

Appendix 2-2: Annual Permit Report for the Loxahatchee River Watershed Restoration Project, L-8 Reservoir

Permit Report (May 1, 2011–April 30, 2012)
Permit Number: 0188365

Guy Germain

Contributors: Nenad Iricanin, Beth Kacvinsky and Ben Gu

SUMMARY

Based on Florida Department of Environmental Protection (FDEP) permit reporting guidelines, **Table 1** lists key permit-related information associated with this report. **Table 2** lists the attachments included with this report. **Table A-1** in Attachment A lists specific pages, tables, graphs, and attachments where project status and annual reporting requirements are addressed. This annual report satisfies the reporting requirements specified in the permit.

Table 1. Key permit-related information for the L-8 Reservoir.

Project Name:	L-8 Reservoir
Permit Number:	Base: 0188365 Latest Mod: 0188365-014
Issue and Expiration Dates:	Issued: 3/30/2007
Permit #: 0188365-001 (original)	Issued: 1/12/2012; Expires: 1/12/2017
Permit #: 0188365-014 (mod)	
Project Phase:	Completed
Permit Specific Condition Requiring Annual Report:	Specific Condition 11, page 8
Relevant Period of Record:	May 1, 2011–April 30, 2012
Report Lead:	Guy Germain ggermain@sfwmd.gov 561-682-6732
Permit Coordinator:	Laura Reilly lreilly@sfwmd.gov 561-682-6875

Table 2. Attachments included with this report.

Attachment	Title
A	Specific Conditions and Cross-References
B	Total Monthly Flow at Inflow and Outflow Points of the L-8 Reservoir for WY2012
C	L-8 Reservoir Project Piezometer Depth-to-Water Data for WY2012
D	Water Quality and Mercury in Fish Data
E	Hydrological Data
F	L-8 Reservoir Pilot Test Water Quality Results
G	Final Report - Emergency Authorization to Discharge Water from the L-8 Reservoir Project

This report provides an evaluation of the results of L-8 Reservoir Project (L8RP) operations, and assesses whether any significant water quality degradation occurred from using the project's cells for temporary water storage. **Figure 1** is a basin map showing the area surrounding the L-8 Reservoir Project. **Figure 2** shows how the project connects to the regional system, and **Figure 3** shows the project facilities. Water quality, stage, flow, and continuous specific conductance monitoring results are presented.

The L8RP covers approximately 1,000 acres, at an average depth of 40 feet, and is made up of a series of interconnected rock pits from the mined-out portions of a limestone quarry in western Palm Beach County. The project scope included data compilation, screening and analysis, and a characterization of the water quality impacts from the L8RP. After the data screening and analyses were completed, trends were reviewed, and conclusions drawn based on the final data set. Based on the information presented in this document, and in compliance with permit requirements, no degradation in water quality has occurred to date in the L-8 canal or basin due to L8RP operation.

In Water Year 2012 (WY2012) (May 1, 2011–April 30, 2012), water from the cells and canals were sampled and tested for physical parameters, nutrients, gross alpha radiation, and mercury. Sampling was conducted in the six reservoir cells (Class III waters) and three sites in the L-8 canal (Class III waters). Compliance with narrative and numerical Class III water quality standards is assessed at the outfall from the L8RP to the L-8 canal (SW6OUT). Exceptions are chloride, which only has a Class I water quality standard (WQS) of ≤ 250 mg/L, and the Class III WQS for specific conductance of ≤ 1275 μ S/cm, for which compliance is assessed at the edges of the FDEP-approved mixing zone at L8MZBN and L8MZBS (see **Table 4** for state water quality criteria). Monitoring locations are shown in **Figures 4** and **7**. Although the specific conductance levels were exceeded for the reservoir, permit criteria were not (i.e., mixing zone was extended during pilot test, and pumps are shut down when mixing water is not adequate to reduce levels appropriately). Water quality data indicate that chlorides and specific conductance are higher in the cells than in the L-8 canal.

During this reporting period, the inflow site (SW6IN) in the L-8 canal had higher concentrations of nutrients (mainly nitrogen and phosphorus species) than in the reservoir (SW6OUT) (**Table 6**, **Figure 5**). Nutrient concentrations within the L8RP reported since it began test-phase operation in December 2001 have frequently been lower than samples collected from

the L-8 and M canals. The L-8 reservoir is not a source of nutrients, and no other major contributing sources of nutrients are known, other than the L-8 canal.

During WY2012, the gross alpha concentrations were all below the Class III criteria (**Table 6**).

Mercury analyses were performed during this reporting period on mosquitofish samples. Samples were collected from each of the cells (L8FISH) and from the downstream site in the L-8 canal adjacent to Cell 3 (L8GRC) (**Table 7**). Currently, the U.S. Environmental Protection Agency's (USEPA) recommended methylmercury (MeHg) fish tissue human consumption criterion is 0.3 milligrams per kilogram (mg/kg) for the edible portions of all fish species. Total mercury (THg) is measured as a substitute of MeHg in fish from South Florida.

As required in permit modification 0188365-014, a dry season operational pilot test was conducted during March through April 2011. A final report (Attachment F, *L-8 Reservoir Pilot Test Water Quality Results*) was submitted to FDEP in June 2011.

An Emergency Order (FDEP Final Order No. 11-0489) to discharge water from the L-8 Reservoir Project was issued from the FDEP to the South Florida Water Management District (District or SFWMD) on June 21, 2011. The Order was issued at the request of the District and in response to the declaration of Exceptional Drought Conditions in the Lower East Coast Region of the District and authorized a temporary extension of the existing mixing zone point of compliance in the L-8 Canal east to Lake Mangonia. The Emergency Order was in effect from June 21, 2011, until Phase III water shortage orders that affected the Lake Okeechobee Service Area were rescinded by the District's Governing Board on November 18, 2011. A final report (Attachment G, *Final Report - Emergency Authorization to Discharge Water from the L-8 Reservoir Project*) for the Emergency Order was sent to FDEP on January 20, 2012.

INTRODUCTION

Water quality sampling for the L-8 Reservoir Project began in November 2001. In February 2003, FDEP executed a Consent Agreement (OGC File No. 030272-50 RO) that allowed the connection of Pits C and D (Cell 1) to the reservoir project pits. In March 2003, the District submitted the First Annual Monitoring Report to FDEP. This report presents the results of the L-8 Reservoir Project's monitoring program. The objective is to ensure that the discharge water meets water quality standards, and that water quality is suitable for water supply and environmental deliveries through the city of West Palm Beach M canal. The assessment is required by the permit to ensure that the collection and analysis of the water quality data complied with FDEP-approved quality assurance/quality control (QA/QC) procedures.

DESCRIPTION OF REGIONAL SYSTEM

The L-8 basin encompasses approximately 170 square miles, with the majority located in northwestern Palm Beach County and approximately two square miles in southwestern Martin County (**Figure 1**). The majority of the land in the Upper L-8 basin is comprised of the J.W. Corbett Wildlife Management Area, owned and managed by the Florida Fish and Wildlife Conservation Commission, and DuPuis Reserve, owned and managed by the SFWMD. However, there are areas in close proximity to Lake Okeechobee that consist of agricultural land. The Lower L-8 basin, located downstream of the M canal includes the Indian Trail Improvement District (ITID) service area and several square miles of agricultural and rural area.

