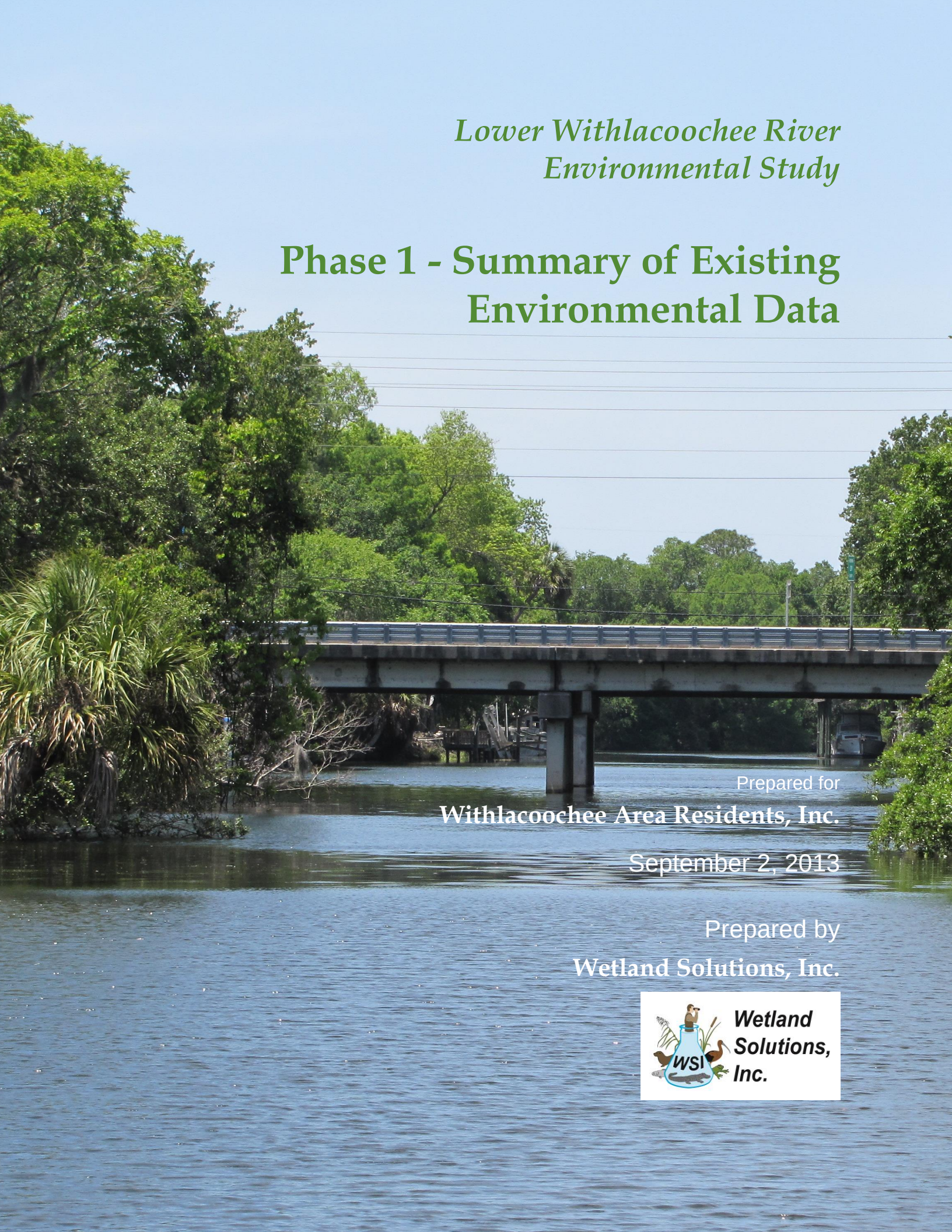

Lower Withlacoochee River
Environmental Study

Phase 1 - Summary of Existing Environmental Data

Prepared for

Withlacoochee Area Residents, Inc.

September 2, 2013

Prepared by

Wetland Solutions, Inc.

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Section 1.0 Introduction

The Withlacoochee River (south) is located in central Florida, drains surface water runoff from the Green Swamp north of Lakeland in Polk County, intercepts groundwater from a large area of karst terrain that extends west through Pasco, Sumter, Citrus, Marion, and Levy counties, and empties into the Gulf of Mexico near Yankeetown (Figure 1-1). The estimated length of the Withlacoochee River is approximately 157 miles with a surface watershed of about 2,060 square miles (Southwest Florida Water Management District, 2010).

In its lower reaches (below Dunnellon) the Withlacoochee River has been highly altered by human activities. The most significant structural changes to the river were the closing of the Inglis Dam on the river in 1909 that impounded Lake Rousseau, and the construction of the Cross Florida Barge Canal and lock system just east of US 19, and south of Inglis in the 1960s. These alterations, as well as other environmental stresses resulting from conversion from natural to developed land uses in the river's watershed have changed the physical, chemical, and biological conditions in the Withlacoochee River.

In spite of local and state protections for this natural aquatic ecosystem, detrimental changes continue to be evident to local residents. In response to these observed changes, a local citizens' advocacy group, the Withlacoochee Area Residents, Inc. (W.A.R.) contracted with Wetland Solutions, Inc. (WSI) to conduct a Phase 1 summary of existing environmental information for the portion of the river referred to as the Lower Withlacoochee River Study Area (Figure 1-2). This river segment extends from the Lake Rousseau Inglis Bypass Canal to the Gulf of Mexico and includes approximately 10 miles of the historic river channel.

The purpose of this report is to summarize available environmental data relevant to the Lower Withlacoochee River Study Area as a reference for comparison between historic and existing conditions. This Phase 1 study is intended to identify known changes in the environment of the lower river and their causes, and to provide recommendations for additional efforts that may be needed to achieve various levels of environmental restoration in the Lower Withlacoochee River.

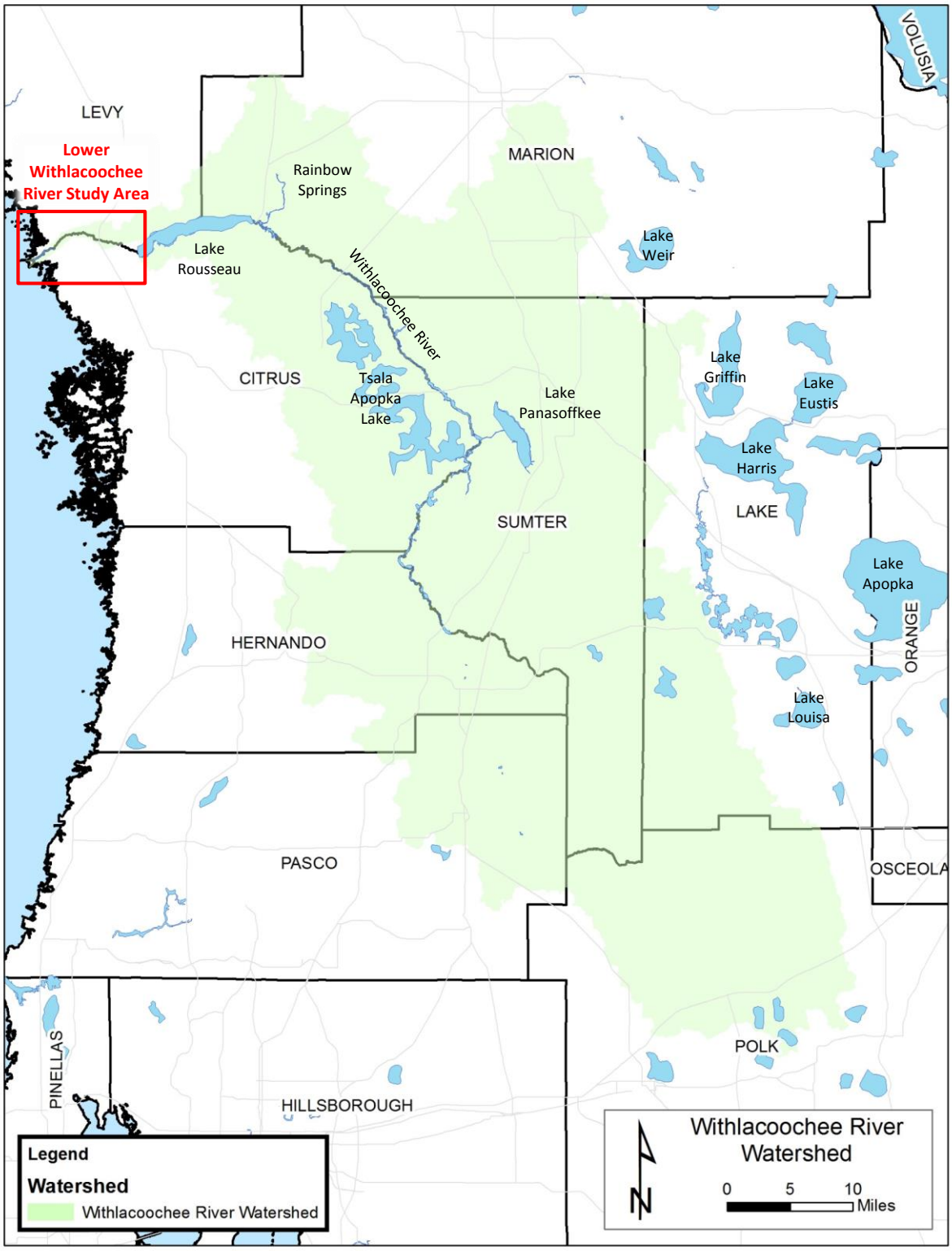


Figure 1-1. Withlacoochee River Watershed identifying the Lower Withlacoochee River Study Area

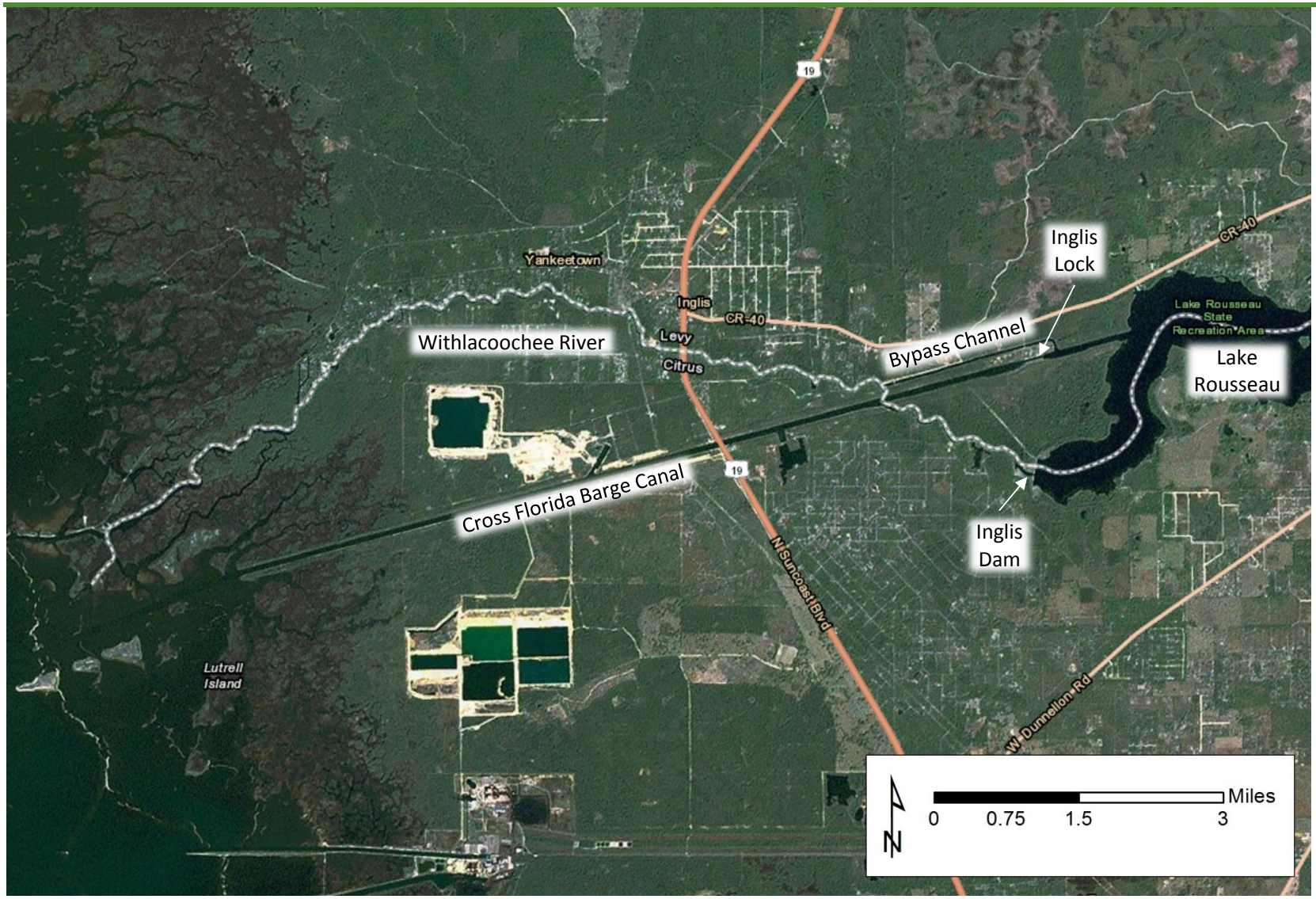


Figure 1-2. Lower Withlacoochee River Study Area

Section 2.0 Existing Data

2.1 Watershed

2.1.1 Location

The majority of the Withlacoochee watershed is located within Marion, Sumter, and Polk Counties, with smaller areas within Levy, Citrus, Hernando, Pasco, and Lake Counties (Figure 1-1). The Green Swamp, located in northern Polk County, forms the headwaters of the 157-mile-long Withlacoochee River and flows northwest ultimately discharging into the Withlacoochee Bay Estuary in the Gulf of Mexico near Yankeetown. The entire river and its connected lakes and tributaries have been designated as Outstanding Florida Waters (Florida Department of Environmental Protection, 2006).

2.1.1.1 Lakes

Lake Panasoffkee and Tsala Apopka Lake are two of the larger lakes in the Withlacoochee watershed. Lake Panasoffkee is a relatively shallow lake located in Sumter County that includes an exposed area of the Floridian aquifer. It is between 3,800 to 4,500 acres, depending on rainfall, and drains a watershed area of about 63,000 acres (Florida Department of Environmental Protection, 2006). Tsala Apopka Lake is located within Citrus County and contains three distinct hydrologic pools (Floral City, Inverness, and Hernando) totaling about 20,000 acres. Thousands of acres of contiguous marsh surround the lake's open-water features (Florida Department of Environmental Protection, 2006).

2.1.1.2 Springs

Rainbow Springs and the Rainbow River are located in southwestern Marion County approximately 4 miles north northeast of the Dunnellon city center and 19 miles west southwest of the Ocala city center. Rainbow Springs forms the headwaters of the Rainbow River which is nearly 6-miles (10 km) long and merges with the Withlacoochee River at Dunnellon. Rainbow Springs includes more than twelve named vents with a total average discharge of more than 600 cubic feet per second [cfs] (390 million gallons per day [MGD]), making it one of the largest first magnitude spring systems in Florida.

Gum Slough is located in Sumter County and is a tributary of the Withlacoochee River. Land uses surrounding Gum Slough and the spring run are in large private and public tracts, dominated by wetlands, forests, and rangeland. Outside of these immediate buffer areas, more intensive agricultural, suburban, and urban developments are evident. Gum Slough Springs is made up of multiple spring vents, some with their own short spring runs. The total length of the spring run is approximately 5.0 miles (8.1 km) from its upper-most Main Spring boil to the junction with the Withlacoochee River.

2.1.1.3 Reservoir

Lake Rousseau is a reservoir that was originally created by construction of the Inglis Dam between 1905 and 1909 to provide navigation for the commercial development (timber, phosphate, and citrus) of the Withlacoochee River. The dam also provided hydroelectric power

generation by the Florida Power Corporation. Lake Rousseau is approximately 5.7-miles (9.2 km) long and has a surface area of about 4,163 ac (1,685 ha). The flow of water over the Inglis Dam produced electric power until 1965 (Florida Department of Environmental Protection, 2006). The Withlacoochee and Rainbow Rivers are the two major surface waters that contribute to Lake Rousseau.

2.1.1.4 Cross-Florida Barge Canal

The Lower Withlacoochee River, the natural channel west of Lake Rousseau, was significantly altered with the construction of the Cross Florida Barge Canal in the 1960s. The Cross Florida Barge Canal project was de-commissioned in the 1990 before it was completed. The barge canal bisected the Withlacoochee River approximately two miles (3.2 km) downstream of the Inglis Dam, cutting off this river segment and re-routing all outflows from Lake Rousseau above about 1,600 cfs to the barge canal and the Gulf. The Inglis Structural Complex includes the Inglis Dam and the various locks and spillways of the abandoned Cross-Florida Barge Canal (Figure 1-2). Discharge to the Lower Withlacoochee River from Lake Rousseau can only be received via the Inglis Bypass Channel. These structural modifications resulted in reduced average and peak flows to the remaining Lower Withlacoochee River. It was also determined that some diffuse groundwater inflows (about 7 cfs) formerly entering the lower river were also intercepted by the excavation of the barge canal (Faulkner 1972 referenced by Bush 1973).

2.1.2 Climate

Regional rainfall was evaluated by using a data set prepared by the SWFWMD for Marion, Citrus, Sumter, Hernando, Lake, Pasco, and Polk Counties. This data set provides annual rainfall totals for the period-of-record from 1915 through 2011 as shown in Figure 2-1. These data show an average precipitation of 53 inches per year over the 97-year period. The LOESS (locally-weighted scatterplot smoothing) procedure was used to better understand the long-term patterns in rainfall. Area precipitation generally increased for the first half of the record from an average of about 50 inches per year in the early 1900s to a maximum average of about 56 inches per year in the 1960s, to an average of about 50 inches per year over the past decade. Extreme annual average rainfall totals in the area range from 32 to 74 inches per year.

The average daily temperature for this area is approximately 72^{o} F, with average summer temperatures in the low 80's ^{o}F and average winter temperatures in the upper 50's ^{o}F (Southwest Florida Water Management District, 2010).

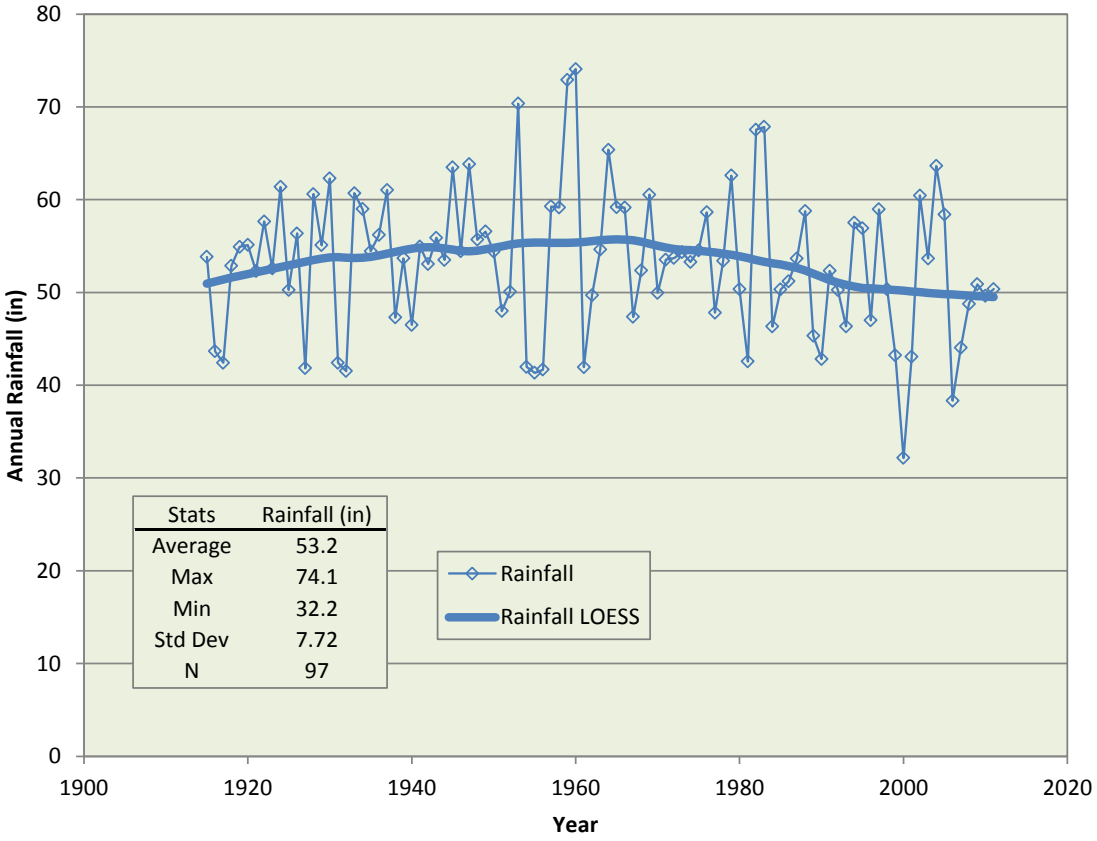


Figure 2-1. Annual Rainfall Summary for Withlacoochee Watershed Counties (Marion, Citrus, Sumter, Hernando, Lake, Pasco, and Polk) with LOESS curve

2.1.3 Physiography

Based on the underlying sediments and topographic relief, the Withlacoochee watershed has been divided into 5 physiographic provinces: Brooksville Ridge, Tsala Apopka Plain, Coastal Lowlands, Webster Limestone Plain, and Dade City Hills. The Brooksville Ridge elevations range from 70 to 200 ft National Geodetic Vertical Datum (NGVD), with clay-rich soils that have slowed the weathering of the underling limestone, resulting in higher elevations in comparison to the surrounding areas. Many hills in the Dade City Hills area have elevations above 200 ft NGVD with the highest reaching 301 ft NGVD. The main structural feature in the Withlacoochee watershed's geology is the Ocala Uplift. The Ocala Uplift is post-Oligocene (relatively recent geologic age) which has eroded to form the trough of the Withlacoochee River and the Green Swamp watershed (Florida Department of Environmental Protection, 2006).

2.1.4 Land-Use

A summary of land use and land cover has been summarized in the Withlacoochee Watershed for 1974, 1990, 1995, and 2004 (Southwest Florida Water Management District, 2010). A map of the 2004 land use and land cover is illustrated in Figure 2-2 The dominant land uses and land coverage in the Withlacoochee Watershed in 1974 were rangeland (40%), wetland forest (25%), and upland forest (19%), totaling 84 percent of the watershed (Table 2-1). Compared to

mapping from 1974, by 2004, the relatively undeveloped land use categories in the watershed had declined to 63 percent, with rangeland area shrinking from 40 to 25 percent. Urban and build-up land uses within the watershed increased at a rapid rate from 4 percent in 1974 to 20 percent in 2004.

In 1909, construction of Lake Rousseau increased water levels in the Lower Withlacoochee River, shifting area land uses from limerock mining and agriculture to mostly residential. Within a ten-mile radius of Dunnellon, the population increased 37.5 percent between 1994 and 2004, and this trend is projected to continue (Florida Department of Environmental Protection, 2013).

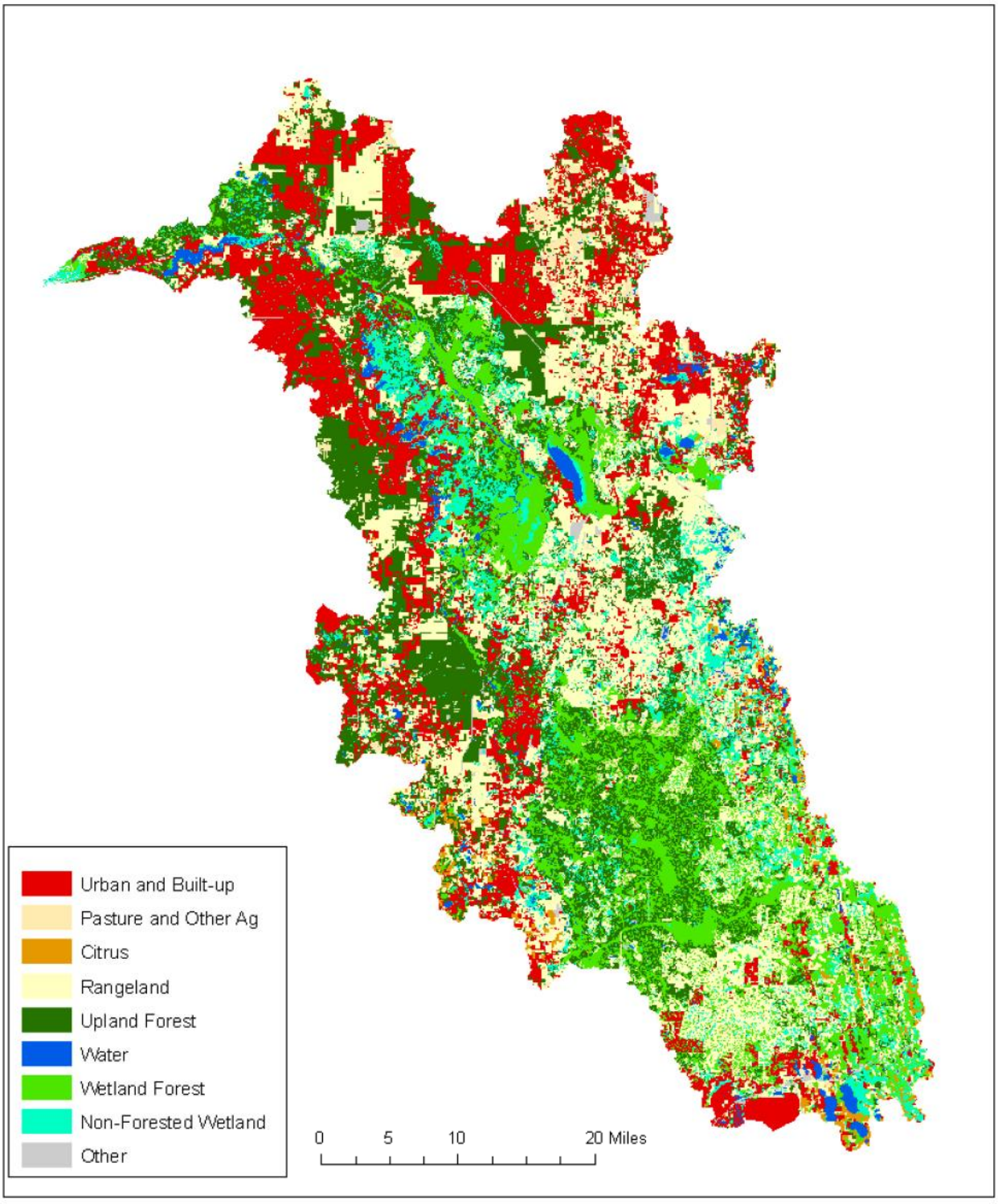


Figure 2-2. 2004 Land Use / Cover Map of the Withlacoochee River Watershed (Southwest Florida Water Management District, 2010)

Table 2-1. Percent of Land Use / Cover within the Withlacoochee River Watershed (1974, 1990, 1995, and 2004).

