#061100

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

April 6, 2007

Honorable Mayor Hanrahan
P.O. Box 490, Station 19
Gainesville, FL 32601-0490

Honorable Mayor Hanrahan and City Commission,

Paynes Prairie is a resource of exceptional local, regional, and national significance recognized as the State's first state preserve and designated as a National Natural Landmark. Its surface waters support hundreds of bird and other animal species and affect water quality in the Floridan aquifer through discharge to Alachua Sink.

In 2002, the Department's Total Maximum Daily Load (TMDL) Program determined that Alachua Sink did not meet state water quality standards due to high levels of total nitrogen contributed by upstream water bodies including Sweetwater Branch. The primary sources of total nitrogen to Sweetwater Branch include Gainesville Regional Utilities' (GRU) Main Street Water Reclamation Facility and stormwater runoff from the Gainesville urban area. The TMDL requires large reductions in total nitrogen loading from both sources.

Through the Orange Creek Basin watershed initiative, the TMDL Program is working closely with GRU, Gainesville Public Works Department, Alachua County, SJRWMD, FDOT and other private and public stakeholders to find solutions to the problem of too much total nitrogen entering Alachua Sink. Treatment upgrades at the Main Street Plant and stormwater retrofits will help achieve the needed reduction in nitrogen. However, the most significant reductions in total nitrogen will be accomplished with the implementation of the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project. This project plays a critical role in addressing the reductions in total nitrogen needed to meet the TMDL and also protect Paynes Prairie. The project has the potential to significantly improve the quality of water reaching Paynes Prairie and improve the prairie's ecology.

The Department's TMDL Program strongly supports the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project because when completed, it will meet GRU's and Gainesville Public Work's nitrogen reduction requirements called for in the Alachua Sink TMDL, restore roughly 1300 acres of wetlands on Paynes Prairie, protect Paynes Prairie Preserve State Park, and protect the Floridan aquifer. We are also willing to provide funding for this project from our TMDL Water Quality Restoration Grant Program. The Department's TMDL Program recognizes the challenges of achieving the goal of the project including the land exchange and regulatory approvals. The Department's TMDL Program applauds the efforts of the City of Gainesville, FDOT, SJRWMD and other local stakeholders in implementing this project.

Thank you for this opportunity to express our support of this project. If you have questions or need additional information, please let me know.

Sincerely,

Eric H. Livingston
Bureau Chief for Watershed Management

Introduced: 4/9/2007 **File Number:** 061100.

Version: 0 **Status:** To Be Introduced

..Title
Conceptual Plan for Paynes Prairie Sheetflow Restoration (B)

This item is a Conceptual Project Plan that will provide necessary water quality improvements under the Total Maximum Daily Load (TMDL) regulatory program.

..Explanation
Alachua Sink is a natural lake located within Paynes Prairie Preserve State Park (Prairie) just south of Gainesville. Sweetwater Branch receives stormwater from the Gainesville urban area and effluent from the Main Street Water Reclamation Facility (MSWRF). Sweetwater Branch currently discharges to Alachua Sink via a man-made channel that has existed since the 1930s.

Alachua Sink has been listed as impaired under the State of Florida Impaired Waters Rule, and as a result the Florida Department of Environmental Protection (FDEP) has developed a Total Maximum Daily Load (TMDL) for Alachua Sink which will require reductions in total nitrogen discharges to Alachua Sink from all sources. The MSWRF and stormwater runoff from the Gainesville area account for 23% and 6%, respectively, of the total nitrogen load to Alachua Sink. The remainder of the nitrogen load comes from other upstream sources including Newnans Lake.

The City of Gainesville Public Works Department (PW) identified a Constructed Wetland Project on the Prairie in their Sweetwater Branch Watershed Management Plan and Restoration Planning process. The original 50 acre project, including funding, is part of the adopted Capital Improvement Program. GRU staff advised the City Commission as part of the FY2007/2008 budget presentations that GRU's cost for complying with the TMDL would range from $10 to $40 million. However, funds were not committed in the GRU FY2007/2008 capital budget due to the uncertainty in the total cost.

Representatives from PW, GRU, Prairie, St Johns River Water Management District (SJRWMD) and FDOT have developed a proposed plan that would meet the TMDL requirements for City of Gainesville (both PW and GRU) and FDOT and would provide significant additional benefits to the Prairie, and the community. The proposed project is described in the Conceptual Plan for Sweetwater Branch/Paynes Prairie Sheetflow Restoration report dated March 2007.

PW and GRU staff have worked in conjunction with Prairie and SJRWMD staff to perform numerous scientific studies in order to develop the proposed plan. The presentation to the City Commission will include presentations from PW and GRU staffs and the consultant who performed the studies which formed the basis of the proposed plan, Wetland Solutions, Inc.

Prairie and SJRWMD staffs will also present. Staff presentations will include discussions of costs for the proposed project, as well as costs and benefits of other potential alternatives for meeting the Alachua Sink TMDL.

..Fiscal Note
The total cost of the project is estimated at approximately $21 million (not including the costs for public access facilities). Efforts have been made and will continue to be made to leverage funding from outside sources, including grant funding and funding partners, in order to minimize the City's costs. Grant awards have been secured for the Sweetwater Branch Enhancement Wetland, with $850,000 obtained through the St Johns River Water Management District Orange Creek Basin Legislative Initiative. The Florida Department of Transportation has committed $300,000 to the Enhancement Wetland and $366,125 to the sheetflow structure. An additional request for $1 million is included in this year's Orange Creek Basin Initiative. An additional $2 million has been requested by GRU for Improvements to Meet Total Maximum Daily Load Limits, through Gainesville's 2007 State Legislative Agenda.

Grant programs have been identified that could provide additional matching funds. These programs include the Florida Fish and Wildlife Conservation Commission Aquatic Habitat Restoration/Enhancement program, the SJRWMD Stormwater Cost Share Grant Program, the FDEP TMDL Water Quality Restoration Grant Program, and the FDEP/USEPA Section 319 Grant Program. Grant applications could be prepared once land rights have been established. This project is eligible for funding under the State Revolving Fund Program and this source of funding may need to be considered for this project.

GRU and PW have come to agreement on the approach for proportioning the City's project costs and responsibilities between GRU and PW, and for allocating contributions from outside funding sources. PW and GRU propose to develop and execute a Memorandum of Understanding between PW and GRU on this issue. Based on preliminary cost estimates, the approximate anticipated cost allocation is as follows:

	GRU	PW
Capital	73%	27%
O&M	80%	20%

These cost proportions may change as more detailed cost estimates are and funding from other funding sources become more defined.

..Recommendation
Recommended Motion: The City Commission: 1) receive a copy of the Conceptual Plan for Paynes Prairie Sheetflow Restoration Project; 2) hear a presentation on the Conceptual Plan; 3) authorize staff to develop a Memorandum of Understanding between the City, SJRWMD, and the State of Florida Department of Environmental Protection Division of Recreation and Parks for the exchange of land and authorize the City Manager and General Manager for Utilities to

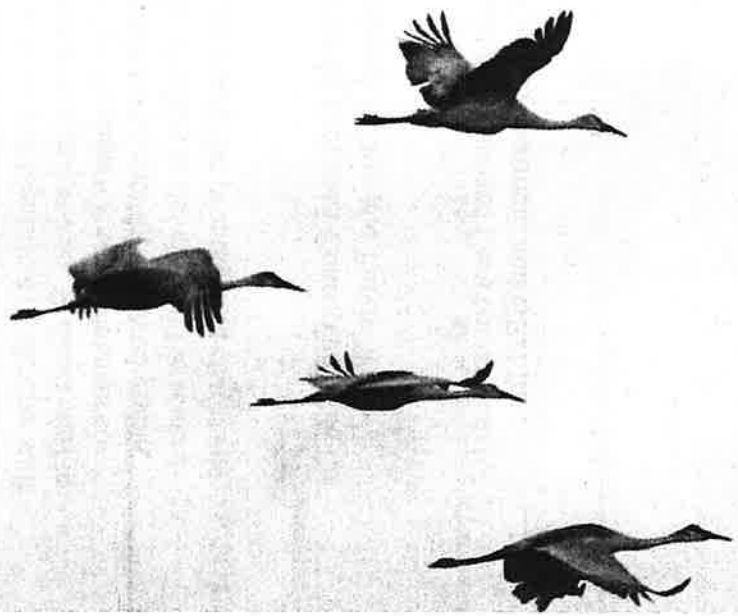
execute same, subject to approval by the City Attorney as to form and legality; 4) authorize staff to begin the consultant selection process to obtain professional design services; 5) direct staff to seek grant opportunities for this project and authorize the City Manager/General Manager for Utilities to execute all selected grant opportunities and related documents for tendered grants; and 6) authorize the City Manager and General Manager for Utilities to develop and execute a Memorandum of Understanding between PW and GRU concerning the proportional shares and responsibilities, and the allocation of future grant funding.

Alternative Recommendation A: The City Commission refer the proposed Conceptual Plan for Paynes Prairie Sheetflow Restoration to the Recreation, Cultural Affairs and Public Works Committee for review and direction.

Alternative Recommendation B: The City Commission refer the proposed Conceptual Plan for Paynes Prairie Sheetflow Restoration back to the Public Works Department and GRU for review.

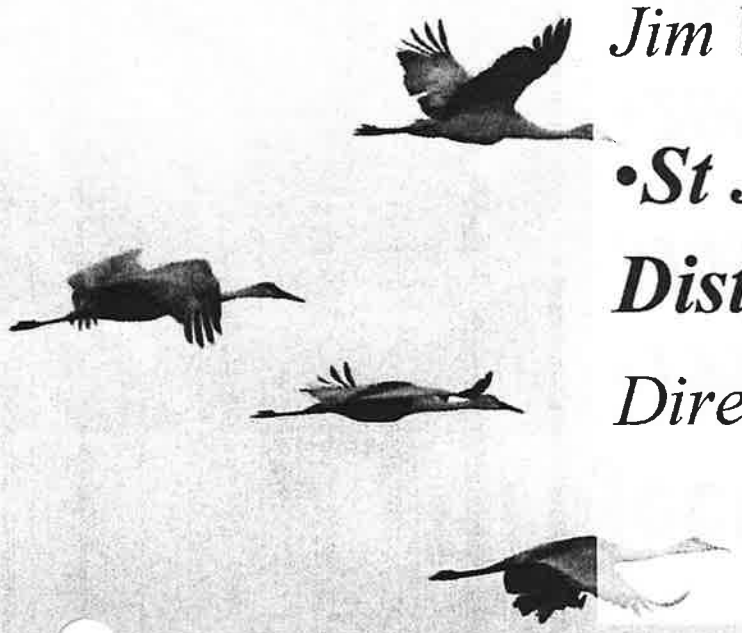
A Conceptual Plan for Restoring Sweetwater Branch Sheetflow to Paynes Prairie

April 9, 2007



Presentation Outline

- ***Public Works - Project Background***
- ***GRU Perspective***
- ***Project Description***
  Bob Knight, Wetland Solutions, Inc.
- ***Paynes Prairie State Park Preserve***
  Jim Weimer, Park Biologist
- ***St Johns River Water Management District*** *Casey Fitzgerald, Assistant Director Department of Water Resources*



Project Background

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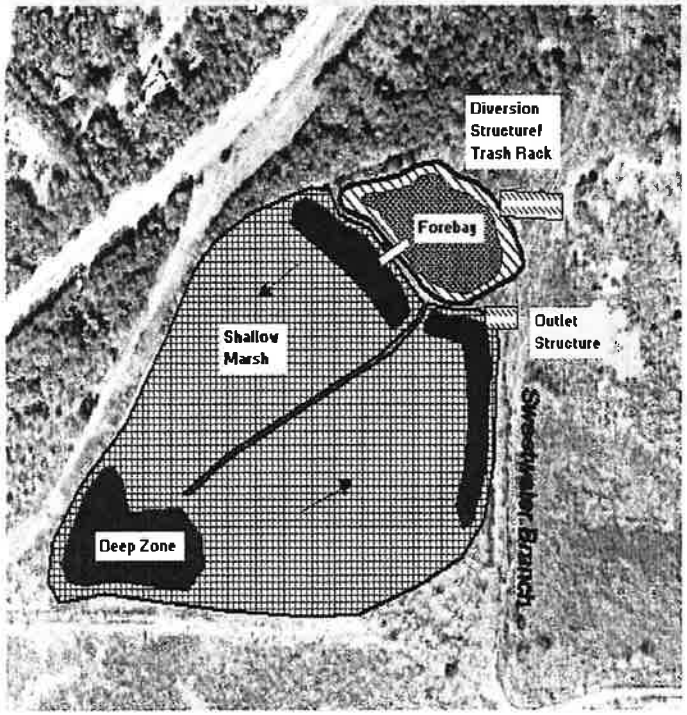

- *1992 Stormwater Management Master Plan*
- *2004 Watershed Management Plan Update – Getting ready for TMDLs*
- *2004 50 acre Wetland Project added to the CIP*
- *2005 Land Exchange Between SJRWMD and Paynes Prairie halted*
- *Find a solution that will restore sheetflow onto the Prairie*

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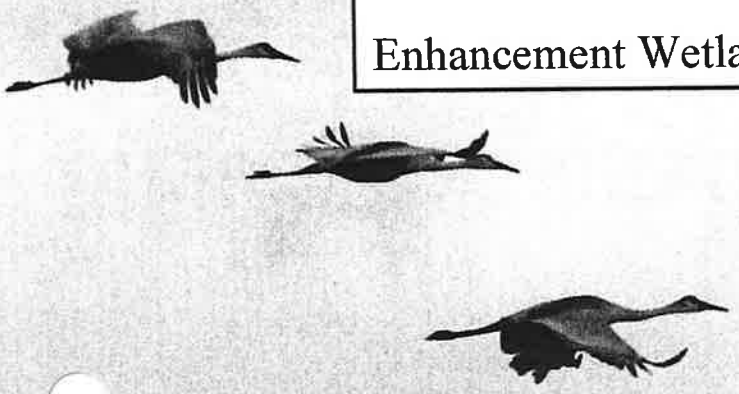
Pollutant Load Reductions

Sweetwater Branch

Water Quality Improvement Projects

	Total Surface Area (acres)	Total N (lb/year)	Total P (lb/year)
2 Existing Basins	4.1	376	142
9 Identified Basins	26.2	1,821	387
Enhancement Wetland	125.0	125,000	2,900



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Slides Presented at 2007/2008 GRU Budget Presentation

Total Maximum Daily Load

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- TMDL Finalized for Alachua Sink
- Basin Management Action Plan (BMAP) – 12/06
- Stakeholder Group Developing BMAP:
  - Gainesville Public Works
  - Alachua County Public Works
  - Marion County
  - DEP (DWRM, NE District, Parks, Aquatic Plant Management)
  - DOH
  - FWCC
  - Sierra Club
  - Sustainable Alachua County
  - City Water Management Committee
  - DACS Agriculture
  - Forestry Industry
  - GRU
  - Alachua County EPD
  - Town of McIntosh
  - DOT
  - DCA
  - UF
  - Women for Wise Growth
  - County EPAC
  - SJRWMD
  - DACS Forestry
  - Private Sector
  - Town of Micanopy
- BMAP will be Signed by all Stakeholders
- BMAP will be Adopted by FDEP Secretarial Order

Basin Management Action Plan

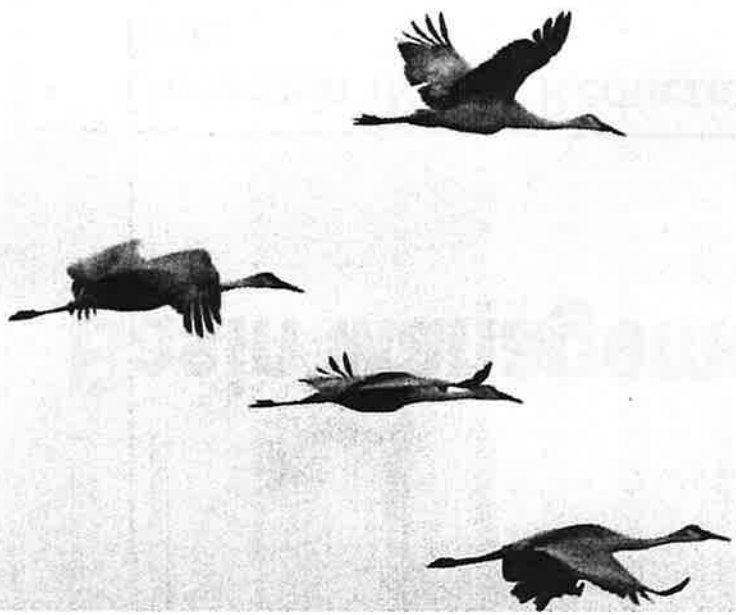
- Facility Cost for GRU to Meet the BMAP could range from $10 to $40 Million
- GRU Facilities would Accomplish 26% of Required Reduction
- 69% of Required Reduction from Natural Systems

