

Enhanced Water Quality Monitoring and Modeling Program for the A.R.M. Loxahatchee National Wildlife Refuge Quarterly Update Report – October 2007

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Overview

This update is a summary of activities since the previous status report of July 2007 on the implementation of the Refuge's Enhanced Water Quality Monitoring and Modeling Program. A project overview, and other detailed information about the program can be found at: http://sofia.usgs.gov/lox_monitor_model/. The primary objective of this overall program focuses on providing information for use in ecological management of the Refuge (Brandt et al. 2004; Harwell et al. 2005; USFWS 2007).

The Refuge's monitoring component of this program also addresses one of the Consent Decree Principals recommendations (17 December 2003):

B. Enhancing Monitoring of the Refuge

Design and implement an enhanced monitoring program to improve spatial and temporal understanding of factors related to phosphorus dynamics.

The Refuge's modeling component of this program also addresses several of the Consent Decree Principals recommendations (17 December 2003):

C. Modeling of the Refuge

- 1. Develop a water quality/hydraulic model for the Refuge with a phosphorus cycling component.*
- 2. Evaluate issues associated with phosphorus loads and transports within the L-40 and L-7 canals.*
- 3. Develop and track a simple phosphorus mass-balance model for the Refuge.*

Information Availability

Through collaboration with USGS, information from the Refuge's Enhanced Water Quality Monitoring and Modeling Program has been made available on the USGS' SOFIA web site at: http://sofia.usgs.gov/lox_monitor_model/.

Final data for monthly samples through May 2006 are publicly posted on DBHYDRO by the SFWMD at <http://www.sfwmd.gov/org/ema/dbhydro/index.html>. Data for June 2006-September 2007 are posted on the Technical Oversight Committee's web site at <http://www.sfwmd.gov/org/ema/toc/index.html>. This report includes information from samples collected through September 2007.

Water Quality Data Analyses Update

Primary efforts from this quarter focused on finalizing the Third Annual Report. This report focuses on extending the period of record captured in the Second Annual Report to December 2006.

Monitoring Update (July 2007 – September 2007)

Sampling of the enhanced water quality monitoring network (**Figure 1**) occurred at 20 stations in July 2007, 34 stations in August 2007, and 34 stations in September 2007 (**Table 1**).

Total phosphorus data available to date for January 2007 to September 2007 are presented in **Table 1**. Maps of stations where samples were collected for July 2007 through September 2007 are presented in **Figures 2-4**.

Conductivity sonde deployment information for January 2007 to September 2007 is presented in **Table 2**.

Modeling Update

Model development continues with intensive effort by the modeling team. The modeling team held their second model results workshop on August 27th in Delray Beach, where more than two dozen people across multiple agencies attended. The workshop covered the updates on the water budget and simple constituents modeling efforts, as details on the complex hydrodynamic modeling. Information from this workshop is tentatively available at: <http://loxmodel.mwaldon.com/>.

Next Steps

The next steps for this program include exploring mechanisms to present information from the Annual Report – in particular the modeling efforts – to a larger audience, continuation of data collection and analysis, additional model development and implementation.

References

http://sofia.usgs.gov/lox_monitor_model/

Brandt, L.A., Harwell, M., Waldon, M. (2004) Work Plan: Water Quality Monitoring and Modeling for the A.R.M. Loxahatchee National Wildlife Refuge: 2004-2006. Prepared for the A.R.M. Loxahatchee National Wildlife Refuge. April, 2004. 33 pp.

Harwell, M. Surratt, D., Waldon, M., Walker, B., Brandt, L. (2005) A.R.M. Loxahatchee National Wildlife Refuge Enhanced Water Quality Monitoring and Modeling Interim Report. April, 2005. 106 pp.

USFWS. (2007) A.R.M. Loxahatchee National Wildlife Refuge - Enhanced Monitoring and Modeling Program – 2nd Annual Report – February 2007. LOXA06-008, U.S. Fish and Wildlife Service, Boynton Beach, FL. 183 pp.

