Appendix 2-1: Annual Permit Report for the Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component

Permit Report (May 1, 2010 – April 30, 2011)
Permit Number: 0221670
Permit Modification: 0221670-008-EM

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Contributors: Cheol Mo and Violeta Ciuca

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 the 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.

The Prairie Canal Backfill and Road Removal component, which was Phase 1 of the Picayune Strand Restoration Project, was completed in 2007 and post-construction monitoring is being conducted. Results from hydrologic monitoring are provided in this report for Water Year 2011 (WY2011) (May 1, 2010 – April 30, 2011). The canal has been plugged and no water is flowing, so no water quality sampling was conducted within the Phase 1 area. Exotic vegetation mapping and control for WY2011 is reported within this annual report. Also Year 4 (WY2011) of the post-restoration vegetation monitoring is reported.

Hydrology has improved within the Phase 1 footprint as well as in Fakahatchee Strand Preserve State Park to the east of the canal as a result of the canal backfilling and road degradation. Groundwater levels adjacent to the backfilled canal have risen by two feet in the summer wet season and five feet in the dry season. As groundwater rose in this area, drawdowns decreased on groundwater in the neighboring Fakahatchee Strand Preserve State Park. These effects extend 1 to 3 miles into the park.

[1] Contributed as SFWMD staff during the draft SFER production cycle.

Table 1. Key permit-related information.

Project Name:	Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component
Permit Number:	0221670
Issue and Expiration Date:	Issue: October 28, 2005 Expiration: October 28, 2010
Permit Modification Number:	0221670-008-EM
Issue and Expiration Date:	Issue: June 11, 2010 Expiration: June 10, 2015
Project Phase:	Post-Construction
Permit Condition Requiring Annual Monitoring Report:	Specific Condition 17
Relevant Period of Record:	Water Year 2011 (May 1, 2010 – April 30, 2011)
Report Generator:	Kimberly Chuirazzi kchuiraz@sfwmd.gov 561-682-2425
Permit Coordinator:	Nirmala Jeyakumar njeyaku@sfwmd.gov 561-242-5520 x3702

Table 2. Attachments included with this report.

Attachment	Attachment Title
A	Specific Conditions and Cross-References
B	Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component Water Quality Data
C	Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component Hydrologic Data
D	Picayune Strand Restoration Project Restored Footprint Exotics Mapping and Control Coordination – Annual Summary Effectiveness Assessment Report (November 2011)
E	Year 4 Post-Restoration Vegetation Monitoring of Prairie Canal and Control Transects – Picayune Strand Restoration PSRP Vegetation Monitoring 2011 Report (September 2011)

INTRODUCTION

PROJECT DESCRIPTION

The Prairie Canal Backfill and Road Removal Project was the first phase of the Picayune Strand Restoration Project. The Picayune Strand Restoration Project is a Comprehensive Everglades Restoration Plan (CERP) project with the objective to restore hydrological and ecological function of the region by establishing pre-development sheetflows and hydroperiods. The first phase of this larger restoration effort consisted of the elimination of channelized flow in the Prairie Canal. To accomplish this, a number of earthen plugs were constructed in the canal. Also, all roads east of Merritt Canal were demolished and degraded or filled to ground level. Source material for the canal plugs and swale blocks consisted of spoils that came from the original canal and swale excavations, as well as the demolition and degradation of the berms and roads.

PROJECT LOCATION

The project is located in the eastern portion of the Picayune Strand Restoration Project area (**Figure 1**), which is located in an area previously known as Southern Golden Gate Estates. The Prairie Canal and roads to be removed are located in Sections 1, 2, 11, 12, 13, 14, 23, 24, 25, 26, 35, and 36 of Township 50 South Range 28 East; and Sections 1, 2, 11, 12, 13, 14, 23, 24, 25, 26, and 35 of Township 51 South Range 28 East. All roads to the east of Merritt Canal were degraded (**Figure 2**). The area is located directly to the west of Fakahatchee Strand Preserve State Park. The filled canal forms the border between the two areas.

PROJECT OBJECTIVE

The objectives of the project are (1) restoration of the historic hydrologic regime including overland sheetflow, and historic water levels and durations (hydroperiods) through the backfilling of Prairie Canal and degradation of roads east of Merritt Canal; (2) recolonization of the construction footprint by native vegetation by controlling the invasion of exotic and nuisance vegetation; and (3) the restoration of historic plant and animal communities.

PROJECT HISTORY

The first phase of this larger restoration effort consisted of the elimination of channelized flow within Prairie Canal. To accomplish this, a number of earthen plugs were constructed along the seven miles of the canal. Also, all 65 miles of roads east of Merritt Canal (**Figure 2**) were demolished and degraded or filled to ground level. Excess materials from the road degradation were used as fill for the canals. More fill was available in the northern portion of the canal so more of the canal was filled in this area while plugs were used to fill the southern portion of the canal.

Work began in 2004 on the portion of the canal and roads north of 79th Street. Hydrologic effects were apparent in this area beginning in the 2005 rainy season. The plugging of the canal and demolition of the roads were completed on March 4, 2007 and effects began to be seen in 2007 in the area south of 79th Street. The effects are discussed in more detail in the *Hydrologic Improvements* section of this report.

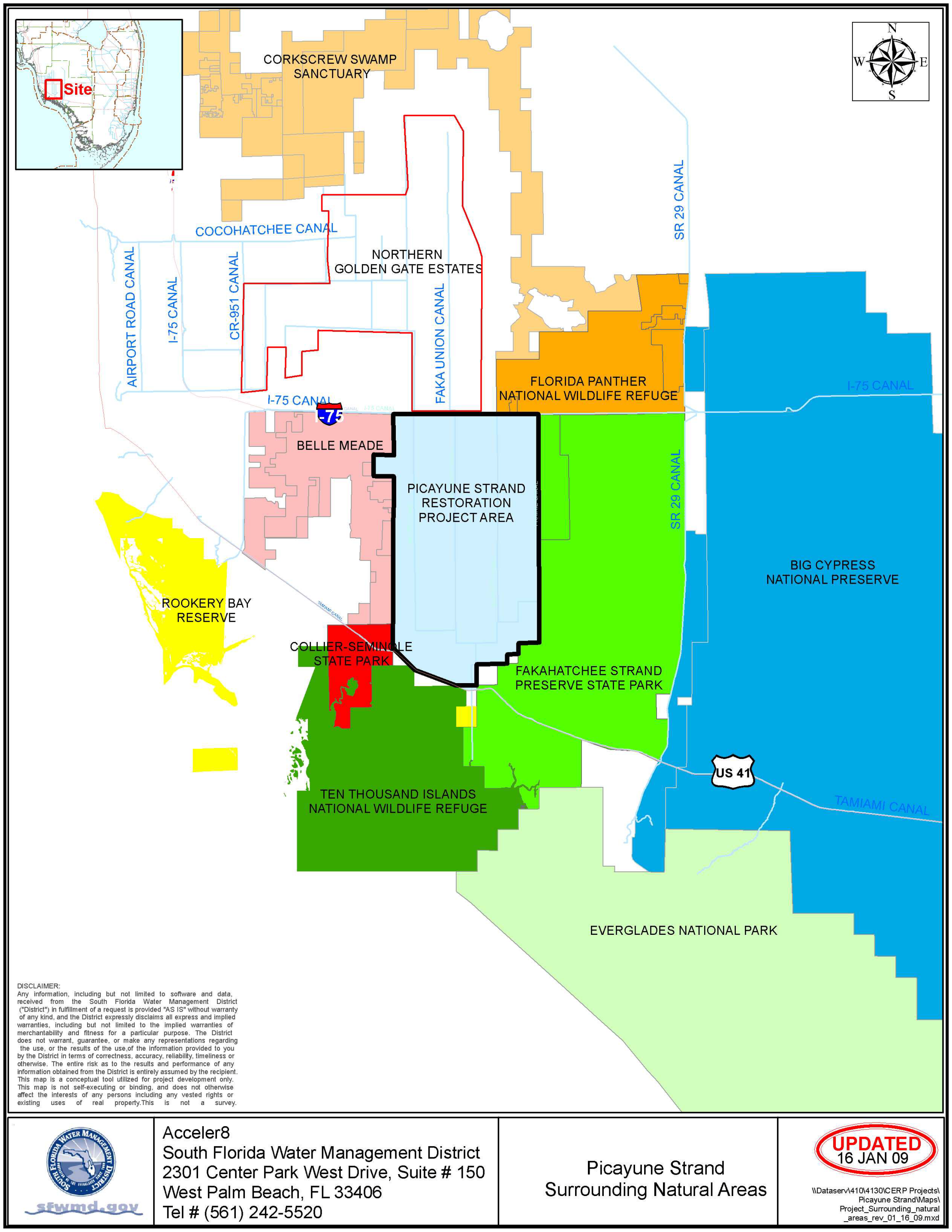


Figure 1. Picayune Strand Restoration Project area and surrounding areas.

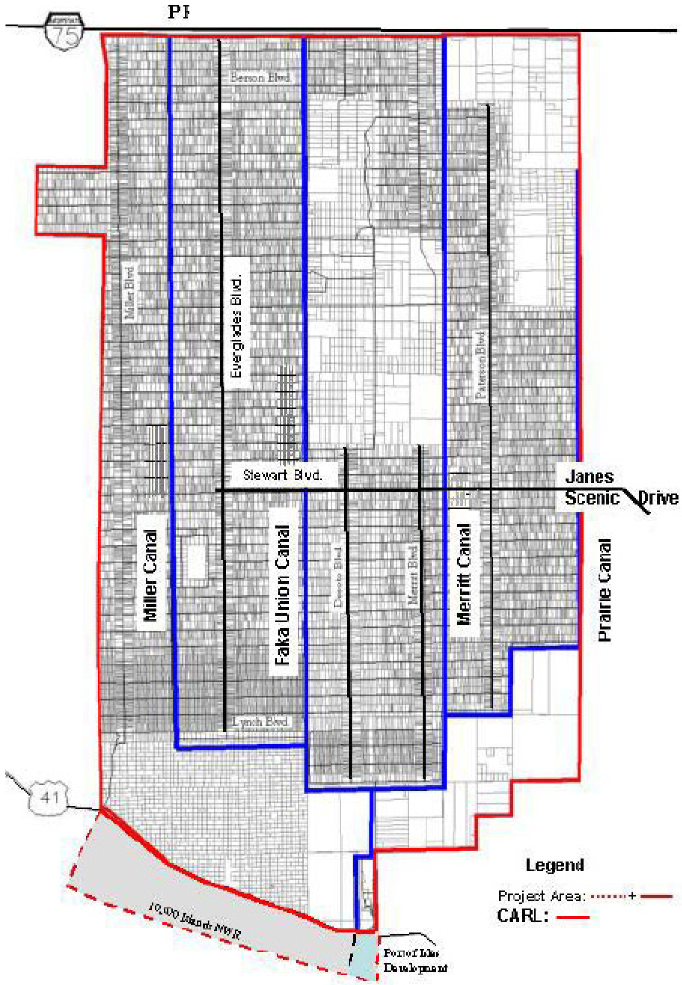


Figure 2. Map of the Picayune Strand Restoration Project area showing subdivision infrastructure prior to canal filling and road degradation.

PERMIT HISTORY

Permit number 0221670-001-GL was issued to the South Florida Water Management District (SFWMD) for the Prairie Canal Backfill and Road Removal Project on October 28, 2005. Specific condition 9 on page 7 of the of permit modifications beginning with 0221670-004-GL requires water level and water quality monitoring be conducted in accordance with the Prairie Canal Restoration Fish and Wildlife Resource Monitoring Vegetation Monitoring and Construction Protocol Plan dated October 14, 2002, and amended based on a letter from Kenneth Ammon, SFWMD, dated September 14, 2005. Specific condition 17 on page 9 of permit modification 0221670-004-GL requires the submittal of an annual report detailing the progress of the project for five years after the completion of construction. The annual report must include a discussion of results obtained from the monitoring plan mentioned earlier in the paragraph. Modification number 0221670-008-EM was issued on June 11, 2010, to modify the post-construction monitoring protocol for this project. At this time, per specific condition 9 on page 2, the Modified Prairie Canal Monitoring Plan (Version 2) replaced the previous plan. Specific condition 17, requiring annual reporting, is now on page 2 of the current modification (02211670-008-EM).

MONITORING AND REPORTING HISTORY

Past reporting for this project has been included in Volume I, Appendix 7A-2 of the *2008 South Florida Environmental Report* (SFER), 2009 SFER, and 2010 SFER, and in Volume III, Appendix 2-1of the 2011 SFER.

PROJECT STATUS

Monitoring continues for Phase 1 per the requirements in the permit modification 0221670-008-EM dated June 11, 2010. Groundwater levels will be measured and reported at the seven stations listed below in **Table 5** through 2050. Water quality is no longer monitored within the Phase 1 footprint as the plugging of Prairie Canal has eliminated surface water for water quality sampling. Once the pump stations currently under construction are operational, water quality will be measured as it enters and leaves the Picayune Strand Restoration Project area. Vegetation is required to be monitored annually for two years following construction and then every three years for six more years (years 1, 2, 4, 7 and 10) at the end of the growing season. Year 4 monitoring was conducted in WY2011. Assessment and treatment of exotic vegetation continues. Once a species has been completely eradicated (has 0.0% coverage for three consecutive years), it will be removed from the list of exotics to be monitored by the SFWMD. Exotic vegetation management will continue to take place throughout the Picayune Strand Restoration Project area through the Division of Forestry Land Management Program but it will not be reported in annual reports.

Work has also been completed on other phases of the Picayune Strand Restoration Project. This work is permitted under the United States Army Corps of Engineers Picayune Strand Restoration Project – Road Removal Project Permit SAJ 2005-6598. Permits 0288313-001 and 0288313-003 have also been issued to the United States Army Corps of Engineers for the Merritt and Faka Union phases, respectively, of the project and construction has commenced for both phases. The clearing and leveling of the logging trams east of Faka Union Canal is now complete, although the cleared vegetation needs to be spread across the tram footprint. The roads in the Merritt Canal phase have been removed with the exception of some that were left off the final plan and those needed to complete work on the pump station. Surveys to assure the area has been properly leveled are pending. Future work on the Merritt Canal phase includes the filling of the north–south portion of the Merritt Canal and completion of the pump station.

Wildlife monitoring will be conducted the first wet season following the first full year after filling the Merritt Canal. Monitoring will be conducted for Florida panther, wading birds, manatee, and aquatic fauna. These monitoring events are not scheduled until after the Merritt Canal is filled because no detectable results are expected to be realized until after the canal filling is completed. For other parameters, monitoring will commence after all three pumps being constructed are operational and the entire Picayune Strand Restoration Project is complete and one full wet season has passed.

WATER QUALITY MONITORING

Because the Prairie Canal has been backfilled, no water was flowing at any of the water quality stations during WY2011 and, therefore, no water quality data is being reported. If water quality data were collected it would have been reported in Attachment B.

HYDROLOGIC MONITORING

WEATHER

Daily rainfall and evapotranspiration (ET) data were retrieved from the SFWMD's DBHYDRO database for a weather station (SGGEWX) in the project area (**Table 3**). The annual average rainfall in the Southwest Rain Area is 54.12 inches (**Table 4**) (2010 SFER – Volume I, Chapter 2). The area received 42.85 inches during WY2011 (**Table 4**) indicating that this was a dry year with a rainfall deficit of more than 11 inches. As a result, WY2011 was an extreme drought year. The annual ET for WY2011 was 56.26 inches (**Table 4**). Most months, ET was higher than rainfall (**Table 4** and **Figure 3**). June and August 2010 were the wettest months. From October 2010 to April 2011, the area was dry with ET far higher than rainfall. This was a La Niña year and during these events in South Florida, dry season rainfall is likely to be below average. Daily rainfall is depicted in **Figure 4** and daily ET for WY2010 is shown in **Figure 5**. Data used for these analyses are provided in Attachment C.

Table 3. Hydrologic monitoring stations and database Dbkeys.

Site Name	Dbkey	Parameter
SGGEWX	OR084	Rainfall
SGGEWX	OR083	Evapotranspiration

Table 4. WY2011 and historical average monthly rainfall and WY2011 ET (May 1, 2010 – April 30, 2011)

Months	Rainfall		ET (inches)
	WY2011	Historical Average	
May	6.01	4.03	6.11
June	9.93	9.13	5.28
July	5.77	8.73	4.89
August	9.78	8.26	4.26
September	4.67	8.20	4.42
October	0.27	4.05	4.60
November	0.98	1.55	3.73
December	1.23	1.43	3.86
January	1.55	1.92	3.47
February	0.50	2.15	3.84
March	0.63	2.46	5.61
April	1.53	2.21	6.19
TOTAL	42.85	54.12	56.26

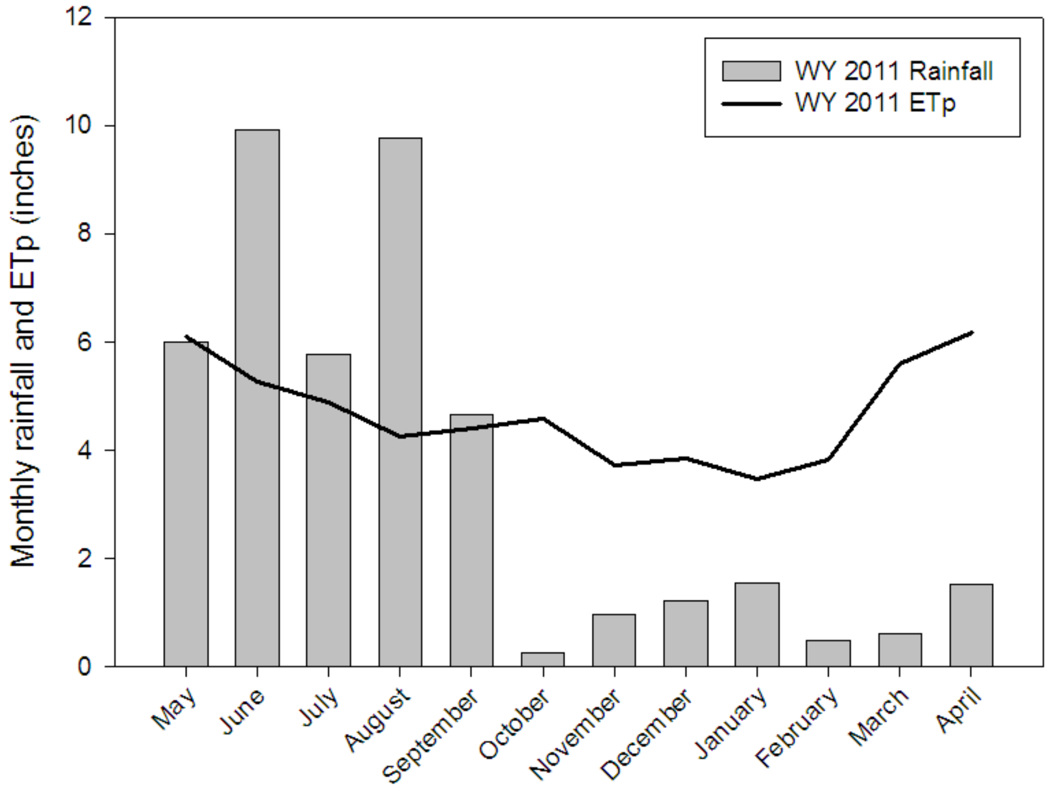


Figure 3. Monthly rainfall and ET at the Picayune Strand Restoration Project.

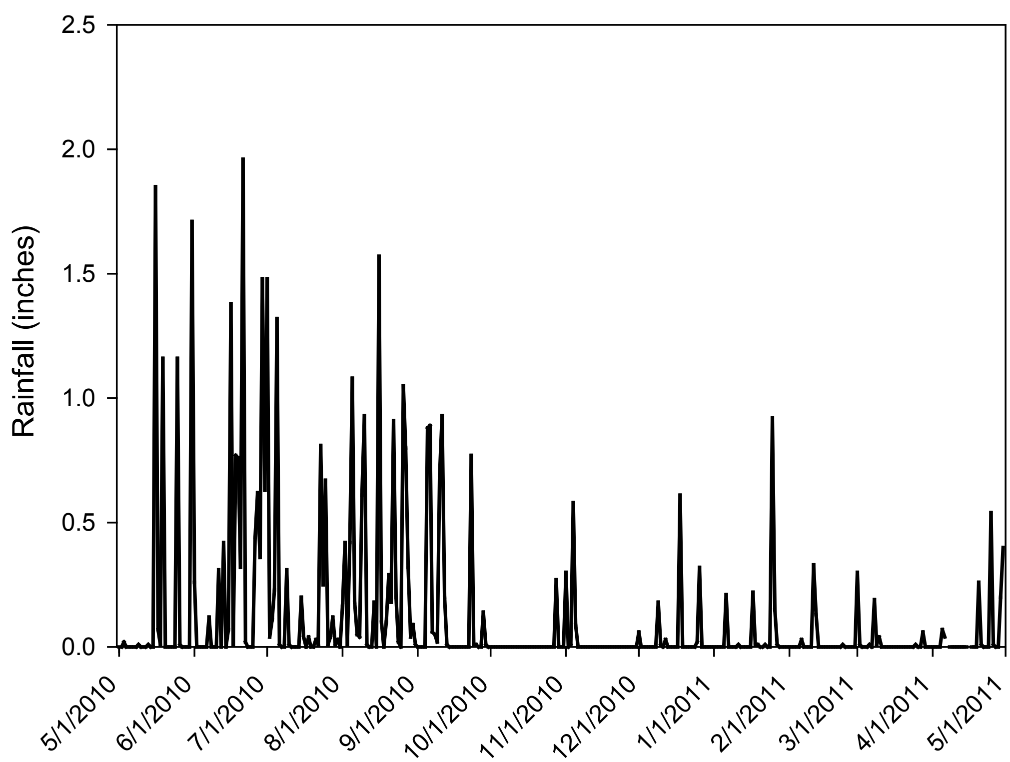


Figure 4. Daily rainfall in the Picayune Strand Restoration Project area.

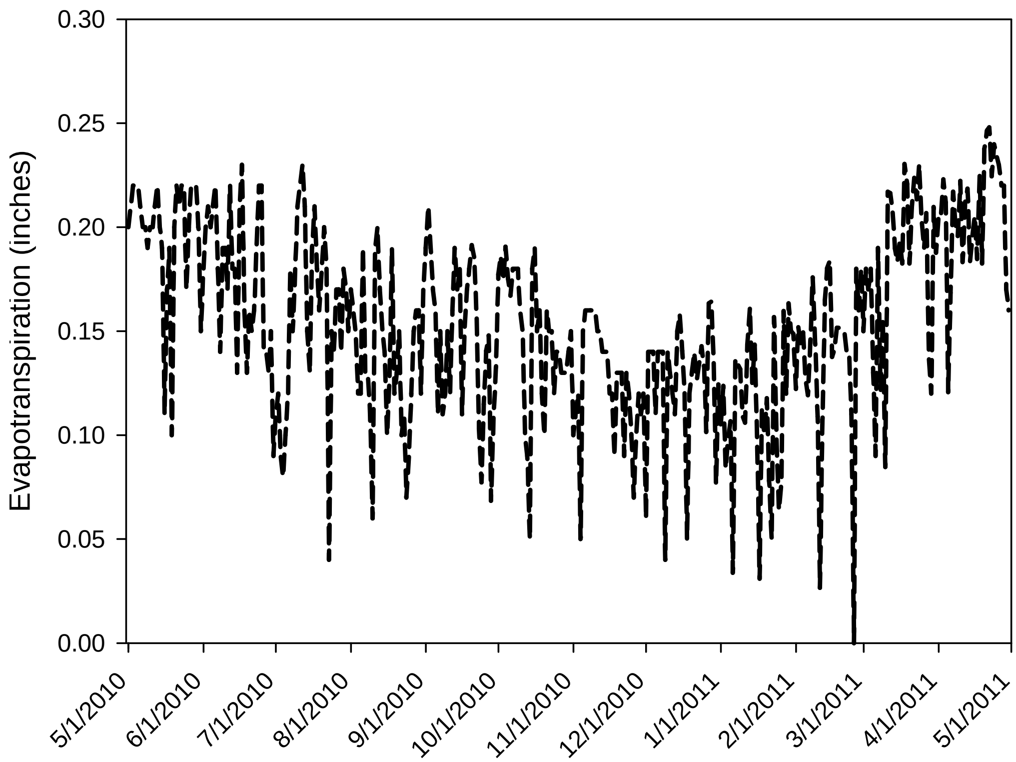


Figure 5. Daily ET in the Picayune Strand Restoration Project area.

GROUNDWATER LEVELS

For this phase of the project (Prairie Canal Backfilling and Road Removal), groundwater level is monitored at seven stations to the east of Merritt Canal, which are shown in **Figure 6** along with the rest of the Picayune Strand Restoration Project stations. The stations sampled are SGT1W5, SGT2W5, SGT2W6, SGT3W5, SGT3W6, SGT3W7, and SGT4W6. Information about these seven sites is presented in **Table 5**. These stations have been renamed since the permit was issued and the former names are also provided in the table. **Figures 7** through **13** show water levels and depths at each of the seven stations for the period of record. Extreme groundwater level declines reflect the extreme drought condition in the region. Data used for these analyses are provided as Attachment C.

Table 5. Water quality and groundwater level monitoring stations coordinates and database Dbkeys.

Latitude	Longitude	Status	DBHYDRO Station Name	Former Station Name	DBHYDRO Dbkey
260835.68	812811.048	Existing	SGT1W5	SGGE5SW	PT049
260635.995	812834.49	Existing	SGT2W5	SGGE10SW	PT059
260535.218	812739.212	Existing	SGT2W6	SGGE11SW	PT061
260319.78	812956.813	Existing	SGT3W5	SGGE16SW	PT069
260227.5	812747.2	Existing	SGT3W6	SGGE23SW	PT071
260252.501	812628.314	Existing	SGT3W7	SGGE17SW	PT073
260138.427	812842.013	Existing	SGT4W6	SGGE22SW	PT087

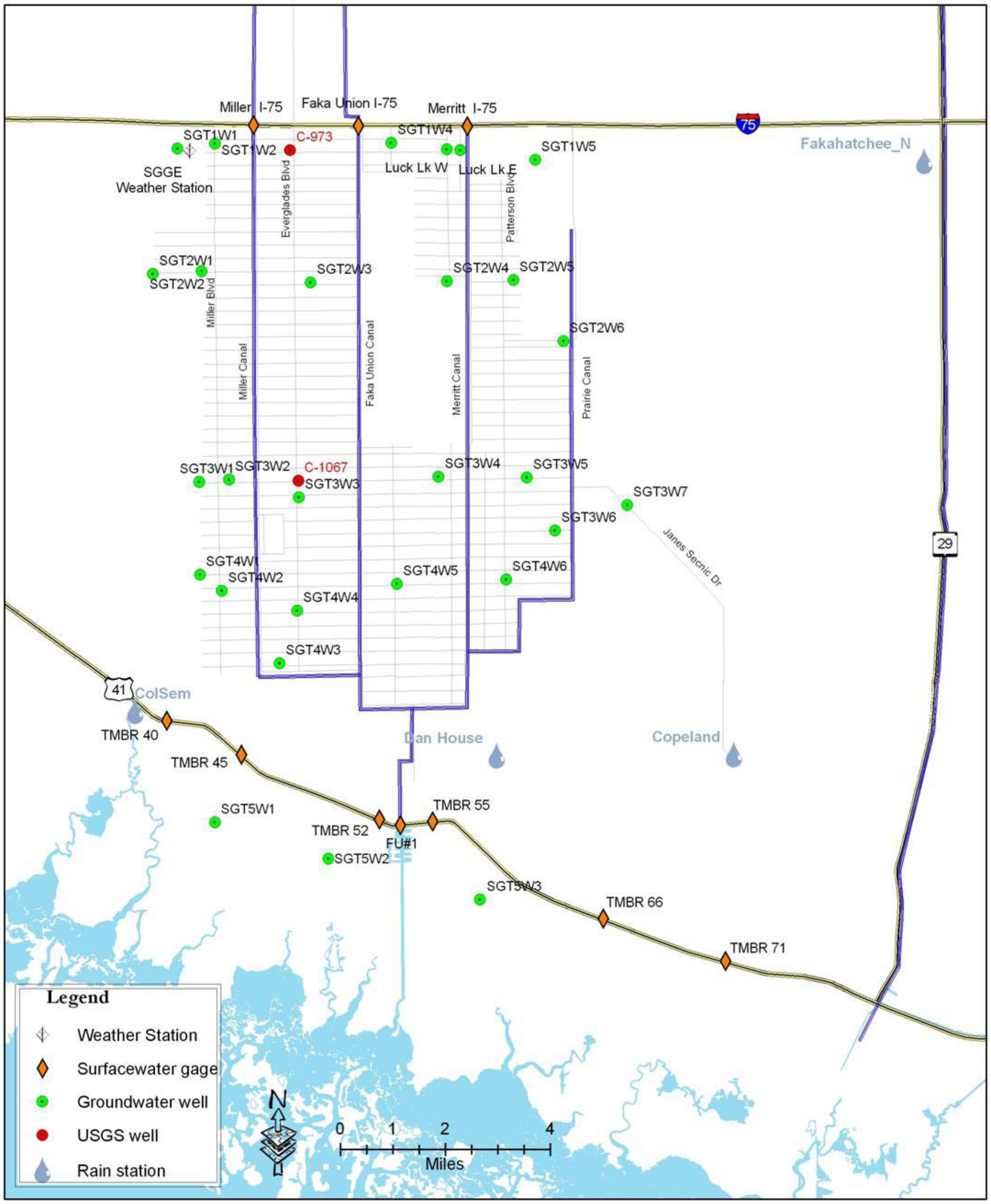


Figure 6. Map showing all water quality and hydrologic sampling stations for the Picayune Strand Restoration Project. Stations reported for this phase of the project are the seven stations to the east of Merritt Canal: SGT1W5, SGT2W5, SGT2W6, SGT3W5, SGT3W6, SGT3W7, and SGT4W6.

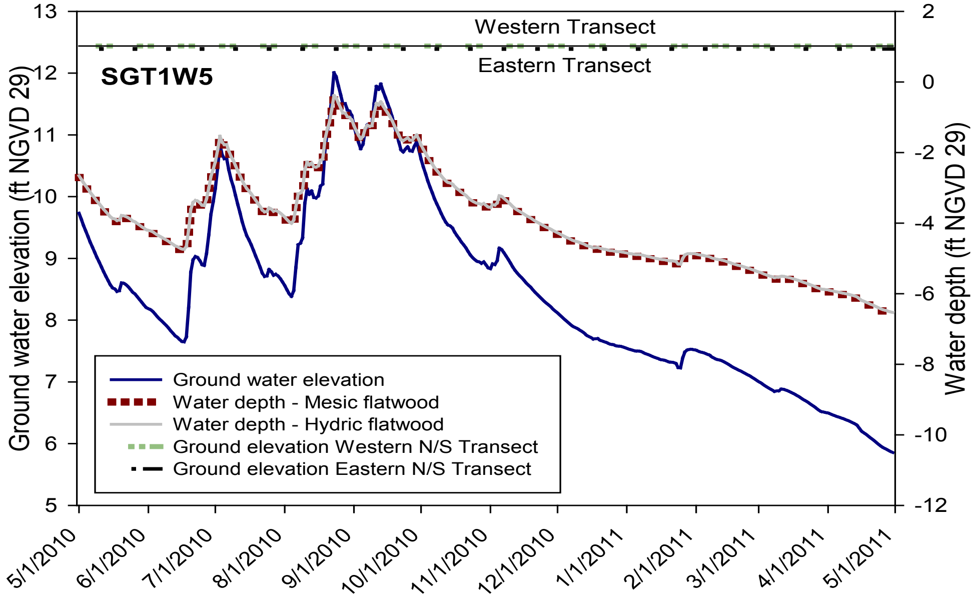


Figure 7. Ground elevation, groundwater elevation, and water depth for well SGT1W5.

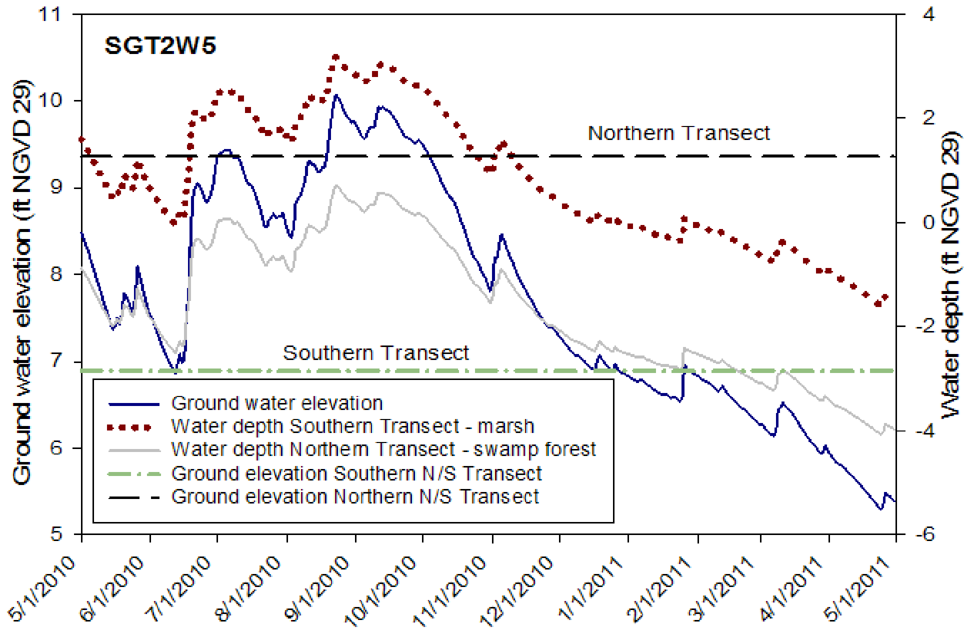


Figure 8. Ground elevation, groundwater elevation, and water depth for well SGT2W5.

N/S = north–south; ft NGVD 29 = feet National Geodetic Vertical Datum of 1929

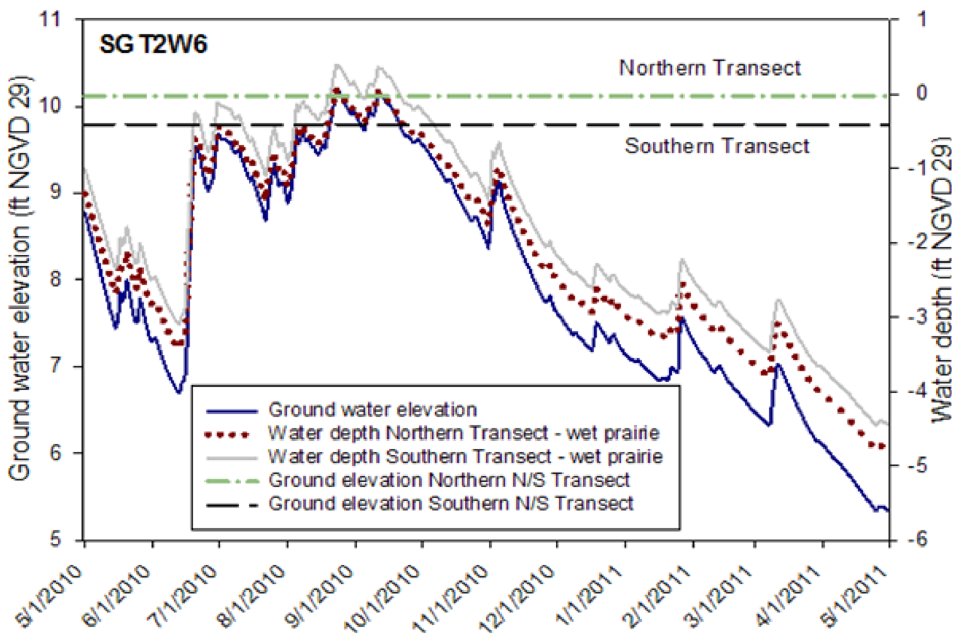


Figure 9. Ground elevation, groundwater elevation, and water depth for well SGT2W6.

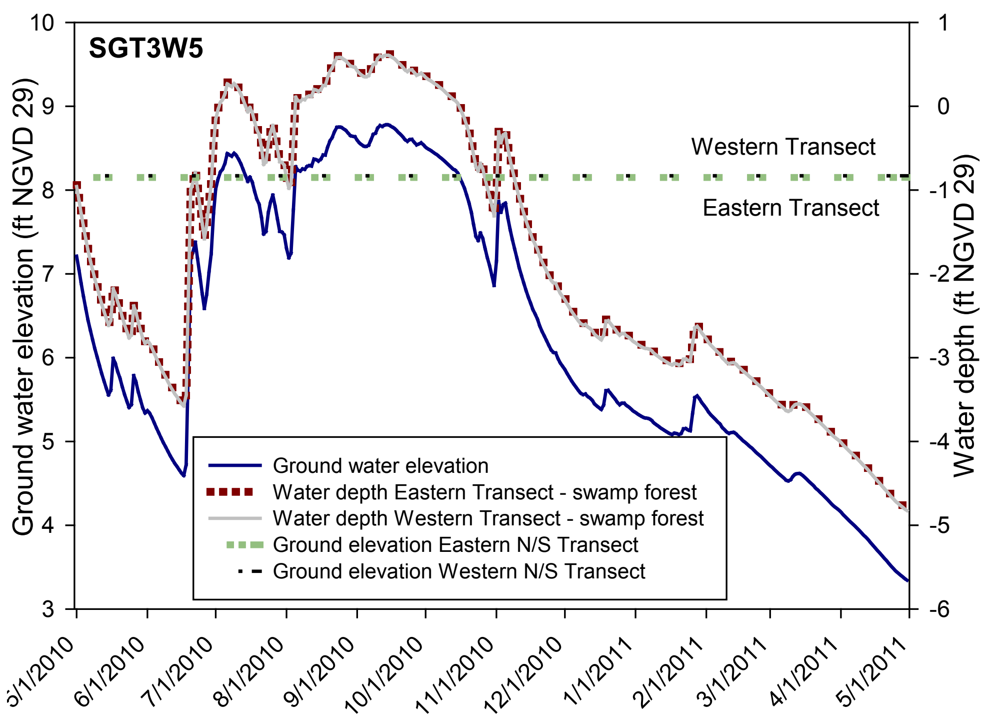


Figure 10. Ground elevation, groundwater elevation, and water depth for well SGT3W5.

N/S = north–south; ft NGVD 29 = feet National Geodetic Vertical Datum of 1929

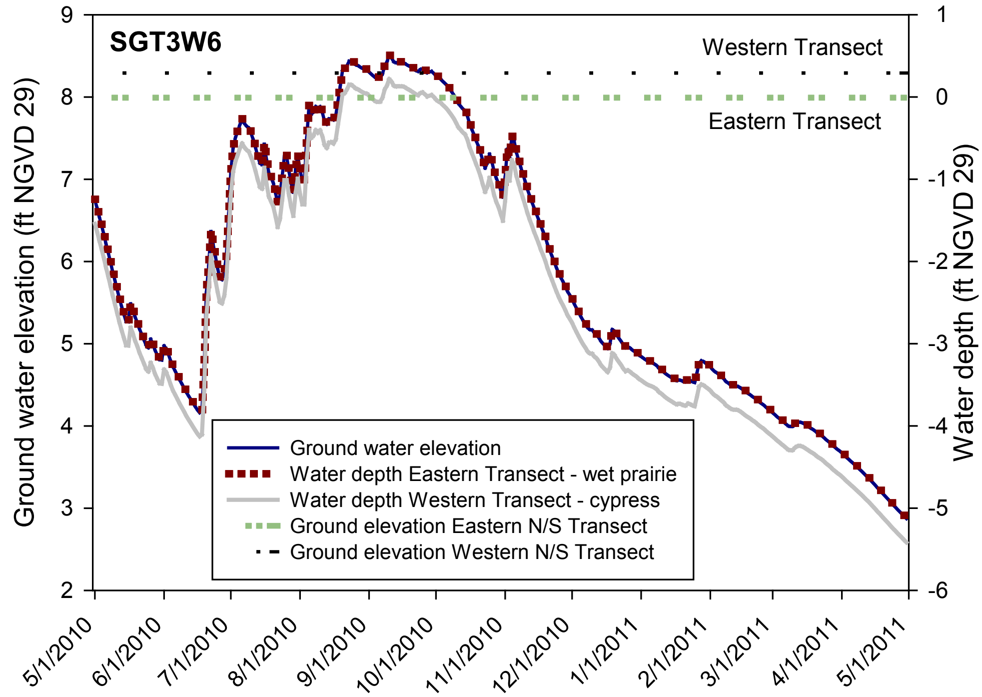


Figure 11. Ground elevation, groundwater elevation, and water depth for well SGT3W6.

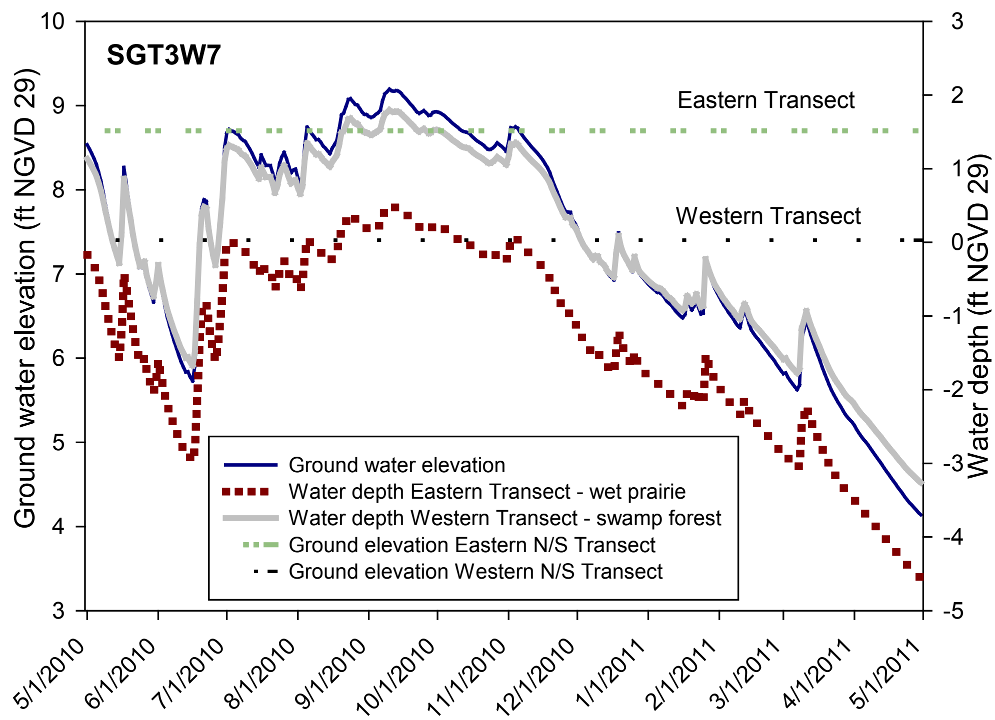


Figure 12. Ground elevation, groundwater elevation, and water depth for well SGT3W7.