Basin Management Action Plan

- Uncertain if/how Reductions from Natural Systems will be Accomplished
- Uncertain if Utility Expenditures would Improve Water Quality at Alachua Sink if other Reductions not Accomplished

- FDEP will Request that City Commission Commit to BMAP Projects
- Could Increase Wastewater Rates Additional 4% to 17%

GRU
Compliance with Alachua Sink TMDL



Outline

- TMDL Explanation
- Alachua Sink TMDL Development
- GRU's Alternatives for meeting TMDL
- Project Costs

Total Maximum Daily Load (TMDL)

- Mandated by EPA and FDEP
- Sets maximum allowable pollutant loads to "impaired" water bodies
- Requires all sources to reduce loads of pollutant(s) causing water body to impaired
- Basin Management Action Plan (BMAP) establishes how TMDL will be met

Alachua Sink TMDL

- TMDL for Total Nitrogen (Jan 2006)
  - Wastewater (MSWRF) — 55% N reduction
  - Stormwater — 45% N reduction
  - Other Sources — 45% N Reduction

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GRU Alternatives to Meet Alachua Sink TMDL

- Water Reuse from MSWRF
  - 5.8 mgd reuse
    - Rapid Infiltration Basis
    - Irrigation/Public Access Reuse
  - $21-$35 M
- Proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project
  - $20-25 M estimated total cost
  - Cost share between GRU & PWD & other funding partners

Current & Potential Funding Partners

- FDEP
- FDOT
- Alachua County
- SJRWMD
- Florida Wildlife & Game
- Fed/Legislative grants
- Alachua County Forever
- Others

Preliminary Costs

- Approximate City Cost ~$21M
  - Additional outside funding sought
  - Not including public access facilities
- GRU & PWD split of City's costs
  - Cost for each project component split based on design load from each source
  - Agreement on allocating grants
  - ***Preliminary*** Cost split:

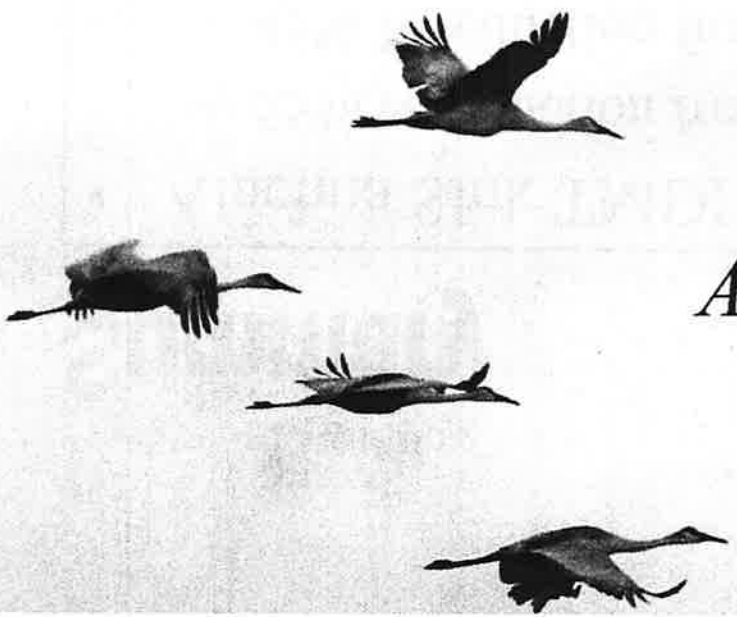
	GRU	PWD
» Capital	73%	27%
» O&M	80%	20%

Summary

- Alachua Sink TMDL
  - 55% N reduction from MSWRF
  - 45% N reduction from stormwater & non-point sources
  - Will be binding in GRU MSWRF & PWD Stormwater permits
- SWB/PP Restoration
  - Meets TMDL for GRU, PWD, FDOT
  - Cost-effective compared to reuse alternative
  - Environmental & Public benefits
  - Optimize outside funding partners/sources
  - Partnership

A Conceptual Plan for Restoring Sweetwater Branch Sheetflow to Paynes Prairie

Robert Knight, Ph.D.
Wetland Solutions, Inc.

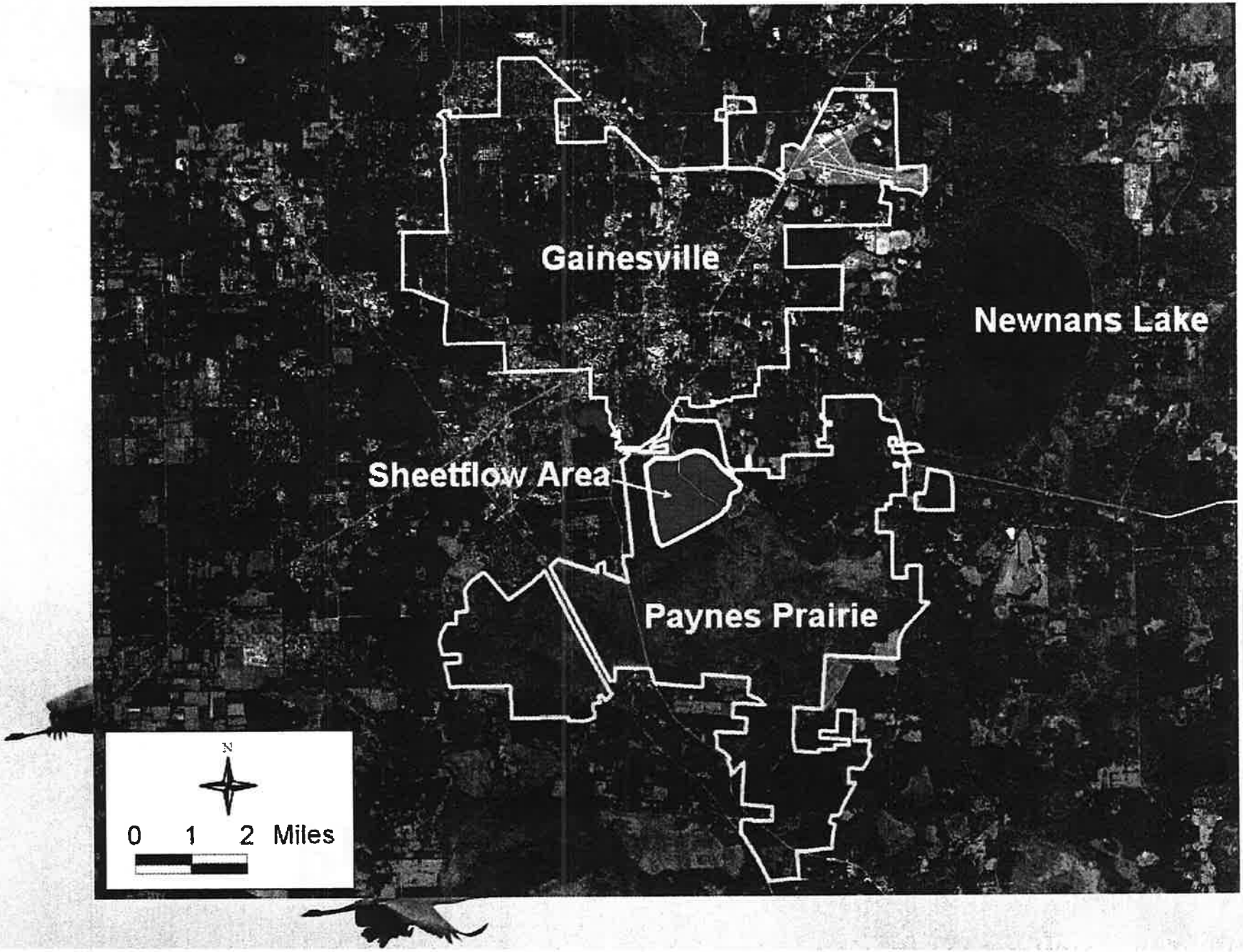


April 9, 2007

Presentation Outline

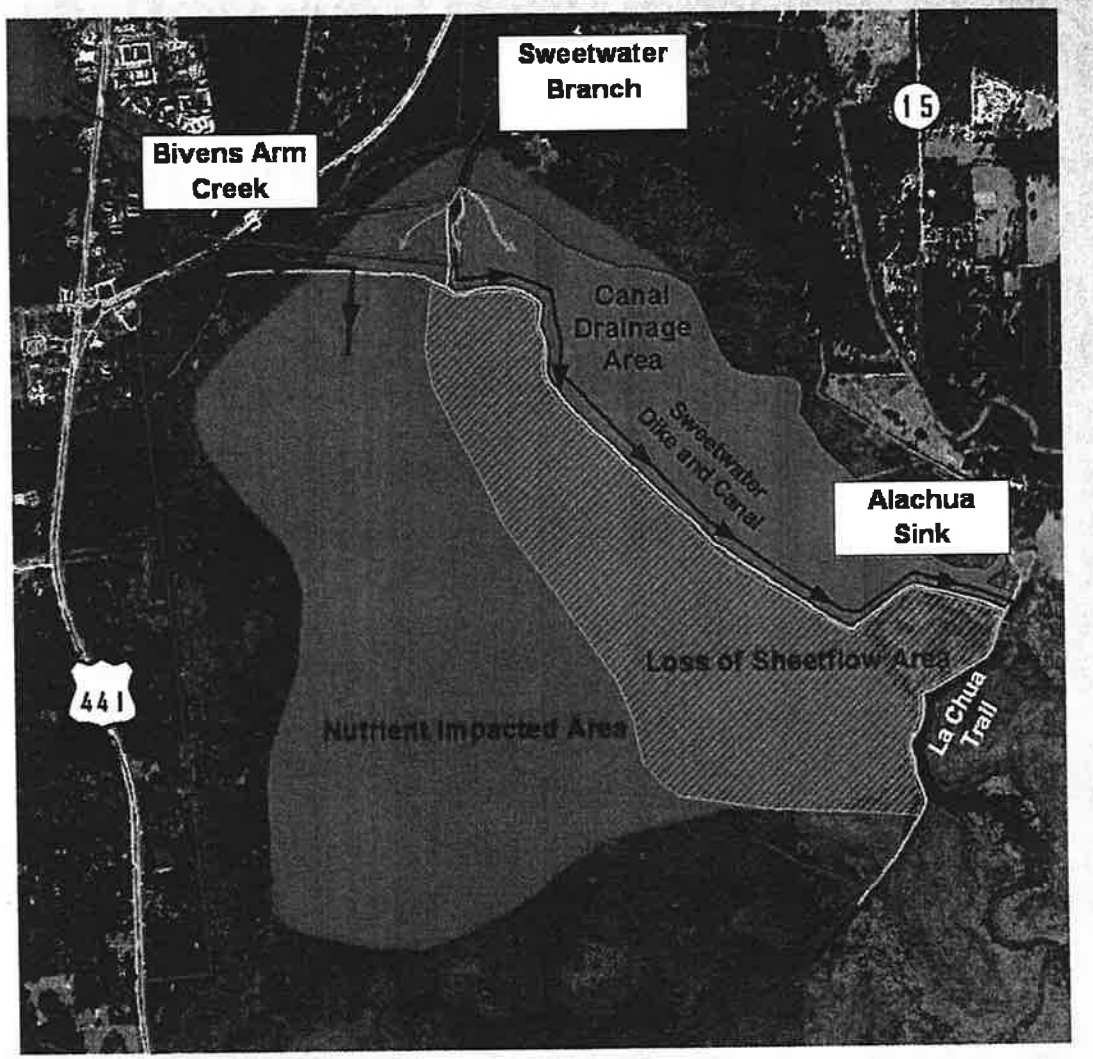
- *Project Background*
- *Conceptual Plan Summary*
- *Environmental Assessment*
- *Implementation*
- *Questions*

Project Location



Description of the Problem

- *Sweetwater Branch Channelized Directly to Alachua Sink*
- *Increased Nutrients on Paynes Prairie due to Main Street WRF and Gainesville Stormwater*
- *Natural Sheetflow of Sweetwater Branch Lost, Resulting in Shortened Hydroperiod*
- *Estimated Impact Area 1,300 acres*



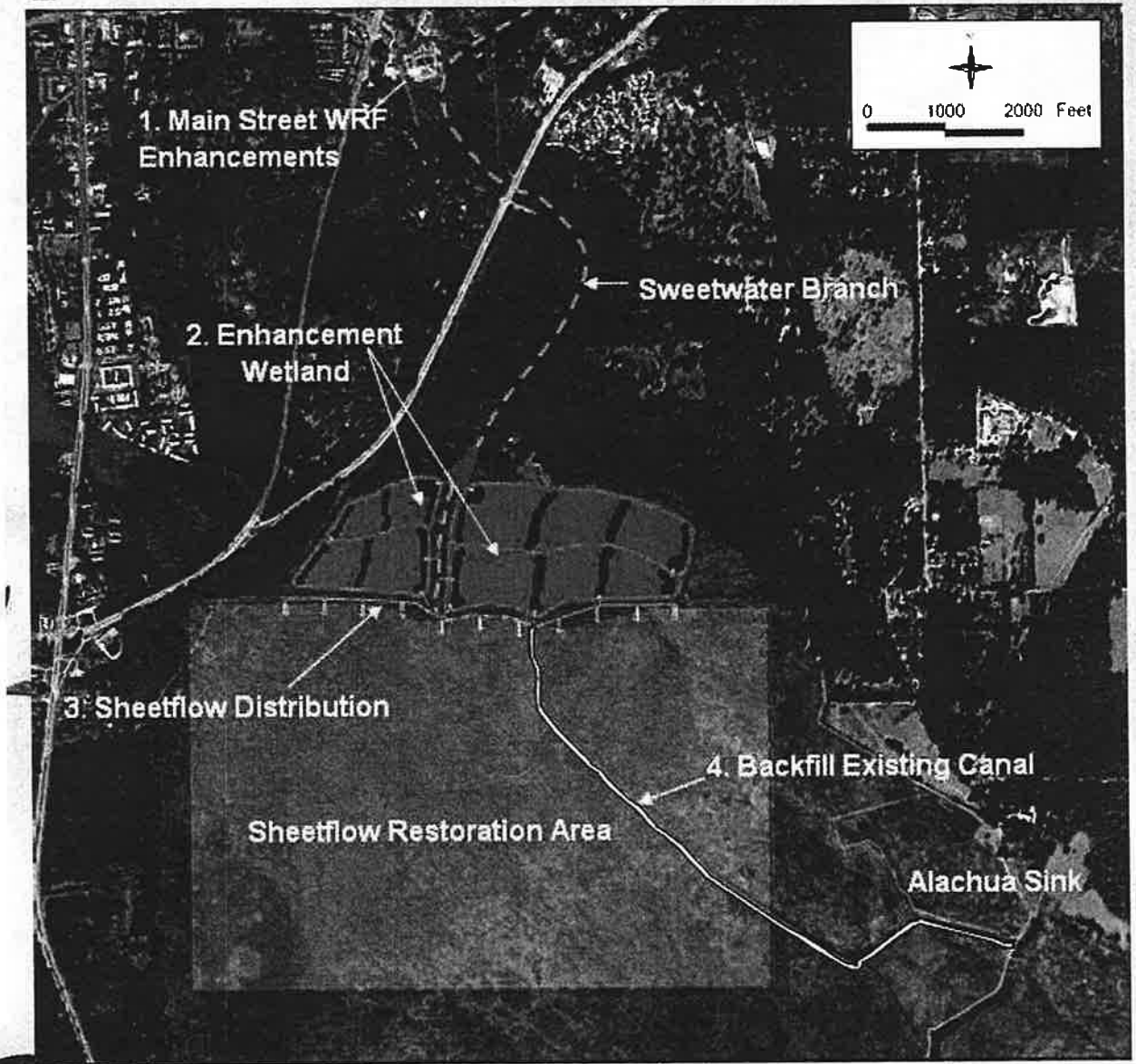
Project Background
Previous Studies

- *Paynes Prairie Management Plan (1970s)*
- *Wastewater Polishing Studies (1980s)*
- *Sheetflow Restoration (1990s)*
- *Watershed Management Plans (2003)*
- *Updated Sheetflow Feasibility (June 2006)*
- *Nutrient Removal Alternatives (Dec. 2006)*

