgefield Parcel
Etoniah Creek State Forest
Haw Creek Preserve State Park
Horseshoe Point Conservation Area
J. A. Ginn Jr. Parcel
Katherine Ordway Preserve
Lake George Conservation Area
Marjorie Harris Carr Cross Florida Greenway
Murphy Creek Conservation Area
Ocala National Forest
Palatka-Lake Butler State Trail
Ravine Gardens State Park
Rice Creek Conservation Area
Rodman Bomb Target
Seven Sisters Islands
Walton Parcel
Welaka National Fish Hatchery
Welaka State Forest
INTERLACHEN
PALATKA
POMONA PARK
WELAKA
CRESCENT CITY
8, 9
N
W
E
S
Miles
0 1 2 4
9/15/2010
Open Space Map
Putnam County
Comprehensive Plan 2010
Data sources are as follows:
Conservation Areas are a digital representation of data obtained from FNAI. For more information, please visit their website at: http://www.fnai.org/dlaccepttoru.cfm
Parks data was obtained from the Putnam County GIS Spatial Library CD June 2006. For more information visit their site at: http://www.putnam-fl.com/gis.asp

c. Other Lands of Interest

Agencies and private conservation organizations listed in Policy E.1.4.1 were contacted to request information about environmentally sensitive lands as defined in Conservation Element Policy E.1.4.1 (wetlands, floodplains, high recharge areas, sites containing listed species, sandhill upland lakes, spring-run streams, scrub uplands, xeric hammock, slope forests, seepage streams, natural, and old growth longleaf pine communities).

The agencies and organizations provided this information as well as information on other lands they considered biologically important for various reasons which will be described below. For the study, these lands were referred to as "Lands of Interest."

To determine the locations of other lands of interest by public agencies and private environmental organizations, mapped data from multiple public agencies and environmental organizations were obtained. These groups included the Florida Natural Areas Inventory (FNAI), the Florida Forever Land Acquisition Program, FDEP, and the Office of Greenways and Trails. Using a computer-based Geographic Information System (GIS), maps from each group showing lands of interest were overlaid and compiled into one map. The resulting map contained approximately 122,000 acres (non-overlap) throughout the County. Potential natural areas are shown in Figure E-8. Most of the potential conservation lands in central Putnam County are determined to create a wildlife corridor between existing conservation lands.

A generalized description of the following resulting acreage is provided: a large core area in the central part of the County corresponding to the existing Etoniah Cross Florida Greenway CARL project, a scattered group of lands in the southwest corner of the County (BJ Bar Ranch), and a tract of land in the northwest corner of the County (Clay Ranch) adjacent to the Ordway-Swisher Biological Station including a portion of the existing Putnam Sandhills CARL project.

A review of the Putnam County Future Land Use map reveals that a majority of these lands are designated as Agriculture II on the Future Land Use map as well as a few small areas of Agriculture I. Agriculture II has a residential density of one unit per 10 acres (with adequate points) or one unit per 20 acres without points. Most of the Agriculture II areas are too far removed from urban services and infrastructure to have the higher points (and resulting densities) and would be limited to one unit per 20 acres. These lands would have to have a land use designation of at least Agriculture I or higher to have the potential to be developed significantly. Current population growth in the County does not justify these land use changes at this time.

Each of the mapped areas from the different groups is described below. Table E-5 identifies the acreage of each area along with the area percentage compared to the total Putnam County land area.

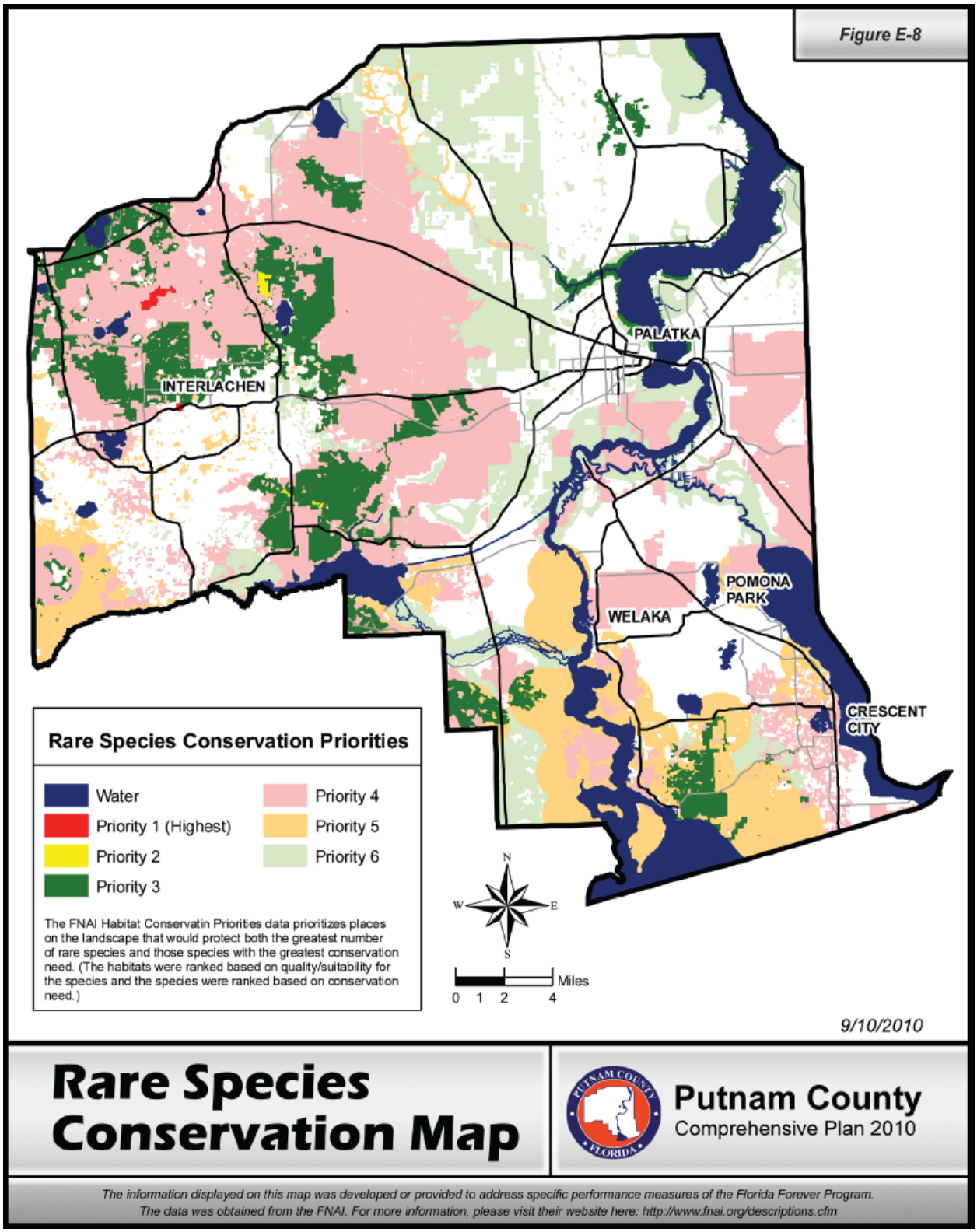


Figure E-8
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
Rare Species Conservation Priorities
Water
Priority 1 (Highest)
Priority 2
Priority 3
Priority 4
Priority 5
Priority 6
The FNAI Habitat Conservatin Priorities data prioritizes places on the landscape that would protect both the greatest number of rare species and those species with the greatest conservation need. (The habitats were ranked based on quality/suitability for the species and the species were ranked based on conservation need.)
N
W
E
S
Miles
0 1 2 4
9/10/2010
Rare Species Conservation Map
Putnam County
Comprehensive Plan 2010
The information displayed on this map was developed or provided to address specific performance measures of the Florida Forever Program.
The data was obtained from the FNAI. For more information, please visit their website here: http://www.fnai.org/descriptions.cfm