N/S = north–south; ft NGVD 29 = feet National Geodetic Vertical Datum of 1929

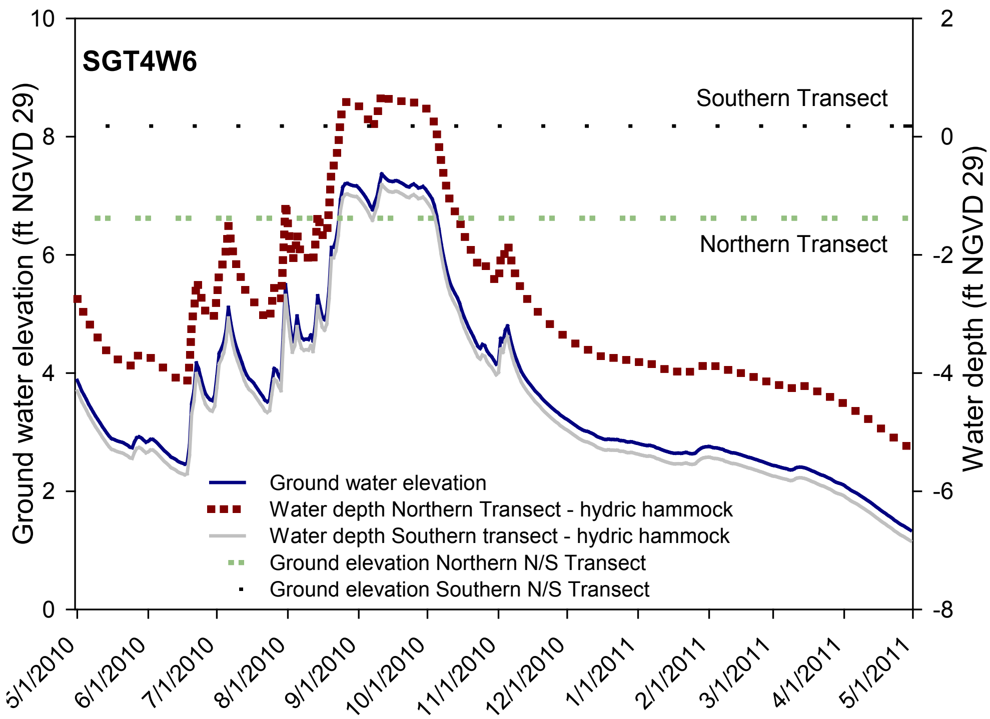


Figure 13. Ground elevation, groundwater elevation, and water depth for well SGT4W6.

N/S = north–south; ft NGVD 29 = feet National Geodetic Vertical Datum of 1929

A reference on natural systems' hydrologic regime (hydroperiods and water depths) for the various plant communities of Picayune Strand is shown in **Table 6** (Duever, 2008).

Table 6. Hydrologic regimes of major Southwest Florida plant communities.

Southwest Florida Plant Communities	Hydroperiod (months)	Seasonal Water Level (inches)	
		Wet	Dry (1,10)*
Xeric Flatwood	0	≤-24	-60, -90
Mesic Flatwood, Mesic Hammock	≤1	≤2	-46, -76
Hydric Flatwood, Hydric Hammock	1 - 2	2 - 6	-30, -60
Wet Prairie, Dwarf Cypress	2 - 6	6 - 12	-24, -54
Marsh	6 - 10	12 - 24	-6, -46
Cypress	6 - 8	12 - 18	-16, -46
Swamp Forest	8 - 10	18 - 24	-6, -36
Open Water	>10	≥24	< 24, -6
Tidal Marsh, Mangrove, Beach	Tidal	Tidal	Tidal

* 1 = average year low water, 10 = 1-in-10 year drought

HYDROLOGIC IMPROVEMENT

In addition to improved hydroperiods shown in **Figures 7** through **13**, the backfilling of Prairie Canal continues to decrease drawdowns in Fakahatchee Strand Preserve State Park even though this past water year experienced a drought. This can be seen by comparing water levels measured at 24 wells placed along two transects within the park (**Figure 14**). The effects can be seen by comparing the drawdowns experienced in 2003 for the North (**Figure 15**) and South (**Figure 16**) Transects to those in 2011 (**Figure 17** and **Figure 18**). Prior to the filling and plugging of the canal, water levels of those closest to the canal were lower than those more than five miles away from the canal. This is especially true during the dry season. The difference in water levels between the west and east end of each transect should lessen even more once the Merritt Canal is filled.

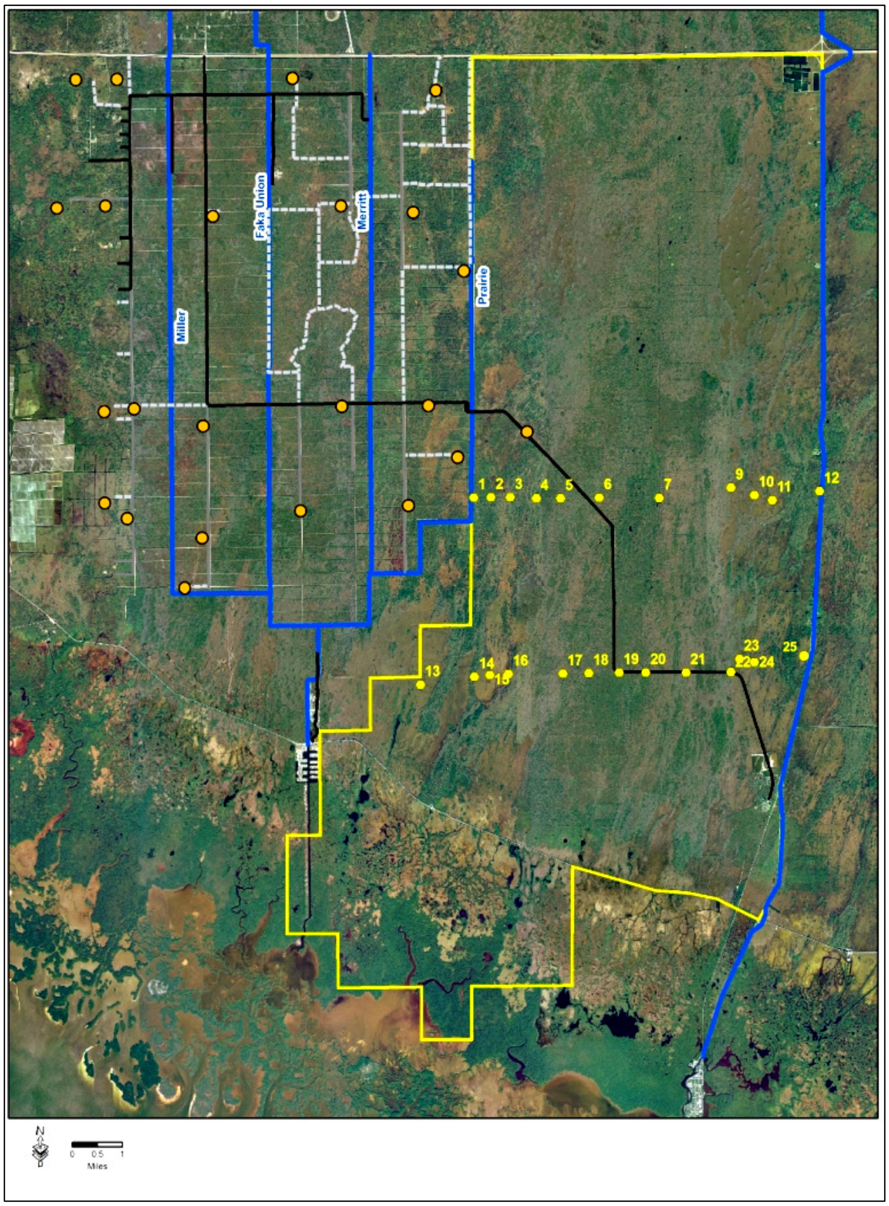


Figure 14. Yellow dots indicate groundwater wells within Fakahatchee Strand Preserve State Park. Orange dots indicate the wells shown in **Figure 6**.

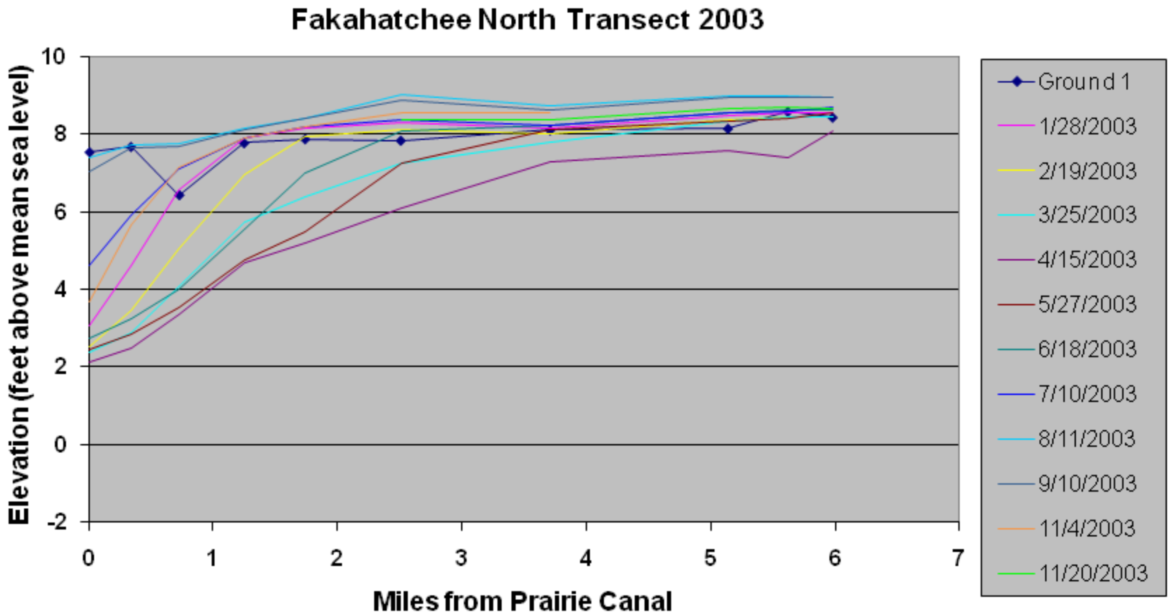


Figure 15. 2003 monthly water profiles (January–December) for Fakahatchee Strand Preserve State Park North Transect.

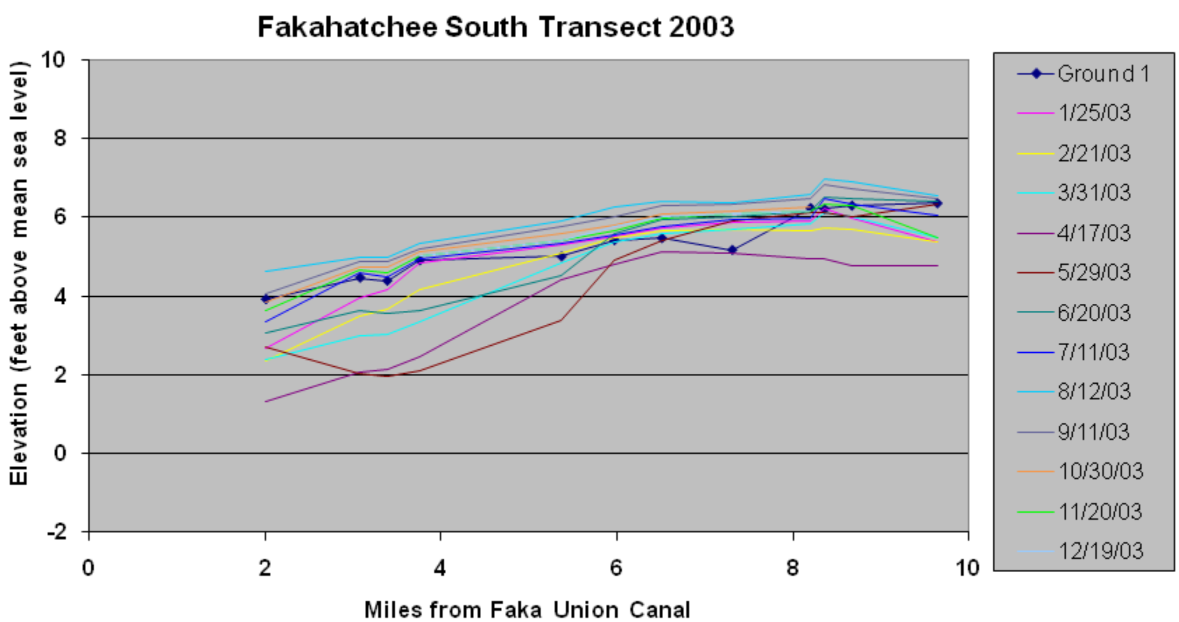


Figure 16. 2003 monthly water profiles (January–December) for Fakahatchee Strand Preserve State Park South Transect.

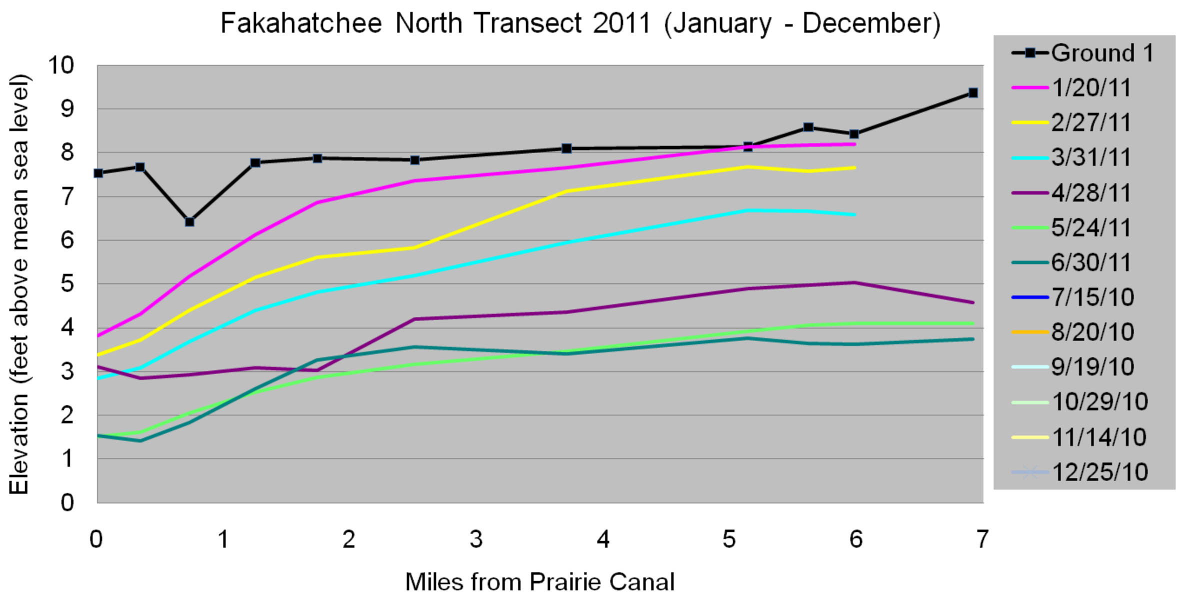


Figure 17. 2011 monthly water profiles (January–December) for Fakahatchee Strand Preserve State Park North Transect.

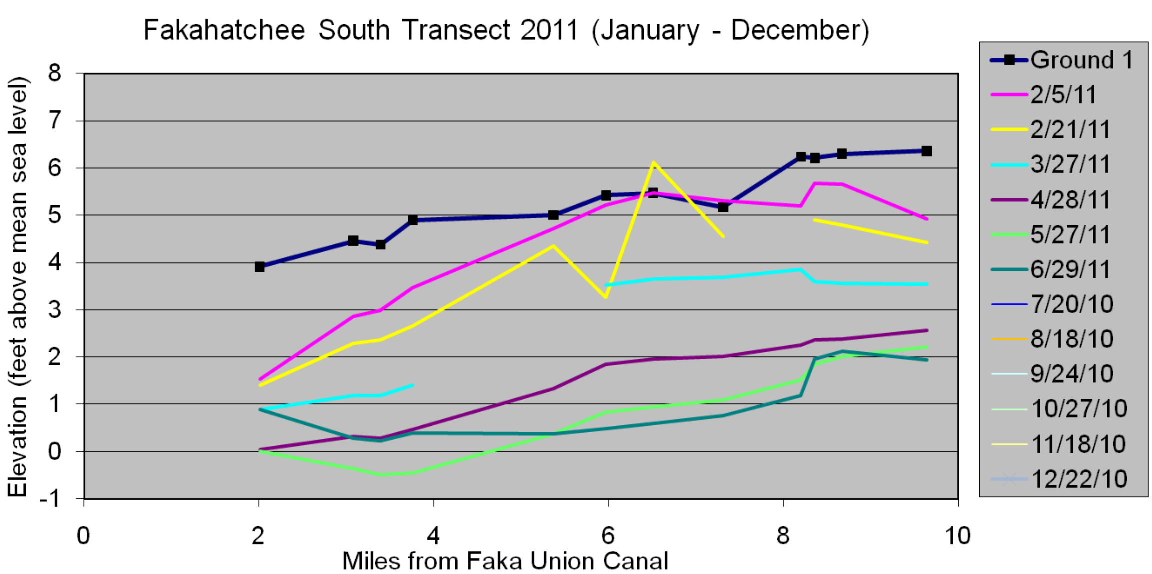


Figure 18. 2011 monthly water profiles (January–December) for Fakahatchee Strand Preserve State Park South Transect.

EXOTICS MAPPING AND CONTROL

Mapping of exotic and nuisance vegetation continued in WY2011 within the footprint of the filled Prairie Canal, the cleared road and house demolition footprints east of Merritt Canal, and the soil inversion sites off Miller Boulevard. Exotic control efforts were also conducted during the water year. The mapping and control efforts are documented in Attachment D, which contains the draft Picayune Strand Restoration Project Restored Footprint Exotics Mapping and Control Coordination – Annual Summary Effectiveness Assessment Report (September 2011) prepared by Environmental Resources Management under contract to the SFWMD.

VEGETATION TRANSECT MONITORING

Year 4 post-restoration vegetation monitoring of Prairie Canal and control transects was conducted in WY2011. The draft report is provided in Attachment E.

WILDLIFE MONITORING

Implementation of the entire Picayune Strand Restoration Project will provide more accurate wildlife data rather than monitoring prior to completion of the entire restoration project. However, in the interim before completion of the entire restoration project ongoing wildlife will be conducted the first wet season following the first full year after the Merritt Canal backfilling has been completed. Florida panther, wading birds, manatee and aquatic fauna will be monitored during this interim period. The monitoring events are not scheduled until after the Merritt Canal is filled because no detectable results are expected to be realized until after canal filling is completed.

REFERENCES

Duever, M. 2008. The Pre-Restoration Status of Wetlands Within and Near Picayune Strand. South Florida Water Management District, West Palm Beach, FL.

Attachment A: Specific Conditions and Cross-References

Table A-1 provides specific conditions, actions taken, and cross-references for the Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component, FDEP Permit Number 0221670-005-GL, Permit Modification 0221670-008-EM.

Table A-1. Specific conditions, actions taken, and cross-references presented for the Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component, Permit Number 0221670-005-GL, Permit Modification: 0221670-008-EM.

Specific Condition	Description	Applicable Phase	Action & Frequency	Table	Narrative	Graphical	Attachment
8	**Water Quality** ammonia, biochemical oxygen demand, hardness, nitrate, nitrite, nox, ortho phosphorus, total dissolved solids, total kjeldahl nitrogen, total phosphorus, total suspended solids, chlorophyll-a, phaeophytin, alkalinity, manganese, magnesium, dissolved silica, sulfate, iron, pH, dissolved oxygen, specific conductance, temperature, sample depth, total depth	pre-construction and during construction until Prairie Canal is fully filled/plugged	monthly grab samples when water is flowing	NA	p. 6	NA	B
8	**Weather** Rainfall and Evapotranspiration at station SGGEWX	post-construction	daily automatic weather recordings	Table 3, p. 7 Table 4, p. 7	p. 7	Figure 3, p. 8 Figure 4, p. 8 Figure 5, p. 9	C
8	**Water Levels at 7 Stations** SGT1W5 (formerly SGGE5SW) SGT2W5 (formerly SGGE10SW) SGT2W6 (formerly SGGE11SW) SGT3W5 (formerly SGGE16SW) SGT3W6 (formerly SGGE23SW) SGT3W7 (formerly SGGE17SW) SGT4W6 (formerly SGGE22SW)	pre- and post-construction	daily automatic stage gage recordings	Table 5, p. 9	p. 9	Figure 6, p.10 Figure 7, p. 11 Figure 8, p. 11 Figure 9, p. 12 Figure 10, p. 12 Figure 11, p. 13 Figure 12, p. 13 Figure 13, p. 14	C
16	**Vegetation Transects**	pre- and post-construction	transect monitoring	NA	p. 18	NA	E
16	**Wildlife** macroinvertebrate, fish and amphibian, small mammals, birds, and other wildlife	after Merritt Canal phase is complete	various		p. 18		
17	**Project Status**	ongoing			p. 6		
17	**Hydrologic Improvement**	pre- and post-construction	stage gauge recordings in project area and in Fakahatchee Strand		p. 15	Figure 14, p. 15 Figure 15, p. 16 Figure 16, p. 16 Figure 17, p. 17 Figure 18, p. 17	
17	**Exotic Footprint Mapping and Control**	post-construction	mapping and control of exotic species during growing seasons		p. 18		D

Attachment B: Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component Water Quality Data

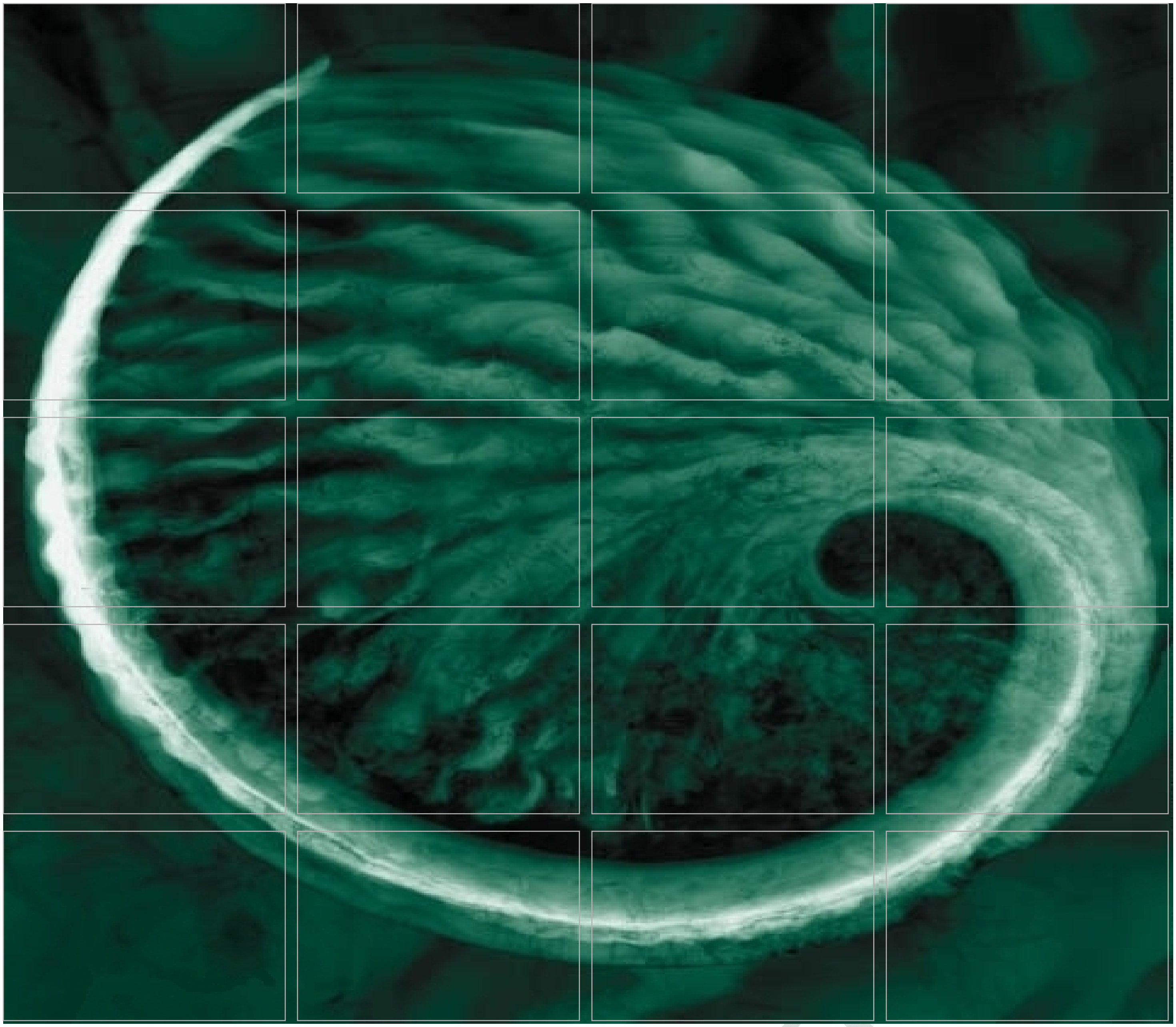
No water was flowing within the project area during WY2011 so no water quality data was collected within the project area.

Attachment C: Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component Hydrologic Data

This project information is required by Specific Condition 8 of the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit for the Picayune Strand Restoration Project, Phase 1 – Prairie Canal Backfill and Road Removal Component, and is available upon request.

Attachment D: Picayune Strand Restoration Project Restored Footprint Exotics Mapping and Control Coordination, Annual Summary Effectiveness Assessment Report (November 2011)

Note: For reader convenience, this document is being produced verbatim and has not been revised by the SFER production staff. The document, dated November 2011, was provided to the South Florida Water Management District by Environmental Resources Management under Work Order #4600001953-WO3.



Picayune Strand Restoration Project Restored Footprint Exotics Mapping and Control Coordination – *Annual Summary Effectiveness Assessment Report (November 2011)*

Prepared for:
South Florida Water Management District
Fort Myers Service Center
2301 McGregor Boulevard
Fort Myers, Florida 33901

Work Order No. 4600001953-WO3

November 16, 2011

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South Florida Water Management District

Picayune Strand Restoration Project Restored Footprint Exotics Mapping and Control Coordination

Annual Summary Effectiveness Assessment Report (November 2011)

Work Order No. 4600001953-WO3

November 16, 2011

Steven C. Hess, Ph.D.
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1.0 INTRODUCTION

Environmental Resources Management-Southeast, Inc. (ERM) was retained by the South Florida Water Management District (SFWMD) to provide Biological/Ecological Monitoring, Assessments, Consultation, and Coordination Services under Contract No. 4600001953, dated June 30, 2010. Work Order No. 4600001953-WO3, between the SFWMD and ERM, was issued for Exotic and Nuisance Native Vegetation Control Coordination and Vegetation Monitoring for the Picayune Strand Restoration Project. At the request of the SFWMD, this work is being performed by ERM and our subcontractor, The Institute for Regional Conservation (IRC), which has been providing such services related to the Picayune Strand Restoration since approximately 2008.

The scope of work included in the subject Work Order includes mapping exotic and nuisance vegetation within the footprint of the filled Prairie Canal, the cleared road and house demolition footprints east of Merritt Canal, and the soil inversion sites off Miller Boulevard. The scope of work also included the coordination of exotic control efforts conducted by Applied Aquatic Management, Inc. (AAM), which is operating under a separate contract with the SFWMD.

ERM's Work Order was executed by the SFWMD on March 1, 2011; however, the documentation of vegetation monitoring and exotic control efforts reported under the subject work order dates back to February 1, 2011. This report is the first Annual Summary Effectiveness Report and covers the efforts completed February 1 to September 30, 2011. To maintain continuity with these previous reports, IRC Senior Biologist, Mr. Mike Barry, was the lead for all fieldwork and preparation of this report.

2.0 METHODS

The geodatabase established between February and October 2008 was utilized and updated for post-treatment and rainy season exotic species cover values and to coordinate new control efforts, based on spot field assessments of the contract area.

The geodatabase (IRC_Master_GDB.mdb, ArcView 9.3 geodatabase format) incorporates points, lines, and polygons of exotic and nuisance vegetation recorded during initial survey efforts with updated values for this fiscal year for density and/or percent cover. Mapping utilized an existing geodatabase and methodology based on the FNAI Florida Invasive Plants Geodatabase project (http://fnai.org/invasivespecies.cfm) with modifications. Modifications included expansion of scope of species mapped. Additionally, survey track logs with percent cover of dominant exotic species along the track route were incorporated to strengthen the data set for production of polygon maps. All Florida Exotic Pest Plant Council (FLEPPC) Category I and II species were recorded in the field, as with FNAI methods. Additional exotic species proven to exhibit invasive behavior in Collier County, but not yet listed by FLEPPC, such as West Indian Pennisetum (*Pennisetum polystachion*) and tannergrass (*Urochloa arrecta*) also were included. Moreover, two native species with potential nuisance behavior, cattail (*Typha domingensis*) and common reed (*Phragmites australis)* also were mapped. Fixed-point, panoramic photographic series were taken occasionally. The initial photograph of each panorama was taken facing north, and additional overlapping photos were taken in a clockwise direction until facing north again. GPS points were recorded at each photo station.

The field team was available for onsite orientation of the exotic control contractor upon initiating control efforts. The field team was also available, as needed, for interpretation of maps, plant identification, discussion of priorities, or adjustment of control methodologies during treatments. A more basic survey of the entire footprint was conducted as the contractor completed each section, with field work timed with other needs of the contractor whenever possible, reporting any missed areas to the contractor, preferably prior to de-mobilization.

Spot assessments of treatment sites were conducted from 1-3 months post-treatment to generally evaluate control methods on target species. GPS track logs were taken into the 50-foot buffer areas around the cleared areas to verify the distance into the buffer area that was treated, and to get an idea of how much was missed or re-sprouting. Emphasis was placed on identifying problems and successes in order to better strategize for future control efforts. Efforts were made to return to as many fixed-point photograph locations as possible to take post-treatment photographs.

3.0 RESULTS AND RECOMMENDATIONS

This report summarizes work completed by ERM and IRC under ERM's contract with the SFWMD and the exotic and native nuisance vegetation control efforts of Applied Aquatic Management, Inc., utilizing Fiscal Year 2011 treatment funds. This report is timed with the completion of all of the treatments planned for the fiscal year, including the fall grass treatments conducted when jaraguá (*Hyparrhenia rufa*) matured in October.

Foliar treatments this year have continued to focus on exotic grasses, especially torpedograss (*Panicum repens*) and cogongrass (*Imperata cylindrica*). The first foliar re-treatment of the footprints, demolition, and soil remediation sites started March 8, 2011 and were completed on April 19, 2011. The results of the first foliar re-treatment efforts were summarized in ERM's first bimonthly Status Report, dated June 15, 2011 (ERM 2011).

The second foliar re-treatment started April 20, 2011 and was in progress at the time of the above-noted report. The second foliar re-treatment was completed August 3, 2011 and is summarized in its entirety in this report. In contrast to the first foliar re-treatment, the second re-treatment placed more effort on searching for and treating cogongrass patches in buffer areas of recently cleared areas around the tie-back levee, ditches and demolition sites. Also, field crews undertook additional backpack treatments of both known and recently discovered areas of cogongrass in less accessible areas. These efforts are summarized separately.

Re-treatment of Brazilian-pepper (*Schinus terebinthifolius*) at the demolition sites began May 9, 2011 and was completed on August 4, 2011 in the Broken Wing area. These efforts also are fully summarized in this report.

Additional re-treatments of torpedograss were conducted due to falling water levels (in remaining pools of former Prairie Canal) and later seed germination, following the delayed onset of the rainy season. This work also is summarized in this report.

Also an 'emergency' treatment of caesarweed (*Urena lobata*) was conducted (completed July 28, 2011) at the demolition sites and their buffers, which burned in the Cobalt Fire on May 12, 2011, causing large areas of nearly solid recruitment.

Re-treatment of both exotic grasses (first foliar re-treatment of Fiscal Year 2011), and the first re-treatment of Brazilian-pepper (including miscellaneous hardwoods) were treated at the demolition sites in the Merritt phase. These areas had been treated last summer (September 2011).

Finally, re-treatment and assessment of the cover of fall flowering grasses was initiated October 26, 2011 and completed November 2, 2011. This treatment specifically targeted jaraguá, which flowers in October and is otherwise difficult to see in the footprints.

Work has entailed the continued coordination of ongoing treatments, including uploading known locations into crew GPS units and printing maps reflecting the status of the work crew efforts during the prior week, as well as the associated general logistical assistance.

Fieldwork has continued in re-assessing the cover of exotic grasses in the footprints and demolition sites. Fieldwork also has included revisits to existing photo points in these areas, as well as the establishment of several new photo points.

Post-fieldwork efforts have included weekly downloads of crew GPS data to record areas treated and to add exotic points to the geodatabase for new infestations discovered by the eradication and monitoring crews.

Assessment of overall coverage by exotic and nuisance species is performed by comparing 2011 cover to data for the previous year. In general FLEPPC listed exotic and nuisance species have been maintained at or below maintenance levels in the Prairie Canal phase footprints and demolition sites, and some headway has been made in the Merritt phase demolition sites. The cover values presented herein represent pre-treatment levels or full recovery from last fiscal year's treatments.

3.1 WEATHER AND WATER LEVELS

Weather again has played an important role determining treatment strategy and field work. This fiscal year we again experienced extremes in temperature, as well as departure from average rainfall and resulting hydrological patterns. Naples temperatures and Big Cypress National Preserve rainfall is presented in Figures 1 and 2, as acquired from The South Florida Watershed Journal website (http://www.gohydrology.org, linked to:

http://www.fgcu.edu/bcw/swamp/journal/Temp_NaplesDaily.gif; and http://www.fgcu.edu/bcw/swamp/rain/R_BC.gif).

Figure 3 shows water levels onsite in well SGT2W5 at 70th Avenue, just east of Patterson.

Temperatures in early December 2010 included a series of hard-freeze nights (Figure 1). Additional freeze events associated with cold fronts in January-February were anticipated; however, temperatures stayed just above freezing on most nights. Because of the early-December, hard freeze, no exotic control treatments were feasible during the cooler months, which are typically the most productive (in terms of labor crews). In April, temperatures increased immediately to the 80s and 90s, starting summer-like afternoon highs very early in the year. Temperatures remained well above average through mid-June, when such temperatures are anticipated, and it remained hot through the entire treatment period, ending the first week of September.

Exotic control crews experienced a worst case scenario for temperatures, as it was already in the 90s when they began working in early May; the late start of treatment operations having been caused by the need to wait for plant recovery from the very early freeze. The heat index averaged over 100 degrees for the entire treatment period since May and regularly exceeded 115 degrees. This excessive and early heat represented a significant health and safety risk to the work crews and severely limited productivity. Because of the experience of the crew leaders in the field no heat-related injuries resulted.

Rainfall this season was below average, especially in October, May, and June 2011. These months coincided with above average temperatures, which then contributed to very low water levels (Figures 2 and 3). Water levels at the Big Cypress National Preserve experienced record dry down in June for Tamiami Bridge 105 (just to the southeast of our project area) with data going back at least 20 years (http://www.gohydrology.org). This is consistent with the personal observations of water levels in the PSRP and Fakahatchee Strand Preserve State Park since 1991 by the Project Senior Biologist, Mr. Mike Barry, making it the driest year in his experience working here. Then in mid- and late-October 2011, just prior to the fall grass treatments, heavy rains in two low pressure events, which caused a dramatic rise in water levels to the highest point of year followed by lower temperatures with the passing of cold fronts (Figures 1-3).

Because low water is necessary for most herbicide treatments, this pattern of reduced rainfall and water levels allowed the field crews to overcome the delays caused by the freeze and the slow work pace dictated by the early and extreme heat. When water levels rise in areas of torpedograss (which is usually concentrated in our lowest elevation/longest hydroperiod areas but spreading elsewhere too), treatment becomes ineffective and must be suspended. Also, when water levels rise out of the center marsh openings, and deepest slough, and lowest portions of cypress strand swamp and extend into the surrounding transitional cypress (where Brazilian-pepper infestations area concentrated), it typically becomes necessary to suspend all treatments for the year (Garlon IV cannot be used over water). Typically, this occurs sometime in late June, although each year is different. Well data from SFWMD well off 70th Avenue and Patterson, near the Broken Wing Ranch (where the majority of the Brazilian-pepper treatments occurred for the year) show how water levels failed to rise above ground level during the majority of the treatment period. Most of the treatments were completed by September 7th. Heavy rains in late October, reflected in Figures 1-2, dramatically raise water levels. These rains affected only the fall flowering grass treatments, which are typically focused on the higher ground where high water levels are less problematic. Treatments ceased on November 2, 2011, when the treatment budget for FY 2011 was exhausted.

3.2 TREATMENTS IN THE BEGINNING OF FISCAL YEAR 2011 PRIOR TO CONTRACT WITH ERM

Exotic control work for FY2011 began in October, prior to the current SFWMD contract with ERM, with coordination work completed by IRC (Purchase Order #4500046172) continuing through January 31, 2011. These treatments set the stage for the rest of the fiscal year and are discussed in detail in PSRP Restored Footprint Exotics Mapping and Control Coordination Monthly Report – January 2011 (Barry 2011).

Because of unusually dry conditions that started in October 2010 (Figure 2) and to get a head start on the dry season, foliar treatments of the Prairie Canal and road footprints began promptly at the beginning of the fiscal year. These treatments primarily targeted torpedograss (*Panicum repens*). A total of 307 acres of the most important, known locations for torpedograss were treated until the effort was cut short by a series of hard freezes beginning in early to mid December.

Work began at soil remediation sites on November 22, 2010 with the first re-treatment of the torpedograss and the initial treatment of large expanses of Bahia lovegrass (*Eragrostis bahiensis*). A total of 111 acres were covered with roughly six acres of actual torpedograss treated and at least half of the 111 acres of Bahia lovegrass in the 75-95% coverage range. A boom sprayer was utilized for these treatments. The southernmost portion of the phase I remediation site was left untreated as a control for the Bahia lovegrass treatments because this was the first time spray treatment was used on this species. All subsequent treatments this fiscal year at the soil remediation sites were follow-ups to this major effort.

Using herbicide donated by the Florida Fish and Wildlife Conservation Commission and funds allocated to treating punktree (*Melaleuca quinquenervia*) within the general boundary of PSRP, Applied Aquatics Management, Inc. began treating punktree in December, after the first hard freeze. The focus of these treatments was to clean up outliers from the south to northwest where areas of dense punktree occur along the edge of the Belle Meade tract. Roughly 5,000 acres were covered by a small crew, or crews with swamp buggies, from December 9, 2010 to January 28, 2011. Although the focus of the work was on the outliers, crews did spend a week on the area known as the "long blocks", which has the worst *Melaleuca* infestation within the PSRP project area. This area is located between 68th and 62nd Avenue West of Miller. The project field team also field ground-truthed the entire area (beyond the areas treated) to be able to estimated costs to complete this work in the future. Also the Florida Division of Forestry (DOF) has agreed to provide a substantial amount of granular Velpar to treat the worst of these locations. Although this work was not possible this season, it may be possible next fiscal year. Additionally. crews treated Old World climbing fern (*Lygodium microphyllum*) and Australian-pine (*Casuarina equisetifolia*) when these exotics were encountered.

3.3 FOLIAR TREATMENTS WITHIN PRAIRIE CANAL AND ROAD FOOTPRINTS AND DEMOLITION SITES IN BROKEN WING RANCH AND MERRITT PHASE

Following the initial, incomplete re-treatment in November, which was cut short by the freeze, two complete foliar re-treatments and several additional special treatments of invasive exotics were completed in the former Prairie Canal footprint and demolition sites. The primary treatments were conducted using Glyphosate with Imazapyr, targeting primarily torpedograss and cogongrass in the first re-treatment. Other targeted species included Bermuda grass (*Cynodon dactylon*), Burma reed (*Neyraudia reynaudiana*), cattail (*Typha domingensis*), vaseygrass (*Paspalum urvillei*), common reed (*Phragmites australis*), Guinea grass (*Panicum maximum*), smutgrass (*Sporobolus indicus* var. *pyramidalis*), natalgrass (*Melinis repens*), Paragrass (*Urochloa mutica*), caesarweed, and thalia lovegrass (*Eragrostis atrivirens*). Additional species treated at new and previously known sites also included limpograss (*Hemarthria altissima*) and itchgrass (*Rottboellia cochinchinensis*), both at demolition sites.

The first foliar re-treatment of the footprints, demolition, and soil remediation sites started March 8, 2011 and was completed April 19, 2011 (Figures 4 - 7). This treatment began along the Prairie Canal footprint, focusing on torpedograss in and around the ponds remaining in the footprint, and continuing throughout the entire footprint area and demolition sites. This work followed ample time for plants to recover from the freeze events in December. A total of 3,249 acres (Table 1) were covered as re-treatment, although actual cover of exotics was generally low with patches few and far between.

The second re-treatment started April 20, 2011 and was completed on August 3, 2011. A total of 3,338 acres (Table 2, Figures 8 - 9) were covered as re-treatment. Although the actual cover of exotics was generally low, there were several newly discovered patches where coverage was high. In addition, extensive smutgrass was treated over much of the area for the first time. This second re-treatment differed from the first re-treatment in that additional species were included and more time was spent searching and covering the 50-foot road buffers and demolition sites.

In general, the worst infestations remain from 79th Avenue SE and northward. However, smutgrass cover, to the south, especially along Patterson, had expanded significantly, presumably from seed, including in the areas where crews had just completed treatments. Young smutgrass was found weeks later around previously sprayed, dead patches. It is expected that flooding will keep this species in check south of 79th Avenue, but to date, this season has been dry, and efforts to control smutgrass, thus far, have not been fully successful.

Because the majority of the areas treated are disturbed soils in cleared footprints, or old home sites with a web of old roads and trails leading to large patches, re-treatments have been conducted using swamp buggies and ATVs fitted with tanks to minimize time for refilling and transporting chemical mixes. Now, because many of the larger patches have been treated several times, and all of the easily accessed areas are approaching maintenance levels, we have started treating some areas by hand, using backpack sprayers (Table 3, Figure 10).

The backpack crews focused first on infestations newly discovered by the Brazilian-pepper crews, which were inaccessible by ATV or swamp buggy. The crews also moved to sweep areas surrounding the larger patches that had been treated on multiple occasions, in an effort to treat the scattered sprigs hidden in the dense undergrowth surrounding almost all infestations. A total of 234 acres was treated in this manner, which included only 4.2 acres of dense cover. Given these conditions, access was difficult and treatment very time consuming, but the result is a much more complete treatment than could be accomplished using ATVs or swamp buggies. In general, this marks the beginning of a shift to this type of treatment for the Broken Wing Ranch area, as we move towards maintenance levels. As long as the exotics are at low cover and less chemical is needed (i.e., refill time is minimal), this method will be more cost effective.

On May 12, 2011, the Cobalt Fire (ignited by lightning and reported by the eradication contractor) burned through the unblocked areas north of 79^{th} Avenue SE, northward to 66^{th} where DOF crews contained the wildfire by burning off of the existing road. While the fire, in general, was ecologically beneficial to most of the area, it did impact exotic control efforts. The fire forced the team to move farther north for safety and to wait for the vegetation to recover before re-treatment could be completed. After several weeks, crews were able to resume the second re-treatment in this area. The fire made cogongrass treatment easier with respect to access and visibility.

Also as a result of the fire, the caesarweed population experienced a massive recruitment from the seed bank throughout the area (as it typically does), with the highest concentrations in and immediately around the abandoned home sites. Crews mobilized to treat the caesarweed for a couple of weeks, using 2,4D and/or Milestone, completing the 226-acre treatment on July 28, 2011 (Table 4, Figure 11). The timing of the fire and subsequent treatment was beneficial, as most of the seeds had germinated, yet flowering was still a month away. We anticipate this treatment will diminish the seed bank considerably, based on past experience.

Torpedograss has continued to be a problem in the same areas, especially at the remaining pools of the former Prairie Canal, the swales along Stewart, and a few other patches on road footprints, such as 94^{th}, 98^{th} and 102^{nd}. Because treatments are ineffective when there is standing water, a third re-treatment of the pools in the Prairie Canal was completed June 3, 2011 to take advantage of the very dry conditions (Table 5, Figures 12 and 13). A total of 152 acres was covered in this effort, although efforts primarily focused on a much smaller area in and around the remnant pools. This re-treatment was actually initiated by crews in the field, as they watched and waited for water levels to drop, showing their commitment to succeeding in control efforts.

While eradication crews worked diligently for weeks in the Broken Wing Ranch area, torpedograss seeds began germinating in all areas to the south, including those already treated on two or three prior occasions. As a result, another treatment was undertaken during the weeks ending July

15 and 22, 2011. A total of over 451 acres, some covered with areas of dense re-infestation, were treated (Table 5, Figures 12 and 13). In some areas, exotics cover actually exceeded cover at the beginning of the season, and patches where only a few clumps were found prior to dry down were now nearly completely covered with young, vigorous growth. After having surveyed these areas prior to and following treatments, we have concluded that these cover changes were the direct result of seed germination and not simply the spreading of areas that might have been missed during previous treatments.