Withlacoochee River Watershed	1974(%)	1990(%)	1995(%)	2004(%)
Urban and Built-up	4	15	18	20
Rangeland	40	28	30	25
Citrus	5	2	2	1
Pasture and Other Ag	0	4	3	4
Upland Forest	19	24	23	23
Water	3	2	2	2
Wetland Forest	25	16	15	15
Non-Forested Wetland	0	8	8	8
Other	5	1	1	1

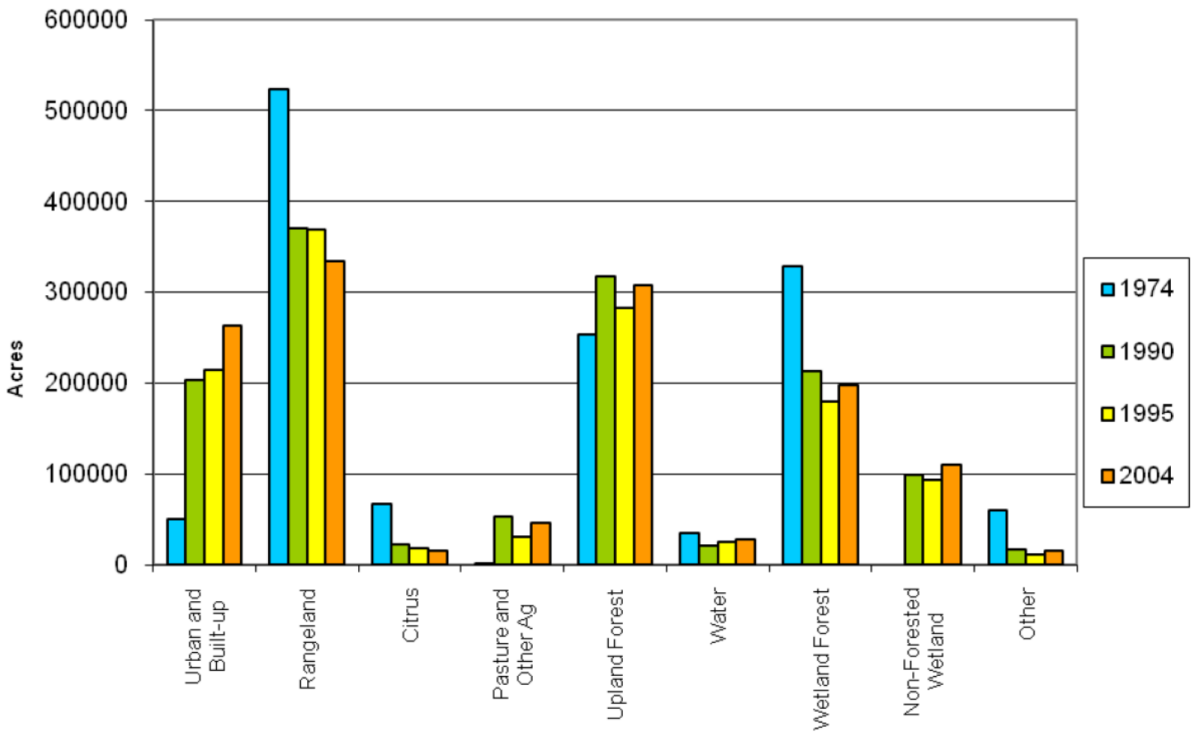


Figure 2-3. Land Use / Cover within the Withlacoochee River Watershed (1974, 1990, 1995, and 2004).

2.2 Study Area

The Lower Withlacoochee River Study Area (Figure 1-2) includes approximately 10 miles of historic river channel that extends from the Lake Rousseau Inglis Bypass Channel to the Gulf of Mexico.

The upper portion of the study area is comprised of residential developments from the Inglis and Yankeetown communities with the lower portion primarily undeveloped salt marsh. The

upper portion has an average channel width of 98 ft (30 m) with an average mid-channel depth of 13 ft (4 m) (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

This section summarizes environmental data from the Lower Withlacoochee River Study Area, as well as relevant areas upstream including Lake Rousseau and the Withlacoochee River downstream of Highway 200.

2.2.1 Discharge and Stage

The locations of USGS stage and discharge stations within the Lower Withlacoochee River are illustrated in Figure 2-4 with metadata in Table 2-1.

Discharge in the Withlacoochee River at Highway 200 (USGS 2313000) varied greatly during wet and dry season in response to storm events with flows ranging from 33 to 8,660 cfs (average 958 cfs) over the period-of-record (Figure 2-5). In comparison, Rainbow River (USGS 2313100) discharges were more stable averaging 679 cfs with a range from 391 to 1,060 cfs. Figure 2-6 presents the LOESS (locally weighted scatterplot smoothing) data curves for the detailed discharge data in Figure 2-5. Based on these curves there has been a general long-term (1960s to present) decline in discharge at each of the stations over the period-of-record. Average declines in flows in the upper and lower river and at the dam are on the order of 40 to 60%.

Discharge to the Lower Withlacoochee River from Lake Rousseau can only be received via the Inglis Bypass Channel. The design peak flow for the spillway is reported by the District to be 1,540 cfs. The average discharge from the Bypass Channel (USGS 2313250) was 1,008 cfs with a maximum recorded flow of 1,840 cfs since 1970. Since the construction of the Cross-Florida Barge Canal the Lower Withlacoochee River has been deprived of high flows. Flows of up to about 6,000 cfs have been discharged through the Inglis Dam (USGS 2313230) to the barge canal which reduces available high flows to the lower river (Figure 2-7). This makes management of water levels in Lake Rousseau difficult since lowering level by a small amount can cause significant flow reductions to the Lower Withlacoochee River (Florida Department of Environmental Protection, 2006).

Figure 2-8 presents daily average stage estimates for USGS stations downstream of Highway 200 for the period-of-record. The station at Highway 200 (USGS 2313000) had the largest fluctuation in water elevations, 26.8 to 40.8 ft NGVD29, and an average of 30.4 ft NGVD29. The average water elevation in the Withlacoochee River (USGS 2313200) downstream of the Rainbow River at Highway 41 was 27.9 ft NGVD29 with a range of 23.1 to 30.4 ft NGVD29. The Lake Rousseau Bypass Channel (USGS 2313250) was approximately 27.1 ft NGVD29 with a range from 21.7 to 28.1 ft NGVD29. The two western most stations at the Lake Rousseau Inglis Dam (USGS 2313229 & 2313230) averaged about 27.4 ft NGVD29 with a range of 21.7 to 28.0 ft NGVD29 between the two stations over the period of record. The mean water depth in Lake Rousseau is about 7.8 ft (2.4 m) with the deepest areas within the original Withlacoochee River channel (Figure 2-9).

Water elevations below the Inglis dam are approximately 26 ft (7.9 m) lower than elevations in Lake Rousseau and fluctuate over 11 ft (-1.90 to 9.25 ft NGVD29) with an average of 1.3 ft NGVD29 (Figure 2-8).

The average stage for the two stations at the Withlacoochee Bay Estuary (USGS 2313272 & 2313274) was -0.37 ft NGVD29 with a range from about -2.6 to 2.6 ft NGVD29.

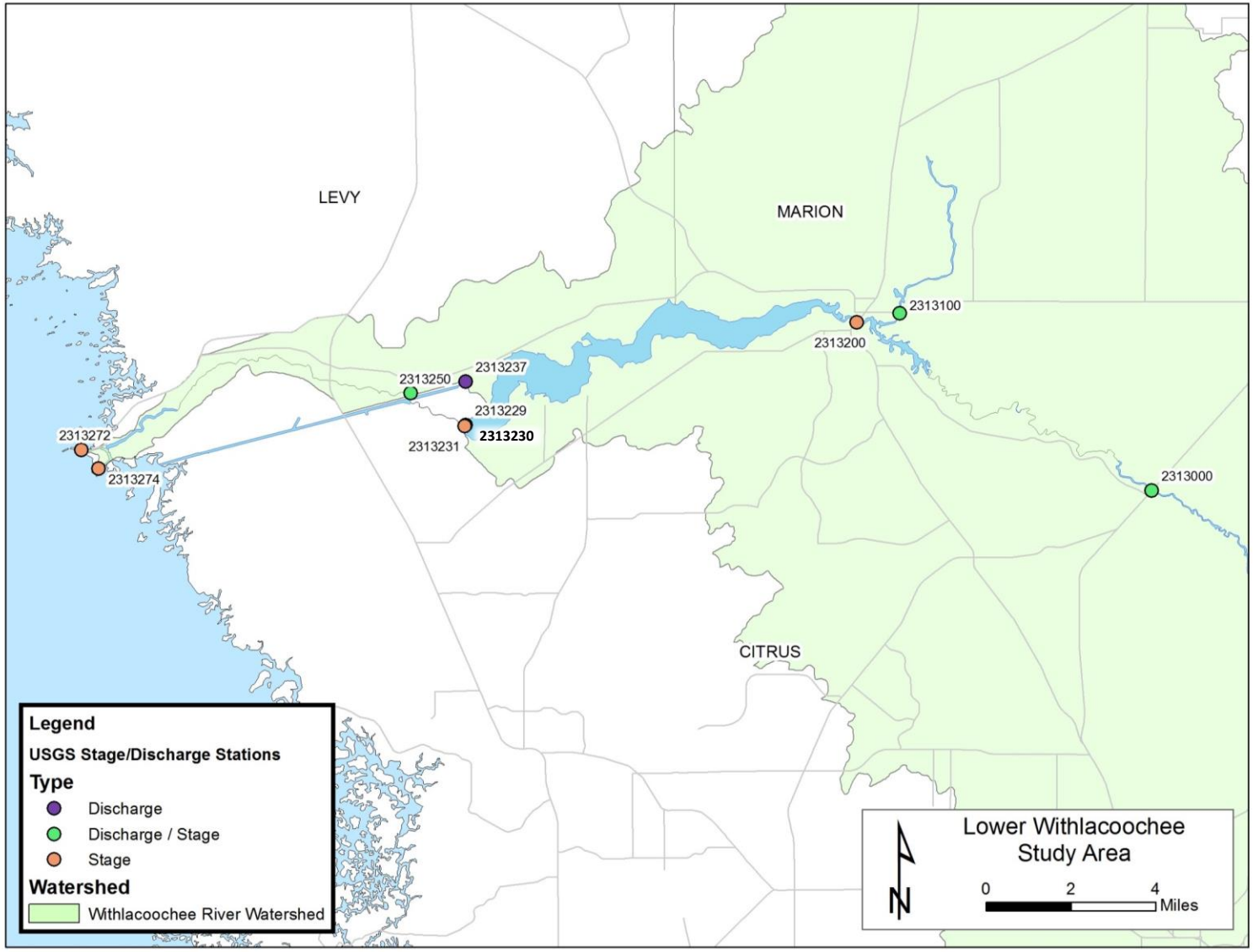
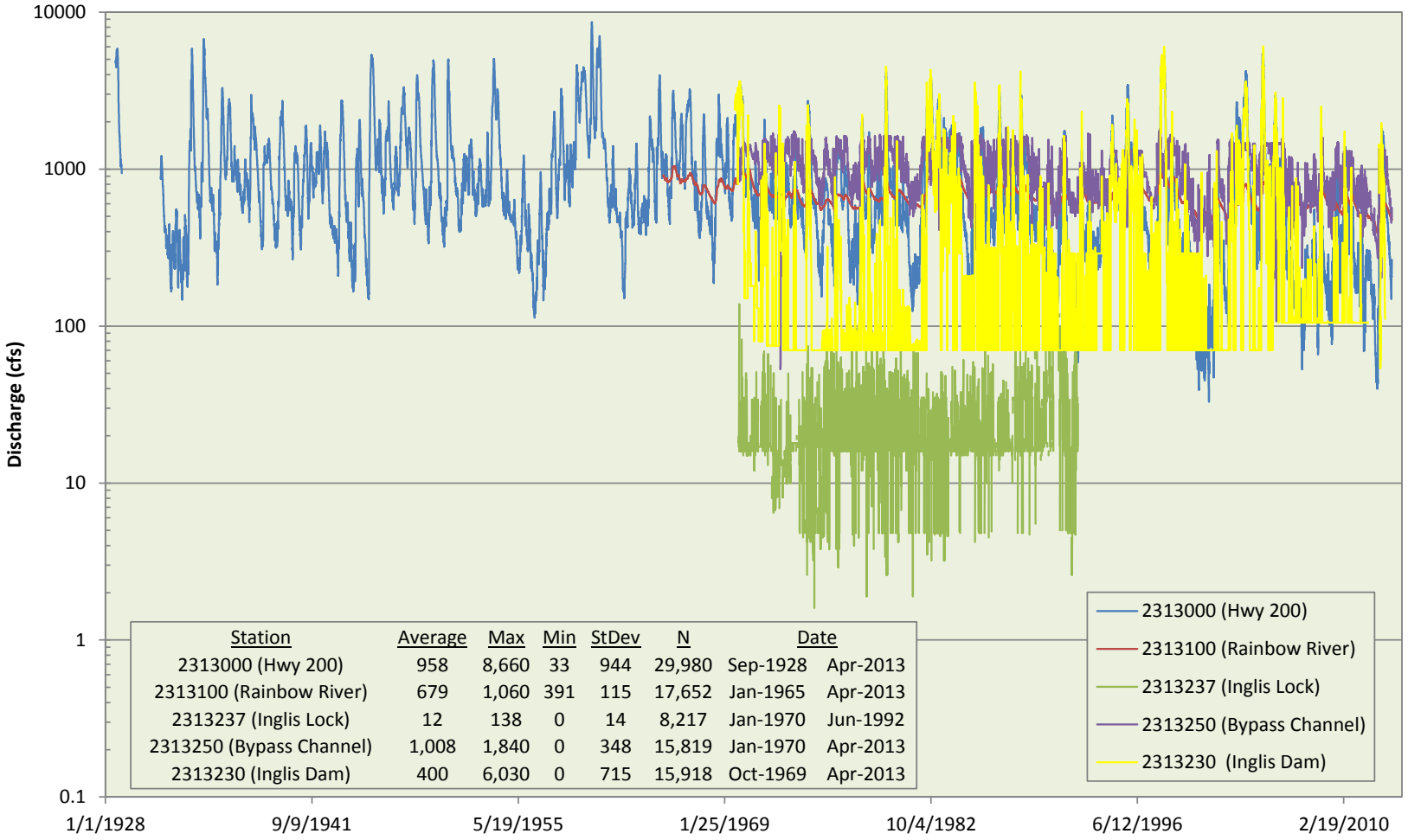


Figure 2-4. USGS Stage/Discharge Stations within the Lower Withlacoochee River

Table 2-2. USGS Stage/Discharge Stations within the Lower Withlacoochee River

STATION ID	STATION NAME	STN TYPE	LATITUDE	LONGITUDE
2313000	WITHLACOOCHEE RIVER NEAR HOLDER, FL	Discharge / Stage	28.988868	-82.349541
2313100	RAINBOW RIVER AT DUNNELLON, FL	Discharge / Stage	29.049167	-82.447778
2313200	WITHLACOOCHEE RIVER AT DUNNELLON, FL	Stage	29.046087	-82.464544
2313229	LAKE ROUSSEAU NR DUNNELLON, FLA.	Stage	29.010253	-82.616492
2313230	WITHLACOOCHEE R AT INGLIS DAM NEAR DUNNELLON, FL	Discharge / Stage	29.009722	-82.616944
2313231	WITHLACOOCHEE R BL INGLIS DAM NR DUNNELLON, FLA.	Stage	29.009975	-82.61677
2313237	BARGE CANAL AT INGLIS LOCK NR INGLIS, FLA.	Discharge	29.025252	-82.616492
2313250	WITHLACOOCHEE R BYPASS CHANNEL NR INGLIS FLA	Discharge / Stage	29.021085	-82.637882
2313272	WITHLACOOCHEE R AT CHAMBERS IS NEAR YANKEETOWN FL	Stage	29.001109	-82.765788
2313274	WITHLACOOCHEE R AT BUNGALOW PASS AT PORT INGLIS FL	Stage	28.994696	-82.758996



Station	Average	Max	Min	StDev	N	Date	
2313000 (Hwy 200)	958	8,660	33	944	29,980	Sep-1928	Apr-2013
2313100 (Rainbow River)	679	1,060	391	115	17,652	Jan-1965	Apr-2013
2313237 (Inglis Lock)	12	138	0	14	8,217	Jan-1970	Jun-1992
2313250 (Bypass Channel)	1,008	1,840	0	348	15,819	Jan-1970	Apr-2013
2313230 (Inglis Dam)	400	6,030	0	715	15,918	Oct-1969	Apr-2013

Figure 2-5. USGS daily average discharge estimates in the Lower Withlacoochee River (Max = maximum, Min = minimum, StDev = standard deviation, and N = number of individual values in the period-of-record)

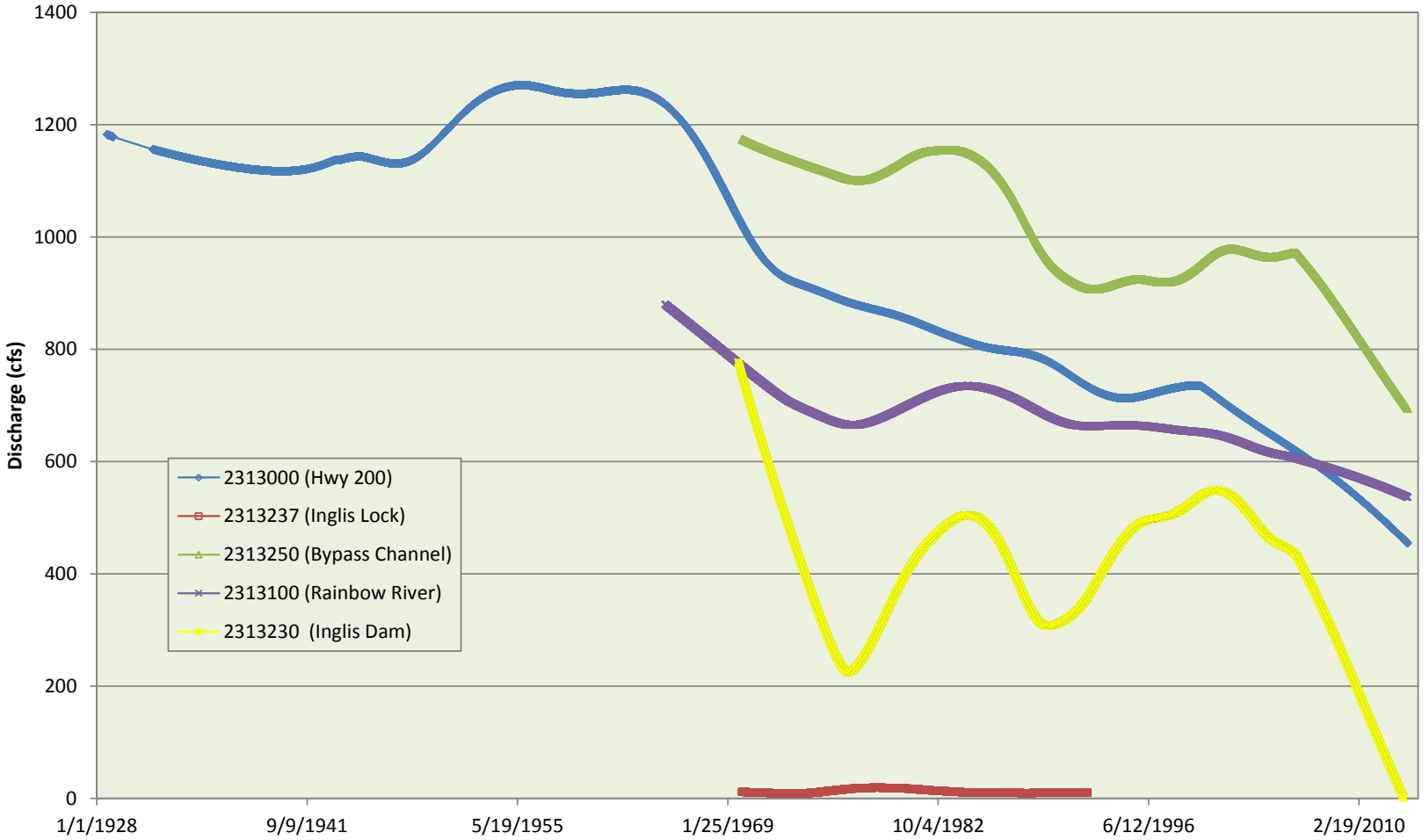


Figure 2-6. LOESS curves (alpha = 0.33) for USGS daily average discharge estimates in the Lower Withlacoochee River

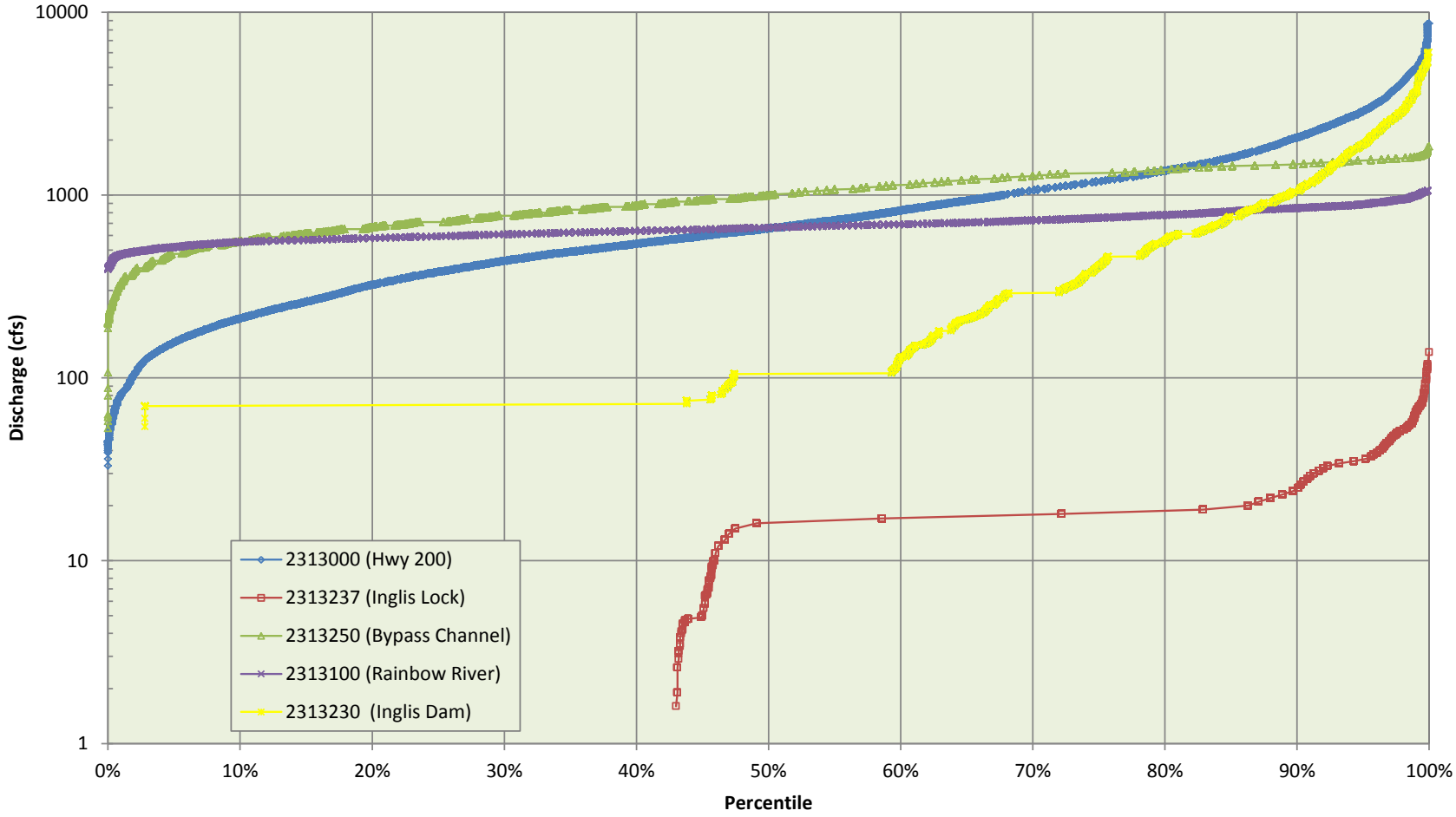
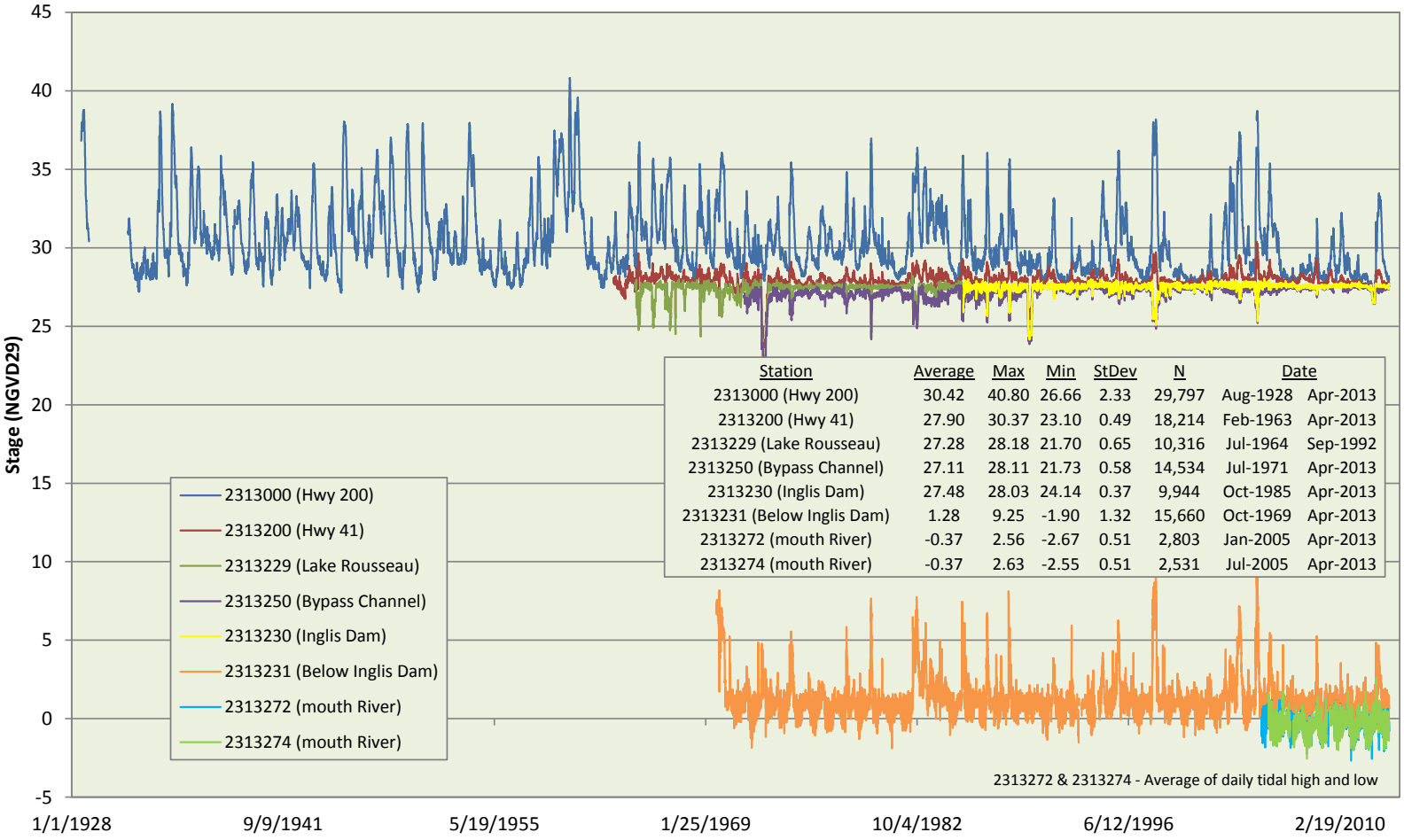


Figure 2-7. Discharge Frequency Curves for the USGS daily average discharge estimates in the Lower Withlacoochee River