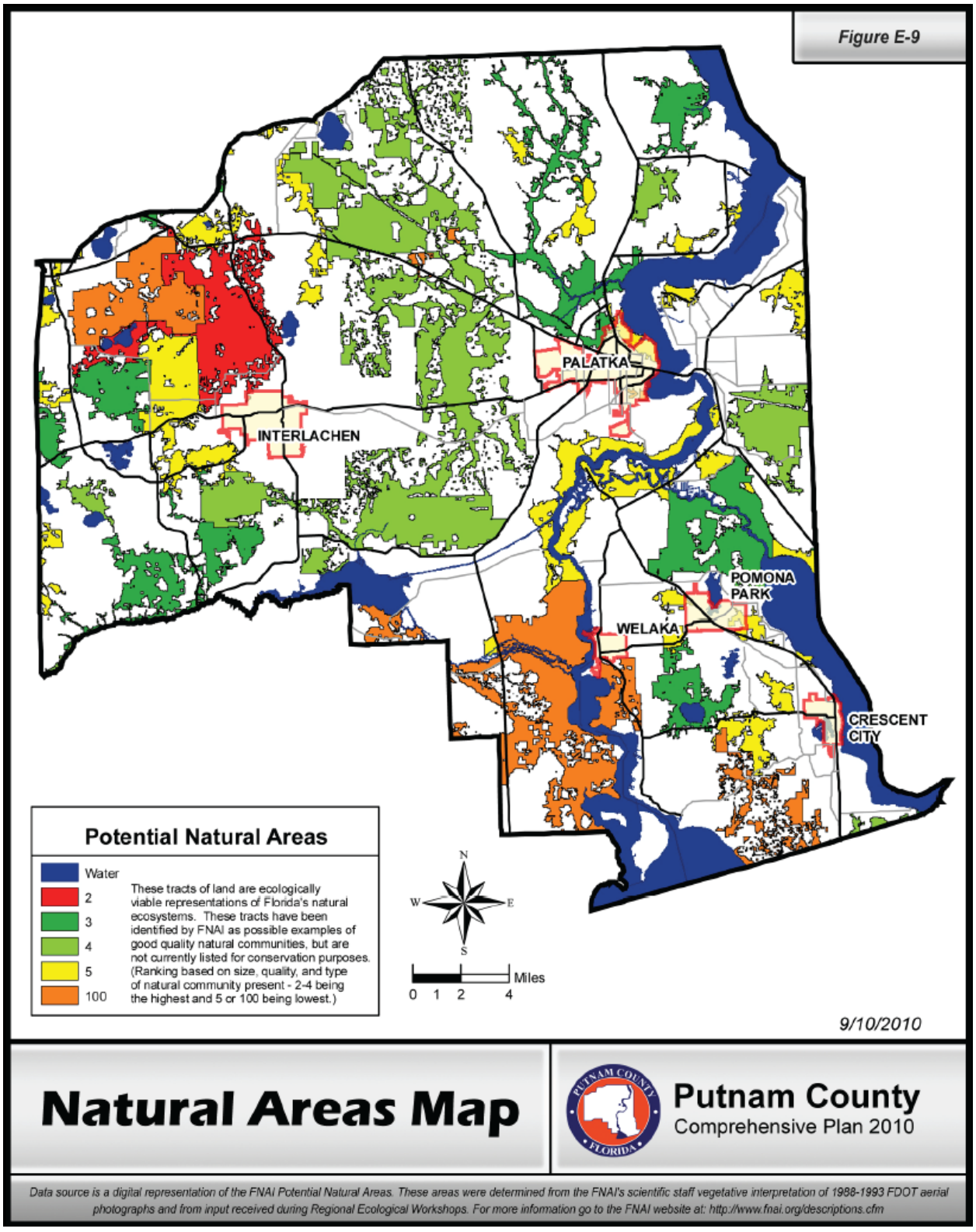


Figure E-9
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
Potential Natural Areas
Water
2
3
4
5
100
These tracts of land are ecologically viable representations of Florida's natural ecosystems. These tracts have been identified by FNAI as possible examples of good quality natural communities, but are not currently listed for conservation purposes. (Ranking based on size, quality, and type of natural community present - 2-4 being the highest and 5 or 100 being lowest.)
N
W
E
S
Miles
0 1 2 4
9/10/2010
Natural Areas Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the FNAI Potential Natural Areas. These areas were determined from the FNAI's scientific staff vegetative interpretation of 1988-1993 FDOT aerial photographs and from input received during Regional Ecological Workshops. For more information go to the FNAI website at: http://www.fnai.org/descriptions.cfm

Table E-5 Acreage of Lands of Interest Identified

Area	Acres	Percent of Putnam County
FNAI Areas of Conservation Interest/ Florida Forever Land Acquisition Areas	90,080	19.50
Florida Ecological Greenway Critical Linkages	114,376	24.75
Combined Areas (non-overlap)	122,064	

Source: FNAI. 2007.

(i) FNAI Areas of Conservation Interest

This data set illustrates Areas of Conservation Interest (ACIs) as categorized by the FNAI in December of 2007. The FNAI data were designed to provide information about significant natural resources for use by the Regional Planning Councils (RPCs) in preparing their Strategic Policy Plans. ACIs support unprotected examples of important natural resources. Rare Species Conservation Priority Areas are shown in Figure E-9.

The occurrence information upon which the sites are based comes from a variety of sources: field surveys by FNAI staff, published and unpublished materials, herbaria and museum collections, and contacts with knowledgeable persons, among others. Although reliable information was obtained from aerial photographic interpretation and regional workshops, most of these sites have not been field-surveyed, and information from the FNAI data base and FGFWFC priority wildlife habitat analysis has not been fully incorporated.

Verification of the current conditions of ACIs is a major ongoing task of FNAI, which will continue to review and incorporate information from its database as the regional ecological analyses continue.

Lands already on Florida's CARL or Save Our Rivers (SOR) project lists are excluded.

Areas of Conservation Interest were identified primarily from aerial photographic interpretation of natural communities by FNAI scientist and from input during the Regional Ecological Workshops (REW) held in each Regional Planning Council.

Participants in REW included county foresters, water management districts, county planning and parks offices, FDEP regional offices, FDEP district biologists, County Soil Conservation Service employees, FGFWFC regional biologists, local chapters of the Florida Native Plant Society, National Audubon Society, Sierra Club, other environmental groups, federal agencies involved in natural resource issues, CARL liaison staff members, and academic researchers.

Staff from the RPCs was asked to provide additional input about locally knowledgeable persons. Participants were asked to identify rare and threatened natural communities, endangered species

habitats, endangered plant communities, outstanding natural areas, and other outstanding natural features within the RPC area and to mark sites that they wished to nominate for consideration as ACIs on county highway maps.

(ii) Strategic Habitat Conservation Areas

In 1994, the FGFWFC produced a report titled **"**Closing the Gaps in Florida's Wildlife Habitat Conservation System." This report looked at existing public and private conservation lands and made recommendations for conserving additional conservation lands. These additional lands are essential to providing some of the state's rarest plants, animals, and natural communities with a land base necessary to sustain them into the future. Lands that were identified by the FGFWFC became known as Strategic Habitat Conservation Areas (SHCA). Several areas in Putnam County were identified, as shown in Figure E-10 and described below.

That portion of the Etoniah Cross Florida Greenway CARL project located north of S.R. 20 was designated as a SHCA due to the occurrence of numerous species of globally imperiled plants, including Etoniah Rosemary, Chapman's Sedge, Florida Mountain Mint, Bog Spicebush, Florida Willow, Florida Spiny Pod, Variable-Leafed Indian Plantain, and Large-Flowered Grass-Of-Parnassus.

The lower portion of this CARL project south of S.R. 20 (Cow Heaven Bay) was also designated as a SHCA due to its providing important habitat for the Florida Black Bear. Another area designated as a SHCA for the Florida black bear is located east of the St. Johns River and includes areas just north of Welaka adjacent to Acosta Creek, the wetlands along Dunns Creek, and a large wetland area east of San Mateo (Hell Cat Bay). These areas were included due to their function as a corridor for black bears moving between the Ocala National Forest and large expanses of bear habitat in Flagler and St. Johns Counties.

Wetlands along the lower portion of Rice Creek as well as Dunns Creek and the St. Johns River south of Palatka have been designated as a SHCA due to their being habitat for the swallow-tailed kite. The large wet prairie southeast of Grandin immediately north of Orange Grove Lake was designated a SHCA due to its importance as habitat for the Florida sandhill crane.

Finally, a large area in extreme southeast Putnam County including Hog Island, Drayton Island, and lands east of these two islands on the Putnam/Volusia County line have been designated as a SHCA due to their importance as habitat for the bald eagle.

Strategic Habitat Conservation Areas occupy approximately 146,000 acres in the County. Of this total, approximately 85,000 acres or 58 percent are already protected within public and/or private conservation areas (Ocala National Forest, Navy Bombing Range, Etoniah Creek State Forest, Welaka State Forest, Ordway-Swisher Biological Station, Dunns Creek Conservation Area, Lake George Conservation Area, Seven Sisters Islands, Murphy Creek Conservation Area, Dunns Creek Preserve, Cross Florida Greenway, and Caravelle Ranch Conservation Area).

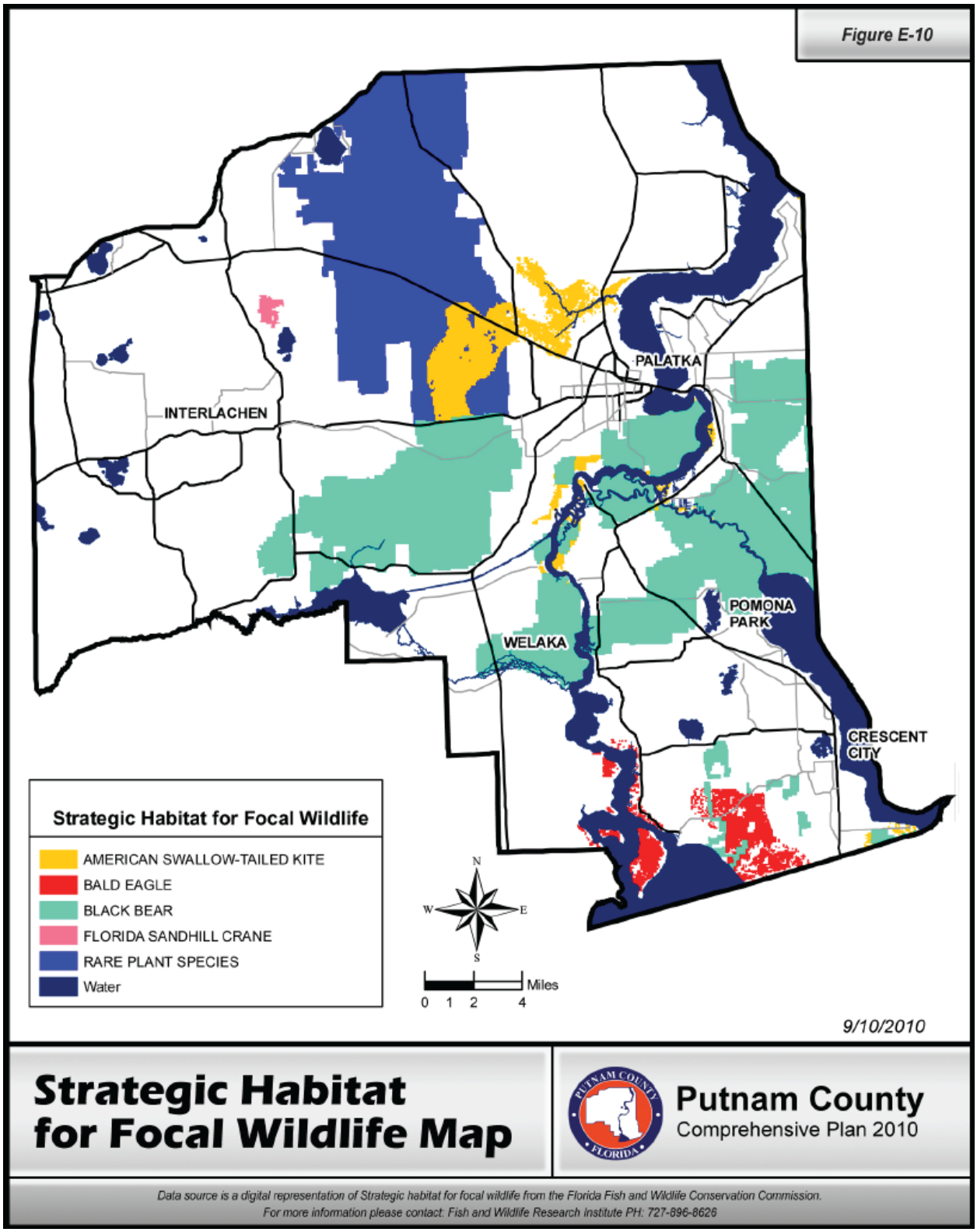


Figure E-10
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
Strategic Habitat for Focal Wildlife
AMERICAN SWALLOW-TAILED KITE
BALD EAGLE
BLACK BEAR
FLORIDA SANDHILL CRANE
RARE PLANT SPECIES
Water
N
W
E
S
Miles
0 1 2 4
9/10/2010
Strategic Habitat for Focal Wildlife Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of Strategic habitat for focal wildlife from the Florida Fish and Wildlife Conservation Commission.
For more information please contact: Fish and Wildlife Research Institute PH: 727-896-8626