During the most recent treatment, crews also focused on areas where the recent clearing of trams and construction of culverts along Stewart had resulted in extensive re-infestation. It is expected that these problem areas will continue to require attention in the future.

The first re-treatment of invasive exotic grasses at the demolition sites of the Merritt Phase began August 4, 2011 and continued to August 18, 2011, completing all of the worst infestations treated last summer (Table 6, Figure 15). Although smutgrass remained dominant around many of the treated areas, it was not treated again this year. Instead focus was on higher priority species such as FLEPPC listed species. Smutgrass has spread over much of the area around these home sites and will continue to prevent colonization by native species. Also no headway was made on the additional home sites in the area, which include large expanses of cogongrass and other invasive exotics all with recently cleared road footprints in the area. Treatment of these areas sooner rather than later to prevent spread (most of these species have wind dispersed seeds) should be considered a priority.

The foliar treatment of fall flowering grasses, especially focusing on jaraguá, was completed by Applied Aquatic Management, Inc. between October 26 and November 2, 2011 within the Prairie Canal phase. To ensure that all patches of jaraguá were effectively treated and that there was a sufficient budget to search all the roads again while inflorescences were up, we narrowed the scope of additional species to be treated to just Burma reed, which may have been missed in previous treatments. That said, some other species were sporadically treated during the effort.

A total of 2,559 acres were covered in the search for jaraguá this year in the Prairie Canal phase (Table 7, Figures 16 and 17). There was generally very low cover, like the previous year, although a few new locations were discovered during these treatments. With the remaining budget for fall flowering grasses, most of one day was also spent treating jaraguá in the Merritt phase demolition sites, in which treatments of exotic grasses over 93.4 acres that had been completed this fiscal year (Table 7, Figure 18).

Some additional small acreage of jaraguá just to the south of the tieback levee also was initially treated. The actual mapping of these areas will be completed at a later date, as surveys are still underway in this area. Although the recently cleared road footprints and demolition sites to the south of the tieback levee that have not yet been treated have quite a bit of jaraguá, only a few infestations were treated at the completed sites.

3.4 SOIL REMEDIATION SITES

This fiscal year began with nearly a complete treatment, as described above in Section 3.2, prior to issuance of the ERM contract, following minimal progress in the preceding fiscal year. Since February 1, 2011, the soil sites have been re-treated three times, as a part of the foliar re-treatments discussed above, including the 'emergency' re-treatment of torpedograss, following the onset of the rainy season. The first treatment was the week of March 25, 2011, and the second treatment was the week of April 22, 2011. Both of these treatment events were discussed in the First Bimonthly Status Report.

A third re-treatment was recently completed August 3, 2011, hitting large areas of torpedograss re-growth, similar to what was observed in the hot spots of the Prairie Canal Phase, following the onset of the rainy season. Therefore, the entire area (115 acres) was re-treated, with the worst areas off 108^{th} west of Miller (Table 5, Figure 14). Because water levels increased prior to finishing the problem area off 108^{th}, we anticipate the area will require additional re-treatment, as soon as the area is dry. To date, in this area, treatments of Bahia lovegrass (*Eragrostis bahiensis*) have proven successful, and no new germination has occurred; however, we anticipate seed germination later in the season.

3.5 BRAZILIAN-PEPPER RE-TREATMENTS AT DEMOLITION SITES

Re-treatment of Brazilian-pepper at the demolition sites began May 9, 2011 and was completed on August 4, 2011 in the Broken Wing area. This work represented a total re-treatment area of nearly 1,500 acres (Table 8, Figure 19). Treatments began in May because of a freeze in early December. The freeze caused cold damage to much of the Brazilian-pepper, especially in open areas. As a result, the eradication team had to wait for re-sprouting to occur to resume treatments. Weather conditions described in Section 2.1 also slowed progress.

Treatments began in the unblocked area just north of 79^{th} Avenue SE, at the Prairie Canal. In this area, Brazilian-pepper was treated in the lowest, wettest areas of the Broken Wing Ranch, in the event summer rains began early. These lower areas were nearly completed when lightning ignited the Cobalt Fire on the afternoon of May 12, 2011, burning the entire area that had just been treated and the areas about to be treated up to 66th Avenue SE. As a result, the crew for the following week began re-treating areas to the north of the tie-back levee, by I-75, and working southward until yet another lightning fire was ignited in that area (this time a much smaller fire). After shifting locations multiple times, crews finally completed re-treatment of the entire area, finishing in the areas burned in the Cobalt Fire. In the intervening period, these areas had re-sprouted substantially following the beginning of the rains. Water levels remained unseasonably low, and the crews called in yet another fire ignited by lighting just to the east of where they were working during the last week of treatment. Air potato (*Dioscorea bulbifera*) at these sites in Broken Wing, which were treated last year, were also re-treated this year, as were the sites by Stewart and Prairie canal. General cover by this species is now low.

Re-treatment of the Brazilian-pepper and miscellaneous exotic hardwoods at the demolition sites in the Merritt phase treated last summer began August 8, 2011 (Table 9 and Figure 15). A total of 403 acres was treated, with a few areas along the edges being initial treatment, expanding the area treated last year somewhat from 336 acres. Although rains had increased in frequency, water levels remained low. This area is still drained, which is why it was re-treated last. Areas of Brazilian-pepper in and around cypress stands that were left during initial treatments last year (August 2, 2010 through September 2, 2010, were treated this year due to the exceptionally low water.

Very little of the lead tree and the miscellaneous hardwood species at these old home sites remained or re-sprouted since the initial treatments last year. These again were re-treated with a 30% Garlon mix to ensure eradication. Air potato treated at the sites last year was re-treated this year. Additionally, while re-treating Brazilian-pepper, especially in the pine-dominated areas around the actual home sites, lantana (*Lantana camara*) was treated, as it was quite abundant in some areas and scattered throughout the area.

Mapping of the additional demolition sites within the Merritt Phase has begun; however, insufficient budget remained to begin treatments at these locations this fiscal year. A few sites with similar miscellaneous hardwoods remain, and large expanses of invasive exotic grasses, including cogongrass, West Indian pennisetum (*Pennisetum polystachion*), jaraguá, tanglehead (*Heteropogon contortus)*, and Guinea grass remain untreated to date. These sites are near newly cleared footprints. Also, smutgrass is dominating most of the home sites and their immediate buffers. At this point no progress has been made on this species.

3.6 SUMMARY OF COMPLETED TREATMENTS IN FISCAL YEAR 2011

The total acreages treated by the exotics control contractors to date in Fiscal Year 2011 are summarized in Table 10. The first three treatments, which were completed on January 28, 2011, were conducted prior to ERM's contract with SFWMD. Treatments began with a "touch-up" to last fiscal year's fall flowering grasses, with a partial treatment of Prairie Canal and selected road footprints, including re-treatment of torpedograss hot spots. Next the soil remediation sites were treated in their entirety, utilizing boom sprayers over the areas dominated by the exotic Bahia lovegrass, as well as the worst of the torpedograss patches. The later infestations resulted from the previously wet year, which prevented successful treatments. Punktree was then treated in the areas of the PSRP where infestations remained un-treated, including Bad Luck Prairie, and finishing up at the "long blocks" off Miller and 66th.

The treatments summarized in ERM's first bimonthly status report (dated June 15, 2011) and the this report commenced with the first and second re-treatments of Prairie Canal Road and canal footprints and demolition sites. Brazilian-pepper re-treatment at Broken Wing Ranch began in May, while the second foliar re-treatment of the footprints and demolition sites began at about the same time and were completed in August. Miscellaneous foliar treatments, including cogongrass and caesarweed backpack treatments, also were conducted at the demolition sites in Broken Wing Ranch Area. Finally, additional re-treatments were necessary to control torpedograss in hot spots, including the Prairie Canal footprint and soil remediation sites. These treatments were completed to take advantage of low water levels (treatment of torpedograss in standing water is ineffective) and seed germination, following the onset of the rainy season.

Brazilian-pepper, miscellaneous hardwoods, and exotic grass areas at demolition sites in the Merritt Phase, which were treated last summer, were re-treated starting August 4, 2011 and ending September 7, 2011. Much work remains at these sites, including large expanses of smutgrass. Additionally, there are many more demolition sites in the Merritt Phase heavily infested by wide diversity of exotics where initial treatments have not yet begun. These areas are now surrounded by recently cleared road footprints.

The remaining balance of fiscal year funds was utilized from October 26 – November 7 for the foliar treatment of fall flowering grasses, especially focusing on jaraguá, just as last year. This year we also covered the previously treated areas of the Merritt demolition sites to treat jaraguá, as well as initial treatment on other patches.

3.7 OVERALL EXOTIC AND NUISANCE SPECIES COVER

It is important to track percent cover of invasive exotic species from year to year to assess effectiveness of exotic control efforts. Total cover presented in this report represents immediately following pre-treatment in 2011, or at full recovery from the 2010 treatments. In this way, we assess the effectiveness of last fiscal year's treatments, which helps to guide the exotic control contractor with more accurate maps and also allows better tracking herbicide use within these mapped areas.

It is important to keep this in mind while reading this section, as actual cover values in the field should be significantly lower now that the treatments described in Sections 2.2 to2.6 have been completed. Also, by analyzing many different groupings of invasive exotics, though seemingly somewhat redundant at times, may shed light on where more effort is needed for control during the next fiscal year.

We utilize GPS units with ArcPAD software to collect data on invasive species cover in the field. We then utilize these data, along with aerial photograph interpretation, hand written notes on hard copy aerials, direct communication with the treatment contractors, and data from the contractor's Garmin GPS units to populate a polygon map of percent cover by invasive exotic species. This fiscal year, over of 135 km were surveyed using ArcPAD. Surveys on foot also included buffer areas within 50 feet of all roads and trails (Table 11). These field data are stored in the IRC_Master_GDB.mdb geodatabase file. Many more additional miles were actually surveyed by truck, at times when only notes on hardcopy maps were taken (especially when visiting previously surveyed areas post-treatment). This year, less GPS data was collected due to GPS unit malfunctions in the field; however, in mid-season, a new GPS was purchased to correct the problem. Data collected using ArcPAD includes the most detail, but other data, including daily to weekly face-to-face discussions with the contractor using maps provided significant reliable data.

In the field, cover by each invasive exotic and nuisance species was recorded by cover class, and these data were entered for each polygon in the contract area. To look at overall invasive species cover, the sum of the midpoints of the cover class for each invasive species found in a polygon were calculated using Microsoft Access in a linked table, which later could be incorporated into ArcGIS. These summed data are then put into the cover classes for analysis.

As discussed in past reports, using the summed data in this way can result in misrepresentations, thus individual species data should always be consulted when there are questions. A total of invasive species cover would result in an overestimate, if for example; one or more exotic species are growing under another exotic species. Also, if only one or two individuals (<1%) of multiple species are found in a large polygon, the program it would jump to the next one or two cover classes (1-5% or 5-25%), thereby generating an overestimate. In general, the more invasive species found in a polygon, the higher the probability of overlapping cover, which could result in an overestimate. This is especially the case if both woody and herbaceous species are present where each group can occupy different strata of the same patch of ground.

A total of 58 invasive exotic species and two native nuisance species were mapped using points, lines, and polygons in PSRP. This represents an increase since last year of eight additional species (Table 12). We are also tracking several additional non-invasive species. A list from the Merritt demolition sites was presented in last year's report (Barry 2010). A few, including a spiny legume, have not been positively identified, as yet, but treatments have thus far been effective on this non-native species. Currently we have recorded over 100 invasive exotic and nuisance species in the geodatabase, with a total of 6,820 points, up from 6,543 points at this time last year. This demonstrated that new infestations are being logged into the geodatabase. This year, at least half of the new points were logged by exotic control crews, either by labor crews walking tight transects in the woods (as is the case for the many newly found concentrations of cogongrass in the Broken Wing Ranch Area), or by the diligence of the foliar crews searching up and down the road footprints. In this case, the success or failure of control efforts might include a measure of the number of new exotic points found in each season, with a decreasing number of new points, indicating continued reduction of new infestations. That being said, we are grateful for the careful searching by the exotics control crews this year, especially in the Broken Wing Ranch area, so these newly documented infestations could be treated, thereby, preventing them from spreading unnoticed and serving as a seed source into other treated areas.

A total of 30 species with multiple locations of significant infestations were incorporated into the polygon map in order to track acreage. This is contrasted with the 26 reported last year (Barry 2010). These species were grouped by priority for the Picayune Strand Restoration Area (Barry 2008, Barry 2009). Prior to 2010, only Priority 1 species were treated whenever they were encountered, while some of the other species were treated opportunistically. Last year vaseygrass (Priority 2), cattail and common reed (Priority 3), and Bermudagrass (Priority 4) were always treated when encountered. This year we incorporated treatments of natalgrass into the routine treatments and hope to start seeing some decline in this species next year. We also began treatment of smutgrass in the Prairie Canal phase, but as areas treated in the south re-seeded quickly as rains began and because so much acreage of this grass exists in the Merritt phase, this has been temporarily discontinued. If budgets are limiting in the next fiscal year, it is doubtful that any headway will be made in controlling this species.

Total acreage (1,797 acres) and percent of total acreage actually covered by combined exotic and nuisance species, FLEPPC I, II, and non-listed, as well as highest priority species tracked inside the footprints (excluding the 50-foot buffers, demolition sites, and demolition site buffers) are presented in Table 13. A summary of actual acreage covered by exotics (calculated by the sum of acres multiplied by the midpoint of the cover value for each polygon) and overall percent of the entire footprint is presented in Table 14. Maps depicting these data are found in Figures 21 to 35. Total acreage is up a few acres from last year because we included a several additional recently cleared footprint areas due to location, although most will fall into Army Corps of Engineers treatments next fiscal year. The acreage covered by exotic species in the demolition sites of the Prairie Canal phase, primarily in the Broken Wing Ranch Area, is presented in Tables 15 and 16. The demolition sites treated, thus far, within the Merritt phase are similarly summarized in Tables 17 and 18, with maps of total exotic and nuisance species, Brazilian-pepper, and cogongrass cover presented in Figures 36 to 38.

Total coverage by all exotic and nuisance species combined in the cleared footprints in 2011 was estimated at 14.5%, down from 15.8% cover in 2008. Changes have been subtle since 2008, but definitely trending towards less coverage of invasive exotics. Although we are not yet at our target "maintenance level" of less than 5% exotic coverage (a land management standard in South Florida), this trend alone should be considered an accomplishment. After all, when we began surveying in March of 2008, there were miles of recently disturbed ground in the cleared footprint, which offered perfect conditions for exotic plant species establishment, especially in the drier areas. If left untreated, cover by invasive exotic species would have increased exponentially in many areas, especially in the cleared upland sections of road adjacent to demolition sites of the Broken Wing Ranch area.

Second, coverage by FLEPPC I species, our highest priority (because these species pose a substantial threat to adjacent less disturbed habitat between the roads), dropped from 107 acres (5.9%) in 2008 to 53 acres (3.0%) in 2011. Most of this reduction is from treatment of Brazilian-pepper. The remaining acreage of this species consists primarily of large areas of <1% cover.

Cogongrass, also a FLEPPC I species, is also trending downward in the cleared footprints with a cover of <1%, indicating success of treatments. The significant effort invested in searching for and controlling patches near the cleared road footprints in the demolition sites and buffers has reduced the number of sporadic new infestations in the footprints found this year, which is encouraging for this species. There is little doubt that without treatments, this species would have colonized large areas of the footprint. Cogongrass has been one of the primary targets and the most in-grained search images for herbicide crews in the field.

Torpedograss has fluctuated since 2008, especially following the wet winter of 2010 when it increased, but cover remains <1% of the entire footprint. However, the known patches have shown a propensity to grow rapidly and spread significantly in relatively short periods between re-treatments. The maintenance of these low levels of cover are no doubt due only to the repeated treatments. Because we still have not seen a significant decrease since 2008 the worst infestations were treated 3-4 times this year in order to increase chances of success. These treatments were focused during peak dry down, when the species is most vulnerable, and re-treating after rains began to eliminate the new recruits arising from newly germinated seeds.

In the cleared footprints, total FLEPPC II species have changed little, reflecting largely that we have not yet targeted all of these species systematically. However, jaraguá has been treated in the fall for the past two years and has changed little since last year, suggesting the seed bank may take some time to eradicate. A few new infestations also were found, though low in cover. The decline shown in fall flowering grasses treated this year (jaraguá and Burma reed), compared to last year, shows a decline, but this reflects a decline in Burma reed.

Non-FLEPCC listed species increased from 113 acres (6%) to 144 acres (8%) in spring of 2010 and perhaps leveled off in 2011. Because this group has not declined and includes several target species, such as vaseygrass, Bermudagrass, common reed, tanglehead, and cattail, we stepped up treatment this year. With anticipated budget cuts, we will likely be unable to treat many of these species in Fiscal Year 2012. As a result, the occurrence may continue to increase. The overall cover of cattail decreased this year due to effective treatments last year, despite wet conditions favoring this species in 2010. Crews also are now becoming more proficient in identifying vaseygrass before it flowers, which should help reduce cover next year. Smutgrass, buttonweed (*Spermacoce verticillata*), pitted bluestem (*Bothriochloa pertusa)*, and a handful of other species also fall into this group. The presence of these species has remained largely unchanged, except in the wetter areas where they have disappeared. Vaseygrass (despite systematic treatments) and thalia lovegrass (*Eragrostis atrovirens*) has been showing up in more and more locations, but generally in small scattered patches. There are always exceptions, like the section of the Prairie Canal footprint between 88th and 90th where thalia lovegrass dominates. Smutgrass has also slightly increased this year, and we began treating it; however, thus far, these treatments have not been effective. Smutgrass has rapidly re-established from seed in some locations, and insufficient budget exists for complete treatment of this very widespread weed. Also, the lack of standing water may have allowed for expansion of this species this year.

Data collected for demolition sites and buffer areas focus on the primary target species only at this time, with only incomplete data on lower priority species such as FLEPPC II or non-listed species. As mentioned in previous reports, in general, there is far less coverage of FLEPPC II and other non-listed species in the demolition site buffer areas than the cleared footprints. However, following a wildfire this year in the Broken Wing Ranch area, caesarweed was mapped because its population had exploded. We made an effort to treat the worst infestations at previously treated sites, but many areas in the 50-foot buffers of the footprints remain untreated.

FLEPPC I species are definitely trending downward at the Prairie Canal demolition sites, with cover in 2008 totaling 334 acres, or 18.5% of the 1,804 acres treated thus far. In 2011, these species covered only 119 acres, or 6.6%of the treated areas. Hopefully, re-treatments will continue to be funded to maintain this trend.

There is also significant acreage dominated by smutgrass at any of the demolition sites, and this may be the biggest challenge to re-establishment of native species in these areas. At this point, little headway has been made; however, it is important to remember that the priority remains in protecting the good habitat around the demolition sites from FLEPPC I and high priority invasives that can easily invade. Smutgrass does not readily penetrate the good habitats, although it will continue to be a problem wherever disturbed ground remains in upland areas.

The total cover at the treated areas of the Merritt demolition sites remains quite high, but only reflects one year of treatments. As a result, this area is several years behind the Prairie Canal phase. Cover by all exotic species combined totaled 35% of the area in 2010. By 2011, this had dropped to 21%. Regardless, there is still a long way to go to control exotics at these old home sites to reach "maintenance" levels.

3.8 RECOMMENDATIONS

Based on the results of cover surveys discussed above, the following treatment priorities are suggested for the coming fiscal year. Highest priority should be assigned to recommendations 1 – 4.

1. Foliar treatments of the entire Prairie Canal footprint and all known locations of torpedograss (including Stewart, 79th, 86th, 94th, 98th, and 102nd) should be conducted again in the fall or early winter 2012 before a freeze event, *if* water levels are low enough for effective torpedograss control.

2. Foliar treatments in the spring and into the early summer should again be conducted focusing on torpedograss, cogongrass, and any of the remaining fall flowering grasses.

3. Cogongrass in the demolition sites and buffers should be re-treated as a part of the entire footprint re-treatments for the Prairie Canal phase. A few small patches not yet treated found by Brazilian-pepper crews late in the season should be treated as well.

4. Foliar treatments focusing on jaraguá and other priority grasses should again be conducted in September-October 2012.

5. At least a partial treatment of the soil remediation sites should be a priority for treatment this fall when water levels recede. This is important at least for the area off 108th, which had patches of torpedograss where the water levels rose just before the final treatment for the fiscal year. Also, if sufficient budget is available, the areas around the demolition sites west of the ends of 124th and 126th, west of Miller, should be considered a priority. In contrast, some of the areas to the south near Lynch and Miller may require no treatment next fiscal year, with the possible exception of areas next to the roads.

6. Continue initial treatments of demolition sites, moving southward through the unblocked section of the Merritt phase, starting at the

abandoned nursery where the new tie-back levee crosses east to west at the Faka Union Pump station. Priority should be given to invasive grass species over Brazilian-pepper, though all lead tree and miscellaneous hardwoods should be treated immediately to limit their spread. These abandoned home sites provide a large seed source (mostly wind dispersed grass seeds) for surrounding recently cleared footprints. Exotic grasses infestations previously treated just to the north of the tieback levee also should be re-treated.

7. Re-treatment of footprint areas for Brazilian-pepper should be discussed. Cover by Brazilian-pepper in the 50-foot buffer should also be re-assessed, as the footprints are surveyed. Given budgets may be limited and treating the buffer is costly, triclopyr treatments in the buffer may be limited anyway.

4.0 REFERENCES

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Tables

Table 1: Acres Covered by First Foliar Treatment of Torpedograss and Cogongrass at PSRP, FY 2011											
Treatment	**Dates**	**Location**	**0**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
First Re-treatment 2011	3/8/2011 to 4/19/2011	50' Outside Footprint	749.6	115.2	0.7	1.6					867.1
		Inside Footprint	1,292.5	391.7	73.7	1.2					1,759.1
Targets: Impecyli, Panirepe, Typhdomi		Buffer areas to New Footprint areas	1.6	4.7	4.0						10.3
		Demolition Site	23.9	25.4	0.2						49.5
		Demolition Site Buffer	257.4	185.2	3.2			0.7			446.5
		Soil Remediation			3.2	9.6					12.8
		Demolition Site - Miller		44.7	37.4	21.6					103.7
		Total:	**2,325.0**	**766.9**	**122.4**	**34.0**	**0.0**	**0.7**	**0.0**	**0.0**	**3,249.0**

Table 2: Acres Covered by Second Foliar Treatment of Torpedograss and Cogongrass at PSRP, FY 2011											
Treatment	**Dates**	**Location**	**0%**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
Targets: Cynodact Eragatro Eragbahi Impecyli Melirepe Neyreyn Panimaxi Panirepe Paspurvi Phraaust Sporindipyra	4/20/2011 to 8/3/2011	Inside Footprint	19.0	257.6	1,080.9	344.9	40.6	20.9	5.6	19.0	1,769.5
		50' Outside Footprint	665.6	130.8	49.4	5.0	0.9	1.1		665.6	852.8
		Buffer areas to New Footprint areas	1.3	2.5	10.6	4.0		0.2		1.3	18.8
		Demolition Site	14.1	8.5	1.2	4.7	0.3	21.4	12.1	14.1	62.4
		Demolition Site Buffer	333.2	169.0	12.4	2.9		0.7	0.4	333.2	518.5
		Soil Remediation		27.2	56.8	19.7					103.7
		Demolition Site - Miller			3.2	8.6					11.8
		Totals:	**1,033.2**	**595.6**	**1,214.5**	**389.8**	**41.9**	**44.3**	**18.2**	**1,033.2**	**3,337.5**

Table 3: Acres Covered by Backpack Foliar Treatment of Cogongrass in Broken Wing Ranch (Limited Access Areas) at PSRP, FY 2011											
Treatment	**Dates**	**Location**	**0**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
Targets: Impecyli Neyrreyn Paspurvi Urocmuti	7/6/2011 to 7/21/2011	Demolition Site	8.9	0.7							9.7
		Demolition Site Buffer	154.2	45.5	11.8	1.3		2.5	0.4		215.8
		50' Outside Footprint		8.0	0.3						8.4
		Totals:	**163.1**	**54.3**	**12.1**	**1.3**	**0.0**	**2.5**	**0.4**	**0.0**	**233.8**

Table 4: Acres Covered by Backpack Post-fire (Cobalt Fire) Foliar Treatment of Caesarweed in Broken Wing Ranch at PSRP, FY 2011											
Treatment	**Dates**	**Location**	**0**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
Targets: Urenloba	7/18/2011 to 7/28/2011	50′ Outside Footprint			2.8	2.8		4.1			9.7
		Demolition Site	0.3		0.7		1.9	8.2	2.3		13.4
		Demolition Site Buffer	7.9	1.7	76.5	62.1	21.9	26.7	5.9		202.6
		Totals:	**8.1**	**1.7**	**80.0**	**64.9**	**23.7**	**39.0**	**8.2**	**0.0**	**225.7**

Table 5: Acres Covered by Third and Fourth Foliar Retreatments of Torpedograss at PSRP, FY 2011											
Treatment	**Dates**	**Location**	**0%**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
Targets: Panirepe Third Re-treatment	6/3/2011	Inside Footprint	62.0	55.7	33.4	0.5					151.7
	7/25/2011 to 8/3/2011	Soil Remediation		44.7	37.4	21.6					103.7
	7/29/2011	Demolition Site - Miller			3.2	9.6					11.8
Fourth Re-treatment	7/11/2011 to 7/22/2011	Inside Footprint	185.4	76.6	40.6	1.2					303.9
		50′ Outside Footprint	136.5	9.1	0.7	1.1					147.4
		Totals:	**383.9**	**186.1**	**115.2**	**34.1**	**0.0**	**0.0**	**0.0**	**0.0**	**719.4**

Table 6: Acres Covered by First Foliar Retreatment of Invasive Exotics Grasses in Merritt Phase at PSRP, FY 2011											
Treatment	**Dates**	**Location**	**0%**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
Targets: Impecyli Melirepe Neyrreyn Panimaxi	8/5/2011 to 8/18/2011	Demolition Site	41.8	37.4	16.4	4.1					99.7
		Demolition Site Buffer	11.8	1.4	4						17.3
		Totals:	**53.6**	**38.8**	**20.4**	**4.1**	**0**	**0**	**0**	**0**	**116.9**

Table 7: Acres Covered by Retreatment of Fall Flowering Exotic Grasses at PSRP, FY 2011											
Treatment	**Dates**	**Location**	**0%**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
Glyphosate/ Imazapyr	10/26/2011 to 11/7/2011	Inside Footprint	1,077.3	420.2	207.8	0.1					1,705.3
		50' Outside Footprint	782.5	46.2	0.4						829.1
		Demolition Sites and Buffers	9.3	12.0	2.8						24.1
	11/2/2011 to 11/7/2011	Merritt Demolition Sites	89.2	1.7	1.9	0.7					93.4
		Totals:	**1,958.2**	**480.1**	**212.9**	**0.8**	**0.0**	**0.0**	**0.0**	**0.0**	**2,652.0**

Table 8: Acres Covered by Completed Basal Bark Retreatment of Brazilian-pepper in Broken Wing Ranch Area at PSRP											
Treatment	**Dates**	**Location**	**0**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
First Re-treatment Schitere	5/9/2010 to 8/4/11	Demolition Site Buffer	32.2	912	492.4	54.4	6.6	0	0	0	1,497.60
		Totals	**32.2**	**9162**	**492.4**	**54.4**	**6.6**	**0**	**0**	**0**	**1,497.60**

Table 9: Acres Covered by Completed Basal Bark Retreatment of Brazilian-pepper in Merritt Phase at PSRP											
Treatment	**Dates**	**Location**	**0**	**0-<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**>95%**	**Total Acres**
First Retreatment Schitere*	8/12/2011 to 9/7/2011	Demolition Sites and Buffer	43	266.4	54.8	36.4	2.1	43	266.4	54.8	402.7
		Totals:	**43**	**266.4**	**54.8**	**36.4**	**2.1**	**43**	**266.4**	**54.8**	**402.7**

**Lantana camara and miscellaneous hardwoods were also retreated, and cover was recorded in tne geodatabase*

Table 10: Summary of Treatments, FY 2011

Treatment	Herbicide	Location	Primary Targets	Dates	Acres Covered	Acres Infested
Initial Complete Treatment*	Gylphosate with Imazapyr	Soil Remediation Sites/Miller Demolition Sites	Torpedograss and Lovegrasses	11/25/2010-12/2/2010	111.4	111.4
Partial Foliar Retreatment*	Gylphosate with Imazapyr	Prairie Canal and selected footprints	Torpedograss and Missed Fall Flowering Grasses	12/6/2010-12/9/2010	307.7	169.0
Initial Treatment*	Imazapyr	Miller, south of 66th, Bad Luck Prairie, and Selected Locations South of Stewart in Prairie Canal Phase of PSRP	Melaleuca	12/9/2010-1/28/2011	4,978.3	3,199.0
First Complete Foliar Retreatment	Gylphosate with Imazapyr	Prairie Canal footprints and demolition Sites, and Soil Remediation Sites	Torpedograss and Cogongrass	3/18/2011-4/19/2011	3,264.2	922.6
First Foliar Retreatment Merritt Phase	Gylphosate with Imazapyr	Merritt Demolition Sites	Invasive Grassess	8/5/2011 - 8/18/2011	116.9	63.3
Second Complete Foliar Retreatment	Gylphosate with Imazapyr	Prairie Canal footprints and demolition Sites, and Soil Remediation Sites	Invasive Grasses	4/20/2011-8/3/2011	3,405.8	2,319.9
Backpack Foliar Retreatment	Gylphosate with Imazapyr	Broken Wing Ranch Area	Cogongrass	7/6/2011-7/21/2011	225.4	62.3
Post Wildfire 'Emergency' Foliar Treatment	2,4D and/or Milestone	Broken Wing Ranch Area	Caesarweed	7/18-7/28/2011	225.7	217.6
Third Foliar Retreatment	Gylphosate with Imazapyr	Prairie Canal footprint	Torpedograss	6/3/2011	151.6	89.7
Third Foliar Retreatment	Gylphosate with Imazapyr	Soil Remediation Sites / Miller Demolition Sites	Torpedograss	7/25/2011-8/3/2011	115.5	115.5
Fourth Foliar Retreatment	Gylphosate with Imazapyr	Prairie Canal footprints and demolition Sites	Torpedograss	7/11/2011-7/22/2011	451.2	126.1
Brazilian-pepper Retreatment	Triclopyr	Broken Wing Ranch Area	Brazilian-pepper	5/9/2010-8/4/2010	1,497.6	1,465.4
Brazilian-pepper Retreatment	Triclopyr	Merritt Demolition Sites	Brazilian-pepper	8/12/2011-9/7/2011	402.7	359.7

Table 11: Total Distance Surveyed Using GPS with ArcPAD (FY11)		
Method	**Meters**	**Kilometers**
Bicycle	27,187.0	27.2
On Foot	50,513.1	50.5
Swamp Buggy	742.7	0.7
Standard Vehicle*	56,709.5	56.7
	Totals	**135.2**
**Many additional miles were surveyed by vehicle using Maps and Garmin GPS with known points uploaded as Guide to Location*		

Table 12: List of Invasive Exotic Species Logged by GPS into Geodatabase						
EPPC	**Priority**	**Full Taxonomic Name**	**Common Names**	**Count of Positions**	**Treatment Type**	**Treatment Type Second**
II	1	*Hyparrhenia rufa*	Jaragua	45	4	2
I	1	*Imperata cylindrica*	Congongrass, Cogongrass	68	2	4
II	1	*Leucaena leucocephala*	White leadtree	6	4	
I	1	*Melaleuca quinquenervia*	Punktree	7	6	
I	1	*Neyraudia reynaudiana*	Burmareed, Silkreed	161	4	
II	1	*Panicum maximum*	Guineagrass	2	4	
I	1	*Panicum repens*	Torpedo grass	47	2	
	1	*Pennisetum polystachion*	West Indian pennisetum, Missiongrass	5	4	
I	1	*Pennisetum purpureum*	Napier grass, Elephantgrass	21	4	
I	1	*Schinus terebinthifolius*	Brazilian-pepper	4	1	2
I	1	*Urochloa mutica*	Paragrass	2	4	
II	1	*Vitex trifolia*	Simpleleaf chastetree	1	1	
I	2	*Acacia auriculiformis*	Earleaf acacia	2	1	2
I	2	*Bauhinia variegata*	Mountain ebony, orchidtree	1	1	2
I	2	*Bischofia javanica*	Javanese bishopwood	3	1	2
I	2	*Cupaniopsis anacardioides*	Carrotwood	1	1	2
I	2	*Lantana camara*	Shrubverbena	26	1	4
I	2	*Ludwigia peruviana*	Peruvian primrosewillow	2	5	
I	2	*Nephrolepis cordifolia*	Tuberous sword fern	1	4	
I	2	*Nephrolepis multiflora*	Asian sword fern	18	4	
	2	*Paspalum urvillei*	Vasey grass	16	4	
I	2	*Rhodomyrtus tomentosa*	Downy myrtle, Rose myrtle	1	1	2
I	2	*Rhynchelytrum repens*	Rose Natalgrass	55	2	
II	2	*Wedelia trilobata*	Creeping wedelia, Creeping oxeye	1	4	
	3	*Phragmites australis*	Common reed	24	3	
	3	*Typha domingensis*	Southern cat-tail	59	3	
	4	*Bambusa vulgaris*	Common bamboo	2	1	
	4	*Cynodon dactylon*	Bermuda grass	10	2	4
II	4	*Dalbergia sissoo*	Indian rosewood	1	1	2
	4	*Epiphyllum phyllanthus* var. *hookeri*	Orchid cactus	1		
	4	*Eragrostis atrovirens*	Thalia love grass	9	4	
I	4	*Ficus microcarpa*	Laurel fig, Indian laurel	2	1	2
	4	*Heteropogon contortus*	Tanglehead	9	4	
	4	*Kalanchoe daigremontiana*	Devil's-backbone	1	2	4
I	4	*Manilkara zapota*	Sapodilla	1	1	2
I	4	*Psidium guajava*	Guava	1	1	2
II	4	*Ricinus communis*	Castor-bean	1		
	4	*Selenicereus pteranthus*	Snake cactus, Princess-of-the-night	1		

Table 12: List of Invasive Exotic Species Logged by GPS into Geodatabase						
EPPC	**Priority**	**Full Taxonomic Name**	**Common Names**	**Count of Positions**	**Treatment Type**	**Treatment Type Second**
	4	*Senna alata*	Candlestick plant	2	1	4
II	4	*Sesbania punicea*	False-rattlebox	1		
I	4	*Syzygium cumini*	Jambolan-plum, Java-plum	3	1	2
II	4	*Terminalia catappa*	Tropical-almond, West Indian-almond	1	1	2
I	4	*Tradescantia spathacea*	Oysterplant, Moses-in-the-cradle, Boatlily	1	1	2
II	4	*Urena lobata*	Caesarweed	15	7	
	5	*Bothriochloa pertusa*	Pitted bluestem, Pitted beardgrass	1		0
II	5	*Dactyloctenium aegyptium*	Crow's-foot grass, Durban crowfootgrass	3	4	
I	5	*Dioscorea alata*	White yam	1	1	0
	5	*Hyptis pectinata*	Comb bushmint	1		
	5	*Paspalum notatum*	Bahia grass	3	4	
	5	*Pongamia pinnata*	Karum tree, Poonga-oil tree	1	1	0
	5	*Sporobolus indicus* var. *pyramidalis*	West Indian dropseed	9	4	
	NA	*Allamanda cathartica*	Yellow allamanda, Golden trumpet	1		
	NA	*Alpinia zerumbet*	Shellflower, Shell ginger	1		
	NA	*Furcraea selloa*		1		
	NA	*Lagerstroemia indica*	Crapemyrtle	1		
	NA	*Stenotaphrum secundatum*	St. Augustine grass	1		
	NA	*Tabebuia aurea*	Caribbean trumpettree	1		
	NA	*Ziziphus mauritiana*	Indian jujube	2		

Table 13: Total Infested Acres by Cover Class and Actual Area Covered by Invasive Exotics in Prairie Canal Cleared Footprints

Category	Period	0% (No Infestation)	Total Infested Acres	Actual Coverage*	<1%	1-5%	5-25%	25-50%	50-75%	75-95%	95-100%	Total Acres
Total Exotics	Spring 2008	18.6	1,778.3	284.3	10.2	663.0	805.5	198.5	80.9	9.0	11.2	1,796.9
	Spring 2009	19.7	1,777.1	252.3	18.4	783.9	723.7	169.6	60.2	15.2	6.1	1,796.9
	Spring 2010	17.9	1,779.0	277.2	14.0	606.3	894.5	179.8	67.4	10.3	6.7	1,796.9
	Spring 2011	14.3	1,782.6	260.2	12.7	659.5	879.8	158.4	55.3	17.0		1,796.9
Total FLEPPC I	Spring 2008	18.6	1,778.3	106.8	440.4	1,089.9	152.5	60.1	19.1	11.3	5.1	1,796.9
	Spring 2009	19.7	1,777.1	83.4	510.0	1,064.6	147.0	41.7	2.9	11.1		1,796.9
	Spring 2010	17.9	1,779.0	63.7	607.2	1,032.1	103.7	34.4	0.3	1.2		1,796.9
	Spring 2011	14.3	1,782.6	53.7	700.6	993.2	60.1	27.2	0.3	1.2		1,796.9
Total FLEPPC II	Spring 2008	169.0	1,627.8	67.9	705.0	698.3	200.4	6.7	17.3			1,796.9
	Spring 2009	168.1	1,628.8	66.3	681.3	741.4	182.0	6.7	17.3			1,796.9
	Spring 2010	168.1	1,628.8	66.1	688.0	734.8	182.0	6.7	17.3			1,796.9
	Spring 2011	178.7	1,618.2	66.1	677.3	734.8	182.0	6.7	17.3			1,796.9
Non-Listed	Spring 2008	65.0	1,731.9	112.5	6.3	1,286.8	403.2	35.6				1,796.9
	Spring 2009	65.0	1,731.9	108.6	32.0	1,334.5	304.9	60.4				1,796.9
	Spring 2010	49.6	1,747.2	143.2	28.3	1,071.2	586.3	61.3				1,796.9
	Spring 2011	44.4	1,752.5	142.5	27.6	1,101.2	560.1	57.8	5.8			1,796.9
FY 2011 Foliar Targets	Spring 2009	51.7	1,745.2	93.8	294.0	1,141.4	258.0	51.8				1,796.9
	Spring 2010	39.6	1,757.2	120.8	238.4	1,118.6	313.3	66.2	15.1	5.6		1,796.9
	Spring 2011	38.9	1,758.0	109.3	262.5	1,161.0	267.3	40.6	20.9	5.6		1,796.9
Fall Grasses	Spring 2008	682.1	1,114.8	54.3	620.1	304.9	157.2	11.5	16.4	4.7		1,796.9
	Spring 2009	651.1	1,145.8	27.0	692.2	370.8	82.8					1,796.9
	Spring 2010	647.0	1,149.9	29.0	654.7	404.9	90.3					1,796.9
	Spring 2011	743.9	1,052.9	26.0	603.5	370.0	79.5					1,796.9
Schinus terebinthifolius	Spring 2008	33.8	1,763.1	41.1	1,491.4	188.3	42.7	25.5	3.9	11.3		1,796.9
	Spring 2009	33.8	1,763.1	26.3	1,704.6	21.3	12.3	11.0	2.9	11.1		1,796.9
	Spring 2010	31.5	1,765.4	10.9	1,728.3	32.4	3.3	0.3	1.2			1,796.9
	Spring 2011	27.4	1,769.5	12.2	1,728.5	32.4	5.6	1.6	0.3	1.2		1,796.9
Imperata cylindrica	Spring 2008	1,439.9	356.9	3.8	295.8	57.4	3.6		0.1			1,796.9
	Spring 2009	1,439.9	356.9	3.7	295.8	57.6	3.6					1,796.9
	Spring 2010	1,453.8	343.0	2.0	333.4	9.6	0.1					1,796.9
	Spring 2011	1,458.6	338.2	1.8	335.6	2.6						1,796.9
Panicum repens	Spring 2008	1,654.5	142.4	1.4	125.5	16.5	0.0			0.3		1,796.9
	Spring 2009	1,649.3	147.6	1.2	131.1	16.5	0.0					1,796.9
	Spring 2010	1,612.8	184.0	3.6	145.8	24.2	14.1					1,796.9
	Spring 2011	1,622.0	174.8	1.7	146.0	27.7	1.2					1,796.9

**Sum of infested acres for each cover class multiplied by the midpoint of the percent cover category*

Table 14: Summary of Actual Area Covered by Invasive Exotics in Prairie Canal Phase Cleared Footprints

Category	Spring 2008		Spring 2009		Spring 2010		Spring 2011		Total Acres
	Actual Coverage*	Percent of Site	Actual Coverage*	Percent of Site	Actual Coverage*	Percent of Site	Actual Coverage*	Percent of Site	
Total Exotics	284.34	15.8%	252.30	14.0%	277.24	15.4%	260.21	14.5%	1,796.9
Total FLEPPC I	106.76	5.9%	83.37	4.6%	63.66	3.5%	53.72	3.0%	1,796.9
Total FLEPPC II	67.88	3.8%	66.29	3.7%	66.12	3.7%	66.07	3.7%	1,796.9
Non-Listed	112.46	6.3%	108.60	6.0%	143.22	8.0%	142.49	7.9%	1,796.9
FY 2010/2011 Foliar Targets	NA	NA	93.85	5.2%	120.79	6.7%	109.32	6.1%	1,796.9
Fall Grasses	54.34	3.0%	27.01	1.5%	28.96	1.6%	26.04	1.4%	1,796.9
Schinus terebinthifolius	41.12	2.3%	26.34	1.5%	10.95	0.6%	12.23	0.7%	1,796.9
Imperata cylindrica	3.82	0.2%	3.74	0.2%	1.96	0.1%	1.76	0.1%	1,796.9
Panicum repens	1.39	0.1%	1.15	0.1%	3.57	0.2%	1.74	0.1%	1,796.9

**sum of infested acres for each cover class multiplied by the midpoint of the percent cover category*

Table 15: Total Infested Acres by Cover Class and Actual Area Covered by Invasive Exotics in Prairie Canal Phase at Demolition Sites and Buffers

Category	Period	0% (No Infestation)	Total Infested Acres	Actual Coverage*	<1%	1-5%	5-25%	25-50%	50-75%	75-95%	95-100%	Total Acres
Total Exotics	Spring 2008	66.2	1,738.1	333.5	30.5	711.7	564.9	224.5	145.9	57.0	3.6	1,804.3
	Spring 2009	66.2	1,738.1	333.5	30.5	711.7	564.9	224.5	145.9	57.0	3.6	1,804.3
	Spring 2010	64.8	1,739.5	201.4	543.1	683.6	263.7	101.7	110.7	35.8	1.0	1,804.3
	Spring 2011	37.6	1,766.7	118.6	749.8	679.9	234.5	32.8	54.5	15.3		1,804.3
Total FLEPPC I	Spring 2008	66.5	1,737.8	324.1	26.7	712.5	581.5	223.8	146.3	45.7	1.2	1,804.3
	Spring 2009	66.5	1,737.8	322.0	30.5	712.8	574.4	235.9	137.3	45.7	1.2	1,804.3
	Spring 2010	66.5	1,737.8	190.3	543.7	683.8	272.0	113.1	100.8	23.4	1.0	1,804.3
	Spring 2011	39.4	1,764.9	51.4	904.0	750.2	81.6	25.3	2.8	1.0		1,804.3
Total FLEPPC II	Spring 2008	1,770.3	34.0	1.0		34.0						1,804.3
	Spring 2009	1,769.2	35.1	1.5	11.4	17.9	5.8					1,804.3
	Spring 2010	1,769.2	35.1	1.5	11.4	17.9	5.8					1,804.3
	Spring 2011	1,399.8	404.5	56.5	15.4	249.1	72.0	24.9	34.9	8.2		1,804.3
Non-Listed	Spring 2008	1,766.7	37.6	10.7			15.7	21.6		0.3		1,804.3
	Spring 2009	1,768.9	35.4	10.8	0.7		11.7	21.4	1.2	0.3		1,804.3
	Spring 2010	1,766.2	38.1	10.8	3.4		11.7	21.4	1.2	0.3		1,804.3
	Spring 2011	1,751.3	53.0	6.1	15.3		36.8	0.5		0.3		1,804.3
FY 2011 Foliar Targets	Spring 2009	1,505.0	299.3	34.6	166.1	73.6	18.2	1.5	25.0	14.8		1,804.3