Table 1. 2006 Total phosphorus data (ppb) available for January 2007 – September 2007 from the Enhanced Water Quality Monitoring Program for: (a) marsh, and (b) canal stations for the A.R.M. Loxahatchee National Wildlife Refuge. Graphical representation of station locations is shown in Figure 1.

a) Marsh stations

Marsh Station	Jan-07	Feb-07	Mar-07	Apr-07	May-07	June-07	July-07	Aug-07	Sept-07
LOXA101	13	12	-	-	-	-	-	20	16
LOXA102	-	-	-	-	-	-	-	-	-
LOXA103	4	-	-	-	-	-	-	-	9
LOXA105	16	10	-	-	-	-	-	24	27
LOXA106	5	-	-	-	-	-	-	6	16
LOXA107	-	-	-	-	-	-	-	-	-
LOXA108	-	-	-	-	-	-	-	-	-
LOXA109	5	-	-	-	-	-	16	6	17
LOXA110	U	-	-	-	-	-	-	U	8
LOXA111	7	U	-	-	-	-	-	U	9
LOXA112	6	5	-	-	-	-	14	U	10
LOXA113	U	U	-	-	-	9	6	U	8
LOXA114	U	5	-	-	-	-	4	U	12
LOXA116	20	-	-	-	-	-	-	99	130*
LOXA117	7	5	-	-	-	-	-	10	21
LOXA118	10	4	-	-	-	-	-	7	16
LOXA119	8	9	-	-	-	-	-	U	9
LOXA120	6	U	12	16	-	11	9	U	10
LOXA121	X	X	X	X	X	X	X	X	X
LOXA122	12	6	-	-	-	-	13	12	13
LOXA123	X	X	X	X	X	X	X	X	X
LOXA124	6	7	-	-	-	24	12	19	12
LOXA126	6	6	-	-	-	-	14	13	8
LOXA127	6	U	-	-	-	-	-	13	U
LOXA128	4	U	-	-	-	-	-	6	5
LOXA130	9	5	-	-	-	-	11	11	20
LOXA131	6	5	-	-	-	-	8	10	5
LOXA133	17	55	-	-	-	-	-	29	-
LOXA134	7	6	-	-	-	44	7	18	15
LOXA136	37	21	-	-	-	-	19	13	25
LOXA137	5	6	-	-	-	20	10	U	14
LOXA138	3	U	-	-	-	9	16	U	8
LOXA139	-	-	-	-	-	11	-	U	12
LOXA140	6	U	-	-	-	-	-	U	9
LOXA141	13	6	8	-	-	-	29	7	12
MAX	37	55	12	16	-	44	29	99	130
MIN	3	4	8	16	-	9	4	6	5

U indicates that compound was analyzed but not detected.

X indicates station no longer sampled

* sample was re-analyzed sample. Second value, LOXA116 Sept-07 = 120 ppb.

Table 1 cont.

b) Canal stations

Canal Station	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	July-07	Aug-07	Sept-07
LOXA104	24	27	100	50	54	29	41	26	46
LOXA115	23	47	25	32	29	14	54	57	36
LOXA129	36	36	84	82	52	270	110	55	37
LOXA132	39	36	54	70	65	200	78	59	27
LOXA135	35	46	48	75	72	130	18	43	27
MAX	39	47	100	82	72	270	110	59	46
MIN	23	27	25	32	29	14	18	26	27

U indicates that compound was analyzed but not detected.

Table 2. January 2007 – September 2007 conductivity sonde deployment information, separated by transect, for the A.R.M. Loxahatchee National Wildlife Refuge. X = data collected from sonde deployment during that month. Graphical representation of station locations is shown in Figure 1.

Site ID	Description	2007									
		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	
LOXA104	NW Transect 0 (canal)					X	X	X	X	X	
LOXA105	NW Transect 0.5	X		X		X		X	X	X	
LOXA106	NW Transect 1	X		X		X		X	X	X	
LOXA107	NW Transect 2	X		X		X		X		X	
LOXA108	NW Transect 4	X		X		X		X	X	X	
LOXA111			X		X	X	X		X		
LOXA112			X		X	X	X		X		
LOXA113			X		X	X	X		X		
LOXA114			X		X	X	X		X		
LOXA115	SW Transect 0 (canal)			X		X	X	X	X	X	
LOXA116	SW Transect 0.5			X	X			X			
LOXA117	SW Transect 1			X	X			X			
LOXA118	SW Transect 2		X		X		X				
LOXA119	SW Transect 4		X		X		X				
LOXA120	SW Transect- X5		X		X		X				
LOXA126			X		X	X	X		X		
LOXA127			X		X	X	X		X		
LOXA128			X		X	X	X		X		
LOXA129	NE Transect S 0 (canal)		X	X	X	X	X	X	X	X	
LOXA130	NE Transect S					X		X		X	
LOXA131	NE Transect S					X		X		X	
LOXA132	NE Transect N 0 (canal)		X	X	X	X	X	X	X	X	
LOXA133	NE Transect N					X		X		X	
LOXA135	NE Transect STA1E 0 (canal)		X	X	X	X	X	X	X	X	
LOXA136	NE Transect STA1E 0.5	X		X		X		X		X	
LOXA137	NE Transect STA1E 1	X		X		X		X		X	
LOXA138	NE Transect STA1E 2	X		X		X		X		X	
LOXA139	NE Transect STA1E 4			X		X		X		X	
LOX6	EVPA site		X		X	X	X		X		
LOX7	EVPA site		X		X	X	X		X		
LOX8	EVPA site		X		X	X	X		X		
LOX9	EVPA site		X		X	X	X		X		
LOX10	EVPA site		X		X	X	X		X		