Sheetflow Conceptual Plan

Principal Plan Components

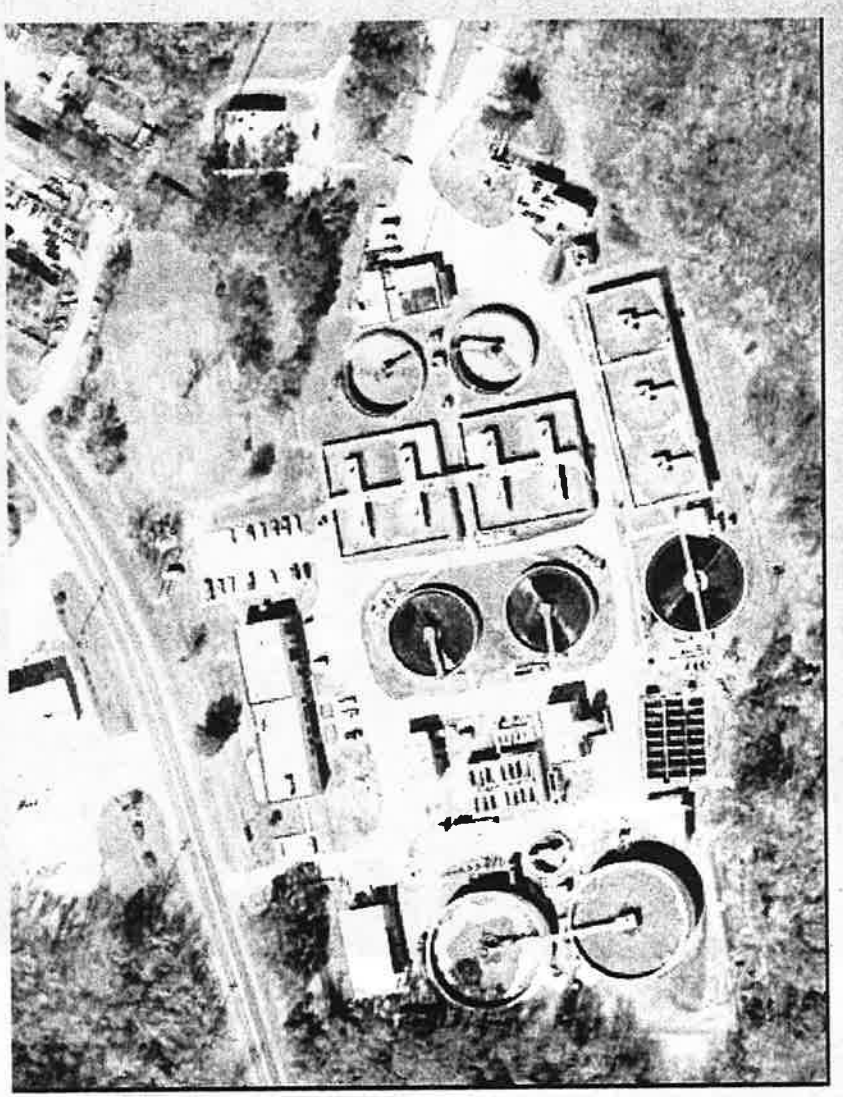
1. *Main Street WRF Upgrades*
2. *SWB Enhancement Wetland*
3. *Sheetflow Distribution*
4. *Backfill SWB Canal*

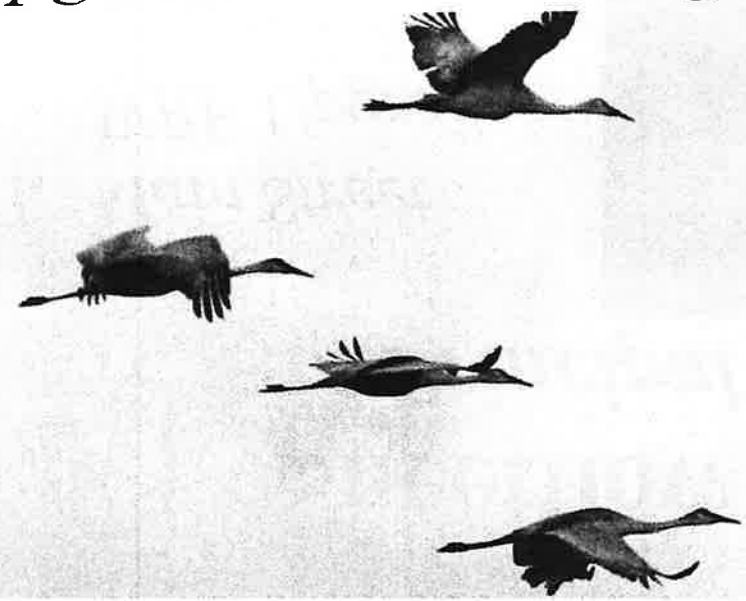


Sheetflow Conceptual Plan

Main Street WRF Upgrades

- *Chemical (alum) P removal to TP <0.3 mg/L*
- *N optimization through mechanical equipment upgrades to TN <8 mg/L*

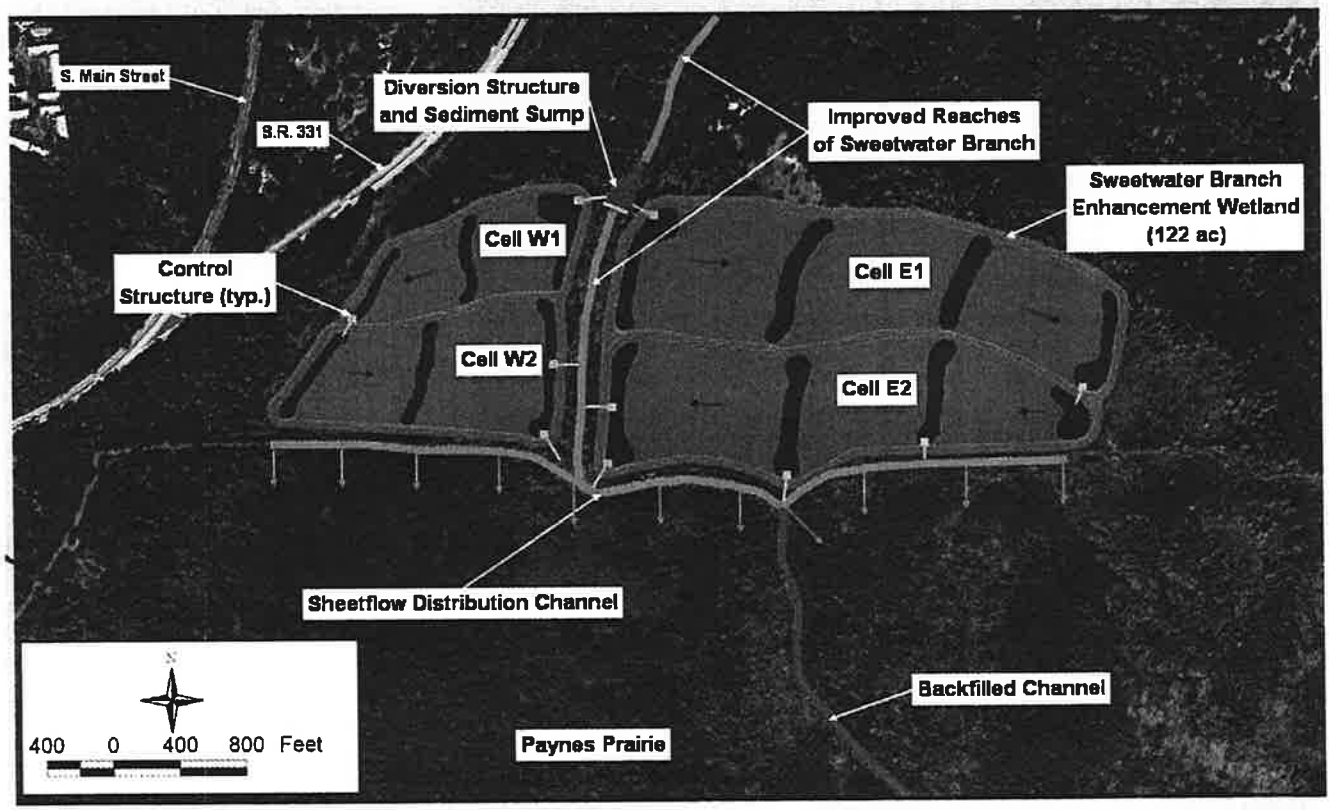




Sheetflow Conceptual Plan

Sweetwater Branch Enhancement Wetland

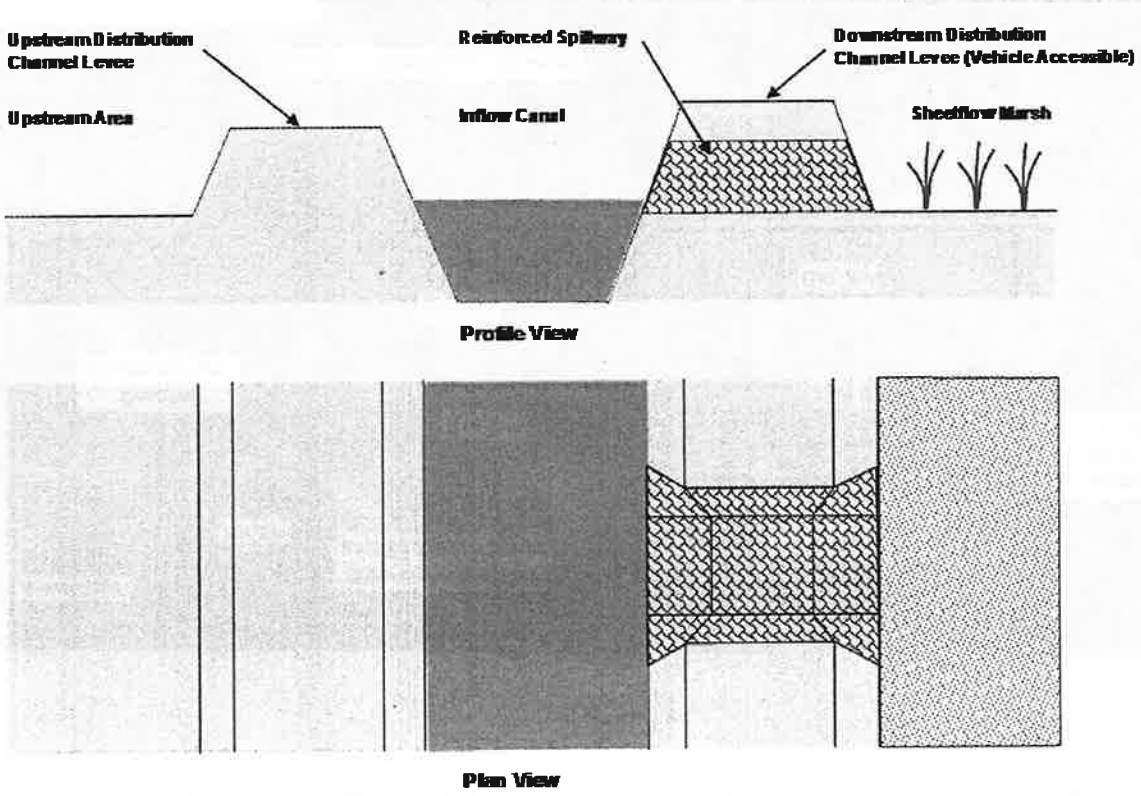
- *Located offline*
- *Channel diversion structure w/sediment pond*
- *Four cells in two trains*
- *122 ac wet area*
- *Emergent marsh/open water*



Sheetflow Conceptual Plan

Sheetflow Distribution Channel

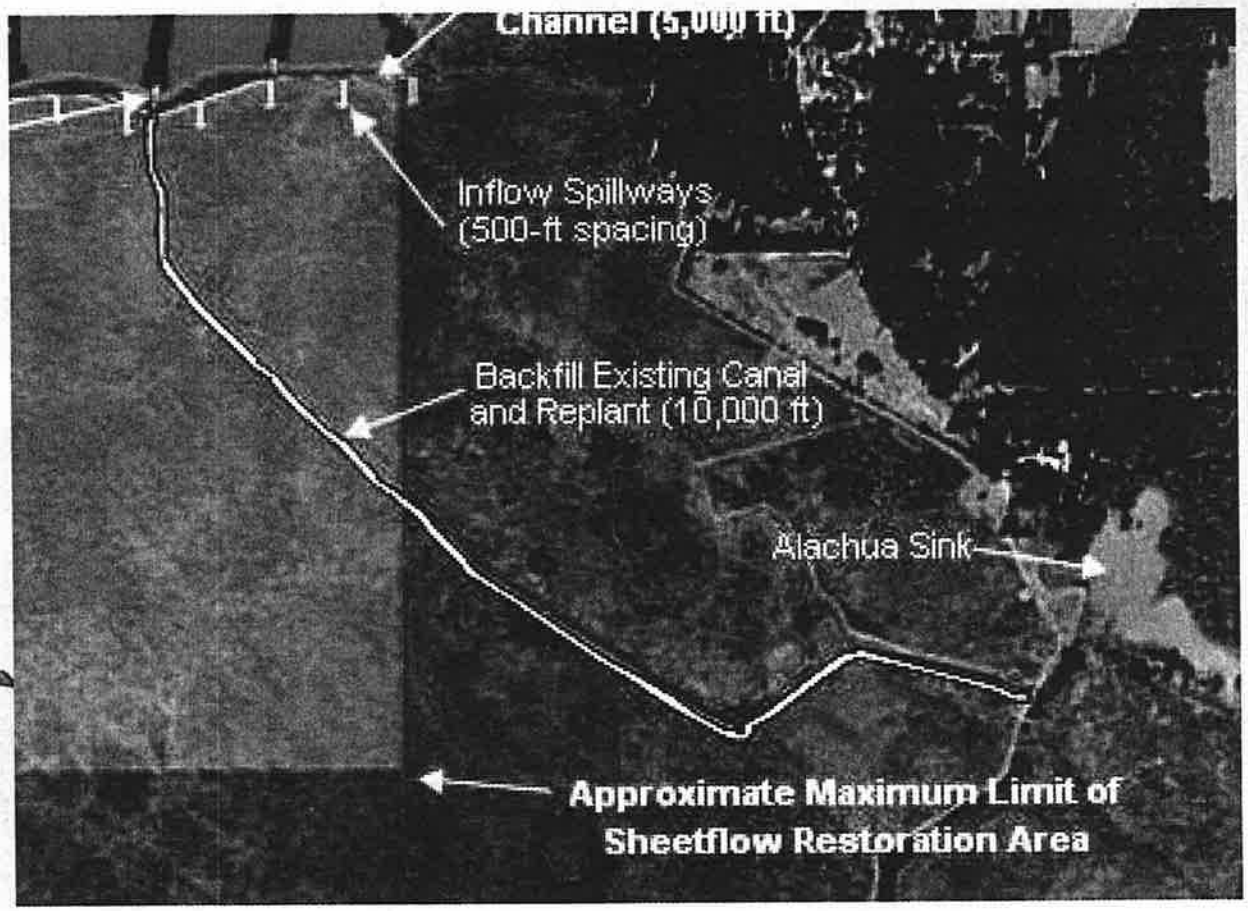
- *Mostly on Existing Channel Footprint*
- *5,000 ft in Length*
- *40-ft Bottom Width*
- *11 Outlet Spillways*



Sheetflow Conceptual Plan

Sweetwater Canal Restoration

- *Backfill about 10,000 ft of existing Sweetwater Branch Canal*
- *Replant 33 ac with native wetland vegetation*
- *Eliminate direct connection to Alachua Sink*



Environmental Assessment

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- *Water Quality Benefits*
  - *Exceeds total N TMDL*
  - *Achieves background total N and P on Prairie*
  - *Removes suspended sediment loads from Prairie*
- *Hydrologic Restoration Benefits*
  - *Restores Sweetwater Branch sheetflow to about 1,300 ac*
  - *Reduces current water deficit on Prairie*

Environmental Assessment (cont.)