Table 15: Total Infested Acres by Cover Class and Actual Area Covered by Invasive Exotics in Prairie Canal Phase at Demolition Sites and Buffers												
Category	**Period**	**0% (No Infestation)**	**Total Infested Acres**	**Actual Coverage***	**<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**95-100%**	**Total Acres**
	Spring 2010	1,491.5	312.8	34.6	178.6	74.6	18.2	1.5	25.2	14.6		1,804.3
	Spring 2011	1,470.2	334.1	21.0	262.7	27.8	17.6	1.0	24.1	1.0		1,804.3
Fall Grasses	Spring 2008	682.1	1,114.8	54.3	620.1	304.9	157.2	11.5	16.4	4.7		1,796.9
	Spring 2009	1,759.4	44.9	0.9	20.9	23.4	0.7					1,804.3
	Spring 2010	1,759.4	44.9	0.9	20.9	23.4	0.7					1,804.3
	Spring 2011	1,743.5	60.8	0.8	42.5	17.7	0.7					1,804.3
Schinus terebinthifolius	Spring 2008	73.5	1,730.8	296.1	31.9	788.8	532.6	211.9	123.8	41.0	0.7	1,804.3
	Spring 2009	73.1	1,731.2	295.6	50.3	771.2	532.4	211.9	123.8	41.0	0.7	1,804.3
	Spring 2010	72.9	1,731.4	162.9	723.6	562.5	250.2	88.0	85.7	20.7	0.7	1,804.3
	Spring 2011	39.6	1,764.7	33.9	1,156.9	531.8	72.6	3.4				1,804.3
Imperata cylindrica	Spring 2008	1,501.9	302.5	10.7	204.1	73.0	18.3	0.8	3.8	2.4		1,804.3
	Spring 2009	1,511.9	293.1	12.8	184.3	71.8	29.3	0.8	3.8	2.4	0.7	1,805.0
	Spring 2010	1,501.0	303.9	12.8	194.3	72.7	29.3	0.8	4.0	2.2	0.7	1,805.0
	Spring 2011	1,491.4	312.9	4.4	289.8	18.4	1.6		2.5	0.7		1,804.3
**Sum of infested acres for each cover class multiplied by the midpoint of the percent cover category*												

Table 16: Summary of Actual Area Covered by Invasive Exotics in Prairie Canal Phase at Demolition Sites and Buffers									
Category	**Spring 2008**		**Spring 2009**		**Spring 2010**		**Spring 2011**		**Total Acres**
	Actual Coverage*	**Percent of Site**	**Actual Coverage***	**Percent of Site**	**Actual Coverage***	**Percent of Site**	**Actual Coverage***	**Percent of Site**	
Total Exotics	333.5	18.5%	333.5	18.5%	201.4	11.2%	118.6	6.6%	1,804.3
Schitere	296.1	16.4%	295.6	16.4%	162.9	9.0%	33.9	1.9%	1,804.3
Impecyli	10.7	0.6%	12.8	0.7%	12.8	0.7%	4.4	0.2%	1,804.3
**sum of infested acres for each cover class multiplied by the midpoint of the percent cover category*									

Table 17: Total Infested Acres by Cover Class and Actual Area Covered by Invasive Exotics in Merritt Phase at Treated Demolition Sites and Buffers												
Category	**Period**	**0% (No Infestation)**	**Total Infested Acres**	**Actual Coverage***	**<1%**	**1-5%**	**5-25%**	**25-50%**	**50-75%**	**75-95%**	**95-100%**	**Total Acres**
Total Exotics	Spring 2010	5.2	436.1	154.7	0.3	24.1	242.5	44.3	53.0	18.5	53.4	441.3
	Spring 2011	0.0	441.3	92.5	10.9	180.7	155.3	22.9	26.0	43.6	1.9	441.3
Total FLEPPC I	Spring 2010	41.9	399.4	88.5	0.3	57.3	241.8	53.3	41.5	3.7	1.4	441.3
	Spring 2011	37.7	403.6	24.1	32.8	273.8	94.0	0.9	2.1			441.3
Total FLEPPC II	Spring 2010	408.2	33.0	6.5	0.0	16.5	8.6	4.4		3.6		441.3
	Spring 2011	408.1	33.1	0.7	16.7	15.2	1.2					441.3
Non-Listed	Spring 2010	293.2	148.1	62.3		34.6	32.9	14.4	23.9	42.4		441.3
	Spring 2011	287.6	153.6	62.9		36.5	36.6	14.4	23.9	42.4		441.3
FY 2011 foliar targets	Spring 2010	236.3	204.9	68.6	26.6	48.4	45.3	14.9	23.2	42.4	4.2	441.3
	Spring 2011	230.5	210.8	64.2	51.0	32.0	45.9	15.7	27.3	38.4	0.5	441.3
Fall Grasses	Spring 2010	433.9	7.3	0.2	1.7	5.6						441.3
	Spring 2011	432.1	9.2	0.2	2.6	6.6						441.3
Schinus terebinthifolius	Spring 2010	75.6	365.7	65.5	19.8	141.5	112.7	53.1	37.6	1.0		441.3
	Spring 2011	71.6	369.6	10.1	267.3	62.8	37.5		2.1			441.3
Imperata cylindrica	Spring 2010	317.3	123.9	6.9	36.3	75.4	8.2		1.3	2.8		441.3
	Spring 2011	315.2	126.0	1.7	103.0	18.9	4.1					441.3

**sum of infested acres for each cover class multiplied by the midpoint of the percent cover category*

Table 18: Summary of Actual Area Covered by Invasive Exotics in Merritt Phase at Treated Demolition Sites & Buffers					
Category	**Spring 2010**		**Spring 2011**		**Total Acres**
	Actual Coverage*	**Percent of Site**	**Actual Coverage***	**Percent of Site**	
Total Exotics	154.7	35.0%	92.5	21.0%	441.3
Schinus terebinthifolius	65.5	14.8%	10.1	2.3%	441.3
Imperata cylindrica	6.9	1.6%	1.7	0.4%	441.3

**Sum of infested acres for each cover class multiplied by the midpoint of the percent cover category*

Figures

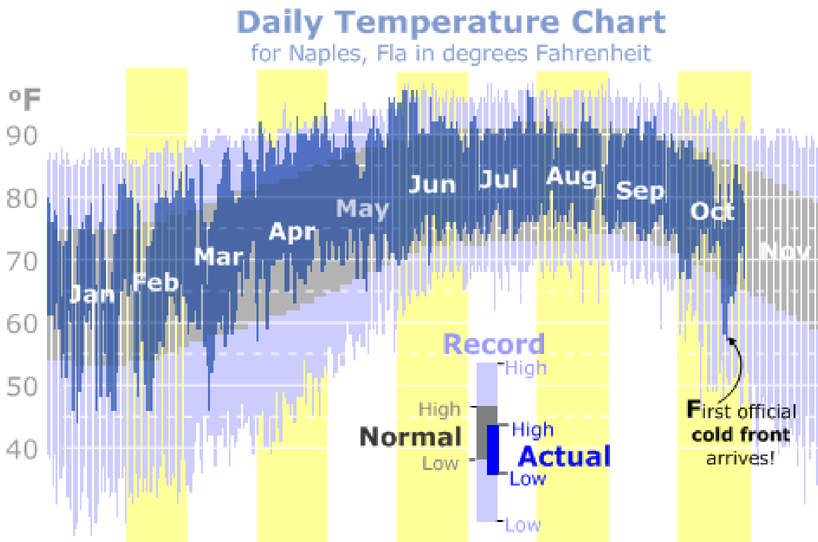


Figure 1. Daily Temperature Chart, Naples, FL

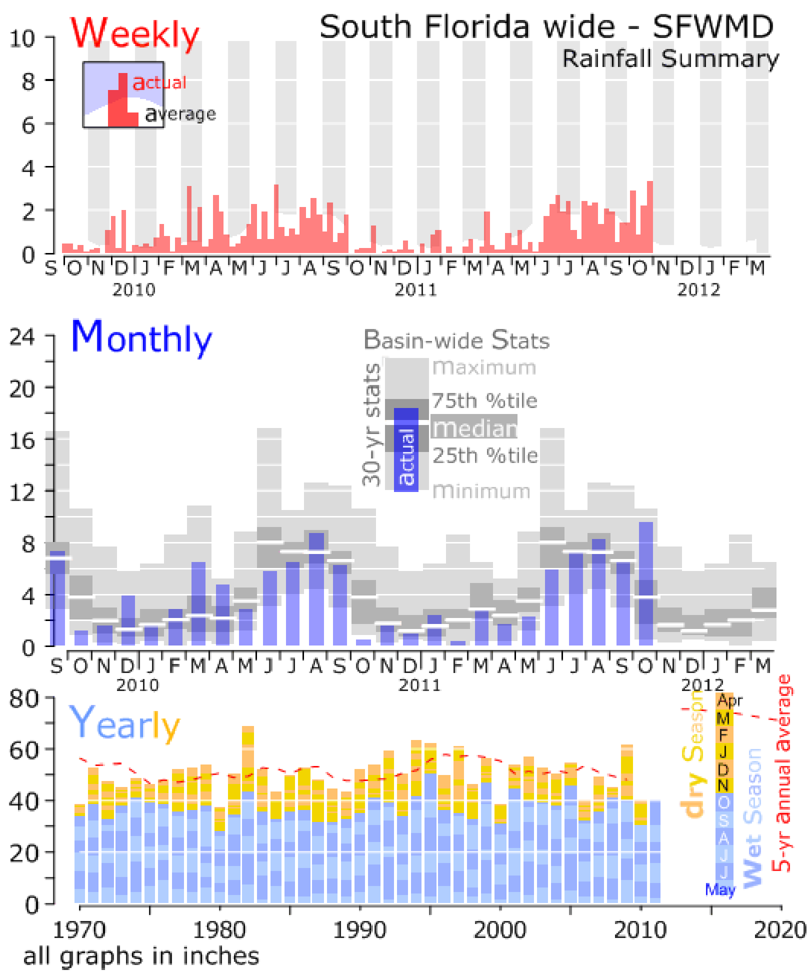


Figure 2. Big Cypress Rainfall Summary

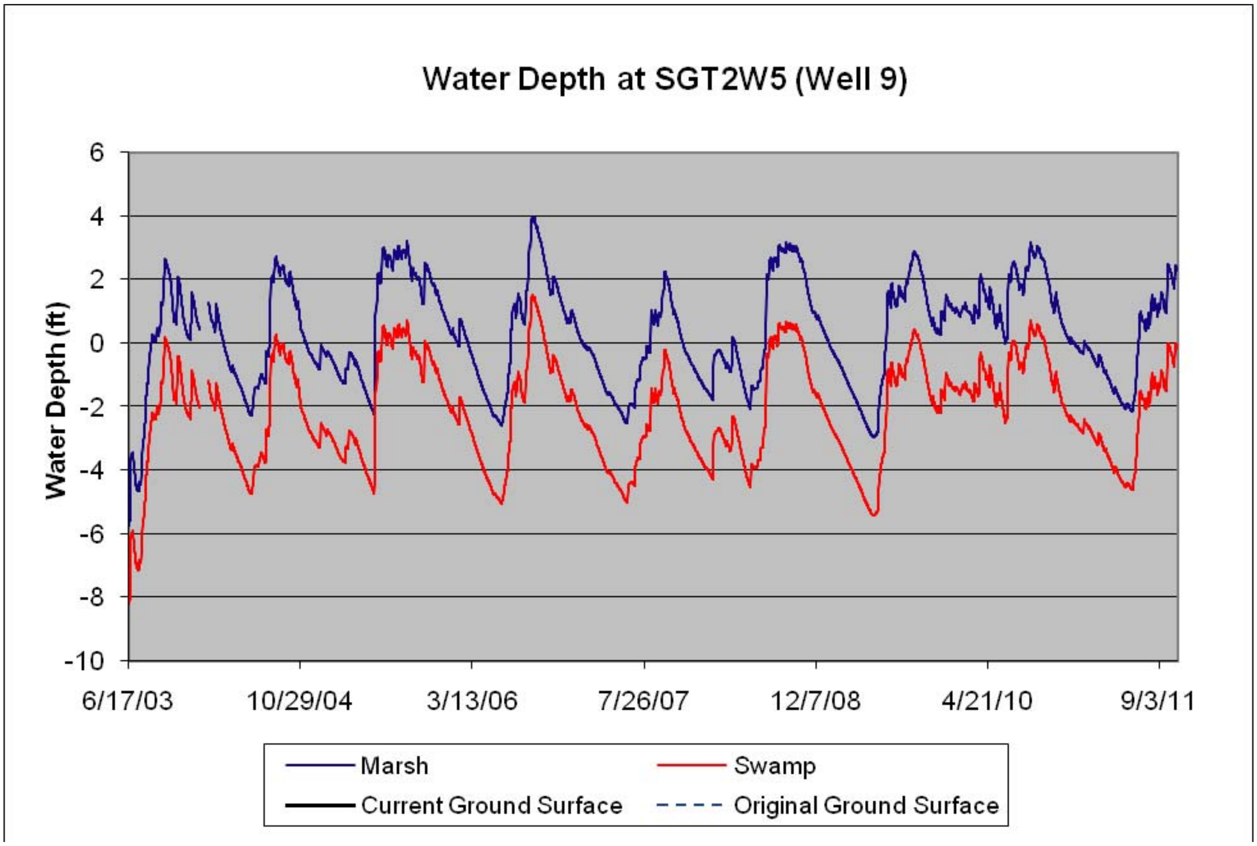


Figure 3. Water Levels at 70th and Patterson, PSRP

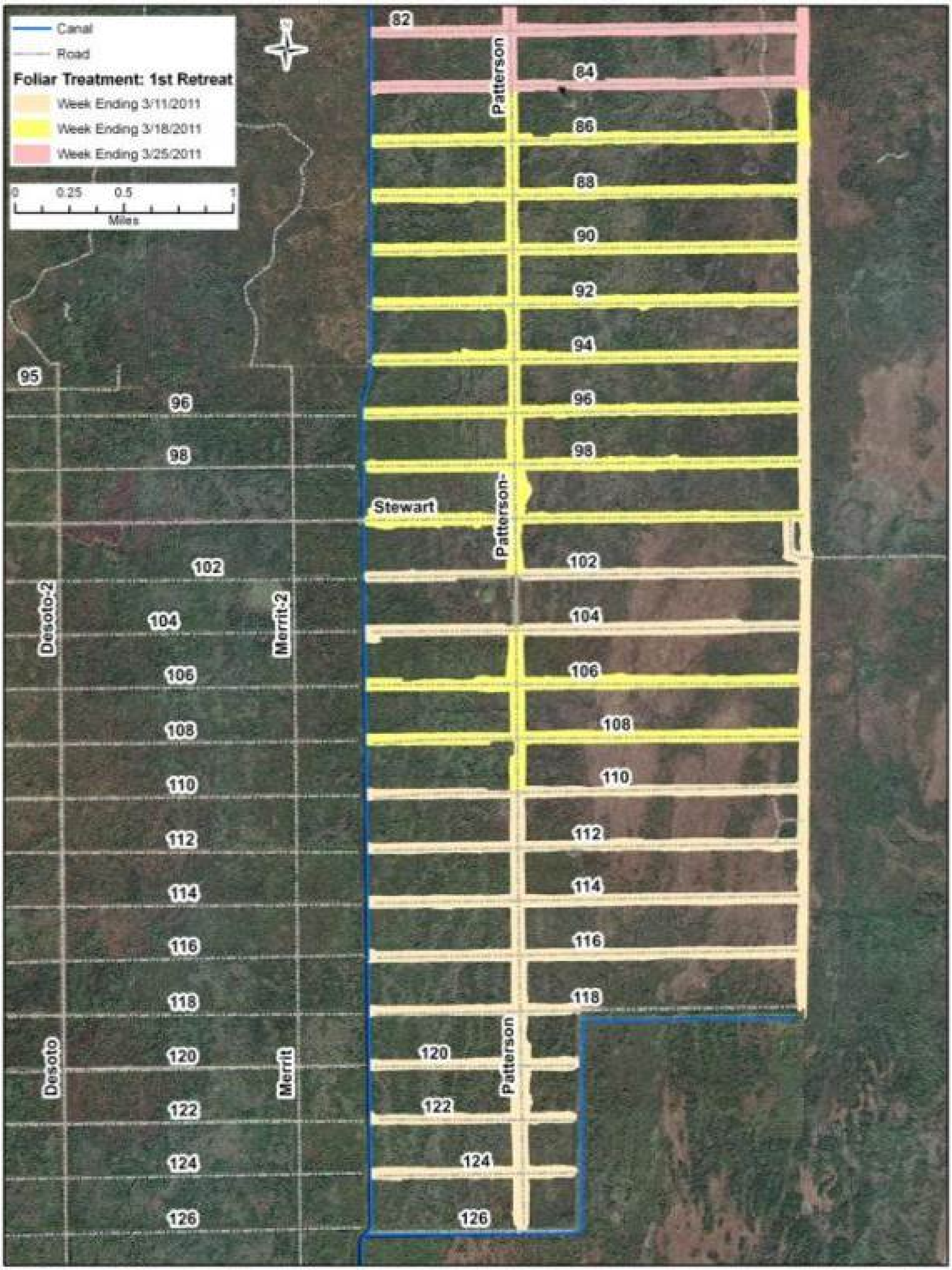


Figure 4. First Foliar Re-treatment (South of 86th)

Figure 5. First Foliar Re-treatment (62nd to 86th)

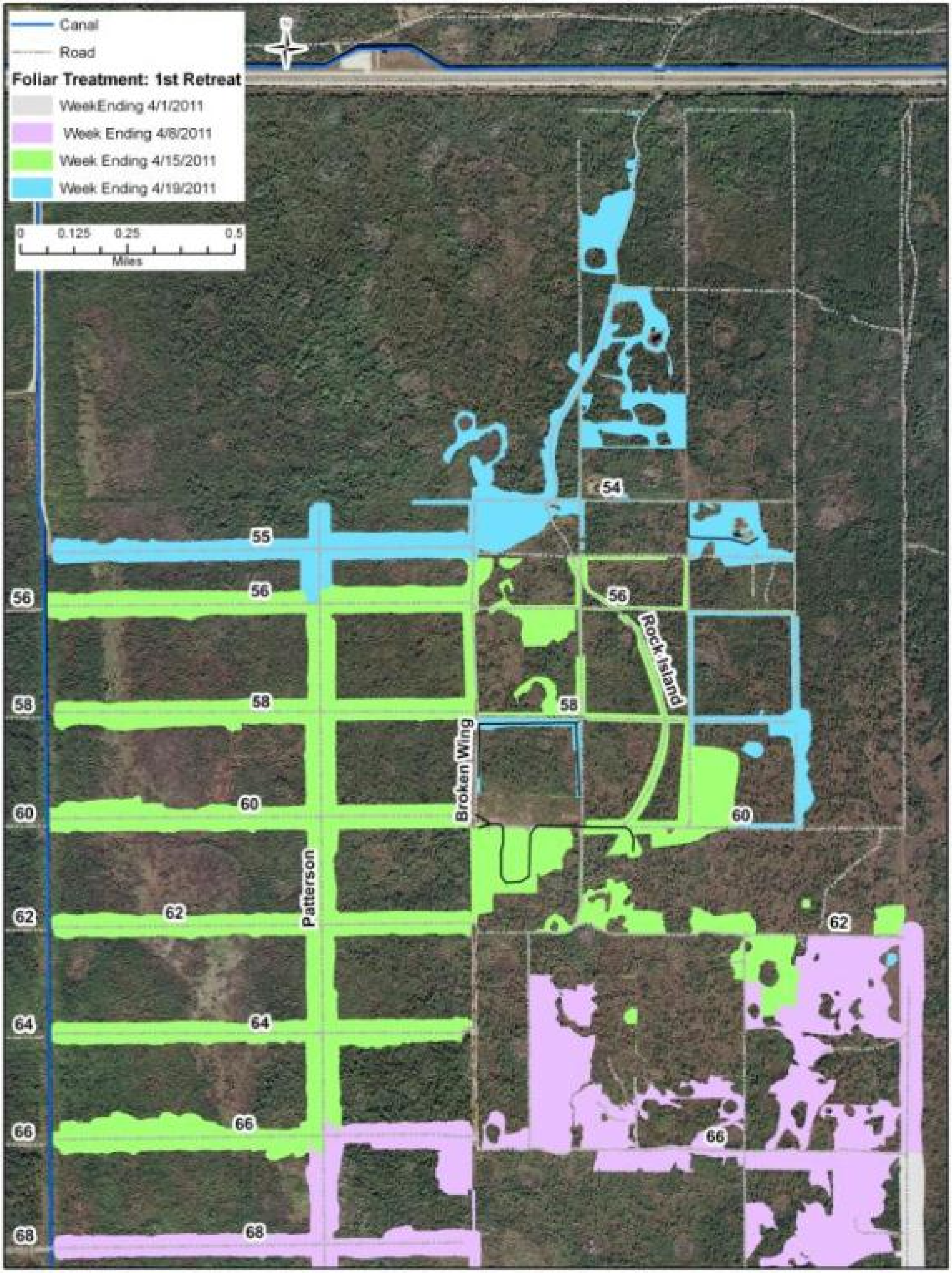


Figure 6. First Foliar Re-treatment (North of 62^{nd})

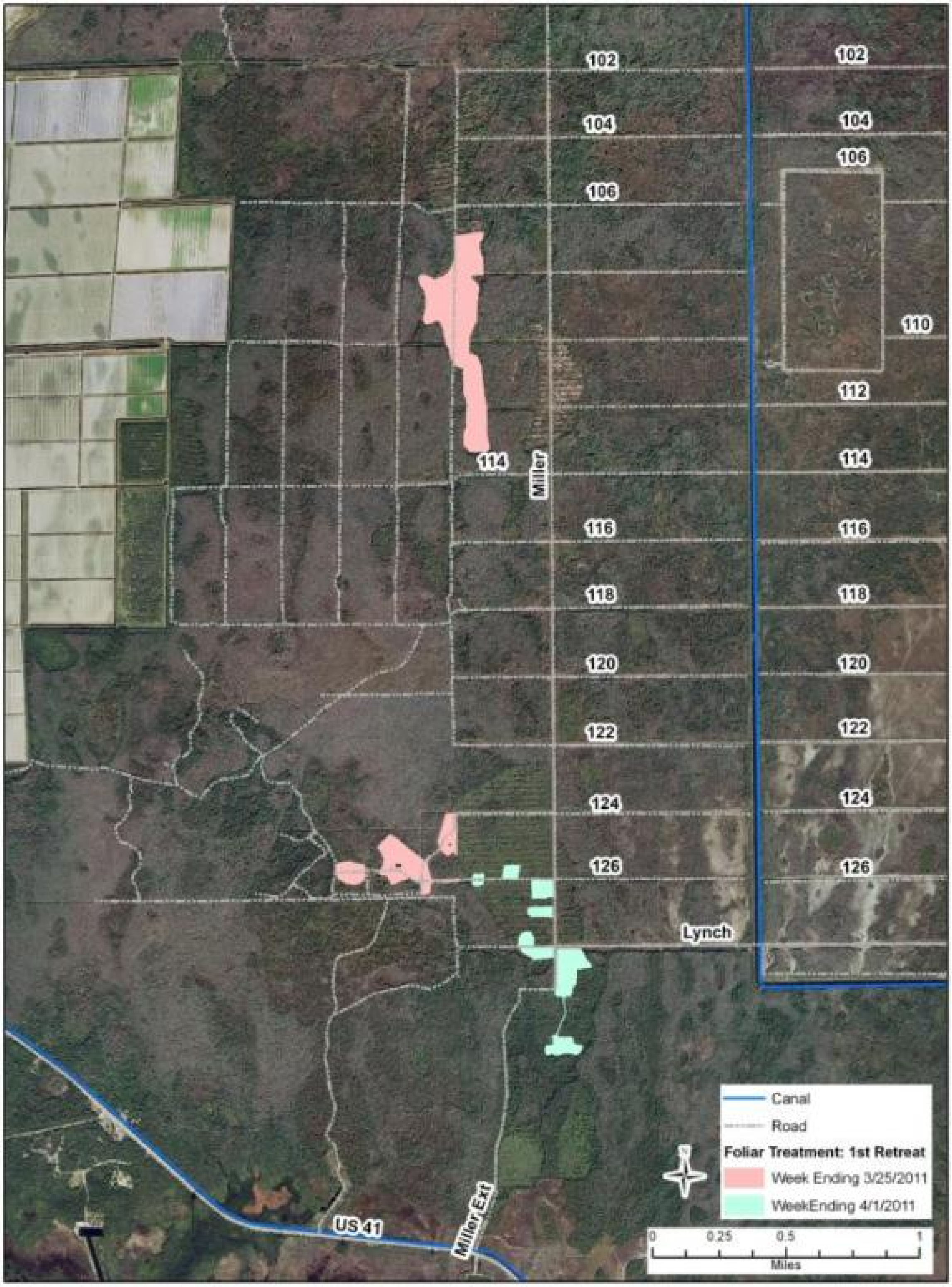


Figure 7.   First Foliar Re-treatment (Soil Remediation Sites)

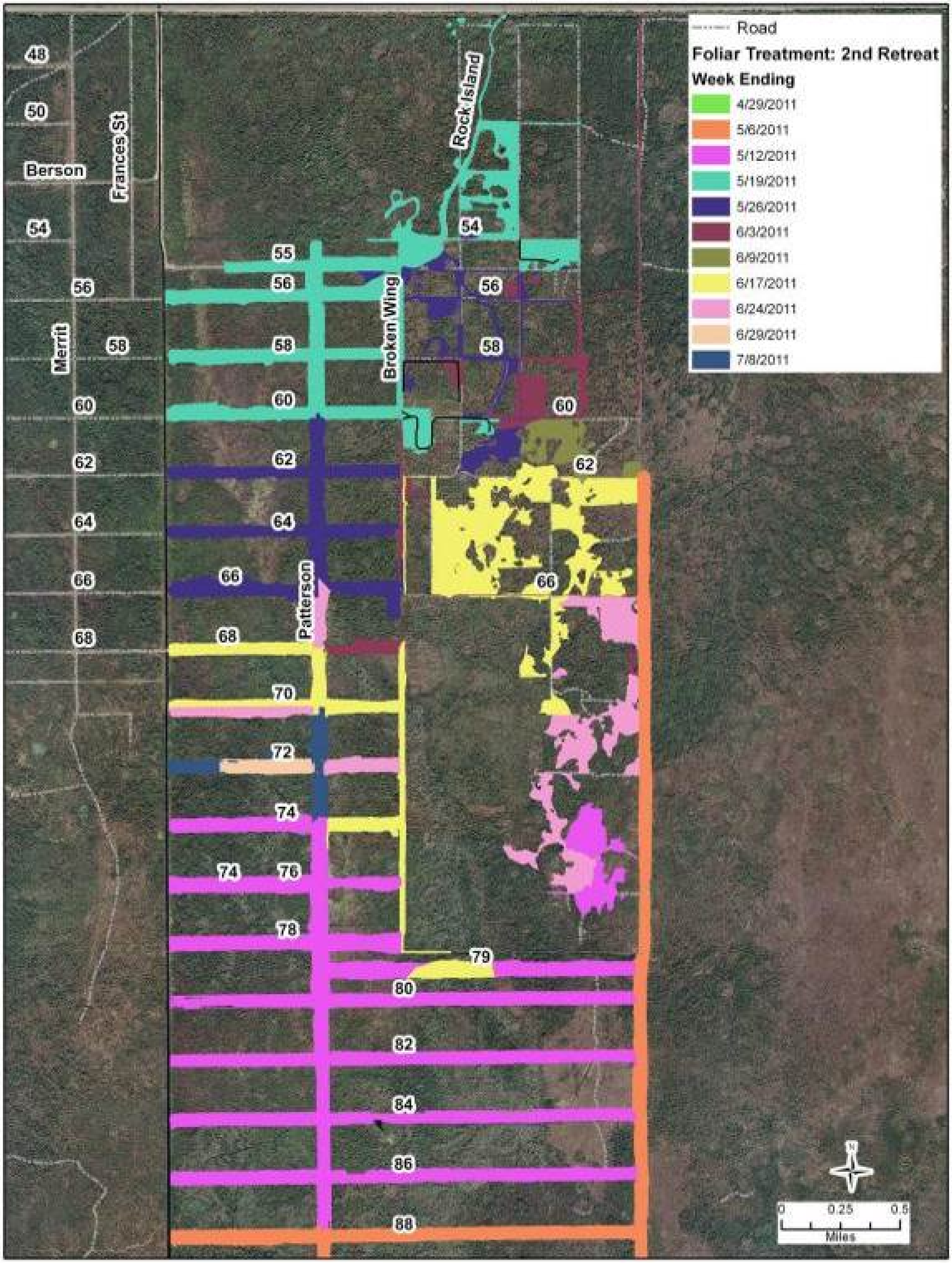


Figure 8. Second Foliar Re-treatment (North of 86th)

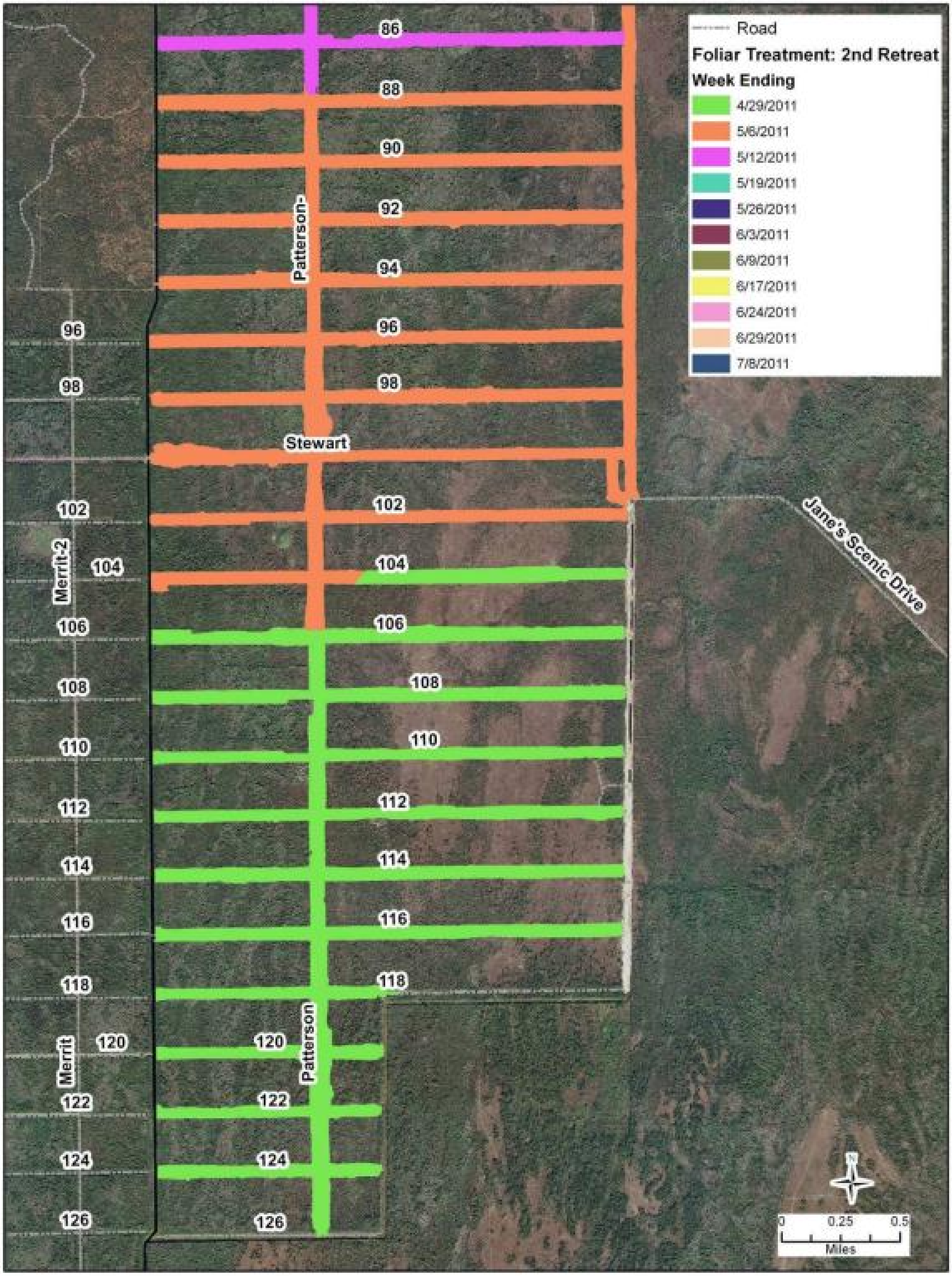


Figure 9.   Second Foliar Re-treatment (South of 86th)

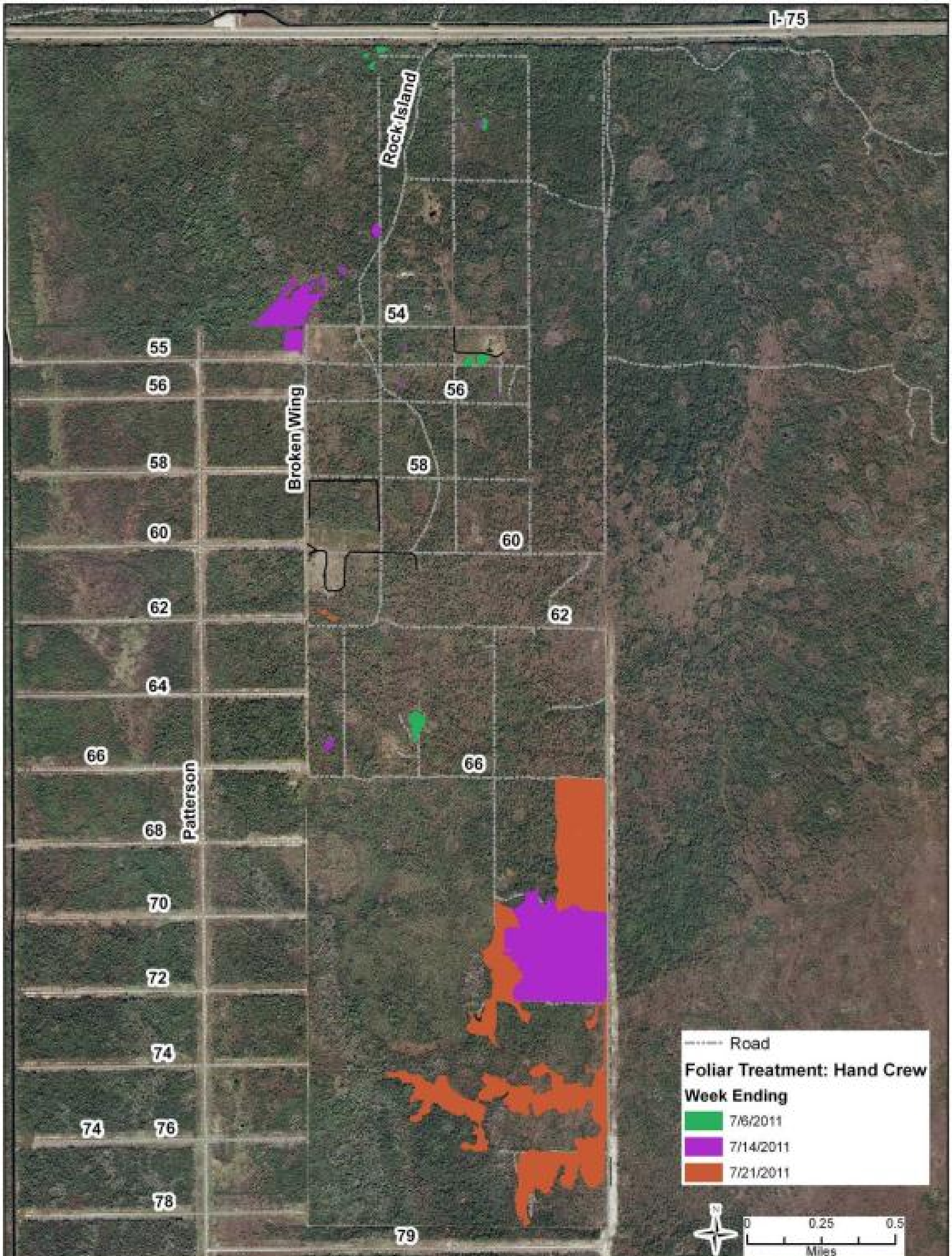


Figure 10. Backpack Foliar Treatment of Cogongrass in Broken Wing Ranch Area

Figure 11. Post-Wildfire Foliar Treatment of Caesarweed in Broken Wing Ranch Area

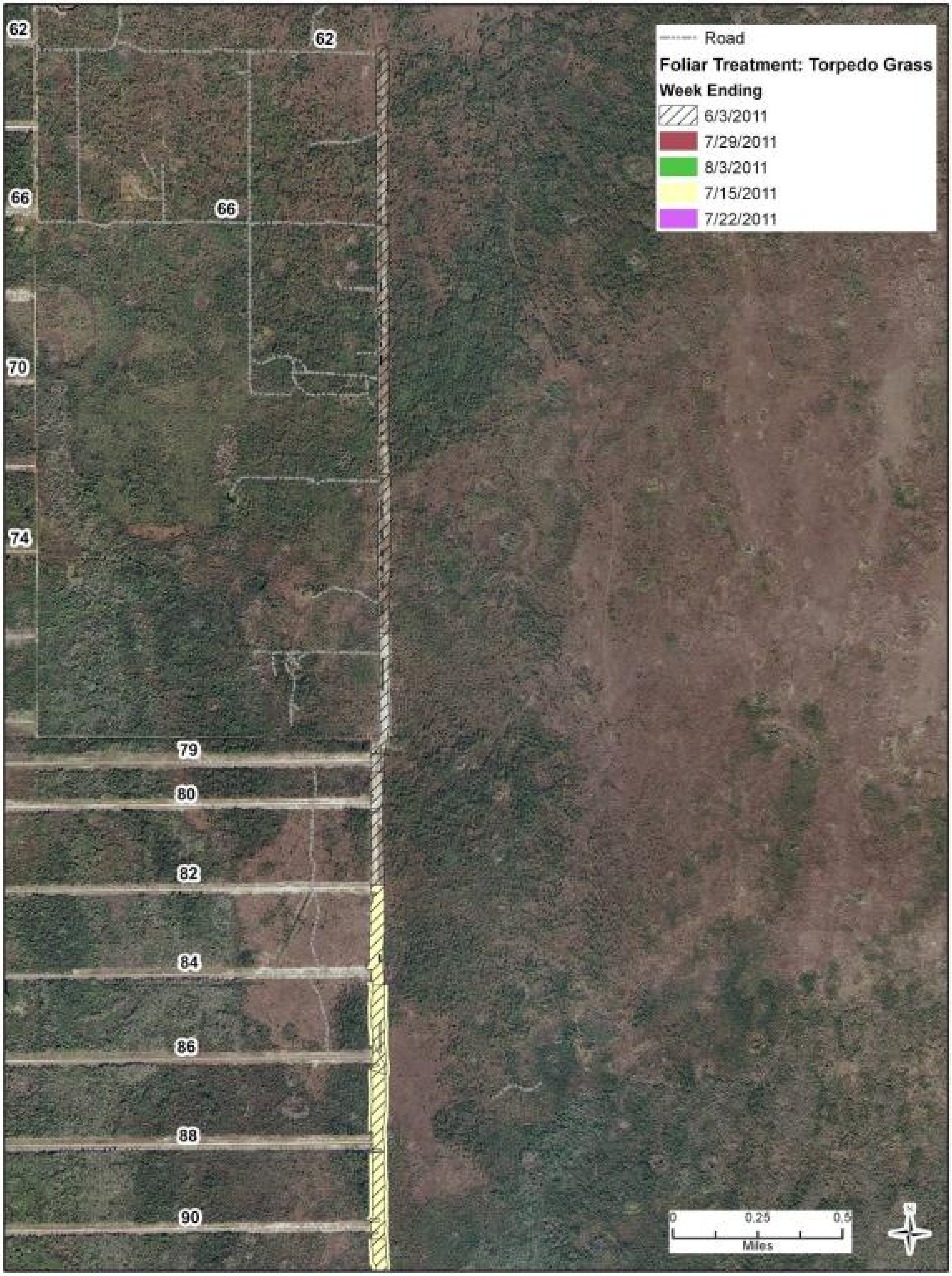


Figure 12. Third and Fourth Foliar Re-treatment of Torpedograss (North of 90th)

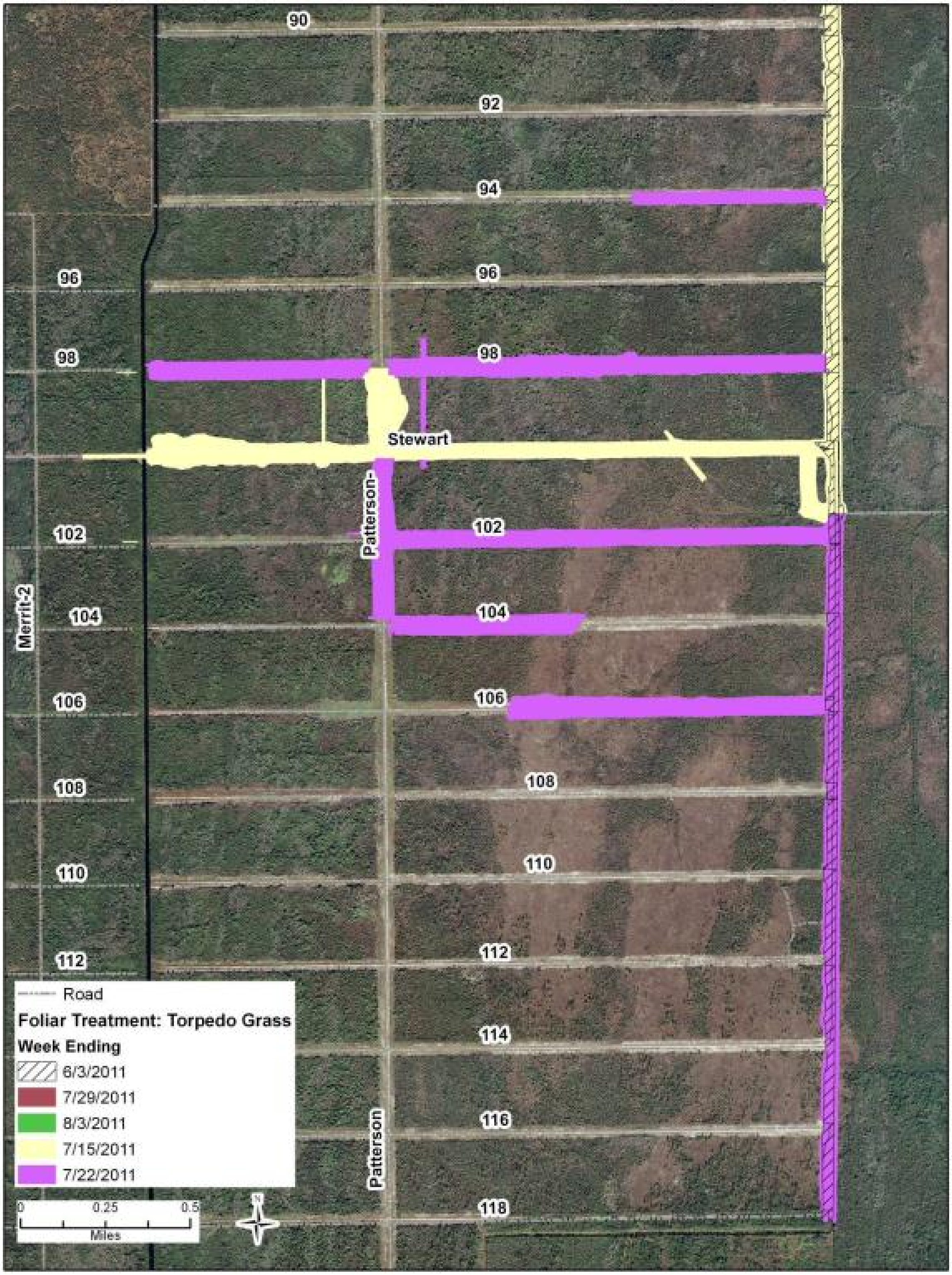


Figure 13. Third and Fourth Foliar Re-treatment of Torpedograss (South of 90th)