The regional flow in the L-8 basin (**Figure 2**) is complex and has several operating procedures that affect the flow into and out of the system. The upstream water source is Lake Okeechobee via SFWMD's Culvert 10A. Culvert 10A is a structure consisting of five 10-ft

diameter corrugated metal pipe (CMP) culverts with inverts at elevation 5.5 ft in relation to the National Geodetic Vertical Datum of 1929 (ft NGVD29). Four of the culverts have flap gates on the lake side, and the center barrel has a 10 ft x 10 ft operable slide gate. Therefore, the inflow into the L-8 canal through Culvert 10A is a function of the head difference between the lake and canal water levels. Throughout the L-8 basin, water is discharged into the L-8 canal for drainage as well as withdrawn for water use. The current water use consists of both public water supply and irrigation. The water used for public water supply is pumped using the city of West Palm Beach's Control 2 Pump Station located on the M canal. Water then flows east via the M canal, and eventually to the city's water supply lakes, Lake Mangonia, and Clear Lake, where it is withdrawn for treatment.

Water in the L-8 canal is withdrawn from and discharged to the L-8 canal during the operation of the L-8 Reservoir Project. The withdrawal/discharge location is south of the confluence of the L-8 and M canals. The reservoir is used for storage of excess runoff from the basin to reduce discharges from the basin to the C-51 canal and ultimately to tide. The water stored can then be either discharged during the dry season for environmental purposes or for public water supply for the city of West Palm Beach. During the wet season, the water can be discharged back into the L-8 canal between storm events at relatively lower discharge rates, once the stage in the L-8 canal has dropped to within the normal operating range to recover storage capacity in the reservoir.

Discharges into the L-8 canal, excluding Lake Okeechobee and the L-8 Reservoir at Palm Beach Aggregates, Inc. (PBA), include Indian Trail Improvement District and Water Conservation Area 1 (WCA-1). The water discharged from ITID consists of stormwater runoff from the 19,000-acre M-1 basin. Water is discharged from the ITID M-1 Basin Impoundment Area through its L-8 outfall structure located approximately 11 miles north of State Road 80. The discharges from WCA-1 are dependent on the operating criteria of SFWMD structures S-5AS, S-5AE, and S-5AW.

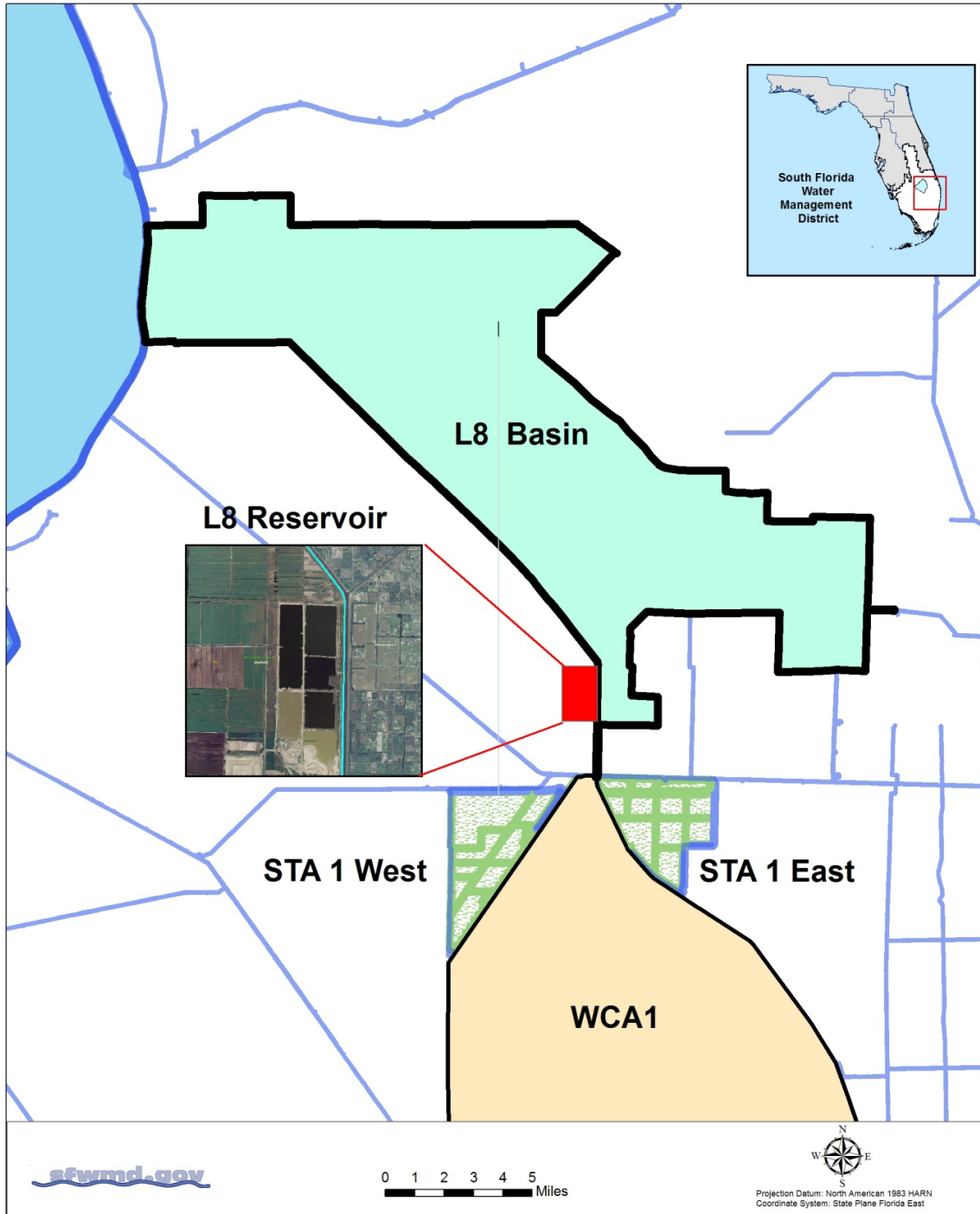


Figure 1. L-8 reservoir and basin.