- *Wetlands Restoration*
  - *Removes 10,000 ft of Sweetwater Branch Canal, restores pre-existing grade, and re-plants native emergent wetland vegetation on 33 ac*
  - *Removes woody vegetation in vicinity of Sheetflow Distribution Channel and re-plants emergent wetland vegetation on about 10 ac*
- *Wetlands Creation*
  - *Creates 100+ ac of high-value emergent marsh and aquatic habitat in formerly impacted areas*

Public Use Benefits

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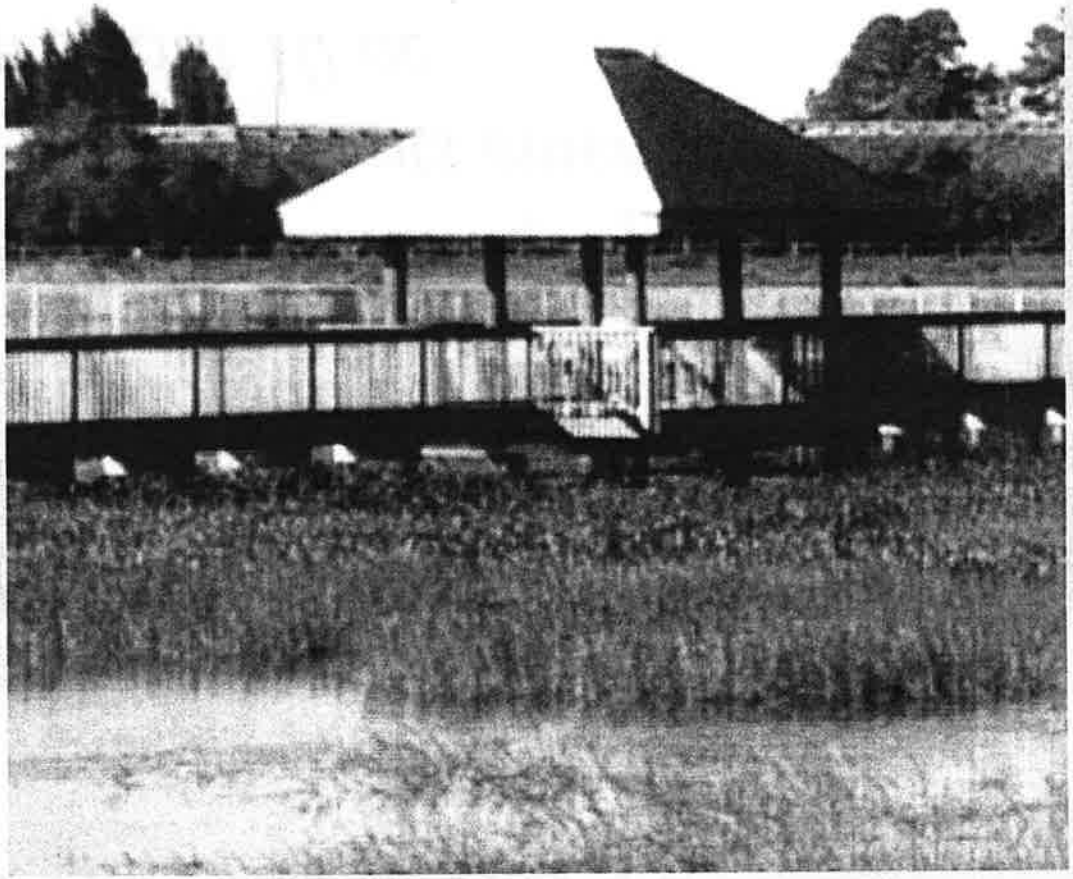
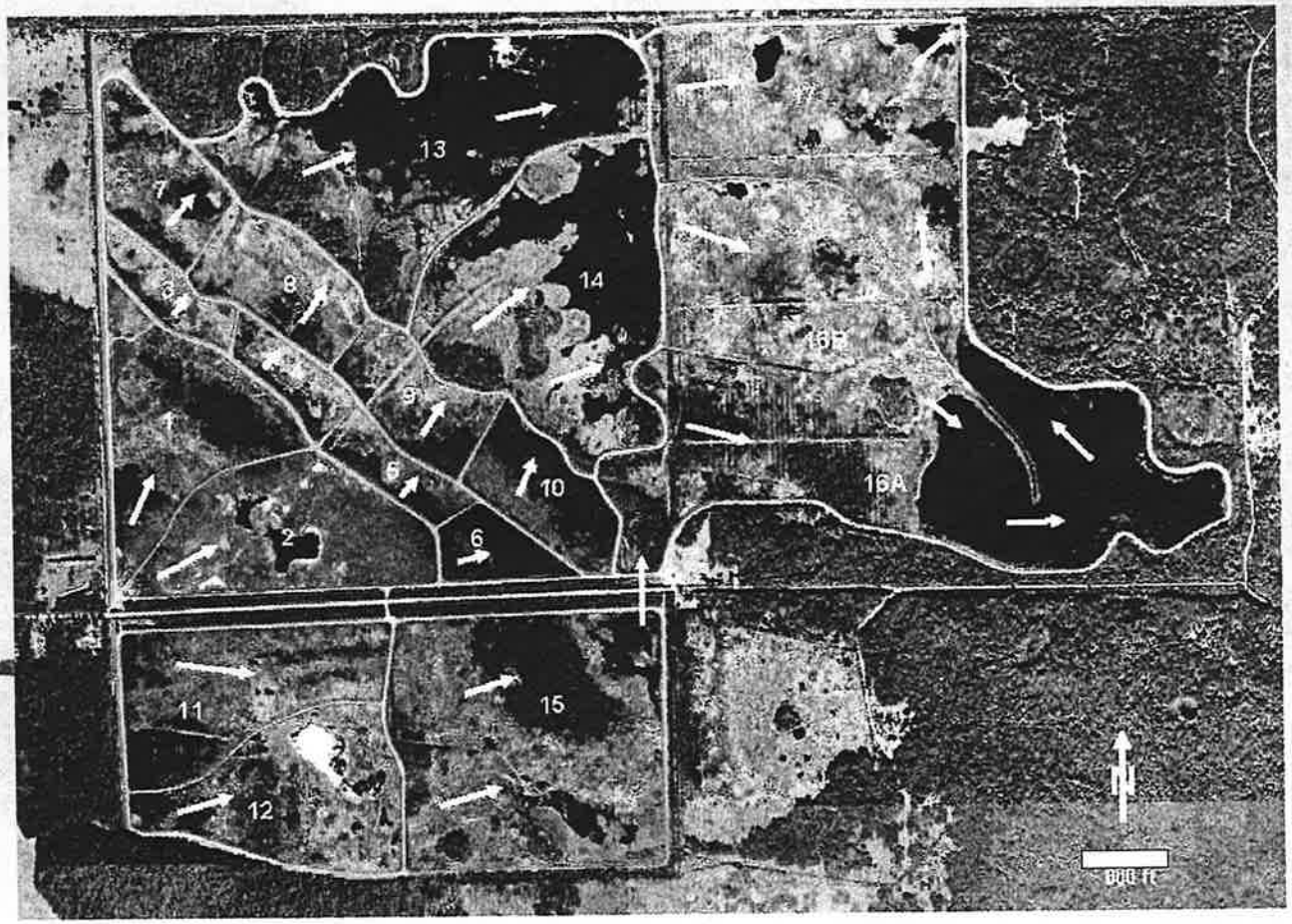
- *Sweetwater Branch Wetland Park*
  - *Hiking trails*
  - *Environmental education*
- *Sheetflow Area*
  - *Prairie overview*



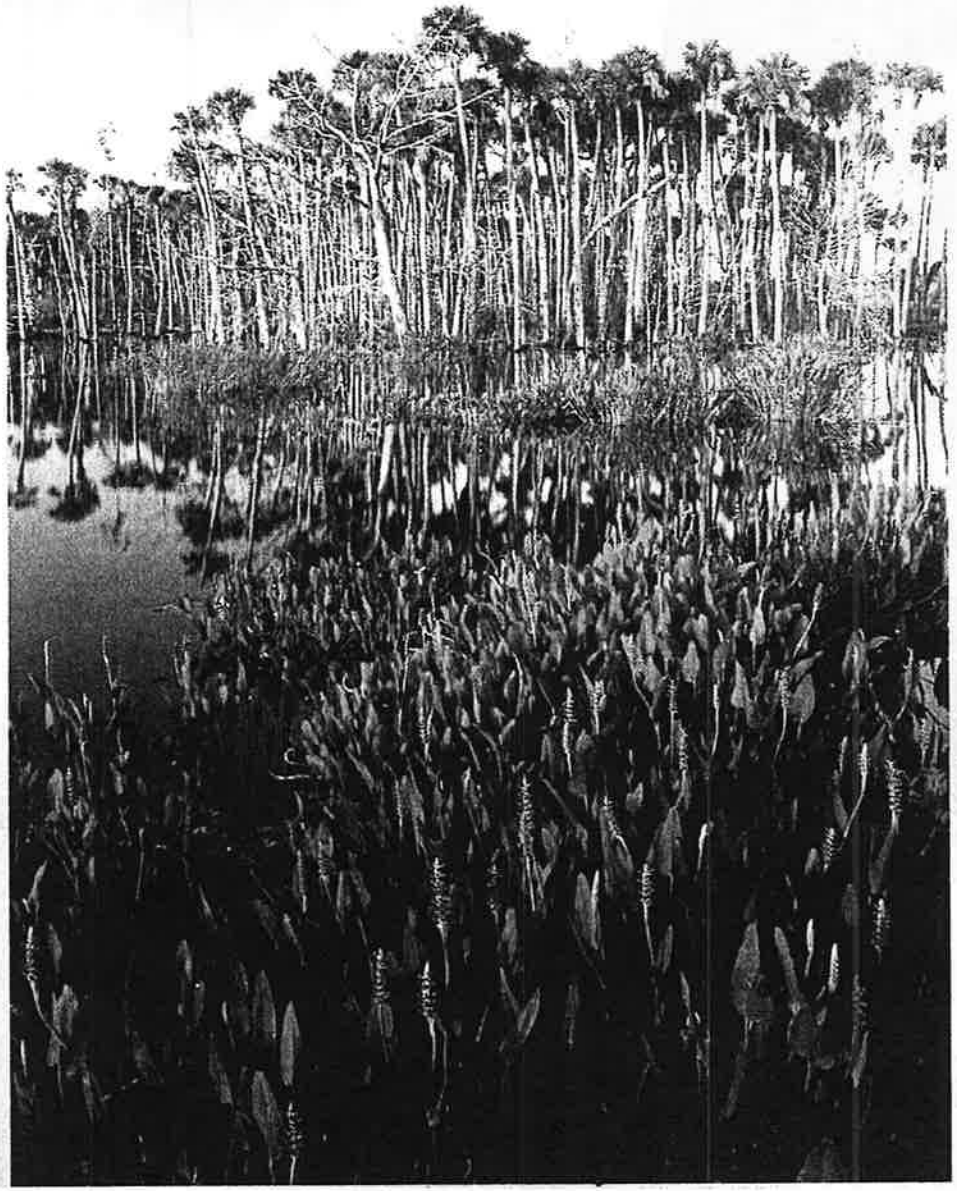
Comparable Constructed Wetlands

Orlando Wilderness Park

- *Start 1987*
- *1,200 ac*
- *Reuse to St. Johns River*



Orlando Wilderness Park



- *TN reduced from 2.4 to 0.8 mg/L*
- *TP reduced from 0.28 to 0.06 mg/L*

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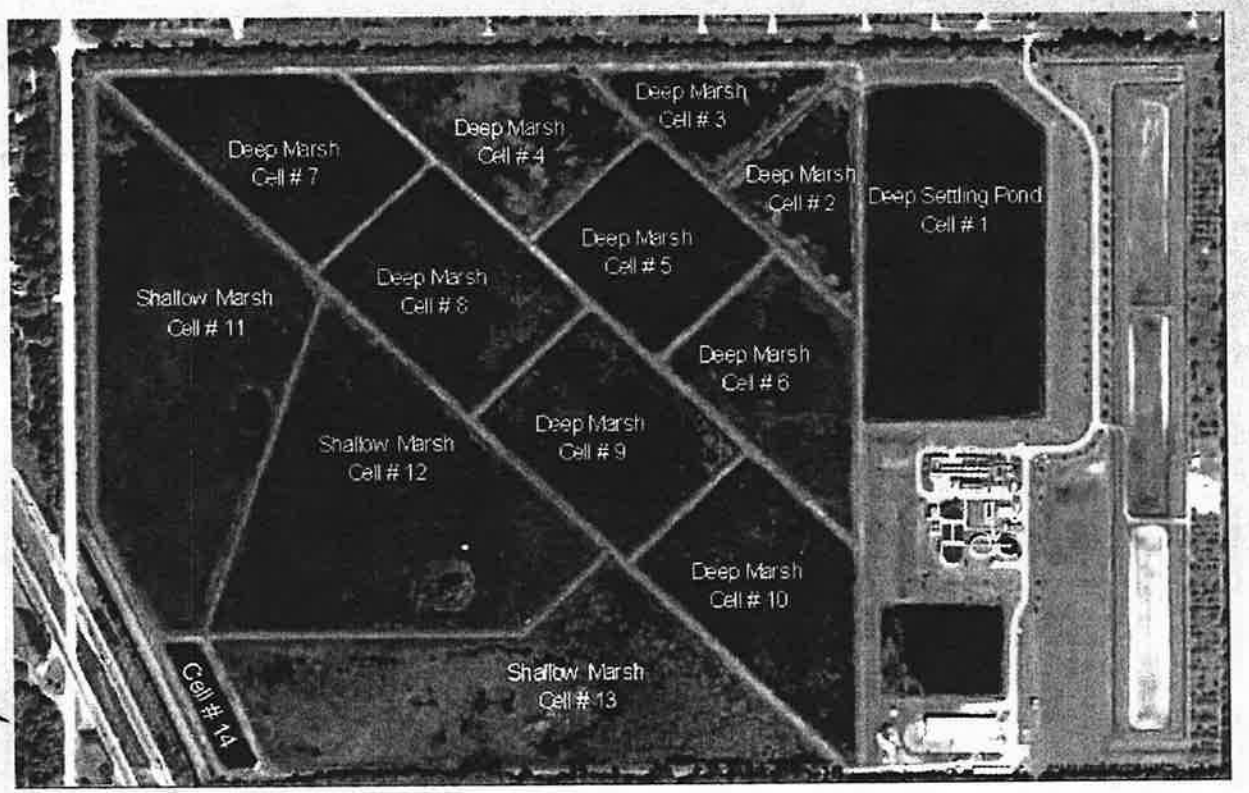
Indian River County Wetland

- *Start 1996*
- *135 ac*
- *Reuse to Indian River Lagoon*



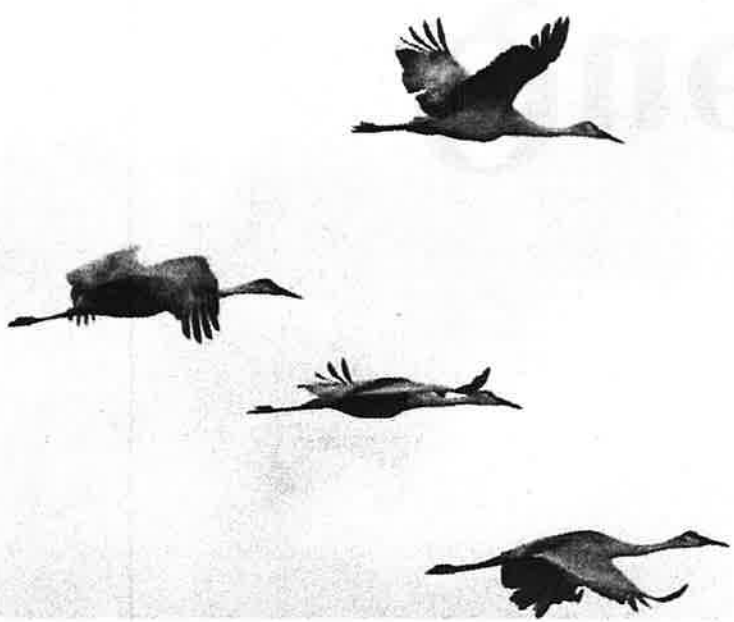
Indian River County Wetland

Questions?

Wetland Solutions, Inc.