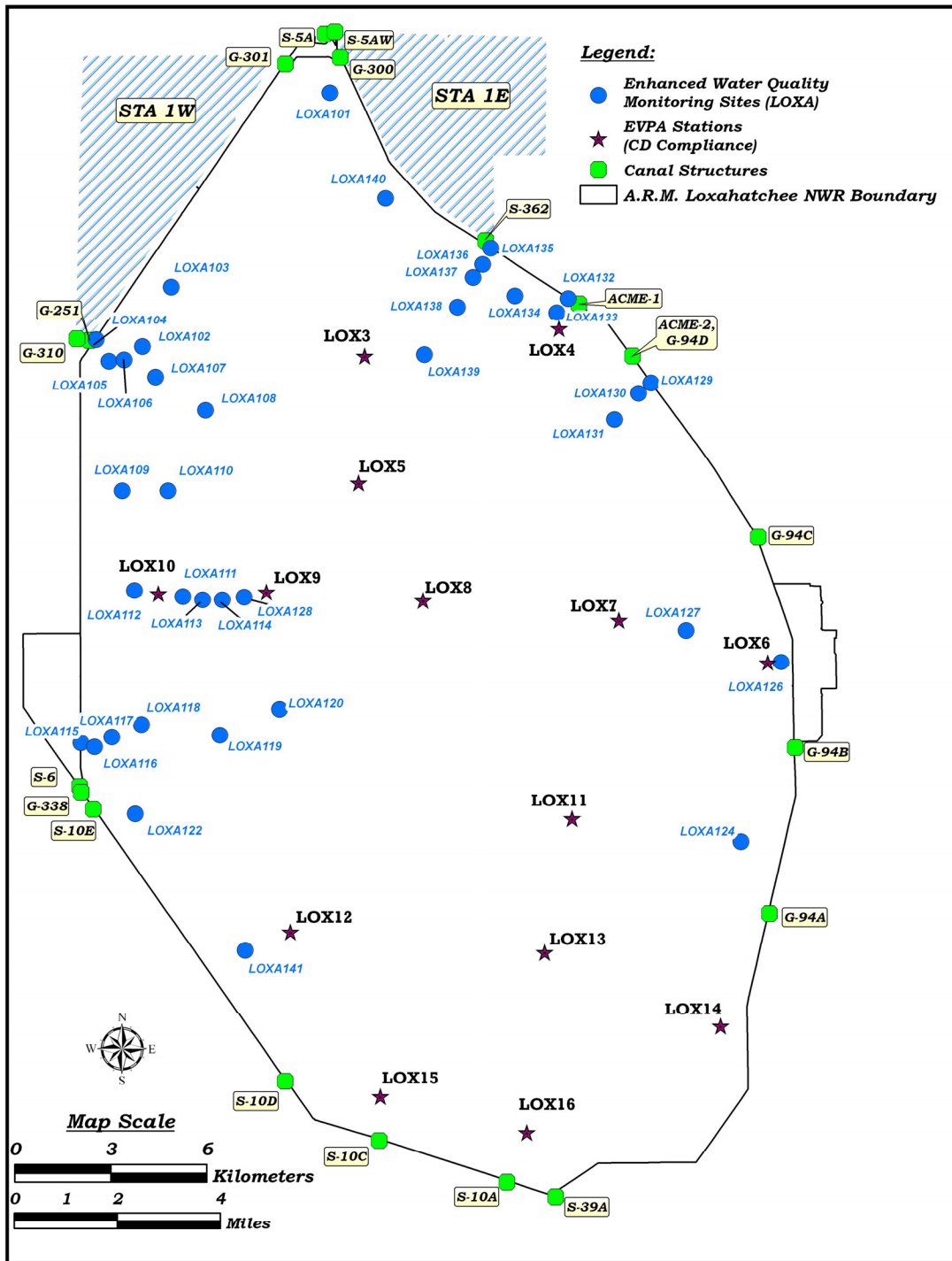


Figure 1. Location of Enhanced Water Quality Monitoring network stations (LOXA###), in relation to Consent Decree compliance stations (LOX##), for the A.R.M. Loxahatchee National Wildlife Refuge.