(iii) ***Biodiversity Hot Spots***

The FGFWFC study mentioned above assembled a large database of known locations of plants, animals, and natural communities. This information was used to create a set of maps known as **"**Biodiversity Hot Spots" maps. These maps also include known species and community locations as identified by FNAI and the FGFWFC databases. Biodiversity Hot Spots are shown on Figure E-11.

The data are divided into three categories based on the number of focal species present. The maps are intended to display areas where large numbers of species co-occur and areas supporting rare plant and animal communities. Within Putnam County the three categories covered a majority of undeveloped lands. As a result, for this study only the highest category was used to identify only those specific areas having the greatest number of species (seven or more).

The highest category of hot spots covers approximately 49,100 acres within the County, of which approximately 30,000 acres or 61 percent are protected through public ownership (Ocala National Forest, Navy Bombing Range, Etoniah Creek State Forest, Welaka State Forest, Swisher Ordway Preserve, Dunns Creek Conservation Area, Murphy Creek Conservation Area, Dunns Creek Preserve - TNC, Cross Florida Greenway and Caravelle Ranch Conservation Area).

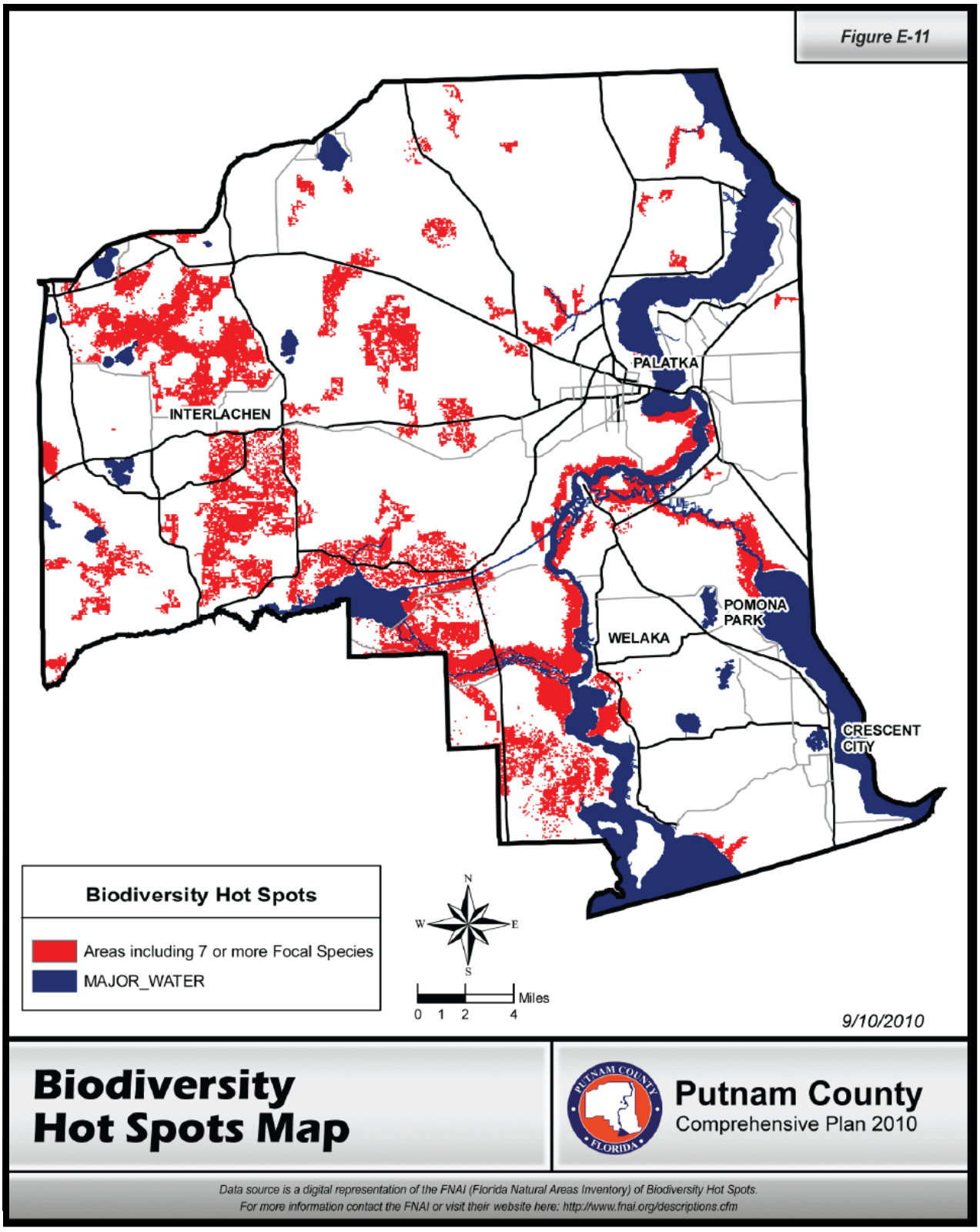


Figure E-11
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
Biodiversity Hot Spots
Areas including 7 or more Focal Species
MAJOR_WATER
N
W
E
S
Miles
0 1 2 4
9/10/2010
Biodiversity Hot Spots Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the FNAI (Florida Natural Areas Inventory) of Biodiversity Hot Spots.
For more information contact the FNAI or visit their website here: http://www.fnai.org/descriptions.cfm

4. Wildlife Species

a. Wildlife Habitat

The FNAI maintains a statewide database of all known locations of listed plants and animals. The FNAI was established in an effort to conserve Florida's natural diversity. The inventory of ecological resources provides a continuous process for identifying significant natural areas and providing protection for these areas. This inventory was used to determine if any "listed species" were recorded for Putnam County.

The FNAI inventory is far from complete and more than likely undocumented sites have yet to be inventoried. An example would be the threatened Florida sandhill crane, which was only listed in one area for Putnam County but is suspected to inhabit numerous wet prairies.

In addition, some species of animals have not been listed simply because of their far-ranging habits. Examples would be the black bear and the manatee, both of which are known to inhabit Putnam County and both of which are endangered.

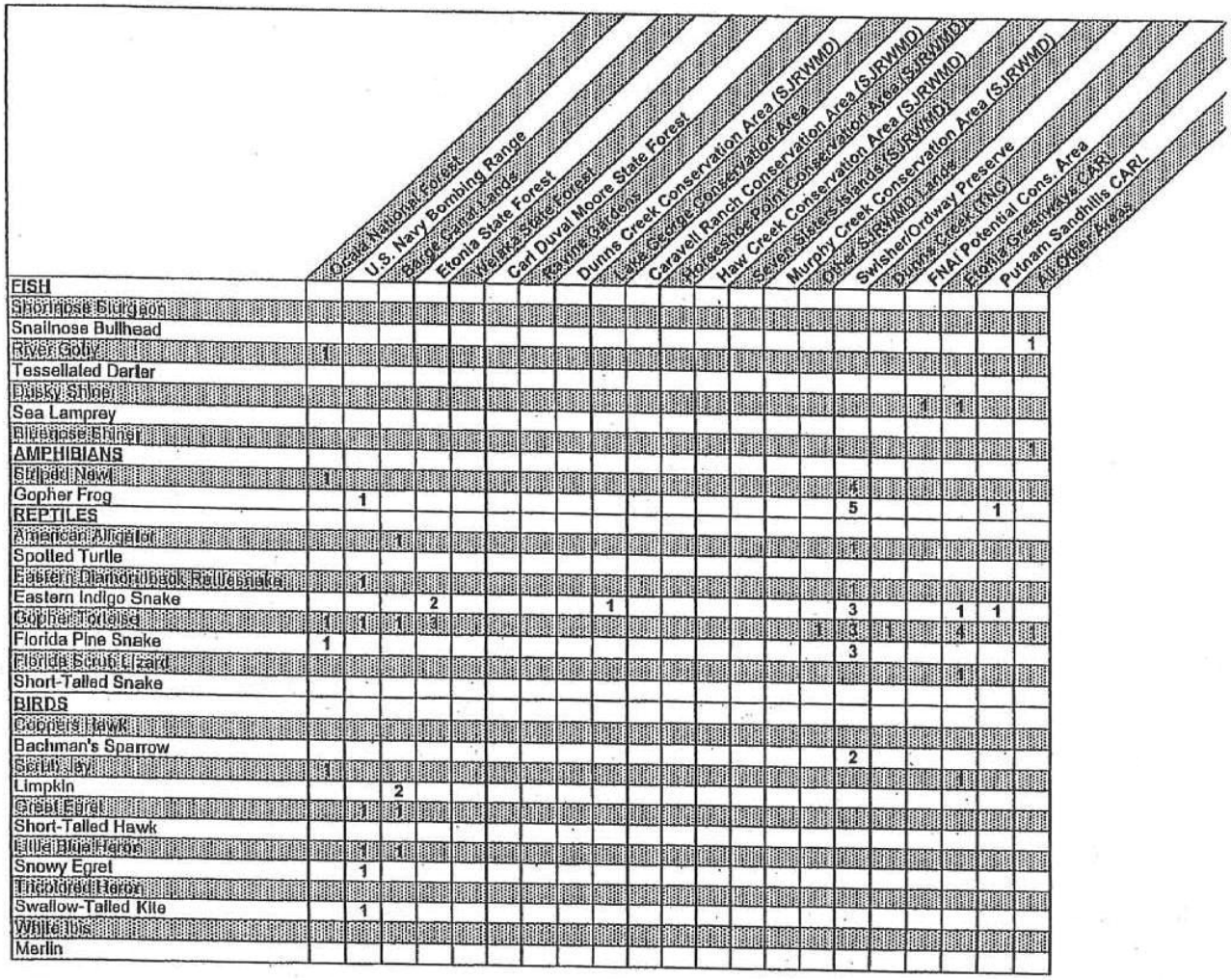
The FNAI inventory was updated as part of the environmentally sensitive land inventory and the results are shown in Table E-6.