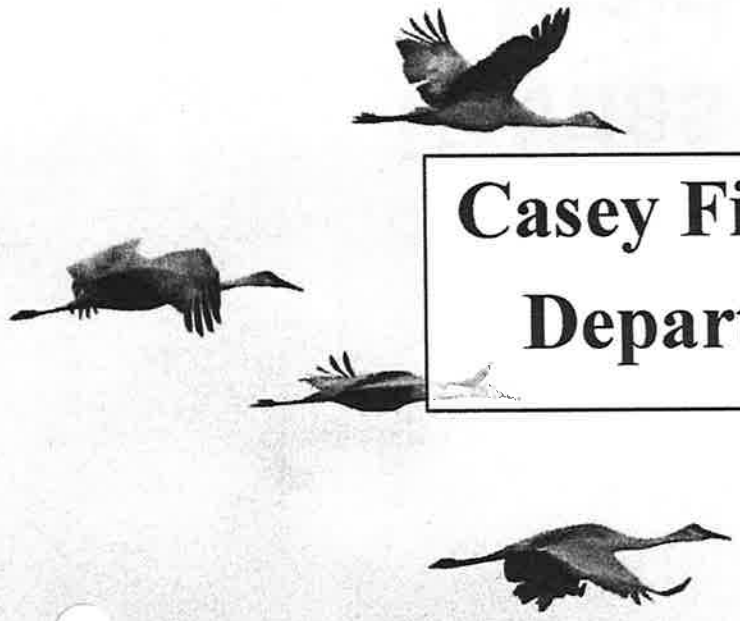
Paynes Prairie Preserve State Park

Jim Weimer, Park Biologist



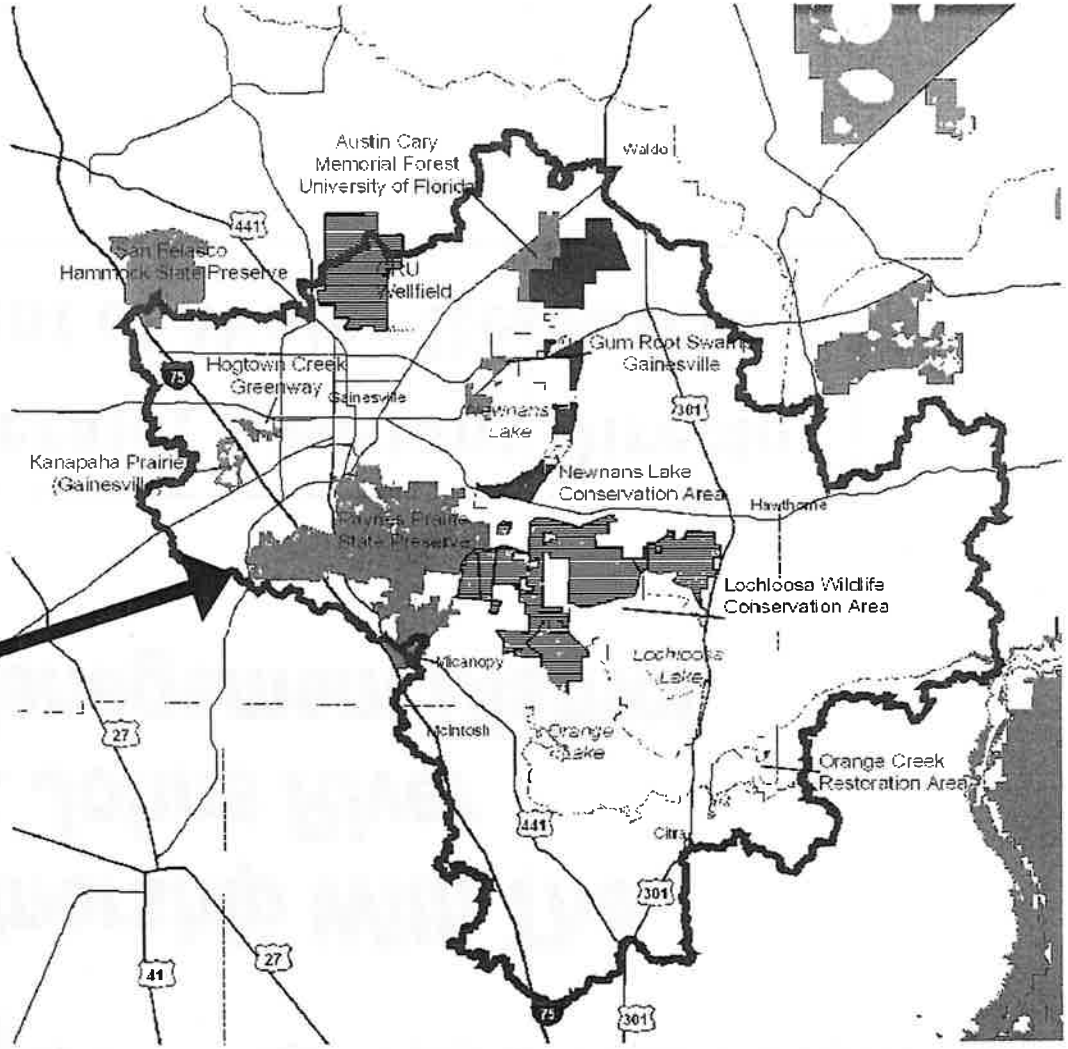
Sweetwater Branch / Paynes Prairie Sheetflow Restoration

A Partnership With The St. Johns River Water Management District



Casey Fitzgerald, Assistant Director
Department of Water Resources

Paynes Prairie



- an Outstanding Florida Water, State Park, and National Natural Landmark
- in the Orange Creek Basin "Surface Water Improvement and Management" (SWIM) program

St. Johns River Water Management District *Participation*

COST-SHARING

- ***To date, obtained $850,000 in legislative appropriations for construction of enhancement wetland***
- ***Cost-share with City on purchase of land to lease or exchange for enhancement wetland site***

PERMITTING

- ***District will review Environmental Resource Permit applications for project construction in wetlands***

Project Benefits

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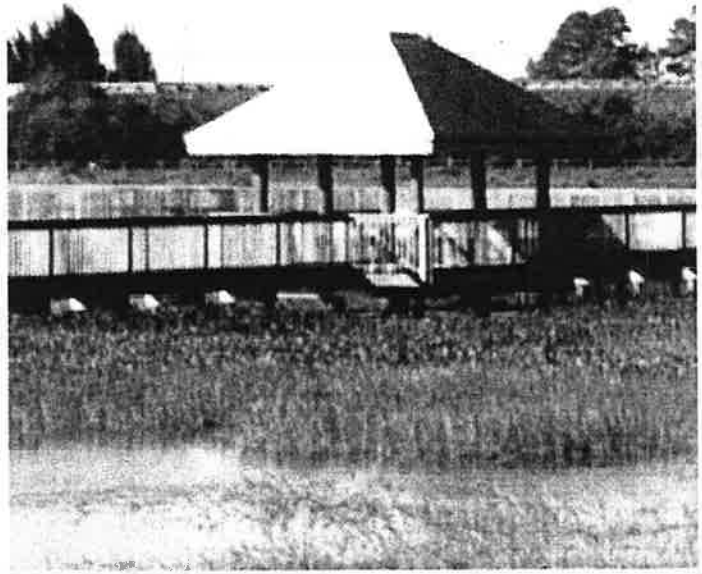
- *Water Quality Benefits*
  - *Exceeds total N TMDL*
  - *Achieves background total N and P on Prairie*
  - *Removes suspended sediment loads from Prairie*
- *Hydrologic Restoration Benefits*
- *Wetlands Restoration*
- *Wetlands Creation*
- *Public Recreation Opportunity*



Next Steps

- Develop Land Exchange MOU
- Develop PW / GRU Cost Share MOU
- Seek Grants and New Project Partners
- Begin Consultant Selection for Project Design

Planning-Level Cost Estimate

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Project Component	Construction Cost ($)	Mobilization, Contingency, Engineering ($)	Capital Cost ($)	Operation & Maintenance Costs ($/yr)
Main Street WRF Upgrades	$ 1,300,000	$ 650,000	$ 1,950,000	$ 640,000
Sweetwater Branch Channel Improvements	$ 831,600	$ 415,800	$ 1,247,400	$ -
Sweetwater Branch Sediment Forebay/Trashrack/Weir Diversion Structure/Sediment Removal	$ 485,450	$ 242,725	$ 728,175	$ 150,000
Sweetwater Branch Constructed Wetland	$ 7,320,600	$ 3,660,300	$ 10,980,900	$ 150,000
Sheetflow Distribution Channel	$ 2,898,702	$ 1,449,351	$ 4,348,053	$ 75,000
Sweetwater Branch Canal Restoration	$ 657,890	$ 328,945	$ 986,835	$ -
Public Use Amenities	$ 1,850,000	$ 925,000	$ 2,775,000	$ 150,000
Project Monitoring	$ 14,000	$ 7,000	$ 21,000	$ 100,000
Estimated Total	**$ 15,358,242**	**$ 7,679,121**	**$ 23,037,363**	**$ 1,265,000**

Note: Assumes mobilization, contingency, engineering = 0.5 x construction cost

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Final Summary

A Conceptual Plan for Sweetwater Branch/Paynes Prairie Sheetflow Restoration

Prepared for

Gainesville City Commission

Prepared by

Sweetwater Branch/Paynes Prairie Sheetflow Restoration Team

March 2007

Contents

Executive Summary

Introduction

The Paynes Prairie Preserve State Park (PPPSP) is a natural and historical landmark which nourishes more than 20 biological communities within its 21,000 acre (ac) footprint. Situated in Alachua County at the southern tip of Gainesville, Florida, Paynes Prairie is considered an Outstanding Florida Water and is a valuable resource that has been enjoyed by surrounding communities long before its inauguration as Florida's first State Preserve in 1971.

For over a century, the Prairie has been receiving inadvertent pollution from the urbanized areas of the City of Gainesville and Alachua County. The Prairie has also been impacted by past agricultural practices, wetland draining and flow channelization of Sweetwater Branch, a natural stream that receives stormwater runoff and treated wastewater effluent from the Gainesville urbanized area and subsequently flows into PPPSP. Alachua Sink, a natural lake located within Paynes Prairie, is considered an impaired water body, and a regulatory Total Maximum Daily Load (TMDL) has been established by the Florida Department of Environmental Protection (FDEP) which requires reducing nitrogen (N) going to this lake from all sources. The proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration project provides a unique opportunity to rectify these problems while providing multiple additional benefits. This project will restore over 1,300 ac of formerly impacted wetlands in PPPSP, achieve regulatory TMDL requirements for the City of Gainesville, provide protection of the Floridan Aquifer, and offer outstanding wildlife habitat and opportunities for public recreation and wildlife viewing.

The Sweetwater Branch/Paynes Prairie Sheetflow Restoration project represents the culmination of focused efforts from a partnership of organizations including the Florida Department of Environmental Protection Division of Recreation and Parks (FDEP), St. Johns River Water Management District (SJRWMD), City of Gainesville Public Works Department (PWD), Gainesville Regional Utilities (GRU), and Florida Department of Transportation (FDOT). This document summarizes the technical work leading to the conceptual plan for this project, whose goal is to restore the harmonious relationship previously enjoyed by Sweetwater Branch and Paynes Prairie.

Conceptual Plan Summary

Figure 1 shows the project area. Sweetwater Branch is a natural stream which drains the Gainesville urban area and flows into the PPPSP. Tumblin' Creek (shown in Figure 1 as well) also drains the Gainesville urban area. In its natural state, Sweetwater Branch discharged via sheetflow onto Paynes Prairie, providing a valuable water source to the prairie wetlands. Water from the Prairie in turn flows into Alachua Sink, a small natural lake located within PPPSP (Figure 1). Alachua Sink overflows into a natural sinkhole connected to the Floridan Aquifer.

Since most of the urban development in the Sweetwater Branch drainage area occurred long before modern stormwater management and other pollution control regulations, Sweetwater Branch, and in turn the Prairie have been heavily impacted by stormwater runoff. The Main Street Water Reclamation Facility (MSWRF) also discharges treated effluent to Sweetwater Branch and is the main contributor of nutrients (N and phosphorus [P]) to the stream. Sweetwater Branch also receives inputs of nutrients, sediments and other contaminants from stormwater runoff, septic tanks and other non-point sources from the Gainesville urban area. The natural sheetflow of Sweetwater Branch onto the Prairie was disrupted by ranchers, in the 1930s, when they constructed a ditch to drain portions of the Prairie to expand grazing areas. The ditch diverts the Sweetwater Branch flow directly to Alachua Sink, and has resulted in the dehydration and alteration of over 1,300 ac of wetlands in the PPPSP. In addition, the direct connection of Sweetwater Branch to Alachua Sink provides a more direct conduit into the Floridan Aquifer. This channelization of Sweetwater Branch through the Prairie has prevented natural attenuation of the nutrients within the stream and has depreciated the water quality flowing into Alachua Sink. The overall water balance to Paynes Prairie has also been affected by diversion of inflows to the Prairie at other locations.

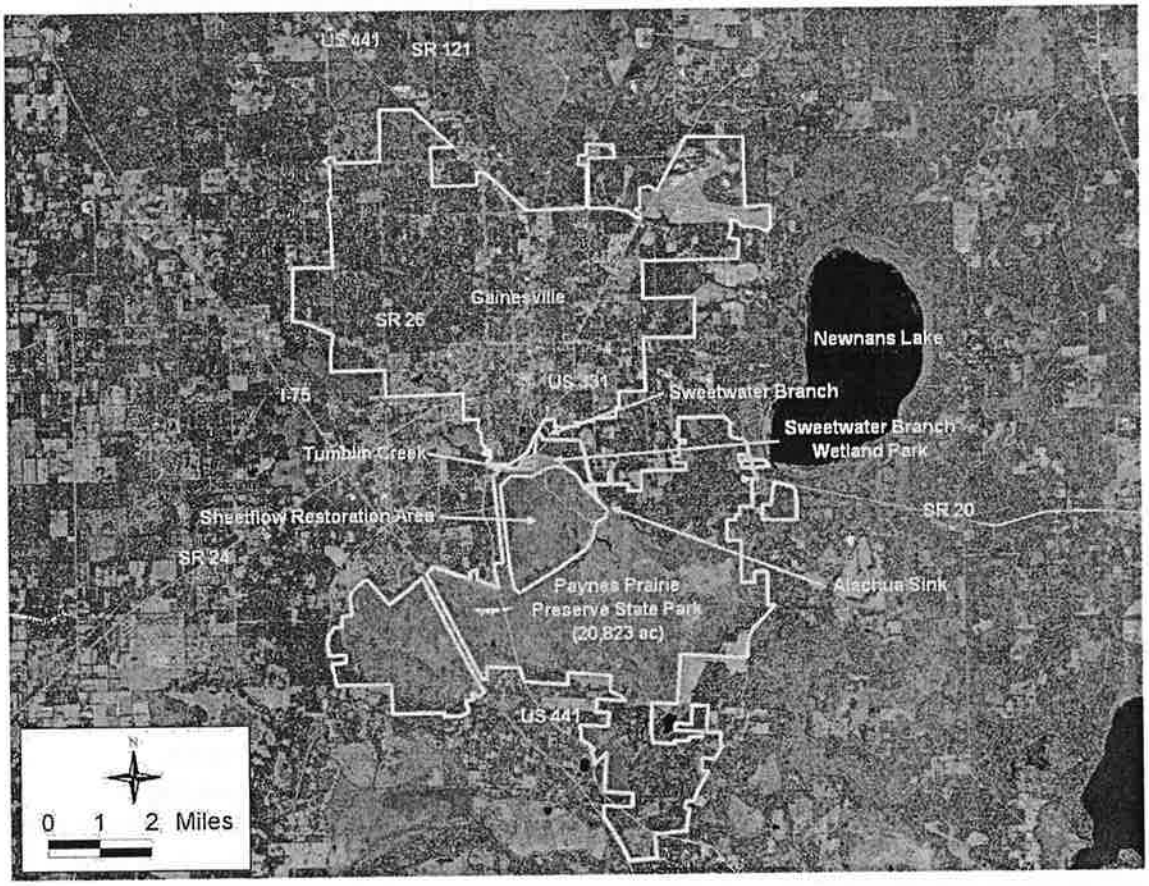


FIGURE 1
Approximate Boundary Map for the Paynes Prairie Preserve State Park Illustrating the Location of the City of Gainesville North of the Prairie and Sweetwater Branch Draining to Alachua Sink.

Alachua Sink is currently listed as an impaired water body due to high N levels, which are partially due to nutrient loads it receives from the Gainesville urban area through Sweetwater Branch. Alachua Sink also receives significant N loading from other upstream sources that drain to Paynes Prairie. A TMDL has been developed for Alachua Sink, which will require reductions in total N loads from urban runoff, wastewater discharge and other sources. The proposed project will restore Sweetwater Branch sheetflow to Paynes Prairie and simultaneously eliminate discharges of excess N and other pollutants from Sweetwater Branch into Alachua Sink.

The principal components of the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Plan (Plan), Figure 2, are as follows:

1 The MSWRF will be upgraded for optimized N removal and enhanced P removal;

2 An enhanced stormwater management and water quality improvement wetland (Sweetwater Branch Enhancement Wetland) will be constructed and will reduce levels of N, P, total suspended solids (TSS) and other pollutants from Sweetwater Branch to produce a high quality low nutrient water source to the PPPSP. This constructed wetland will be the focal point of a new Sweetwater Branch Wetland Park with public use facilities;

3 Water from the Sweetwater Branch Enhancement Wetland will be distributed to the Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area, to restore the natural sheetflow to Paynes Prairie; and

4 Approximately 10,000 feet of existing canals and berms on PPPSP will be removed and the area will be both re-graded to pre-development conditions and re-planted with natural wetland vegetation.

A critical objective of the proposed project is that the water leaving the Sweetwater Branch Enhancement Wetland and entering the Sheetflow Restoration Area on PPPSP must be of sufficient quality to allow the reestablishment of desirable, native wetland plant communities and wildlife habitat. This will require reductions in phosphorus (P) and total suspended solids (TSS) in addition to N. Several evaluations were performed as part of the development of this project to establish the necessary quality of water entering the Sheetflow Restoration Area, and to ensure that these criteria can be achieved through the proposed combination of MSWRF upgrades and the Sweetwater Branch Enhancement Wetland. The average water quality of the sheetflow leaving the wetland that will achieve the desired goals of the project have been established at 3 mg/L total N, 0.3 mg/l total P, and 5 mg/L TSS. These studies have also determined that additional assimilation of residual nutrients will naturally occur within the Sheetflow Restoration Area so that background nutrient levels similar to estimated pre-development concentrations (approximately 1.4 mg/L total N and 0.1 mg/L total P) will be achieved.