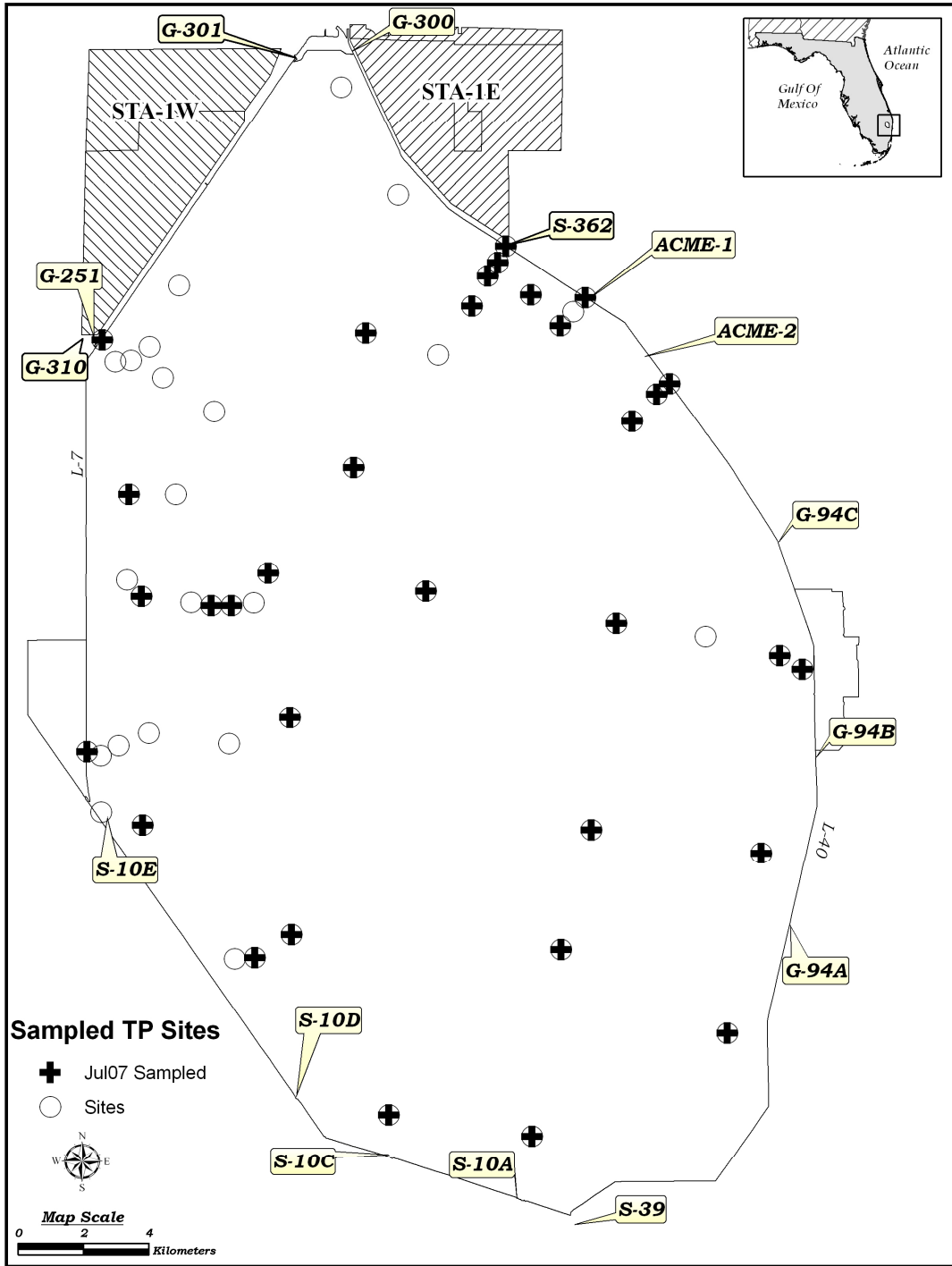


Figure 2. July 2007 map of total phosphorus sample collections from the Enhanced Water Quality Monitoring and the EVPA stations in the A.R.M. Loxahatchee National Wildlife Refuge. A primary reason that a station is not sampled is that it has less than 10 cm of clear water column representative of that area.