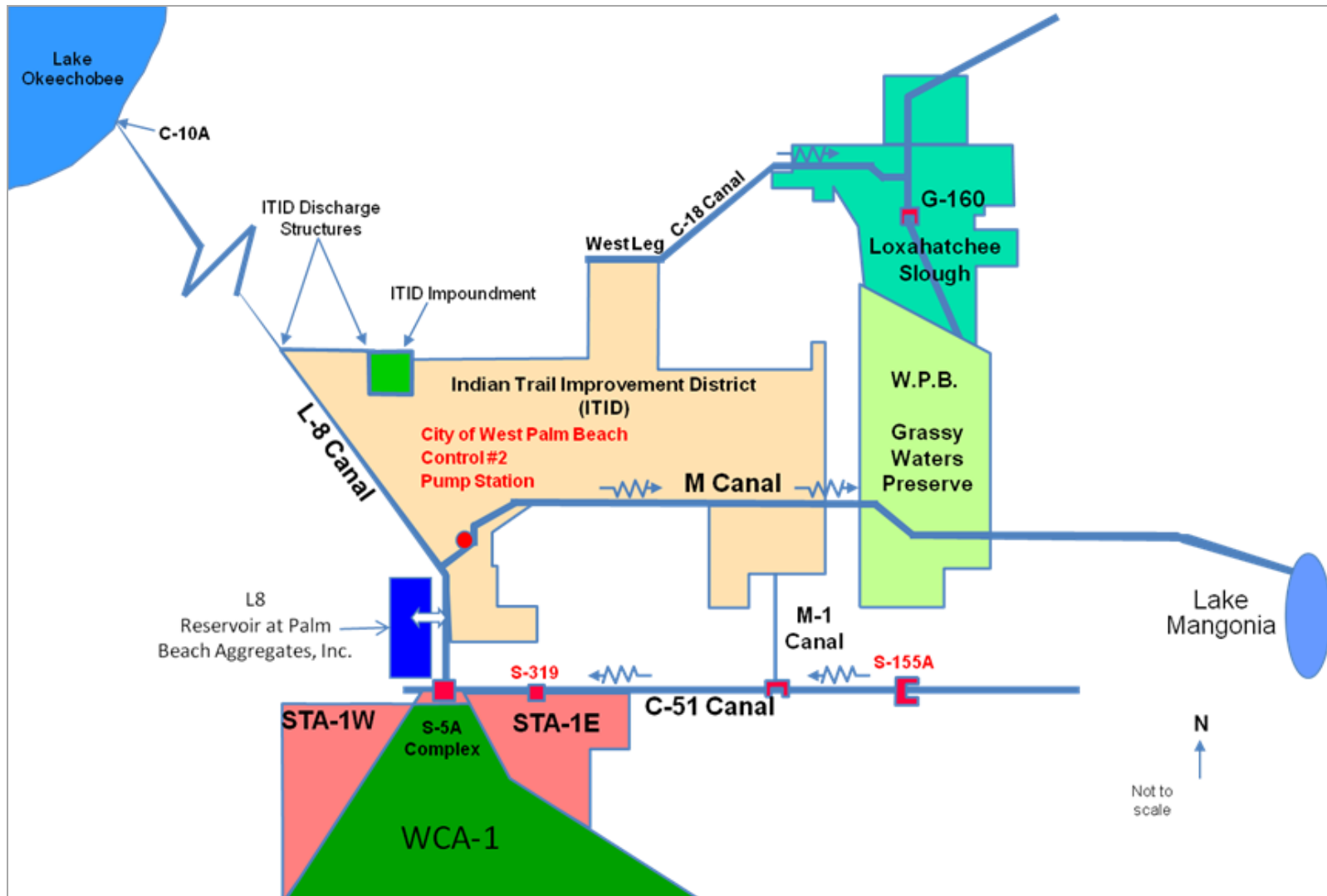


Figure 2. L-8 Reservoir Project connections to the regional system.

L-8 RESERVOIR PROJECT

LOCAL HYDROLOGY

The inflow structure from the L-8 canal to Cell 1/2 consists of two 72 inch x 472 linear feet of reinforced concrete pipe (RCP) culverts with invert elevations of +7.5 ft NGVD29, each with a 6 ft x 6 ft sluice gate, and another 100 ft of 72-inch CMP culvert. The discharge structure is equipped with one 75 cubic feet per second (cfs) capacity pump that discharges to the water control structure box, and out of the twin 72-inch RCP culverts to the L-8 canal (**Figure 3**). Flow data are provided in Attachment B.

GEOLOGY

The L-8 reservoir was previously a rock quarry excavated by Palm Beach Aggregates and is located in central Palm Beach County, Florida, centered approximately two miles north of SR 80, near 20-Mile Bend. The surrounding area was historically used for agricultural purposes, and to some extent continues to be utilized for growing sugarcane and turf. The quarry was subdivided into six pits, and each pit was dewatered by pumping from sumps and perimeter rim ditches. Each pit was originally excavated to approximately 30 ft below surrounding grade for mining purposes. Each pit has been excavated further to approximately 50 ft below surrounding grade for the reservoir project.

Based upon review of the U.S. Geological Survey (USGS) Loxahatchee, Florida quadrangle map dated 1971, and photo-revised in 1984, the PBA site has a natural ground surface elevation of approximately +15 ft NGVD29. Research of the Soil Survey of Palm Beach County Area, Florida, published by the U.S. Department of Agriculture, Soil Conservation Service (SCS) indicates the site is masked by the soil association Holopaw fine sand. This is nearly level, poorly drained sand that has loamy subsoil at a depth of 40 to 72 inches. Under natural conditions (i.e., absent drainage improvements), the water table is near the ground surface.

Geologic conditions at the PBA site consist of thin depths of surficial peat and sands over a relatively thick deposit of well-cemented sand and shell of marine origin. The cemented layer is referred to as the "Carbonate Rich" zone. It has been reported that the South Florida peninsula formerly existed with sea stands considerably higher than those that currently exist (LBFH and DE&T, 2005). A series of shallow inland tidal channels became home for thousands of marine animals. These and other life forms accumulated over time into reefs, which later lithified into the cemented sand and shell Carbonate Rich zone. Beneath this layer, a thick deposit of sand and gravel with some cemented zones is common to this geologic area.

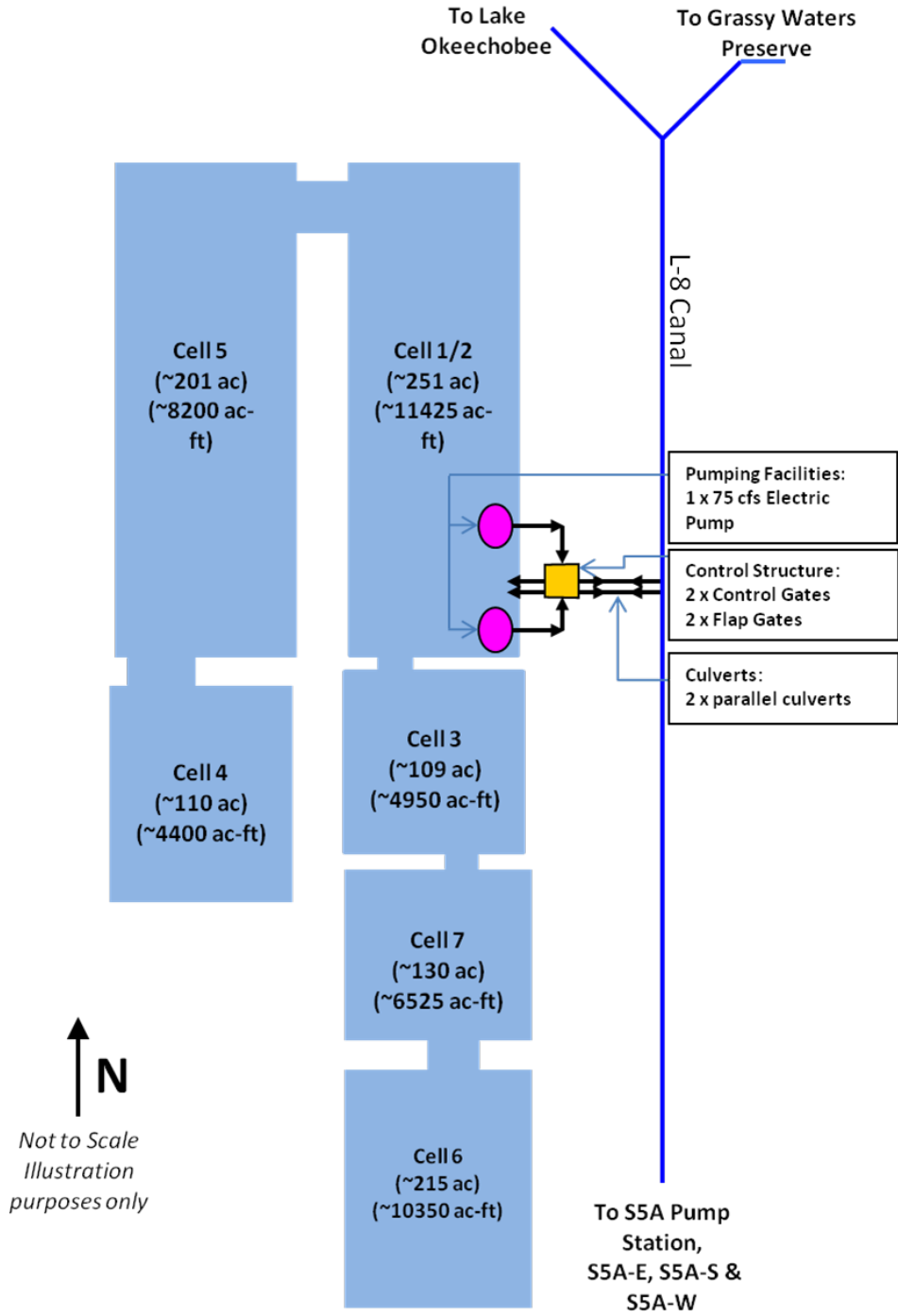


Figure 3. L-8 Reservoir project facilities.