The FNAI inventory shows that numerous listed species have been documented throughout the County including eight species of fish, 25 species of birds, seven species of mammal, 10 species of reptiles, two species of amphibian, 47 species of invertebrates, and 22 species of plants.

Bald Eagle

One of the more well known and admired of the listed species is the bald eagle. Southeastern Putnam County is a stronghold for the threatened bald eagle in Florida. This region has large areas of undeveloped lands, including those lands within the Ocala National Forest. The St. Johns River is a major attractor of bald eagles, providing suitable habitat and an abundant food source. The FWC periodically updates its inventory of known eagle nesting sites by County. The 2007 inventory shows Putnam County to have as many as 50 active nest sites. This is a more complete listing than the FNAI inventory, which currently only shows 29 nest sites. Nesting eagles are sensitive to any type of human-related activities near their nests and adequate protection measures need to be taken to avoid disturbing them. The County should become familiar with all known locations of nesting eagles. Any developments within eagle nesting areas should be required to follow the "Habitat Management Guidelines for the Bald Eagle in the Southeastern Region" as published by the U.S. Fish and Wildlife Service.

Table E-6 Putnam County FNAI Species Occurrence Records by Area



	Ocala National Forest	U.S. Navy Bombing Range	Barge Canal Lands	Etonia State Forest	Welaka State Forest	Carl Duval Moore State Forest	Ravine Gardens	Dunns Creek Conservation Area (SJRWMD)	Lake George Conservation Area (SJRWMD)	Caravell Ranch Conservation Area (SJRWMD)	Horseshoe Point Conservation Area (SJRWMD)	Haw Creek Conservation Area (SJRWMD)	Seven Sisters Islands (SJRWMD)	Murphy Creek Conservation Area (SJRWMD)	Other SJRWMD Lands	Swisher/Ordway Preserve	Dunns Creek (TNC)	FNAI Potential Cons. Area	Etonia Greenways CARL	Putnam Sandhills CARL	All Other Areas
FISH																					
Shortnose Sturgeon																					
Snailnose Bullhead																					1
River Goby	1																				
Tessellated Darter																					
Dusky Shiner																		1	1		
Sea Lamprey																					
Bluenose Shiner																					1
AMPHIBIANS																					
Striped Newt	1																				
Gopher Frog		1													5				1		
REPTILES																					
American Alligator			1																		
Spotted Turtle																					
Eastern Diamondback Rattlesnake		1																			
Eastern Indigo Snake			2				1								3			1	1		
Gopher Tortoise	1	1	1	1										1	3	1		1			
Florida Pine Snake	1														3						
Florida Scrub Lizard																		1			
Short-Tailed Snake																					
BIRDS																					
Cooper's Hawk																					
Bachman's Sparrow															2						
Scrub Jay	1																				
Limpkin			2																		
Great Egret		1	1																		
Short-Tailed Hawk																					
Little Blue Heron		1	1																		
Snowy Egret		1																			
Tricolored Heron																					
Swallow-Tailed Kite		1																			
White Ibis																					
Merlin																					

Black Bear

Although not listed in the FNAI inventory, the endangered black bear inhabits the southern two thirds of Putnam County, primarily near large wetland systems. This part of the County is only a portion of a larger area of known bear habitat, which extends south into the Ocala National Forest and northern Lake County and also east into western Flagler and Volusia Counties. Several areas in Putnam County are known to be strongholds for black bears, including Rice Creek Swamp, Cow Heaven Bay, the Slash, and the Ocala National Forest, especially within and adjacent to the hard-wood swamps associated with the St. Johns and Oklawaha Rivers. Black bears have large home ranges, which average 10 square miles for females to 40 square miles for males. Black bears are opportunistic feeders and will go wherever food is. However, they do have preferred habitats and will use corridors frequently.

b. Wildlife Corridors

An area in the County that functions as a wildlife corridor is the Rice Creek Swamp/Cow Heaven Bay/Ocala National Forest area. This area can likely be preserved as a corridor since much of it is already either wetland and/or is in public ownership. The Rice Creek Swamp is owned by Koch Industries, Inc., which manages it for multiple uses including silviculture, hunting, and hiking. The largest privately held area in this corridor is the Cow Heaven Bay and surrounding pine flatwoods, which are partly used for silviculture. The remainder of the corridor consists of Cross Florida Greenway lands and the Ocala National Forest.

This area runs north and south covering approximately 15 linear miles. As development increases within Putnam County, the bear population will be further restricted to those more inaccessible areas with the least human disturbance.

5. Marine Habitat

The St. Johns River is known to be a major habitat for the endangered West Indian manatee. During spring, summer, and fall, manatees are found along the St. Johns River throughout Putnam County including Dunns Creek, the Oklawaha River, and the Cross Florida Barge Canal area. The St. Johns River within Putnam County is a major travel corridor for the manatee. Every winter manatees travel up the St. Johns River, passing through Putnam County to reach warmer water farther upstream. This warm water comes from freshwater springs and warm water discharges from power plants and industry. Manatees have been reported during the winter near the Florida Power & Light (FPL) power plant in East Palatka and in Welaka Springs located just north of the Town of Welaka.

Other manatees migrate upstream to Blue Springs near Deland where the water is a constant 72 degrees. The remaining manatees migrate downstream to the Atlantic where they either go north to the warm water effluent sources in Fernandina Beach or they go south to the warmer waters and/or power plants along the east coast of Central and South Florida.

No manatees have been documented within the Rodman Reservoir; however there are unconfirmed

reports of manatees occasionally inhabiting Silver Springs upstream from Rodman Reservoir, indicating that they have come through the Buckman Lock from the St. Johns River and traveled through the Rodman Reservoir to reach Silver Springs. Sheltered coves along the St. Johns River are popular locations for manatees, including the coves adjacent to Palatka and East Palatka and Mud Creek Cove just south of Welaka.

6. Analysis of Environmentally Sensitive Lands

The County should work with the FDEP and the U.S. Fish and Wildlife Service and other appropriate agencies in developing a manatee awareness program which includes identification of known manatee concentrations in the County, the posting of manatee educational displays at major boat ramps, and the posting of no-wake speed zones at appropriate areas including boat ramps.

F. Air Resources

The EPA has designated and developed standards for six air-quality pollutants—particulate matter, sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide, and lead—which in high concentrations cause adverse health, environmental, economic, and structural impacts.

1. Particulate Matter (PM)

PM is the fraction of airborne solid or liquid particles ranging from about 0.1 to 100 microns in diameter, which includes the bulk of the particulate matter in the atmosphere. Other particulate includes lead-containing particles from motor vehicles, as well as dusts, ash, soil, and pollen and spores. TSPs are emitted from a variety of sources, including motor vehicles; commercial ovens; utility boilers; dust from agriculture, roads, mining, and construction; forest fires; and industry.

FDEP has one monitoring station for PM in the Palatka area, north of Palatka at the intersection of Comfort Road and Port Road. The sampler runs one day out of six for 24 continuous hours. PM is at acceptable levels in the Palatka area with no known violations. Monthly PM values at the FDEP sampling site~~s~~ fall well within acceptable limits in accordance with Florida State laws (150 micrograms per cubic meter (µg/cm) for a 24-hour averaging time). See Table E-7 for a summary of these tests.

Table E-7
Summary of Particulate Matter (PM) Monitoring Results,
Putnam County, Florida, 1999-2008

Year	2nd Max 24-hr	Annual Mean
1999	44	24
2000	49	27
2001	45	25
2002	49	21
2003	52	23
2004	97	25
2005	52	26
2006	70	26
2007	87	24
2008	73	22

Source: U.S. EPA AirData-County Air Quality Report. 2008

Notes: Data units: Micrograms per cubic meter of air ($\mu g/m^3$)
2nd Max 24-hr should not exceed the level of the 24-hour standard (150 µg/m3).
Annual Mean should not exceed annual standard of (50 µg/m3)

2. Sulfur Dioxide

Sulfur dioxide (SO2) is emitted from a variety of sources including coal and oil-fired power plants, transportation, sulfuric acid production, and natural gas production. However, approximately 73 percent of all human-caused sulfur dioxide is emitted by power plants through the combustion of coal and oil in utility and industrial boilers. Its emission is primarily controlled through the use of coal and oil with relatively low sulfur content.

There is a coal-fired power plant just north of Palatka (Seminole Electric) and one natural gas/oil-fired power plant (FPL) in East Palatka. FDEP has therefore installed a monitoring station for sulfur dioxide at the same site as the PM monitor, just north of Palatka at the intersection of Comfort Road and Port Road.

SO2 values at the FDEP sampling site fall well within acceptable limits in accordance with Florida State laws (100 parts per billion for 24 hours and 500 parts per billion for a 3-hour period). See Table E-8 for a summary of these tests.

Table E-8
Summary of Sulfur Dioxide (SO2) Monitoring Results,
Putnam County, Florida, 1999-2008

Year	2nd Max 24-hr	Annual Mean
1999	0.015	0.003
2000	0.014	0.003
2001	0.012	0.002
2002	0.009	0.002
2003	0.014	0.002
2004	0.01	0.002
2005	0.101	0.003
2006	0.014	0.002
2007	0.007	0.002
2008	0.007	0.002

Source: U.S. EPA AirData-County Air Quality Report. 2008.