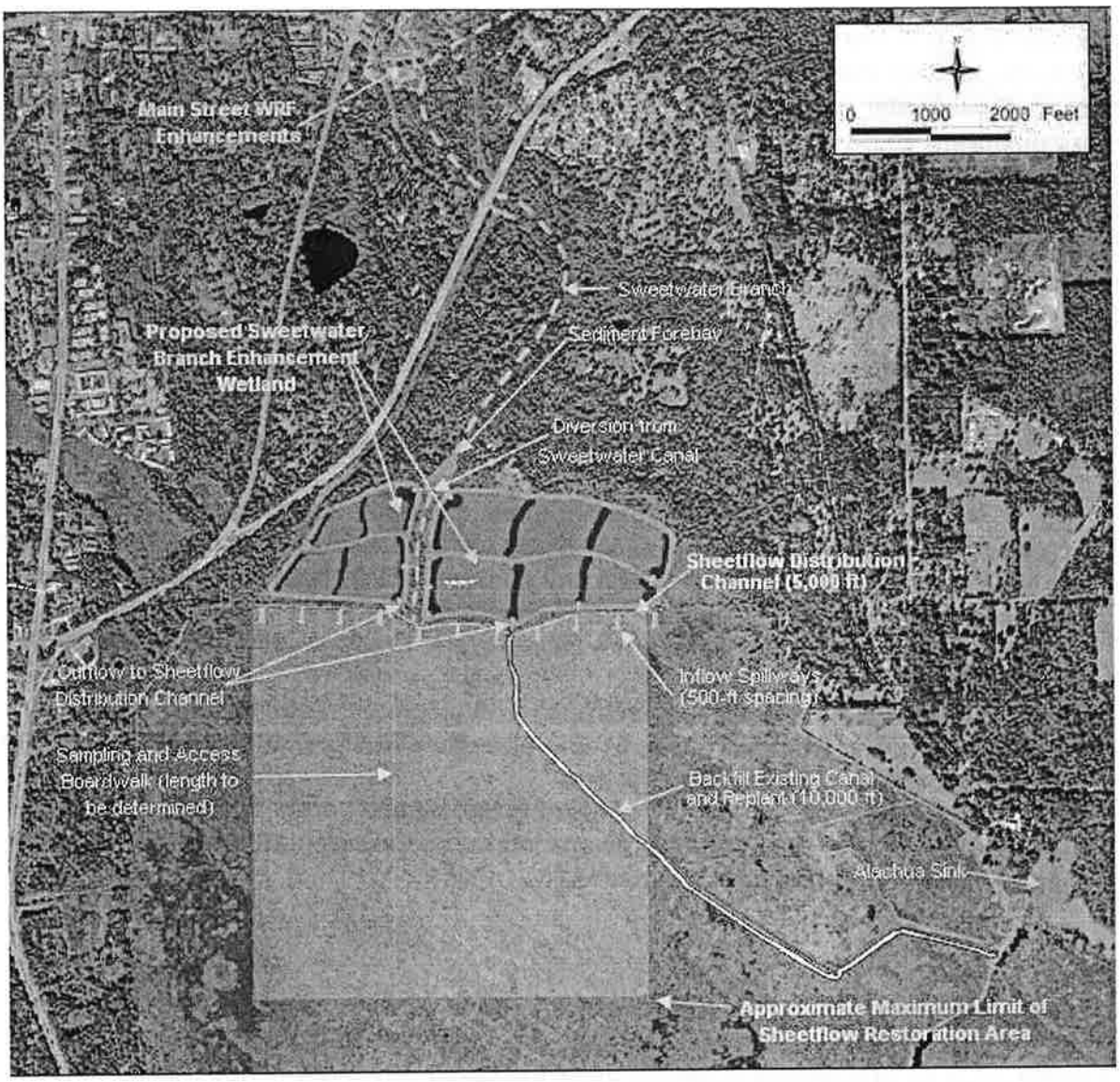


FIGURE 2
Proposed Plan Illustrating the Overall Conceptual Project Including Upgrades at the Main Street WRF, the Sweetwater Branch Enhancement Wetland, and the Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area

Project Benefits

At a minimum this proposed project is expected to provide the following benefits:

1. Restore (re-hydrate) over 1,300 ac of formerly-impacted wetlands in PPPSP;

2. Cost effectively attain regulatory TMDL requirements for reduction of total N discharges to Alachua Sink from City of Gainesville and FDOT stormwater runoff and from the GRU MSWRF;

3. Create about 150 ac of high-quality wetland wildlife habitat and a public use area for bird-watching and nature study within the Sweetwater Branch Wetland Park;

4. Naturally assimilate other nutrients, sediments and other pollutants in the Sweetwater Branch flow in order to protect the PPPSP Sheetflow Restoration Area, Alachua Sink, and the Floridan Aquifer; and

5. Restore part of the overall water balance to Paynes Prairie, which has been impacted by diversion of water from the Prairie at other locations.

A comprehensive monitoring and evaluation program will be part of project implementation and will be used to quantitatively assess the environmental benefits of the project.

Implementation

The proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project will require several years and considerable political resolve to implement. The estimated overall project implementation cost is approximately $24 million (M) with an annual recurring operations and maintenance (O&M) cost of about $1.3 M.

Teamwork between governmental agencies will be needed to accomplish the following critical tasks:

- Securing of cost-share funding to assist in the project costs;
- Purchase by SJRWMD, with City cost-share, of land adjacent to PPPSP, and approval by the Governor and Cabinet to exchange this parcel for State Park land needed by the City for the Sweetwater Branch Enhancement Wetland;
- Preparation of detailed construction plans that are compatible with extensive site-clearing and earthwork in a sensitive environment;
- Negotiations for environmental permits and reviews allowing project construction;
- Construction in potentially wet conditions while protecting the environmental resources of the PPPSP, an Outstanding Florida Water (OFW); and
- Development and implementation of a monitoring program to quantify project benefits to water quality and ecological structure and function on Paynes Prairie.

The proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration is an ambitious project which will require focused efforts and commitment from multiple organizations. Preliminary evaluation indicates that the potential benefits of the project are high. Final planning and evaluation will be required to fully quantify the costs and benefits of the project and ultimately insuring that the critical goal

of Sweetwater Branch sheetflow restoration to Paynes Prairie is accomplished in a manner that is in the best interests of the citizens of Gainesville, Alachua County, and the State of Florida.

Introduction

The proposed Sweetwater Branch/Paynes Prairie Restoration project is intended to mitigate several outstanding environmental problems and provide numerous benefits to the environment, the residents, and visitors to the City of Gainesville and Alachua County. This project will restore over 1,300 acres (ac) of previously impacted wetlands in the Paynes Prairie Preserve State Park (PPPSP), achieve Total Maximum Daily Load (TMDL) requirements for the City of Gainesville and the Florida Department of Transportation (FDOT), provide protection of the Floridan Aquifer and provide outstanding wildlife habitat and opportunities for public recreation and wildlife viewing.

Background/Project Need

History of the Sweetwater Branch/Paynes Prairie Connection

The PPPSP is a 21,000 ac Florida State Park located in Alachua County, just south of Gainesville (Figure 1). The park is a natural and historical landmark which nourishes more than 20 biological communities and is considered an Outstanding Florida Water (OFW). The PPPSP serves as critical habitat for numerous plant and animal species, including the bald eagle and the Florida sandhill crane. The Park is also a valuable recreational resource that has been enjoyed by surrounding communities long before its inauguration as Florida's first State Preserve in 1971.

Sweetwater Branch is a natural stream which drains what is now the Gainesville urban area and flows into the PPPSP. Tumblin' Creek is a tributary to Paynes Prairie which also drains the Gainesville urban area. In its natural state, Sweetwater Branch discharged via sheetflow onto Paynes Prairie into the area of the Prairie known as Alachua Lake, which is actually a wet prairie. Water from Alachua Lake flows into Alachua Sink, which is a small picturesque natural lake located within PPPSP (Figure 1). Alachua Sink provides valuable habitat for birds, alligators and fish and is popular to the public for wildlife viewing and nature study. Alachua Sink empties into a natural sinkhole connected to the Floridan Aquifer.

Since its establishment in the 1800's, Gainesville has relied on Sweetwater Branch as a means to remove stormwater and wastewater from the City center. As the City developed and increased in population, the load of excess flow, sediments, nutrients and other pollutants in Sweetwater Branch increased. The City of Gainesville has been proactive in retrofitting stormwater facilities to meet current standards and reduce the impacts of stormwater on Sweetwater Branch and Paynes Prairie. However, since virtually all of the Gainesville urban area draining into Sweetwater Branch was developed prior to the modern stormwater standards, the ability to reduce stormwater inputs to Sweetwater Branch is limited.

Sweetwater Branch is also the receiving stream for the City of Gainesville, Gainesville Regional Utilities (GRU) Main Street Water Reclamation Facility (MSWRF). The MSWRF has been upgraded numerous times over its operating history since 1939, and currently achieves tertiary treatment. The MSWRF produces an excellent quality effluent and consistently meets its permit limits. However, it is the main contributor of nutrients (nitrogen [N] and phosphorus [P]) to the stream. Sweetwater Branch also receives inputs of nutrients, sediments, trash and other contaminants from stormwater runoff, septic tanks and other non-point sources from the Gainesville urban area

In addition to the impacts of pollutant loads from the urban areas of Gainesville and Alachua County upstream of the Prairie, Sweetwater Branch and the Prairie have been impacted by flow channelization and wetland draining activities which occurred with extensive ranching activities in the 1930s. Channelization of Sweetwater Branch resulted in dehydration of over 1,300 ac in this portion of the Prairie basin, resulting in invasion by woody species (trees and shrubs) and undesirable wetland marsh plant communities on the Prairie. Figure 3 shows the historical and current flow path of Sweetwater Branch onto PPPSP. Subsequent filling of the Sweetwater Branch canal by sediments and resulting overflows of treated municipal effluent and stormwater pollutants to this portion of the Prairie caused saturation of soils with elevated levels of nutrients.

During the past 35 years the effects of these pollutant loads and drainage activities on the ultimate receiving water body for Sweetwater Branch, namely Alachua Lake and Alachua Sink located in Paynes Prairie, have been documented and widely recognized. Combined with extensive ranching-related drainage activities on the Prairie started in the 1930's, the inflow of excess water, sediments and nutrients from the City of Gainesville has resulted in deposition of sediment loads on the Paynes Prairie marsh, alteration of natural plant communities, and water quality impairment on the Prairie. Approximately 1,300 ac of the 16,000 ac Paynes Prairie basin have been impacted by nutrients and channelization of Sweetwater Branch (Figure 3).

Total Maximum Daily Load Requirements

Alachua Sink (WBID 2720A) was listed as impaired for total N on Florida's Impaired Waters list (FDEP 2003). A TMDL was adopted for total N for Alachua Sink in January 2006, which quantified N sources to Alachua Sink (Gao *et al.* 2006). The MSWRF and urban runoff from the City contribute approximately 23% and 6%, respectively of the total N load to Alachua Sink. The remainder is contributed by Newnans Lake and other upstream sources not connected with Sweetwater Branch. The Alachua Sink TMDL specifies a total N critical dry-period load reduction of 41,000 lbs/yr for wastewater point-source discharges from the MSWRF and the J.R. Kelly Generating Station and a 45% reduction in loads from stormwater and other non-point sources.

Sweetwater Branch (WBID 2711) is also listed as an impaired water for fecal coliforms. Investigations are underway to identify sources of these fecal coliforms. Existing water quality in Sweetwater Branch has been an

environmental concern not only because of its effects on the flora and fauna of the PPPSP, but also because this water enters the potable Floridan Aquifer with minimal assimilation of transported pollutants from the Gainesville urban area.

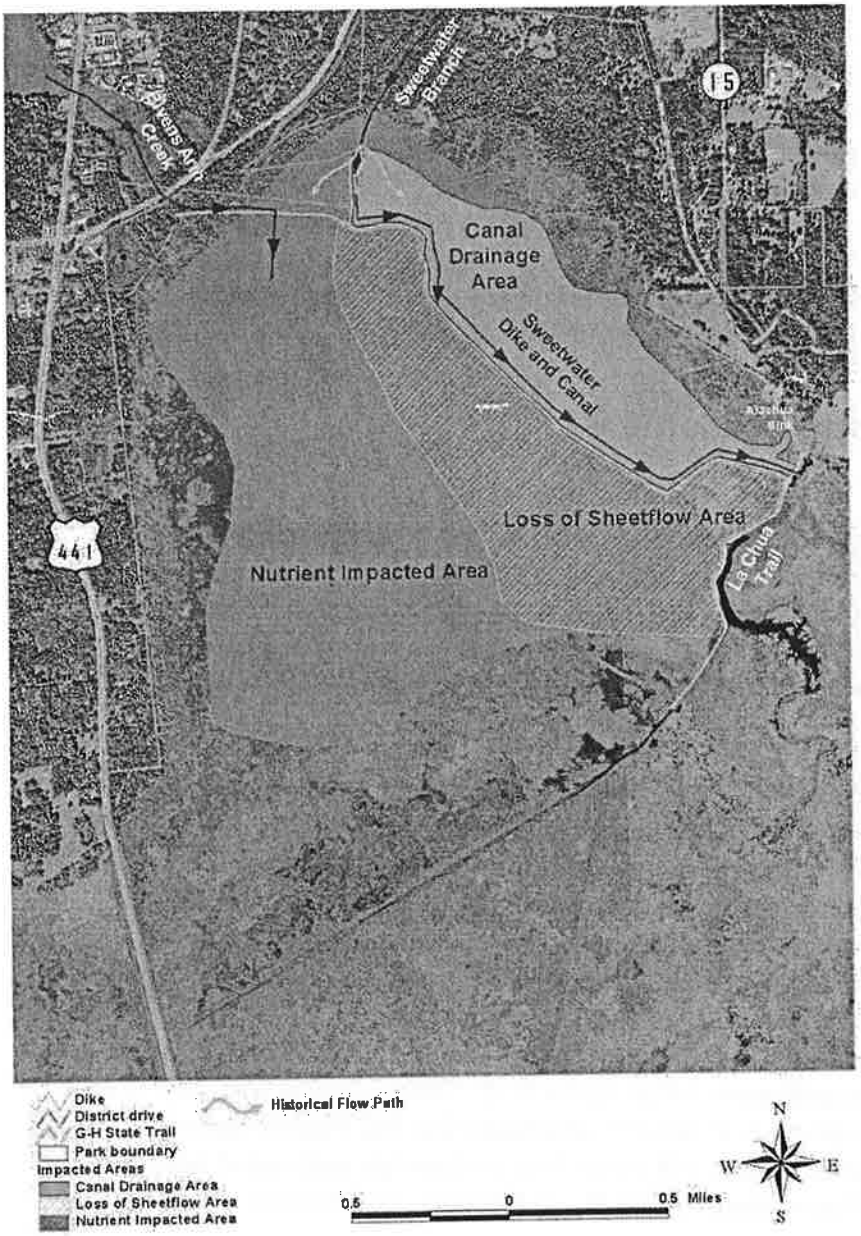


FIGURE 3
Estimated Area of Water Quality and Hydrological Impacts in the Proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area (source: PPPSP).

The primary stakeholders for reducing N loads in Sweetwater Branch include GRU due to the MSWRF and the City of Gainesville PWD, Alachua County Public Works Department, and FDOT because of their responsibility for stormwater management within the Gainesville Urban Area, and FDEP and St.

Johns River Water Management District (SJRWMD) who are responsible for reducing N load from other upstream sources. The proposed project would enable GRU, PWD, Alachua County Public Works Department, and FDOT to meet N reductions as required in the Alachua Sink TMDL. It will not address N loads from other upstream non-point sources not discharging into Sweetwater Branch.

The SJRWMD is also involved in this TMDL because Paynes Prairie is located in the Orange Creek Basin, a priority watershed under the Surface Water Improvement and Management (SWIM) program. FDEP and the Florida Park Service (FPS) are interested in this TMDL since the receiving water named in the TMDL, Alachua Sink, is an Outstanding Florida Water due to its geographical setting within a State Park. All of these interested parties are pursuing a plan that meets the requirements of the TMDL while simultaneously meeting their other diverse objectives for cost effectiveness and environmental restoration and protection.

Description of Previous Sheetflow Proposals

PPPSP has long recognized Sweetwater Branch as the greatest ecological threat to Paynes Prairie. The concept of re-establishing sheetflow from Sweetwater Branch and Tumblin' Creek on the Paynes Prairie Basin, and significantly improving the water quality of these streams is an old one that has been described by several authors. This section briefly summarizes previous proposals to accomplish these goals.