Station	Average	Max	Min	StDev	N	Date	
2313000 (Hwy 200)	30.42	40.80	26.66	2.33	29,797	Aug-1928	Apr-2013
2313200 (Hwy 41)	27.90	30.37	23.10	0.49	18,214	Feb-1963	Apr-2013
2313229 (Lake Rousseau)	27.28	28.18	21.70	0.65	10,316	Jul-1964	Sep-1992
2313250 (Bypass Channel)	27.11	28.11	21.73	0.58	14,534	Jul-1971	Apr-2013
2313230 (Inglis Dam)	27.48	28.03	24.14	0.37	9,944	Oct-1985	Apr-2013
2313231 (Below Inglis Dam)	1.28	9.25	-1.90	1.32	15,660	Oct-1969	Apr-2013
2313272 (mouth River)	-0.37	2.56	-2.67	0.51	2,803	Jan-2005	Apr-2013
2313274 (mouth River)	-0.37	2.63	-2.55	0.51	2,531	Jul-2005	Apr-2013

Figure 2-8. USGS daily average stage estimates in the Lower Withlacoochee River

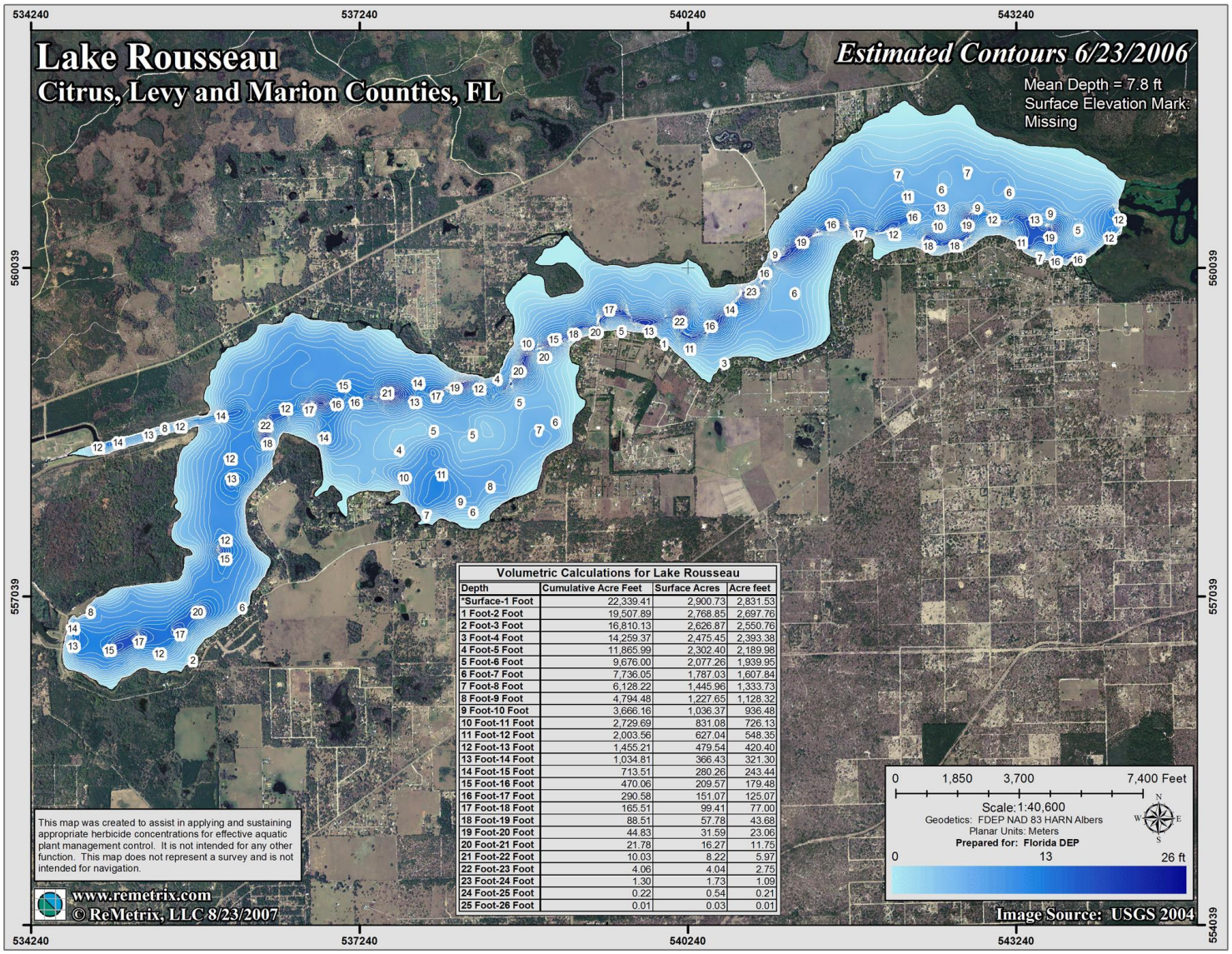


Figure 2-9. Lake Rousseau Bathymetric map (UF IFAS, 2007)

Figure 2-10 through Figure 2-12 present summaries of flow rates, discharge, and water depths along transects in the Lower Withlacoochee River below the Bypass Channel (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001). Averages were calculated from measurements collected at each transect from August 1998 to January 2001 (10 quarterly events). Transect 1 was located just downstream of the Inglis Bypass Channel and Transect 15 was located where the river enters the Gulf of Mexico at Chambers Island. Average flow velocities ranged from 0.41 m/s near the upper freshwater section of the river to 0.03 m/s near the lower estuary tidal areas. Reverse flows were measured as far upstream as Transect 4 (near U.S. 19). Mean discharge estimates for the upper 10 transects were variable and ranged from 339 cfs (Transect 9) to 777 cfs (Transect 2). The average depth ranged from 2.0 m (Transect 2) to 6.0 m (Transect 5) with an average depth of 3.9 m for the entire river.

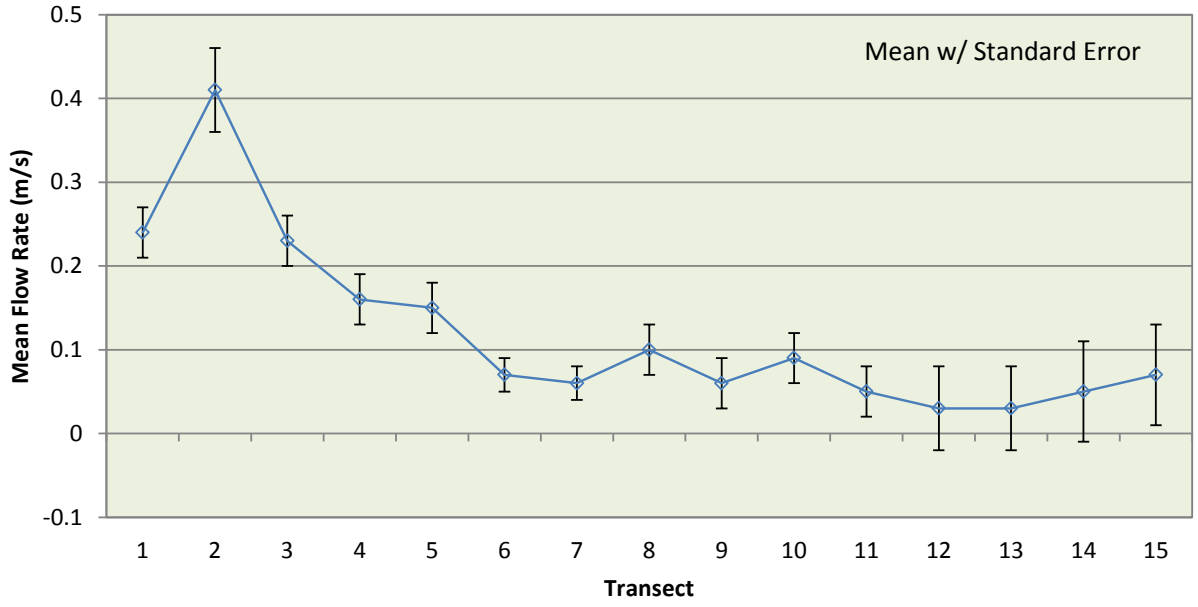


Figure 2-10. Mean flow velocities (m/s) measured along transects within the Withlacoochee River below the Bypass Channel (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

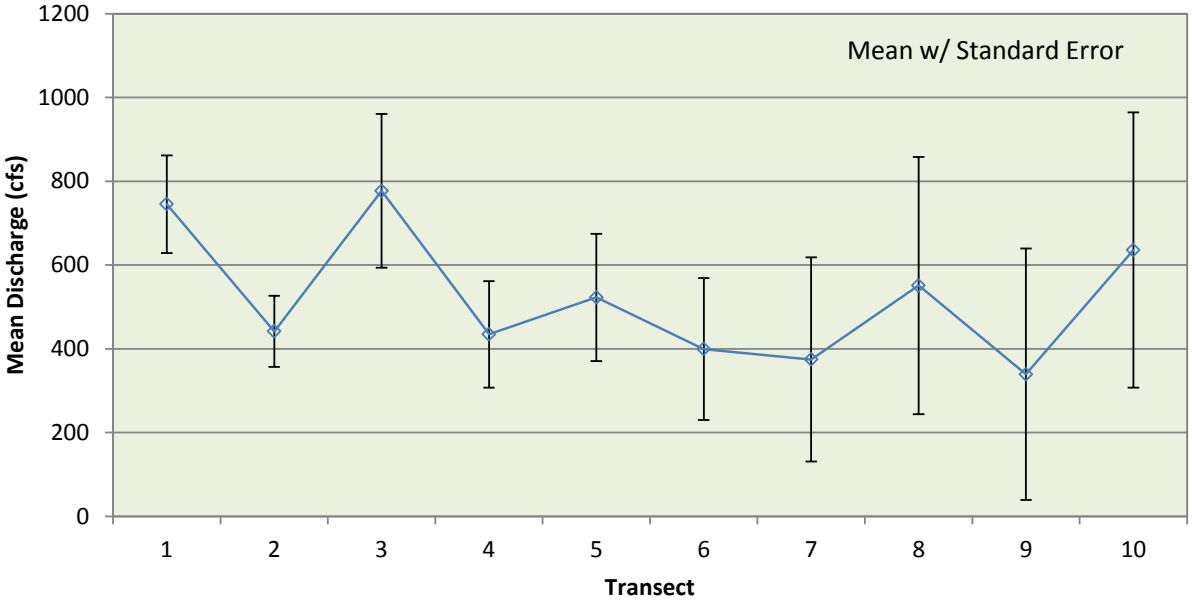


Figure 2-11. Mean discharge (cfs) measured along transects within the Withlacoochee River below the Bypass Channel (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

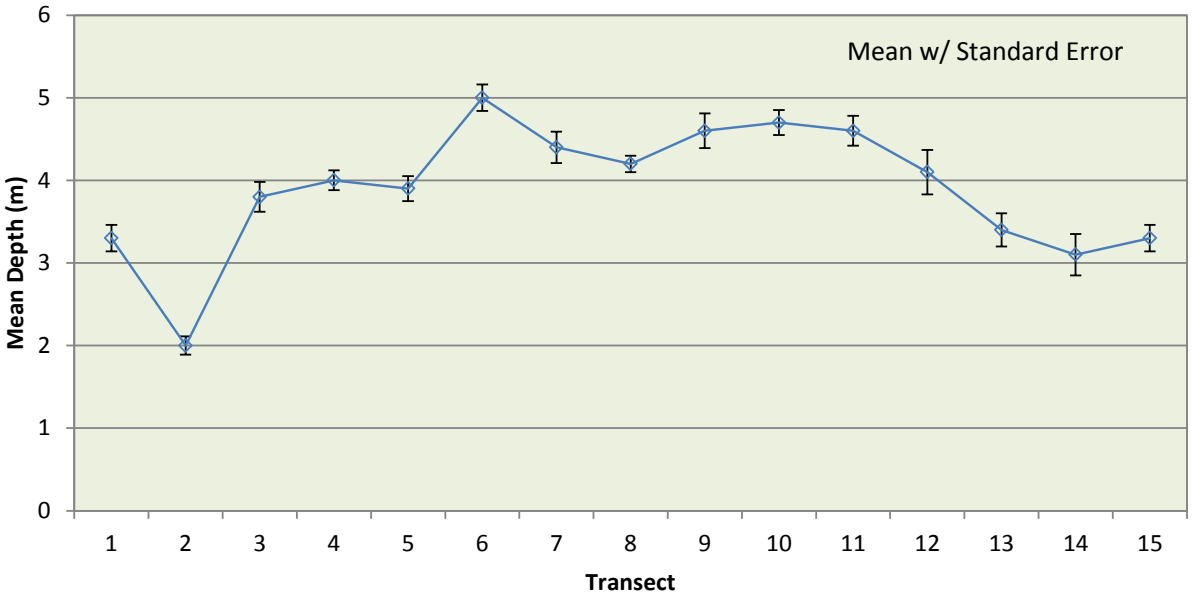


Figure 2-12. Mean depth (m) measured along transects within the Withlacoochee River below the Bypass Channel (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

2.2.2 Water Quality

2.2.2.1 Water Quality Assessment Status

The Withlacoochee River and Lake Rousseau are classified as Class III (recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife) and have been reported in 2010 to EPA under Sections 305(b) and 303(d) of the Clean Water Act as impaired (Table 2-3). The impaired areas of the Withlacoochee River include two segments downstream of Lake Rousseau - the Lower Withlacoochee River below the Bypass Channel and the river segment between the Inglis Dam and Cross Florida Barge Canal. Each waterbody was listed as impaired for mercury in fish tissue; dissolved oxygen impairments in Lake Rousseau and the Withlacoochee River below the Inglis dam; benthic macroinvertebrate bioassessment impairment for the Lower Withlacoochee River; and chlorophyll-a impairment in the Withlacoochee River below the Inglis dam.

Table 2-3. Water Quality Assessment Report – 2010 (US Environmental Protection Agency, 2010)

Waterbody	Type	Impairment	Cause
Lake Rousseau (FL1329B)	Freshwater Lake	Dissolved oxygen	Organic Enrichment / Oxygen Depletion
		Mercury in fish tissue	Mercury
Withlacoochee River (FL1337)	Stream	Benthic Macroinvertebrate Bioassessment	Cause Unknown – Impaired Biota
		Mercury in fish tissue	Mercury
Withlacoochee River - Cross Florida Barge Canal (FL1329A)	Estuary	Chlorophyll-A	Algal Growth
		Dissolved Oxygen	Organic Enrichment/Oxygen Depletion
		Mercury in Fish Tissue	Mercury

2.2.2.2 Water Quality Summary

Water quality data for the Withlacoochee River and Lake Rousseau from the 1950's to present were available from the following sources.

- SWFWMD Water Management Information System (http://www.swfwmd.state.fl.us/data/water-quality)
- USGS (http://waterdata.usgs.gov/fl/nwis)
- Florida STORET (http://storet.dep.state.fl.us)
- STORET Legacy (http://www.epa.gov/storet/legacy)

Figure 2-13 identifies the locations of the surface water quality stations within the Withlacoochee River (below Highway 200) and Lake Rousseau with metadata in Appendix A.

Due to the number of stations with data collected over varying time periods, water quality stations were spatially grouped into the following locations to make the data more manageable.

- River (Hwy200-RR): Withlacoochee River downstream of Highway 200 and confluence with Rainbow River
- River (RR-LR): Withlacoochee River downstream of the confluence with the Rainbow River to Lake Rousseau
- Lake (East): Lake Rousseau East
- Lake (West): Lake Rousseau West
- River (Bypass Channel): Lake Rousseau Bypass Channel discharge
- Lake (Inglis Dam): Lake Rousseau Inglis Dam discharge
- Lake (Inglis Lock): Lake Rousseau at the Inglis Lock
- River (LR-CFBC): Withlacoochee River downstream of Inglis Dam and Cross Florida Barge Canal
- River (Lower): Lower Withlacoochee River downstream of Bypass Channel
- Canal: Cross Florida Barge Canal
- Estuary: Estuary at the mouth of the Withlacoochee River

These water quality data are summarized in Table 2-4 which provides decadal averages (if available) for the above station locations. Period-of-record statistics for available water quality parameters are provided in Appendix A.

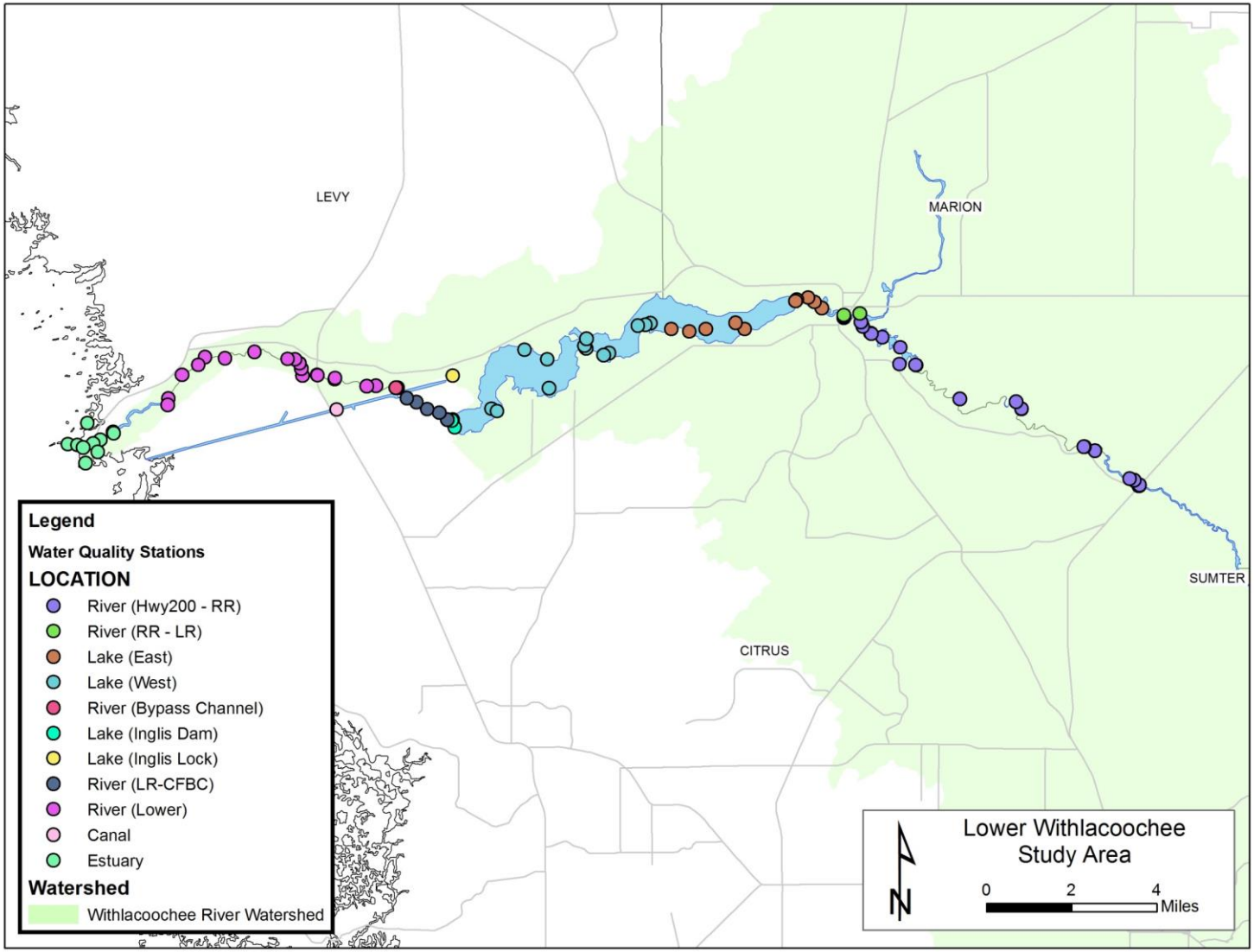


Figure 2-13. Water Quality Stations identified by station type and location within the Lower Withlacoochee River

Table 2-4. Average water quality summary by decade for stations in the Lower Withlacoochee River (T = total and D = dissolved)

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	Decade						
				1950	1960	1970	1980	1990	2000	2010
BIOLOGICAL	Chl-a corr	µg/L	River (Hwy200 - RR)	---	---	---	---	3.26	2.61	2.67
			River (RR - LR)	---	---	---	---	---	2.50	2.77
			Lake (East)	---	---	---	---	---	1.52	---
			Lake (West)	---	---	---	---	15.2	6.47	27.6
			Lake (Inglis Dam)	---	---	---	---	---	---	34.5
			River (LR-CFBC)	---	---	---	---	---	1.63	---
			River (Lower)	---	---	---	---	---	5.47	5.32
			Canal	---	---	---	---	---	11.1	---
			Estuary	---	---	---	---	---	4.87	2.23
DISSOLVED OXYGEN	DO	%	River (Hwy200 - RR)	---	77.9	63.2	65.8	64.5	54.6	64.0
			River (RR - LR)	---	80.8	71.6	68.4	76.5	83.9	74.5
			Lake (East)	---	72.9	---	---	---	79.8	---
			Lake (West)	---	---	---	---	70.5	86.5	---
			River (Bypass Channel)	---	74.0	83.0	65.7	85.0	---	---
			Lake (Inglis Dam)	---	99.5	65.0	81.1	124	---	---
			Lake (Inglis Lock)	---	---	49.8	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	70.7	---
			River (Lower)	---	102	101	85.3	93.5	93.5	---
			Estuary	---	---	---	78.7	89.0	95.4	---
	DO	mg/L	River (Hwy200 - RR)	---	6.57	5.72	5.97	6.06	5.91	5.53
			River (RR - LR)	---	6.91	6.36	6.27	6.43	6.13	6.14
			Lake (East)	---	6.22	---	---	---	6.48	---
			Lake (West)	---	---	---	---	6.27	7.98	8.36
			River (Bypass Channel)	---	6.00	6.94	5.81	7.23	---	---
			Lake (Inglis Dam)	---	8.45	6.05	7.12	10.3	---	8.36
			Lake (Inglis Lock)	---	---	4.11	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	6.18	---
			River (Lower)	---	8.80	8.68	7.36	6.66	8.05	8.40
			Canal	---	---	---	---	---	5.62	5.20
			Estuary	---	---	---	7.04	7.72	7.08	6.93
GENERAL INORGANIC	Alk	mg/L as CaCO3	River (Hwy200 - RR)	99.7	98.5	103	111	109	109	118
			River (RR - LR)	---	110	105	110	90.7	112	114
			Lake (West)	---	---	---	---	103	---	112
			River (Bypass Channel)	---	92.0	97.7	95.3	---	---	---
			Lake (Inglis Dam)	---	104	129	---	---	---	114
			Lake (Inglis Lock)	---	---	138	---	---	---	---
			River (Lower)	---	108	108	---	99.3	106	110
			Canal	---	---	---	---	---	116	121
	Cl-T	mg/L	River (Hwy200 - RR)	8.92	8.35	9.48	9.16	9.26	9.35	10.8
			River (RR - LR)	---	7.07	7.00	8.34	6.24	7.60	8.25
			Lake (East)	---	---	---	---	---	7.36	---
			Lake (West)	---	---	---	---	7.35	7.46	7.98
			River (Bypass Channel)	---	8.00	9.41	10.6	---	---	---
			Lake (Inglis Dam)	---	7.56	214	---	---	---	8.30
			Lake (Inglis Lock)	---	---	5,697	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	154	---
			River (Lower)	---	6.67	26.0	---	7.18	7.64	8.40
			Canal	---	---	---	---	---	3,710	---
			Estuary	---	---	---	---	---	836	---

Table 2-4. Average water quality summary by decade for stations in the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	Decade						
				1950	1960	1970	1980	1990	2000	2010
GENERAL INORGANIC	SO4	mg/L	River (Hwy200 - RR)	26.4	23.6	26.0	25.8	29.5	51.5	42.2
			River (RR - LR)	---	16.0	9.60	17.1	13.3	22.9	24.2
			Lake (East)	---	---	---	---	---	22.5	---
			Lake (West)	---	---	---	---	14.7	21.3	15.6
			River (Bypass Channel)	---	14.0	20.8	20.8	---	---	---
			Lake (Inglis Dam)	---	16.3	---	---	---	---	17.7
			River (LR-CFBC)	---	---	---	---	---	46.2	---
			River (Lower)	---	13.7	17.0	---	19.9	21.0	23.7
			Canal	---	---	---	---	---	581	---
			Estuary	---	---	---	---	---	151	---
GENERAL ORGANIC	TOC	mg/L	River (Hwy200 - RR)	---	18.0	12.1	12.4	10.7	14.5	16.2
			River (RR - LR)	---	---	8.50	10.0	10.8	8.05	7.02
			Lake (East)	---	---	---	---	---	7.44	---
			Lake (West)	---	---	---	---	8.35	8.01	---
			River (Bypass Channel)	---	---	11.4	14.8	---	---	---
			Lake (Inglis Dam)	---	---	6.25	15.2	---	---	---
			Lake (Inglis Lock)	---	---	8.32	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	10.1	---
			River (Lower)	---	---	---	---	9.61	8.43	6.99
			Canal	---	---	---	---	---	8.33	7.63
			Estuary	---	---	---	---	---	11.0	10.5
METAL	Ca-D	mg/L	River (Hwy200 - RR)	45.0	44.8	47.5	47.9	53.2	39.7	60.1
			River (RR - LR)	---	46.5	41.0	44.0	---	49.4	50.7
			Lake (West)	---	---	---	---	49.0	---	46.6
			River (Bypass Channel)	---	35.0	40.1	40.0	---	---	---
			Lake (Inglis Dam)	---	42.1	41.0	---	---	---	48.0
			Lake (Inglis Lock)	---	---	187	---	---	---	---
			River (Lower)	---	39.0	43.0	---	47.9	45.6	47.9
			Canal	---	---	---	---	---	87.4	98.0
	Ca-T	mg/L	River (Hwy200 - RR)	---	---	---	---	54.1	61.3	60.6
			River (RR - LR)	---	---	---	52.2	43.0	49.4	50.7
			Lake (East)	---	---	---	---	---	48.9	---
			Lake (West)	---	---	---	---	53.3	45.6	46.6
			Lake (Inglis Dam)	---	---	---	---	---	---	48.0
			River (LR-CFBC)	---	---	---	---	---	49.1	---
			River (Lower)	---	---	---	---	53.5	45.7	47.9
			Canal	---	---	---	---	---	96.9	---
			Estuary	---	---	---	---	---	71.1	---
	Fe-T	µg/L	River (Hwy200 - RR)	275	120	225	374	285	677	---
			River (RR - LR)	---	100	---	139	49.0	---	---
			Lake (West)	---	---	---	100	222	---	95.4
			River (Bypass Channel)	---	---	40.0	---	---	---	---
			Lake (Inglis Dam)	---	---	---	---	---	---	58.5
			River (Lower)	---	150	---	---	126	---	---
	Hg-T	µg/L	River (Hwy200 - RR)	---	---	0.230	0.186	0.050	---	---
			River (RR - LR)	---	---	---	0.221	0.200	---	---
			River (Bypass Channel)	---	---	0.250	0.223	0.200	---	---
			Lake (Inglis Dam)	---	---	---	0.194	0.200	---	---