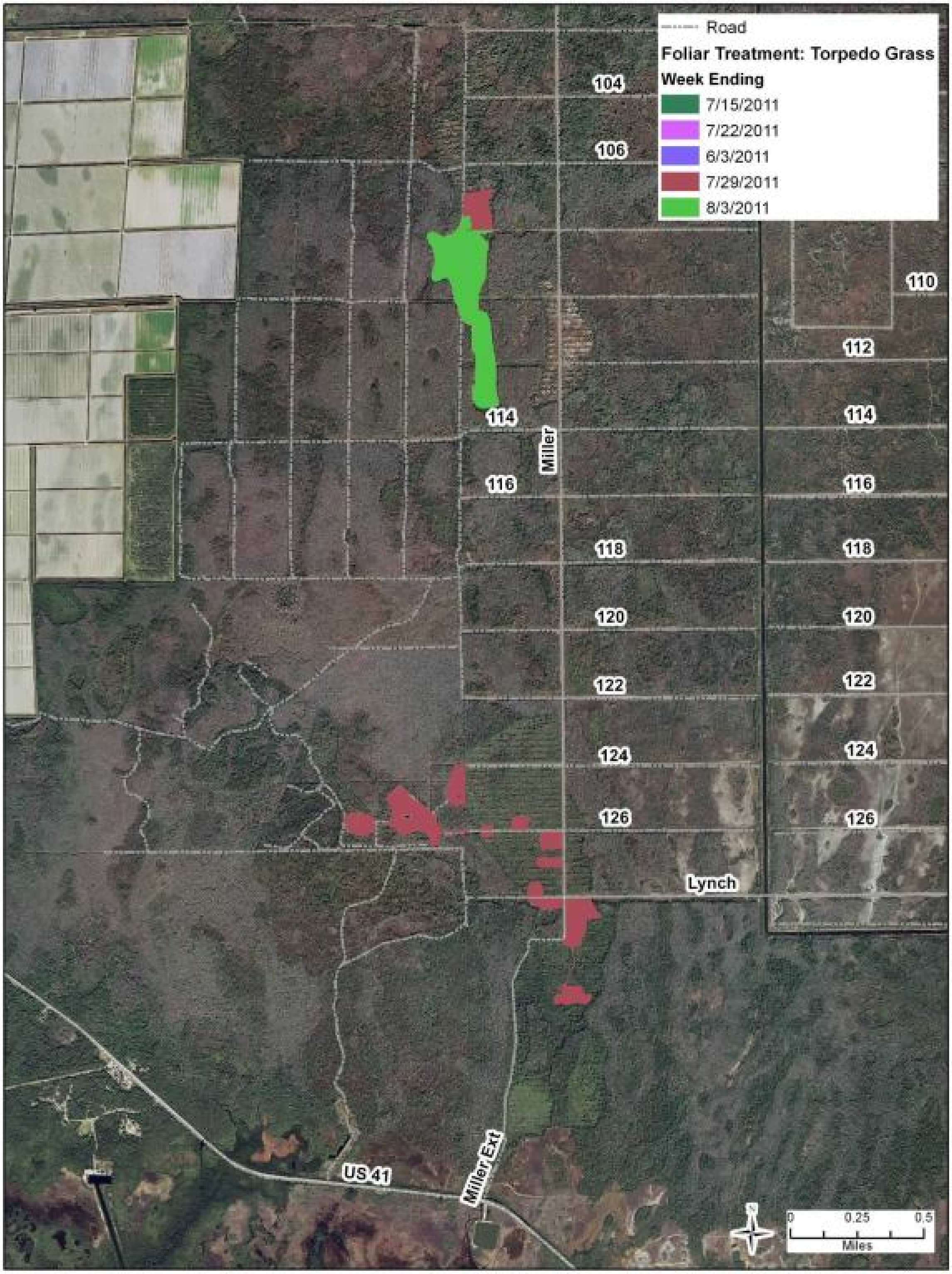


Figure 14. Third Foliar Re-treatment of Torpedograss (Soil Remediation Sites)

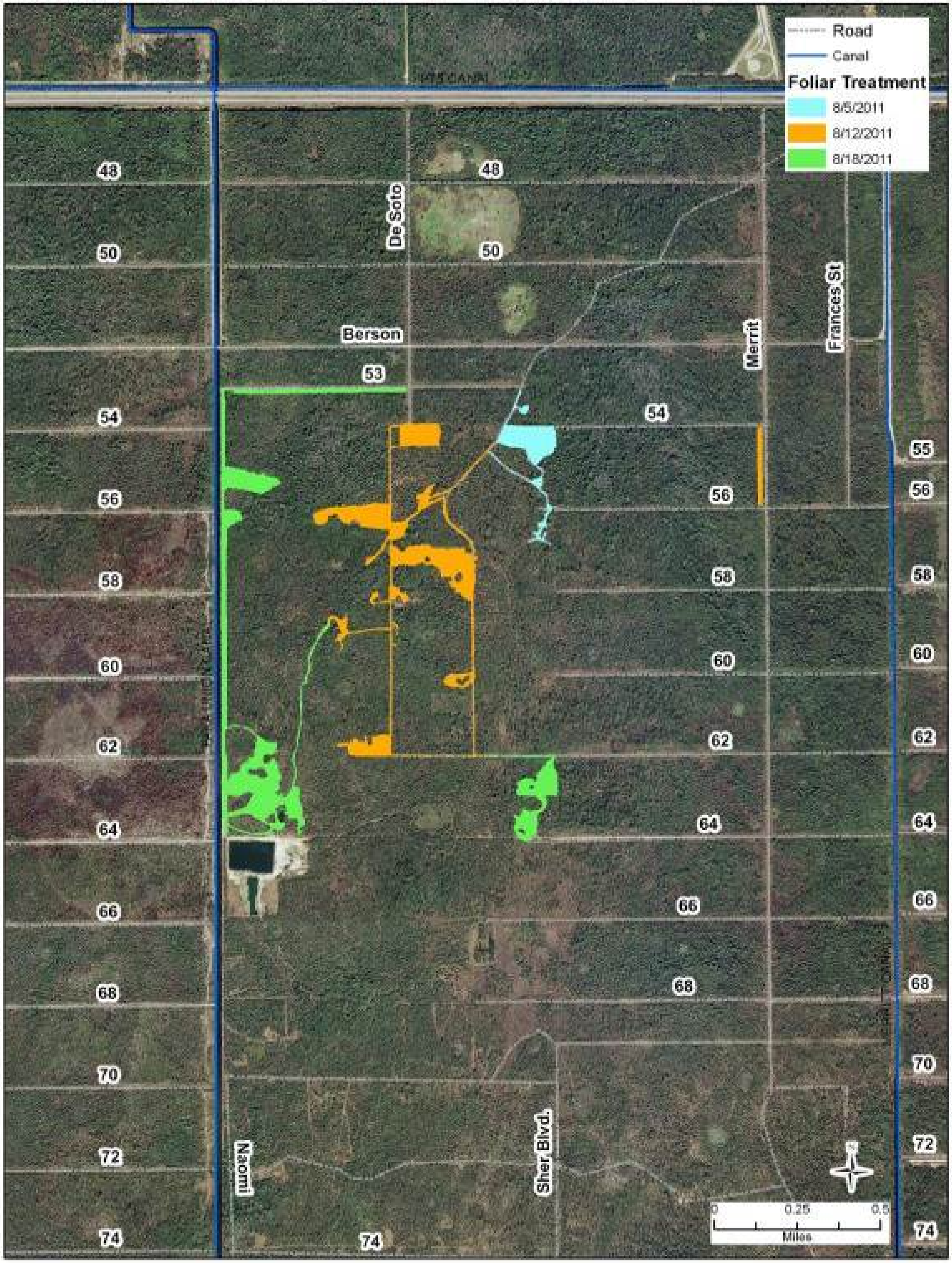


Figure 15. First Foliar Re-treatment of Exotic Grasses (Merritt Demolition Sites)

Figure 16. Foliar Re-treatment of Fall Flowering Grasses (North of 112th)

Figure 17: Foliar Re-treatment of Fall Flowering Grasses (South of 112th)

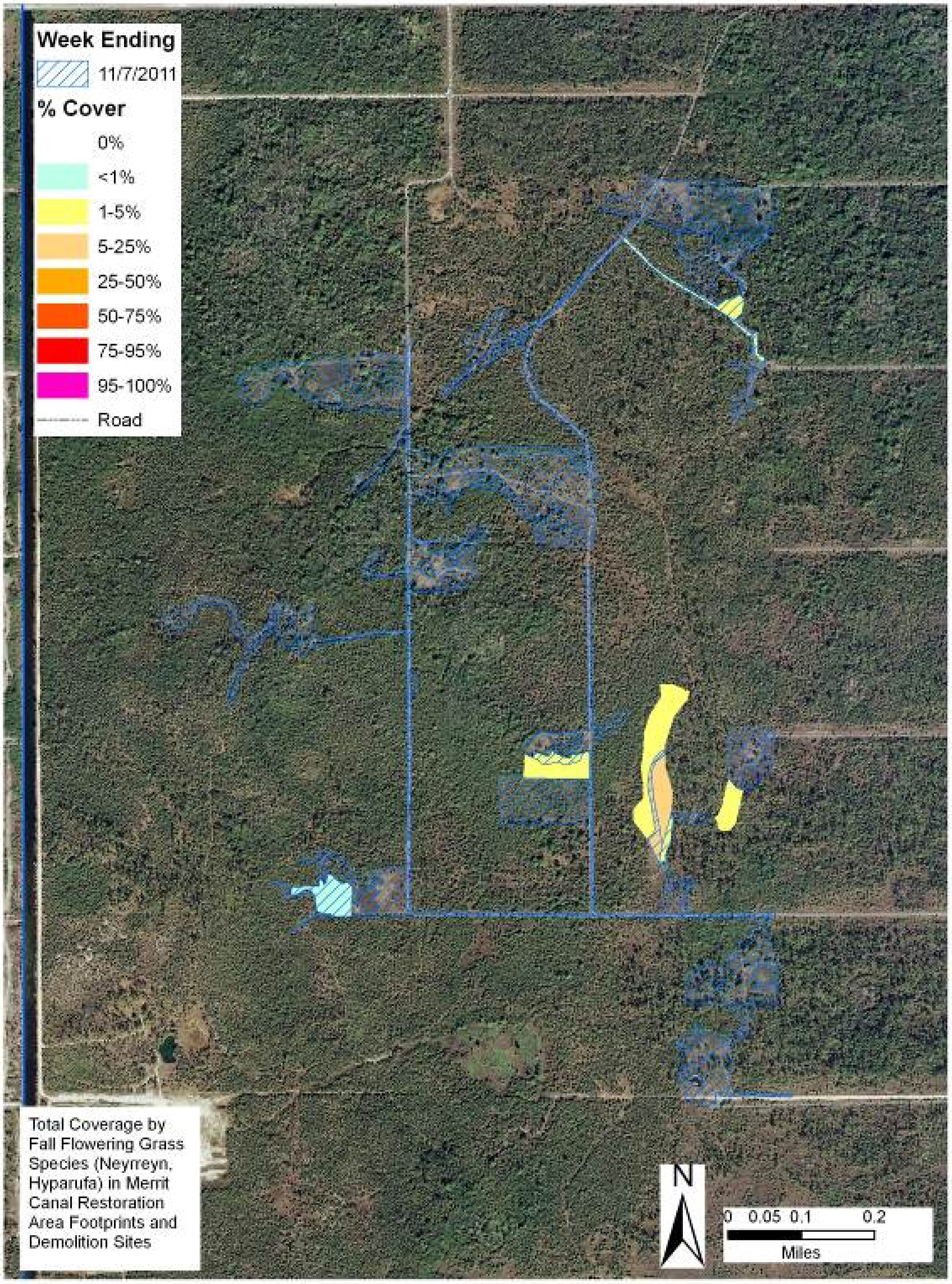
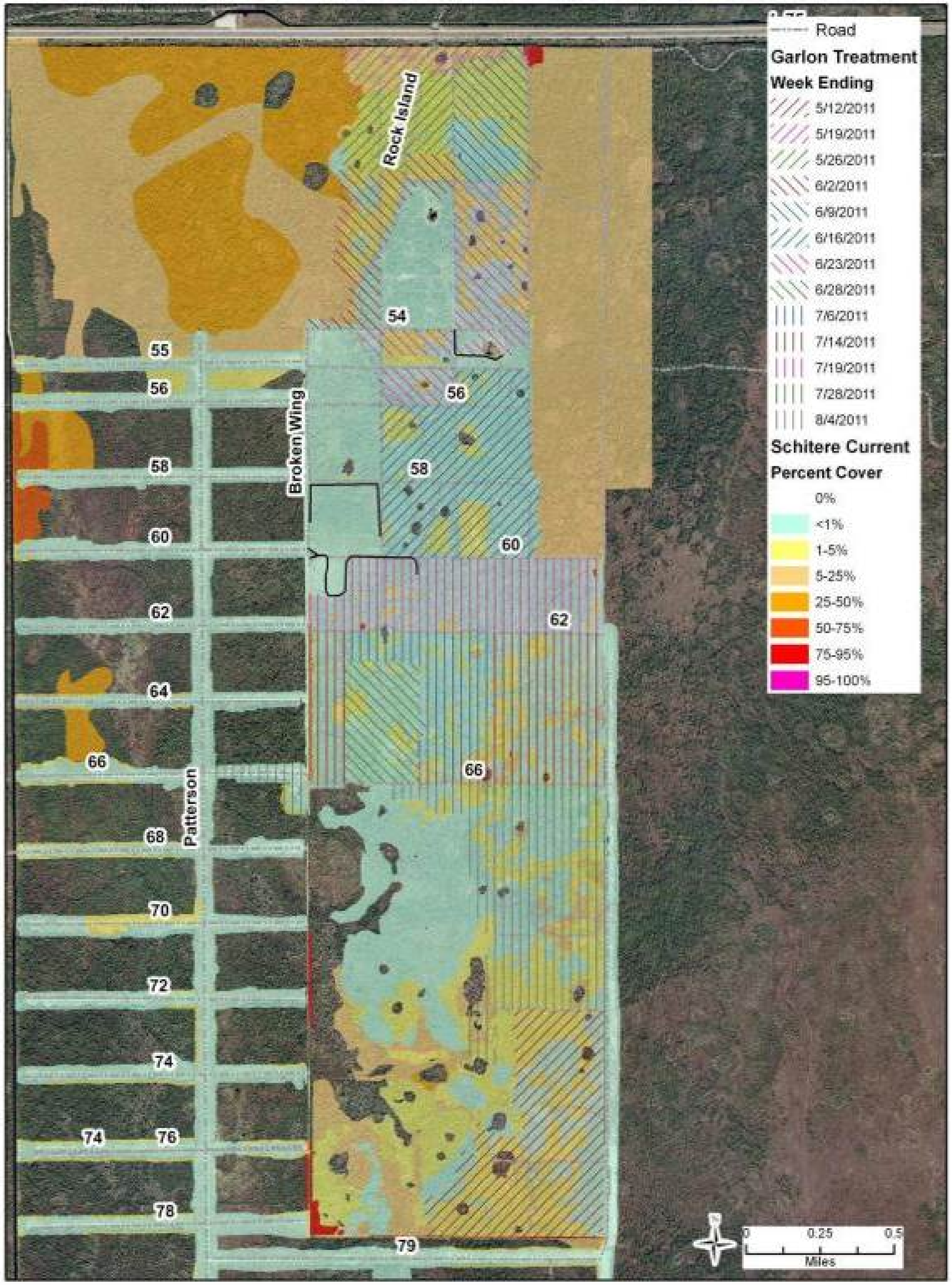


Figure 18: Foliar Re-treatment of Fall Flowering Grasses (Merritt Demolition Sites)



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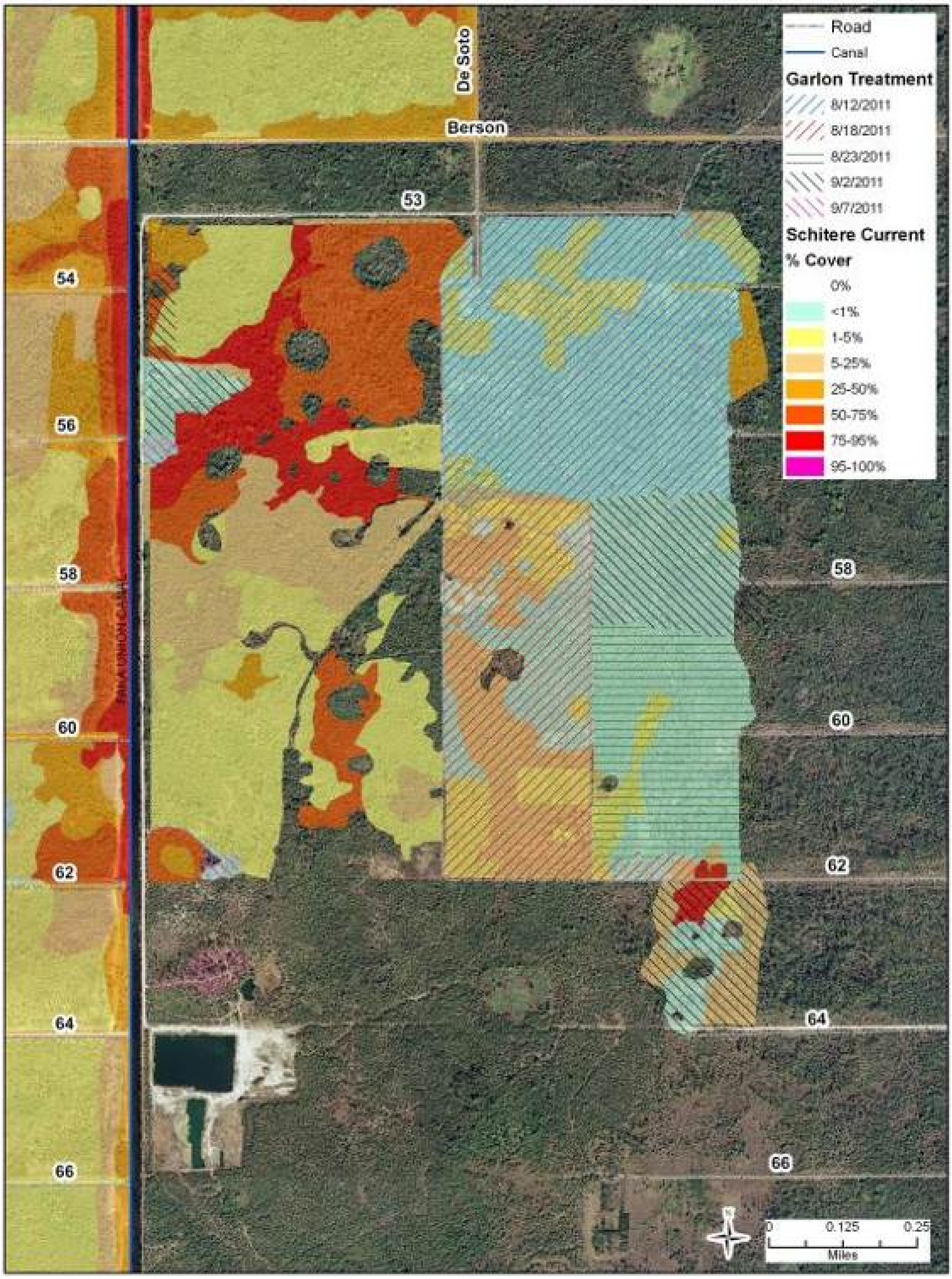

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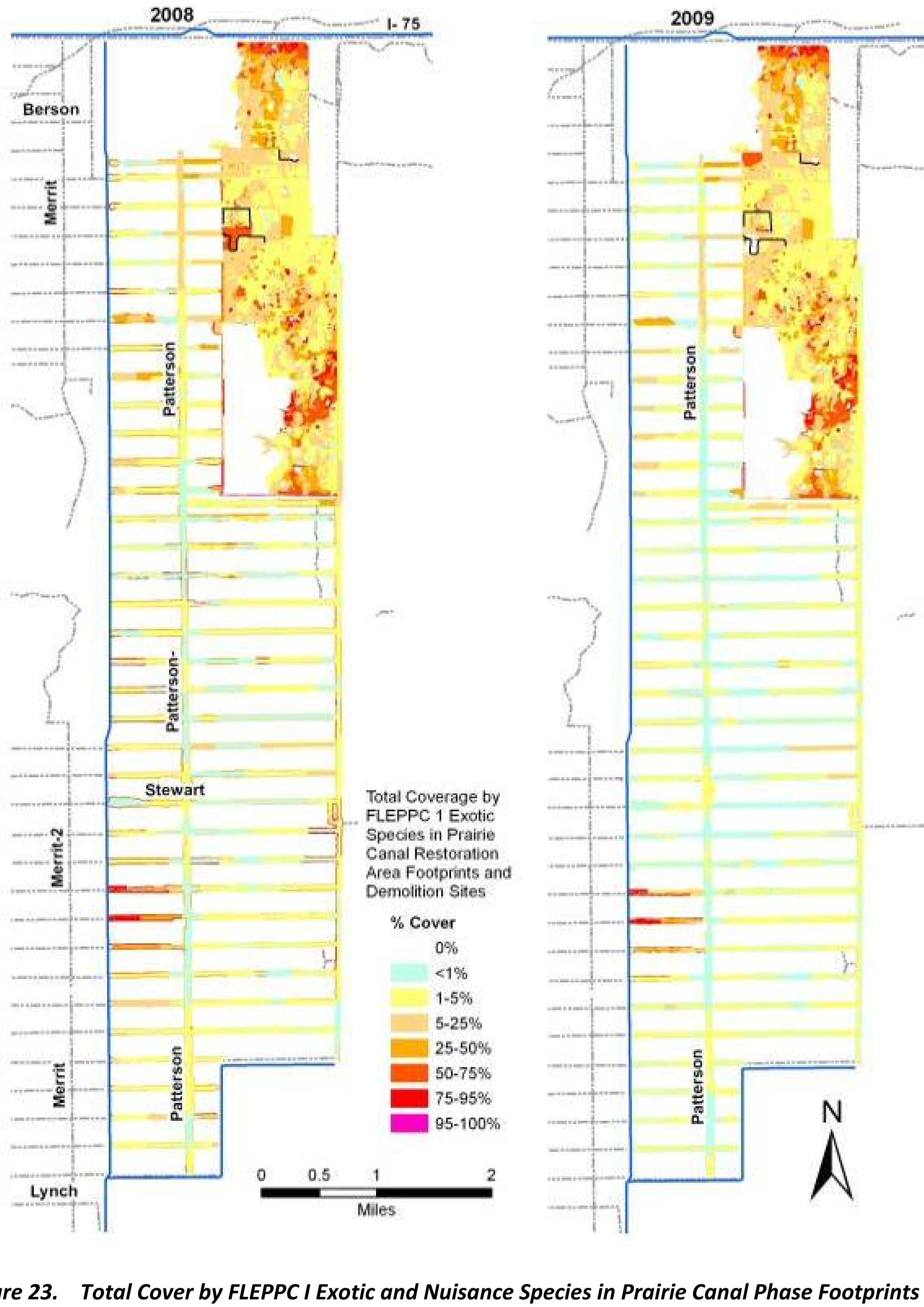

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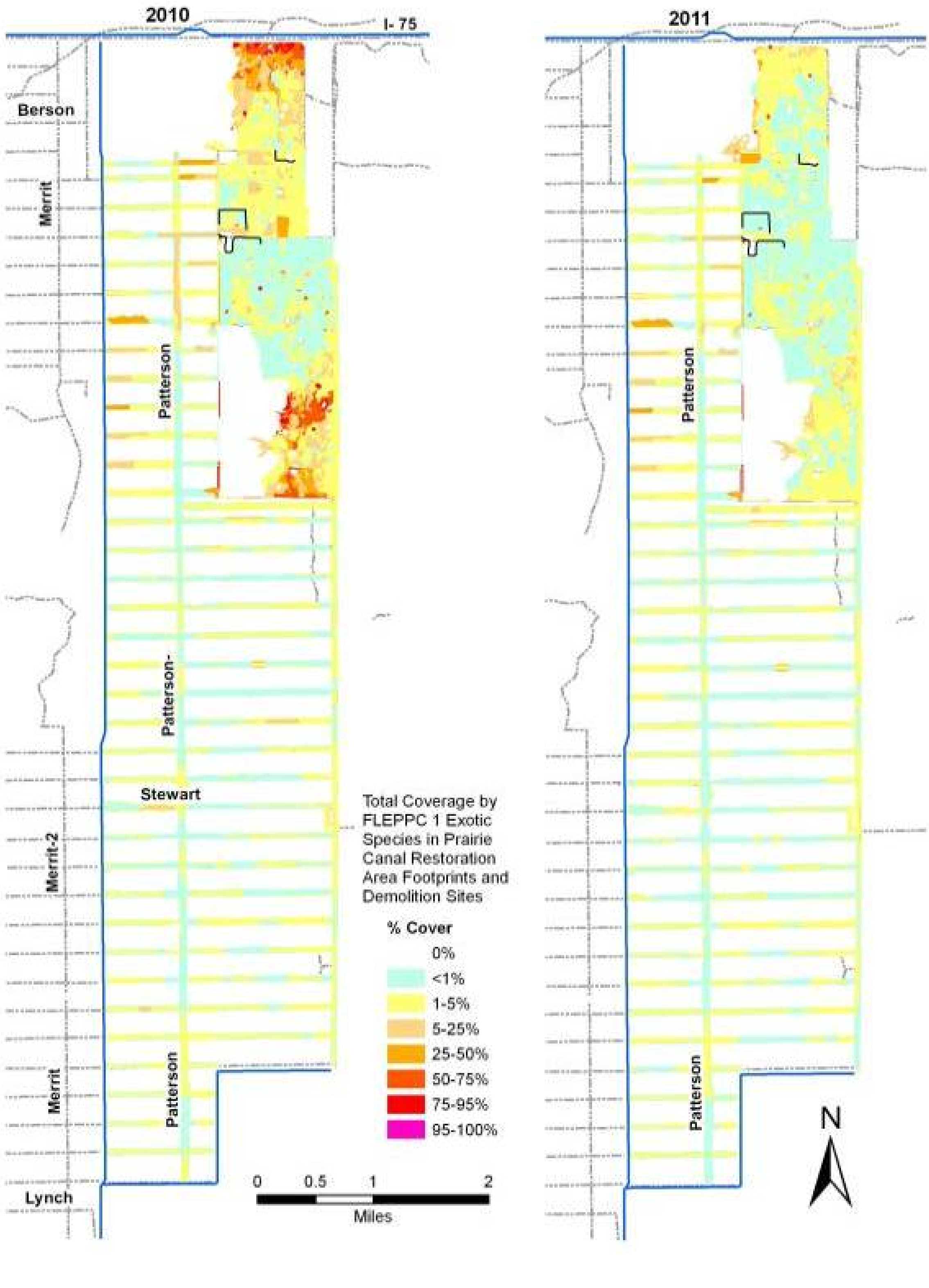

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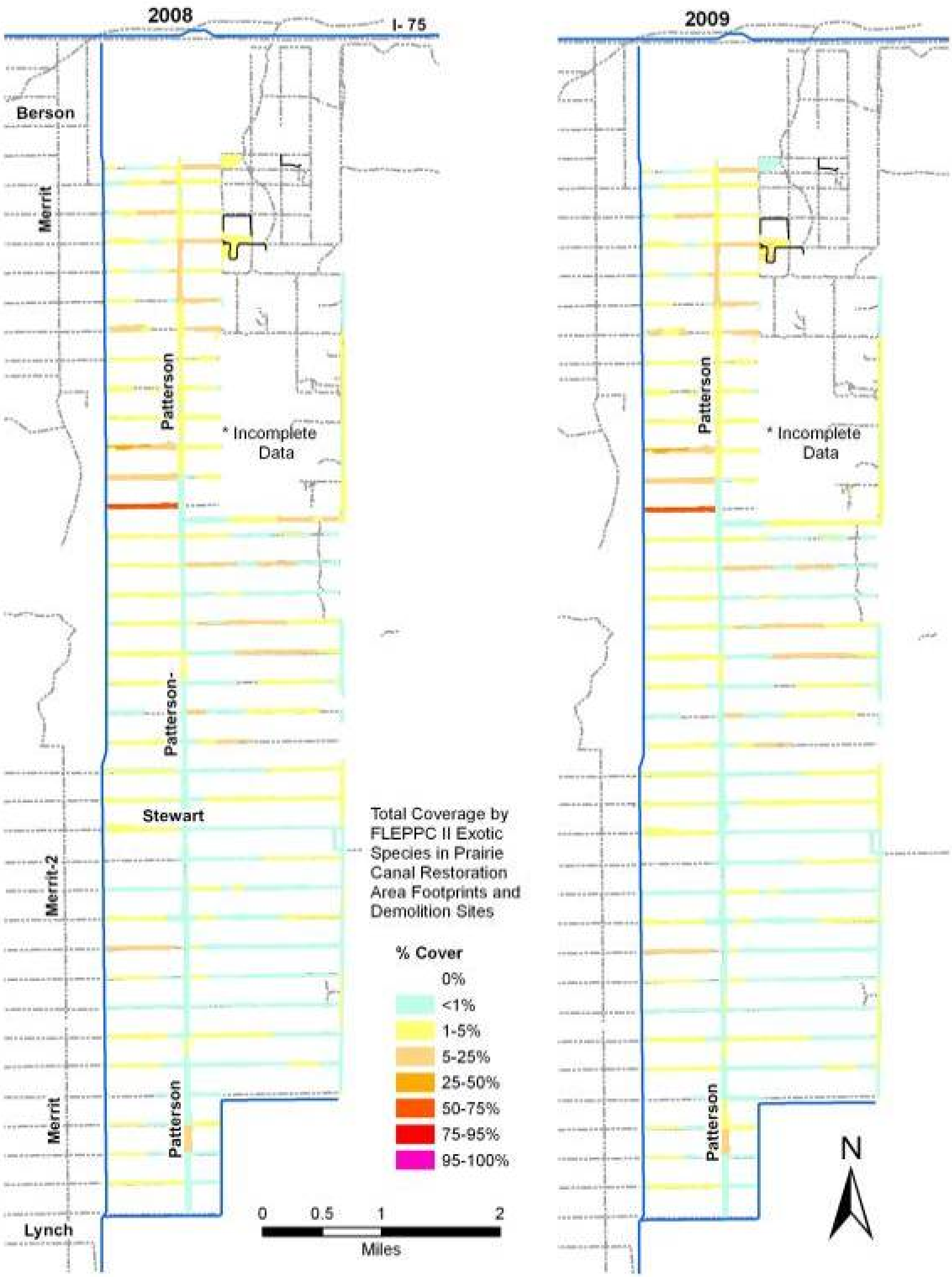

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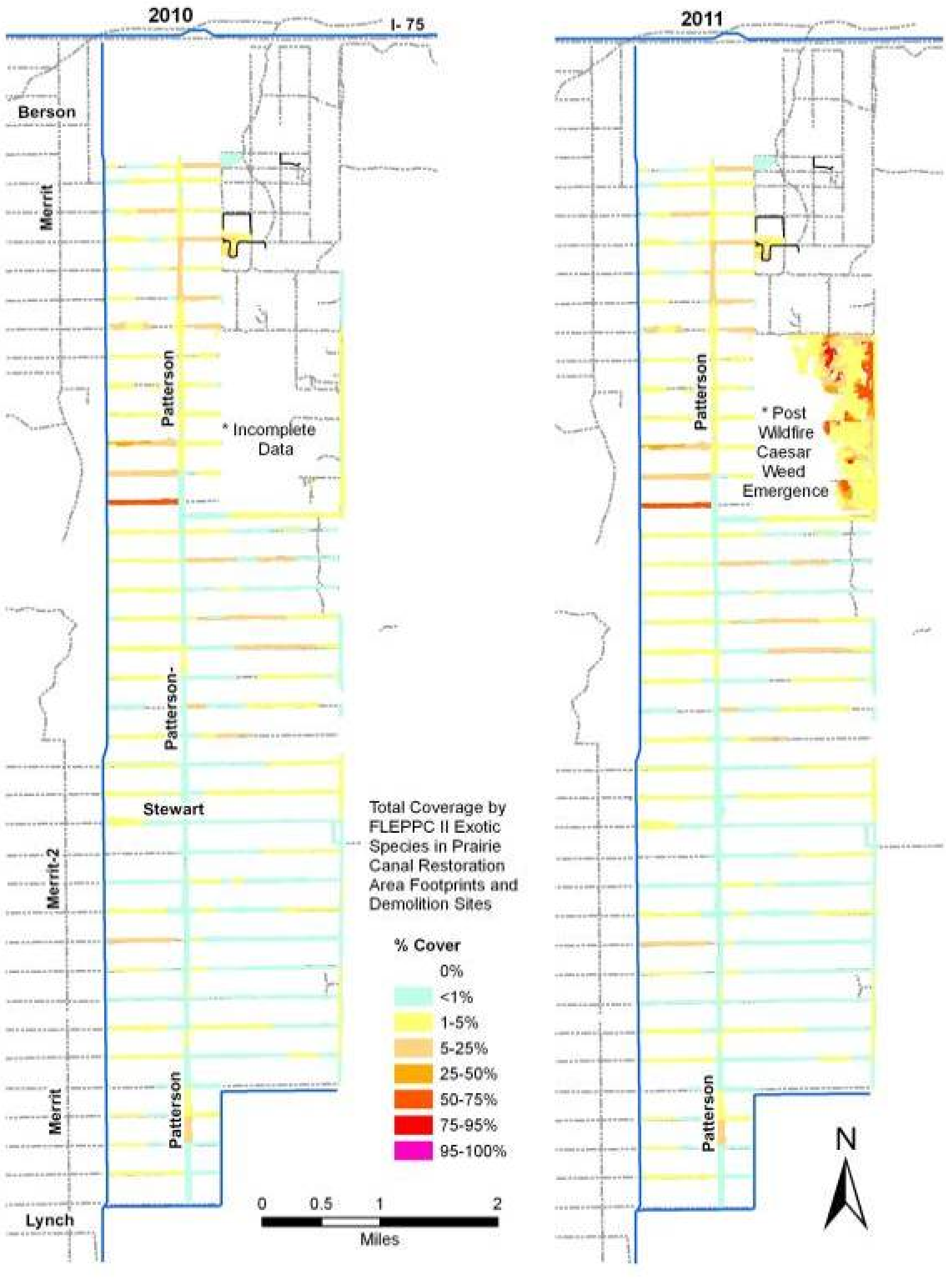

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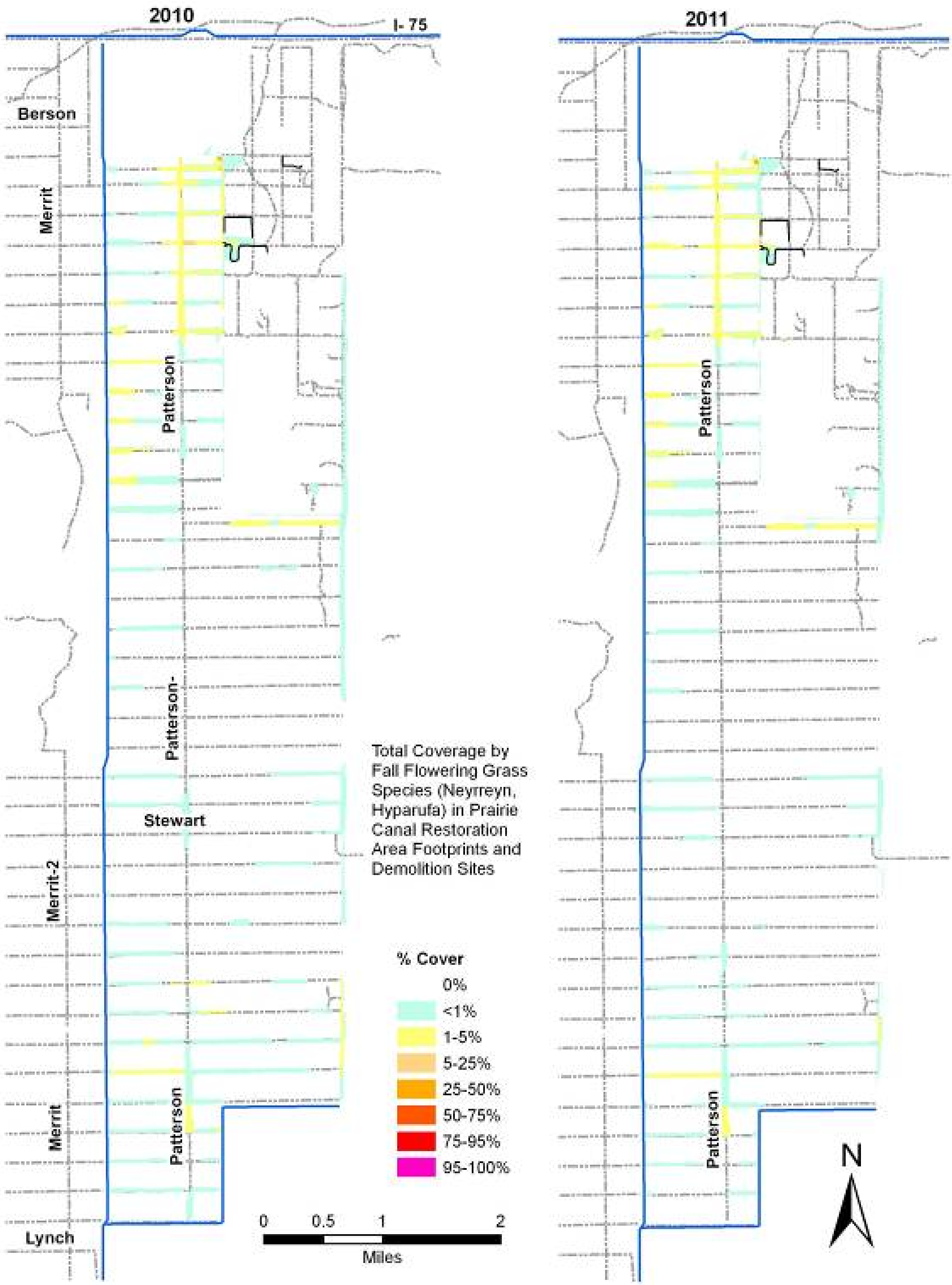

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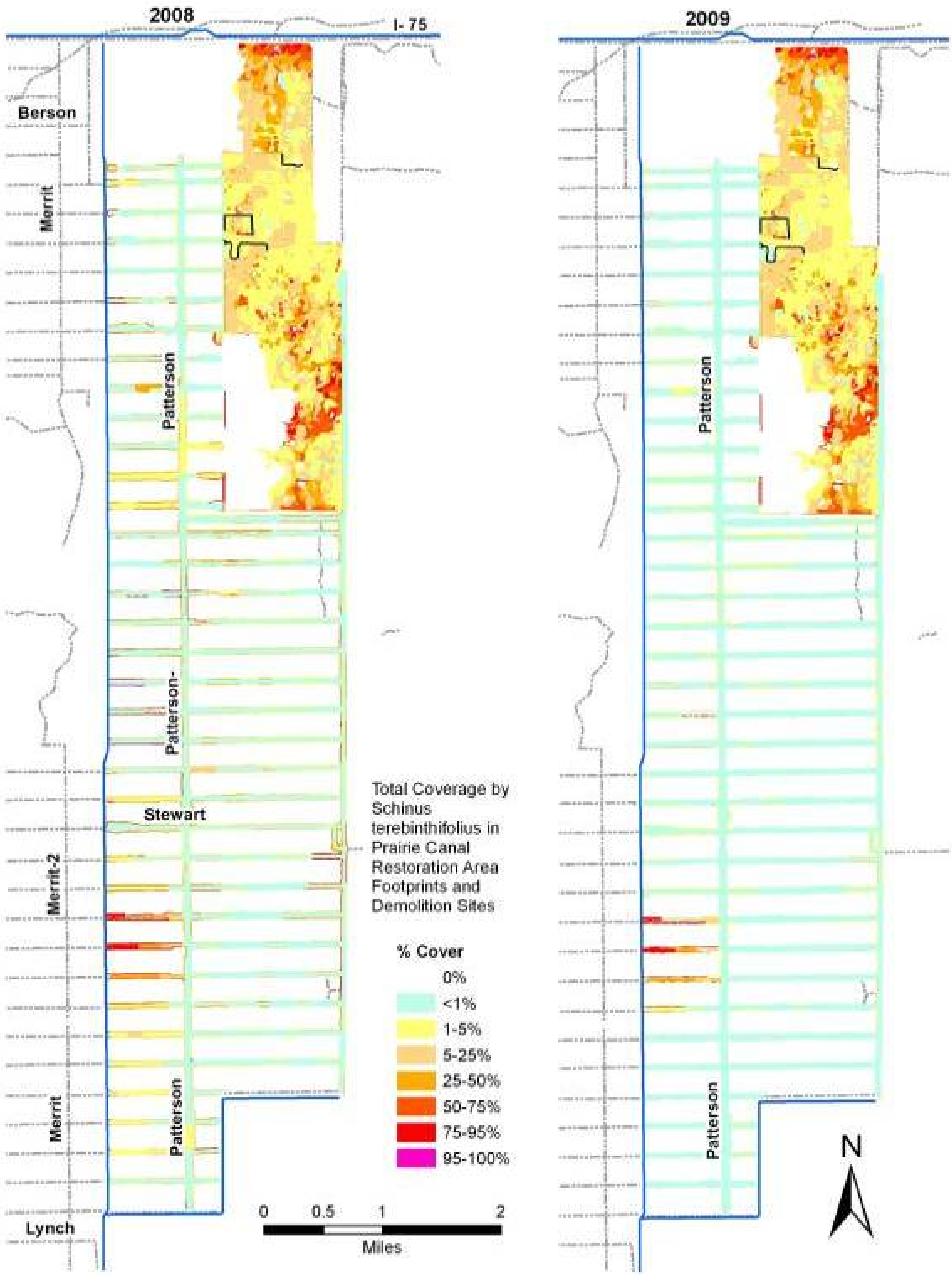