Dr. Larry White of the University of Florida's School of Forest Resources and Conservation studied the effects of wastewater effluent disposal on Paynes Prairie and developed alternatives for improved management of the Sweetwater Branch/Tumblin' Creek discharges to the Prairie (White 1972, 1975). Dr. White noted that total P in Sweetwater Branch was about 4.0 mg/L and total N was about 19.4 mg/L at the time of his study. These concentrations are indicative of conditions before the implementation of tertiary wastewater treatment at the MSWRF in 1993. Dr. White also observed that nutrient concentrations reaching Alachua Sink were lower than in the Sweetwater Branch inflow (total P -0.139 mg/L and total N – 3.75 mg/L), indicating a certain amount of natural attenuation in the Prairie wetlands. However, these concentrations were still much higher than his estimated normal background levels in the Prairie Basin (total P – 0.09 mg/L and total N – 1.42 mg/L).

Two graduate students working under Dr. Jack Ewel of the University of Florida, Department of Botany conducted studies of the effects of the Sweetwater Branch discharge on the northern portion of the Paynes Prairie Basin (Zeilinga 1975 and Braat 1975). Zeilinga's work showed that total N concentrations were partially reduced within 610 m (2,000 ft) of the point of discharge to the marsh and fully assimilated to background levels within about 3,050 m (10,000 ft) of the point of discharge. Concentrations of total P were reduced at a much lower rate than total N. Braat (1975) prepared a detailed vegetation map of the impacted marsh areas immediately south of the Sweetwater Branch/Tumblin' Creek Canal.

Based on a review of aerial photographs, it was estimated that willow-dominated areas had increased by 74% (from 5% to 20% of the study area) within the period from 1956 to 1974. He concluded that dike topography and point discharges from the failing canal created areas where woody vegetation invaded deeper portions of the natural marsh plant community.

CH2M HILL prepared an assessment for using Paynes Prairie for biological advanced treatment and wetland discharge (CH2M HILL 1981). This study was funded by GRU and was conducted after treatment wetlands had become a recognized method for managing wastewater effluents in Florida and other regions of the United States (Odum *et al.* 1977). The MSWRF effluent was to be applied in a sheetflow fashion to the previously-impacted marsh and shrub areas adjacent to the Sweetwater Branch/Tumblin Creek Canal, following removal of debris and suspended solids by use of treatment/retention ponds. Considerable monitoring was recommended before and during implementation of the proposed sheetflow restoration project. This project was not pursued further at that time and the MSWRF was eventually upgraded in 1993 to achieve ammonia removal and tertiary treatment.

Best *et al.* (1995) with the University of Florida's Center for Wetlands prepared an assessment of options for managing the Sweetwater Branch surface water inflow to the PPPSP. Four management options that were considered included:

1. Off-site treatment
2. Multifunctional wetland treatment system
3. Wetland treatment with enhanced phosphorus removal (alum addition)
4. Sweetwater/Paynes Prairie bypass canal

Best *et al.* (1995) recommended implementation of the Multifunctional Wetland option (Option 2), including treatment of Sweetwater Branch flows and loads (up to 10-year storm) in a 250 ac wet detention pond and a 736 ac treatment wetland located on the Paynes Prairie Basin, sheetflow of the treated Sweetwater Branch flows onto the Prairie Basin, and restoration of about 1,000 ac of impacted wetlands. The estimated 10-year, total present worth cost of this management option was $14,370,000 with an estimated annual operation and maintenance cost of $258,800 (1991 $).

Sheetflow Restoration Plan Development

Introduction

The previous studies and proposals for restoration provided useful background information for the development of the project currently proposed. The Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project conceptual plan described here is the culmination of several more recent intensive scientific and engineering studies conducted through a cooperative effort by the project participants. These efforts included the following:

- *Offline Sweetwater Branch Stormwater Wetland Analysis*
  An evaluation of stormwater Best Management Practices (BMPs) for improving water quality in Sweetwater Branch and specifically a stormwater management and water quality improvement wetland (Sweetwater Branch Enhancement Wetland) to be located near the point where Sweetwater Branch flows onto the Prairie basin (Jones Edmunds 2003),

- *Sweetwater Branch Sheetflow Restoration Feasibility Analysis*
  An evaluation of the sheetflow concept for distributing higher quality Sweetwater Branch flows over a larger area of Paynes Prairie to minimize hydrologic and water quality impacts as well as identifying the level of pre-treatment needed to adequately protect and restore the area of the Prairie receiving the inflow (WSI 2006a),

- *Main Street WRF Upgrade Analysis*
  An evaluation of technically and economically feasible alternatives for additional upgrades at the MSWRF to achieve additional nutrient removal prior to discharge into Sweetwater Branch (CH2M HILL 2006),

- *Detailed Water Quality Performance Assessment*
  Modeling of effects of MSWRF upgrade alternatives on the Sweetwater Branch Enhancement Wetland sizing and on ultimate water quality of flows delivered to PPPSP (WSI 2006b).

Each of these specific technical efforts is briefly described below.

Offline Sweetwater Stormwater Wetland Analysis

The concept of the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration project evolved from an overall evaluation of BMPs for water quality improvement in Sweetwater Branch. The City PWD contracted for a preliminary feasibility study of a stormwater management pond/wetland near the downstream end of Sweetwater Branch (Jones Edmunds 2003). A constructed wetland system was selected for analysis. This proposed stormwater pond/wetland consisted of from 30 to 200 ac of constructed forebay (sediment trap) and marsh.

A low-head diversion structure located in the channel of Sweetwater Branch would divert all of the baseflow and some portion of the higher storm flows from Sweetwater Branch into the forebay pond of the proposed off-line treatment system. Coarse solids would be captured in this feature and clarified water would then flow through the constructed marsh component of the system. Dissolved nutrients and other trace contaminants would be removed within the marsh before water would ultimately be released back into Sweetwater Branch downstream of the inflow structure.

Estimated performance was dependent upon the final area selected for the stormwater management system. It was estimated that a 50-ac project would remove on average about 58% of the nitrate N, 52% of the TSS, and 53% of the fecal coliforms in Sweetwater Branch. A larger constructed wetland would remove even larger fractions of the existing pollutant loads in the creek.

Estimated total P reduction in this size treatment wetland is considerably lower (18%), necessitating evaluation of various chemical total P removal options at the MSWRF.

Sweetwater Branch/Paynes Prairie Sheetflow Restoration Analysis

This study established the initial concept of the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project and laid the groundwork for follow-up studies to develop the project plan. A fundamental tenant of the proposed sheetflow restoration on Paynes Prairie is that the water quality from Sweetwater Branch entering the Prairie must be consistently improved to a level that will enhance and promote the eventual re-establishment of desirable native plant communities in the northern portion of Paynes Prairie. Channelization of Sweetwater Branch that began in the 1930's resulted in dehydration of this portion of the Prairie basin, resulting in invasion by woody species (trees and shrubs) and undesirable wetland marsh plant communities on the Prairie. Subsequent filling of the Sweetwater Branch canal by sediments and resulting overflows of partially treated municipal effluent and stormwater pollutants to this portion of the Prairie caused additional vegetative impacts and saturation of soils with elevated levels of nutrients (see Figure 3).

From this study, it became clear that the proposed Sheetflow Restoration Project would have to contain four major components to be successful (Figure 4):

1 Upgrades to the MSWRF for nutrient removal;
2 Installation of an off-line water quality polishing wetland (Sweetwater Branch Enhancement Wetland) to further reduce nutrients and to remove sediments, trash and other pollutants from the Sweetwater Branch flow;
3 Distribution of the Sweetwater Branch flow leaving the Sweetwater Branch Enhancement Wetland to restore the natural sheetflow into the Sheetflow Restoration Area of the Prairie; and
4 Removal of the existing man-made channel connecting Sweetwater Branch to Alachua Sink.

A fundamental outcome of this study was the development of water quality goals for water entering the Sheetflow Restoration Area in PPPSP, necessary to promote the re-establishment of desirable native plant communities. Based on a review of historical water quality and plant community data from Paynes Prairie and from a number of Florida municipal treatment wetlands receiving a range of nutrient concentration inputs from comparable wastewater treatment systems, WSI (2006a) presented recommendations for allowable nutrient levels that are compatible with re-establishment of desirable herbaceous wetland plant communities on this portion of the Prairie.

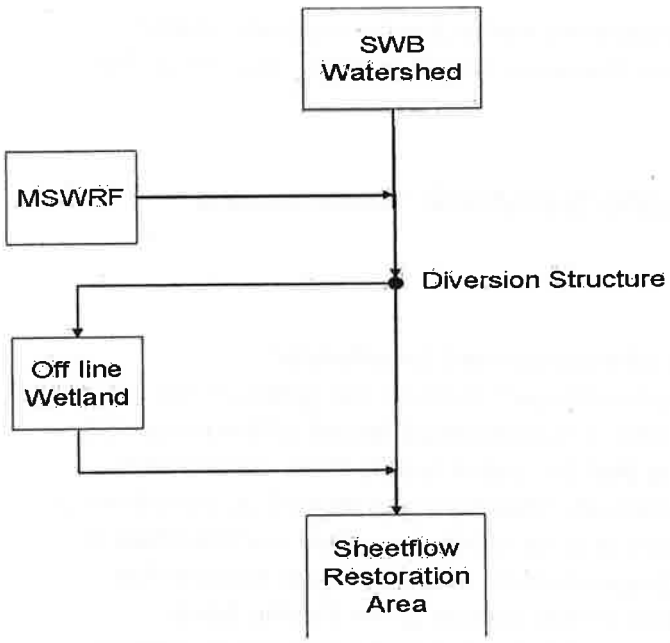


FIGURE 4
Conceptual Diagram of the Principal Components of the Proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project (see text for full description).

A field trip was conducted to representative constructed wetlands in Florida that receive highly-treated municipal effluents to allow the project team an opportunity to have a first-hand view of the plant communities that colonize these systems over a range of nutrient concentrations (Figure 5). WSI's recommendations were reviewed by biological staff with the PPPSP and consisted of maximum long-term average concentrations of total N, total P and TSS of 3 mg/l, 0.3 mg/l and 5 mg/L, respectively, for water discharging to the Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area.

Another fundamental outcome from this study is the determination that additional nutrient assimilation (in excess of the TMDL requirements) would naturally occur within the Sheetflow Restoration Area such that average background nutrient levels (estimated at 1.4 mg/L total N and 0.1 mg/L total P) would be achieved before this sheetflow water reaches Alachua Lake and Alachua Sink.

Main Street WRF Upgrade Analysis

The aforementioned study defined nutrient criteria for the water entering the Sheetflow Restoration Area. This water quality would be achieved primarily through a combination of upgrades to the GRU MSWRF and the Sweetwater Branch Enhancement Wetland. Additional analyses were required in order to determine the appropriate combination of MSWRF upgrades and the required Sweetwater Branch Enhancement Wetland sizing to achieve these criteria. This section describes the analyses of the MSWRF upgrade alternatives. The next section describes detailed water quality performance assessment for the Sweetwater Branch Enhancement Wetland.

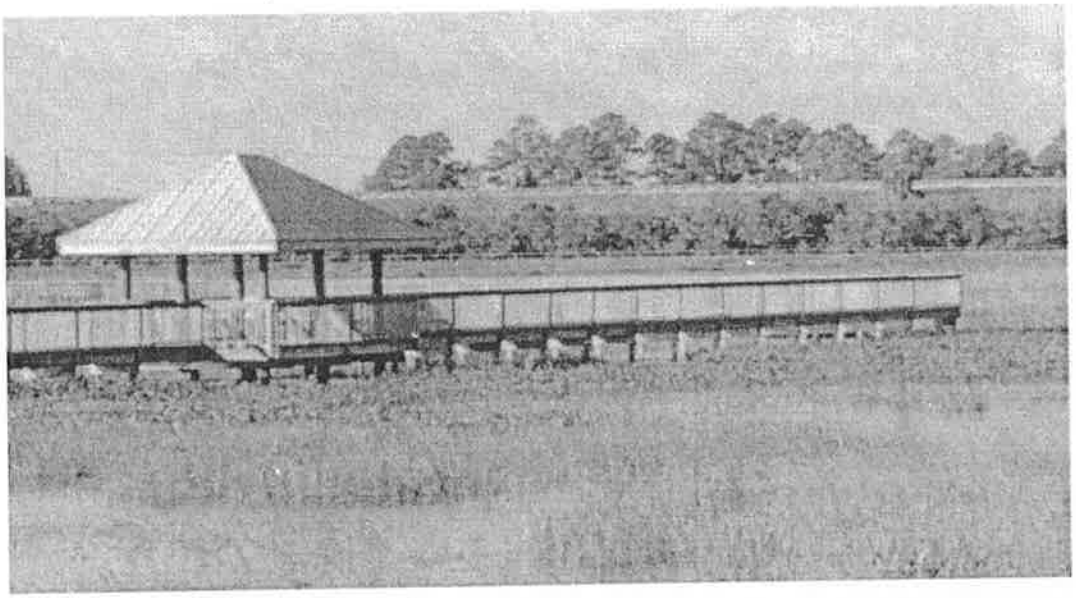


FIGURE 5
Indian River County, Florida Constructed Wetland was one of the municipal treatment wetlands visited by the Sweetwater Branch/Paynes Prairie Sheetflow Restoration team. This system has received advanced treated effluent since 1996 and has average outflow nutrient concentrations of about 1.0 mg/L total N and 0.2 mg/L total P.

The MSWRF is classified as a tertiary treatment facility and incorporates an extended aeration activated sludge treatment process, effluent filtration, and disinfection (Figure 6). It is permitted to discharge an annual average daily flow of 7.5 million gallons per day (MGD). The facility consistently meets all of its effluent permit limits, and achieves effluent five-day biochemical oxygen demands (BOD_5) and TSS levels of 1 mg/l or less. The plant does not currently have permit limits for total N or total P, and was not designed to achieve advanced nutrient removal. However, plant operations have been optimized to achieve fairly enhanced levels of N and P removal compared to many other WRFs.

Although the MSWRF achieves a consistently high quality effluent, additional nutrient removal would be required to achieve the desired water quality goals for the Sheetflow Restoration Project. Several alternatives were evaluated for upgrading the MSWRF. The various alternatives would achieve different levels of N removal at the MSWRF, and the remainder of the required N removal would be achieved through the Sweetwater Branch Enhancement Wetland. All of the alternatives would require upgrades to achieve advanced waste treatment (AWT) levels of 0.3 mg/l for TP. The alternatives evaluated and estimated costs are summarized in Table 1.

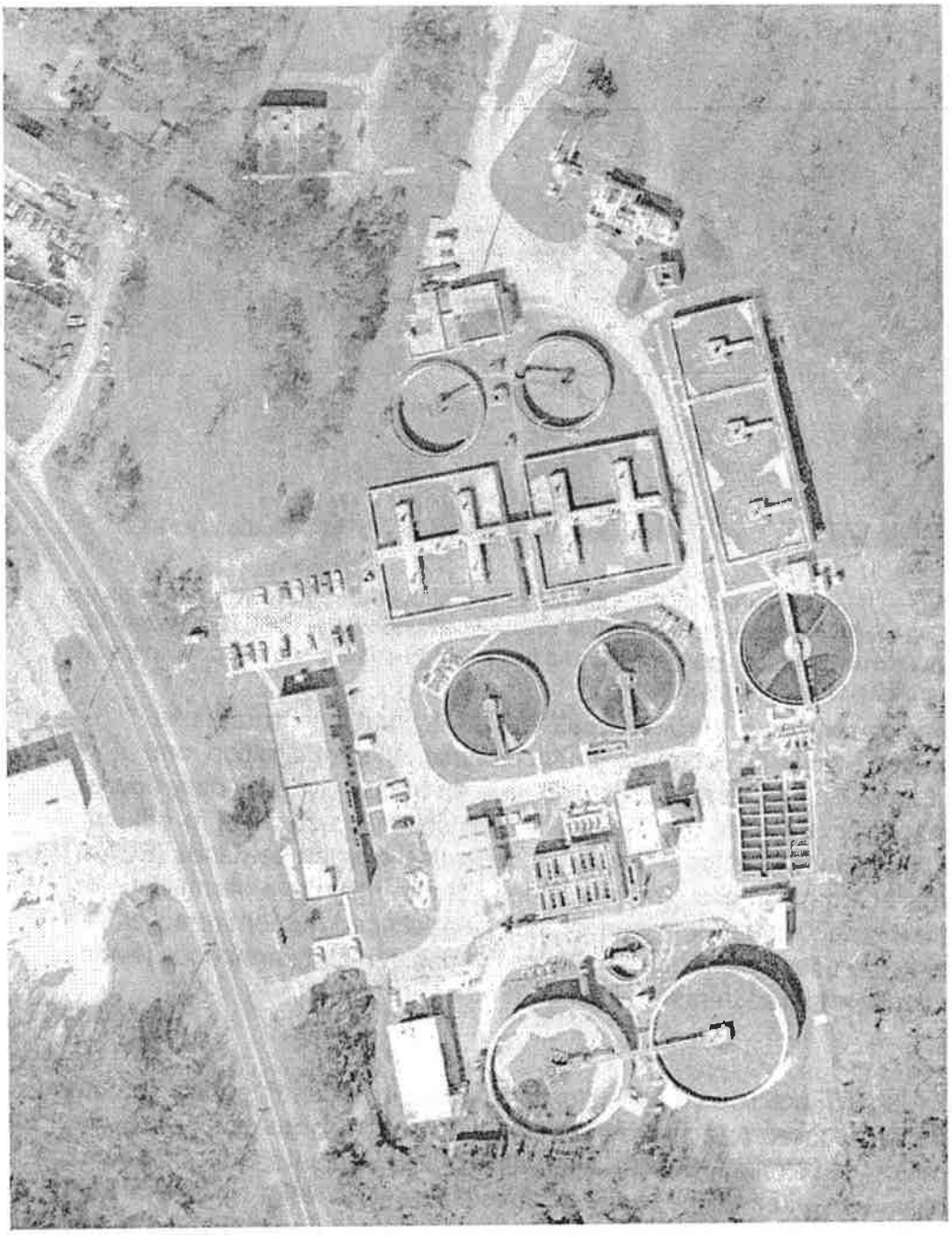


FIGURE 6
Main Street Water Reclamation Facility Aerial Photograph Illustrating Two Parallel Advanced Secondary Treatment Trains. Final Chlorine Contact Chamber for Disinfection is on the Lower Right of the Photo and is the Last Point in the Process before Discharge to Sweetwater Branch.