Table 2-4. Average water quality summary by decade for stations in the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	Decade						
				1950	1960	1970	1980	1990	2000	2010
METAL	K-D	mg/L	River (Hwy200 - RR)	0.394	0.554	0.419	0.622	0.578	1.31	0.717
			River (RR - LR)	---	0.300	0.100	0.200	---	0.462	0.469
			Lake (West)	---	---	---	---	0.450	---	0.370
			River (Bypass Channel)	---	0.200	0.320	0.350	---	---	---
			Lake (Inglis Dam)	---	0.314	---	---	---	---	0.400
			River (Lower)	---	0.250	0.600	---	0.785	0.457	0.465
			Canal	---	---	---	---	---	41.6	49.2
	K-T	mg/L	River (Hwy200 - RR)	---	---	---	---	0.628	0.723	0.765
			River (RR - LR)	---	---	---	1.62	1.35	0.464	0.426
			Lake (East)	---	---	---	---	---	0.551	---
			Lake (West)	---	---	---	---	0.426	0.510	0.370
			Lake (Inglis Dam)	---	---	---	---	---	---	0.400
			River (LR-CFBC)	---	---	---	---	---	4.47	---
			River (Lower)	---	---	---	---	2.21	0.484	0.424
			Canal	---	---	---	---	---	78.7	---
			Estuary	---	---	---	---	---	27.8	---
	Mg-D	mg/L	River (Hwy200 - RR)	4.06	4.01	4.38	4.50	5.00	3.02	5.10
			River (RR - LR)	---	6.72	4.00	5.00	---	5.23	5.48
			Lake (West)	---	---	---	---	5.03	---	5.13
			River (Bypass Channel)	---	3.80	4.72	4.88	---	---	---
			Lake (Inglis Dam)	---	4.43	4.55	---	---	---	5.12
			Lake (Inglis Lock)	---	---	507	---	---	---	---
			River (Lower)	---	6.33	5.70	---	4.80	5.18	5.50
			Canal	---	---	---	---	---	140	168
	Mg-T	mg/L	River (Hwy200 - RR)	---	---	---	---	4.52	5.58	5.60
			River (RR - LR)	---	---	---	6.56	4.85	5.21	5.55
			Lake (East)	---	---	---	---	---	5.08	---
			Lake (West)	---	---	---	---	4.47	5.02	5.13
			Lake (Inglis Dam)	---	---	---	---	---	---	5.12
			River (LR-CFBC)	---	---	---	---	---	16.8	---
			River (Lower)	---	---	---	---	11.8	5.08	5.57
			Canal	---	---	---	---	---	293	---
			Estuary	---	---	---	---	---	96.2	---
	Na-D	mg/L	River (Hwy200 - RR)	5.04	4.72	5.23	5.12	5.42	5.09	6.38
			River (RR - LR)	---	3.80	4.20	3.60	---	4.38	4.64
			Lake (West)	---	---	---	---	4.24	---	4.55
			River (Bypass Channel)	---	4.10	6.14	6.58	---	---	---
			Lake (Inglis Dam)	---	4.10	---	---	---	---	4.75
			River (Lower)	---	4.00	16.0	---	5.46	4.37	4.69
			Canal	---	---	---	---	---	1,077	1,315

Table 2-4. Average water quality summary by decade for stations in the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	Decade						
				1950	1960	1970	1980	1990	2000	2010
NITROGEN	NH4-N	mg/L	River (Hwy200 - RR)	---	0.081	0.024	0.038	0.023	0.071	0.034
			River (RR - LR)	---	0.005	---	0.080	0.030	0.031	0.022
			Lake (West)	---	---	---	0.00	0.039	---	0.004
			River (Bypass Channel)	---	---	0.046	0.039	---	---	---
			Lake (Inglis Dam)	---	---	0.146	---	---	---	0.004
			Lake (Inglis Lock)	---	---	0.106	---	---	---	---
			River (Lower)	---	0.035	---	---	0.052	0.048	0.051
			Canal	---	---	---	---	---	0.054	0.030
			Estuary	---	---	---	---	---	0.019	---
	NO3-N	mg/L	River (Hwy200 - RR)	0.171	0.093	0.062	0.131	0.168	---	---
			River (RR - LR)	---	---	---	0.332	0.110	---	---
			Lake (West)	---	---	---	---	0.270	---	---
			River (Bypass Channel)	---	---	0.064	0.102	---	---	---
			Lake (Inglis Dam)	---	0.142	0.065	---	---	---	---
			Lake (Inglis Lock)	---	---	0.016	---	---	---	---
			River (Lower)	---	---	---	---	0.228	---	---
NITROGEN	NOx-N	mg/L	River (Hwy200 - RR)	---	---	0.073	0.123	0.170	0.168	0.216
			River (RR - LR)	---	0.215	---	---	0.743	0.730	0.955
			Lake (East)	---	---	---	---	---	0.727	---
			Lake (West)	---	---	---	---	0.215	0.343	0.360
			River (Bypass Channel)	---	---	0.083	0.101	---	---	---
			Lake (Inglis Dam)	---	---	0.079	---	---	---	0.021
			Lake (Inglis Lock)	---	---	0.031	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	0.273	---
			River (Lower)	---	0.770	---	---	0.205	0.309	0.396
			Canal	---	---	---	---	---	0.184	0.202
			Estuary	---	---	---	---	---	0.175	0.320
	OrgN	mg/L	River (Hwy200 - RR)	---	0.793	0.550	0.577	0.546	---	---
			River (RR - LR)	---	---	0.305	0.410	0.343	---	---
			River (Bypass Channel)	---	0.730	0.449	0.387	---	---	---
			Lake (Inglis Dam)	---	0.735	0.458	---	---	---	---
			Lake (Inglis Lock)	---	---	0.459	---	---	---	---
			River (Lower)	---	---	0.230	---	---	---	---
	TKN	mg/L	River (Hwy200 - RR)	---	---	0.538	0.662	0.585	0.858	0.889
			River (RR - LR)	---	0.335	---	0.490	0.146	0.290	---
			Lake (East)	---	---	---	---	---	0.517	---
			Lake (West)	---	---	---	---	0.634	0.628	---
			River (Bypass Channel)	---	---	0.450	0.414	---	---	---
			Lake (Inglis Dam)	---	---	0.664	---	---	---	---
			Lake (Inglis Lock)	---	---	0.495	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	0.875	---
			River (Lower)	---	0.610	---	---	0.589	0.623	---
			Estuary	---	---	---	---	---	0.837	0.630
	TN	mg/L	River (Hwy200 - RR)	---	1.17	0.644	0.733	0.717	1.14	1.18
			River (RR - LR)	---	---	---	---	0.940	1.15	1.27
			Lake (East)	---	---	---	---	0.678	0.973	0.873
			Lake (West)	---	---	---	---	0.534	1.01	0.758
			River (Bypass Channel)	---	---	0.570	0.516	---	---	---
			Lake (Inglis Dam)	---	---	0.714	---	---	---	0.475
			Lake (Inglis Lock)	---	---	0.566	---	---	---	---
			River (Lower)	---	---	---	---	0.619	0.697	0.747
			Canal	---	---	---	---	---	0.750	0.627
			Estuary	---	---	---	---	0.600	0.588	---

Table 2-4. Average water quality summary by decade for stations in the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	Decade						
				1950	1960	1970	1980	1990	2000	2010
OXYGEN DEMAND	BOD5	mg/L	River (Hwy200 - RR)	---	1.17	0.725	0.880	1.17	---	---
			River (RR - LR)	---	1.17	0.567	1.26	1.04	---	---
			Lake (East)	---	0.981	---	---	---	0.958	---
			Lake (West)	---	---	---	---	---	1.64	---
			River (Bypass Channel)	---	0.400	0.948	1.08	1.27	---	---
			Lake (Inglis Dam)	---	0.858	1.12	1.42	1.10	---	---
			Lake (Inglis Lock)	---	---	1.33	---	---	---	---
			River (Lower)	---	1.46	---	---	1.20	---	---
	cBOD5	mg/L	River (Hwy200 - RR)	---	---	---	---	---	0.827	---
			Lake (East)	---	---	---	---	---	1.03	---
			Lake (West)	---	---	---	---	---	1.61	---
			River (LR-CFBC)	---	---	---	---	---	0.825	---
			River (Lower)	---	---	---	---	---	0.673	---
			Estuary	---	---	---	---	---	0.978	---
PHOSPHORUS	OrthoP	mg/L	River (Hwy200 - RR)	---	0.019	0.021	0.080	0.026	0.038	0.035
			River (RR - LR)	---	---	---	0.033	0.023	0.033	0.031
			Lake (East)	---	---	---	---	---	0.050	---
			Lake (West)	---	---	---	---	0.026	0.037	0.007
			River (Bypass Channel)	---	---	0.024	0.028	0.015	---	---
			Lake (Inglis Dam)	---	0.025	0.058	0.028	0.010	---	0.003
			Lake (Inglis Lock)	---	---	0.056	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	0.076	---
			River (Lower)	---	---	---	0.029	0.032	0.030	0.018
			Canal	---	---	---	---	---	0.030	0.017
			Estuary	---	---	---	0.030	---	0.054	---
	TP	mg/L	River (Hwy200 - RR)	---	0.028	0.031	0.046	0.096	0.066	0.051
			River (RR - LR)	---	---	---	0.087	0.062	0.061	0.048
			Lake (East)	---	---	---	---	0.045	0.051	0.045
			Lake (West)	---	---	---	---	0.054	0.070	0.046
			River (Bypass Channel)	---	---	0.040	0.045	---	---	---
			Lake (Inglis Dam)	---	---	0.081	---	---	---	0.055
			Lake (Inglis Lock)	---	---	0.076	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	0.123	---
			River (Lower)	---	---	---	---	0.047	0.048	0.045
			Canal	---	---	---	---	---	0.062	0.064
			Estuary	---	---	---	---	0.073	0.070	0.068
PHYSICAL	Color	CPU	River (Hwy200 - RR)	66.5	68.3	55.4	15.0	70.9	102	118
			River (RR - LR)	---	15.6	25.0	60.8	12.6	70.7	48.0
			Lake (East)	---	19.0	---	---	---	55.9	---
			Lake (West)	---	---	---	---	74.5	57.6	67.9
			River (Bypass Channel)	---	80.0	31.4	58.7	40.0	---	---
			Lake (Inglis Dam)	---	36.6	30.9	65.7	26.7	---	68.0
			Lake (Inglis Lock)	---	---	20.4	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	99.6	---
			River (Lower)	---	20.4	30.0	49.4	49.0	62.2	44.5
			Canal	---	---	---	---	---	64.3	43.5
			Estuary	---	---	---	39.4	14.5	61.6	80.7

Table 2-4. Average water quality summary by decade for stations in the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	Decade						
				1950	1960	1970	1980	1990	2000	2010
PHYSICAL	pH	SU	River (Hwy200 - RR)	7.44	7.50	7.51	7.64	7.53	7.42	7.28
			River (RR - LR)	---	7.51	7.21	7.34	7.09	7.51	7.55
			Lake (East)	---	7.43	---	---	---	7.50	---
			Lake (West)	---	---	---	---	7.28	7.78	7.69
			River (Bypass Channel)	---	7.10	7.62	7.30	7.46	---	---
			Lake (Inglis Dam)	---	7.74	7.67	7.50	7.77	---	8.10
			Lake (Inglis Lock)	---	---	7.54	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	7.47	---
			River (Lower)	---	7.79	7.00	7.28	7.53	7.87	7.80
			Canal	---	---	---	---	---	7.64	7.63
			Estuary	---	---	---	7.69	8.10	7.85	8.01
	Salinity	ppt	River (Hwy200 - RR)	---	---	---	---	0.140	0.162	0.047
			River (RR - LR)	---	---	---	---	---	0.140	0.152
			Lake (East)	---	---	---	---	---	0.133	---
			Lake (West)	---	---	---	---	0.109	0.129	0.134
			Lake (Inglis Dam)	---	---	---	---	---	---	0.135
			River (LR-CFBC)	---	---	---	---	---	1.44	---
			River (Lower)	---	---	---	---	2.79	1.99	0.145
			Canal	---	---	---	---	---	6.07	---
			Estuary	---	---	---	6.95	6.05	8.78	8.90
	SpCond	umhos/cm	River (Hwy200 - RR)	270	265	289	286	301	346	350
			River (RR - LR)	---	270	276	257	254	302	316
			Lake (East)	---	301	---	---	---	307	---
			Lake (West)	---	---	---	---	258	301	282
			River (Bypass Channel)	---	222	270	260	259	---	---
			Lake (Inglis Dam)	---	268	531	380	232	---	288
			Lake (Inglis Lock)	---	---	16,378	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	2,476	---
			River (Lower)	---	296	276	2,755	440	283	303
			Canal	---	---	---	---	---	15,164	14,409
			Estuary	---	---	---	13,929	---	22,874	23,204
	Turb	NTU	River (Hwy200 - RR)	---	1.11	2.05	1.03	1.22	2.06	1.81
			River (RR - LR)	---	---	3.00	1.58	0.687	0.868	0.971
			Lake (East)	---	---	---	---	---	1.44	---
			Lake (West)	---	---	---	---	2.71	1.85	2.18
			River (Bypass Channel)	---	27.0	2.79	1.21	0.897	---	---
			Lake (Inglis Dam)	---	20.0	6.62	1.44	1.00	---	8.80
			Lake (Inglis Lock)	---	---	8.08	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	1.56	---
			River (Lower)	---	---	5.00	1.32	1.32	1.19	1.67
			Canal	---	---	---	---	---	2.20	4.17
			Estuary	---	---	---	2.83	11.3	2.32	2.68

Table 2-4. Average water quality summary by decade for stations in the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	Decade						
				1950	1960	1970	1980	1990	2000	2010
SOLID	TDS	mg/L	River (Hwy200 - RR)	169	166	177	178	193	237	235
			River (RR - LR)	---	169	146	161	157	189	192
			Lake (East)	---	---	---	---	---	178	---
			Lake (West)	---	---	---	---	163	170	---
			River (Bypass Channel)	---	148	158	150	---	---	---
			Lake (Inglis Dam)	---	150	---	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	307	---
			River (Lower)	---	142	193	---	155	179	185
			Canal	---	---	---	---	---	3,710	4,294
			Estuary	---	---	---	---	---	1,554	---
	TSS	mg/L	River (Hwy200 - RR)	---	---	---	---	2.86	3.12	3.35
			River (RR - LR)	---	---	---	3.21	1.59	1.43	1.49
			Lake (East)	---	---	---	---	---	3.00	---
			Lake (West)	---	---	---	---	6.03	3.39	3.11
			Lake (Inglis Dam)	---	---	---	---	---	---	6.96
			River (LR-CFBC)	---	---	---	---	---	2.79	---
			River (Lower)	---	---	---	---	2.30	1.75	2.46
			Canal	---	---	---	---	---	3.89	8.06
			Estuary	---	---	---	---	---	8.65	---
TEMPERATURE	Wtr Temp	C	River (Hwy200 - RR)	23.5	23.4	22.2	22.8	22.8	23.3	22.7
			River (RR - LR)	---	24.0	23.0	22.6	23.0	22.8	22.7
			Lake (East)	---	23.9	---	---	---	23.4	---
			Lake (West)	---	---	---	---	23.1	22.7	26.3
			River (Bypass Channel)	---	27.0	25.0	23.0	24.7	---	---
			Lake (Inglis Dam)	---	23.0	24.0	23.2	25.4	---	26.2
			Lake (Inglis Lock)	---	---	25.6	---	---	---	---
			River (LR-CFBC)	---	---	---	---	---	23.6	---
			River (Lower)	---	23.5	23.9	23.8	23.8	23.6	23.0
			Canal	---	---	---	---	---	23.4	23.4
			Estuary	---	---	---	23.5	23.0	23.8	23.6

The Withlacoochee River upstream of the confluence with the Rainbow River had moderately high levels of color (82 cpu) and nutrients (TN = 0.84 mg/L, TP = 0.06 mg/L) over the period-of-record. About 78 percent of total nitrogen was in the organic form. The dissolved nutrients including orthophosphorus and nitrate averaged 0.03 mg/L and 0.15 mg/L, respectively. The average specific conductance for this river segment was 319 umhos/cm and salinity averaged 0.15 ppt. Turbidity and suspended solids averaged over the period-of-record was 1.8 NTU and 3.1 mg/L, respectively.

Withlacoochee River water quality below the confluence with the Rainbow River reflects the inflows of these two sources. During periods with low water levels in the Withlacoochee River, water quality conditions downstream of the confluence would be more representative of conditions in the Rainbow River. In comparison to the upstream river segment stations, a decrease was observed in color (60 cpu), turbidity (0.9 NTU), suspended solids (1.6 mg/L), and specific conductance (293 umhos/cm) over the period-of-record. Total phosphorus and orthophosphorus concentration remained about the same (TP = 0.06 mg/L, OrthoP = 0.03 mg/L). Total nitrogen increased (1.2 mg/L), however only about 30% was in the organic form. Nitrate showed a substantial increase to 0.78 mg/L over the period-of-record due to inputs from the Rainbow River.

Rainbow Springs has experienced a significant increase in nitrate concentrations over the past four decades (Southwest Florida Water Management District, 2008). Nitrate concentrations reported from the main spring pool during March 1927 were 0.08 mg/L (Ferguson, Lingham, Love, & Vernon, 1947). Recent nitrate concentrations at the Rainbow Springs complex (RR1) are consistently above 2.2 mg/L, an increase of about 2,650% (Figure 2-14).

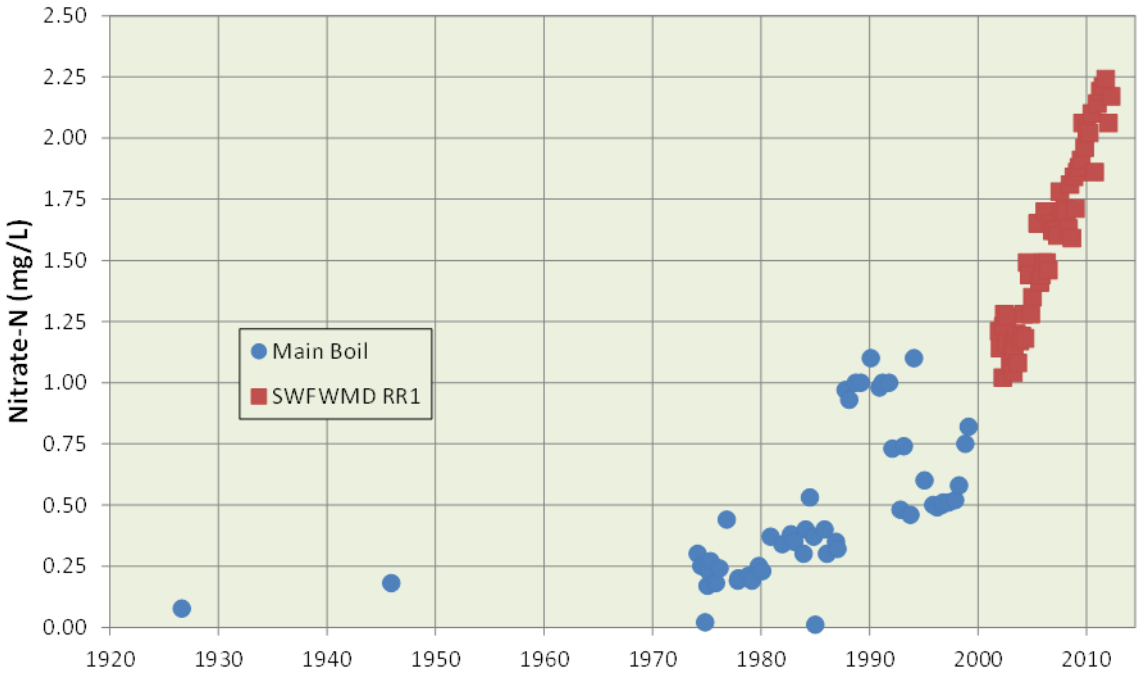


Figure 2-14. Nitrate concentrations in the vicinity of the Main Boil at Rainbow Spring from 1927-2012. Average nitrate concentrations have risen by 27 fold since the 1920s (Wetland Solutions, Inc., 2013).

Water quality in Lake Rousseau reveals the transition from a riverine to a reservoir system. Period-of-record average chlorophyll-a concentrations were much higher in Lake Rousseau (West - 12.6 ug/L) and nitrate lower (East - 0.73 mg/L, West – 0.29 mg/L, Dam – 0.07 mg.L) in comparison to upstream river stations. Mean total nitrogen concentrations ranged from 0.68 mg/L (Dam) to 0.91 mg/L (East) in Lake Rousseau over the period-of-record with approximately 70% in an organic form. Total phosphorus concentrations increased with distance through Lake Rousseau (East = 0.049 mg/L, West = 0.061 mg/L, Dam = 0.077 mg/L) while orthophosphorus concentrations were variable (East = 0.050 mg/L, West = 0.027 mg/L, Dam = 0.036 mg/L).

Lower Withlacoochee River water quality data had an observed decrease in chlorophyll-a (5.5 mg/L), an increase in specific conductance (506 umhos/cm) and salinity (2.0 ppt), and little change in nutrients (TN = 0.66 mg/L, TP = 0.047 mg/L) over the period-of-record in comparison to Lake Rousseau. As freshwater from the Lower Withlacoochee River flows into the Withlacoochee Bay Estuary, lower nitrate concentrations (0.20 mg/L) and higher total

phosphorus concentrations (0.071 mg/L), specific conductance (18,900 umhos/cm), salinity (7.6 ppt), turbidity (7.5 NTU), and suspended solids (8.6 mg/L) were observed.

Figure 2-14 to Figure 2-17 provide water quality results from surface water samples collected by Frazer *et al.* (2001) along transects in the Lower Withlacoochee River below the Bypass Channel from August 1998 to January 2001. Nitrogen concentrations showed little change with distance downstream below the Inglis Bypass Channel until the river increased in salinity and mixed with waters in the Withlacoochee Bay Estuary where nitrate decreased and organic nitrogen increased (Figure 2-15).

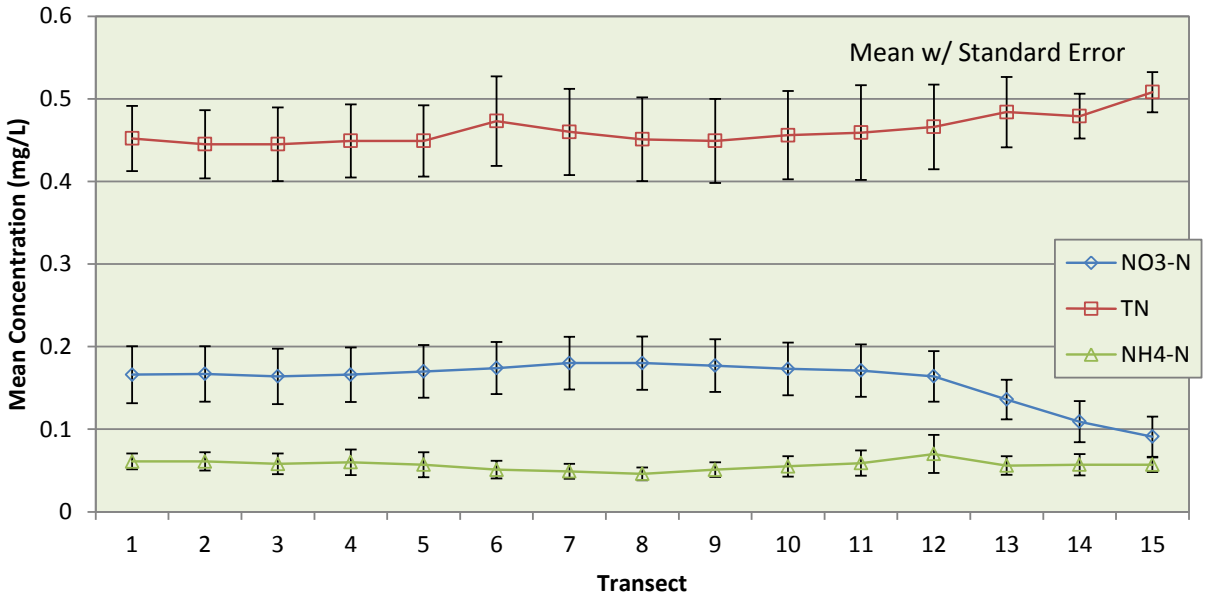


Figure 2-15. Nitrogen concentration (mg/L) measured along transects within the Withlacoochee River below the Inglis Bypass Channel (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

Total and soluble reactive phosphorus were generally consistent with distance below the Inglis Bypass Channel until the river increased in salinity and mixed with waters in the Withlacoochee Bay Estuary, where TP increased and SRP decreased (Figure 2-16).

Mean salinity was 0 ppt for the upper section of the Withlacoochee River below the Inglis Bypass Channel and increased sharply in the Withlacoochee River Estuary (Figure 2-17). Average chlorophyll concentrations were generally stable (4 ug/L) and increased as the river flowed through the marsh and into the estuary.

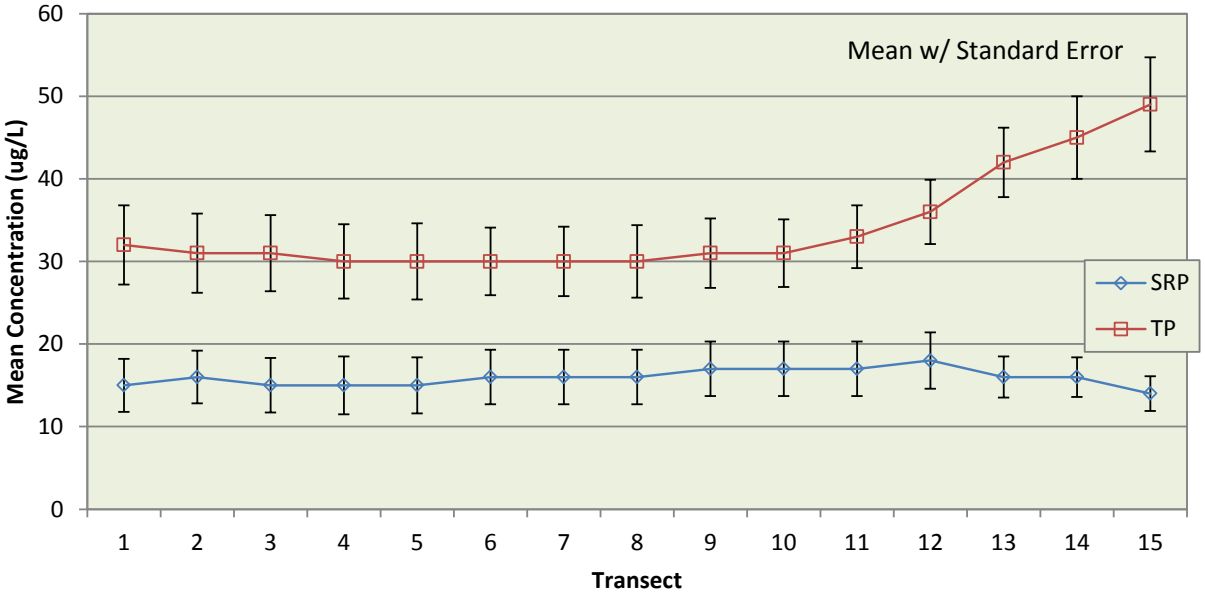


Figure 2-16. Phosphorus concentration (ug/L) measured along transects within the Withlacoochee River below the Inglis Bypass Channel (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

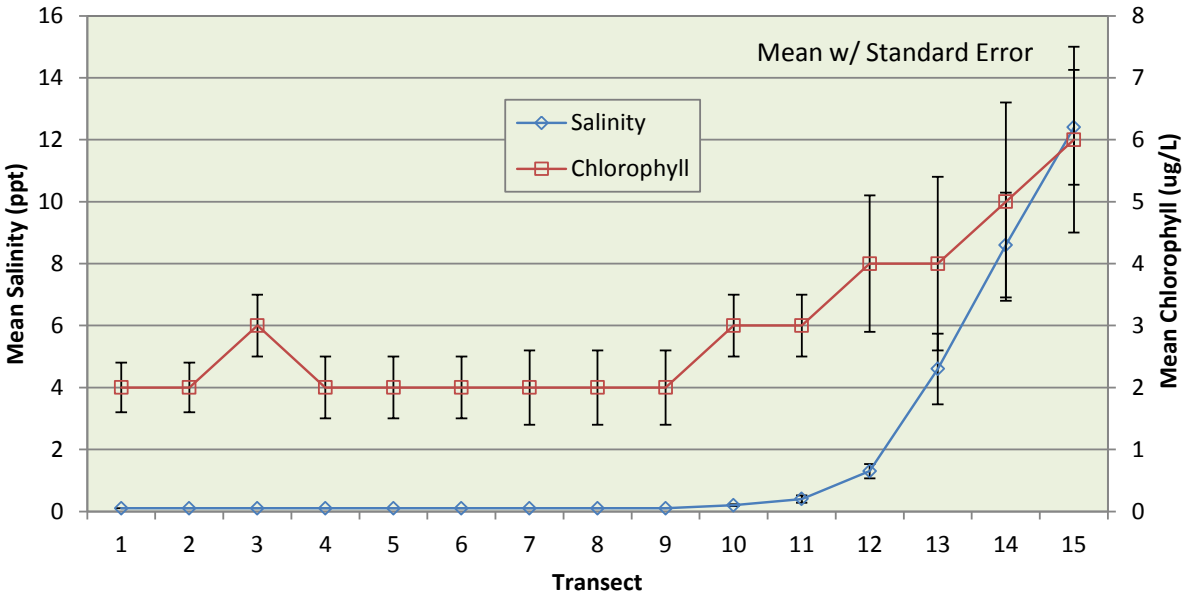


Figure 2-17. Salinity (ppt) and Chlorophyll concentrations (ug/L) measured along transects within the Withlacoochee River below the Inglis Bypass Channel (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

Table 2-5 and Figure 2-18 present results from a multi-parameter water quality data sonde deployed by WSI to collect measurements every 30 minutes in the Withlacoochee River

downstream of Lake Rousseau from 5/30/2013 to 6/19/2013. A distinct diurnal pattern of dissolved oxygen concentrations is evident due to a release of produced oxygen from submerged plants and algae during daylight hours and respiratory consumption of dissolved oxygen by all submerged organisms during night. Water temperature at this station averaged 28.6 °C and ranged from 26.1 to 31.1 °C. Dissolved oxygen concentrations were super-saturated (DO > 100%) approximately 96 percent of the time during this deployment period, averaging 108% (8.37 mg/L) with concentrations ranging from 118% (9.10 mg/L) to 91.7% (7.37 mg/L). The range in pH measurements were from 7.78 to 8.67 SU with an average of 8.27 SU. Conductivity was relatively stable with concentrations ranging from 198 to 220 uS/cm, averaging 207 uS/cm.