WATER QUALITY

MONITORING LOCATIONS

Surface water sampling locations are listed in **Table 3** and shown on **Figure 4**.

Table 3. Surface water quality monitoring locations.

Sample Station	Sample Location	Coordinates	
		Latitude	Longitude
SW-6IN	Inflow Structure Southeast corner of Cell 1/2	264338.836	802149.982
SW-6OUT	Outflow Structure Southeast corner of Cell 1/2	264339.412	802154.419
L8MZBN	L-8 Canal 800 meters north of the discharge location	264404.689	802147.253
L8MZBS	L-8 Canal 800 meters south of the discharge location	264313.305	802148.492

Note: Latitude and longitude are in degrees minutes and decimal seconds.

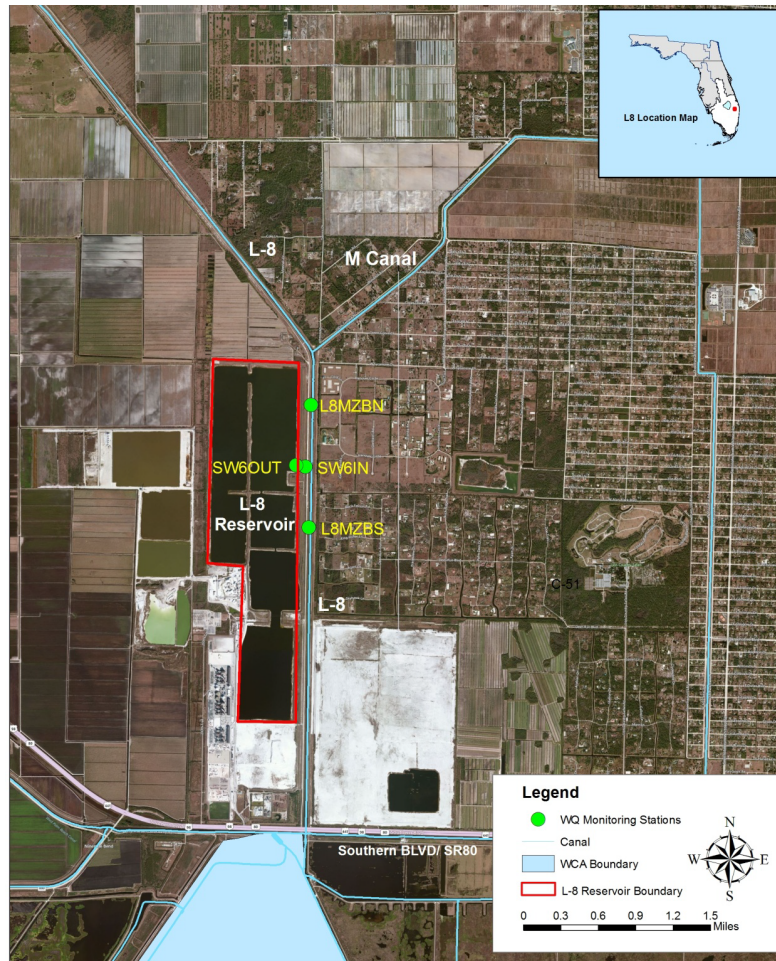


Figure 4. L-8 Reservoir Project water quality sampling locations.

SAMPLING PROTOCOL

Surface water samples were collected from all sampling locations on a weekly basis only during inflow or outflow events according to the *Monitoring Plan for L8 Regional Testing*, dated June 15, 2007, and revised January 21, 2010. Gross alpha radiation is sampled monthly only during inflow and outflow events at SW6OUT. During this reporting period all monitoring was conducted by District staff. The samples were obtained from 0.5 meters below the water surface. Specific conductivity, pH, dissolved oxygen, and temperature were measured in the field for all samples.

Water Quality Standards

Review of Chapter 62-302.530, Florida Administrative Code (F.A.C.), Criteria for Surface Water Quality Classifications, indicates the water quality criteria for Class I (Potable Water Supply) and Class III (Predominantly Fresh Waters) Waters for selected analytical parameters (**Table 4**). Though the point of discharge in the L-8 canal is considered Class III waters, because water can be delivered to the L-8 tieback canal and the M canal, Class I standards can be applied.

Table 4. Surface water quality criteria pursuant to Chapter 62-302.530, F.A.C.

Parameter	Units	Surface Water Criteria	
		Class I	Class III
Chlorides	mg/L	≤ 250	NA
Specific Conductance	μS/cm	≤1275*	≤1275*
Dissolved Oxygen	mg/L	≥5.0	≥5.0
pH	Standard	6.0 < pH < 8.5	
Total Mercury	μg/L	<0.012	<0.012
Gross Alpha	pCi/L	≤15	≤15

Notes:

μS/cm = μS/cm = microSiemens per centimeter

μg/L = micrograms per liter

mg/L = milligrams per liter

pCi/L = picoCuries per liter

* 1,275 μS/cm or 50% above background, whichever is greater

Data Summary Tables

Table 5. Statistical summary of physical parameters monitored in the L-8 canal and L-8 Reservoir during WY2012.

Temperature (°C)					pH (units) ^a				
Statistics	SW6IN L8 Canal		SW6OUT Cell 1/2		Statistics	SW6IN L8 Canal		SW6OUT Cell 1/2	
Count	15		15		Count	15		15	
Average	24.8		25.4		Average	7.8		8.0	
STD	3.1		3.0		STD	-NC-		-NC-	
Min	19.0		19.5		Min	7.4		7.7	
25%	23.0		23.6		25%	7.6		7.9	
Median	25.1		25.6		Median	7.9		8.1	
75%	26.9		27.5		75%	8.2		8.4	
Max	30.2		31.0		Max	8.4		8.5	
Dissolved Oxygen (mg/L)					Sulfate (mg/L)				
Statistics	SW6IN L8 Canal		SW6OUT Cell 1/2		Statistics	SW6IN L8 Canal		SW6OUT Cell 1/2	
Count	15		15		Count	15		15	
Average	7.05		7.71		Average	65.7		132.3	
STD	2.01		1.56		STD	57.2		20.3	
Min	3.85		5.36		Min	<0.1		94.8	
25%	5.57		6.32		25%	27.5		120.0	
Median	7.30		7.79		Median	38.6		130.0	
75%	8.14		8.77		75%	121.3		147.5	
Max	11.80		10.90		Max	161.0		162.0	
Specific Conductance (µS/cm)					Calculated Chloride (mg/L) ^b				
Statistics	SW6IN L8 Canal	SW6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal	Statistics	SW6IN L8 Canal	SW6OU Cell 1/2	L8MZB L8 Canal	L8MZBS L8 Canal
Count	15	15	15	15	Count	---	15	15	15
Average	1,053	1,700	876	776	Average	---	323.4	143.7	122.0
STD	609.9	235.0	476.2	387.8	STD	---	51.2	103.8	84.5
Min	296	1,353	296	395	Min	---	247.8	17.3	38.9
25%	584	1,525	537	568	25%	---	285.2	69.8	76.7
Median	769	1,680	792	719	Median	---	319.0	125.5	109.5
75%	1,577	1,865	1,184	792	75%	---	359.4	210.8	125.5
Max	2,100	2,102	2,099	2,082	Max	---	411.0	410.4	406.7

Notes:

^a All pH values were converted to hydrogen ion concentrations prior to performing statistical summaries. The statistical summaries were back converted to pH values using the following formula: $pH = -\log[H^+]$. -N- indicates that a calculation could not be made.