Notes: Data units: (ppm) parts per million
2nd Max 24-hr should not exceed the level of the 24-hour standard (0.14 ppm).
Annual Mean should not exceed annual standard of (0.030 ppm)

3. Nitrogen Oxides

Nitrogen oxides are also emitted by motor vehicles and by utility power plants. These emissions are expected to increase dramatically in Florida due to an increased demand for electrical power and an expected increase in the use of coal as fuel for power plants.

FPL has monitored nitrogen dioxide at its two sampling locations for several years. Their Putnam plant was built as a combined cycle facility, that is, it is designed to use either gas or low-sulfur oil for its generating operations, and the plant includes a fuel desulfurization system to reduce the oil sulfur content to even lower levels than mandated by FDEP. Low sulfur oil is very clean but very expensive to use, and the plant now uses only natural gas for the sake of overall economy. This benefits Putnam County's air quality, since gas is even cleaner than oil. FDEP does not monitor nitrogen oxides in Putnam County; the nearest monitoring station is in Jacksonville.

4. Total Reduced Sulfur Compounds

The odor problem evident in the Palatka area is caused by the emission of reduced sulfur compounds from the Georgia Pacific pulp plant west of the City. There are no ambient air quality standards for total reduced sulfur (TRS) compounds at the present time. EPA investigations determined that ambient concentrations of TRS have no apparent health effects. TRS does have negative effects on public welfare, however, in that the unpleasant odor affects the local quality of life and property values, limits the attractiveness of the area for tourism, and affects the finishes of some paints and metals. For these reasons TRS is considered a nuisance pollutant.

5. Other Pollutants

Carbon monoxide and lead are not monitored in Putnam County. Both of these pollutants are most likely to occur in urban areas as a result of emissions from motor vehicles, although motor vehicles are not their only source.

Ozone, which results from the production of volatile organic compounds (VOCs) by the combustion of petroleum products and various industrial processes, is also more common to large urban areas than to rural ones. Ozone is not monitored in Putnam County and is not an issue of concern in the County.

6. Analysis of Air Resources

The FDEP predicts no change in the PM levels in the near future, unless more industrial facilities move into the area.

Putnam County citizens have expressed a desire for more air samplers to be installed and that all the criteria pollutants listed by the FDEP be monitored. Although residents do not dispute that the odor problem is more of a nuisance than a health hazard, they would likely to set certain requirements for odorous emissions.

The FDEP publishes an annual air quality index (AQI) report for each Florida County. Within this report the air quality is given a description of good, moderate, unhealthy for sensitive groups, unhealthy, and very unhealthy. According to the AQI report for Putnam County during year 2006 there were 355 days that were described as good air quality and 10 days that were described as moderate air quality. This data illustrates that during 2006 the air quality in Putnam County was good 97.3 percent of the year. See Table E-9 for a summary of the 2004 through 2006 air quality data.

Table E-9 Summary of Air Quality Index, Putnam County, Florida 2004-2006

AQI Descriptor	2004 (days, %)	2005 (days, %)	2006 (days, %)
Good	360, 98.4	359, 98.4	355, 97.3
Moderate	6, 1.6	6, 1.6	10, 2.7
Unhealthy for Sensitive Groups	0, 0	0, 0	0, 0
Unhealthy	0, 0	0, 0	0, 0
Very Healthy	0, 0	0, 0	0, 0

Source: FDEP

G. Areas Known to Experience Soil Erosion

The soils of Putnam County range from excessively well drained in the northwestern part of the County to very poorly drained along the St. Johns and Ocklawaha Rivers (Figure E-12).

1. Potential for Erosion

Much of Putnam County consists of sandy, flat, quickly drained soils. Local agricultural and irrigation practices do not ordinarily cause erosion, although minor erosion problems may occur when Class Six soils are row cropped. Forested areas are currently without major problems, but the potential for major erosion exists for any forested areas should they be stripped of their vegetation.

There is a high potential for soil erosion as a result of urban development. Cleared slopes and swales at roadsides are particularly subject to erosion. The County Public Works Department did note some eroded areas along clay roads and where roads have been cut into slopes. This problem is primarily confined to the western portion of the County between Melrose and Johnson. Following heavy rainfall, sand and clay erodes into adjacent ditches and can ultimately end up in area lakes or streams. The County is attempting to correct this problem in some areas by using resinous adhesives, constructing small berms within ditches to reduce flow velocities, and in some cases using stormwater ponds. The County is considering limiting future dirt road subdivisions by requiring more paving.

Construction practices can contribute to soil erosion. However, numerous techniques can be used during construction to help minimize erosion. Applying mulch, moisture, resinous adhesives, or fast-growing grass seed to help hold the soil in place can protect exposed surfaces. Other techniques which can be used include phasing to minimize the amount of exposed land during any given time; sloping the surface to minimize rapid runoff; stormwater management to help contain sediments on-site; and the use of hay bales, filter cloth, or some other suitable material to contain sediments within drainage ditches or creeks. In total, soil erosion is not considered to be a very significant problem in Putnam County.

A section on erosion control is included in the Putnam County Land Development Code (Article 7, 7.08.05). The code requires that erosion control be installed before any construction activity and be maintained in an effective condition until such time as the completion of a permanent system can ensure adequate erosion and sediment control.

According to the Public Works Department, the Interlachen area has problems with erosion on the area's dirt roads and in adjacent drainage ditches following heavy rainfall. The area topography, in combination with an abundance of dirt roads and local traffic, contributes to this problem. Much time has been spent in this area attempting to maintain and repair the area roads and ditches. This area is in need of drainage improvements to reduce the amount of erosion occurring.

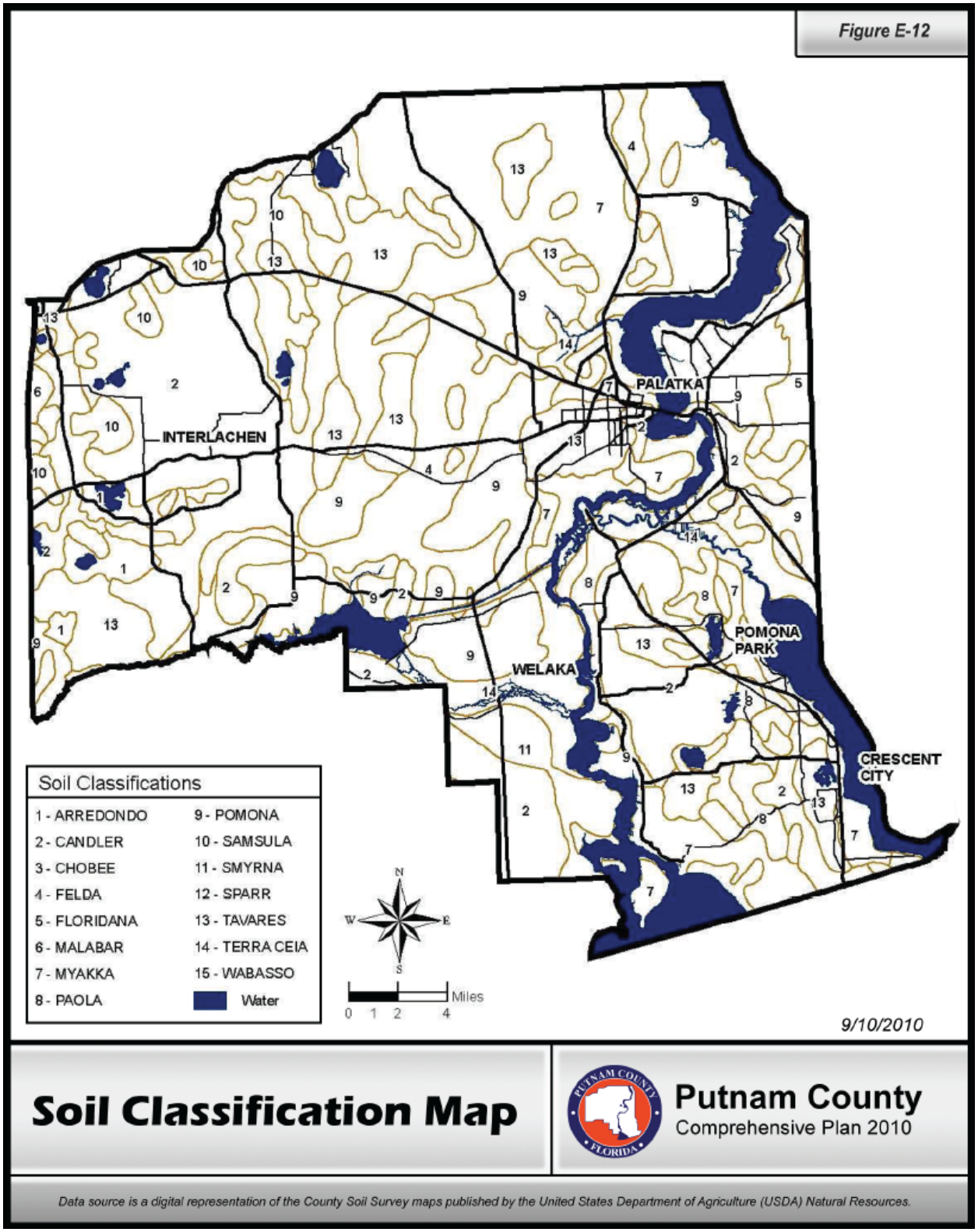


Figure E-12
PALATKA
INTERLACHEN
WELAKA
POMONA PARK
CRESCENT CITY
Soil Classifications
1 - ARREDONDO
2 - CANDLER
3 - CHOBEE
4 - FELDA
5 - FLORIDANA
6 - MALABAR
7 - MYAKKA
8 - PAOLA
9 - POMONA
10 - SAMSULA
11 - SMYRNA
12 - SPARR
13 - TAVARES
14 - TERRA CEIA
15 - WABASSO
Water
N
W
E
S
Miles
0 1 2 4
9/10/2010
Soil Classification Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the County Soil Survey maps published by the United States Department of Agriculture (USDA) Natural Resources.