Table 2-5. Field parameter summary collected in the Withlacoochee River downstream of Lake Rousseau from 5/30/2013 to 6/19/2013.

Parameter	Average	Minimum	Maximum	Std Dev	Count
Temperature (C)	28.6	26.1	31.1	1.2	983
DO (mg/L)	8.37	7.37	9.10	0.32	943
DO (%)	108.0	91.7	118.5	4.4	943
pH (SU)	8.27	7.78	8.67	0.17	983
Sp Cond (uS/cm)	207.1	198.0	220.0	3.9	983

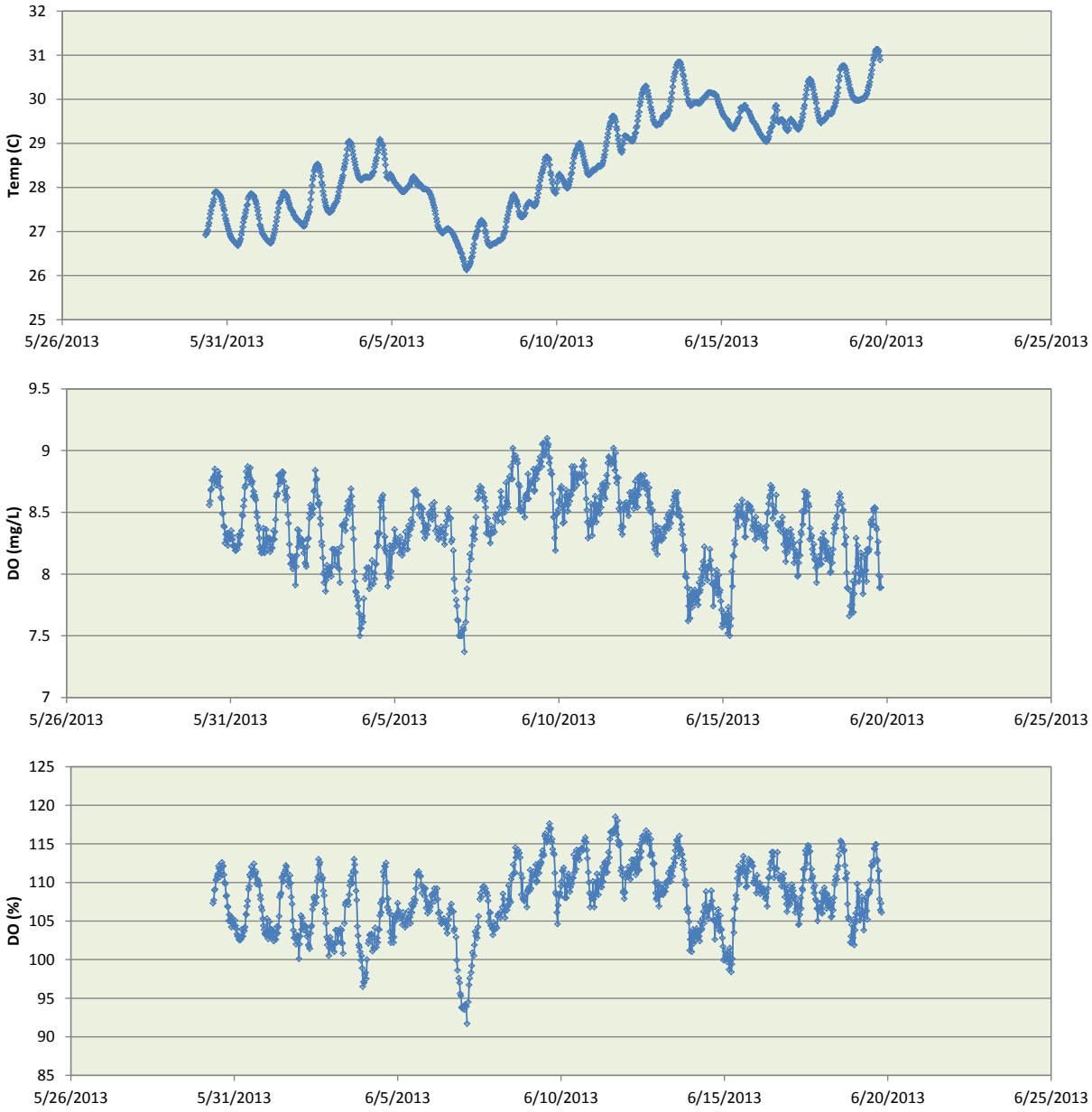


Figure 2-18. Field parameter measurements collected in the Withlacoochee River downstream of Lake Rousseau from 5/30/2013 to 6/19/2013.

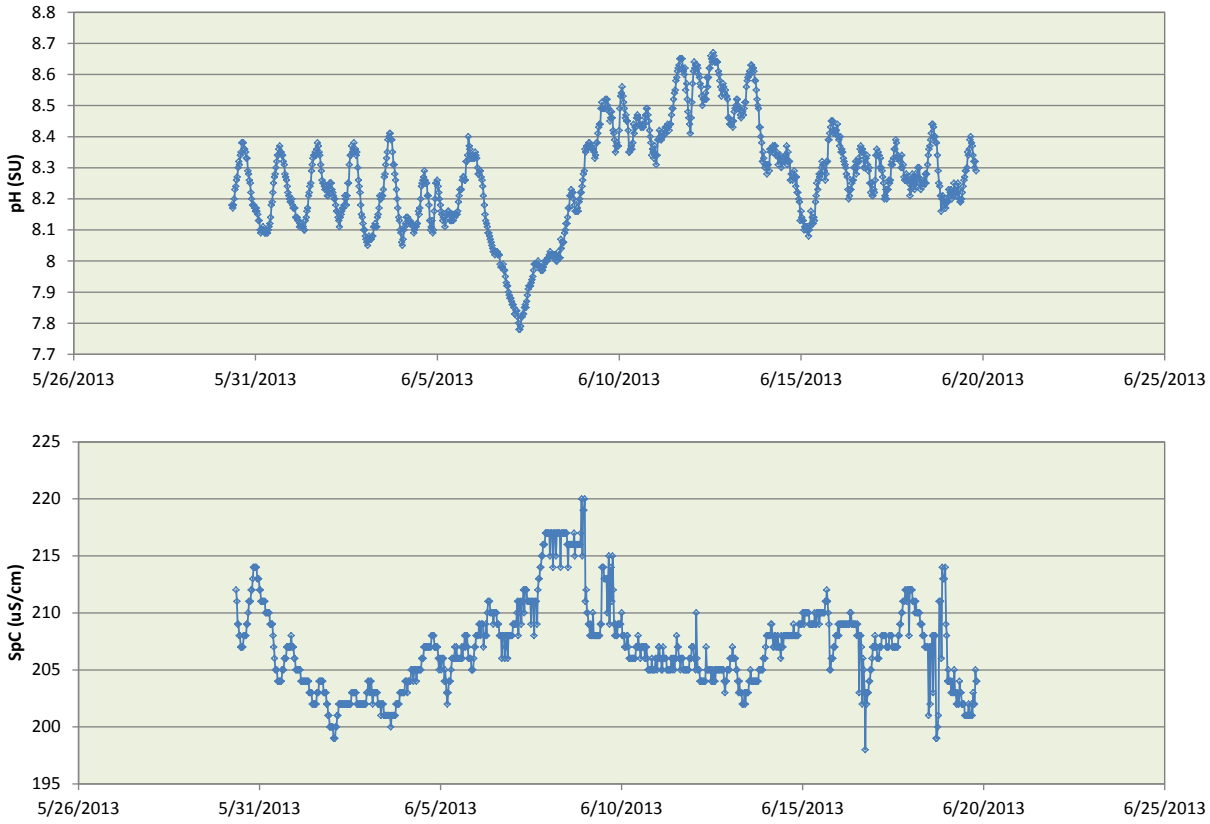


Figure 2-18. Field parameter measurements collected in the Withlacoochee River downstream of Lake Rousseau from 5/30/2013 to 6/19/2013.

2.2.3 Light Attenuation

Water column light attenuation is affected by water quality conditions such as turbidity or suspended solids and color (dissolved organic matter). These factors can also have a seasonal pattern in response to biological activity. Frazer *et al.* (2001) measured light attenuation in the Withlacoochee River below the Inglis Bypass Channel and found the highest attenuation in the upper transects (below Inglis Bypass Channel) and just below U.S. 19 (Figure 2-19). The remaining stations were relatively similar (1.0 – 1.1 m^{-1}).

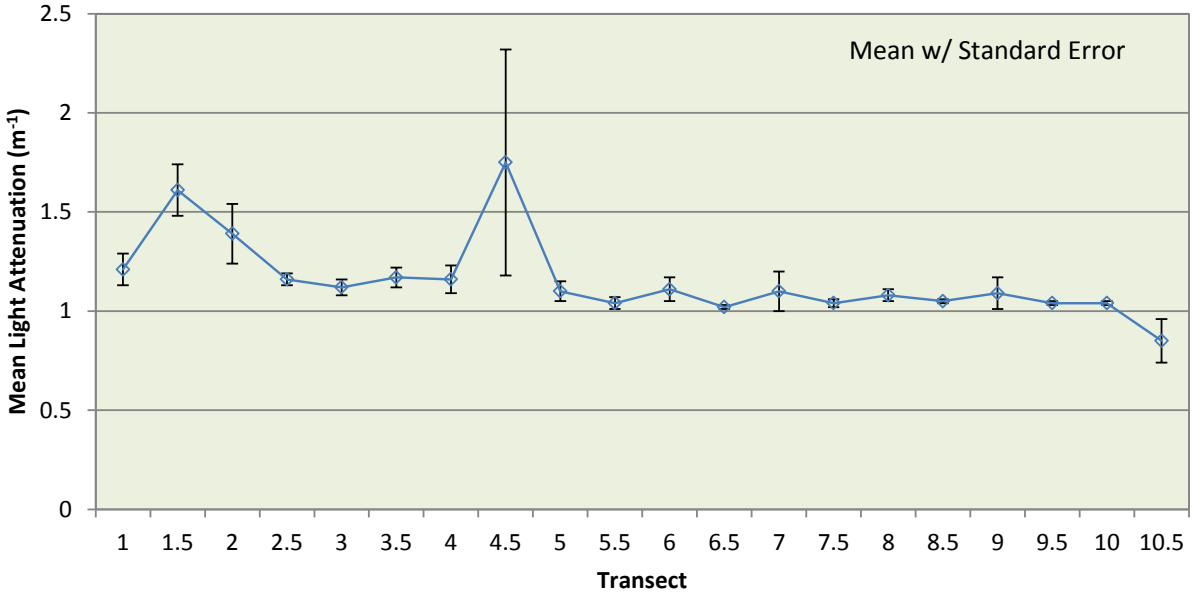


Figure 2-19. Mean light attenuation (m^{-1}) measured along transects within the Withlacoochee River below the Inglis Bypass Channel – August 1998 (Frazer, Hoyer, Notestein, Hale, & Canfield, Jr., 2001).

2.2.4 Biological

Very little submerged aquatic vegetation is currently present in the Lower Withlacoochee River below the Inglis Bypass Channel, although there are a number of anecdotal observations that submerged plants, including hydrilla, were abundant in the river at least as recently as the 1980s. Submerged aquatic plants listed in the river in the mid-1970s by Hartman (1974) included: hydrilla, milfoil, tapegrass, coontail, four varieties of pondweed, southern naiad, and widgeon grass. Floating aquatic plants that were listed included: water hyacinth, common salvinia, water lettuce, and duckweed (Hartman 1974).

By the late 1990s, Frazer *et al.* (2001) reported a lack of submerged aquatic plants in this river segment, and infrequent occurrences of filamentous algae growing attached to rocks. Frazer *et al.* (2001) concluded that the combination of limited light transmittance due to water depth (4m) and limited suitable substrate areas for plant colonization makes the presence of submerged aquatic plants in this reach uncommon. Shading by terrestrial canopy coverage was not considered a significant factor in limiting submerged aquatic plant growth for this area (Frazer *et al.* estimated seven percent coverage in 1998).

No submerged aquatic plants were observed in the Lower Withlacoochee River segment below the Inglis Spillway during field visits in 2013. However, fragmented macrophytes including hydrilla (*Hydrilla verticillata*), water lettuce (*Pistia stratiotes*), and water hyacinth (*Eichhornia crassipes*) were observed floating downstream in this river segment during 2013, presumably coming over the spillway from Lake Rousseau.

Lake Rousseau contains excessive aquatic weed growth, including hydrilla and water hyacinth, and periodically receives state-funded herbicide treatments for control. Aquatic plant management of water hyacinth on the Withlacoochee River was required as early as the 1920s. Historically, water hyacinths formed expansive mats on the Withlacoochee River and Lake Rousseau making navigation impossible (Florida Department of Environmental Protection, 2006). The Cooperative Aquatic Plant Control Program administered by FWC in Florida's public waters produces an annual summary of plants treated and funding necessary to manage aquatic plants in public waters in accordance with §369.22 (7), Florida Statutes. Herbicides and application rates typically used include Reward (0.375 gal/ac), Sunwet (0.25 gal/ac), and Accuracy (0.125 gal/ac). Figure 2-20 presents a summary of data since 2001 for areas treated under this program within Lake Rousseau by fiscal year and target species (Florida Fish and Wildlife Conservation Commission, 2013). Detailed data identifying the total treated area by individual water body was only available from 2001 through 2007, 2011 and 2012. A total of 6,752 acres were treated in Lake Rousseau over this period with hydrilla and floating plants (water hyacinth and water lettuce) being the most abundant (3,638 and 2,978 acres, respectively). The largest treated area occurred during fiscal year 2005-2006 with a total herbicide treatment area of 2,533 acres. This coincides with historic imagery of Lake Rousseau in May 2005 when the majority of the reservoir can be seen covered with aquatic vegetation presumed to be topped-out hydrilla (Appendix B). Appendix B includes a summary of historic aerial imagery of Lake Rousseau from 1944 (prior to the construction of the Cross-Florida Barge Canal) and from 1994 to 2011.

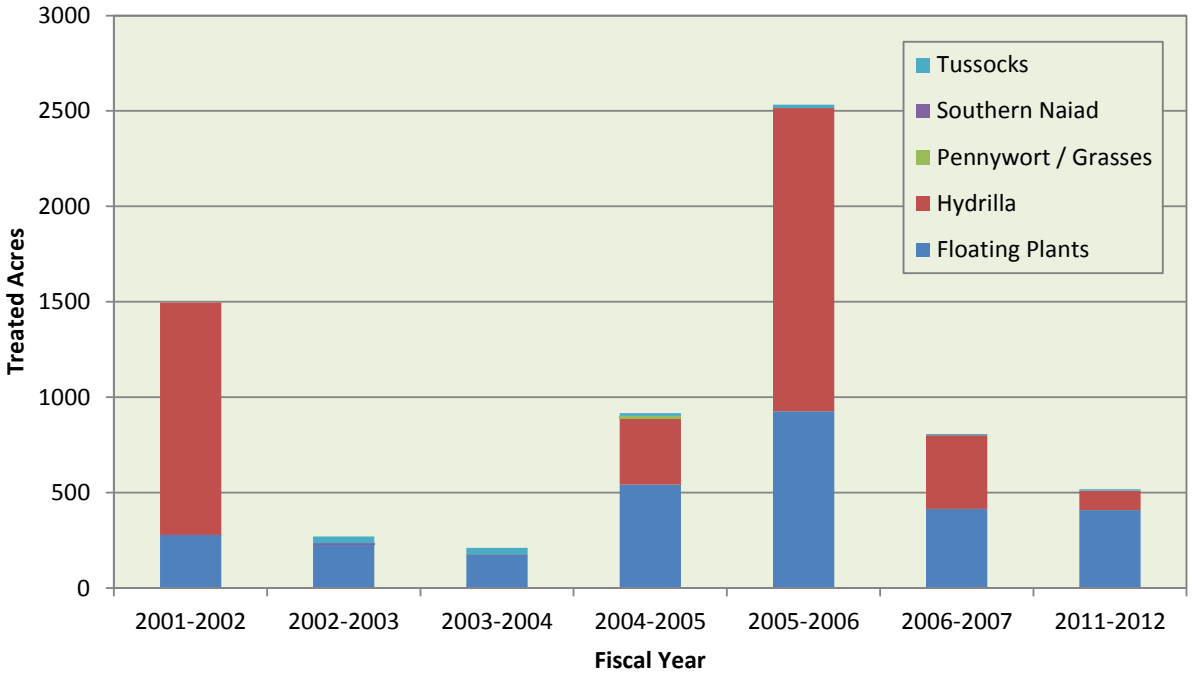


Figure 2-20. Aquatic plant treatment areas in Lake Rousseau by Fiscal Year under the FWC aquatic plant management program.

Section 3.0 Summary and Recommendations

This Phase 1 summary of existing environmental data from the Lower Withlacoochee River provides the following preliminary conclusions:

- The Lower Withlacoochee River has been significantly altered by human activities over the past 100+ years and very likely since the first colonization of the Gulf Coastal Plain by Europeans. Major impacts include historic timber extraction, dredging, ditching, phosphate mining, construction of dams and spillways, construction of the Cross-Florida Barge Canal, aquatic weed management, and agricultural, residential, and urban developments in the surface and groundwater basin that supplies water to the river.
- Specific impacts affecting the existing environment in the Lower Withlacoochee River noted during this study include the following:
    - Creation and maintenance of a dredged channel connecting the mouth of the lower river to the Gulf of Mexico
    - Construction of the Inglis Dam and lock in 1904
    - Alterations in water quality and the physical aquatic environment with the conversion of 5.7 miles of the historic river and floodplain wetlands to Lake Rousseau
    - Diversion of historic high flows from the lower river to the Cross Florida Barge Canal in December 1969
    - Significant long-term (1960s to present) flow reduction in all portions of the system on the order of 40 to 60%
    - Increasing concentrations of nitrate nitrogen, a plant-growth nutrient, entering the Rainbow River from groundwater sources and traveling downstream to the lower river
    - Proliferation of native and non-native aquatic plants in the Rainbow River and Lake Rousseau, leading to state-funded eradication efforts, and
    - Releases of dead plant matter, herbicides, and high densities of microscopic planktonic algae to Lake Rousseau and the lower river, with creation eutrophic conditions, and wide swings in concentrations of dissolved oxygen and pH.
    - Apparent eradication of submerged aquatic vegetation with associated declines in fish, manatees, and other wildlife

Studies by Frazer *et al.* (2001) from the University of Florida indicate that there was little to no submerged aquatic vegetation in the Lower Withlacoochee River for at least the past 15 years, if not longer. However, there is a paucity of biological data from the lower river. No algal, macroinvertebrate, fish, reptile/amphibian, bird, or mammal population data were located for this analysis. This data gap, both past and present, makes development of conclusions concerning causation of current conditions highly speculative.

Two additional Phases of study/synthesis are recommended to guide some measure of restoration of the Lower Withlacoochee River. These include Phase 2 to conduct a comprehensive baseline evaluation of existing conditions and Phase 3 to develop a plan for specific restoration needs, costs, and responsible entities. These activities are only recommended for a limited area, namely the 10 miles (16 km) of the lower river from the Inglis Spillway to the outlet of the river.

Phase 2 should include collection of synoptic data over a one to three-year period to better characterize the existing environmental resources in Lower Withlacoochee River. Recommended study components include the following:

- Physical Setting
    - Land use of the surface watershed (including waterfront houses and septic systems)
    - Water balance (inflows and outflows of surface and ground water)
    - River bathymetry
    - Flow regime (velocity profiles)
    - Sediment sampling (5 stations) for grain size, organic content, and occurrence of trace metals and organics
- Water Quality (5 stations)
    - Light transmittance (secchi depth and underwater photometer)
    - Field parameters vertical profiles and continuous (temperature, pH, dissolve oxygen, specific conductance)
    - General analytical monthly surface, mid-depth, and bottom (chloride, salinity, sulfate, iron, chlorophyll a, nitrate-nitrite, total ammonia, and organic nitrogen, ortho-phosphorus, total phosphorus, fecal coliforms, total coliforms)
- Biological (5 transects)
    - Algal taxonomy and biovolume
    - Benthic macroinvertebrates (Ponar dredge)
    - Fish (species and biomass)
    - Other fauna (herptiles, birds, mammals)
- Human Use
    - Creel/fishing survey
    - Boating survey

Phase 3 of the Lower Withlacoochee Environmental Study would result in the development of a restoration plan based on the results and findings of Phases 1 and 2, and on community input. This restoration plan should include specific actions and projects needed to achieve a realistic level of restoration.

It is recommended that W.A.R. lobby the Florida Department of Environmental Protection, Southwest Florida Water Management District, and Citrus and Marion counties to assist with funding for the Phase 2 and Phase 3 studies.

Section 4.0 References

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Appendix A

Water Quality Summary

Appendix A-1. Water Quality Stations within the Lower Withlacoochee River

STATION ID	STATION NAME	SOURCE	ORG ID	STN TYPE	LATITUDE	LONGITUDE
Withlacoochee River (Between Hwy 200 and Rainbow River Confluence)						
3513	WITHLACOOCHEE RIVER AT STOKES FERRY	FL STORET	21FLGW	River/Stream	28.988548	-82.349844
17945	SWA-LR-1002 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.001891	-82.371286
17956	SWA-LR-1017 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.044301	-82.458168
22927	WITHLACOOCHEE RIVER NR HOLDER	SWFWMD	---	River/Stream	28.988800	-82.349600
22927	WITHLACOOCHEE RIVER NR HOLDER	FL STORET	21FLSWFD	River/Stream	28.988547	-82.349845
32789	SW4-LR-2012 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.039151	-82.449663
32795	SW4-LR-2021 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.018141	-82.419640
32805	SW4-LR-2037 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.017215	-82.397728
32812	SW4-LR-2049 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.001893	-82.370966
37002	Z4-LR-3017 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.029614	-82.436741
37007	Z4-LR-3033 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.014741	-82.395473
37943	Z4-LR-3017R WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.029443	-82.436672
37948	Z4-LR-3033R WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.014701	-82.395481
40208	Z4-LR-5016 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.040456	-82.454316
40769	Z4-LR-5016R WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.040259	-82.454065
42216	Z4-LR-6005 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.035673	-82.442770
110350	WITHLACOOCHEE R SR 200 E HOLDER	STORET Legacy	1113S050	River/Stream	28.983333	-82.350000
2313000	WITHLACOOCHEE RIVER NEAR HOLDER, FL	USGS	---	River/Stream	28.988868	-82.349541
2313090	WITHLACOOCHEE RI AB BLUE RUN NR DUNNELLON FLA.	USGS	---	River/Stream	29.042754	-82.457322
23010465	WITHLACOOCHEE R.BASIN	STORET Legacy	21FLA	River/Stream	28.989139	-82.350389
28592788221124	TP319-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	28.991056	-82.353445
29000218222013	TP318-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.000583	-82.367028
285918489220591	TP320-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	28.988445	-82.349750
CIT506LR	WITHLACOOCHEE RIVER NEAR 4949 SPRUCE DRIVE (WBID 1329C)	FL STORET	21FLWQSP	River/Stream	28.990501	-82.351781
CIT-WI-SPRINGS	CITRUS-WITHLACOOCHEE RIVER-CITRUS SPRINGS-1	FL STORET	21FLKWAT	River/Stream	29.029833	-82.443000
FLO0090	WITHLACOOCHEE RV. @ STOKES FERRY	STORET Legacy	21FLSWFD	River/Stream	28.991667	-82.354722
FLO0090	WITHLACOOCHEE RV. @ STOKES FERRY	STORET Legacy	21FLGW	River/Stream	28.988333	-82.348889
Withlacoochee River (Between Rainbow River Confluence and Lake Rousseau)						
23414	WITHLACOOCHEE RIVER @ HWY 41	FL STORET	21FLSWFD	River/Stream	29.045658	-82.464749
23414	WITHLACOOCHEE AT HWY 41	SWFWMD	---	River/Stream	29.045700	-82.464800
32802	SW4-LR-2033 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.047180	-82.458635
110285	WITHLACOOCHEE R HWY 41 DUNNELLON	STORET Legacy	1113S050	River/Stream	29.050000	-82.450000
2313200	WITHLACOOCHEE RIVER AT DUNNELLON, FL	USGS	---	River/Stream	29.046087	-82.464544
23010404	WITHLACOOCHEE R. BASIN	STORET Legacy	21FLA	River/Stream	29.049639	-82.448194
3CFB10014	WITHLACOOCHEE RIVER AT SR 41	STORET Legacy	11COEJAX	River/Stream	29.045556	-82.465000
MAR-WI-UNNELLON	MARION-WITHLACOOCHEE RIVER-DUNNELLON-1	FL STORET	21FLKWAT	River/Stream	29.046500	-82.464833
Lake Rousseau (East)						
32800	SW4-LR-2030 WITHLACOOCHEE RIVER	FL STORET	21FLGW	Lake	29.051227	-82.483519
33463	SW4-LL-2019 LAKE ROUSSEAU	FL STORET	21FLGW	Lake	29.040749	-82.524704
33471	SW4-LL-2052 LAKE ROUSSEAU	FL STORET	21FLGW	Lake	29.043854	-82.506839
110225	INGLIS RESERVOIR 7.5M S DUNELLON	STORET Legacy	1113S050	Lake	29.050000	-82.466667
110275	INGLIS RESERVOIR 0.7 MI S DNLLON	STORET Legacy	1113S050	Lake	29.050000	-82.466667
23010435	LAKE ROUSSEAU OFF N BEARLE TERRACE	STORET Legacy	21FLA	Lake	29.041667	-82.518667
29022978231064	TP240-LAKE ROUSSEAU	FL STORET	21FLTPA	Lake	29.041583	-82.518445
CIT-ROUSSEAE-1	CITRUS-ROUSSEAU EAST-1	FL STORET	21FLKWAT	Lake	29.049050	-82.473250
CIT-ROUSSEAE-2	CITRUS-ROUSSEAU EAST-2	FL STORET	21FLKWAT	Lake	29.041617	-82.503200
CIT-ROUSSEAE-3	CITRUS-ROUSSEAU EAST-3	FL STORET	21FLKWAT	Lake	29.041550	-82.531717
MAR-E RIVER-1-1	MARION-WITHLACOOCHEE RIVER-1-1	FL STORET	21FLKWAT	Lake	29.051056	-82.476306
MAR-E RIVER-2-1	MARION-WITHLACOOCHEE RIVER-2-1	FL STORET	21FLKWAT	Lake	29.052528	-82.478611
MAR-E RIVER-3-1	MARION-WITHLACOOCHEE RIVER-3-1	FL STORET	21FLKWAT	Lake	29.051750	-82.483056
Lake Rousseau (West)						
22952	LAKE ROUSSEAU 4	SWFWMD	---	Lake	29.014400	-82.635400
22962	LAKE ROUSSEAU 3	SWFWMD	---	Lake	29.025800	-82.660600
22973	LAKE ROUSSEAU 2	SWFWMD	---	Lake	29.038100	-82.564700
22985	LAKE ROUSSEAU	FL STORET	21FLSWFD	Lake	29.033333	-82.555833
22985	LAKE ROUSSEAU 1	SWFWMD	---	Lake	29.033300	-82.555800
33464	SW4-LL-2022 LAKE ROUSSEAU	FL STORET	21FLGW	Lake	29.034287	-82.588623
33474	SW4-LL-2059 LAKE ROUSSEAU	FL STORET	21FLGW	Lake	29.031050	-82.579902
33476	SW4-LL-2065 LAKE ROUSSEAU	FL STORET	21FLGW	Lake	29.032598	-82.557943
33482	SW4-LL-2080 LAKE ROUSSEAU	FL STORET	21FLGW	Lake	29.013989	-82.601369
33484	SW4-LL-2085 LAKE ROUSSEAU	FL STORET	21FLGW	Lake	29.034813	-82.564778
758327	LAKE ROUSSEAU SOUTH-CENTRAL	SWFWMD	---	Lake	29.021200	-82.579100
758327	LAKE ROUSSEAU SOUTH-CENTRAL	FL STORET	21FLSWFD	Lake	29.021194	-82.579083
23010434	LAKE ROUSSEAU OFF N PEELER POINT	STORET Legacy	21FLA	Lake	29.025333	-82.588333
29004758235572	TP238-LAKE ROUSSEAU	FL STORET	21FLTPA	Lake	29.013194	-82.599222