^b Chlorides were calculated from specific conductance using the equation specified in CERPRA No. 0188365-008: Chloride = $0.218(\text{Specific Conductance}) - 47.2$. Chloride equation has a specific conductance range limit of 270 – 3847 µS/cm.

--- Data not available.

Table 6. Statistical summary of nutrients and radiological parameters monitored in the L-8 canal and L-8 reservoir during WY2012.

Total Phosphorus (mg/L)			Total Kjeldahl Nitrogen (mg/L)		
Statistics	SW6IN L8 Canal	SW6OUT Cell 1/2	Statistics	SW6IN L8 Canal	SW6OUT Cell 1/2
Count	15	15	Count	15	15
Average	0.061	0.021	Average	1.17	0.99
STD	0.039	0.006	STD	0.26	0.08
Min	0.020	0.012	Min	0.93	0.89
25%	0.035	0.015	25%	0.99	0.95
Median	0.047	0.024	Median	1.13	0.97
75%	0.075	0.027	75%	1.23	0.99
Max	0.169	0.030	Max	1.97	1.18

Nitrate + Nitrite as N (mg/L)			Total Nitrogen (mg/L)		
Statistics	SW6IN L8 Canal	SW6OUT Cell 1/2	Statistics	SW6IN L8 Canal	SW6OUT Cell 1/2
Count	15	14	Count	15	14
Average	0.168	0.058	Average	1.34	1.05
STD	0.178	0.065	STD	0.33	0.12
Min	<0.005	<0.005	Min	0.96	0.93
25%	0.077	0.005	25%	1.08	0.96
Median	0.108	0.027	Median	1.32	0.99
75%	0.232	0.135	75%	1.48	1.13
Max	0.711	0.177	Max	2.06	1.32

Gross Alpha (pCi/L)	
Statistics	SW6OUT Cell 1/2
Count	5.0
Average	5.6
STD	0.9
Min	<5.5
25%	5.2
Median	5.5
75%	6.1
Max	6.8

ASSESSMENT OF WATER QUALITY DATA

Surface water quality data collected during WY2012 for the L-8 Reservoir Project and mercury in fish are provided in Attachment D.

Gross Alpha

Gross alpha is a by-product of radioactive decay and occurs naturally in the environment. It is present in varying amounts in nearly all rock, soils, and water. Gross alpha was sampled at SW6OUT (Table 6). Gross alpha at SW6OUT ranged from less than 5.5 to 6.8 picoCuries per liter (pCi/L). The state criterion is less than 15 pCi/L for both state Class I and Class III waters. Based on the Class I and III criteria, there were no gross alpha values above the criterion.

Nutrients

The nutrients analyzed in the L-8 canal and L-8 reservoir include total phosphorus (TP), total Kjeldahl nitrogen (TKN), NOX (NO₂+NO₃) and total nitrogen (TN). All nutrients had higher concentrations in the L-8 canal than in the reservoir (Table 6; Figure 5). Table 6 also shows the highest TP concentration from the reservoir at SW6OUT was 0.03 milligrams per liter (mg/L), while the highest in the L-8 canal was 0.169 mg/L. The highest TN concentration in the reservoir was 1.32 mg/L, and the highest TN concentration in the L-8 canal was 2.06 mg/L. Based on available data, the L-8 reservoir does not appear to cause or contribute to an increase of phosphorus or nitrogen in the L-8 canal.

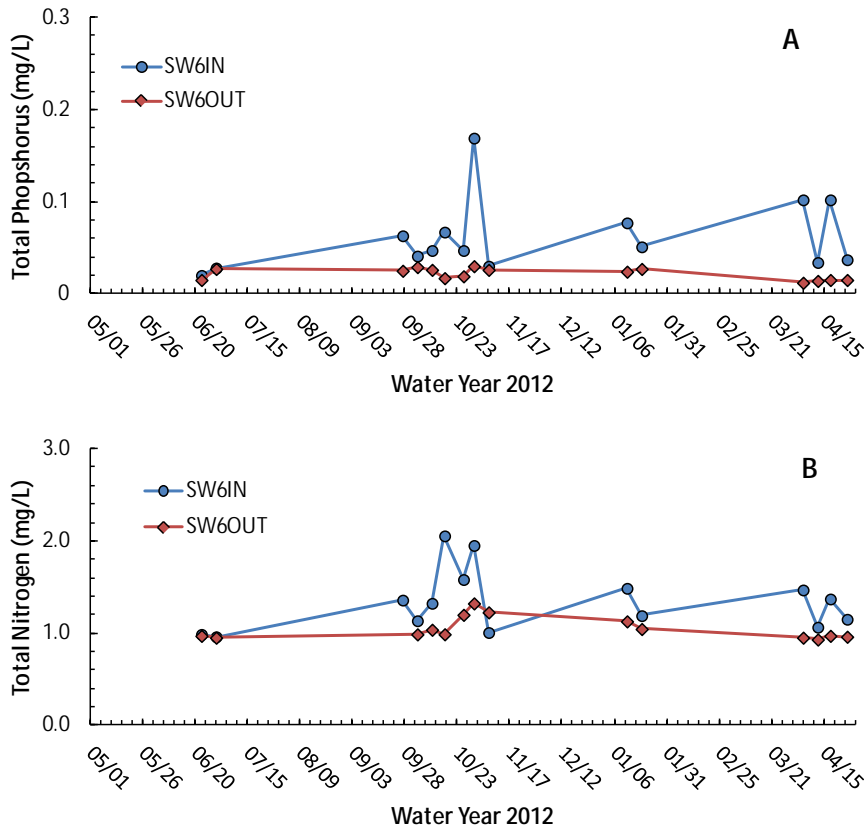


Figure 5. Time series plots of (A) total phosphorus and (B) total nitrogen measured at two structures during WY2012.

Physical Parameters

The physical parameters analyzed in the reservoir and canal include temperature, dissolved oxygen, pH, specific conductance, and calculated chloride. As shown on **Figure 6A** and in **Table 5**, specific conductance was consistently higher in the reservoir than in the canal. The permitted mixing zone monitoring sites L8MZBN and L8MZBS were initiated in October 2007. These sites are located 800 meters north and south of where the discharge water enters the L-8 canal. These sites are monitored every 15 minutes for specific conductance along with SW6OUT 24 hours a day. Time-weighted daily average values required by the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit were calculated from the 15 minute values recorded, are provided in Attachment D.