2. Analysis of Soil Erosion

Good agricultural practices are enabling the County to avoid major cropland and forestland erosion. Roadside ditches and swales and road cuts into slopes need to be monitored during construction and agricultural operations so that erosion can be stopped and prevented. Unpaved roads should be prohibited in areas having slopes so steep that erosion cannot be prevented. In areas of new development, cleared areas need to be protected from the eroding effects of rain and wind.

As part of the Master Stormwater Plan, the County has identified areas with erosion problems and will develop plans to eliminate these problems under the direction of the Public Works Department.

H. Known Sources of Commercially Valuable Minerals

Commercially valuable mineral deposits in Putnam County are of four types: sand, kaolin clay, heavy minerals, and peat (not a mineral, but an extractable resource). The known locations of these deposits are shown on the map in Figure E-13. Table E-10 is an inventory of all known active and inactive mining operations in the County.

Table E-10 Putnam County Mining Operations (Active and Inactive)

Company Name	Mine Name	Commodity	Status	Location
Chesser & Strickland Sand Company	Interlachen Mine	Sand	Inactive	T10S,R24E,S16
Florida Rock Industries	Keuka Mine	Sand	Active	T10S,R24E,S29
Feldspar Corporation, Edgar Plastic Kaolin Division	Edgar Mine	Kaolin Sand	Active	T10S,R24E,S30
Keystone Sand Co.	Grandin Pit	Sand	Inactive	T09S,R24E,S08
United Clay Mines Corporation	Crossley Mine	Sand	Inactive	T10S,R23E,S27
Traxler Peat Co.	Florahome	Peat	Active	T09S,R24E,S11 T09S,R24E,S12
Florida Rock Industries	Grandin Mine	Sand	Active	T09S,R23E,S12 T09S,R24E,S07 And south to T10S,R24E,S05 T10S,R24E,S06
Burt Burdin	Burdin	Clay	Active	T12S,R27E
Iluka Resources, Inc.	Green Cove Springs Mine	Titanium Heavy Minerals	Inactive	T8S,R26E,S22

Source: FDEP. Date: 2009.

1. Sand

Sand deposits extend in a broad band on the western side of the County from the area around Putnam Hall and Grandin in the northwest through the sinkhole country on the western side of the County to the vicinity of Interlachen and the southern border with Marion County west of Rodman Reservoir. Numerous sandpits from current and previous mining operations dot this area. A large inactive operation, the Keystone Sand Mine, is located north of Highway 100 between Putnam Hall and Florahome. Another inactive operation, the Crossley mine, is northwest of Interlachen near Long Pond.

Florida Rock Industries has extensive sand mining operations in both the Grandin Mine, in the area between Grandin and Putnam Hall just off SR 100, and the Keuka Mine, in the area southwest of Interlachen just off CR 20A.

The sand produced is primarily construction sand. However, the Feldspar Corporation kaolin operation at Edgar produces both construction and specialty sands as a byproduct of the clay mining process. The specialty sands are important for glass manufacture and other industrial uses; the glass sands have markets in Alabama, Florida, and Tennessee (Boyle, 1985, p. 9).

2. Kaolin

Kaolin clay is common throughout the citronelle sediments of western Putnam County along the Lake Wales Ridge. This is roughly the area west of Highway 315. As of 1983, all the kaolin produced in the State came from the Feldspar Corporation's Edgar mine in Putnam County (Boyle and Hendry, 1985, p. 6). Both sand and kaolin are produced at this mine; the sediments are hydraulically mined and water processed (dredged and slurried).

Florida kaolin has a combination of properties not known to exist naturally in any other commercial kaolin. Thus Florida kaolin is used as a single substitute for a variety of other clay blends. It is used in a wide variety of ceramic products, including high- and low-voltage electric porcelain, spark plug porcelain, sanitary ware, chemical porcelain, floor and wall tile, high-temperature refractories, artware, and electronic ceramics (Pirkle, 1960, p. 1385).

When kaolin alone is extracted from the sand body, only 20 percent of the mined material is actually marketed; the value of the silica sands in the same deposits was not exploited until around 1958. With the inclusion of construction and specialty-quality sands in the production mix, more than 85 percent of the sediments mined can be marketed (Pirkle, 1960, p. 1403). Thus the Feldspar Corporation mine at Edgar produces sand as well as kaolin (see below).

3. Heavy Minerals

Private owners previously leased the Green Cove Springs mine to ILUKA Resources, Inc. This project was located west of U.S. 17 in southern Clay County and northern Putnam County. All

active mining has ceased at this site and reclamation is almost complete. There was a significant deposit of heavy mineral sands - the Green Cove Springs ore body - straddling the border between Putnam and Clay Counties east of Simms Creek and northwest of Bostwick. It lies on the Duval Upland of northern peninsular Florida. The deposit is composed of loose to slightly consolidated quartz sands containing an average of three or four percent heavy minerals. The most abundant of these minerals were ilmenite, leucoxene, rutile, kyanite, sillimanite, staurolite, zircon, and tourmaline. Minor amounts of epidote and garnet were also found, as well as monazite (Pirkle, 1974, 1133-4).

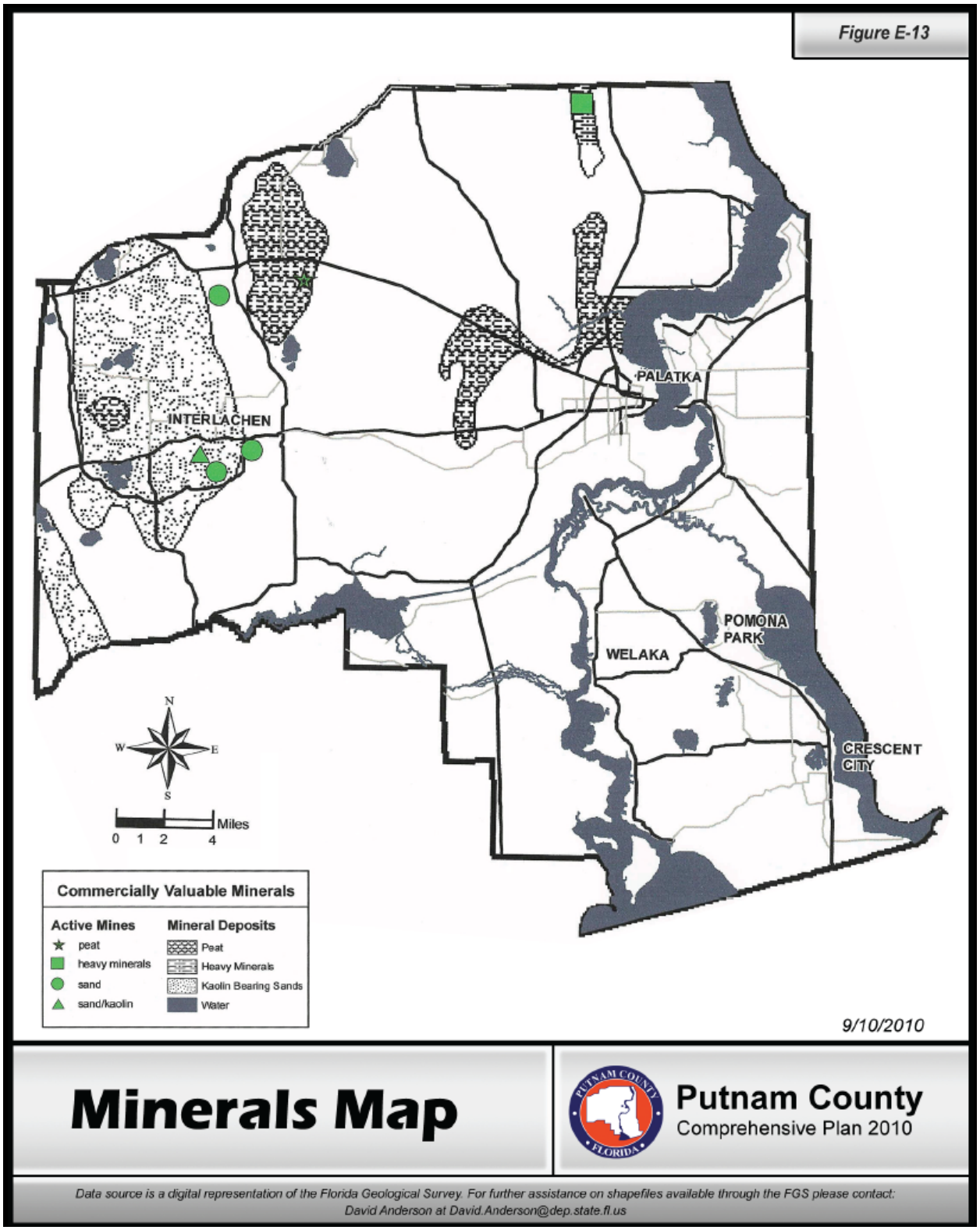


Figure E-13
PALATKA
INTERLACHEN
POMONA PARK
WELAKA
CRESCENT CITY
N
W
E
S
0 1 2 4
Miles
Commercially Valuable Minerals
Active Mines
peat
heavy minerals
sand
sand/kaolin
Mineral Deposits
Peat
Heavy Minerals
Kaolin Bearing Sands
Water
9/10/2010
Minerals Map
Putnam County
Comprehensive Plan 2010
Data source is a digital representation of the Florida Geological Survey. For further assistance on shapefiles available through the FGS please contact:
David Anderson at David.Anderson@dep.state.fl.us

Due to process improvements, the permittee determined it was economical to reprocess old tailing material and capture zircon that was not captured during the initial mining process. The tailing material was taken from a stockpile and put into a slurry. The zircon was separated at the processing plant and the non-mineral tailings were transported via a slurry to a wastewater treatment and settling pond. The clarified water was decanted off the settling pond and used back in the process. Groundwater was used as makeup water when enough clarified water was not available. Both uplands and wetlands have been replanted and created on the site as part of the land reclamation that need to occur prior to the mine closure. Once the zircon reprocessing was complete, reclamation has occurred around the plant site. It is anticipated that all reclamation activities will be completed by 2011.