Appendix A-1. Water Quality Stations within the Lower Withlacoochee River

STATION ID	STATION NAME	SOURCE	ORG ID	STN TYPE	LATITUDE	LONGITUDE
Lake Rousseau (West)						
29020848233558	TP239-LAKE ROUSSEAU	FL STORET	21FLTPA	Lake	29.035667	-82.565500
CIT-ROUSSEAU-1	CITRUS-ROUSSEAU-1	FL STORET	21FLKWAT	Lake	29.043611	-82.539945
CIT-ROUSSEAU-2	CITRUS-ROUSSEAU-2	FL STORET	21FLKWAT	Lake	29.043028	-82.541833
CIT-ROUSSEAU-3	CITRUS-ROUSSEAU-3	FL STORET	21FLKWAT	Lake	29.042722	-82.544667
STA0084	LAKE ROUSSEAU	STORET Legacy	21FLGW	Lake	29.033333	-82.555833
STA0084	LAKE ROUSSEAU	STORET Legacy	21FLSWFD	Lake	29.033333	-82.555833
STA0085	LAKE ROUSSEAU	STORET Legacy	21FLGW	Lake	29.038056	-82.564722
STA0085	LAKE ROUSSEAU	STORET Legacy	21FLSWFD	Lake	29.038056	-82.564722
Lake Rousseau - Bypass Channel						
2313250	WITHLACOOCHEE R BYPASS CHANNEL NR INGLIS FLA	USGS	---	River/Stream	29.021085	-82.637882
2313251	WITHLACOOCHEE R BYPASS CH BEL STR NR INGLIS, FLA	USGS	---	River/Stream	29.021085	-82.638715
3CFB10013	BYPASS CANAL AT INGLES LOCK	STORET Legacy	11COEJAX	River/Stream	29.023056	-82.646389
Lake Rousseau - Inglis Dam						
22954	INGLIS DAM UPSTREAM (LAKE ROUSSEAU)	SWFWMD	---	Lake	29.007600	-82.615600
22954	INGLIS DAM UPSTREAM (LAKE ROUSSEAU)	FL STORET	21FLSWFD	Lake	29.007611	-82.615583
110210	WITHLACOOCHEE R AT INGLIS DAM	STORET Legacy	1113S050	Lake	29.033333	-82.666667
2313229	LAKE ROUSSEAU NR DUNNELLON, FLA.	USGS	---	Lake	29.010253	-82.616492
2313231	WITHLACOOCHEE R BL INGLIS DAM NR DUNNELLON, FLA.	USGS	---	Lake	29.009975	-82.616770
23010032	WITHLACOOCHEE R AT TOP SDE OF DA	STORET Legacy	21FLA	Lake	29.013333	-82.611667
3CFB10012	LAKE ROUSEAU ABOVE DAM	STORET Legacy	11COEJAX	Lake	29.010000	-82.616667
Lake Rousseau - Inglis Lock						
2313237	BARGE CANAL AT INGLIS LOCK NR INGLIS, FLA.	USGS	---	Lake	29.025252	-82.616492
Withlacoochee River (Between Lake Rousseau Inglis Dam and Cross Florida Barge Canal)						
29003728237070	TP254-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.010333	-82.618611
29004518237180	TP253-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.012528	-82.621667
29004958237352	TP252-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.013750	-82.626445
29005858237498	TP251-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.016250	-82.630500
29010308238033	TP250-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.017500	-82.634250
Cross Florida Barge Canal						
23434	CROSS-FLORIDA BARGE CANAL	SWFWMD	---	Canal	29.013500	-82.661500
Withlacoochee River (Lower)						
22965	WITHLACOOCHEE RIVER AB BAY	SWFWMD	---	River/Stream	29.014700	-82.727200
23409	WITHLACOOCHEE CITRUS 2	SWFWMD	---	River/Stream	29.025000	-82.721700
23409	WITHLACOOCHEE-2	FL STORET	21FLPCSW	River/Stream	29.025000	-82.721667
23410	WITHLACOOCHEE CITRUS 3	SWFWMD	---	River/Stream	29.025000	-82.675000
23410	WITHLACOOCHEE-3	FL STORET	21FLPCSW	River/Stream	29.025000	-82.675000
23411	WITHLACOOCHEE RIVER AT YANKEETOWN WQ	SWFWMD	---	River/Stream	29.025300	-82.669200
23411	WITHLACOOCHEE RIVER @ YANKEETOWN	FL STORET	21FLSWFD	River/Stream	29.025148	-82.669062
32784	SW4-LR-2004 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.030847	-82.705055
32787	SW4-LR-2008 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.021587	-82.649922
32796	SW4-LR-2023 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.028439	-82.715395
32806	SW4-LR-2039 WITHLACOOCHEE RIVER	FL STORET	21FLGW	River/Stream	29.027480	-82.675439
110175	WITHLACOOCHEE R HWY 19 INGLIS	STORET Legacy	1113S050	River/Stream	29.033333	-82.666667
110200	WITHLACOOCHEE R BELOW INGLIS DAM	STORET Legacy	1113S050	River/Stream	29.016667	-82.666667
2313265	WITHLACOOCHEE RIVER AT CRACKERTOWN, FLA.	USGS	---	River/Stream	29.030529	-82.677883
23010405	WITHLACOOCHEE R.BASIN	STORET Legacy	21FLA	River/Stream	29.026083	-82.669028
29012558239447	TP333-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.023750	-82.662417
29014508240340	TP335-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.029167	-82.676111
29015068240504	TP334-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	River/Stream	29.030722	-82.680667
CIT-WI-RIVER-1	CITRUS-WITHLACOOCHEE RIVER-1-1	FL STORET	21FLKWAT	River/Stream	29.021667	-82.646375
CIT-WI-RIVER-2	CITRUS-WITHLACOOCHEE RIVER-2-2	FL STORET	21FLKWAT	River/Stream	29.024167	-82.662217
CIT-WI-RIVER-3	CITRUS-WITHLACOOCHEE RIVER-3-3	FL STORET	21FLKWAT	River/Stream	29.033050	-82.693617
CIT-WI-RIVER-4	CITRUS-WITHLACOOCHEE RIVER-4-4	FL STORET	21FLKWAT	River/Stream	29.031117	-82.712783
CIT-WI-RIVER-5	CITRUS-WITHLACOOCHEE RIVER-5-5	FL STORET	21FLKWAT	River/Stream	29.016950	-82.726950
FLO0092	WITHLACOOCHEE RIVER @ YANKEETOWN	STORET Legacy	21FLSWFD	River/Stream	29.025278	-82.669167
FLO0092	WITHLACOOCHEE RIVER @ YANKEETOWN@ HWY	STORET Legacy	21FLGW	River/Stream	29.025278	-82.669167
WITH-1	WITHLACOOCHEE RIVER-1; UP FROM DREDGED CANAL	STORET Legacy	21FLSWFD	River/Stream	29.018333	-82.726111
WITH-2	WITHLACOOCHEE RIVER-2; UP FROM BENNETS CREEK	STORET Legacy	21FLSWFD	River/Stream	29.014444	-82.728611
WITHLACOOCH1A	WITHLACOOCH 1A CITRUS CO	STORET Legacy	21FLKWAT	River/Stream	29.021667	-82.646389
WITHLACOOCH1B	WITHLACOOCH 1B CITRUS CO	STORET Legacy	21FLKWAT	River/Stream	29.024167	-82.662222
WITHLACOOCH1C	WITHLACOOCH 1C CITRUS CO	STORET Legacy	21FLKWAT	River/Stream	29.031111	-82.712778
WITHLACOOCH1D	WITHLACOOCH 1D CITRUS CO	STORET Legacy	21FLKWAT	River/Stream	29.033056	-82.693611
WITHLACOOCHR1	WITHLACOOCH_R1_CITRUS_CO	STORET Legacy	21FLKWAT	River/Stream	29.016944	-82.726944

Appendix A-1. Water Quality Stations within the Lower Withlacoochee River

STATION ID	STATION NAME	SOURCE	ORG ID	STN TYPE	LATITUDE	LONGITUDE
Estuary						
22971	WITHLACOOCHEE LEVY 6	SWFWMD	---	Estuary	29.008300	-82.758300
2313272	WITHLACOOCHEE R AT CHAMBERS IS NEAR YANKEETOWN FL	USGS	---	Estuary	29.001109	-82.765788
2313274	WITHLACOOCHEE R AT BUNGALOW PASS AT PORT INGLIS FL	USGS	---	Estuary	28.994696	-82.758996
28595468245153	TP330-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	Estuary	28.998500	-82.754250
29000318245439	TP329A-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	Estuary	29.000861	-82.762195
29000958245117	TP331-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	Estuary	29.002639	-82.753250
29001798244531	TP332-WITHLACOOCHEE RIVER	FL STORET	21FLTPA	Estuary	29.004972	-82.748083
34010SEAS	WITHLACOOCHEE RIVER AT BENNETS CREEK	STORET Legacy	21FLA	Estuary	29.016667	-82.733333
34020SEAS	WITHLACOOCHEE RIVER CM# 43	STORET Legacy	21FLA	Estuary	29.005000	-82.748333
34040SEAS	WITHLACOOCHEE RIVER CM# 38	STORET Legacy	21FLA	Estuary	29.000000	-82.768333
34SEAS010	WITHLACOOCHEE RIVER AT BENNETS CREEK	FL STORET	21FLSEAS	Estuary	29.005333	-82.748333
34SEAS020	WITHLACOOCHEE RIVER CM# 43	FL STORET	21FLWQA	Estuary	29.001333	-82.756166
34SEAS020	WITHLACOOCHEE RIVER CM# 43	FL STORET	21FLSEAS	Estuary	29.001333	-82.756167
WAC200127	WACCASASSA - WITHLACOOCHEE BAY	FL STORET	21FLFMRI	Estuary	29.000000	-82.760000
WITH-3	WITHLACOOCHEE RIVER-3;B	STORET Legacy	21FLSWFD	Estuary	29.012500	-82.739444
WITH-4	WITHLACOOCHEE RIVER-4; AT PATS ELBOW	STORET Legacy	21FLSWFD	Estuary	29.007778	-82.741667
WITH-5	WITHLACOOCHEE RIVER-5; AT MARKER 43	STORET Legacy	21FLSWFD	Estuary	29.005278	-82.747778
WITH-6	WITHLACOOCHEE RIVER-6; AT MARKER 40A	STORET Legacy	21FLSWFD	Estuary	29.001389	-82.757778
WITH-7	WITHLACOOCHEE RIVER-7; BOAT RAMP AT MOUTH	STORET Legacy	21FLSWFD	Estuary	29.000833	-82.762222

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
BACTERIOLOGICAL	EColi	#/100ml	River (Hwy200 - RR)	21.4	86.0	2.00	20.3	38	0	1/4/2000	6/5/2001
	Enterococci	#/100ml	River (Hwy200 - RR)	207	5,300	1.00	705	240	1	1/4/2000	2/6/2013
			River (RR - LR)	1,500	1,500	1,500	---	1	0	7/25/2007	7/25/2007
			Lake (East)	15.0	33.0	5.00	15.6	3	0	5/17/2007	11/27/2007
			Lake (West)	3.60	8.00	1.00	2.88	5	1	11/13/2007	12/10/2007
			River (Lower)	226	480	4.00	223	4	0	5/15/2007	7/24/2007
	FC	#/100ml	River (Hwy200 - RR)	56.1	1,300	0.00	110	335	1	10/10/1974	2/6/2013
			River (RR - LR)	57.5	138	12.0	34.7	11	0	2/23/1993	7/25/2007
			Lake (East)	17.5	50.0	5.00	13.3	11	0	3/2/2004	8/4/2009
			Lake (West)	54.6	2,000	0.00	250	64	13	12/15/1992	10/6/2009
			River (Bypass Channel)	29.6	140	0.00	48.6	12	0	1/20/1975	12/10/1975
			Lake (Inglis Dam)	11.3	50.0	0.00	13.5	12	0	1/21/1975	12/10/1975
			Lake (Inglis Lock)	10.0	60.0	0.00	18.5	12	0	1/20/1975	12/10/1975
			River (LR-CFBC)	13.3	60.0	1.00	13.2	23	0	3/2/2004	12/6/2004
			River (Lower)	27.2	270	0.00	49.5	51	4	12/15/1992	7/24/2007
			Estuary	89.3	1,600	1.00	130	398	2	11/16/1983	11/15/2012
	TC	#/100ml	River (Hwy200 - RR)	512	17,000	0.00	1,545	179	0	5/16/1969	10/11/2004
			River (RR - LR)	414	1,300	40.0	346	20	0	4/3/1967	4/12/1995
			Lake (East)	128	250	60.0	87.3	4	0	3/2/2004	10/5/2004
			Lake (West)	305	2,500	1.00	561	38	0	9/27/1995	10/5/2004
			River (Bypass Channel)	160	1,000	10.0	205	25	0	5/20/1970	5/24/1977
			Lake (Inglis Dam)	539	6,600	0.00	1,376	26	0	5/20/1970	5/20/1977
			Lake (Inglis Lock)	218	750	0.00	204	25	0	5/20/1970	5/24/1977
			River (LR-CFBC)	80.3	270	1.00	80.0	23	0	3/2/2004	12/6/2004
			River (Lower)	224	1,340	20.0	255	51	0	4/3/1967	10/18/2004
			Estuary	412	1,200	20.0	314	17	0	3/9/2004	10/18/2004
BIOLOGICAL	Chl-a corr	µg/L	River (Hwy200 - RR)	2.63	57.0	0.275	5.71	190	91	11/2/1999	2/6/2013
			River (RR - LR)	2.54	18.0	0.500	2.80	150	19	12/9/2002	4/3/2012
			Lake (East)	1.52	2.90	0.425	0.840	11	4	3/2/2004	8/4/2009
			Lake (West)	12.6	175	0.340	24.2	59	6	6/27/1995	10/12/2010
			Lake (Inglis Dam)	34.5	47.4	21.5	18.3	2	0	6/1/2010	10/12/2010
			River (LR-CFBC)	1.63	10.0	0.425	2.12	23	14	3/2/2004	12/6/2004
			River (Lower)	5.46	33.0	0.425	6.28	309	49	12/9/2002	4/3/2012
			Canal	11.1	46.8	0.500	12.8	40	2	12/9/2002	4/3/2006
			Estuary	4.73	22.9	0.425	4.84	57	15	7/31/2001	1/10/2013
	Chl-b	µg/L	River (RR - LR)	0.544	1.90	0.500	0.204	78	74	12/9/2002	4/3/2006
			Lake (West)	0.677	3.35	0.015	0.680	34	24	6/27/1995	9/29/1998
			River (Lower)	0.553	1.52	0.500	0.190	76	70	12/9/2002	2/6/2006
			Canal	0.584	1.80	0.500	0.267	39	35	12/9/2002	4/3/2006
	Chl-c corr	µg/L	River (RR - LR)	0.556	1.90	0.500	0.225	75	70	12/9/2002	1/10/2006
			Lake (West)	1.28	4.69	0.050	1.26	34	17	6/27/1995	9/29/1998
			River (Lower)	0.554	1.52	0.500	0.191	75	69	12/9/2002	4/3/2006
			Canal	1.56	7.10	0.500	1.67	38	21	12/9/2002	2/6/2006
	Chl-T	µg/L	River (Hwy200 - RR)	1.60	24.0	0.425	3.47	71	54	11/2/1999	5/4/2010
			River (RR - LR)	2.27	12.5	0.500	2.11	115	16	12/9/2002	2/4/2013
			Lake (West)	12.4	132	0.030	21.3	46	8	12/15/1992	10/12/2010
			Lake (Inglis Dam)	34.5	47.4	21.5	18.3	2	0	6/1/2010	10/12/2010
			River (Lower)	3.61	31.5	0.400	3.88	308	33	6/16/1993	2/4/2013
			Canal	14.4	234	0.500	24.0	114	7	12/9/2002	2/4/2013
			Estuary	7.43	39.1	0.600	6.54	96	0	11/19/1996	12/17/2004
	Pheo-a	µg/L	River (Hwy200 - RR)	0.736	6.40	0.00	0.742	257	167	11/2/1999	2/6/2013
			River (RR - LR)	1.84	8.20	0.500	1.06	227	34	12/9/2002	2/4/2013
			Lake (East)	0.710	1.10	0.00	0.288	11	4	3/2/2004	8/4/2009
			Lake (West)	3.99	62.6	0.00	7.81	73	12	12/15/1992	10/12/2010
			Lake (Inglis Dam)	6.52	8.17	4.87	1.91	4	0	6/1/2010	10/12/2010
			River (LR-CFBC)	0.420	0.950	0.00	0.336	23	14	3/2/2004	12/6/2004
			River (Lower)	3.98	15.4	0.120	3.01	245	28	6/16/1993	2/4/2013
			Canal	4.19	54.3	0.500	5.44	114	12	12/9/2002	2/4/2013
			Estuary	0.580	2.20	0.00	0.429	20	16	3/9/2004	1/10/2013

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
DISSOLVED OXYGEN	DO	%	River (Hwy200 - RR)	64.0	97.6	5.90	19.5	177	0	5/17/1965	12/18/2012
			River (RR - LR)	73.5	105	37.0	14.5	91	0	4/3/1967	10/18/2010
			Lake (East)	74.7	133	5.40	18.7	38	0	4/3/1967	8/4/2009
			Lake (West)	75.6	159	2.44	37.1	63	0	12/15/1992	10/6/2009
			River (Bypass Channel)	75.9	120	25.4	21.6	79	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	77.6	125	7.00	25.5	108	0	4/3/1967	9/25/1990
			Lake (Inglis Lock)	49.8	96.0	11.0	24.4	25	0	5/20/1970	5/24/1977
			River (LR-CFBC)	70.7	107	20.3	26.6	28	0	3/2/2004	12/6/2004
			River (Lower)	92.0	111	60.7	12.5	116	0	4/3/1967	10/18/2004
			Estuary	86.8	146	21.5	16.7	560	0	1/5/1984	10/18/2004
	DO	mg/L	River (Hwy200 - RR)	5.87	14.2	0.200	2.30	751	0	5/17/1965	2/6/2013
			River (RR - LR)	6.19	13.2	0.900	1.43	770	0	4/3/1967	4/2/2013
			Lake (East)	6.32	10.8	0.440	1.70	44	0	4/3/1967	8/4/2009
			Lake (West)	6.99	14.2	0.200	3.17	141	0	12/15/1992	10/12/2010
			River (Bypass Channel)	6.44	11.4	2.06	1.89	91	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	6.80	10.6	1.60	2.07	181	0	4/3/1967	10/12/2010
			Lake (Inglis Lock)	4.11	8.40	0.900	1.89	31	0	5/20/1970	5/24/1977
			River (LR-CFBC)	6.18	10.5	1.67	2.78	28	0	3/2/2004	12/6/2004
			River (Lower)	7.85	16.5	2.60	1.70	1,189	0	4/3/1967	4/2/2013
			Canal	5.52	13.8	0.090	2.60	252	0	12/9/2002	4/2/2013
			Estuary	7.41	12.4	1.70	1.85	1,384	0	11/16/1983	11/15/2012
GENERAL INORGANIC	Alk	mg/L as CaCO3	River (Hwy200 - RR)	104	151	25.0	21.8	382	0	1/1/1950	5/4/2010
			River (RR - LR)	110	268	7.50	23.9	169	0	5/31/1966	2/4/2013
			Lake (West)	104	139	58.6	14.9	46	0	12/15/1992	10/12/2010
			River (Bypass Channel)	97.1	121	66.0	14.1	22	0	9/23/1969	5/29/1981
			Lake (Inglis Dam)	120	357	90.0	53.4	23	0	3/21/1963	10/12/2010
			Lake (Inglis Lock)	138	148	123	7.87	14	0	1/19/1971	12/10/1975
			River (Lower)	106	158	55.6	16.4	160	0	4/4/1967	2/4/2013
			Canal	117	148	71.9	16.2	115	0	12/9/2002	2/4/2013
	Cl-D	mg/L	River (Hwy200 - RR)	8.91	11.0	7.10	1.21	12	0	6/26/1995	5/4/2010
			River (RR - LR)	7.78	10.6	6.00	0.813	114	0	1/8/2003	2/4/2013
			Lake (West)	7.12	12.0	5.14	1.56	36	0	12/15/1992	10/12/2010
			Lake (Inglis Dam)	8.30	8.60	8.00	0.424	2	0	6/1/2010	10/12/2010
			River (Lower)	28.0	2,600	5.37	228	129	0	12/15/1992	2/4/2013
			Canal	2,079	8,060	6.46	1,765	114	0	1/8/2003	2/4/2013
	Cl-T	mg/L	River (Hwy200 - RR)	9.28	58.0	3.00	2.50	657	0	1/1/1950	2/6/2013
			River (RR - LR)	7.67	17.0	3.20	1.90	168	0	5/31/1966	4/3/2012
			Lake (East)	7.36	9.10	6.30	0.977	8	0	3/2/2004	8/4/2009
			Lake (West)	7.49	9.00	6.50	0.753	32	0	2/9/1998	10/12/2010
			River (Bypass Channel)	9.51	39.0	4.50	7.48	34	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	158	3,300	4.50	580	37	0	3/21/1963	10/12/2010
			Lake (Inglis Lock)	5,697	12,000	100	2,638	26	0	5/20/1970	5/24/1977
			River (LR-CFBC)	154	960	1.00	278	23	0	3/2/2004	12/6/2004
			River (Lower)	7.74	26.0	4.00	1.76	155	0	4/3/1967	4/3/2012
			Canal	3,710	3,710	3,710	---	1	0	12/9/2002	12/9/2002
			Estuary	836	5,400	2.30	1,693	17	1	3/9/2004	10/18/2004
	CO2	mg/L	River (Hwy200 - RR)	8.09	70.0	0.700	7.96	314	0	1/1/1950	12/18/2012
			River (RR - LR)	9.57	17.0	1.60	5.77	6	0	5/31/1966	4/14/1981
			River (Bypass Channel)	13.7	192	0.800	41.1	21	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	6.41	28.0	1.00	6.56	20	0	3/21/1963	12/10/1975
			Lake (Inglis Lock)	6.69	21.0	1.70	4.67	14	0	1/19/1971	12/10/1975
			River (Lower)	10.9	21.0	3.90	8.94	3	0	5/18/1967	5/20/1970
	F-D	mg/L	River (Hwy200 - RR)	0.150	0.500	0.00	0.088	297	9	1/1/1950	9/7/1995
			River (RR - LR)	0.233	0.300	0.200	0.052	6	0	5/31/1966	4/14/1981
			River (Bypass Channel)	0.200	0.300	0.100	0.094	10	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	0.257	0.300	0.200	0.053	7	0	3/21/1963	9/23/1969
			River (Lower)	0.233	0.300	0.200	0.058	3	0	5/18/1967	5/20/1970
	F-T	mg/L	River (Hwy200 - RR)	0.113	0.260	0.050	0.034	304	46	6/26/1995	2/6/2013
			River (RR - LR)	0.120	0.170	0.090	0.018	234	0	2/4/1982	2/4/2013
			Lake (East)	0.105	0.120	0.088	0.011	8	0	3/2/2004	8/4/2009
			Lake (West)	0.100	0.221	0.050	0.036	60	15	12/15/1992	10/6/2009
			River (LR-CFBC)	0.119	0.180	0.085	0.024	23	0	3/2/2004	12/6/2004
			River (Lower)	0.117	0.230	0.050	0.023	267	13	12/15/1992	2/4/2013
			Canal	0.221	0.430	0.090	0.081	116	0	12/9/2002	2/4/2013
			Estuary	0.205	0.510	0.110	0.130	17	0	3/9/2004	10/18/2004