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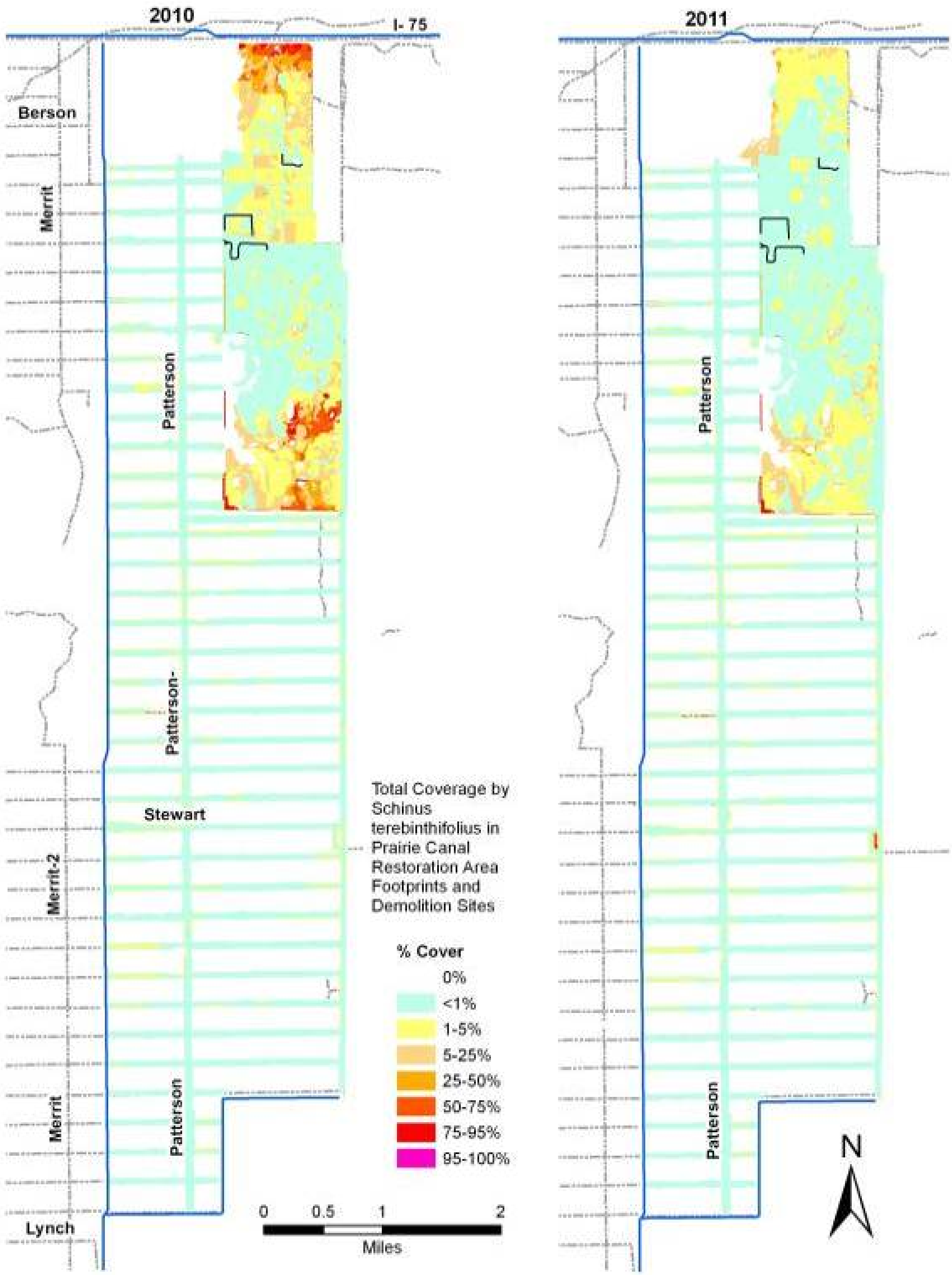

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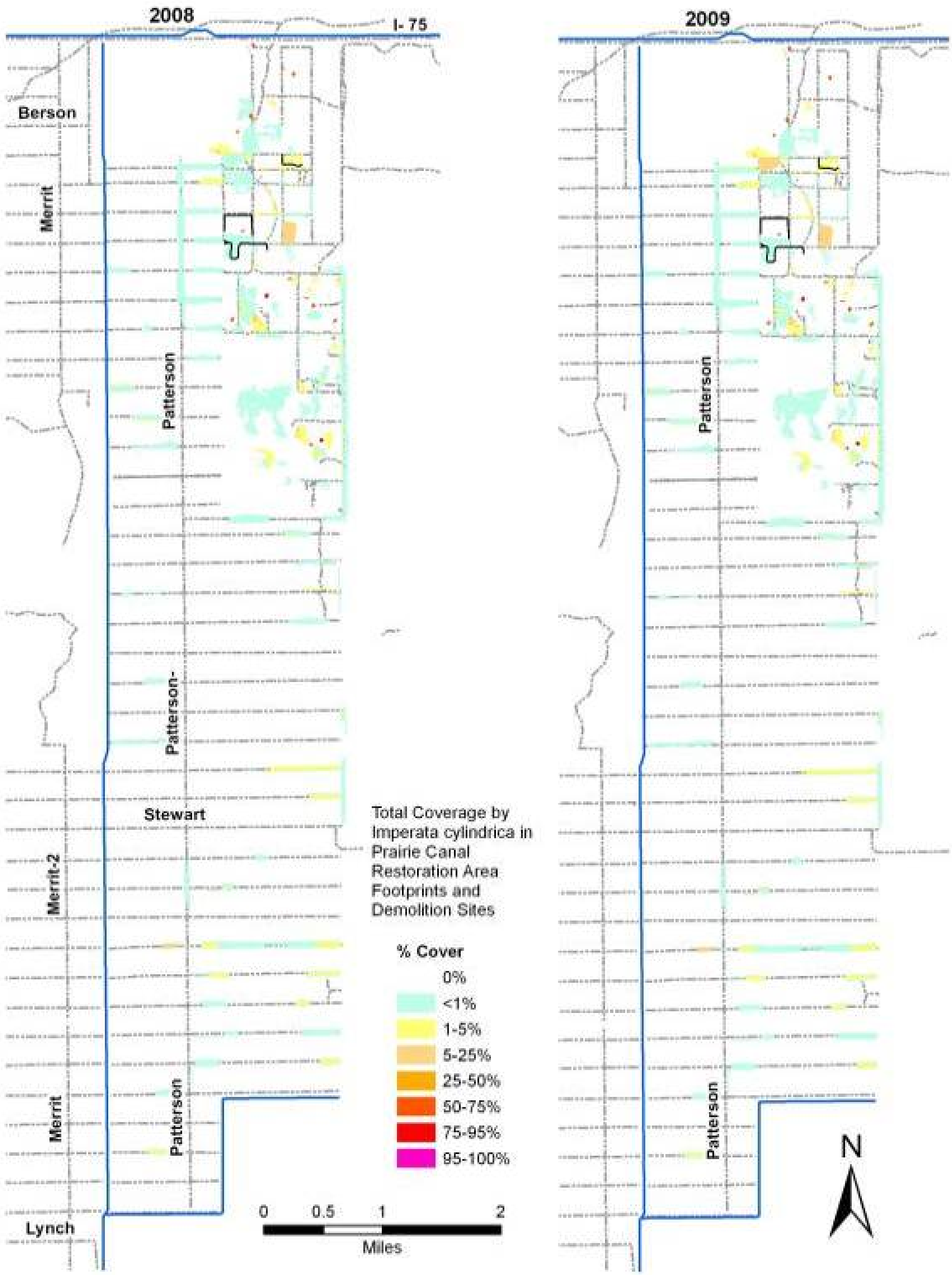

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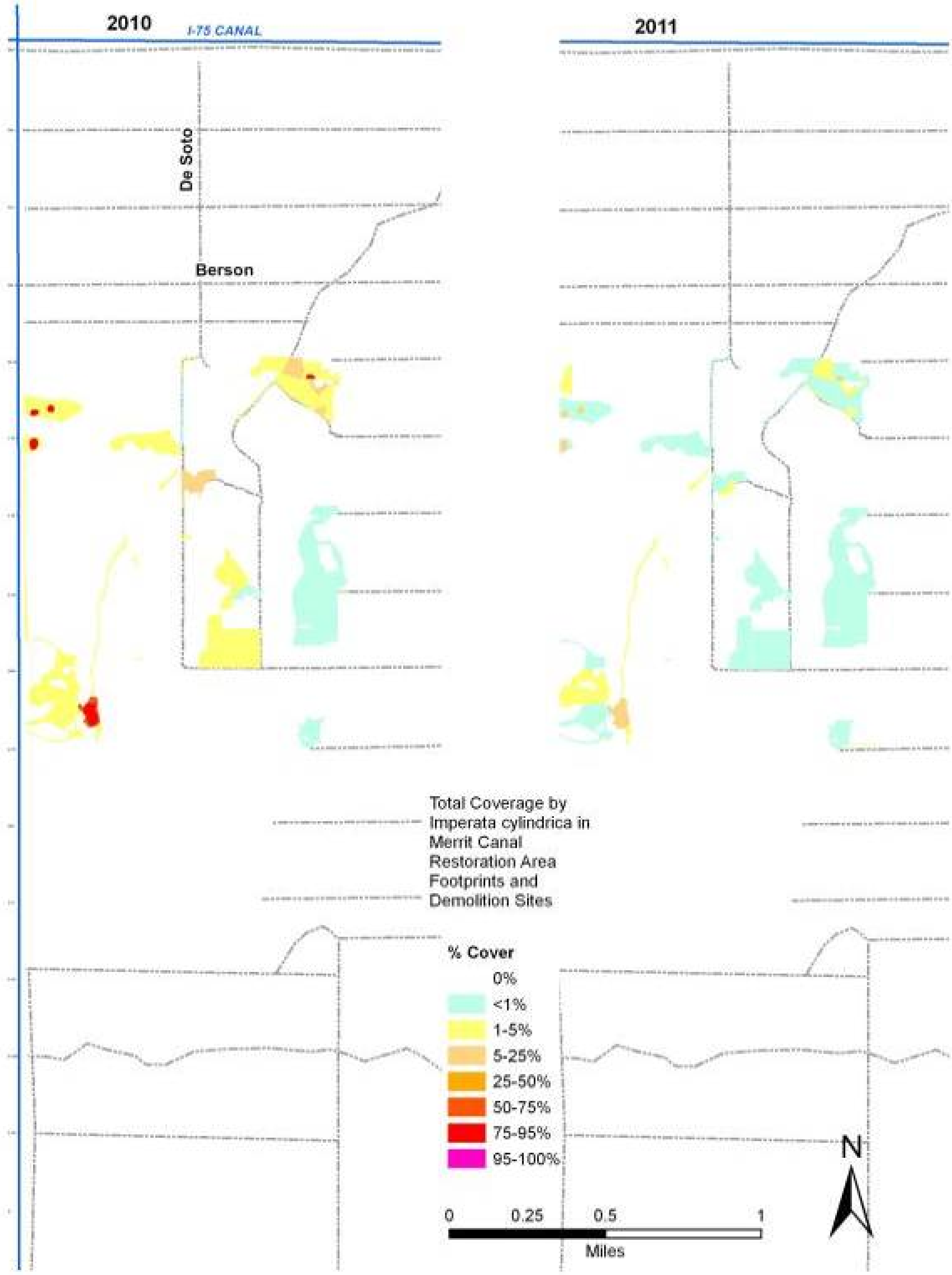

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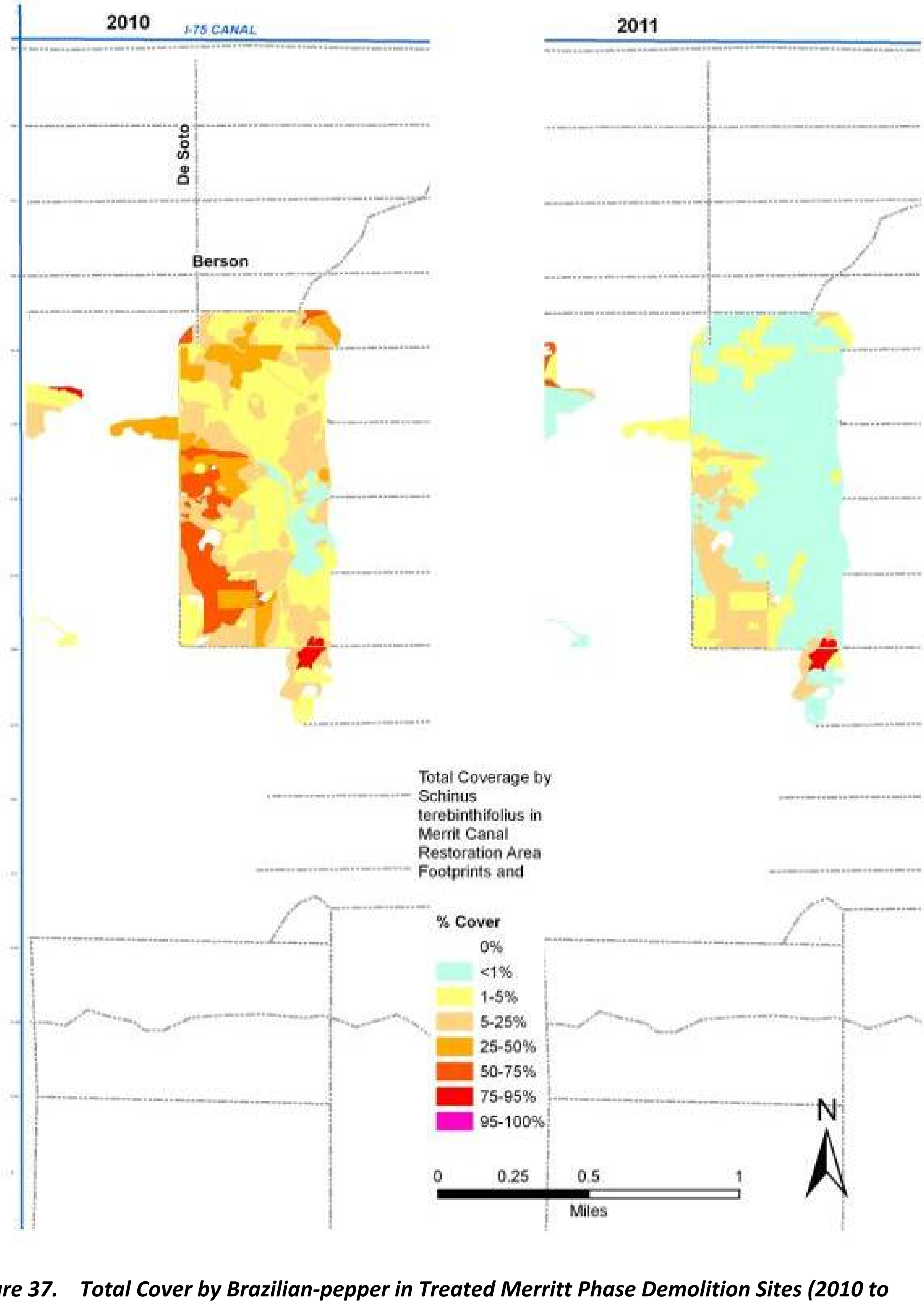

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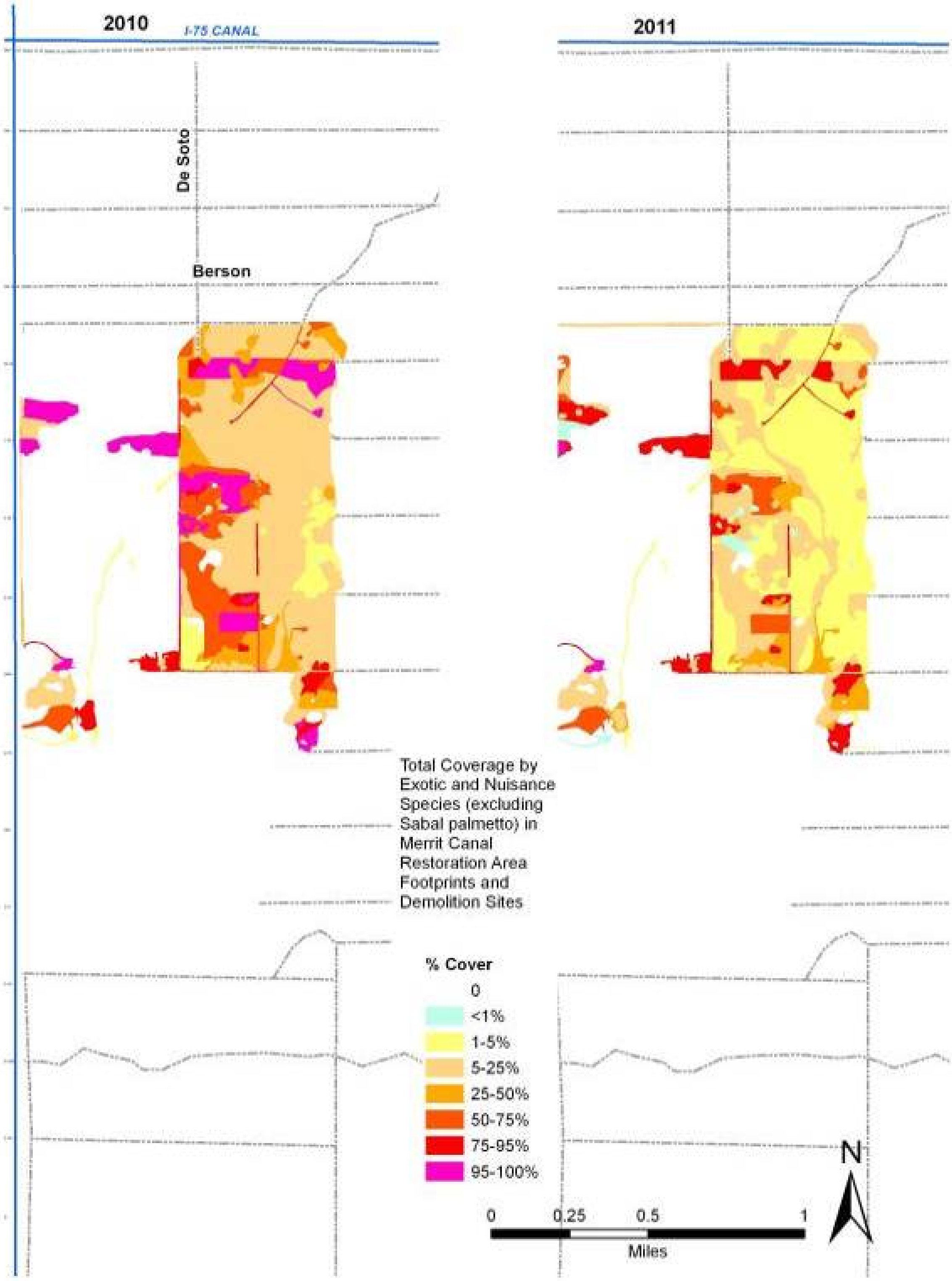

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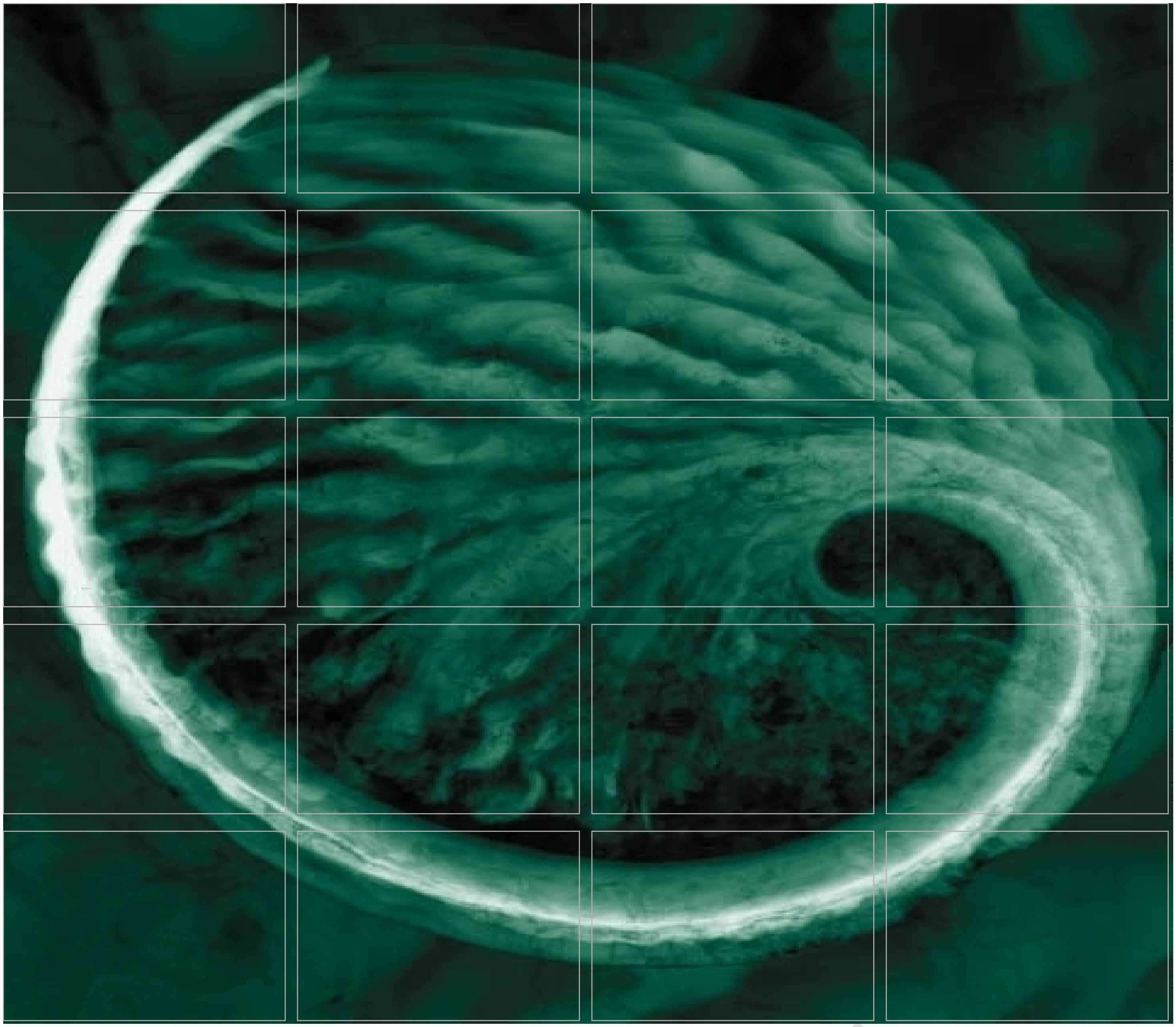
Attachment E: Year 4 Post-Restoration Vegetation Monitoring of Prairie Canal and Control Transects – Picayune Strand Restoration PSRP Vegetation Monitoring 2011 Report (September 2011)

Note: For reader convenience, this document is being produced verbatim and has not been revised by the SFER production staff. The document, dated September 2011, was provided to the South Florida Water Management District by Environmental Resources Management under Work Order #4600001953-WO3.



Year 4 Post-Restoration Vegetation Monitoring of Prairie Canal & Control Transects - Picayune Strand Restoration PSRP Vegetation Monitoring 2011

Prepared for:
South Florida Water Management District
Fort Myers Service Center
2301 McGregor Boulevard
Fort Myers, Florida 33901

Work Order No. 4600001953

September 30, 2011

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Year 4 Post-Restoration Vegetation Monitoring of Prairie Canal & Control Transects - Picayune Strand Restoration PSRP Vegetation Monitoring 2011

Work Order No. 4600001953-WO3

September 30, 2011

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1.0 INTRODUCTION

The Picayune Strand Restoration Project (PSRP) area, formerly known as Southern Golden Gate Estates (SGGE), is a large, former development located east of Naples in southern Collier County. It is located within the southeastern portion of Picayune Strand, and is part of a larger development, the Golden Gate Estates (GGE), the northern portion of which is a residential community. The entire GGE area has undergone hydrologic and environmental alteration due to construction of a network of canals, levees, and roads built in the 1960s. Four major, north-to-south canals drain the PSRP. These four canals interconnect at the southern end of the area and, together, drain into the Ten Thousand Islands, the marine ecosystem downstream and outside the PSRP.

Prior to development, the PSRP was characterized by seasonal flooding and slow-moving overland sheet flow that supported a variety of plant and animal communities in uplands and freshwater wetlands and, in downstream areas, brackish wetlands and estuaries. Channelization of water flows has resulted in the elimination of sheet flow across the PSRP and into the estuaries, lowered water tables within the PSRP, and a fluctuating freshwater point discharge to the estuarine ecosystem in the Ten Thousand Islands. As a result, upland, wetland, and estuarine plant communities have been degraded, the abundance of native fish, wildlife, and estuarine shellfish populations has declined, recharge of the surficial aquifer has been reduced, and non-native species have increased in abundance. The drained conditions have resulted in widespread and more intense wildfires than occurred under pre-drainage conditions. These fires are accelerating the change in vegetation from wetlands to upland communities dominated by fire tolerant species, such as cabbage palm (*Sabal palmetto*) and exotics such as Brazilian-pepper (*Schinus terebinthifolius*). In addition, these impacts extend a mile or more into other conservation areas, including the Fakahatchee Strand Preserve State Park.

The PSRP currently has a network of east-west roads every quarter mile, connected by north-south roads approximately every mile. These roads formerly had paved surfaces overlying emplaced fill. This network of roadways resulted in several environmental impacts: the impeded the natural sheet flow of surface water, and their construction resulting in altered habitat that allowed the invasion of a wide diversity of exotic plants. Additionally, the roads also provide access to all parts of the project area where there are impacts from off-road vehicles, poaching of animals and plants, vandalism, and the illegal dumping of solid waste. This has resulted in the fragmentation of an extensive block of contiguous natural lands that compromises the value of the area for a variety of wideranging wildlife, such as the Florida panther and other threatened and endangered species.

In 2007, the removal of 65 miles of road east of the Merritt Canal and the filling of the north-south portion of Prairie Canal was completed. Construction work began in 2004 at the northernmost portion (north of 79th Avenue SE) and progress of the filling of the canal continued southward until 2007.

The plugging and filling of long sections of Prairie Canal, the eastern-most canal in the PSRP, has eliminated the rapid loss of water along most of its seven-mile length by stopping quick flows and re-establishing sheet flow in the area during high rainfall periods. It has also greatly slowed drainage after the water table falls below ground during drier periods, although slightly increased flows probably remain through the less consolidated fill material in the restored canal and adjacent substrates that were fractured during construction. Over time, these slightly higher groundwater flows should steadily diminish as organics accumulate in the pools remaining along the canal and seal the pool bottoms.

The area benefited hydrologically by the plugging and filling of the Prairie Canal, including virtually all of SGGE to the east of Patterson Boulevard. Based on 20 years of monitoring water levels in the adjacent Fakahatchee Strand (a reference site), the effects from the Prairie Canal plugging have extended from one to three miles into Fakahatchee Strand during the wet and dry periods. These beneficial effects are increasingly apparent proximal to the canal.

Assuming a similar extent of impacts from the other SGGE canals, the portion of SGGE to the west of Patterson Boulevard will probably continue to be severely impacted until the Merritt Canal is restored. Also, since the southern-most, east-west portion of Prairie Canal (below the restored upper seven miles) is still open and draining into Merritt Canal, it is likely that the water table in the lower one-to-three miles of the area between Patterson Boulevard and the north-south portion of the filled Prairie Canal is still being negatively impacted hydrologically.

An additional influence on water levels to the west of Prairie Canal is the major cypress strand that crosses I-75 and enters SGGE in the vicinity of the Merritt Canal. This large strand swamp is the actual Picayune Strand and the namesake of the entire state forest and project area. This large flow-way turns to the east and approaches Prairie Canal above Stewart Boulevard, before turning back to the west and leaving SGGE in the vicinity of the Faka Union Canal at US 41. Historically, during and for some time following wetter periods, flows in this strand would have increased water levels along and to the west of the Prairie Canal, prior to the construction of the SGGE canal system. These water levels cannot be completely restored until Merritt Canal is restored.

Based on the above observations, hydrologic restoration resulting from plugging and filling Prairie Canal should be close to complete east of the canal, but benefits should diminish moving west from the canal and approaching the unfilled east-west (southernmost) section between the Merritt and Prairie Canals.

In the Spring of 2004, prior to plugging and filling the Prairie Canal, three east-west vegetation transects were established in the upper, middle, and lower portions of the seven-mile long north-south portion of the canal. These transects were sampled once to establish baseline conditions when subsequently documenting the restoration of plant communities along the canal. Vegetation monitoring was scheduled to commence along these transects after one full growing season, following the completion of construction, and then annually for some additional years. Depending on the observed restoration response, less frequent sampling might occur thereafter, until a trend toward pre-development conditions was established.

The original baseline monitoring was conducted during Spring 2004, and all post-construction monitoring began in spring 2008. Therefore, the data collected in the northern-most areas have potentially been affected by a lengthened hydroperiod during the rainy seasons of 2005, 2006, 2007 and 2008, while the southern portion would have only experienced two post-restoration rainy seasons: 2007, which was a drought year, and 2008.

The purpose of this report is to analyze vegetative changes observed in re-sampling of these transects along the Prairie Canal, from pre-restoration to post-restoration, to evaluate if restoration is indeed having an impact on vegetation composition and structure, and if the vegetation is converging towards the baseline composition. This report specifically addresses the monitoring activities completed in FY2011.

2.0 *METHODS*

Permanently marked, 50-meter (m) transects were previously established along the Prairie Canal, and control transects were established in the Florida Panther National Wildlife Refuge (FPNWR) and Fakahatchee Strand Preserve State Park (FSPSP), as depicted in Figure 1.

In 2011, re-sampling was conducted on 36 transects, including 11 control transects. The Prairie Canal area includes 30 transects (PC01-PC30), located along three east-west lines (north, central, south), which extend 1 kilometer (km) to the east and 1 km to the west of Prairie Canal. These transects were established in 2004. Transects to the east of the Prairie Canal are within Picayune Strand State Forest (PSSF), while those to the west are within the FSPSP. Five additional Prairie Canal transects (42, 53, 55, 56, and 57) were established at the original Natural Resources Conservation Service (NRCS) monitoring sites within the PSSF at that same time. Additional control transects in FPNWR and FSPSP were re-sampled as they were in 2005, 2008 and 2009. Most of these were established in 2005 (32, 45, 37, 39, 51, 64, and 67), but in some cases, we utilized transects established as early as 1996 (07PI11, 07WP11, 32PI33, 32WP33), which include several sampling events prior to 2005.

Each transect was relocated using a Global Positioning System (GPS), marked with rebar at each end. Each rebar position was recorded in UTMs (NAD83 17N) using a GPS device with sub-meter accuracy. Trees near each rebar were flagged using orange tape. A 50-meter transect tape was then strung tightly between the two rebar locations to provided a taught, straight transect line. In all cases, transects were positioned North/South and East/West, with the origins occurring at the East or North, with the exception of the transects established prior to 2004. These older transects, established on FPNWR, had start ends closest to buggy trails; and most have the start marked on aluminum foil tags attached to the rebar. Start ends also are recorded accordingly in the geo-database. Although not required, for each transect, at least one photo was taken at each rebar position in the direction of the other rebar stake.

Vegetation sampling methods similar to those utilized during the pre-construction sampling were utilized during the post-construction sampling (Woodmansee & Barry 2005). These methods were derived from those utilized at FPNWR, with some modification to include the canopy stratum (Main et al. 2000). Restoration targets for the Prairie Canal monitoring sites are a function of the new hydrologic regime and should be comparable to the composition and structure of hydrologically similar reference sites in the FPNWR and FSPSP sampled during the baseline PSRP vegetation monitoring effort. This included a total of 13 transects placed as control plots (see Figure 1).

The vegetation along the transects was divided into four strata, based on DEP 62-340.200, F.A.C. (1996) of the Florida Wetlands Delineation Manual, *Delineation of the Landward Extent of Wetlands and Surface Waters*.

- Canopy trees, consisting of those woody plants with a diameter at breast height (dbh) greater than 10 centimeters (cm) or 4 inches (in);

- Sub-canopy trees, consisting of tree species with a dbh between 2.5 and 10 cm (1-4 in), excluding woody shrubs;

- Shrub layer, consisting of trees with a dbh less than 2.5 cm (1 in) and any-sized individuals of shrub species (see "shrub notes" in Appendix M); and

- Ground cover, consisting of all plants not found in the other strata and primarily herbaceous species.

Extra emphasis was placed on cabbage palm (*Sabal palmetto*) densities due to the current high densities observed in the drained areas of PSRP relative to historical accounts of the area, prior to drainage. Cabbage palms were separated into 5 strata described below.

- Canopy palms with apical meristems above 2.4 m (8 feet (ft)). Sub-stratum below 1.5 m was noted for "old growth", or pre-disturbance cabbage palms (or pre-disturbance overstory slash pine (*Pinus elliottii*), as well) based on morphological characters such as bootless trunks lacking boot-scars, and the presence of adventitious roots. For slash pine this determination was based on characters such as crown form and swollen base. A detailed explanation of old-growth cabbage palm can be found in the 2006 FPNWR report (Barry & Woodmansee 2006);

- Sub canopy palms with apical meristems greater than breast height of 1.4 m (4.5 ft), but less than 2.4 m (8 ft);

- Shrub layer palms with apical meristems just above ground level to a breast height of 1.4 m (4.5 ft);

- Groundcover palms, including individuals with apical meristems still at ground level (*i.e.,* no trunk), and with palmate leaves or with at least four (or evidence of having produced four) simple leaves. According to McPherson and Williams (1996), this stratum would include pre-trunk plants with palmate leaves down to plants with simple leaves, but with leaf widths >8 mm. In 2011, stratum 4 was additionally segregated into sub-stratum 4-palmate and 4-simple; and

- Palm seedlings defined as individuals without palmate leaves and only two to three leaves (including remnant petioles at the base, if present). McPherson and Williams (1996) defined new recruits to be the smallest plants with leaves of three or fewer, accordion, V-shaped folds and leaf widths less than or equal to 8 millimeters (mm).

For cabbage palms with trunks conforming to strata 1 - 3, the presence or absence of adventitious roots was recorded

Canopy trees, sub canopy trees, and all strata of cabbage palms were sampled along 5-m wide, belt transects (Mueller-Dombois & Ellenberg 1974). Diameters of all canopy trees were measured and tagged to facilitate re-sampling and to document mortality and recruitment. Sub-canopy trees were counted by species to estimate density, but not measured or tagged. The number of cabbage palms was recorded in each of the five strata.

The composition and cover of the shrub stratum, as defined above, were quantified using the line-intercept method, along each of the transects (Canfield 1941, Lindsey 1955, Mueller-Dombois & Ellenberg 1974). Line-intercept data included all overhanging or underlying species in the shrub stratum. Saw palmetto (*Serenoa repens*) was consistently considered a shrub. Cabbage palms in strata 3 – 5 were also recorded. These data were used to calculate percent coverage.

Ground cover species were sampled using 0.5-square meter (m^2), rectangular quadrats (40.5 in x 20.75 in), placed at 0-0.5 m, 10-10.5 m, 20-20.5 m, 30-30.5 m, 40-40.5 m, and 50-50.5 m, with the short edge of the rectangle on the intercept, and the long edge extending to the west (for transects starting on the north end) or north (for transects starting on the east end). Species composition and cover were quantified using Daubenmire (1959) cover classes: 1) 0-5%, 2) 5-25%, 3) 25-50%, 4) 50-75%, 5) 75-95%, and 6) 95-100%.

A field guide for transect methods is included as Appendix 1.

All plant species whose stems originated from within the quadrat were assigned cover class values. Shrub stratum species, epiphytes, and vines were assigned cover class values, if any part of the plant overhung the quadrat, regardless of where the stems originated. Cabbage palm strata 3 – 5 were lumped into one cover class, with additional notation made for the number of seedlings within the quadrat. Records were kept of all plant species observed within the quadrat that were flowering, fruiting, at seedling stage, or deer-browsed. Records of other species observed in or nearby the transect were made and incorporated into the site species lists.

Because fire is so important to the re-establishment of natural vegetation on the PSRP, records of wildfires and prescribed burns that affect portions of the PSRP vegetation monitoring sites were requested from appropriate agencies in the course of sampling. For each transect, fire interval was recorded. Fire intervals were placed into three categories: 1 = <1 year; 2 = 1-7 years; and 3 = > 7 years. Intervals were determined using these recorded burn history data or field observations when actual burn dates were not available.

Plant nomenclature followed Wunderlin (2003), with certain exceptions, including any generally accepted taxonomic changes, since the date of this publication. Important departures include South Florida bluestem (*Schizachyrium rhizomatum*); which in Wunderlin (2003) is lumped with little bluestem (*S. scoparium)*. To avoid confusion, the synonyms are provided in the species list included in the database.

In accordance with our work order requirements, the weighted (by total percent cover) percent of species not identified to species level must be less than 1% of the total species recorded. As a result, at least 98% of vascular plants and ferns encountered in the plots had to be identified to species, which at times required more than one trip to a sampling site. Taxa not identified to species level were identified to the lowest taxonomic level possible, and a specimen was collected from outside the transect as a voucher, where possible.

2.1 DATA ENTRY

Data were entered into a Microsoft Access database. A single table was used for each study type: belt transect data, line intercept data, and quadrat data. In addition, tables were created for descriptions of each transect, including well number, location, rebar number, transect number, fire history, habitat, former habitat, and any notes. A table was also created for sampling events containing dates, surveyors, and "time since fire data". Comment fields were included in all tables. Additional tables were provided, including a GPS table linking geographic coordinates of each rebar belonging to each transect, an Accepted Names table (linking taxonomic code with genus species, higher taxonomic data, plant authority code, nativity, rare plant status, and Florida Exotic Pest Plant Council status), an Authority table (linking authority code with the appropriate literature reference), and Lookup tables for each of the data tables. After initial data entry, data were cross-checked for errors and corrected accordingly.

Previous data collection events utilizing the same field study methods were incorporated into the Access database and were included in some of the analyses of this report. These sampling events, listed in Table 1, were conducted as early as 1996. This was done to allow discussion of preliminary findings and to summarize pre-restoration habitats.

A total of 309 transects have been established and sampled multiple times (totaling 1,006 samples) through multiple funding sources. Pertinent data associated with all of these samples were included in the current database. A summary of all data set events is provided in Table 1. For a complete discussion of these events refer to Barry (2006).

2.2 *DATA ANALYSES*

Of the entire database described above, only a subset of transects and sampling events were utilized for the data analysis presented in this report. This data subset is presented in Table 2. Basic statistics were calculated and presented for each of the field methods, including standard forestry parameters such as density, basal area, and stand basal area for belt transect data, percent cover for line intercept data, and percent cover, percent frequency of occurrence in quadrats, and percent dominance using quadrat data. Additional analysis was carried out using wetland indicator values (Reed 1988). Wetland Affinity Indices (WAI) were computed and utilized when evaluating the effects of hydrological conditions on the plant communities.

2.2.1 *Percent Cover and Species Richness*

Percent cover and species richness developed for the Final Year 4 Report will be analyzed in a manner similar to that used in the Year 2 monitoring report (Barry et al. 2009). For the purposes of this draft report, only transect means are provided for each sampling type.

2.2.2 *Wetland Affinity Index*

Dominance by hydrophytic species can be quantified by summarizing the data using wetland indicator values (Reed 1988). These values were revised in 1996, but not yet published, though the list is due for publication soon (Steve Mortallero, USFWS, personal communication). The calculations used herein follow the revised 1996 classification method. This classification assigns a probability for each plant species in the region to occur in a wetland (P_{usfws}). The WAI, or simply the weighted mean probability of occurrence in wetlands for all species combined in each one meter² quadrat, is calculated by the following formula:

$$WAI = \sum XiWi \Big/ \sum Wi$$

Where :

X_i = P_{USFWS} for indicator category i, based on the above-noted 1996 classification;

P_{usfws} = Probability that a plant species in the region occurring in a wetland; and

W_i = Weight = Percent Frequency by plants in indicator category i

This artificial index of dominance by hydrophytic vegetation allows the quantification of the degree of dominance by inundation-tolerant species (WAI 0.99 = obligate wetland species, WAI 0.50 = facultative wetland species, and WAI <0.50 = upland species).

3.0 RESULTS & DISCUSSION

Vegetation sampling was conducted for the Prairie Canal vegetation transects and control/reference sites beginning on May 16, 2011 and ending July 9, 2011, capturing the peak and end of the dry season. These data will be compared to data collected during dry seasons of 2008 and 2009. The data also will be compared to control sites sampled in the Fall of 2005 (wet season) and restoration sites sampled in the Spring (dry season) of 2004.

The comparisons with the control sites sampled in the Fall of 2005 (wet season) are not considered valid for groundcover analysis because the wet season sampling typically consists of greater species richness and abundance of wetland plants compared to the dry season in flatwoods and prairies and lower species richness in cypress wetlands. Nevertheless, these data are presented for discussion purposes. Assessment of woody vegetation is not influenced by seasonality of sampling.

Because of drought and a lightning-ignited wildfire, the Cobalt Fire (May 12, 2011), a total of 10 transects burned. As a result, these transects were not sampled during this monitoring period. These burned transects included all of the western half of the northern Prairie Canal transects (PC01-PC05), 4 transects from the eastern half (FSPSP) of the middle transect (PC16-PC19), and one transect near monitoring well SGT off 79th Avenue SE, east of Patterson (55). With the exception of one transect (PC02), all of these transects were either wet prairie or pineland transects. As a result, it is expected the groundcover strata in these areas will benefit greatly from the fire. Photos at the ends of each of these transects (matching photos taken normally while sampling) were taken on May 23, 2011 to generally capture pine canopy scorch percent, char height, percent consumption of fuels, and overall severity of the fire.

Due to the lack of data for these burned transects, this report addresses data for transects actually sampled during this reporting period. To evaluate restoration, available data are compared to conditions noted in 2004, 2005, 2008, 2009 to 2011 (see Table 2). An analysis of the data for the transects burned in the Cobalt Fire was presented in the Year 2 Monitoring Report (Barry et al. 2009).

3.1 HYDROLOGY

In 2007, the removal of 65 miles of road east of Merritt Canal and the filling of the north-south portion of Prairie Canal was completed.

Construction work began in 2004 at the northernmost portion (north of 79th) and progress of the filling of the canal continued southward until 2007. Therefore, the data collected in the northernmost areas have potentially been affected by a lengthened hydroperiod, starting during the rainy seasons of 2005, experiencing restoration for 6 years. The southern portion would have only experienced a shorter timeframe of four "restored" rainy seasons, starting in 2007. While the Prairie Canal has been mostly filled, it is important to note that none of the these transects have been completely "restored" hydrologically because the lower east-west section remains as drainage and because some of the overland flow in this area still drains off to the west into the Merritt Canal.

Rainfall data has been recorded at SFWMD's SGGEWX weather station (located in PSSF), since its establishment in September of 2002. These data are presented in Figure 2. Drought from below average rainfall during the wet season, especially in June and October, along with above average temperatures, has been fairly common in recent years, since 2007, although in general, rainfall data indicate patterns roughly consistent with long-term averages posted by the SFWMD. There have been a few notable years (Abtew & Huebner 2002; http://www.gohydrology.org). Total rainfall in 2005, the year that hurricanes Katrina, Rita, and Wilma passed nearby or over the study site, was 74 inches, which is above average for the Naples Area (52-55 inches per year).

In contrast, 2007 rainfall totaled 50 inches, which was slightly below average. Notably, however, monthly totals were especially low during July through October (wet season). In 2008, the dry season was very hot and dry in May, and the wet season was around average with total rainfall for 2008 at 61 inches. Tropical Storm Fay passed just to the north of the project area in mid August, 2008, but did not significantly affect the Picayune Strand, even though heavy rains increase water levels just to the north in Corkscrew Swamp and Immokalee. The dry season started immediately in October 2008 and was below average rainfall until sampling in 2009.

The winter of 2009-2010 proved to be a substantial departure from the average, with rains occurring through mid-may and water levels, though not flooding the majority of the transects, did maintain abundant moisture. In June 2010, conditions changed dramatically with below average rainfall, above average temperatures, and dry air masses contributing to a quick dry-down before the rainy season kicked in. The dry season of 2010-2011 began again quite dramatically in October, coupled with above average temperatures. Dry-down by June ended up with the lowest recorded water levels in the Big Cypress in at least twenty years (http://www.gohydrology.org). Since June, precipitation has been near normal levels, but water levels have not recovered.

The weather influence on water levels, especially since 2009, is not best explained by total rainfall alone. In the winter of 2009, there were many weeks of drier than normal air masses associated with frequent cool fronts, followed by warmer than normal dry air masses during the summer, which acted to exacerbate water shortages to plants (pers. observation). This pattern repeated itself in 2010 and 2011 with many periods of above average temperatures, including a very warm May and June 2010, and above average temperatures starting even earlier in April of 2011 continuing through the summer months (http://www.gohydrology.org). Since 2007, May - June and October temperatures have been above average, with below average rainfall contributing to shorter hydroperiods.

As mentioned in the last annual report, water levels were manually recorded in the PSRP area between 1997 and 2004, using piezometers installed by NRCS. Deeper monitoring wells with automated data recorders were installed by SFWMD in 2003. The locations of all of these monitoring wells can be found in Figure 1.