4. Peat

Putnam County includes several significant peat deposits. One large deposit is located in the northwestern area, extending north and south of Highway 100 between Grandin and Florahome. The Traxler Peat Company operates a mine in this area, producing peat for horticultural purposes. Maps of peat deposits in the county consistently show this deposit. Griffin, et al. (1982, p. 14) mapped numerous other fuel-grade peat deposits. However, the map is shown at such a reduced scale that it is difficult to place the deposits correctly on a larger map for this report.

In 1981, the FDEP denied permits to Georgia Pacific for an experimental peat mine in the area of Cow Bay Swamp west of Bostwick. This deposit is part of a significant deposit in the vicinity of Rice Creek and its tributaries. The denial was based on the possibility of water quality degradation in the Swamp and Simms Creek nearby. Peat from that operation would have been used as fuel for the Georgia Pacific mill near Palatka.

5. Potential Environmental Impacts of Mining Operations

Mining can result in numerous impacts to natural resources, including altering natural upland and wetland plant communities, lowering surficial aquifer levels and Floridan aquifer potentiometric surfaces, polluting surface water bodies, and creating unproductive pits. Several agencies are now involved in the regulation of the various phases of mining activities. FDEP and the USACOE must review and approve applications whenever dredge-and-fill permits are needed, such as when wetlands are to be mined. The SJRWMD and SRWMD are involved in issuing Consumptive Use Permits for any wells needed or ERPs for mines over a certain size. The FDEP, however, is the lead agency and is involved with reviewing and approving reclamation plans for most mines, as specified in Rule 62C-37.

All mining currently taking place in Putnam County occurs in the western portion where there are six sand mines, one kaolin mine, and one peat mine. Apparently these mines do not use large quantities of groundwater and only the peat mine is affecting wetlands. Wetlands mined by the peat mine are replaced by similar wetlands as required by the permitting process.

As mentioned above, the heavy minerals mine previously operating in southeastern Clay County had expanded into northeastern Putnam County. Heavy mineral mines can use large amounts of groundwater and can impact wetlands. In addition, breaches in containment dikes surrounding settling ponds can impact downstream surface water bodies. However, impacts to Simms Creek were avoided by establishing significant setbacks from the streambed and associated wetlands. Sand, kaolin, and heavy mineral extraction operations all involve dredging operations. Heavy minerals comprise such small proportions (see above) of the surrounding sand body that no pits remain after mining operations are complete and most of the material processed is returned to the site. Sand and kaolin operations, however, sell most of the material extracted, leaving large pits, which are often filled with water. Peat mining operations also extract and sell most of the material mined, leaving large excavated pits which must be dealt with after mining operations cease.

6. Analysis of Known Sources of Commercially Valuable Minerals

The County will continue to coordinate with the mining operations in the County and with FDEP in monitoring the expansion of these facilities to ensure that water supplies of adjacent landowners are not adversely impacted by these uses.

III. Management of Hazardous Waste

Many households and businesses use hazardous materials in their day-to-day activities. Many of these activities produce hazardous wastes that can injure or even kill living things. Hazardous waste must be handled in special ways to prevent threats to human health and the environment. Paint products, solvents, some batteries, household cleaners, and pesticides are typical examples. When disposed of in the municipal landfill or otherwise improperly managed, these materials have the potential to contaminate the groundwater (the drinking water supply).

The government does not regulate hazardous wastes generated in the home. In Florida, household hazardous waste collection centers have been established in most communities. Putnam County residents can take their household hazardous waste to the Central Landfill Recycling Drop-Off Site (four miles north of Palatka), the Huntington Solid Waste/Recycling Center (four miles west of Crescent City), or the Interlachen Solid Waste/Recycling Center (one mile west of Interlachen).

Hazardous waste is identified in one of two ways. Waste is considered hazardous if it can be found on lists published in Title 40 of the Code of Federal Regulations (CFR), parts 260-271. The State of Florida has adopted by reference portions of the federal regulations into its Florida Administrative Code (FAC), 62-730. If waste cannot be identified on one of the hazardous waste lists, it might still be hazardous if it exhibits one or more characteristics of ignitability, corrosivity, reactivity, or toxicity.

Ensuring that hazardous wastes are handled in accordance with Federal and State rules and laws is the responsibility of the Compliance and Enforcement Sub-section of the FDEP. This group interacts with the public and with the Resource Conservation and Recovery Act (RCRA) branch of the EPA

to develop policies and guidance, to provide compliance assistance to the public and the regulated community, and to enforce the laws regulating the handling of hazardous waste.

In general, hazardous waste generators are broken into three categories based upon the quantity of hazardous waste generated per month. Each category has its own special requirements for properly managing hazardous waste. Conditionally exempt small-quantity generators generate less than 220 pounds of hazardous waste per month and less than 2.2 pounds of acute waste (such as some pesticides, toxins, or arsenic and cyanide compounds) per month. Regulated small-quantity generators generate 220-2,200 pounds of hazardous waste per month. Large-quantity generators (LQGs) generate 2,200 pounds or more of hazardous waste per month or 2.2 pounds or more of acute hazardous waste per month.

A. Hazardous Waste Generators

1. Large-Quantity Generators (LQGs)

LQGs are industries, which generate 1,000 kilograms or more per month of hazardous waste. Current large-quantity generators of hazardous wastes in Putnam County include Seminole Electric Cooperative and the Georgia Pacific. Table E-11 show the Putnam County facilities that handle or produce large quantities of hazardous chemicals. These facilities are listed by the FDEP, the EPA, and the Putnam County Fire Marshall.

LQGs are required to obtain an EPA identification number and to label all hazardous waste containers. In addition, the waste must be stored properly onsite and in limited quantities until shipped off site. The shipper must ensure that the materials are shipped properly to the disposal and storage sites. Since 1986 LQGs have been required to do the following:

- Perform hazardous wastes determinations.
- Obtain EPA identification numbers.
- Use manifest system and ship only to a permitted facility.
- Meet pre-transport requirements (packing, labeling, etc.).
- Not store hazardous waste for more than 90 days.
- File a biennial report.
- Meet personnel training requirements for handling hazardous wastes.
- Maintain hazardous waste emergency equipment.

These requirements help to ensure that wastes are accounted for and are properly stored and disposed of. Both the FDEP and the EPA manage this process.

Table E-11 Putnam County Facilities Generating Large and Small Quantities of Hazardous Materials

Name	Address	City	Zip	Status
A J Giammanco & Assoc Inc	972 Comfort Rd	Palatka	32177	CES
A T & T	SR 100	Caraway	60606	CES
American Cabinet Mfg	US 17 N & Union Ave	Crescent City	32112	SQG
Anahop Cycles	342 S Hwy 17	East Palatka	32177	CES
Atlantic Yacht Builders Inc	US 17 N St Johns River Bargepo	Palatka	32178	SQG
B M Tire And Auto Service Center	4102 Crill Ave	Palatka	32177	CES
Baggs Tire & Auto Service	608 Reid St	Palatka	32177	CES
Bainbridge Motors Inc	1910 Reid Street	Palatka	32077	SQG
Beck Chrysler Plymouth Dodge	3523 Reid St	Palatka	32177	SQG
Beck Chrysler Plymouth Dodge	256 US Hwy 17 N	Palatka	32177	SQG
Bellsouth Pmpkflma 33474	212 Worchester Rd	Pomona Park	32081	CES
Best Packers	1122 Bronson Rd	Palatka	32078	CES
Branams Exxon	3200 Crill Ave	Palatka	32177	CES
Burnett Brothers Garage	284 US Hwy 17 S	East Palatka	32131	CES
Carnes Car Clinic	Hwy 17 North & Eddie Vreen Rd	Palatka	32078	SQG
Cdr Systems Corporation	2 Kay Larkin Circle	Palatka	32177	CES
Community Automotive Repair	1370 US Hwy 17	Bostwick	32177	CES
Crabtree Tire & Auto Service	401 S Summit St	Crescent City	32112	SQG
Crabtree Tire & Auto Service	608 Reid St	Palatka	32177	SQG
Cranes	Hwy 17	San Mateo	32187	SQG
Cross Creek Marine Products	501 Putnam County Blvd	East Palatka	32131	CES
Csd Acquisition Corp	1400 Reid St	Palatka	32177	SQG
CSX Transportation	Seaboard Dr & Hwy 17 N	Palatka	32202	SQG
CYS #003519	14 Eastgate Square US Hwy 17	East Palatka	32131	SQG
CYS #004422	201 S SR 19	Palatka	32177	SQG
Dallas Automotive Repair	899 N Hwy 19	Palatka	32177	CES
DSI Forms	Rt 6 Box 971	Palatka	32077	SQG

Table E-11 Putnam County Facilities Generating Large and Small Quantities of Hazardous Materials

Name	Address	City	Zip	Status
Edco Auto Parts	Highway 20 Route 3 Box 286	Interlachen	32148	SQG
Florida DMA National Guard Armory	1301 Moseley Ave	Palatka	32085	CES
Florida Power & Light Co Mcmeekin Substation	951 SR 20A	Mcmeekin	32640	CES
Florida Rock Industries	Keuka Rd	Keuka	32049	SQG
Floyd's Garage	921 Highway 20	Interlachen	32148	CES
FPL Crescent City Service Center	Summitt & Lemon Streets	Crescent City	33407	SQG
FPL Palatka Plant	US Hwy 17 S	East Palatka	32031	SQG
FPL Palatka Service Center	200 Pine St	Palatka	33407	CES
FPL Putnam Plant	392 US Hwy 17 S	East Palatka	32640	CES
FPL St Johns Sub Service Center	367 US Hwy 17 S	San Mateo	33408	CES
Gem City Cleaners	1210 St Johns	Palatka	32077	SQG
Georgia Pacific Corp	234 Comfort Rd	Palatka	32177	CES
Georgia Pacific Corp Palatka Oper	CR 216	Palatka	32177	LQG
Georgia Pacific Tech Center	190 CR 216	Palatka	32178	SQG
Hames Contracting Seminole El	US Hwy 17	North Palatka	30201	SQG
Haseleu's Transmission Service	2621 Fenwick St	Palatka	32177	CES
Home Depot USA Inc Hd8531	417 N Hwy 19	Palatka	32177	CES
Huntley Jiffy Food Stores #15	SR 20 Rt 4 Box 582	Francis	32067	SQG
Huntley Jiffy Food Stores #272	Hwy 17 S & 100 E	San Mateo	32067	SQG
Huntley Jiffy Food Stores #289	US 17 & Horse Landing	Satsuma	32067	SQG
Huntley Jiffy Food Stores #3	1000-02 US 17	East Palatka	32067	SQG
Huntley Jiffy Food Stores #36	SR 21 Rt 1 Box 8276	Johnson	32067	SQG
Huntley Jiffy Food Stores #51	Hwy 21 & 21A Rt 2 Box 2734	Melrose	32067	SQG
Huntley Jiffy Food Stores #64	SR 20 & US 19	Palatka	32067	SQG