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
GENERAL INORGANIC	Hardness	mg/L as CaCO3	River (Hwy200 - RR)	136	284	14.0	31.6	393	0	1/1/1950	2/6/2013
			River (RR - LR)	149	599	81.0	73.1	49	0	5/31/1966	9/25/1990
			River (Bypass Channel)	125	230	88.0	23.3	34	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	181	1,400	13.0	232	35	0	3/21/1963	5/20/1977
			Lake (Inglis Lock)	2,045	3,400	180	829	25	0	5/20/1970	5/24/1977
			River (Lower)	120	130	74.5	18.1	14	0	4/4/1967	9/29/1998
	Si-D	mg/L	River (Hwy200 - RR)	6.56	68.0	0.300	4.24	327	0	1/1/1950	12/18/2012
			River (RR - LR)	5.69	8.20	2.30	1.65	10	0	5/31/1966	11/30/1982
			River (Bypass Channel)	5.81	8.40	2.90	1.53	17	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	4.90	7.40	2.40	1.46	16	0	3/21/1963	9/17/1973
			Lake (Inglis Lock)	4.61	6.30	3.00	1.09	7	0	9/18/1970	9/17/1973
			River (Lower)	3.85	5.00	2.60	1.03	4	0	5/18/1967	5/4/1971
	SO4	mg/L	River (Hwy200 - RR)	36.2	330	3.20	37.5	614	0	1/1/1950	2/6/2013
			River (RR - LR)	21.0	78.6	3.80	12.0	157	0	5/31/1966	4/3/2012
			Lake (East)	22.5	36.0	6.70	8.40	8	0	3/2/2004	8/4/2009
			Lake (West)	18.5	33.0	7.10	6.32	32	0	2/9/1998	10/12/2010
			River (Bypass Channel)	20.1	38.0	11.0	7.67	10	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	16.6	24.0	13.0	3.74	9	0	3/21/1963	10/12/2010
			River (LR-CFBC)	46.2	170	6.80	50.6	23	0	3/2/2004	12/6/2004
			River (Lower)	21.1	67.2	5.65	10.3	146	0	4/3/1967	4/3/2012
			Canal	581	581	581	---	1	0	12/9/2002	12/9/2002
			Estuary	151	760	1.10	236	17	0	3/9/2004	10/18/2004
	SO4-D	mg/L	River (Hwy200 - RR)	23.9	47.0	4.80	12.6	12	0	6/26/1995	5/4/2010
			River (RR - LR)	22.9	78.6	5.45	12.7	114	0	1/8/2003	2/4/2013
			Lake (West)	17.4	44.0	6.10	7.44	36	0	12/15/1992	10/12/2010
			Lake (Inglis Dam)	17.7	20.6	14.7	4.17	2	0	6/1/2010	10/12/2010
			River (Lower)	23.5	390	5.65	33.9	131	0	12/15/1992	2/4/2013
			Canal	313	1,100	5.83	240	114	0	1/8/2003	2/4/2013
GENERAL ORGANIC	DOC	mg/L	River (Hwy200 - RR)	14.9	43.0	3.50	10.6	15	0	1/25/1978	12/18/2012
	TOC	mg/L	River (Hwy200 - RR)	13.6	56.0	0.00	10.2	431	2	9/25/1968	2/6/2013
			River (RR - LR)	8.22	33.0	0.00	7.08	306	0	6/14/1978	2/4/2013
			Lake (East)	7.44	18.0	1.80	6.11	9	0	3/2/2004	8/4/2009
			Lake (West)	8.25	24.0	1.98	5.95	60	0	12/15/1992	10/6/2009
			River (Bypass Channel)	11.7	134	0.00	24.0	30	0	9/16/1971	6/29/1982
			Lake (Inglis Dam)	7.97	22.0	1.00	5.63	31	0	5/15/1972	6/29/1982
			Lake (Inglis Lock)	8.32	34.0	1.00	8.21	25	0	5/20/1970	5/24/1977
			River (LR-CFBC)	10.1	20.0	5.20	5.00	23	0	3/2/2004	12/6/2004
			River (Lower)	8.25	28.1	1.79	6.51	267	0	12/15/1992	2/4/2013
			Canal	8.14	26.4	2.20	6.07	115	0	12/9/2002	2/4/2013
			Estuary	10.9	24.0	3.10	7.53	20	0	3/9/2004	1/10/2013
METAL	Ag-D	µg/L	River (Hwy200 - RR)	0.464	1.00	0.00	0.187	56	55	1/25/1978	9/7/1995
	Ag-T	µg/L	River (Hwy200 - RR)	0.393	2.00	0.00	0.561	14	12	1/25/1978	8/31/1982
	Al-D	µg/L	River (Hwy200 - RR)	16.6	70.0	5.00	17.1	45	21	11/5/1982	9/7/1995
			River (Lower)	57.0	57.0	57.0	---	1	0	12/10/1997	12/10/1997
	Al-T	µg/L	River (Hwy200 - RR)	44.7	138	0.00	45.8	7	4	5/2/1970	10/1/2008
			River (RR - LR)	51.5	240	1.00	95.5	6	0	2/4/1982	8/30/1983
			River (Bypass Channel)	---	---	---	---	0	0	6/1/1978	6/1/1978
	As-D	µg/L	River (Hwy200 - RR)	1.34	10.0	0.00	2.31	63	27	5/2/1970	9/4/1991
	As-T	µg/L	River (Hwy200 - RR)	1.72	12.0	0.00	2.17	48	8	5/16/1972	7/7/2011
			River (RR - LR)	1.57	2.80	0.300	0.579	32	0	2/4/1982	9/25/1990
			River (Bypass Channel)	1.00	1.00	1.00	---	1	0	6/1/1978	6/1/1978
	Ba-D	µg/L	River (Hwy200 - RR)	19.0	130	0.00	24.9	63	7	1/25/1978	9/7/1995
	Ba-T	µg/L	River (Hwy200 - RR)	54.2	100	0.00	28.8	18	13	1/25/1978	8/31/1982
	Be-D	µg/L	River (Hwy200 - RR)	0.298	0.800	0.00	0.146	27	25	11/5/1982	9/4/1991
	Ca-D	mg/L	River (Hwy200 - RR)	46.9	83.0	16.0	9.98	327	0	1/1/1950	12/18/2012
			River (RR - LR)	49.5	72.4	30.3	7.04	121	0	5/31/1966	2/4/2013
			Lake (West)	48.2	65.5	37.0	7.60	12	0	6/27/1995	10/12/2010
			River (Bypass Channel)	39.7	50.0	30.0	4.94	14	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	42.7	49.0	37.0	3.79	13	0	3/21/1963	10/12/2010
			Lake (Inglis Lock)	187	220	140	41.6	3	0	5/21/1976	5/24/1977
			River (Lower)	46.1	66.5	28.6	7.03	123	0	5/18/1967	2/4/2013
			Canal	90.2	201	31.9	37.7	116	0	1/8/2003	2/4/2013

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
METAL	Ca-T	mg/L	River (Hwy200 - RR)	59.9	146	22.3	20.0	303	0	6/26/1995	2/6/2013
			River (RR - LR)	50.1	236	28.0	17.5	142	0	2/4/1982	4/3/2012
			Lake (East)	48.9	55.0	31.7	7.47	8	0	3/2/2004	8/4/2009
			Lake (West)	50.7	98.9	17.0	17.0	64	0	12/15/1992	10/12/2010
			Lake (Inglis Dam)	48.0	49.0	47.0	1.41	2	0	6/1/2010	10/12/2010
			River (LR-CFBC)	49.1	68.8	31.4	11.2	23	0	3/2/2004	12/6/2004
			River (Lower)	47.5	97.7	26.0	10.8	149	0	12/15/1992	4/3/2012
			Canal	96.9	96.9	96.9	---	1	0	12/9/2002	12/9/2002
			Estuary	71.1	185	33.9	43.3	17	0	3/9/2004	10/18/2004
	Cd-D	µg/L	River (Hwy200 - RR)	0.750	7.00	0.00	1.07	42	42	5/18/1971	9/4/1991
	Cd-T	µg/L	River (Hwy200 - RR)	2.44	50.0	0.00	10.1	24	33	5/16/1972	7/7/2011
			River (RR - LR)	0.462	3.20	0.100	0.595	33	0	2/4/1982	9/25/1990
			River (Bypass Channel)	---	---	---	---	0	1	6/1/1978	6/1/1978
	Co-D	µg/L	River (Hwy200 - RR)	1.29	4.00	0.00	0.739	61	65	5/18/1971	9/7/1995
	Co-T	µg/L	River (Hwy200 - RR)	1.07	10.0	0.00	2.51	15	18	5/16/1972	8/31/1982
			River (RR - LR)	4.33	20.0	1.00	7.69	6	0	2/4/1982	8/30/1983
	Cr-D	µg/L	River (Hwy200 - RR)	2.96	20.0	0.500	4.35	42	44	10/10/1974	9/4/1991
	Cr-T	µg/L	River (Hwy200 - RR)	9.08	20.0	0.00	6.38	42	17	5/2/1970	7/7/2011
			River (RR - LR)	1.63	3.80	1.00	1.13	6	0	2/4/1982	8/30/1983
	Cu-D	µg/L	River (Hwy200 - RR)	2.35	10.0	0.00	2.97	33	19	5/2/1970	8/21/1992
			River (Bypass Channel)	1.00	1.00	1.00	---	1	1	6/1/1978	6/1/1978
	Cu-T	µg/L	River (Hwy200 - RR)	3.18	30.0	0.00	8.14	14	13	5/16/1972	7/7/2011
			River (RR - LR)	1.88	12.0	0.600	2.02	33	0	2/4/1982	9/25/1990
			Lake (West)	0.00	0.00	0.00	0.00	2	0	8/10/1987	8/10/1987
	Fe-D	µg/L	River (Hwy200 - RR)	90.3	640	0.00	125	239	1	1/1/1950	9/7/1995
			River (RR - LR)	37.5	90.0	0.00	38.6	4	0	5/31/1966	5/2/1969
			Lake (West)	95.4	138	62.3	31.8	4	0	6/1/2010	10/12/2010
			River (Bypass Channel)	45.0	50.0	40.0	7.07	2	0	9/23/1969	6/1/1978
			Lake (Inglis Dam)	69.6	310	0.00	111	7	0	3/21/1963	10/12/2010
			River (Lower)	107	181	10.0	87.8	3	0	5/18/1967	12/10/1997
	Fe-T	µg/L	River (Hwy200 - RR)	286	1,200	20.0	224	82	0	9/21/1954	10/1/2008
			River (RR - LR)	129	675	11.0	123	34	0	4/3/1967	9/25/1990
			Lake (West)	128	310	62.3	77.5	8	0	8/10/1987	10/12/2010
			River (Bypass Channel)	40.0	40.0	40.0	---	1	0	6/1/1978	6/1/1978
			Lake (Inglis Dam)	58.5	95.4	21.5	52.3	2	0	6/1/2010	10/12/2010
			River (Lower)	138	200	100	43.1	4	0	4/3/1967	5/19/1998
	Hg-D	µg/L	River (Hwy200 - RR)	0.656	24.0	0.00	3.20	56	37	9/23/1970	9/4/1991
	Hg-T	µg/L	River (Hwy200 - RR)	0.210	0.800	0.00	0.143	41	30	5/18/1971	8/21/1992
			River (RR - LR)	0.219	1.10	0.00	0.200	33	0	2/4/1982	9/25/1990
			River (Bypass Channel)	0.222	1.20	0.010	0.195	31	1	6/1/1978	9/25/1990
			Lake (Inglis Dam)	0.195	0.600	0.010	0.111	33	0	2/4/1982	9/25/1990
	K-D	mg/L	River (Hwy200 - RR)	0.495	8.50	0.00	0.692	305	0	1/1/1950	12/18/2012
			River (RR - LR)	0.454	1.86	0.100	0.265	123	5	5/31/1966	2/4/2013
			Lake (West)	0.423	0.800	0.200	0.170	12	0	6/27/1995	10/12/2010
			River (Bypass Channel)	0.320	0.500	0.100	0.175	10	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	0.333	1.10	0.00	0.346	9	0	3/21/1963	10/12/2010
			River (Lower)	0.467	1.76	0.125	0.281	121	13	5/18/1967	2/4/2013
			Canal	43.5	156	0.590	36.1	116	0	1/8/2003	2/4/2013
	K-T	mg/L	River (Hwy200 - RR)	0.711	2.10	0.150	0.377	303	8	6/26/1995	2/6/2013
			River (RR - LR)	0.706	16.0	0.125	1.43	142	5	2/4/1982	4/3/2012
			Lake (East)	0.551	1.80	0.150	0.550	8	2	3/2/2004	8/4/2009
			Lake (West)	0.446	1.70	0.150	0.275	64	5	12/15/1992	10/12/2010
			Lake (Inglis Dam)	0.400	0.400	0.400	0.00	2	0	6/1/2010	10/12/2010
			River (LR-CFBC)	4.47	19.3	0.280	6.17	23	0	3/2/2004	12/6/2004
			River (Lower)	0.775	44.1	0.125	3.59	149	13	12/15/1992	4/3/2012
			Canal	78.7	78.7	78.7	---	1	0	12/9/2002	12/9/2002
			Estuary	27.8	146	1.30	43.5	17	0	3/9/2004	10/18/2004
	Mg-D	mg/L	River (Hwy200 - RR)	4.28	8.90	1.00	1.24	325	0	1/1/1950	12/18/2012
			River (RR - LR)	5.35	12.0	2.66	1.18	123	0	5/31/1966	2/4/2013
			Lake (West)	5.08	5.22	4.90	0.105	8	0	7/24/1997	10/12/2010
			River (Bypass Channel)	4.70	6.00	3.70	0.866	14	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	4.57	5.90	2.80	0.805	13	0	3/21/1963	10/12/2010
			Lake (Inglis Lock)	507	650	310	176	3	0	5/21/1976	5/24/1977
			River (Lower)	5.28	10.0	2.78	0.984	123	0	4/10/1967	2/4/2013
			Canal	147	517	2.84	117	113	0	1/8/2003	2/4/2013

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
METAL	Mg-T	mg/L	River (Hwy200 - RR)	5.40	21.8	1.82	2.10	302	0	6/26/1995	2/6/2013
			River (RR - LR)	5.54	40.0	2.40	3.41	142	0	2/4/1982	4/3/2012
			Lake (East)	5.08	6.04	3.00	0.982	8	0	3/2/2004	8/4/2009
			Lake (West)	4.68	6.03	2.28	0.875	60	0	12/15/1992	10/12/2010
			Lake (Inglis Dam)	5.12	5.28	4.96	0.226	2	0	6/1/2010	10/12/2010
			River (LR-CFBC)	16.8	67.1	3.00	21.5	23	0	3/2/2004	12/6/2004
			River (Lower)	6.25	183	2.33	14.7	147	0	12/15/1992	4/3/2012
			Canal	293	293	293	---	1	0	12/9/2002	12/9/2002
			Estuary	96.2	494	5.30	148	17	0	3/9/2004	10/18/2004
	Mn-D	µg/L	River (Hwy200 - RR)	7.45	33.0	0.00	6.23	77	21	5/17/1965	9/7/1995
			River (RR - LR)	5.00	10.0	0.00	7.07	2	0	5/17/1967	5/3/1968
			River (Bypass Channel)	5.00	5.00	5.00	---	1	1	6/1/1978	6/1/1978
			Lake (Inglis Dam)	0.00	0.00	0.00	---	1	0	5/18/1967	5/18/1967
			River (Lower)	0.00	0.00	0.00	---	1	0	5/18/1967	5/18/1967
	Mn-T	µg/L	River (Hwy200 - RR)	14.4	60.0	2.50	13.4	37	15	5/16/1972	8/21/1992
			River (RR - LR)	4.45	15.2	0.00	5.71	8	0	4/3/1967	8/30/1983
			River (Bypass Channel)	5.00	5.00	5.00	---	1	1	6/1/1978	6/1/1978
			River (Lower)	50.0	100	0.00	70.7	2	0	4/3/1967	4/10/1967
	Mo-D	µg/L	River (Hwy200 - RR)	5.00	5.00	5.00	0.00	45	45	11/5/1982	9/7/1995
	Na-D	mg/L	River (Hwy200 - RR)	5.10	11.0	1.80	0.870	307	0	1/1/1950	12/18/2012
			River (RR - LR)	4.42	6.46	3.20	0.540	121	0	5/31/1966	2/4/2013
			Lake (West)	4.32	5.10	3.60	0.477	14	0	6/27/1995	10/12/2010
			River (Bypass Channel)	6.11	15.0	3.20	4.70	10	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	4.24	5.20	3.40	0.583	9	0	3/21/1963	10/12/2010
			River (Lower)	4.59	16.0	3.56	1.22	124	0	5/18/1967	2/4/2013
			Canal	1,139	4,160	3.74	949	115	0	1/8/2003	2/4/2013
	Na-T	mg/L	River (Hwy200 - RR)	5.50	7.50	3.57	0.764	303	0	6/26/1995	2/6/2013
			River (RR - LR)	4.52	21.0	2.70	1.56	142	0	2/4/1982	4/3/2012
			Lake (East)	4.27	4.99	3.76	0.520	8	0	3/2/2004	8/4/2009
			Lake (West)	3.92	6.30	0.005	1.12	62	2	12/15/1992	10/12/2010
			Lake (Inglis Dam)	4.75	4.92	4.58	0.240	2	0	6/1/2010	10/12/2010
			River (LR-CFBC)	110	551	3.62	181	23	0	3/2/2004	12/6/2004
			River (Lower)	14.0	1,400	2.00	116	146	0	12/15/1992	4/3/2012
			Canal	2,190	2,190	2,190	---	1	0	12/9/2002	12/9/2002
			Estuary	473	2,900	1.15	930	17	0	3/9/2004	10/18/2004
	Ni-D	µg/L	River (Hwy200 - RR)	0.793	5.00	0.00	0.934	46	33	11/27/1979	9/7/1995
	Ni-T	µg/L	River (Hwy200 - RR)	0.500	1.00	0.00	0.408	4	3	5/21/1973	8/21/1992
			River (Bypass Channel)	---	---	---	---	0	0	6/1/1978	6/1/1978
	Pb-D	µg/L	River (Hwy200 - RR)	3.94	100	0.00	16.7	35	26	5/2/1970	8/21/1992
			River (Bypass Channel)	---	---	---	---	0	1	6/1/1978	6/1/1978
	Pb-T	µg/L	River (Hwy200 - RR)	16.9	200	0.100	57.7	12	11	5/16/1972	7/7/2011
			River (RR - LR)	1.84	8.00	1.00	1.79	33	0	2/4/1982	9/25/1990
			Lake (West)	0.00	0.00	0.00	0.00	2	0	8/10/1987	8/10/1987
			River (Bypass Channel)	---	---	---	---	0	0	6/1/1978	6/1/1978
	SAR	ratio	River (Hwy200 - RR)	0.198	0.500	0.100	0.036	306	0	1/1/1950	12/18/2012
			River (RR - LR)	0.150	0.200	0.100	0.055	6	0	5/31/1966	4/14/1981
			River (Bypass Channel)	0.250	0.600	0.100	0.190	10	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	0.171	0.200	0.100	0.049	7	0	3/21/1963	9/23/1969
			River (Lower)	0.333	0.600	0.200	0.231	3	0	5/18/1967	5/20/1970
	Se-D	µg/L	River (Hwy200 - RR)	0.473	1.00	0.00	0.163	74	67	10/10/1974	9/7/1995
	Se-T	µg/L	River (Hwy200 - RR)	0.397	0.500	0.00	0.206	29	23	10/10/1974	8/31/1982
	Sr-D	µg/L	River (Hwy200 - RR)	300	1,300	100	136	90	0	5/17/1965	12/18/2012
			River (RR - LR)	243	397	125	105	6	2	5/17/1967	2/3/2003
			River (Bypass Channel)	208	240	170	24.4	9	0	5/20/1970	6/29/1982
			Lake (Inglis Dam)	260	260	260	---	1	0	5/18/1967	5/18/1967
			River (Lower)	221	409	125	117	5	2	5/18/1967	2/3/2003
			Canal	265	405	125	198	2	1	1/8/2003	2/3/2003
	Sr-T	µg/L	River (Hwy200 - RR)	260	260	260	---	1	0	12/9/1997	12/9/1997
	V-D	µg/L	River (Hwy200 - RR)	3.11	8.00	3.00	0.745	45	44	11/5/1982	9/7/1995
	Zn-D	µg/L	River (Hwy200 - RR)	17.7	90.0	1.50	18.8	55	24	5/2/1970	8/21/1992
			River (Bypass Channel)	10.0	10.0	10.0	---	1	1	6/1/1978	6/1/1978
	Zn-T	µg/L	River (Hwy200 - RR)	19.8	140	0.00	24.6	38	17	5/16/1972	7/7/2011
			River (RR - LR)	33.5	269	1.00	52.6	32	0	2/4/1982	9/25/1990
			Lake (West)	0.00	0.00	0.00	0.00	2	0	8/10/1987	8/10/1987

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
NITROGEN	NH3-N	mg/L	River (Hwy200 - RR)	0.049	0.450	0.0001	0.066	167	10	12/9/1997	2/6/2013
			River (RR - LR)	0.021	0.230	0.0000	0.028	148	3	6/29/1982	4/3/2012
			Lake (East)	0.043	0.160	0.022	0.038	12	0	3/2/2004	8/4/2009
			Lake (West)	0.034	0.180	0.004	0.045	27	10	3/2/2004	10/12/2010
			Lake (Inglis Dam)	0.004	0.004	0.004	0.00	2	2	6/1/2010	10/12/2010
			River (LR-CFBC)	0.082	0.230	0.020	0.074	23	0	3/2/2004	12/6/2004
			River (Lower)	0.051	0.380	0.0001	0.049	142	1	2/23/1993	4/3/2012
			Estuary	0.076	0.180	0.030	0.056	17	0	3/9/2004	10/18/2004
	NH4-N	mg/L	River (Hwy200 - RR)	0.038	0.670	0.00	0.061	274	22	9/23/1968	5/4/2010
			River (RR - LR)	0.038	0.230	0.00	0.040	159	5	4/3/1967	2/4/2013
			Lake (West)	0.035	0.170	0.00	0.034	47	14	8/10/1987	10/12/2010
			River (Bypass Channel)	0.044	0.140	0.010	0.025	49	0	5/15/1972	3/2/1983
			Lake (Inglis Dam)	0.134	2.00	0.004	0.401	24	4	5/15/1972	10/12/2010
			Lake (Inglis Lock)	0.106	0.270	0.010	0.067	21	0	5/15/1972	5/24/1977
			River (Lower)	0.050	0.231	0.003	0.029	158	4	4/3/1967	2/4/2013
			Canal	0.048	0.221	0.003	0.042	113	13	12/9/2002	2/4/2013
			Estuary	0.019	0.019	0.019	---	1	0	7/31/2001	7/31/2001
	NO2-N	mg/L	River (Hwy200 - RR)	0.007	0.030	0.00	0.005	173	40	7/31/1968	5/4/2010
			River (RR - LR)	0.007	0.033	0.001	0.004	260	23	2/4/1982	2/4/2013
			Lake (West)	0.007	0.012	0.0005	0.004	10	2	12/11/1995	10/12/2010
			River (Bypass Channel)	0.009	0.100	0.00	0.014	49	5	5/15/1972	3/2/1983
			Lake (Inglis Dam)	0.010	0.070	0.002	0.012	26	3	5/15/1972	10/12/2010
			Lake (Inglis Lock)	0.008	0.010	0.002	0.003	21	4	5/15/1972	5/24/1977
			River (Lower)	0.008	0.036	0.0005	0.004	230	28	12/27/1995	2/4/2013
			Canal	0.008	0.036	0.002	0.005	116	22	12/9/2002	2/4/2013
	NO2-N-D	mg/L	River (Hwy200 - RR)	0.006	0.020	0.00	0.004	60	44	12/30/1977	12/18/2012
			Lake (West)	0.003	0.013	0.0005	0.003	16	15	3/14/1996	10/8/1997
			River (Lower)	0.002	0.005	0.0005	0.002	7	7	3/11/1996	10/2/1997
	NO3-N	mg/L	River (Hwy200 - RR)	0.116	1.60	0.00	0.149	355	0	1/1/1950	10/2/1997
			River (RR - LR)	0.319	1.04	0.019	0.263	32	0	2/4/1982	9/25/1990
			Lake (West)	0.270	0.478	0.002	0.146	22	1	12/11/1995	10/8/1997
			River (Bypass Channel)	0.076	0.250	0.00	0.058	50	0	5/4/1971	3/2/1983
			Lake (Inglis Dam)	0.079	0.320	0.00	0.077	27	0	3/21/1963	5/20/1977
			Lake (Inglis Lock)	0.016	0.110	0.00	0.026	21	0	5/15/1972	5/24/1977
			River (Lower)	0.228	0.474	0.041	0.165	11	0	12/27/1995	10/2/1997
	NOx-N	mg/L	River (Hwy200 - RR)	0.154	0.710	0.00	0.115	406	12	6/27/1974	2/6/2013
			River (RR - LR)	0.777	2.00	0.140	0.288	244	0	4/3/1967	2/4/2013
			Lake (East)	0.727	1.00	0.070	0.284	11	0	4/5/2004	8/4/2009
			Lake (West)	0.292	0.810	0.00	0.218	53	2	12/15/1992	10/12/2010
			River (Bypass Channel)	0.089	0.290	0.010	0.063	43	0	9/16/1974	3/2/1983
			Lake (Inglis Dam)	0.068	0.180	0.005	0.051	21	1	9/16/1974	10/12/2010
			Lake (Inglis Lock)	0.031	0.120	0.010	0.030	16	1	9/16/1974	5/24/1977
			River (LR-CFBC)	0.273	1.20	0.00	0.239	23	0	3/2/2004	12/6/2004
			River (Lower)	0.319	1.50	0.002	0.196	273	2	4/3/1967	2/4/2013
			Canal	0.189	0.489	0.003	0.121	116	1	12/9/2002	2/4/2013
			Estuary	0.196	0.480	0.012	0.106	21	0	7/31/2001	1/10/2013
	NOx-N-D	mg/L	River (Hwy200 - RR)	0.138	0.380	0.020	0.071	75	12	12/30/1977	12/18/2012
	OrgN	mg/L	River (Hwy200 - RR)	0.560	3.30	0.00	0.339	195	4	9/23/1968	9/7/1995
			River (RR - LR)	0.398	1.69	0.00	0.334	34	0	4/30/1970	3/20/1997
			River (Bypass Channel)	0.437	1.50	0.010	0.269	54	0	9/23/1969	3/2/1983
			Lake (Inglis Dam)	0.476	1.70	0.160	0.343	30	0	9/23/1969	5/20/1977
			Lake (Inglis Lock)	0.459	0.860	0.160	0.171	25	0	5/20/1970	5/24/1977
			River (Lower)	0.230	0.230	0.230	0.00	2	0	5/20/1970	5/4/1971
	TKN	mg/L	River (Hwy200 - RR)	0.740	2.80	0.190	0.468	460	0	6/27/1974	2/6/2013
			River (RR - LR)	0.374	1.81	0.010	0.345	46	1	4/3/1967	7/25/2007
			Lake (East)	0.517	1.70	0.170	0.456	11	0	4/5/2004	8/4/2009
			Lake (West)	0.632	1.80	0.040	0.368	63	1	12/15/1992	10/6/2009
			River (Bypass Channel)	0.438	0.900	0.040	0.201	43	0	9/16/1974	3/2/1983
			Lake (Inglis Dam)	0.664	3.70	0.220	0.820	17	0	9/16/1974	5/20/1977
			Lake (Inglis Lock)	0.495	0.750	0.360	0.113	16	0	9/16/1974	5/24/1977
			River (LR-CFBC)	0.875	1.80	0.310	0.487	23	0	3/2/2004	12/6/2004
			River (Lower)	0.600	1.53	0.140	0.353	55	0	4/3/1967	7/24/2007
			Estuary	0.806	1.60	0.355	0.402	20	1	3/9/2004	1/10/2013
	TKN-D	mg/L	River (Hwy200 - RR)	0.592	1.60	0.060	0.340	44	0	2/22/1978	12/18/2012