Hydrographs were prepared for select NRCS wells, while charts for SFWMD wells were provided by Dr. M. Duever and the SFWMD. A hydrograph for SFWMD well SGT3W7 is presented in Figure 3, as a control data comparison, though it is near the eastern edge of the expected zone of influence for the former Prairie Canal. Hydrographs for NRCS piezometer 14 and SFWMD well SGT2W6 at the same location are presented in Figures 4 and 5 to represent the middle to northern section of the Prairie Canal study area. Data for NRCS piezometer 13 and SFWMD well SGT3W6 are presented in Figures 6 and 7 to represent the middle to southern area. Data for NRCS piezometer 21 and SFWMD well SGT4W6 are presented in Figures 8 and 9 to show additional data from the southernmost area.

These hydrographs begin to suggest a lengthening of the hydroperiod since restoration, as water levels above ground level are recorded at the restoration sites by SFWMD wells. Water levels were rarely above ground level in the data collected in the NRCS piezometer s. NRCS piezometer 13 and SFWMD well SGT3W6 most strongly suggest the effect of restoration at this early stage of restoration, with the evidence of a brief period of standing water during a close to average year of rainfall in the wet season of 2006 and again in 2008. This is significant in light of the lack of recorded standing water in the period from 1997 to 2004. As more data become available and more statistically reliable averages can be developed, the average number of days inundated pre- and post-treatment could be utilized in future analysis using the NRCS data (primarily for pre-treatment conditions (Barry & Woodmansee 2006)).

SFWMD well data could be used for the short pre-treatment period, but mostly for post-treatment conditions.

Heavy rains in 2005 resulted in a more extended hydroperiod, even at the control well site (SGT3W7). Conversely, all wells showed a shortened hydroperiod in 2007, which followed the rainfall patterns (Figure 2). The Spring 2008 rains also appear in the hydrograph, which helped ease the effects of drought, and the steady rains of June through September of 2008 also resulted in a good period of high water roughly from July through September. Prior to sampling in June 2008, low rainfall and high temperatures in May resulted in a return to drought conditions, and these were made somewhat more severe due to the presence of very dry air masses over the winter.

After a brief period of high water in 2009, the dry season began with a hot and dry October, but in the spring of 2010, regular rains maintained high than expected water levels. The hot June of 2010 lowered water levels substantially. The summer water levels followed with a brief period of high water. The dry season of 2010-2011 dropped early with yet another hot, dry October and fell to extreme low levels in June, remaining so through the sampling period well into July. In fact, June was the lowest recorded water levels (20 years of data) for bridge 105 Tamiami in the Big Cypress (http://www.gohydrology.org).

In short, weather and water levels since time zero restoration (2007) have resulted in more drought than flood, and hydroperiods have been relatively short. Specifically, the beginning and the ends (May/June and October, respectively) of a few of the rainy seasons have been characterized by above average temperatures and below average rainfall. Longer term data do, however, suggest that prior to the last two decades such droughts definitely were more prevalent (http://www.gohydrology.org).

This recent drought, coupled with high temperatures, could also potentially be indicative of long-term trends predicted by climatologists. IPPC models based on mid-range scenarios of CO_2 loading until the end of this century predict slight decreases in precipitation for December-February and a 10-15 percent decrease in the wet season from June-August (ENP 2008). In the literature synthesis, it goes on to say that "the combined effect of even modest increases in temperature, along with modest reductions in rainfall during the historic wet season, would be extended droughts with increased evaporation and uncertain recharge of Everglades' wetland ecosystems and surface aquifers during the wet season."

If these warmer and drier conditions do become more prevalent, the effects of hydrological restoration on the vegetation will be less obvious than anticipated. Conversely, if the canals were not filled we would expect even more severe effects on vegetation than what we have observed over the past 30-40 years. In fact, in mid- to late-July, just after sampling was completed, cypress throughout the forest began turning yellow, which is the earliest the authors have observed, suggesting the effects of heat and drought stress. The most dramatic color change was observed in the south-central drained portion of the forest, which has not been restored, while at the restored Prairie Canal phase, the early color change was much less widespread. Continued monitoring of the vegetation transects at control and restoration sites over the long term would help answer these questions.

3.2 HABITATS

Habitat designations followed Jim Burch's definitions (Burch et al. 1998), with some modifications. This habitat classification system was chosen for analysis because all of the past work for PSRP, including pre- and post-drainage vegetation maps, has utilized these habitat types. The database also includes the vegetation classification system for South Florida (Rutchey et al. 2006), and more detailed mapping of PSRP, using this more precise classifications system, is being utilized for Picayune exotics monitoring (Barry 2009). However, for analytical purposes, we have found it necessary to reduce precision below even the NRCS codes due to small sample size.

A total of eight distinct habitats (including altered habitat types) were studied under this project at control and reference sites (see Table 3). For most of the statistical analysis, we found it helpful to combine all cypress habitats (Ch, Cg, and C) to one group and both mesic and hydric pine flatwoods for comparisons between control and restoration sites to increase sample size by habitat. This results in 4 control and 12 restoration cypress transects along with 3 control and 12 restoration pine flatwoods transects in total. In this sampling event, however, only 11 restoration cypress transects and 5 pineland transects were sampled due to fire impacts.

The general location of all transects at control and restoration sites were presented above in the Methods section in Figure 1. Each transect is presented below with both pre-drainage and current (baseline) habitat type in Table 4. Soil types, following the mapping data from the Soil Survey for Collier County (Liudahl et al. 1998) also are tabulated. The restoration sites are shown over 1940 and 2009 aerial photography separated by Northern, Middle, and Southern transects in Figures 10-15. Existing condition or baseline habitat types were designated based on general assessment of the site in the field and utilizing transect data. Historic or pre-drainage habitat types were determined using a combination of factors, including evaluation of 1940's aerial photography and field evidence, such as the presence or absence of old-growth trees, dead stumps or trunks, and species composition.

Dominant soil types generally follow habitat types. Half of the transects (23 of 46) consist of Ochopee fine sandy loam and Ochopee fine sandy loam, low. These conditions are prevalent in the wet prairies (G), graminoid-dominated hydric pine flatwoods (Ph), and some of the more open cypress with graminoid (Cg) transects. Pinelands also consisted of Hallandale and Boca fine sands. Cypress areas included Boca, Riviera, limestone substratum, and Copeland fine sands, digressional. The wet prairie with this soil type is a narrow area around a cypress dome, thus the soil type is probably different, likely just reflecting the lack of precision in the soils mapping. To analyze effects of soils specifically it would be advisable to first have a soil scientist evaluate each transect in the field.

Historic aerial photograph interpretation was also utilized for indications of past site conditions. Interpretation of the 1940's aerial photography of the PSRP suggests that, in areas not directly cleared or disturbed since 1940, the woody vegetation has increased and has encroached on graminoid-dominated areas, or has reduced graminoid coverage within pineland and transitional cypress (Cg) habitats. This same trend of reduced openness in pinelands was also observed in aerial photography in Rookery Bay National Estuarine Research Reserve and in TTINWR (pers. observation).

While in general the 1940's aerial photography is a good indication of pre-drainage conditions, when examining these photos one must bear in mind that logging of slash pine may have occurred here in the 1920's and 1930's, as saw mills were operating during these years along S.R. 29 (Duever et al. 1986). This may contribute to the observed changes in canopy of the pinelands. Several disturbed areas and trails evident in the 1940's aerial photography may have been utilized for timber extraction. Also one must be careful in examining the figures in this report because geo-referencing of the 1940's aerials was less precise than the 2008 aerials so transect placement over the photography is less accurate.

The Northern Transects includes PC01-PC10, which historically were predominantly open and assumed fire-maintained habitats, with the possible exception of PC02. It is also possible that the very open canopy nature of this general area evident in the 1940's aerial may be in part artificial due to logging, as evidenced by the visible trail running through the middle of the most open area, but this cannot be determined simply from aerial interpretation. PC02 consists of more visible canopy (less open) in the 1940 aerial and is currently considered to be cypress with hardwoods (Ch) because of the abundant swamp bay (*Persea palustris*) and old growth cabbage palms. The canopy seems more closed in the current aerial photography. The Cobalt Fire (May 12, 2011) burned PC01 to PC05. Incidentally, PC02 had already changed dramatically after the "Pretty Island" Fire in June of 2004, which opened the canopy quite substantially by killing much of the swamp bay and promoting growth of sawgrass (*Cladium jamaicense*) underneath. Now, following the Cobalt Fire, the transect is even more open and is basically scattered mature cabbage palm with a graminoid understory on the east half, while shrubs still dominate the west half. Perhaps due to drainage and drought, the effects of fire in this area is more severe than it would have been in 1940, or it is simply the death of the former dominants (*Taxodium*) that make it seem more open now. Two additional transects in the area include one pineland (53) and one cypress (42) transect, which were closer to the actual Picayune Strand Swamp that extends from north to south along the western side of the study area.

The middle transects include PC11-PC20, which were predominantly cypress dominated communities to the west of the Prairie Canal (the main Picayune Strand jogs to the east just north of this location) and the far eastern transect. Wet prairie and pineland habitats are more in the central area. The wet prairies occur just to the west of the former Prairie Canal in transect PC14 and to the east in transects PC16 and PC17. To the east, a slightly higher, fire-maintained area of pineland occurs (PC18 and PC19), which grades back into another cypress dominated area (PC20). This area has since burned out (2001) killing overstory cypress trees. One additional transect sampled (55) occurs about a mile to the north, on the Picayune Strand side of the former Prairie Canal. This area represents a stretch of former cypress with a graminoid understory (Cg) that has become colonized by slash pine and shrubs.

Another important change that is evident in the cypress with graminoid (Cg) transects (PC11 and PC13) in this middle area is that they have become much more closed-canopy since the 1940's aerial photography. This suggests that the shrubs, palms, and vines dominating these transects may have increased since that time. Also the young pines at the east end of PC11 and to the south of this transect may be recent colonization, as well, since it appears there was a prairie-like open area extending from the edge of that transect.

The southern transects (PC21-PC30) are open fire-maintained wet prairie and pineland to the west of the former Prairie Canal. Areas around the canal (PC26) and to the east generally are cypress-dominated ecosystems. Changes since 1940 are less obvious from the aerial photography compared to conditions observed in the field. Most of the wet prairies have changed little in overall structure, although scattered dead trunks of small cypress trees can be found, indicating that cypress was perhaps more abundant previously, but not dominant. The cypress areas appear to have a closed canopy in both the 1940 and 2009 aerial photography,; however, cypress logging after 1940, drainage, and fire has obviously lowered the overall canopy height in many areas, based on the abundant, large, cypress stumps and logs found in these areas. PC28 is a good example of a logged old growth stand with large stumps and at least one very large, standing, dead, hollow trunk that was probably left when the area was logged shortly after the 1940's aerial photography was taken.

PC27 was considered to be cabbage palm hammock (Hp) in both historic and current condition because it occurs on an isolated (by strand swamp) slightly higher, rocky area and is currently dominated by old growth (tall bootless) cabbage palms and a variety of shrubs typical of hammock areas. There are no dead cypress trunks or stumps in this area, so it is doubtful cypress occurred here. The transect also appears possibly a little more open in 1940, suggesting that historically it was more of a woodland with scattered palms, which is typical along the edges of less disturbed areas of the Fakahatchee Strand. The designation of hammock (Hp) is still the closest fit in the NRCS habitat classification system.

Large areas of this habitat type likely occurred along the edges of the actual Picayune Strand flow way, which is evidenced by persisting old palms in the field and large areas mapped by NRCS in the 1940's vegetation map called "cabbage palm flatwoods". It is important to take notice of these areas when considering control of cabbage palm as a nuisance species in other habitats where a substantial increase in palms has affected species composition and the ecology of the area negatively.

3.3 EFFECTS OF TIME SINCE FIRE

Fire may have a much more immediate and substantial effect on vegetation transect data than hydrological restoration in the short term. To address this, a geodatabase of wildfire and prescribed (Rx) burns was compiled using existing GIS data from PSSF, FSPSP, and FPNWR. These data, however, are still incomplete. The three fire interval categories described in the Methods section were, at times, determined based on estimates of time of year or, in a few cases, fire category was determined in the field based on professional judgment using signs of char and woody growth. Unfortunately, since the last event in 2009, it has become even more difficult to incorporate actual GIS data into our analysis of fire, with FPNWR being the only agency at this time to actually record and provide these data for our geodatabase. We will continue to attempt to compile fire data and will work with DOF to perhaps assist with collection of GPS data on recent fires, while assessing exotic vegetation.

Maps of fires occurring prior to the 2004 sampling and between sampling events in 2004, 2008 and 2009 were presented in the Year 2 monitoring report (Barry et al. 2009). Fires in PSSF affecting transects in the northern section (PC01-PC05) were all wildfires under drought conditions (after periods of fire suppression in June of 2004, immediately following sampling). Photographs of the transects were taken immediately following this fire. The middle transects (PC11-PC15) are long fire suppressed, while the southern transects (PC21-PC25, 57) in PSSF have been burned more than once in prescribed burns. Fakahatchee fires along Prairie Canal are the least well mapped, therefore, the fire histories of some of the transects may be in error. These are largely wildfires prior to 2004 and more recently in June 2007 (PC08-PC10, PC18-PC20), with the exception of the wet prairie transects (PC06-PC07, PC16-PC17) which were prescribed burns in early 2007. Fakahatchee control transects in the isolated prairies and areas of Janes' Scenic Drive (39, 64, and 67) have been burned under both Rx burns and wildfires, but the exact data have not yet been acquired. No fires along Prairie Canal occurred between sampling events in 2008 and 2009. Transect (64), along Janes' Scenic Drive was burned again between the 2008 and 2009 sampling event, although the exact date is not known.

At least 3 fires have affected Prairie Canal vegetation transects since 2009. On the FPNWR, a controlled burn on July 9, 2010 affected transects 07PI11 and 07WP11, but did not penetrate the cypress in transect 32, all of which were sampled on May 26, 2011. In FSPSP, a fire sometime around February 2011 (Bonness, pers. obs.) affected transects 39 and 67, which were sampled on June 1 and June 4, 2011, respectively. Finally, the Cobalt Fire consumed fuels in transects PC01-05, PC16-PC19, and 55 on May 12, 2011. As a result, these transects were not sampled.

Within the study area, one transect in 2004 and 8 transects in 2008 were sampled less than one year following fire (Category 1) in hydric flatwoods (Ph), mesic flatwoods (Pm) and prairie (G) habitats (see Table 5). Twenty-six transects in 2004 and 2005 and nineteen transects in 2008 were sampled from 1 - 7 years since fire (Category 2) in various habitats. Nineteen transects in 2004 and 2005 and sixteen transects in 2008 were sampled greater than 7 years since fire (Category 3). The majority of these transects were cypress or former cypress (C, Cg, Ch, Hh) habitats, which rarely burn. Additionally, these transects included some hydric and mesic flatwoods (Ph, Pm) and wet prairie (G) sites in PSSF, which are long fire-suppressed. Only one wet prairie site (G) and one cypress with graminoid understory (Cg) transect burned between the 2008 and 2009 sampling events, totaling 2 transects of less than 1 year since fire in 2009. A total of 28 transects were from 1-7 years since fire (Category 2) in 2009. A total of 16 transects were long fire suppressed (Category 3) in 2009. One difference to note in the data since the Year 2 Report regards transect 56. This area was considered hydric hammock (Hh) and historically was cypress (C). After reviewing the data, the area have been recategorized to long fire suppressed (Category 3) because a controlled burn on August 2, 2006 apparently did not penetrate the area.

A total of 4 Category 1 transects were sampled in 2011, all of which were control sites (see Table 5). A total of 15 Category 2 transects were sampled in 2011. A total of 17 Category 3 transects were sampled in 2011. A total of 10 transects, all in the restored areas of PSSF and FSPSP, burned in the Cobalt Fire in May 2011 and were not sampled during 2011.

3.4 EFFECTS OF WIND DAMAGE & HURRICANE WILMA ON BELT TRANSECTS

Several hurricanes hit the monitoring area between the 2004/2005 sampling events and the 2008/2009 sampling events, with Hurricane Wilma having the most profound impact. The 75-mile wide eye of Hurricane Wilma passed directly over the study area with 120 mph sustained winds on October 24, 2005. Other storms, such as Hurricanes Charley, Frances, Jeanne, Katrina, and Rita may also have effected some of the transects to a lesser degree, since the initial sampling in the Spring of 2004/2005.

Based on sampling results immediately after Wilma on FPNWR, the most substantial effect of the storm on pine flatwoods was an approximate 9% reduction in slash pine overstory density. Secondarily, there was an approximate 3.5% reduction in old (tall bootless) cabbage palms and a 14% reduction in the density of the fairly uncommon live oak, as discussed in more detail in the Year 1 monitoring report (Barry 2006). Effects on cypress habitats differed greatly, with no measurable effect on pop-ash (*Fraxinus caroliniana*) and pond cypress (*Taxodium ascendens*) in control sites and up to 50% mortality observed in restoration transects (Barry and Saha 2008). No major widespread wind storms hit the study area between the since the 2008 sampling event.

3.5 BELT TRANSECT EVALUATION

Data for density and basal area for overstory and density for understory and cabbage palm in all strata for each transect sampled in 2011, with sampling data for prior years for these same transects is being provided to SFWMD electronically.

3.6 LINE INTERCEPT DATA

Percent cover by species for each transect sampled in 2011, with sampling data for prior years for these same transects is being provided to SFWMD electronically.

3.7 QUADRAT DATA EVALUATION

All data collected using 0.5-meter quadrats is maintained in the PLANT_RAWDATA.mdb database file provided by the authors to the SFWMD. The "QUAD_DA' table in this database now houses 57,098 records. This data table includes the data summarized and discussed below and also includes many data fields not analyzed to date for the PSRP, such as phenology, evidence of browsing by white-tailed deer (a major prey item of the Florida Panther), as well as data from PSSF and FPNWR dating from 1999. Summaries by species and transects, habitat, and time since fire are available in the QUAD_ANALYSIS.mdb file also provided to SFWMD. Many of the tables are too large to present in this report.

3.7.1 Plant Identification

Plant species were identified to the lowest possible taxonomic level during all sampling events. In previous sampling events, records identified to species or variety level ranged 97-98%. When weighted by percent cover, identification to the species or variety level exceeded 99% (Barry et al. 2009). Identification problems primarily included immature members of Poaceae, Cyperaceae, and Asteraceae. During sampling in 2011, similar levels of identification were achieved, with greater than 99% of the records identified to species or variety level when weighted by percent cover values (see Table 6).

3.7.2 Mean Percent Cover and Frequency of Each Species Observed by Transect

Transect mean values of percent cover and percent frequency of species for transects sampled in 2011, including data collected for the same transects in prior years are being provided to SFWMD electronically.

3.7.3 Effects of Management Regimes on Wetland Affinity Index

Wetland indicator values (Reed 1988) were utilized to calculate Wetland Affinity Indices (WAI) to assist with evaluating the effects of hydrological conditions on plant communities across management regimes. Transect mean WAI values for transects sampled in 2011, including data for the same transects from previous sampling events are being provided to SFWMD electronically.

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Tables

Table 1: Summary of Sampling Events Included in Database.

Location	Funding Source	Principal Investigator	Management Regime	Sampling Event No.	Start Date	End Date	No. of Transects
Florida Panther National Wildlife Refuge (FPNWR)	USFWS	Dr. M. Main	Control	0	12/20/1997	1/5/1998	4
	USFWS	Dr. M. Main	Control	1	5/20/1998	6/2/1998	4
	SFWMD PC P502173	M. Barry and S. Woodmansee	Control	4	10/19/2005	12/5/2005	6
	SFWMD 4500026581	M. Barry	Control	5	6/7/2008	6/7/2008	3
	SFWMD 4500026581	M. Barry	Control	6	5/29/2009	6/11/2009	6
	SFWMD 4600001953	M. Barry and M. Bonness	Control	7	5/26/2011	6/1/2011	6
	USFWS	Dr. M. Main	N/A	0	4/29/1996	1/7/1998	212
	USFWS	Dr. M. Main	N/A	1	8/12/1996	6/2/1998	201
	USFWS	Dr. M. Main	N/A	2	11/14/1996	12/10/1997	153
	USFWS	Dr. M. Main	N/A	3	4/23/1997	9/20/1998	135
	Everglades Reprogram	M. Barry	N/A	4	5/13/2005	9/20/2006	72
Fakahatchee Strand Preserve State Park (FSPSP)	SFWMD PC P502173	M. Barry and S. Woodmansee	Control	4	9/30/2005	11/10/2005	5
	SFWMD 4500026581	M. Barry	Control	5	6/5/2008	7/8/2008	5
	SFWMD 4500026581	M. Barry	Control	6	6/18/2009	6/25/2009	5
	SFWMD 4600001953	M. Barry and M. Bonness	Control	7	6/1/2011	6/4/2011	5
	Interagency	M. Barry	Restored	0	3/11/2004	5/3/2004	15
	SFWMD 4500026581	M. Barry	Restored	5	5/8/2008	6/4/2008	15
	SFWMD 4500026581	M. Barry	Restored	6	5/21/2009	6/22/2009	15
	SFWMD 4600001953	M. Barry and M. Bonness	Restored	7	5/17/2011	6/21/2011	11

Location	Funding Source	Principal Investigator	Management Regime	Sampling Event No.	Start Date	End Date	No. of Transects
Picayune Strand State Forest (PSSF)	Interagency	M. Barry	Restored	0	12/9/2003	5/11/2004	23
	SFWMD PC P502173	M. Barry and S. Woodmansee	Restored	4	9/6/2005	10/6/2005	46
	SFWMD 4500026581	M. Barry	Restored	5	5/20/2008	7/9/2008	20
	SFWMD 4500026581	M. Barry	Restored	6	5/19/2009	6/16/2009	20
	SFWMD 4600001953	M. Barry and M. Bonness	Restored	7	5/16/2011	7/9/2011	14
Ten Thousand Islands National Wildlife Refuge (TTINWR)	SFWMD PC P502173	M. Barry and S. Woodmansee	Restored	4	8/10/2005	10/14/2005	4
Rookery Bay National Estuarine Research Reserve	N/A	M. Barry	N/A	0	10/21/2010	10/21/2010	1
309 permanently marked transects						**Sample Total:**	**1,006**

Table 2: Summary of Transects and Sampling Events Analyzed in this Report.

Location	Mgmt. Regime	Sampling Event No.	Start Date	End Date	Transect ID	No. of Transects
FPNWR	Control	4	10/19/2005	12/5/2005	07WP11, 07PI11, 32, 32PI33, 32WP33, 45	6
FPNWR	Control	5	6/7/2008	6/7/2008	07WP11, 07PI11, 32 (32PI33, 32WP33, 45 not sampled due to Rx burn)	3
FPNWR	Control	6	5/29/2009	6/11/2009	07WP11, 07PI11, 32, 32PI33, 32WP33, 45	6
FPNWR	Control	7	5/26/2011	6/1/2011	same as above)	6
FSPSP	Control	4	9/30/2005	11/9/2005	37, 39, 51, 64, 67	5
FSPSP	Control	5	6/5/2008	7/8/2008	(same as above)	5
FSPSP	Control	6	6/18/2009	6/25/2009	(same as above)	5
FSPSP	Control	7	6/1/2011	6/4/2011	(same as above)	5
FSPSP	Restored	0	3/11/2004	5/3/2004	PC06, PC07, PC08, PC09, PC10, PC20, PC26, PC27, PC28, PC29, PC30; (PC16, PC17, PC18, PC19 excluded from analysis due to wildfire 5/12/2011)	11
FSPSP	Restored	5	5/8/2008	6/4/2008	(same as above)	11

Location	Mgmt. Regime	Sampling Event No.	Start Date	End Date	Transect ID	No. of Transects
FSPSP	Restored	6	5/21/2009	6/22/2009	(same as above)	11
FSPSP	Restored	7	5/17/2011	6/21/2011	(same as above)	11
PSSF	Restored	0	12/9/2003	5/11/2004	PC11, PC12, PC13, PC14, PC15, PC21, PC22, PC23, PC24, PC25, 42, 53, 56, 57 (PC01, PC02, PC03, PC04, PC05, 55 excluded from analysis due to wildfire 5/12/2011)	14
PSSF	Restored	5	5/20/2008	7/9/2008	(same as above)	14
PSSF	Restored	6	5/19/2009	6/16/2009	(same as above)	14
PSSF	Restored	7	5/16/2011	7/9/2011	(same as above)	14

Table 3: Transects by Existing Habitat Type and Management Regime.

Management Regime	Habitat Name	Habitat	Total No. of Transects	No. Sampled in 2011
Control	Cypress	C	3	3
Control	Cypress with graminoid understory	Cg	1	1
Control	Pine flatwoods/hydric	Ph	3	3
Control	Wet Prairie	G	4	4
Restored	Cypress	C	5	5
Restored	Cypress with graminoid understory*	Cg	5 (7)	5 (5)
Restored	Cypress with hardwoods	Ch	2	1
Restored	Hammock/cabbage palm	Hp	1	1
Restored	Hammock/hydric (historically C)	Hh (C)	1 (0)	1
Restored	Pine flatwoods/hydric (2 were historically Cg)	Ph	10 (8)	5 (5)
Restored	Pine flatwoods/mesic	Pm	2	0
Restored	Wet Prairie	G	9	7
		Totals	**46**	**360**

* 2 Cg historically colonized by slash pine.

Table 4: Transect Descriptions

Transect	Management Regime	Location	Habitat Group	Pre-drainage NRCS Habitat	Baseline NRCS Habitat	Soil No.	Soil Type Name
07PI11	Control	FPNWR	Pineland	Ph	Ph	11	Hallandale Fine Sand
07WP11	Control	FPNWR	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
32	Control	FPNWR	Cypress	C	C	51	Ochopee Fine Sandy Loam
32PI33	Control	FPNWR	Pineland	Ph	Ph	49	Hallandale and Boca Fine Sands
32WP33	Control	FPNWR	Wet Prairie	G	G	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional
37	Control	FSPSP	Cypress	C	C	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional
39	Control	FSPSP	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
42	Restored	PSSF	Cypress	C	C	11	Hallandale Fine Sand
45	Control	FPNWR	Cypress	Cg	Cg	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional
51	Control	FSPSP	Cypress	C	C	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional
53	Restored	PSSF	Pineland	Pm	Pm	11	Hallandale Fine Sand
55	Restored	PSSF	Cypress	Cg	Ph	50	Ochopee Fine Sandy Loam, Low
56	Restored	PSSF	Cypress	C	Hh	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional
57	Restored	PSSF	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
64	Control	FSPSP	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
67	Control	FSPSP	Pineland	Ph	Ph	51	Ochopee Fine Sandy Loam, Low
PC01	Restored	PSSF	Pineland	Pm	Pm	11	Hallandale Fine Sand
PC02	Restored	PSSF	Cypress	Ch	Ch	11	Hallandale Fine Sand
PC03	Restored	PSSF	Pineland	Ph	Ph	11	Hallandale Fine Sand
PC04	Restored	PSSF	Cypress	Cg	Ph	51	Ochopee Fine Sandy Loam
PC05	Restored	PSSF	Pineland	Ph	Ph	51	Ochopee Fine Sandy Loam
PC06	Restored	FSPSP	Wet Prairie	G	G	51	Ochopee Fine Sandy Loam
PC07	Restored	FSPSP	Wet Prairie	G	G	51	Ochopee Fine Sandy Loam
PC08	Restored	FSPSP	Pineland	Ph	Ph	51	Ochopee Fine Sandy Loam
PC09	Restored	FSPSP	Pineland	Ph	Ph	51	Ochopee Fine Sandy Loam
PC10	Restored	FSPSP	Pineland	Ph	Ph	51	Ochopee Fine Sandy Loam
PC11	Restored	PSSF	Cypress	Cg	Cg	49	Hallandale and Boca Fine Sands

Transect	Management Regime	Location	Habitat Group	Pre-drainage NRCS Habitat	Baseline NRCS Habitat	Soil No.	Soil Type Name
PC12	Restored	PSSF	Cypress	C	C	49	Hallandale and Boca Fine Sands
PC13	Restored	PSSF	Cypress	Cg	Cg	49	Hallandale and Boca Fine Sands
PC14	Restored	PSSF	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
PC15	Restored	PSSF	Cypress	C	Ch	11	Hallandale Fine Sand
PC16	Restored	FSPSP	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
PC17	Restored	FSPSP	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
PC18	Restored	FSPSP	Pineland	Ph	Ph	51	Ochopee Fine Sandy Loam, Low
PC19	Restored	FSPSP	Pineland	Ph	Ph	51	Ochopee Fine Sandy Loam, Low
PC20	Restored	FSPSP	Cypress	C	C	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional
PC21	Restored	PSSF	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
PC22	Restored	PSSF	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
PC23	Restored	PSSF	Pineland	Ph	Ph	49	Hallandale and Boca Fine Sands
PC24	Restored	PSSF	Wet Prairie	G	G	50	Ochopee Fine Sandy Loam, Low
PC25	Restored	PSSF	Cypress	Cg	Cg	49	Hallandale and Boca Fine Sands
PC26	Restored	FSPSP	Cypress	C	C	49	Hallandale and Boca Fine Sands
PC27	Restored	FSPSP	Hammock	Hp	Hp	49	Hallandale and Boca Fine Sands
PC28	Restored	FSPSP	Cypress	C	C	51	Ochopee Fine Sandy Loam
PC29	Restored	FSPSP	Cypress	Cg	Cg	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional
PC30	Restored	FSPSP	Cypress	Cg	Cg	25	Boca, Riviera, Limestone substratum, Copeland Fine Sands, Depressional

Table 5: Transects by Habitat and Time Since Fire.

Management Regime	Habitat	Transect	Time Since Fire Category					Burned Since Last Event		
			2004 (Spring)	2005 (Fall)	2008 (Spring)	2009 (Spring)	2011 (Spring)	2008	2009	2011
Control	C	32		3	3	3	3	Yes		
Control	C	37		3	3	3	3			
Control	C	51		3	3	3	3			
Control	Cg	45		2		1	2		Yes	
Control	G	07WP11		2	2	2	1	Yes		Yes
Control	G	32WP33		2		2	2		Yes	
Control	G	39		2	2	2	1			Yes
Control	G	64		3	2	1	2	Yes	Yes	
Control	Ph	07PI11		2	2	2	1	Yes		Yes
Control	Ph	32PI33		2		2	2		Yes	
Control	Ph	67		3	3	3	1			Yes
Restored	C	42	3	3*	3	3	3			
Restored	C	PC12	3		3	3	3			
Restored	C	PC20	2		3	3	3			
Restored	C	PC26	3		3	3	3			
Restored	C	PC28	3		3	3	3			
Restored	Cg	PC11	3		3	3	3			
Restored	Cg	PC13	3		3	3	3			
Restored	Cg	PC25	2		2	2	2	Yes		
Restored	Cg	PC29	2		2	2	3			
Restored	Cg	PC30	2		2	2	3			
Restored	Ch	PC02	3		2	2	N/A	Yes		Yes
Restored	Ch	PC15	3		3	3	3			
Restored	G	57	2	2*	2	2	2	Yes		
Restored	G	PC06	2		1	2	2	Yes		
Restored	G	PC07	2		1	2	2	Yes		
Restored	G	PC14	3		3	3	3			
Restored	G	PC16	3		2	2	N/A	Yes		Yes
Restored	G	PC17	2		1	2	N/A	Yes		Yes
Restored	G	PC21	2		2	2	2	Yes		
Restored	G	PC22	2		2	2	2	Yes		
Restored	G	PC24	2		2	2	2	Yes		
Restored	Hh	56	3	3*	3	3	3			
Restored	Hp	PC27	3		3	3	3			
Restored	Ph	55	1	2*	2	2	N/A			Yes
Restored	Ph	PC03	2		2	2	N/A	Yes		Yes
Restored	Ph	PC04	2		2	2	N/A	Yes		Yes
Restored	Ph	PC05	2		2	2	N/A	Yes		Yes
Restored	Ph	PC08	2		1	2	2	Yes		
Restored	Ph	PC09	2		1	2	2	Yes		
Restored	Ph	PC10	2		1	2	2	Yes		
Restored	Ph	PC18	2		1	2	N/A	Yes		Yes

Management Regime	Habitat	Transect	Time Since Fire Category					Burned Since Last Event		
			2004 (Spring)	2005 (Fall)	2008 (Spring)	2009 (Spring)	2011 (Spring)	2008	2009	2011
Restored	Ph	PC19	2		1	2	N/A	Yes		Yes
Restored	Ph	PC23	2		2	2	2	Yes		
Restored	Pm	53	3	3*	3	3	3			
Restored	Pm	PC01	3		2	2	N/A	Yes		Yes

** These data were not included in analysis*

Table 6: Level of Plant Identification in Quadrat Sampling Data in 2011

Level of Identification	Total Cover	Total No. of Records	% Total Cover	% Total Records
Above family	7	9	0.0%	0.4%
ID to family	16	22	0.1%	1.0%
ID to Genus	31.5	24	0.2%	1.1%
Total Partial ID	54.5	55	0.3%	2.4%
Full ID	18,298	2,230	99.7%	97.6%
Totals	**18,407**	**2,340**		

Figures

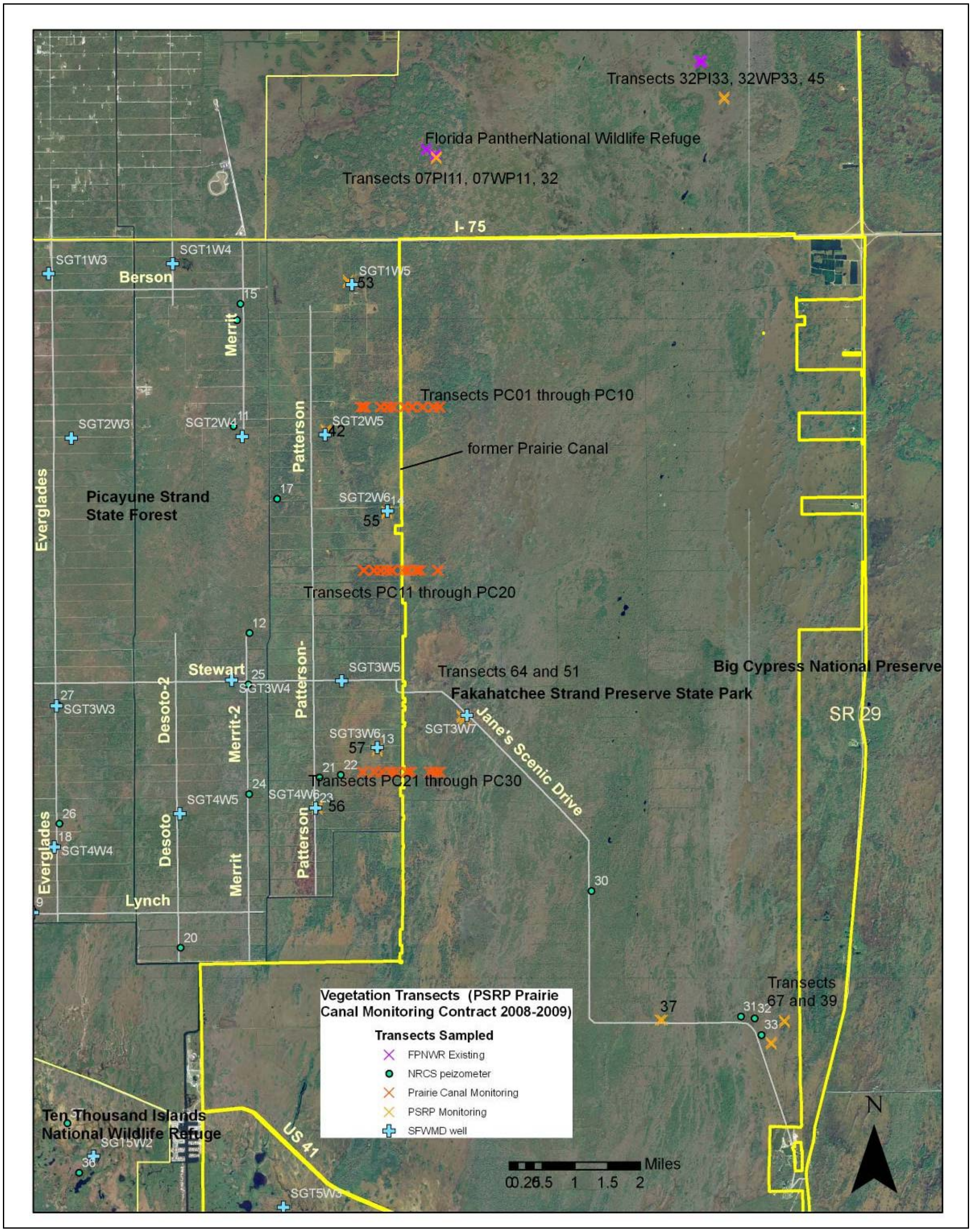

Figure 1. Picayune Strand State Forest Vegetation Monitoring Study Area

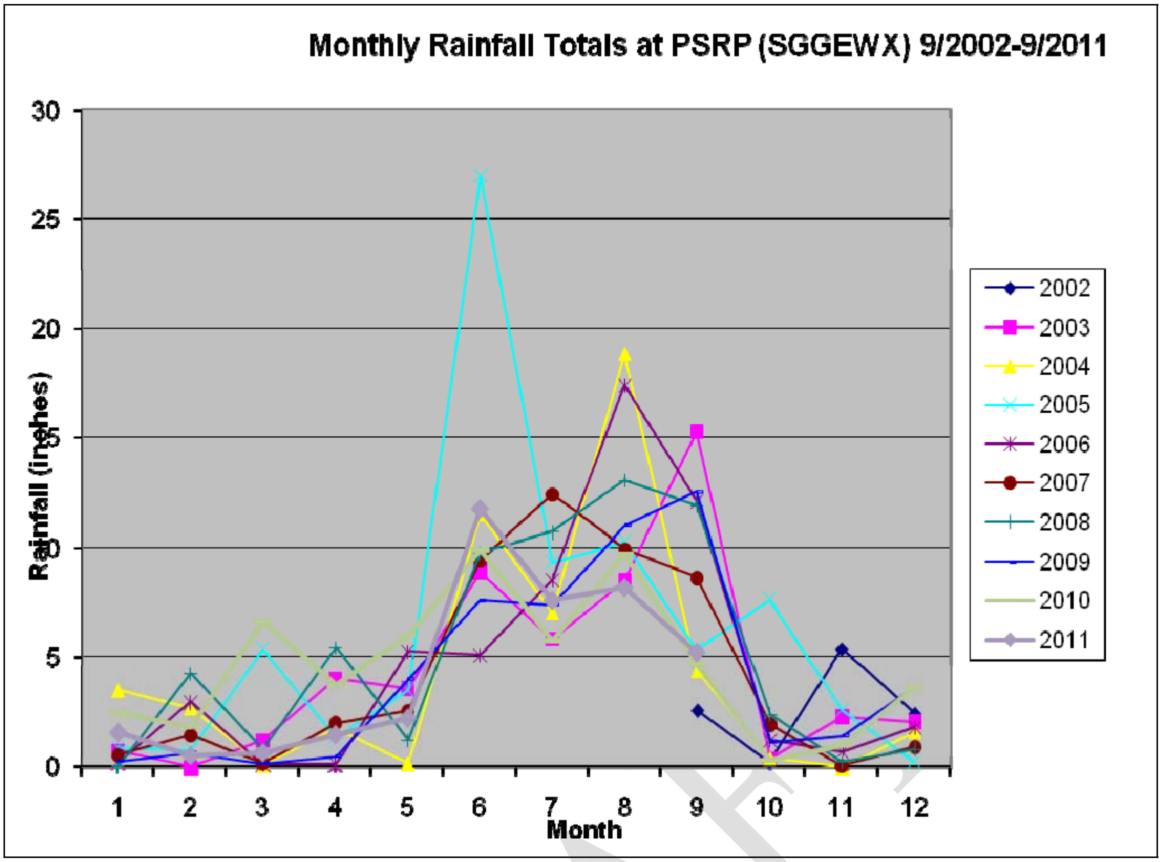

Figure 2. Monthly Rainfall Totals at PSRP (SGGEWX) 2002-2011

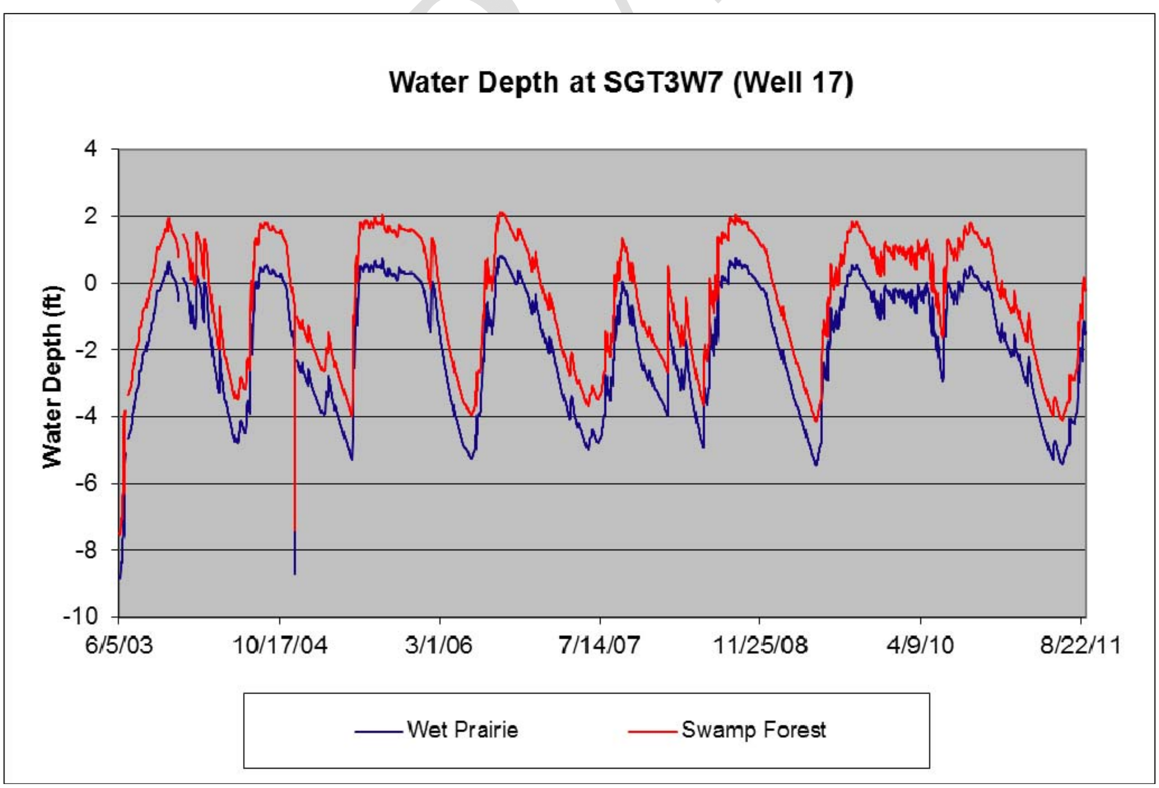

Figure 3. Water Depth at SGT3W7 (Well 17)