Table E-11 Putnam County Facilities Generating Large and Small Quantities of Hazardous Materials

Name	Address	City	Zip	Status
Huntley Jiffy Food Stores #68	Hwy 20 & Hoover Rd	Hollister	32067	SQG
Huntley Jiffy Food Stores #69	CR 209 W Rt 2 Box 2095	Palatka	32067	SQG
Huntley Jiffy Food Stores #9	SR 21 Rt 2 Box 2360	Melrose	32067	SQG
Jims Paint & Body Shop	2 S Summit St	Crescent City	32112	CES
Johns Metal Palatka	7405 Crill Ave	Palatka	32177	CES
K Mart Store #9511	111 Town Country Dr	Palatka	32177	SQG
Keith Marine	End Of Stokes Landing	Palatka	32177	SQG
Lil Champ Jiffy #537	720 US Hwy 19	Palatka	32256	SQG
Lipko Automatic Transmission	1400 St Johns Ave	Palatka	32177	SQG
Longs Garage	Hwy 17, PO Box 3	Pomona Park	32181	CES
Maranatha Auto Body	284a S US Hwy 17	East Palatka	32131	SQG
Midway Industrial Contractor	US Hwy 17 N	Palatka	32077	CES
Offshore Shipbuilding Inc	Rt 3 Box 4785	Palatka	32177	SQG
Ootens Auto Service	248 N Hwy 17	Palatka	32177	CES
Pacific Substation	221 Garden Chapel Rd	Hawthorne	32640	CES
Pal Custom Refinishing	Rt 2 Box 11	Satsuma	32180	SQG
Palatka Auto Body	3517 Reid St	Palatka	32177	CES
Palatka Auto Parts Inc	US Hwy 20 At Us Hwy 19	Palatka	32177	CES
Palatka Ford Mercury Inc	420 N Palm Avenue	Palatka	32077	SQG
Palatka Housing Authority	706 15th St	Palatka	32178	CES
Palatka Substation	1807 Twigg St	Palatka	32177	CES
PDM Bridge LLC	211 Comfort Rd	Palatka	32177	SQG
Peninsular Auto Parts	435 S Summit St	Crescent City	32112	SQG
Penske Auto Center	111 Town Country Dr #1	Palatka	48084	CES
Perma Shine	1008 Reid St	Palatka	32177	CES
Permashine Auto Repair	1160 US Hwy 17 S	Satsuma	32189	CES
Precision Fleet Service Inc	3900-C Crill Ave	Palatka	32177	CES
Precision Fleet Services Inc	841 S Moody Rd	Palatka	32177	CES
Putnam Co Central Landfill	140 Co Landfill Rd	Palatka	32178	SQG
Putnam Co District School Board	801 N 13th St	Palatka	32177	SQG
Putnam Co Government	223 Putnam County Blvd	East Palatka	32178	CES

Table E-11 Putnam County Facilities Generating Large and Small Quantities of Hazardous Materials

Name	Address	City	Zip	Status
Putnam Correctional Institution	126 Yelvington Rd	East Palatka	32131	CES
Putnam County Fleet Maintenance	223 Putnam County Blvd	East Palatka	32177	CES
Putnam School Board Maint Dept	124 W Louis Broer Rd	East Palatka	32131	CES
R & J Automotive	2620 Highway 17 S	Crescent City	32112	CES
Red Barn Antiques	Hwy 309 C	Georgetown	32139	SQG
Resco Inc	4095 Silver Lake Dr	Palatka	32177	CES
Residence Charlotte Pleasant	118 Oak Ln	Interlachen	32148	CES
Residence Jessica Chandler	4709 SE 8th St	Melrose	32666	CES
Rice Substation	398 Old Starke Rd	Palatka	32177	CES
Rons Quick Lube	2223 Reid St	Palatka	32177	CES
Ryder Truck Rental Inc	809 Kirby St	Palatka	32236	SQG
Sapps Garage	179 Hwy 207	East Palatka	32177	
Satsuma Inc	US 17 South	Pomona	32089	SQG
Seminole Electric Coop Inc	SR 17	Palatka	33688	LQG
SJRWMD	West Highway 100	Palatka	32078	SQG
Smith Products Co Inc	1005 Kirby St	Palatka	32077	SQG
St Johns Auto Body	1609 St John Ave	Palatka	32077	CES
St Johns Chevrolet Buick	1601 Reid St	Palatka	32077	SQG
St Johns Co St Augustine Tech Ctr	113 Putnam Co Rd PCC Campus	East Palatka	32095	CES
Star Paper Tube	Comfort Rd	Palatka	32178	SQG
Suburban Propane Fleet Maint	3506 Crill Ave	Palatka	32177	SQG
Sunoco Service Station #06139349	2600 Reid St	Palatka	32177	CES
Sunoco Service Station #07135114	276 S US Hwy 17	East Palatka	32131	CES
Sunoco Service Station #08874919	167 S US Hwy 17	East Palatka	32131	CES
Tire Kingdom Inc #192	813 Reid St	Palatka	32204	CES
Todds Automotive Sales & Services	116 N Summit St	Crescent City	32112	CES
Tomoka Auto Parts	454 Hwy 17 North	Palatka	32177	CES
Truck Stuff Inc	117b Towles Ave	Palatka	32177	CES
USA Palatka Amsa 55 M	4300 St Johns Avenue	Palatka	31314	SQG
Village Tire & Auto Service	701 Reid St	Palatka	32177	SQG

Table E-11 Putnam County Facilities Generating Large and Small Quantities of Hazardous Materials

Name	Address	City	Zip	Status
Wal Mart Store #551	101 US Hwy N	Palatka	32177	CES
Wallace Auto Service	322 Reid St	Palatka	32177	CES
Walmart Supercenter #551	1024 SR 19 S	Palatka	32177	CES
Welaka Landing	407 Front Street	Welaka	32193	CES
Williams Body Shop	519 Main St	Palatka	32177	CES
Winn Dixie #163	901 US Hwy 19 S	Palatka	32077	SQG
Winn Dixie #198	1115 N Summit St	Crescent City	32112	CES
Wyatts Paint & Body Shop	CR 2 Box 1473	Crescent City	32112	CES

Source: FDEP Hazardous Waste Database 2005
CES= Conditionally Exempt Small Quantity Generator
SQG=Small Quantity Generator
LQG=Large Quantity Generator

2. Small-Quantity Generators

In 1984, the Final Report on Development of a Hazardous Waste Assessment Program for Putnam County was submitted to the County by Environmental Resources Management-South, Inc., through the Northeast Florida Regional Planning Council.

Preparation of the 1984 report included a one-time survey of potential small-quantity generators (SQGs) in Putnam County (LQGs were not included in the study). All totaled, 223 establishments indicated that they generated more than 10,000 pounds of hazardous waste each year. The total quantity of hazardous waste generated by these firms was 5,641,571 pounds, or 52 percent of the total quantity of hazardous waste accounted for by the survey.

The majority of the waste was produced by Standard Industrial Classification 55, Auto Dealers and Service Stations, with a reported figure of 469,431 pounds, or nearly 235 tons. According to the survey, 49.95 percent of the waste generated in 1983 was in the form of lead acid storage batteries, and 40.36 percent was waste oils, greases, or lubricants.

SQGs are required to obtain an EPA identification number and to label all hazardous waste containers. In addition, the waste must be stored properly onsite and in limited quantities until shipped off site. The shipper must ensure that the materials are shipped properly to the disposal and storage sites. Since 1986 SQG have been required to do the following:

- Use multiple manifests and maintain copies for three years.
- Obtain EPA identification numbers.
- Accumulate no more than 13,200 pounds of hazardous waste for no longer

than 180 days.
- Implement a preparedness and prevention plan.
- Use only FDEP-approved transporters.
- Dispose of hazardous waste only at Resource Conservation and Recovery Act (RCRA) permitted facilities.

These requirements help to ensure that wastes are accounted for and are properly stored and disposed of.

B. Disposal Facilities

Putnam County operates one permitted Class I landfill. As of June 2005, Putnam County ceased accepting waste at the permitted Class III Landfill. The Putnam Central Class III Landfill Closure Permit was issued on March 22, 2006. A minor permit modification was issued on April 27, 2007. Both are located four miles north of Palatka, at 140 County Landfill Road. The Class I and Class III landfills have approved monitoring wells, and groundwater sample results are regularly submitted to the FDEP. Both sites have locked gates and a fence to limit access after hours. In addition, there are two active private construction and demolition debris (C/DD) landfill sites in the County.

The active permitted private C/DD landfills are (1) Star Environmental, also known as, Madison C&D located at 178 West River Road and (2) Interlachen Recycling, Inc. C&D located at Route 2, Box 36.

Landfill facilities are discussed in more detail in the Infrastructure Element.

C. Analysis of the Management of Hazardous Waste

The County shall continue to cooperate and coordinate with the FDEP and the EPA in monitoring hazardous waste generators. The County should continue to monitor solid waste brought to the County's Class I landfill to ensure that hazardous wastes do not enter the waste stream. In addition, the County should continue to promote and participate in FDEP's periodic "Amnesty Days" program to provide residents the opportunity to dispose of household hazardous waste at designated drop sites.