The average daily specific conductance is required to be less than 1,275 microsiemens per centimeter ($\mu\text{S}/\text{cm}$) at the mixing zone boundaries. As shown in **Figure 6** and **Table 5**, specific conductance concentrations recorded during routine sample collection (inflow and outflow events) did exceed the state Class III criteria for conductivity of $<1,275 \mu\text{S}/\text{cm}$ at the original two mixing zone sites as authorized by the emergency order. An emergency order allowed water to be pumped out of the L-8 reservoir from June 23, 2011 to July 15, 2011 for drought relief and water supply. The Emergency Order also granted an exemption to extend the mixing zone compliance location to Lake Mangonia, and at no time did the specific conductance at the lake exceed the Class III criteria. During WY2012, SW6OUT had an average concentration of $1,700 \mu\text{S}/\text{cm}$, with a maximum of $2,102 \mu\text{S}/\text{cm}$. SW6IN had an average concentration of $1,053 \mu\text{S}/\text{cm}$, with a maximum of $2,100 \mu\text{S}/\text{cm}$. These findings show that even though conductivity levels were above the Class III criteria within the reservoir, it was well mixed and diluted when it reached Lake Mangonia. On July 21, 2011, an 800-meter mixing zone for specific conductivity from the point of discharge of the L-8 reservoir was reauthorized through August 26, 2013 (permit modification 0188365-015).

Calculated chloride concentrations are presented in **Table 5** and **Figure 6B**. Chlorides were calculated from the specific conductance values recorded when routine samples were collected during inflow and outflow events by using the following equation (specified in CERPRA Permit 0188365-008): $\text{Chloride} = 0.218(\text{Conductivity}) - 47.2$. Since chloride is derived from specific conductance, the same scenarios for specific conductance explained above apply to chloride. There is no state Class III standard for chloride. SW6OUT and SW6IN exhibited the same increases as described for conductivity. Daily specific conductance and calculated chloride data for the L-8 Reservoir Project are provided in Attachment D.

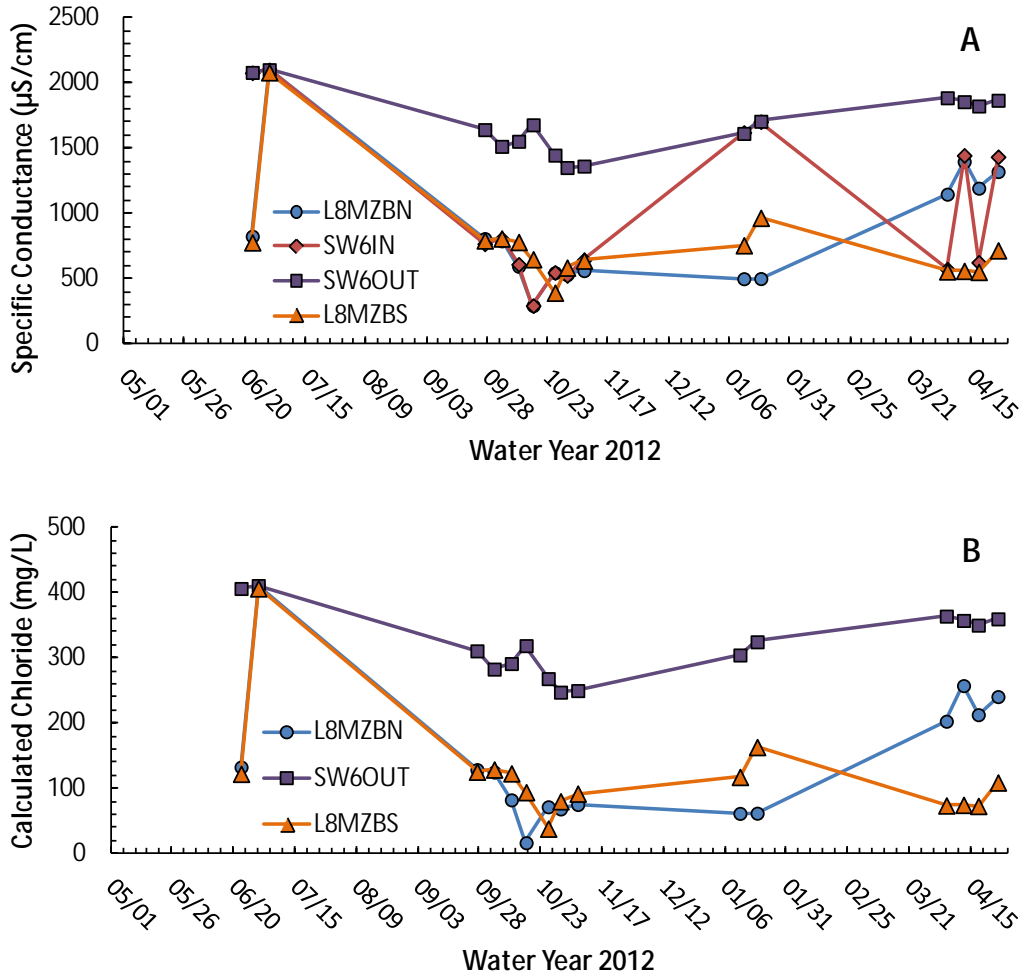


Figure 6. Time series plots of (A) specific conductance levels at four structures and (B) calculated chloride levels at three structures including two mixing zone stations (L8MZBN and L8MZBS) during WY2012.

MERCURY MONITORING

On December 31, 2009, the FDEP issued the District a minor permit modification (0188365-012-EM) to update mercury monitoring for the L-8 Reservoir Project to reflect the transfer from Phase 2-Tier 1 (Routine Monitoring During Stabilization Period) to Phase 3 - Tier 1 (Routine Operational Monitoring from Year 4 to Year 9). In Phase 3-Tier 1, surface water sampling is discontinued and the frequency of mosquitofish (*Gambusia holbrooki*) collection is reduced to semiannually. Mosquitofish are collected and combined into two sets. One is from all the cells of the L-8 reservoir (named L8FISH), and the other is from a location adjacent to the reservoir in the L-8 canal (L8GRC) (**Figure 7**). The samples are analyzed for total mercury (THg). The frequency of large-bodied fish collection is reduced to one collection event every three years and was not scheduled for WY2012. Collection of sunfish (*Lepomis* sp.) and largemouth bass (*Micropterus salmoides*) at GRL, a site about 15 miles east of the L-8 reservoir in the M canal by the outflow to Grassy Waters Preserve (**Figure 7**), was also transferred from Phase 2 - Tier 1 (Routine Monitoring During Stabilization Period) to Phase 3 - Tier 1 (Routine Operational Monitoring from Year 4 to Year 9). No samples were taken in WY2012.

The U.S. Environmental Protection Agency's (USEPA) recommended methylmercury (MeHg) fish tissue criterion is 0.077 milligrams per kilograms (mg/kg) for trophic level III fish (USEPA, 2001). THg was used as a substitute of MeHg in fish from South Florida. **Table 7** shows all the samples collected during this reporting period. THg concentrations in mosquitofish from the L-8 reservoir are well below the USEPA standard for trophic level III fish despite the fact the trophic level of mosquitofish likely falls between trophic level II and III.

The 75th percentile for the period of record (WY1998–WY2012) for mosquitofish collected in the Everglades Protection Area is 0.083 mg/kg. **Table 7** shows that all the samples collected during this reporting period have results well below this standard.

Table 7. Total mercury level (mg/kg) in mosquitofish from the reservoir interior (L8FISH) and L-8 canal (L8GRC) in the same quarters of WY2011 and WY2012.