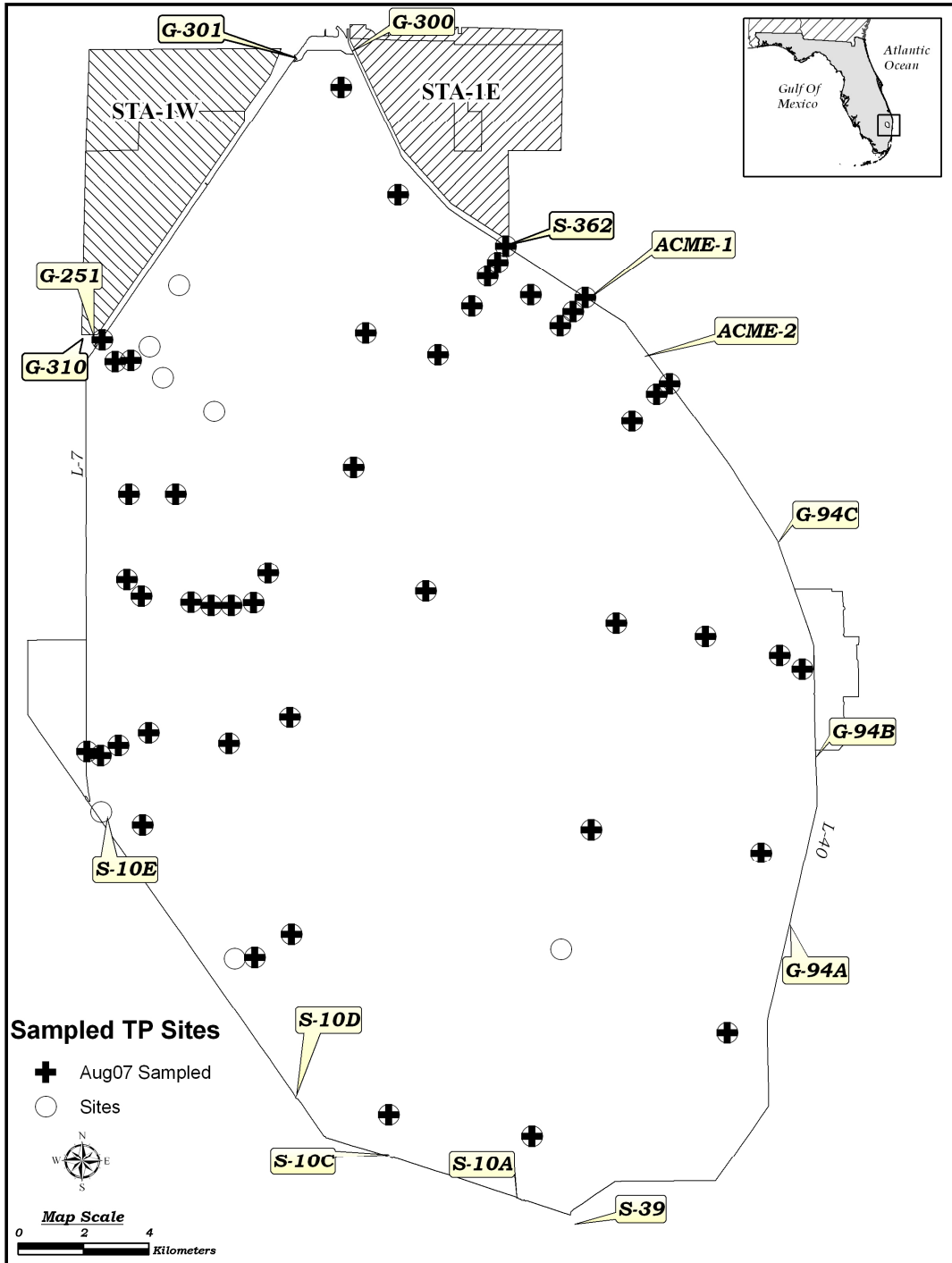


Figure 3. August 2007 map of total phosphorus sample collections from the Enhanced Water Quality Monitoring and the EVPA stations in the A.R.M. Loxahatchee National Wildlife Refuge. A primary reason that a station is not sampled is that it has less than 10 cm of clear water column representative of that area.