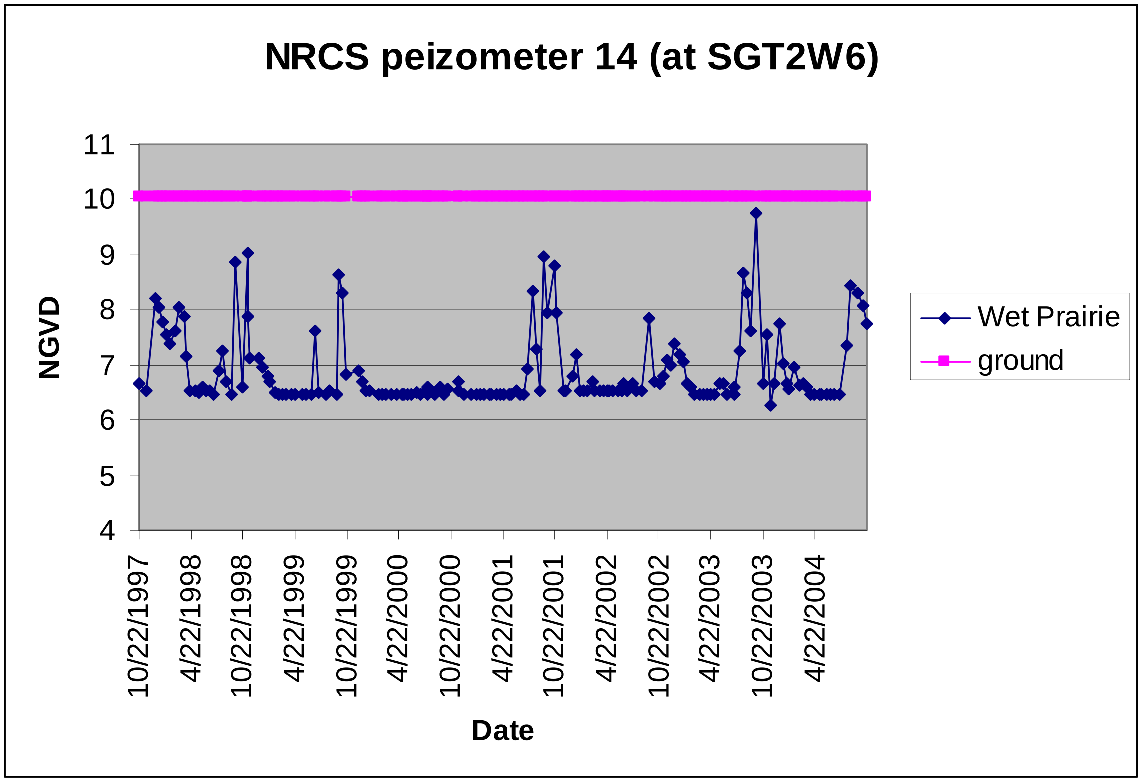

Figure 4. *NRCS Piezometer 14 (at SGT2W6)*

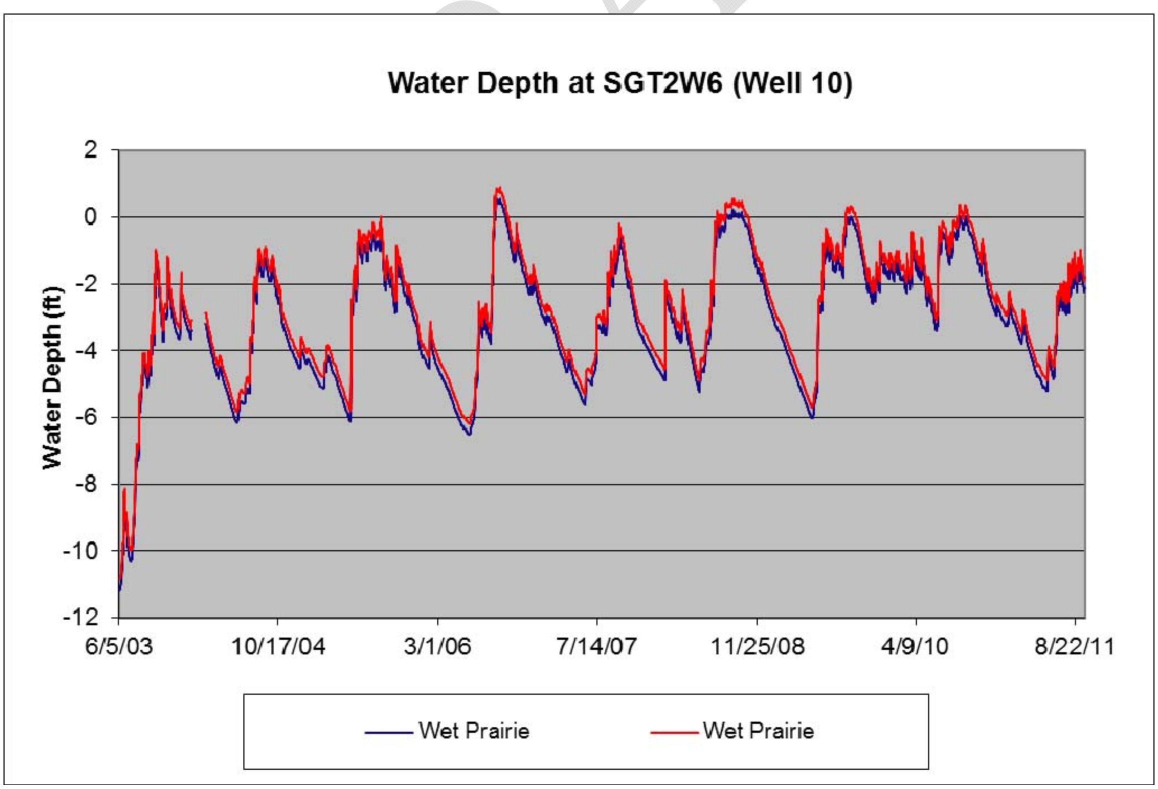

Figure 5. *Water Depth at SGT2W6 (Well 11)*

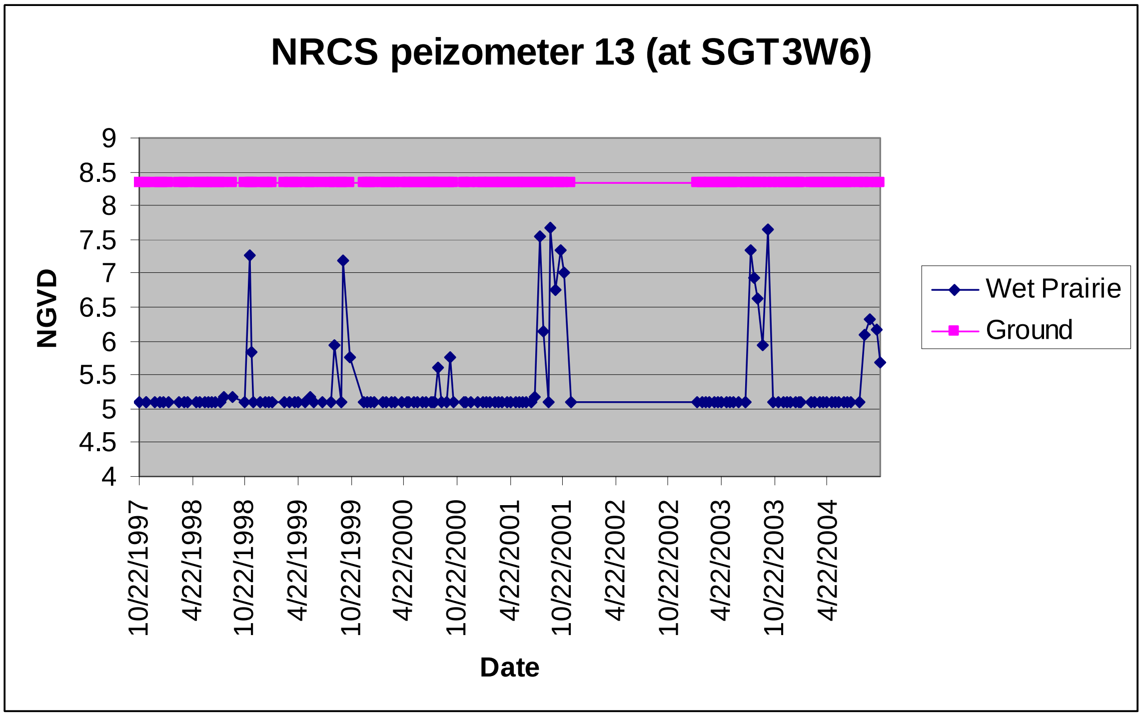

Figure 6. NRCS Piezometer 13 (at SGT3W6)

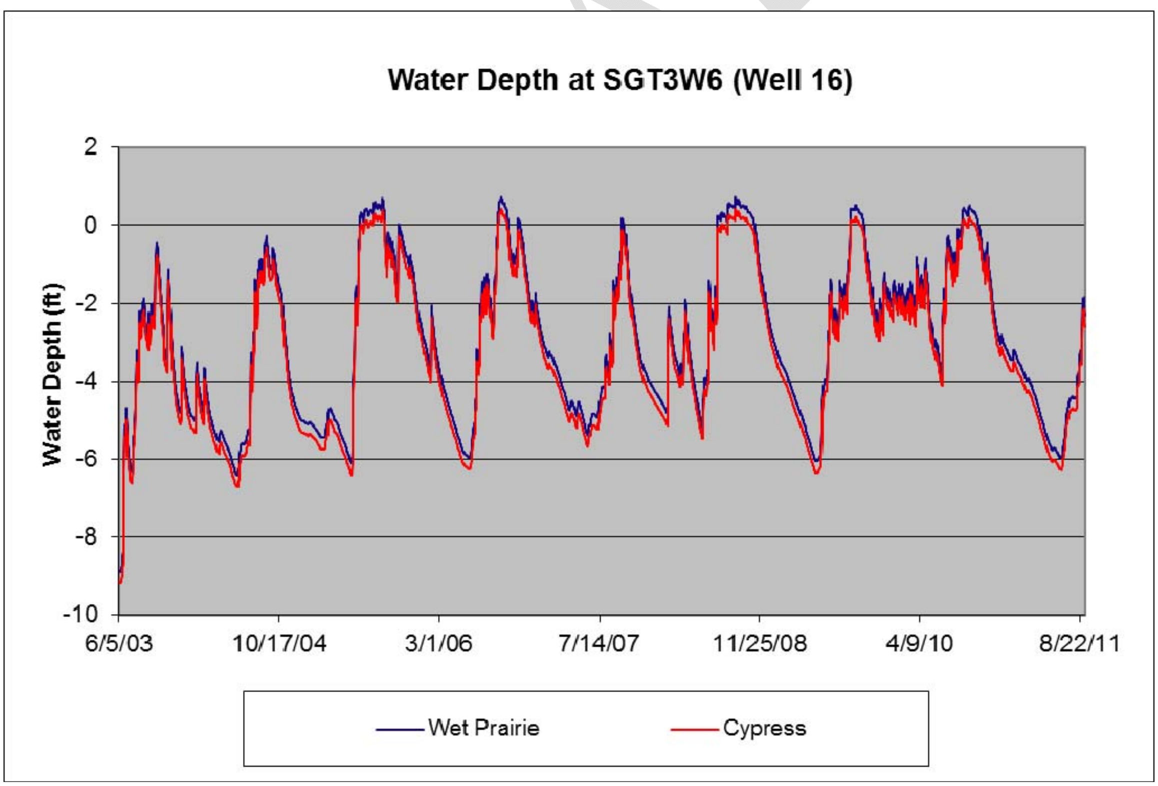

Figure 7. Water Depth at SGT3W6 (Well 23)

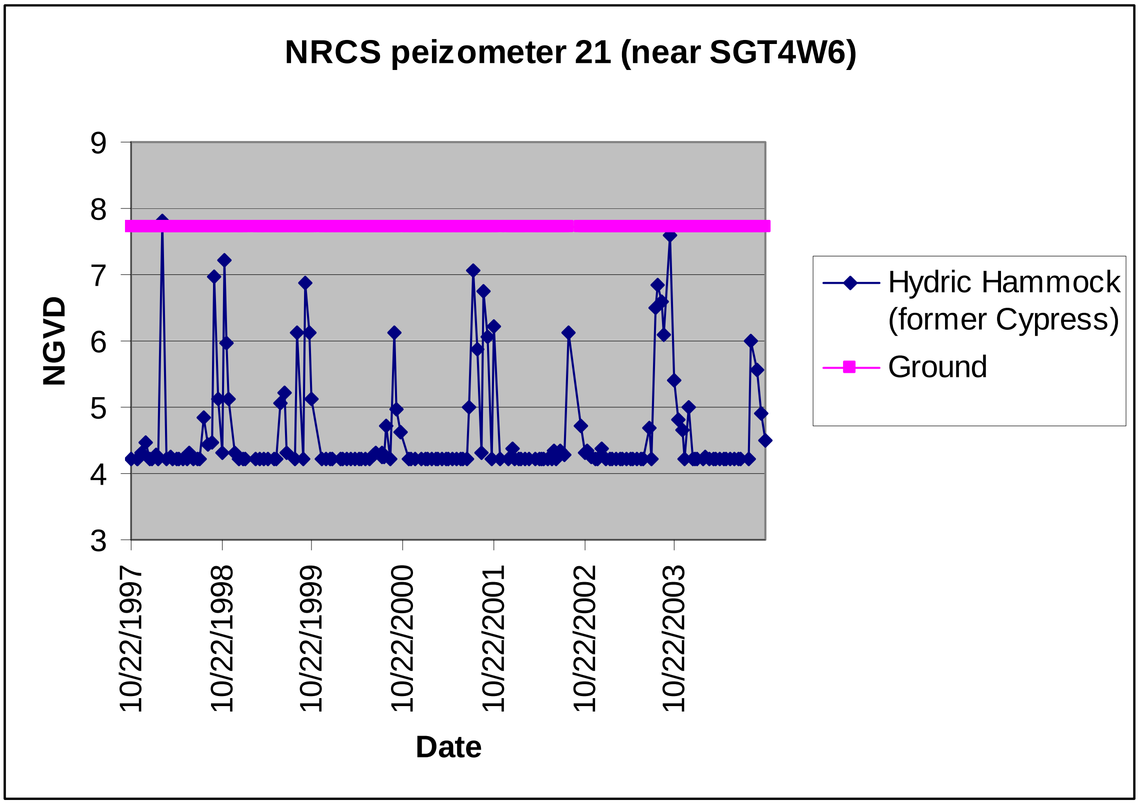

Figure 8. NRCS Piezometer 21 (near SGT4W6)

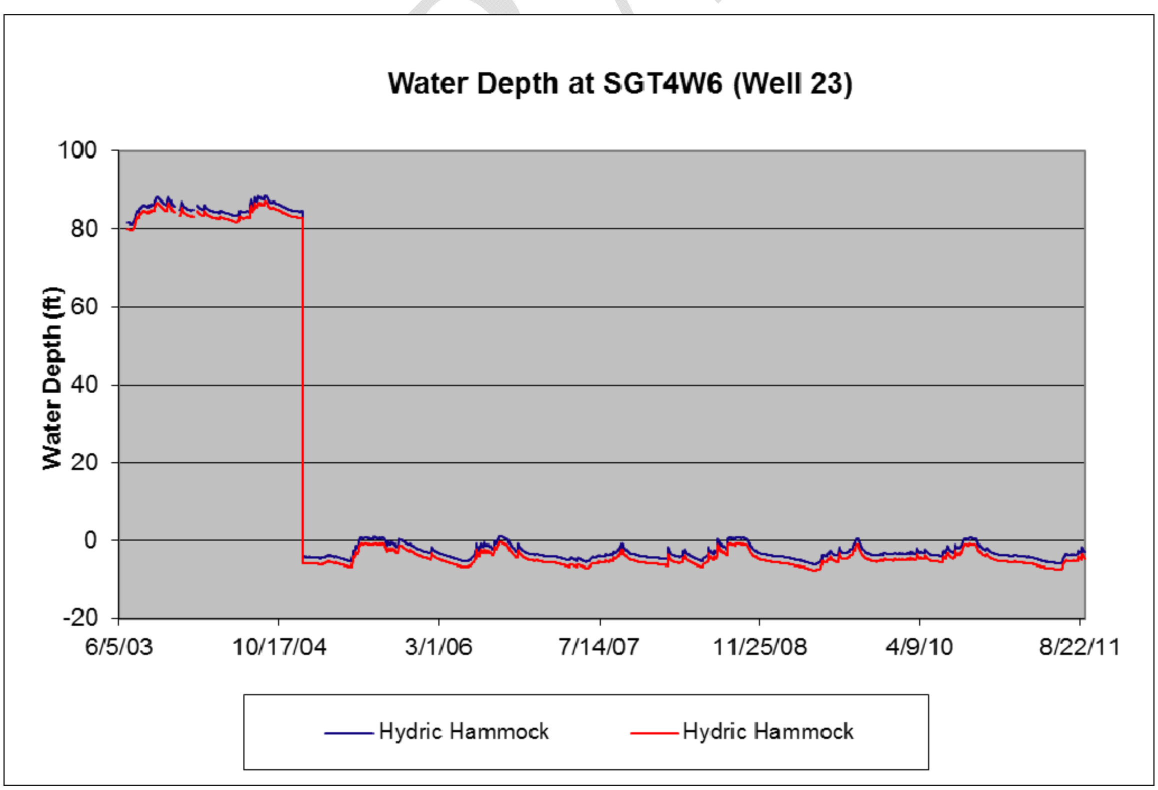

Figure 9. Water Depth at SGT4W6

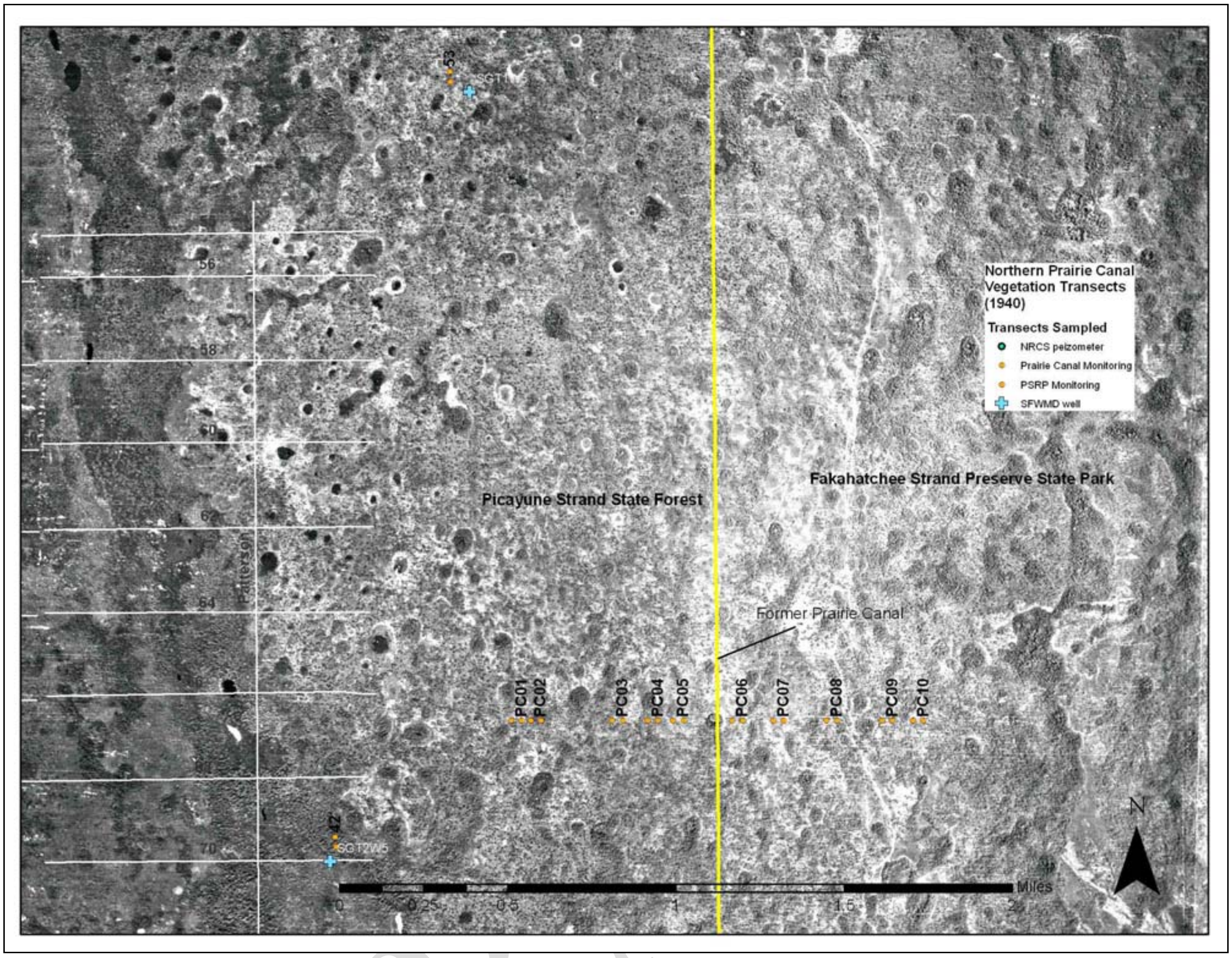

Figure 10. Northern Prairie Canal Vegetation Transects (1940)

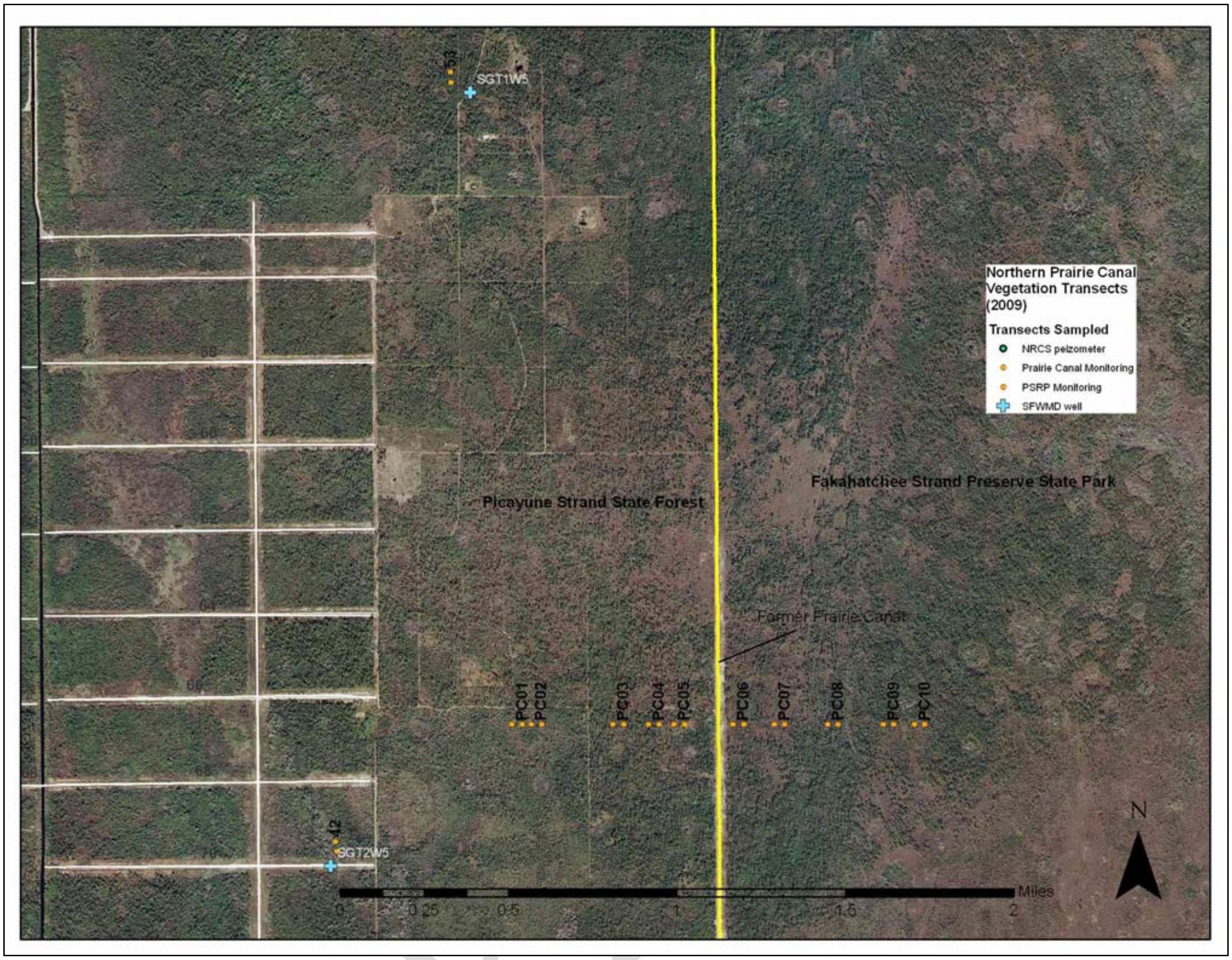

Figure 11. Northern Prairie Canal Vegetation Transects (2009)

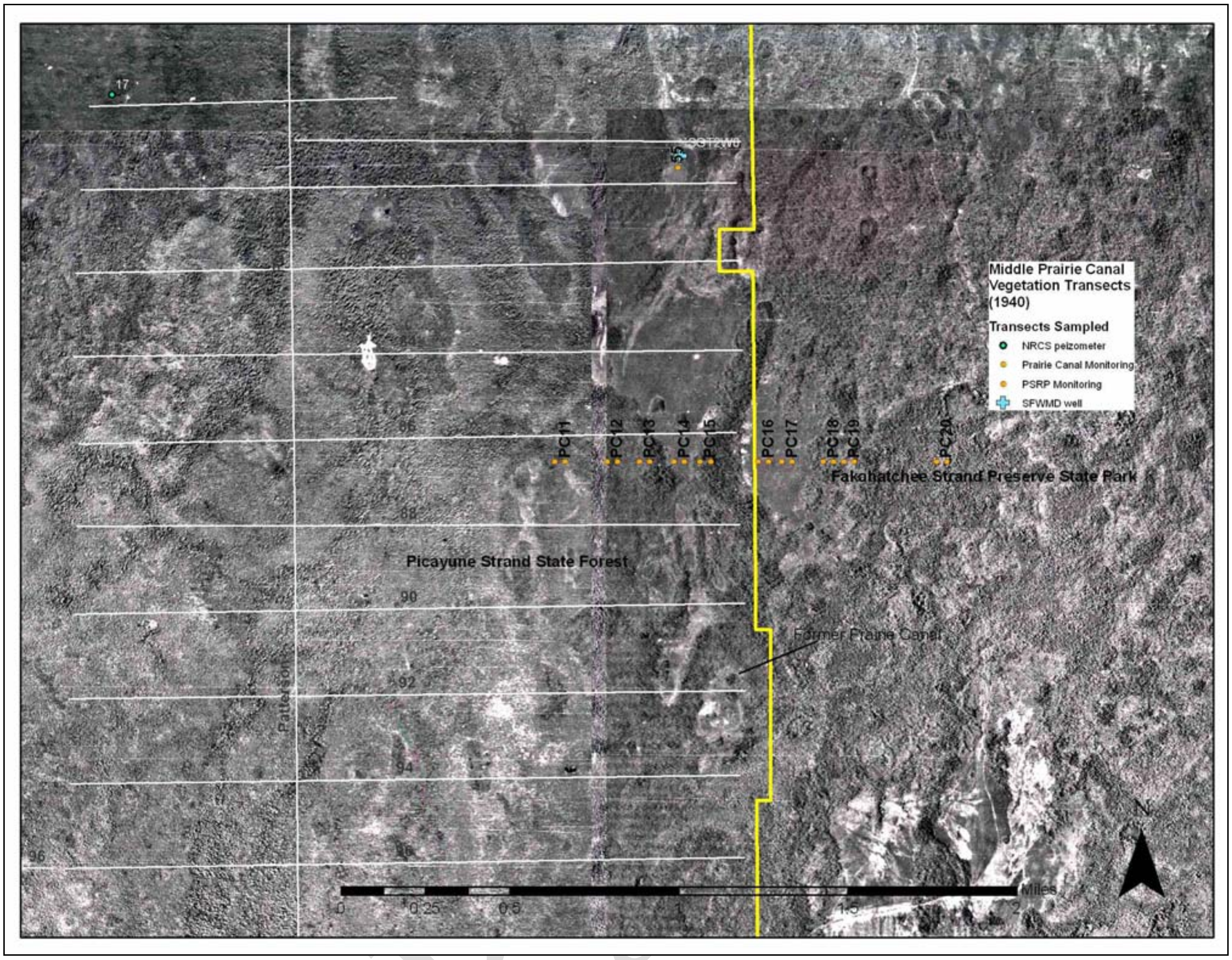

Figure 12. Middle Prairie Canal Vegetation Transects (1940)

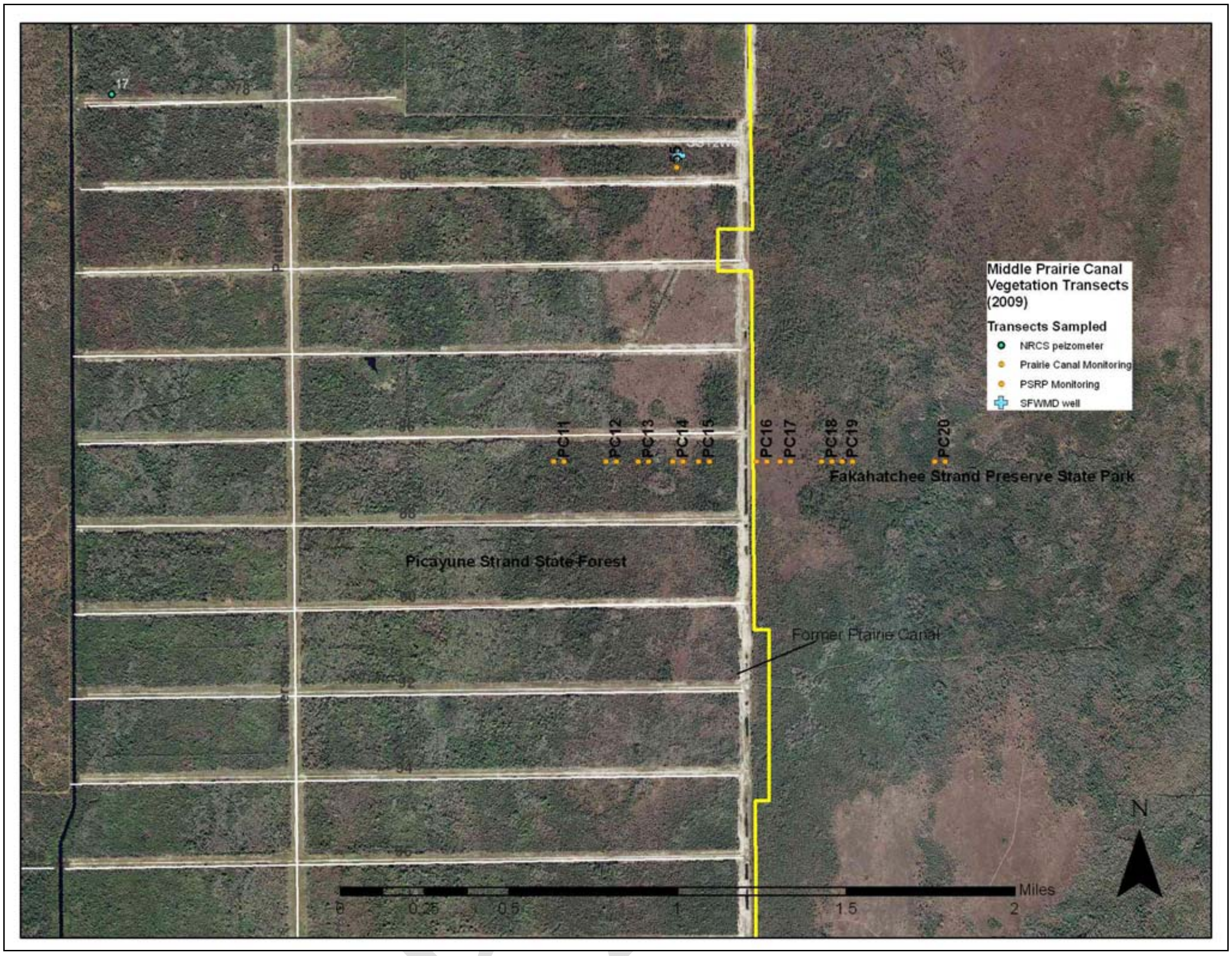

Figure 13. Middle Prairie Canal Vegetation Transects (2009)

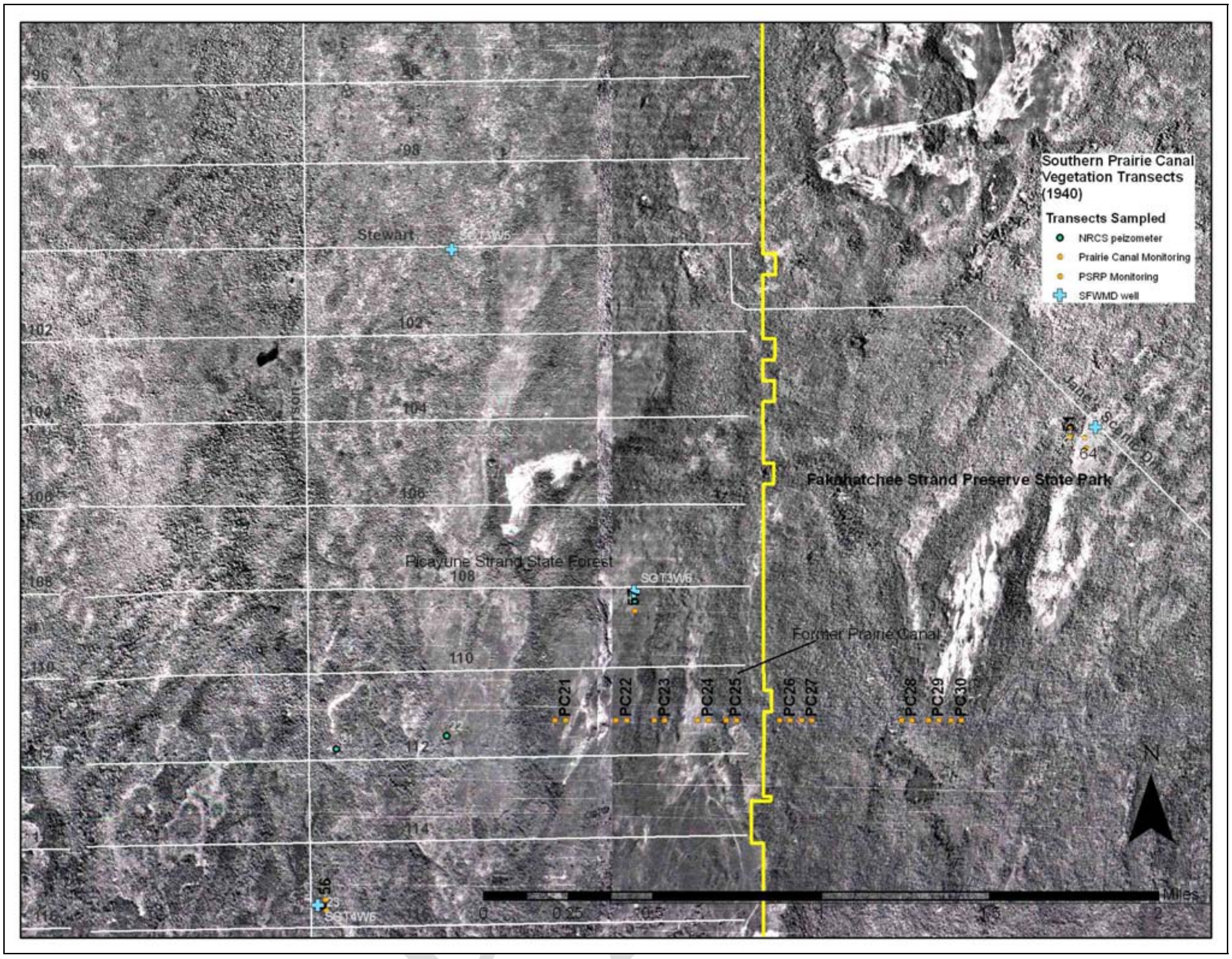

Figure 14. Southern Prairie Canal Vegetation Transects (1940)

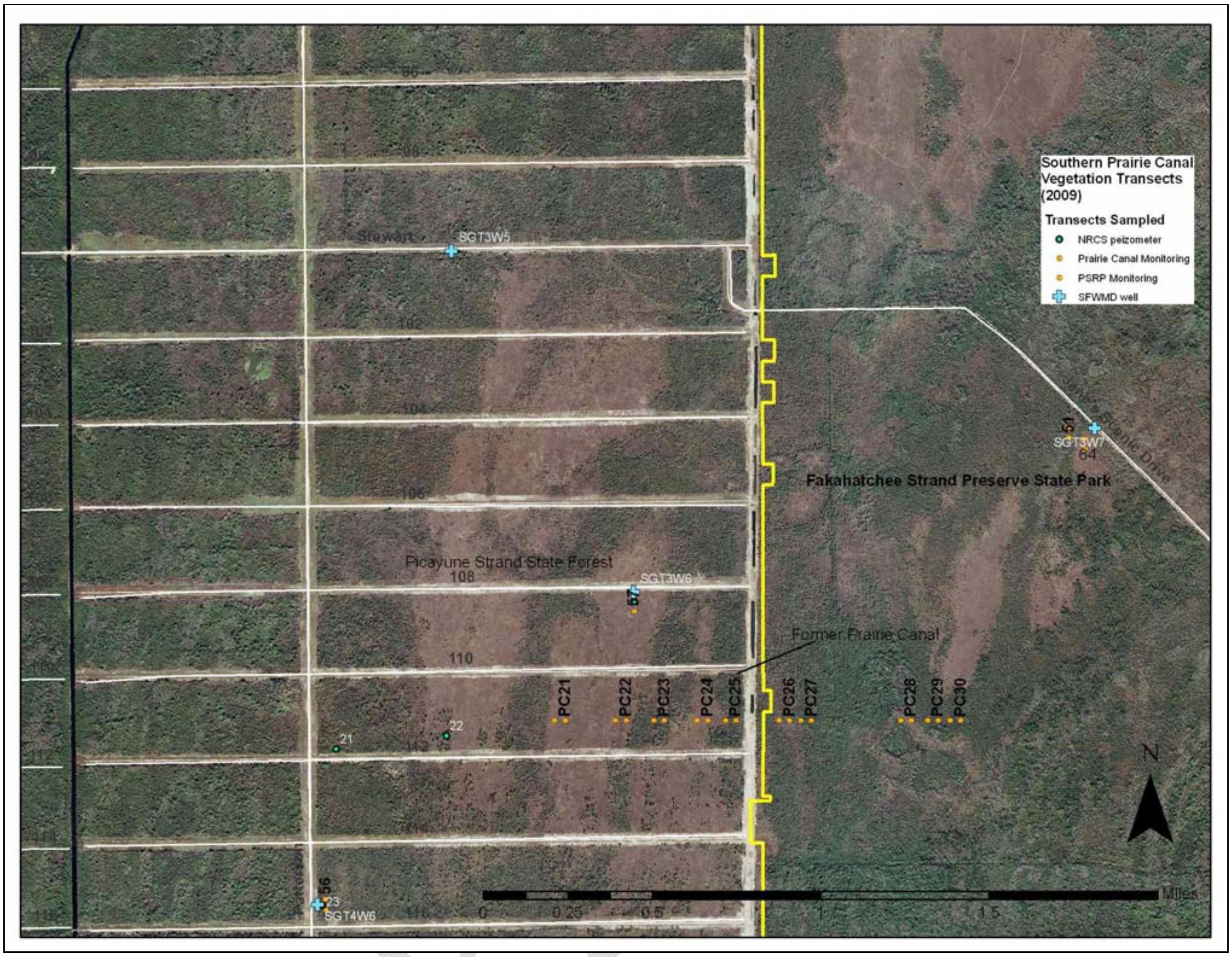

Figure 15. *Northern Prairie Canal Vegetation Transects (2009)*

Appendices

Appendix 1
Picayune Vegetation Monitoring Methods: Field Guide

Appendix 1:
Picayune Vegetation Monitoring Methods
Field Measurement Guide
Revised September 7, 2011

Equipment:
50-meter tape; 2.5-meter stick; flagging tape; compass; 0.5 m^2 quadrat; camera; hand lens; tree tags; hammer and nails; DBH tape (in cm); pen/pencil; clipboard; previous year data sheet; field notebook; GPS; field safety equipment, including water

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Set-up:

Avoid stepping on quadrat locations. Locate transect ends. Set tape alignment on transect. N. or E. = start, unless noted otherwise. Follow previous line (not necessarily straight) with guidance from flagging on vegetation and field notes from previous years. Flagging tape <u>knot</u> = transect tape location. Refresh flagging on ends, and within transect as needed.

Photos:

Consult field notebook identifying transect, date, time, researchers. First Photo - Start of transect: from ~2 meter away, take photo of end-post and tape showing 1st quadrat. Vertical photo preferred. Photos 2+ additional photos as needed (e.g., treetops to show live specimens vs. snags); if view of whole transect is obstructed, take general photo facing away from transect end. Final Photo - end of transect & final quad

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Belt Transect 1:

Avoid stepping on quadrat locations - Using 2.5 m pole as guide for belt boundary, walk along each side of tape to record canopy and sub-canopy. Stems are "in" belt, if >50% of the trunk base is within belt boundary. Record data on data sheet with previous year information.

<u>Canopy (≥10 cm dbh): measure DBH -</u> trees are numbered and tagged; measure just above nail; make sure dbh tape is level; check notes about vines or obstructions; tag any trees that have grown to be ≥10 cm dbh

<u>Sub-canopy (dbh 2.5 – 10 cm): count no. of stems for each species -</u> "sub-canopy" = woody plants that could become trees (e.g., bay, dahoon holly, sapling pine, sapling cypress, etc.); exclude shrub species: (e.g., brazilian pepper, willow, saltbush, wax myrtle, palmetto, dogwood, myrsine); see notes below.

Count Sabal Palm Trees in Strata 1 and 2 - apical meristem >8ft; Strata 1.5 - old growth (bootless, no leaf scars, adventitious roots); Strata 2 - apical meristem 4.5 – 8 ft;

Belt Transect 2:

Avoid stepping on quadrat locations
Count Sabal Palm in each of strata 3 through 5
Strata 3 - trunk above ground to 4.5 ft tall
Strata 4 - palmate leaves; no trunk
Strata 4 – simple; 4 or more simple leaves
Strata 5 - ≤ 3 leaves (including old leaf stems); largest leaf ≤ 3 folds

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Quadrats Numbers 0 – 5.

Short side of quadrat placed along tape at 0-0.5 m, 10-10.5, 20-20.5, 30-30.5, 40-40.5, 50-50.5 meters on north or west side of tape (unless noted otherwise); when standing at 0 m, facing transect, quadrat is always located to the RIGHT of transect line. Record data in field notebook.

Identify all species within quadrat. Record 8-letter species code. For herbaceous groundcover spp., exclude plants, if stem is outside of quadrat.
Include vines & epiphytes
Include trees <2.5 cm dbh
Include shrubs (see notes below) overhanging quadrat
Include Sabal Palm strata 3–5

Record "cover class" for each species.
0.5 (0-1%), 37.5 (25-50%), 3 (1-5%), 62.5 (50-75%), 15 (5-25%), 85 (75-95%), 97.5 (95-100%).

Record notes:
SE=seedling, SA=sapling, ?=unsure, FL=flowering, FR=fruit, B=deer-browsed. For palms record number of seedlings in quadrat. Label unknown species "P_[family or genus]" + description

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Line Intercept:

Avoid stepping on quadrat locations
Record % cover of shrubs, young trees, and Sabal Palm strata 3 – 5 that are directly over transect tape. Use 0.1 meter increments. Record all data in field notebook.
Include all woody plants <2.5 cm dbh
Include all "shrub" species regardless of dbh. (see notes below)

Include seedlings & saplings of woody plants
Include Sabal palm strata 3–5 (lumped together)
Exclude perennial forbs, suffructescent (e.g., *Hypericum*, *Stillingia*, *Lythrum*…)

Follow-up: scan/photo data for back-up

SHRUB NOTES:

"Shrubs" = multi-stem woody species; stem numbers and % cover varies much year-to-year. (e.g., Brazilian pepper, dogwood, wax myrtle, saltbush, willow, myrsine, shiny blueberry, *Psychotria* spp., gallberry.

Serenoa repens is always considered to be a shrub.

Shrubs = plants that could become sub-canopy trees (e.g., bay, dahoon, pop-ash, strangler fig, pond apple, magnolia, oak) when DBH is <2.5cm.

NOT shrubs = perennial, suffructescent forbs (e.g., *Stillingia*, *Hypericum*, *Lythrum*, *Urena*).

Appendix 2
Belt Transect Data by Transect

Appendix 3
Line Intercept Data by Transect

Appendix 4
Mean Quadrat Percent Cover and Frequency by Transect

Appendix 5
Wetland Affinity Index by Transect