Date	WY2011		WY2012		75 th Percentile	USEPA Criteria
	3 rd Quarter	4 th Quarter	3 rd Quarter	4 th Quarter		
L8FISH	0.024	0.057	0.053	0.073	0.083	0.077
L8GRC	0.023	0.019	0.025	0.037		

Notes:

L8FISH = Composite of fish from all cells of the L-8 reservoir

L8GRC = Telemetry platform in L-8 canal east of Cell 3

A mosquitofish sample is a composite sample of ≥ 100 fish

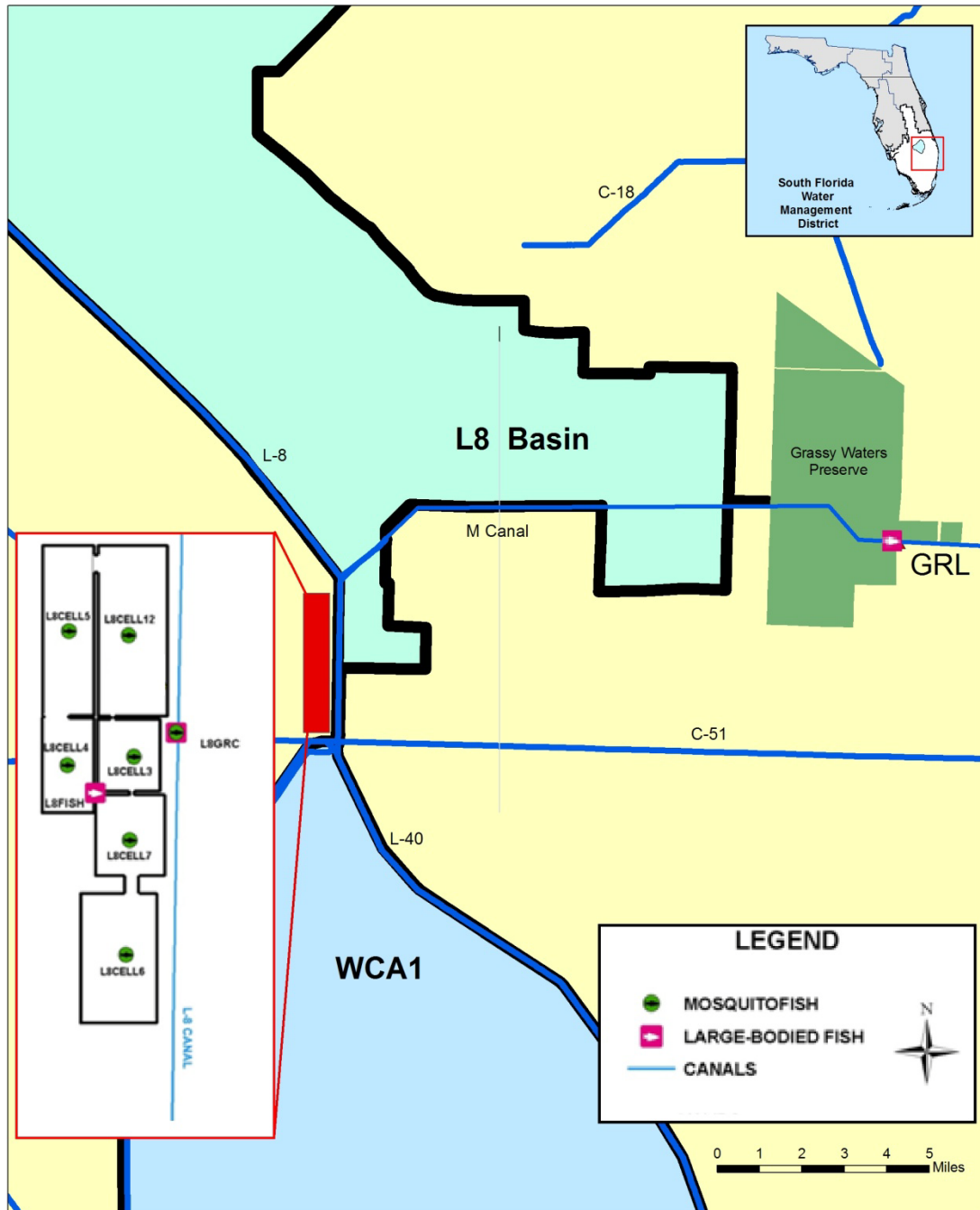


Figure 7. Mercury monitoring locations in the L-8 reservoir, L-8 canal, and outflow of the Grassy Waters Preserve.

Mosquitofish THg concentration fluctuated seasonally over the period of record, but displayed an overall increasing trend at the reservoir interior. There is only a slight increasing trend for the L-8 canal site (**Figure 8, upper panel**). Both sites displayed a similar pattern of changes over time. The increases in mosquitofish THg concentration corresponded well to the drops in sulfate concentration in the reservoir, which was apparently dictated by the changes in stage (**Figure 8, lower panel**). Mercury methylation mediated by sulfate-reducing bacteria (SRB) is controlled in part by the concentration of sulfate. Methylmercury produced by SRB can be transferred to higher trophic levels via algal assimilation and food consumption by fish. High sulfate concentration inhibits SRB growth through the accumulation of the toxic sulfide, and promotes mercury precipitation (HgS). The extremely high sulfate concentration in the L-8 reservoir when the stage was low might have inhibited mercury methylation and resulted in HgS formation, while the decline in sulfate concentration when stage was high (dilution effect) may have reduced these impacts. The changes in stage and, subsequently, sulfate concentration and mercury methylation rate indirectly affected the THg concentration in mosquitofish. It appears that the increasing trend of mosquitofish THg is likely associated with the decreasing trend of sulfate concentration.