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
NITROGEN	TN	mg/L	River (Hwy200 - RR)	0.844	3.40	0.160	0.433	292	10	9/23/1968	3/11/2012
			River (RR - LR)	1.18	2.30	0.620	0.220	327	0	3/20/1997	2/4/2013
			Lake (East)	0.906	1.61	0.220	0.288	92	0	12/2/1996	1/25/2010
			Lake (West)	0.792	2.28	0.230	0.357	171	0	6/17/1996	10/12/2010
			River (Bypass Channel)	0.554	1.70	0.130	0.271	48	0	5/15/1972	3/2/1983
			Lake (Inglis Dam)	0.677	3.80	0.300	0.678	26	0	5/15/1972	10/12/2010
			Lake (Inglis Lock)	0.566	0.950	0.390	0.141	21	0	5/15/1972	5/24/1977
			River (Lower)	0.661	2.05	0.030	0.298	1,410	0	3/15/1990	2/4/2013
			Canal	0.718	1.69	0.270	0.274	116	0	12/9/2002	2/4/2013
			Estuary	0.592	2.00	0.200	0.280	135	0	11/19/1996	12/29/2009
OXYGEN DEMAND	BOD5	mg/L	River (Hwy200 - RR)	0.828	2.70	0.00	0.577	94	0	4/3/1967	1/22/1997
			River (RR - LR)	1.16	6.20	0.100	0.905	59	2	4/3/1967	7/5/1995
			Lake (East)	0.978	2.90	0.100	0.572	31	0	4/3/1967	8/4/2009
			Lake (West)	1.64	2.70	0.990	0.595	10	0	2/10/2009	10/6/2009
			River (Bypass Channel)	1.02	2.40	0.200	0.534	60	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	1.17	2.90	0.300	0.606	83	0	4/3/1967	9/25/1990
			Lake (Inglis Lock)	1.33	4.10	0.200	0.849	25	0	5/20/1970	5/24/1977
			River (Lower)	1.37	2.70	0.800	0.474	30	1	4/3/1967	7/5/1995
	cBOD5	mg/L	River (Hwy200 - RR)	0.827	2.40	0.100	0.879	12	1	3/23/2004	10/11/2004
			Lake (East)	1.03	3.10	0.100	1.39	4	1	3/2/2004	10/5/2004
			Lake (West)	1.61	4.90	0.310	1.58	8	0	3/2/2004	10/5/2004
			River (LR-CFBC)	0.825	2.60	0.100	0.924	23	8	3/2/2004	12/6/2004
			River (Lower)	0.673	2.12	0.100	0.570	12	4	3/9/2004	10/18/2004
			Estuary	0.978	2.32	0.100	0.712	17	3	3/9/2004	10/18/2004
	COD	mg/L	River (RR - LR)	15.0	15.0	15.0	---	1	0	2/4/1982	2/4/1982
			River (Bypass Channel)	11.0	11.0	11.0	---	1	0	2/4/1982	2/4/1982
			Lake (Inglis Dam)	2.00	2.00	2.00	---	1	0	2/4/1982	2/4/1982
PHOSPHORUS	OrthoP	mg/L	River (Hwy200 - RR)	0.034	2.50	0.00	0.117	476	21	5/23/1963	12/18/2012
			River (RR - LR)	0.032	0.165	0.003	0.022	260	2	2/4/1982	2/4/2013
			Lake (East)	0.050	0.190	0.011	0.059	8	0	3/2/2004	8/4/2009
			Lake (West)	0.027	0.210	0.002	0.037	62	15	8/22/1996	10/12/2010
			River (Bypass Channel)	0.026	0.090	0.006	0.016	77	0	5/15/1972	9/25/1990
			Lake (Inglis Dam)	0.036	0.700	0.003	0.089	60	4	3/21/1963	10/12/2010
			Lake (Inglis Lock)	0.056	0.100	0.020	0.021	21	0	5/15/1972	5/24/1977
			River (LR-CFBC)	0.076	0.240	0.009	0.081	23	0	3/2/2004	12/6/2004
			River (Lower)	0.027	0.193	0.002	0.028	281	31	1/5/1984	2/4/2013
			Canal	0.026	0.187	0.003	0.027	115	18	12/9/2002	2/4/2013
			Estuary	0.038	0.150	0.014	0.032	53	0	1/5/1984	10/18/2004
	TDP	mg/L	River (Hwy200 - RR)	0.077	2.50	0.005	0.310	103	6	12/30/1977	12/18/2012
	TP	mg/L	River (Hwy200 - RR)	0.059	2.20	0.00	0.130	631	4	5/3/1968	2/6/2013
			River (RR - LR)	0.061	0.396	0.010	0.051	370	0	2/4/1982	2/4/2013
			Lake (East)	0.049	0.350	0.024	0.035	104	0	12/2/1996	1/25/2010
			Lake (West)	0.061	0.361	0.002	0.053	239	5	12/15/1992	10/12/2010
			River (Bypass Channel)	0.041	0.090	0.015	0.016	49	0	5/15/1972	3/2/1983
			Lake (Inglis Dam)	0.077	0.740	0.014	0.141	26	0	5/15/1972	10/12/2010
			Lake (Inglis Lock)	0.076	0.150	0.018	0.034	21	0	5/15/1972	5/24/1977
			River (LR-CFBC)	0.123	0.340	0.028	0.108	23	0	3/2/2004	12/6/2004
			River (Lower)	0.047	0.289	0.009	0.028	1,467	3	3/15/1990	2/4/2013
			Canal	0.062	0.268	0.023	0.033	115	0	12/9/2002	2/4/2013
			Estuary	0.071	0.379	0.015	0.051	154	0	11/19/1996	1/10/2013
PHYSICAL	Alk-D	mg/L as CaCO3	River (Hwy200 - RR)	121	159	78.0	16.6	19	0	11/12/1987	12/18/2012
	Color	CPU	River (Hwy200 - RR)	82.1	600	0.00	90.0	598	5	1/1/1950	2/6/2013
			River (RR - LR)	60.4	400	0.00	78.8	280	14	5/31/1966	2/4/2013
			Lake (East)	34.6	300	5.00	58.7	26	0	4/4/1967	8/4/2009
			Lake (West)	70.7	300	2.50	80.6	116	2	12/15/1992	10/12/2010
			River (Bypass Channel)	45.6	280	0.00	47.9	63	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	46.5	260	0.00	49.1	79	0	3/21/1963	10/12/2010
			Lake (Inglis Lock)	20.4	80.0	0.00	19.2	26	0	5/20/1970	5/24/1977
			River (LR-CFBC)	99.6	300	20.0	95.9	23	0	3/2/2004	12/6/2004
			River (Lower)	58.1	400	2.50	77.7	690	12	4/4/1967	2/4/2013
			Canal	58.9	350	5.00	74.6	116	1	12/9/2002	2/4/2013
			Estuary	52.7	385	4.00	65.6	125	0	1/5/1984	1/10/2013

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
PHYSICAL	Depth	m	River (Hwy200 - RR)	1.25	4.52	0.050	0.888	255	0	9/16/1992	10/12/2010
			River (RR - LR)	1.80	6.08	0.500	1.22	386	0	2/23/1993	4/2/2013
			Lake (West)	1.63	5.00	0.100	0.830	140	0	12/15/1992	10/12/2010
			Lake (Inglis Dam)	1.42	2.60	0.500	0.799	8	0	6/1/2010	10/12/2010
			River (Lower)	1.97	6.00	0.250	1.64	901	0	12/15/1992	4/2/2013
			Canal	1.64	3.62	0.500	0.934	369	0	12/9/2002	4/2/2013
			Estuary	0.583	1.90	0.025	0.418	231	0	11/19/1996	12/29/2009
	ORP	mV	River (RR - LR)	233	420	133	82.8	31	0	2/4/1982	9/25/1990
			River (Bypass Channel)	232	403	122	83.4	28	0	2/4/1982	9/25/1990
			Lake (Inglis Dam)	219	391	124	81.6	31	0	2/4/1982	9/25/1990
	pH	SU	River (Hwy200 - RR)	7.46	8.50	6.42	0.357	972	0	1/1/1950	2/6/2013
			River (RR - LR)	7.47	8.40	5.20	0.380	822	0	5/31/1966	4/2/2013
			Lake (East)	7.46	8.22	6.93	0.228	43	0	4/3/1967	8/4/2009
			Lake (West)	7.52	8.72	5.91	0.610	110	0	12/15/1992	10/12/2010
			River (Bypass Channel)	7.42	8.40	6.00	0.552	109	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	7.64	8.94	6.16	0.473	153	0	3/21/1963	10/12/2010
			Lake (Inglis Lock)	7.54	8.20	7.00	0.271	26	0	5/20/1970	5/24/1977
			River (LR-CFBC)	7.47	7.96	6.95	0.274	28	0	3/2/2004	12/6/2004
			River (Lower)	7.81	9.09	5.70	0.403	947	0	4/3/1967	4/2/2013
			Canal	7.63	8.42	6.86	0.284	331	0	12/9/2002	4/2/2013
			Estuary	7.86	8.90	5.70	0.392	533	0	11/16/1983	11/15/2012
	Salinity	ppt	River (Hwy200 - RR)	0.154	0.400	0.00	0.062	185	0	6/26/1995	10/12/2010
			River (RR - LR)	0.142	0.210	0.080	0.025	320	0	12/9/2002	4/3/2012
			Lake (East)	0.133	0.160	0.090	0.020	10	0	3/2/2004	8/4/2009
			Lake (West)	0.120	0.200	0.090	0.026	65	0	6/27/1995	10/12/2010
			Lake (Inglis Dam)	0.135	0.140	0.130	0.005	6	0	6/1/2010	10/12/2010
			River (LR-CFBC)	1.44	12.1	0.090	3.16	28	0	3/2/2004	12/6/2004
			River (Lower)	2.03	25.5	0.00	5.12	825	0	6/27/1995	4/3/2012
			Canal	6.07	22.8	0.080	7.04	76	0	12/9/2002	12/5/2005
			Estuary	7.60	30.1	0.100	7.57	802	0	11/16/1983	11/15/2012
	SpCond	umhos/cm	River (Hwy200 - RR)	319	833	102	93.3	1,299	0	1/1/1950	2/6/2013
			River (RR - LR)	293	804	70.0	51.7	817	0	5/31/1966	4/2/2013
			Lake (East)	303	377	184	32.9	46	0	4/3/1967	8/4/2009
			Lake (West)	270	718	45.0	62.4	168	0	12/15/1992	10/12/2010
			River (Bypass Channel)	263	530	170	46.4	113	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	407	11,300	155	899	221	0	3/21/1963	10/12/2010
			Lake (Inglis Lock)	16,378	28,600	632	6,940	26	0	5/20/1970	5/24/1977
			River (LR-CFBC)	2,476	20,399	185	5,398	28	0	3/2/2004	12/6/2004
			River (Lower)	506	17,638	151	1,468	666	0	4/3/1967	4/2/2013
			Canal	14,973	42,587	181	11,275	253	0	12/9/2002	4/2/2013
			Estuary	18,880	44,500	216	11,565	348	0	1/5/1984	10/4/2011
	Turb	NTU	River (Hwy200 - RR)	1.78	10.0	0.00	1.41	529	2	6/27/1966	2/6/2013
			River (RR - LR)	0.966	14.0	0.040	1.24	273	68	5/26/1971	2/4/2013
			Lake (East)	1.44	5.30	0.450	1.35	11	0	3/2/2004	8/4/2009
			Lake (West)	2.50	14.0	0.100	2.61	115	0	12/15/1992	10/12/2010
			River (Bypass Channel)	2.28	27.0	0.100	3.76	79	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	4.61	90.0	0.00	11.3	68	0	9/23/1969	10/12/2010
			Lake (Inglis Lock)	8.08	25.0	2.00	5.36	25	0	5/20/1970	5/24/1977
			River (LR-CFBC)	1.56	4.30	0.600	1.06	23	0	3/2/2004	12/6/2004
			River (Lower)	1.32	5.88	0.003	1.11	300	41	5/20/1970	2/4/2013
			Canal	2.71	21.0	0.040	3.42	116	19	12/9/2002	2/4/2013
			Estuary	7.52	100	0.00	12.3	536	0	11/16/1983	3/7/2012
SOLID	TDS	mg/L	River (Hwy200 - RR)	193	612	0.908	60.0	901	0	1/1/1950	2/6/2013
			River (RR - LR)	185	280	127	27.2	269	0	5/31/1966	2/4/2013
			Lake (East)	178	210	145	18.5	9	0	3/2/2004	8/4/2009
			Lake (West)	166	356	2.33	48.5	54	0	6/27/1995	10/6/2009
			River (Bypass Channel)	154	207	104	24.3	20	0	9/23/1969	6/29/1982
			Lake (Inglis Dam)	150	216	62.0	36.8	12	0	3/21/1963	9/23/1969
			River (LR-CFBC)	307	1,920	1.12	397	28	0	3/2/2004	12/6/2004
			River (Lower)	178	254	1.77	28.5	268	0	5/18/1967	2/4/2013
			Canal	3,860	14,800	147	3,190	117	0	12/9/2002	2/4/2013
			Estuary	1,554	10,800	1.02	2,895	17	0	3/9/2004	10/18/2004

Appendix A-2. Water Quality Summary within the Lower Withlacoochee River

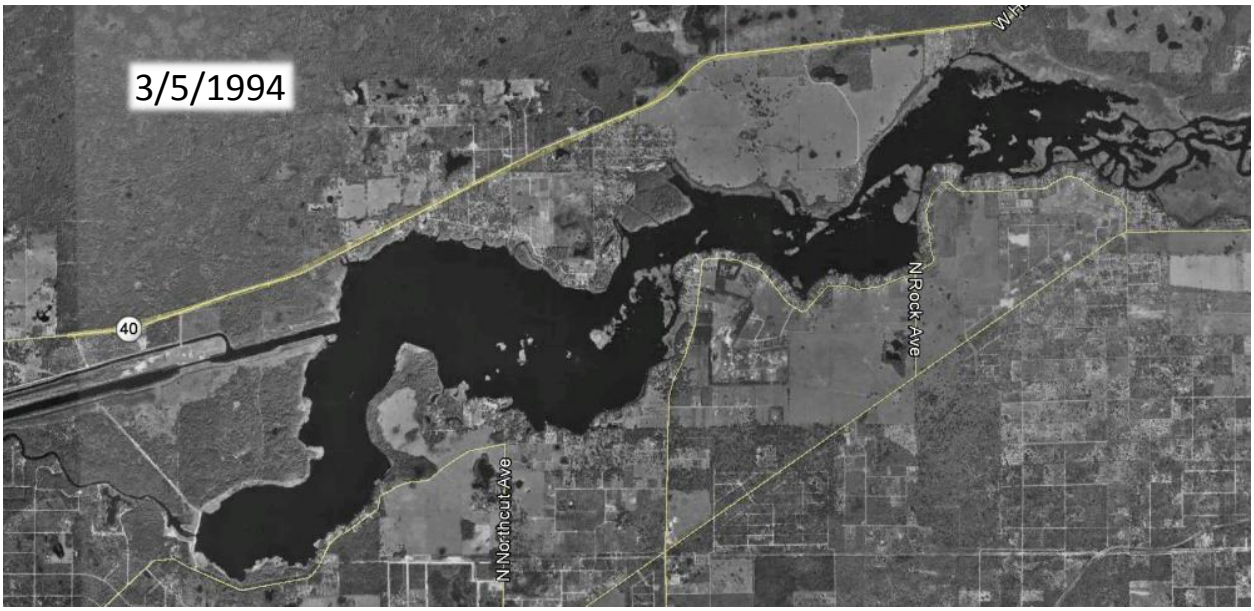
PARAMETER GROUP	PARAMETER	UNITS	STATION GROUP	AVERAGE	MAXIMUM	MINIMUM	STDDEV	N	N BDL	PERIOD OF RECORD	
SOLID	TSS	mg/L	River (Hwy200 - RR)	3.11	74.0	0.005	4.42	302	200	6/26/1995	2/6/2013
			River (RR - LR)	1.64	26.0	0.240	1.97	269	9	2/4/1982	2/4/2013
			Lake (East)	3.00	7.00	2.00	2.00	9	7	3/2/2004	8/4/2009
			Lake (West)	4.96	85.8	0.389	10.8	66	20	12/15/1992	10/12/2010
			Lake (Inglis Dam)	6.96	9.38	4.53	2.80	4	0	6/1/2010	10/12/2010
			River (LR-CFBC)	2.79	7.00	2.00	1.75	28	23	3/2/2004	12/6/2004
			River (Lower)	1.96	15.0	0.060	1.73	275	28	12/15/1992	2/4/2013
			Canal	4.96	46.4	0.250	6.55	117	2	12/9/2002	2/4/2013
			Estuary	8.65	40.0	2.00	9.61	17	4	3/9/2004	10/18/2004
TEMPERATURE	Wtr Temp	C	River (Hwy200 - RR)	23.0	33.1	10.0	4.90	884	0	3/1/1950	2/6/2013
			River (RR - LR)	22.9	32.0	11.0	3.12	792	0	1/6/1967	4/2/2013
			Lake (East)	23.7	31.9	18.3	2.12	44	0	4/3/1967	8/4/2009
			Lake (West)	23.6	30.4	14.5	4.50	140	0	12/15/1992	10/12/2010
			River (Bypass Channel)	24.2	30.5	13.7	4.38	109	0	9/23/1969	9/25/1990
			Lake (Inglis Dam)	23.8	32.0	10.5	4.67	209	0	5/31/1966	10/12/2010
			Lake (Inglis Lock)	25.6	31.5	15.0	4.13	32	0	5/20/1970	5/24/1977
			River (LR-CFBC)	23.6	29.8	16.6	4.99	28	0	3/2/2004	12/6/2004
			River (Lower)	23.6	32.4	10.3	5.28	1,042	0	4/3/1967	4/2/2013
			Canal	23.4	31.8	11.4	5.42	253	0	12/9/2002	4/2/2013
			Estuary	23.3	34.3	9.60	5.39	1,641	0	11/16/1983	11/15/2012

Appendix B

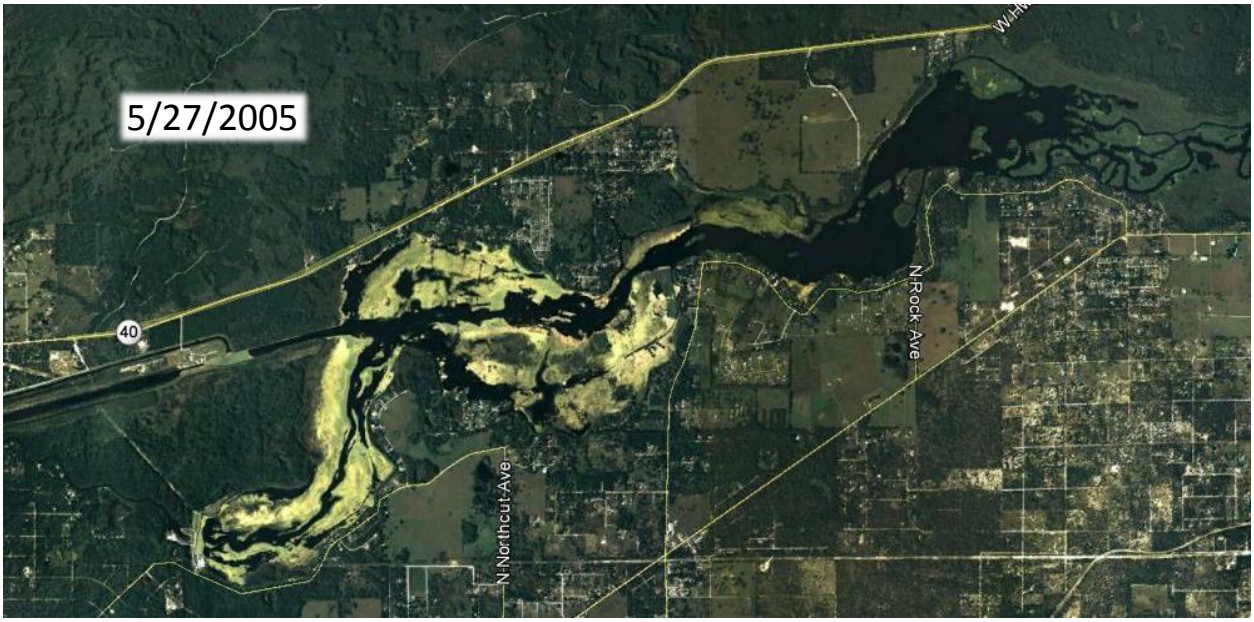
Historic Imagery of Lake Rousseau

Appendix B. Historic imagery of Lake Rousseau (Source: UF George A Smathers Library – Digital Collections)

Appendix B. Historic imagery of Lake Rousseau (Source: Google Earth)

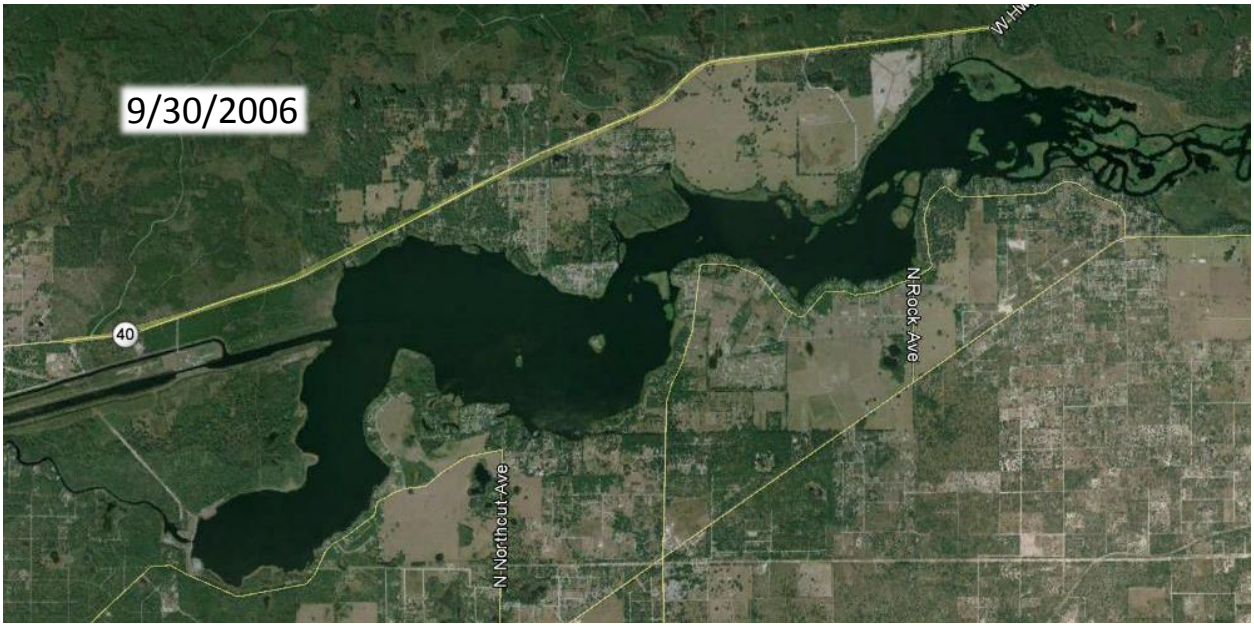


Appendix B. Historic imagery of Lake Rousseau (Source: Google Earth)

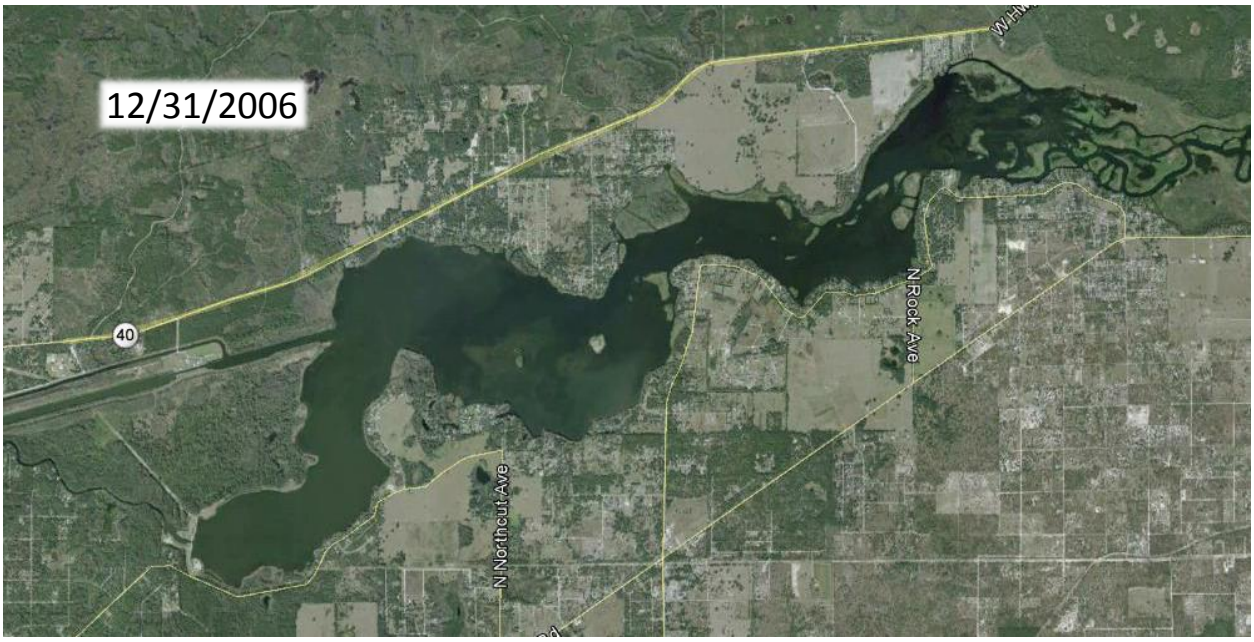


Appendix B. Historic imagery of Lake Rousseau (Source: Google Earth)

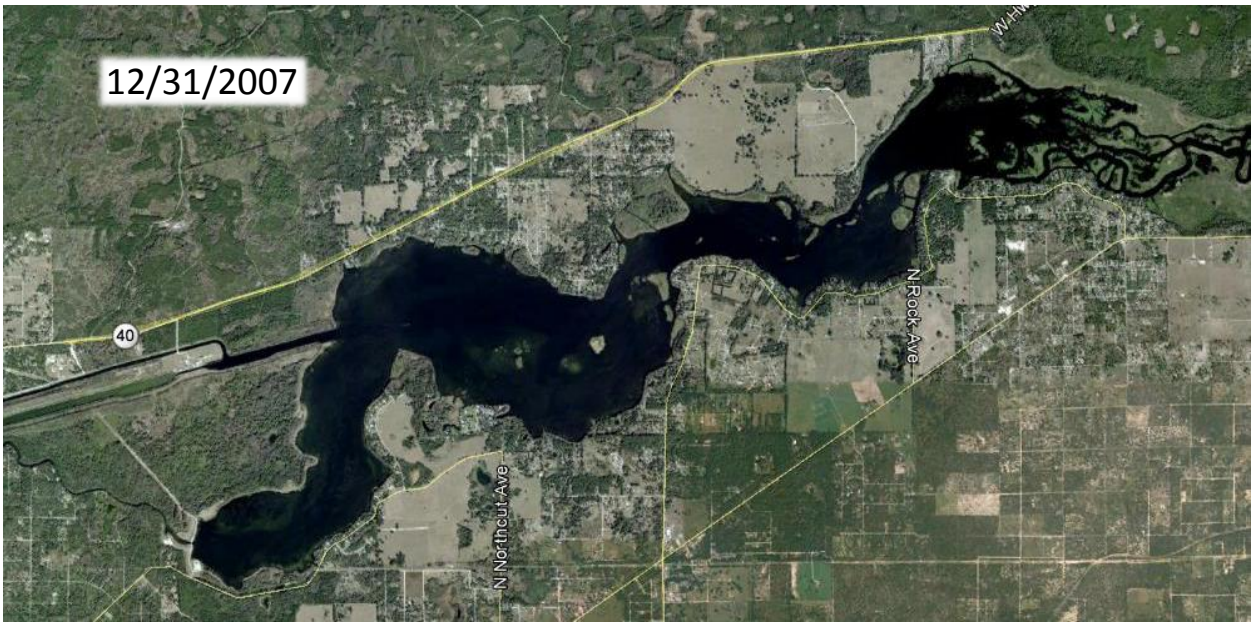
Appendix B. Historic imagery of Lake Rousseau (Source: Google Earth)



Appendix B. Historic imagery of Lake Rousseau (Source: Google Earth)



Appendix B. Historic imagery of Lake Rousseau (Source: Google Earth)



Appendix B. Historic imagery of Lake Rousseau (Source: Google Earth)