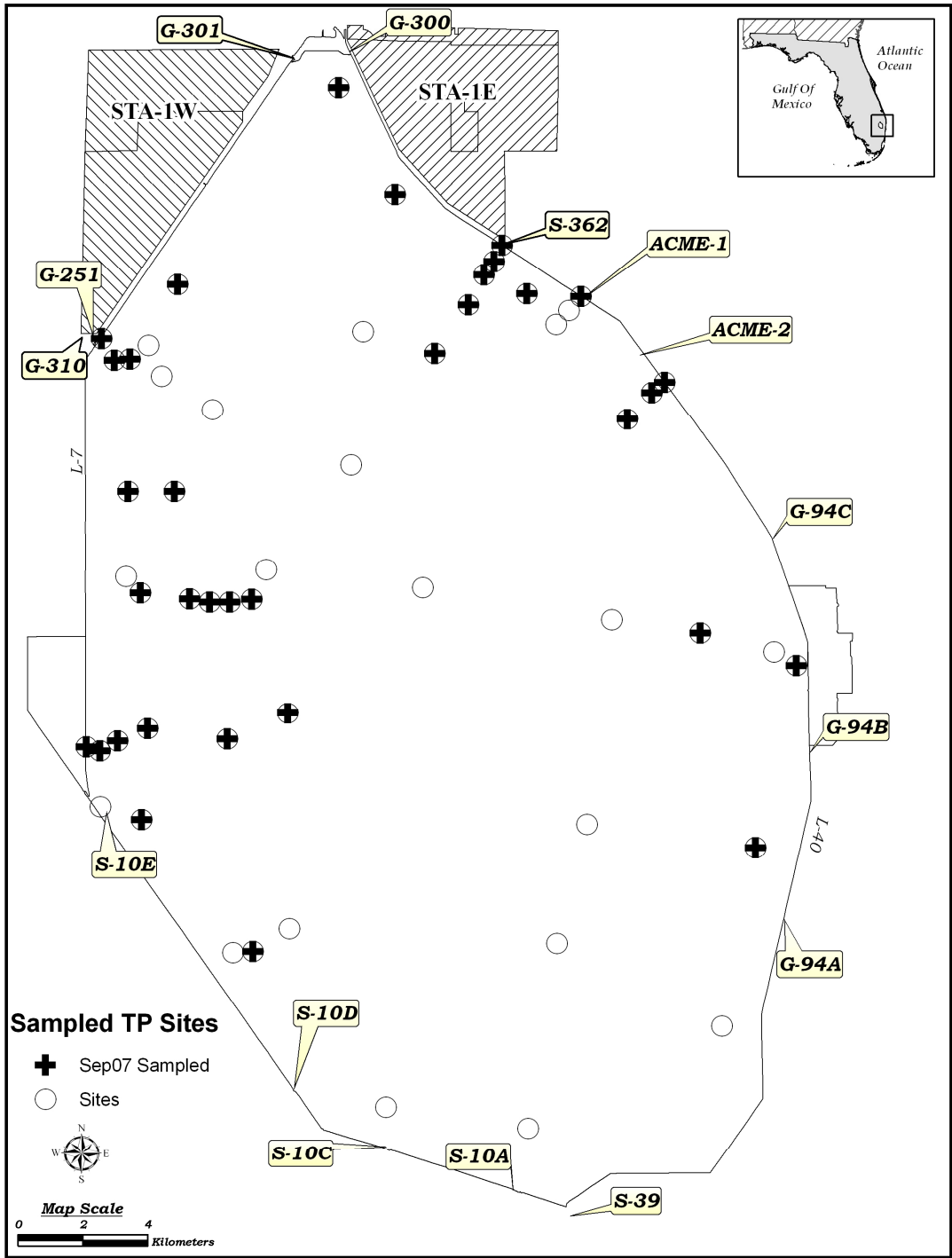


Figure 4. September 2007 map of total phosphorus sample collections from the Enhanced Water Quality Monitoring and the EVPA stations in the A.R.M. Loxahatchee National Wildlife Refuge. A primary reason that a station is not sampled is that it has less than 10 cm of clear water column representative of that area.