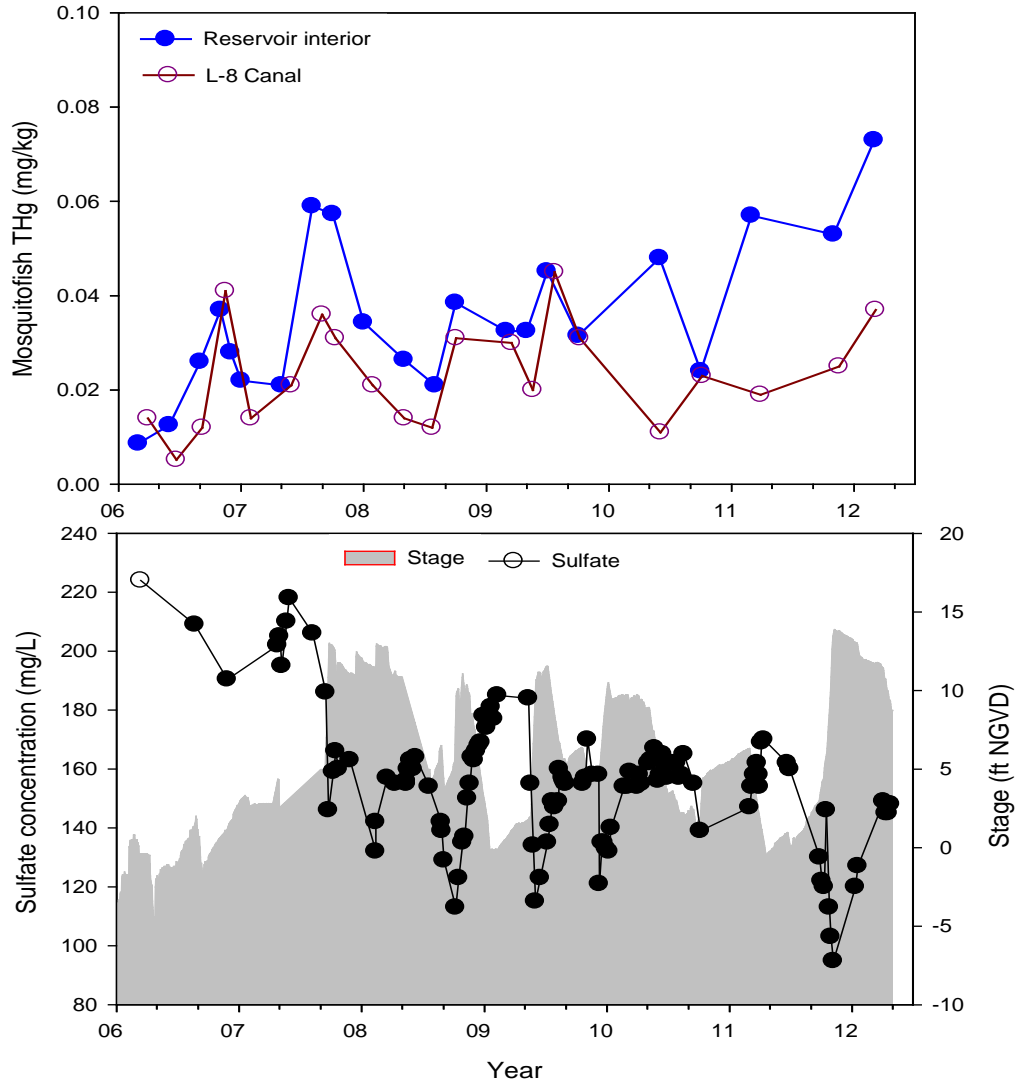


Figure 8. Changes in mosquitofish THg concentrations at the reservoir interior and L-8 canal (upper panel) and stage and sulfate concentration at the reservoir interior (lower panel). Fish samples were collected from several interior sites (L8Cell12, L8Cell13, L8Cell14, L8Cell15, L8Cell16, and L8Cell17) between WY2006 and WY2012, and were averaged for each water year. Starting in 2011, a single composite sample from all cells was collected (L8FISH). The L-8 canal site (L8GRC) is located at the telemetry platform in the L-8 canal east of Cell 3 (**Figure 7**).

WATER QUALITY CONCLUSIONS

Based on the preceding analyses and results, and in compliance with permit requirements, there has been no degradation in water quality due to the operation of the L8RP in the L-8 canal or basin in this reporting period.

LITERATURE CITED

- Florida Administrative Code, Section 62-302.530, Criteria for Surface Water Quality Classifications. Online at <https://www.flrules.org/gateway/ruleno.asp?id=62-302.530>.
- LBFH, Inc. and DE&T. 2005. L-8 Reservoir Project Water Quality Assessment Report. Prepared for the South Florida Water Management District, West Palm Beach, FL
- USEPA. 2001. Water Quality Criteria: Notice of Availability of Water Quality Criterion for the Protection of Human Health: Methylmercury. U.S. Environmental Protection Agency, Federal Register Environmental Document. Online at <http://www.epa.gov/fedrgstr/EPA-WATER/2001/January/Day-08/w217.htm>.

Attachment A: Specific Conditions and Cross-References

Table A-1. Specific conditions, actions taken, and cross-references presented for the L-8 Reservoir (CERPRA Permit #: 0188365) in this report.

Specific Condition	Description	Applicable Phase	Action Taken	Reported in the 2013 SFER in: <i>(All references are to Volume III, unless noted)</i>			
				Narrative (page #'s)	Figure	Table	Attachment
3	Best Management Practices (BMPs)	Construction	N/A (no new construction)				
4	Turbidity Monitoring	Construction	N/A (no new construction)				
5	Water Quantity and Flooding Impacts	Operation	No impacts occurred				
6	Operating Plan	Operation	Followed as required				
7	Water Reservation / Allocation	Operation	Complied with as required.				
8	Monitoring Requirements	Operation	Monitoring conducted as required				B - E
9	Mercury Monitoring	Operation	Monitoring conducted as required	3, 16, 18, 19, 20	7 - 8	2, 7	D
10	Daily Stage Monitoring	Operation	Monitoring conducted as required				E
11	Annual Water Quality Monitoring Requirements and Reporting	Operation	Monitoring and reporting conducted as required	1 - 4, 9, 11 - 14, 16, 18, 19, 20	4 - 8	1 - 7	B - D
12	Quality Assurance and Quality Control	Operation	QA/QC complied with requirements				D
13	Method Detection Limits (MDLs)	Operation	Followed as required				D
14	Removal of Parameters	N/A	N/A (no parameters removed)				
15	Addition of Parameters	N/A	N/A (no parameters added)				
16	Emergency Suspension of Sampling	N/A	N/A				
18	Permit Modifications	N/A	N/A (no mods instituted during reporting period)				
19	Construction	Construction	N/A (no new construction)				
20	Permit Renewal	N/A	N/A				

Attachment B: Total Monthly Flow at Inflow and Outflow Points of the L-8 Reservoir for WY2012

Table B-1. Total monthly flow at the inflow and outflow points of the L-8 Reservoir for WY2012.

Month	Inflow (acre-feet)	Outflow (acre-feet)
May 2011	0	0
June 2011	0	1210
July 2011	0	323
August 2011	0	0
September 2011	290	0
October 2011	4540	0
November 2011	1963	0
December 2011	0	0
January 2012	16	0
February 2012	0	0
March 2012	0	152
April 2012	0	2993

Attachment C: L-8 Reservoir Project Piezometer Depth-to-Water Data for WY2012

Table C-1. Piezometer depth-to-water data.

	PZ5A	PZ5B	PZ5C	PZ5D	PZ8A	PZ8B
Piezometer Depth (feet)	15.5	35.5	55.5	75.5	20	40
Surveyed Elevation (TOC in feet) (03/29/07) ± 0.1	22.95	23.08	23.19	23.02	26.8	26.57
Actual Depth (feet) (3/29/07)	18	38.02	58.2	78.3	23.02	43.14

Date Measured²	Depth to Water (feet)					
	PZ5A	PZ5B	PZ5C	PZ5D	PZ8A	PZ8B
7/21/2011	16.47	16.67	16.84	16.8	17.85	17.18
8/4/2011	17.19	17.37	17.5	17.43	18.59	18.56
9/1/2011	15.85	16.04	16.2	16.15	17.31	17.28
11/7/2011	10.63	10.75	10.84	10.65	14.13	14.04
12/1/2011	10.38	10.52	10.61	10.42	14.02	13.88
1/5/2012	11.43	11.64	11.73	11.52	14.93	14.89
2/9/2012	11.55	11.67	11.77	11.57	15	14.81
3/5/2012	11.98	12.09	12.18	11.99	15.4	15.24
4/17/2012	13.04	13.18	13.31	13.12	16.21	16.12

¹ TOC = Top of casing; the surveyed elevation of the top of a well's casing; used as the starting point when measuring the depth to the water's surface within a well.

² No readings were taken in May 2011, June 2011, and October 2011

Attachment D: Water Quality and Mercury in Fish Data

This project information is required by Specific Condition 11(a) of the L-8 Reservoir Permit - Operations Authorization (0188365), and is available upon request.

Attachment E: Hydrological Data

This project information is required by Specific Condition 11(a) of the L-8 Reservoir Permit - Operations Authorization (0188365), and is available upon request.

Attachment F: L-8 Reservoir Pilot Test Water Quality Results

This report is submitted in accordance with the terms of Exemption #2 of the FDEP Exemption Request for L-8 Reservoir Operational Pilot Test Project Modification 0188365-014, and is available upon request.

Attachment G: Final Report - Emergency Authorization to Discharge Water from the L-8 Reservoir Project

This report is submitted in accordance with requirement 19(k) of FDEP Emergency Final Order 11-0489 to Discharge Water from the L-8 Reservoir Project, and is available upon request.