TABLE 1
Summary of Main Street WRF Alternatives Evaluated and Costs

Main Street WRF Treatment Option	Main St. WRF Eff Total N (mg/l)	Main St. WRF Eff Total P (mg/l)	Capital Cost ($ Million)	O&M ($/yr)	Net Present Worth ($)
1. Bardenpho 5Stage Process 2. MLE Process w/ P removal 3. N Optimization w/ P Removal	4.0 6.2 8.0	0.3 0.3 0.3	$40.8M $29.4M $2.0M	$0.6M $0.4M $0.4M	$41.3M $33.4M $5.6M

Option 1 (Bardenpho 5-Stage Process) would provide the lowest total N levels achievable using current technologies. Option 2 (Modified Ludzack-Ettinger (MLE) Process) would achieve some improvement in total N removal beyond the current plant process, with some reduction in capital cost compared to Option 1. Both of these alternatives would involve major plant modifications which would include demolishing existing tanks and piping, and installation of additional tanks, piping and other facilities. Construction costs for either of these alternatives at the MSWRF are exacerbated by the fact that there is very little space available for new facilities at the site. Construction at the site would be very difficult and would require significant demolition of existing facilities and all the construction activities would have to accommodate the continuous treatment of the wastewater currently being discharged to the MSWRF. As a result both of these alternatives would involve a prohibitively high capital cost.

Under Option 3 (N Optimization w/ P Removal) total N removal at the plant would be further optimized through upgrading mechanical equipment and the use of additional process control equipment. Chemical coagulation facilities would be installed for total P removal. Under this alternative, the target water quality criteria for total P (0.3 mg/l) for water entering the Sheetflow Restoration Area would be attained at the MSWRF. The total N criteria would be met through a combination of optimization of the MSWRF and the Sweetwater Branch Enhancement Wetland. This alternative takes advantage of the fact that wetland systems are highly effective for removing N (and particularly nitrate, which is the primary form of N in the MSWRF effluent). Based on the Sweetwater Branch Enhancement Wetland analysis described earlier, the constructed wetland will effectively remove the additional total N needed to meet the proposed water quality goals for discharge to the Sheetflow Restoration Area.

As will be described in the next section, the detailed water quality assessment concluded that the constructed wetland will effectively remove the additional total

N needed to meet the proposed water quality goals for discharge to the Sheetflow Restoration Area. While the Sweetwater Branch Enhancement Wetland will provide some total P removal, it will be necessary for the MSWRF to achieve effluent total P levels down to AWT standards 0.3 mg/l (annual average) in order to ensure that the water quality goals for the Sheetflow Restoration Area are met. This will be achieved through chemical P removal at the MSWRF. The capital and operating costs for implementing this alternative at the MSWRF represent a significant commitment from GRU. However, the costs are not prohibitive. Therefore, this alternative was selected for moving forward with the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration project.

Detailed Water Quality Performance Assessment

Based on the technically feasible treatment upgrade options described in the CH2M HILL (2006) report, GRU contracted with WSI (2006b) for an evaluation of the effects of the various MSWRF upgrade alternatives on the required Sweetwater Branch Enhancement Wetland sizing and performance. Three MSWRF upgrade options were evaluated, based on the current design flow rate of 7.5 million gallons per day (mgd):

- Option 1 – total P removal to less than 0.3 mg/L and total N removal to less than 4 mg/L;
- Option 2 – total P removal to less than 0.3 mg/L and total N removal to less than 6.2 mg/L; and
- Option 3 – total P removal to less than 0.3 mg/L and total N removal to less than 8 mg/L.

A fourth option was also evaluated which was based on a possible expanded future flow capacity of 14 mgd with upgrades using evolving technologies:

- Option 4 – total P less than 0.3 mg/L and total N less than 4 mg/L.

TSS concentrations in the MSWRF discharge would be less than 5 mg/L for all of these evaluated alternatives.

Each of the options was evaluated in combination with two different Sweetwater Branch Enhancement Wetland sizes: 50 ac and 125 ac. The 125 ac wetland area represented a preliminary estimate of the practical upper limit for locating a constructed water quality improvement wetland on the northern edge of PPPSP in the vicinity of the Sweetwater Branch inflow. The WSI evaluation utilized water quality performance models to evaluate total N and total P concentration and load reductions through the proposed stormwater management wetland for the various MSWRF treatment alternatives.

The following conclusions were drawn from these analyses (WSI 2006b):

- For MSWRF treatment Option 1, a Sweetwater Branch Enhancement Wetland of less than 50 ac would be adequate to achieve the desired nutrient concentration goals for discharge to the Sheetflow Restoration Area;

- For MSWRF treatment Option 2, the Sweetwater Branch Enhancement Wetland would likely have to be greater than 50 ac to achieve the desired nutrient goals for discharge to the Sheetflow Restoration Area;

- For MSWRF treatment Option 3, the constructed Sweetwater Branch Enhancement Wetland would need to be enlarged to approximately 125 ac to assure that target nutrient concentration goals for discharging to the Sheetflow Restoration Area are met;

- A Sweetwater Branch Enhancement Wetland of 125 ac would achieve average total N concentrations in the range of approximately 2.4 mg/l or less for all of the MSWRF treatment options. In addition, model estimates of maximum daily total N concentrations rarely exceed (< 1% of the time) the 3 mg/l annual average total N target. A total P concentration of 0.3 mg/L at the inlet of the proposed Sheetflow Restoration Area can most cost-effectively be achieved with plant upgrades for total P removal at the MSWRF and not by expansion of the area of the Sweetwater Branch Enhancement Wetland;

- A larger (up to 125 ac) Sweetwater Branch Enhancement Wetland offers several advantages over a smaller (50 ac) wetland option:
  - Additional total N removal;
  - Additional total P removal down to approximately 0.2 mg/l;
  - Nutrient and sediment removal from a significantly greater proportion of the Sweetwater Branch stormwater flow, including capture of a much greater proportion of the "first flush" from storm events;
  - Greater buffering capacity for removing/containing other pollutants (such as fecal coliforms) before discharging to Paynes Prairie;

- Future MSWRF upgrades for total N reduction in concert with an adequately sized Sweetwater Branch Enhancement Wetland could allow future increases of reclaimed water effluent flow volumes up to about two times the current permitted flow.

Based on the results of this study the MSWRF upgrade Option 3 (optimized N removal with enhanced P removal) in conjunction with the 125 ac enhanced wetland was proposed for the Paynes Prairie Sheetflow Restoration project. This approach would provide the most cost-effective approach to achieve the required water quality criteria for the Sheetflow Restoration Area. The use of the larger (125 ac) Sweetwater Branch Wetland not only reduces the N removal and costs for the MSWRF upgrades, but provides key benefits in its ability to treat a much higher proportion of the stormwater flows from Sweetwater Branch and for its enhanced ability to remove other pollutants.

Description of the Selected Conceptual Plan

The sections below describe the principal components of the selected plan for the Sweetwater Branch/Paynes Prairie Sheetflow Restoration project. Figure 7 illustrates these proposed project enhancements.

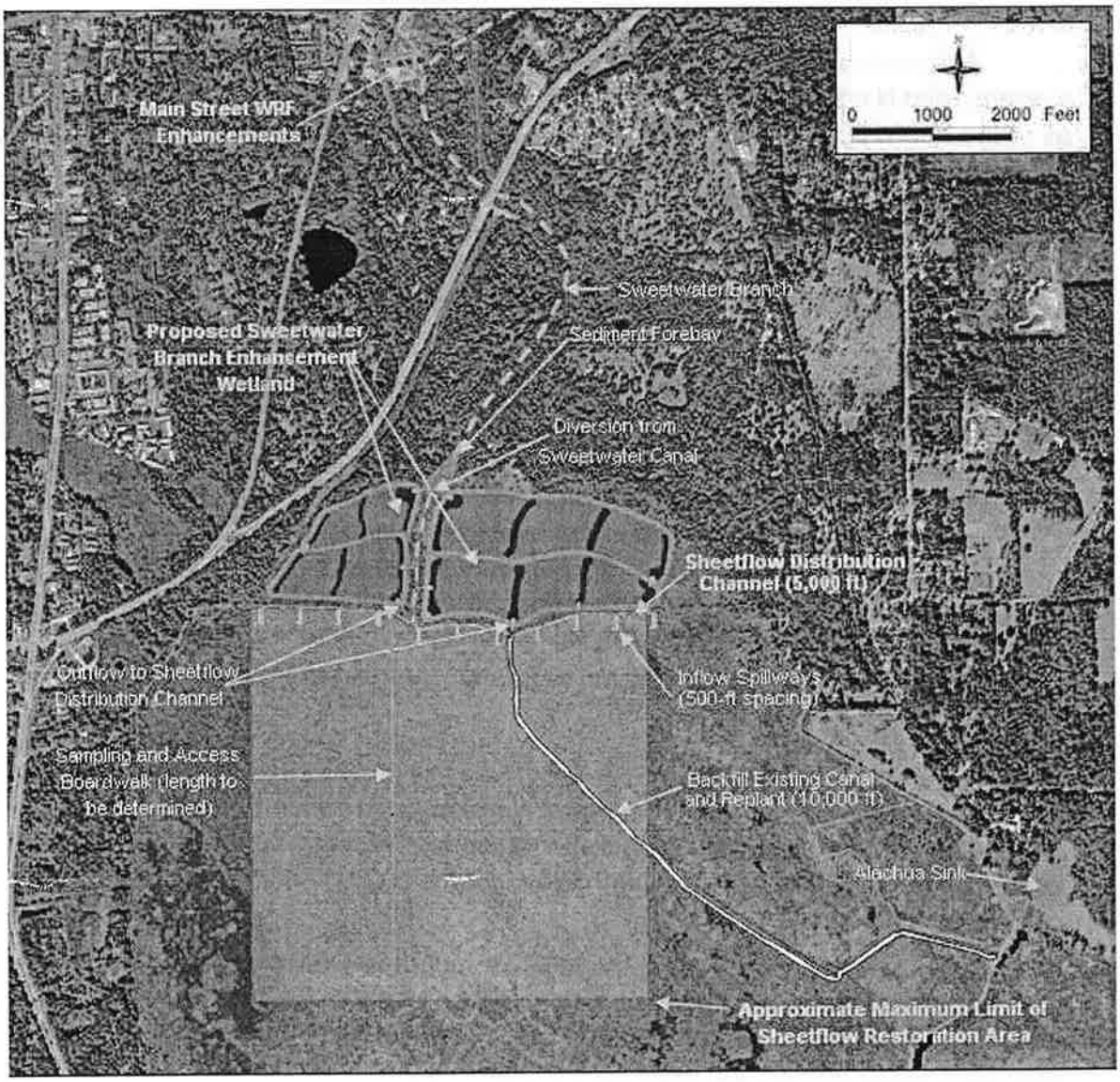


FIGURE 7
Proposed Plan Illustrating the Overall Conceptual Project Including Upgrades at the Main Street WRF, the Sweetwater Branch Enhancement Wetland, and the Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area

Sweetwater Branch BMP Upgrades

Potential BMPs for pollutant load reduction have been evaluated for Tumblin' Creek and Sweetwater Branch, the two major streams that feed the Sheetflow Restoration Area (Jones Edmunds 2003, 2006). There are three existing BMPs in this combined watershed with a total wet area of about 6 ac and an estimated average nutrient removal rate of about 676 lb total N/yr and 179 lbs total P/yr (Table 2). An additional 20 potential BMP projects have been identified in the basin and are currently being evaluated in terms of cost effectiveness and prioritization. These identified projects in conjunction with the existing projects could provide a maximum wet treatment area of about 80 ac with a combined estimated nutrient removal potential of 6,234 lbs total N/yr and 1,207 lbs total P/yr.

The existing sub-regional stormwater treatment facilities in the Sweetwater and Tumblin' Creek watersheds have been established as water quality treatment banks. Water quality improvement is required for all new construction and re-developed sites. Credits in the sub-regional basins are sold to developers who are in turn given credit for providing off-site water quality improvements.

The majority of growth in the downtown area is re-development. Water quality banking provides a future growth strategy that will ensure that stormwater water quality from the downtown area will improve over time. This will further assure the continued success of the Sweetwater Branch/Paynes Prairie Sheetflow Restoration project.

Main Street WRF Upgrades

Upgrades to the MSWRF will include installation of process control equipment to optimize nitrogen removal, and installation of chemical phosphorus removal facilities. This will include upgrades to mechanical equipment and installation of continuous on-line monitoring equipment which will allow operators to evaluate plant performance on a continuous basis and make operating adjustments on a real-time basis to optimize nitrogen removal. Annual average MSWRF effluent total N concentrations will be maintained at or below 8 mg/l. MSWRF effluent total P levels will be maintained at or below 0.3 mg/l (annual average) through the use of a chemical addition system, resulting in the removal of about 16,000 lbs total P/yr. Previous analyses have shown that total P removal at the MSWRF is the most cost effective approach to achieving the low targets necessary for Sweetwater Branch sheetflow restoration to Paynes Prairie. Total estimated costs at the MSWRF for the Sheetflow Restoration Project are $2 M for construction, increased operations and maintenance costs of $0.4 M per year, and a total 20-year present worth cost of $5.6 M.

Sweetwater Branch Enhancement Wetland

The Sweetwater Branch/Paynes Prairie Sheetflow Restoration study (WSI 2006a) determined that the Sweetwater Branch Enhancement Wetland for polishing the flows in Sweetwater Branch could be constructed on the northern portion of Paynes Prairie. Based on additional study it was determined that the

optimal area for the Sweetwater Branch Enhancement Wetland would be between about 100 and 125 acres (WSI 2006b) with a total project footprint between 125 and 150 acres. Preliminary water quality modeling estimated that the annual average total nutrient removal rates in the Sweetwater Branch Enhancement Wetland would be about 124,000 lbs total N/yr and 2,900 lbs total P/yr.

TABLE 2

Summary of existing and possible BMPs identified for use in the Sweetwater Branch/Tumblin Creek watershed in Gainesville, Florida (Jones Edmunds 2003, 2006). This is the watershed that contributes most stormwater runoff to the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area.

Sub-Regional Water Quality Improvement Projects Tumblin Creek			
		Load Reductions (lb/yr)	
Pond ID	**Surface Area (acres)**	**Total N**	**Total P**
Existing Projects			
SW 5th Ave Basin	1.9	300	37
Total Existing	**1.9**	**300**	**37**
Projects Identified			
Sorority Woods	0.7	35	4
Tumblin Creek Park	1.3	93	30
Kirkwood Park -A	1.8	165	29
Kirkwood Park -B	4.6	641	172
South Main Street -A	0.3	13	6
South Main Street -B	0.3	19	6
Arbor Park Apartments	2.1	51	16
Colclough Pond In-line Wetland	3.0	410	69
Colclough Pond Off-line Wetland	2.3	139	19
Bivens Arm Nature Park Wetland	5.3	760	113
Bivens Arm Lake Wetland -Alt 5	26.0	1410	178
Total Identified	**47.7**	**3,737**	**641**

Sweetwater Branch Sub-Regional Water Quality Improvement Projects			
		Load Reductions (lb/yr)	
Pond ID	**Surface Area (acres)**	**Total N**	**Total P**
Existing Projects			
Spring Hill Stromwater Park	0.9	66	22
Depot Park West Pond	3.2	310	120
Total Existing	**4.1**	**376**	**142**
Projects Identified			
Pond -1	1.3	111	15
Pond -2	1.1	128	28
Pond -3	5.3	185	37
Pond -4	1.9	259	53
SE 2nd Ave Basin	0.3	13	3
Pond -6	1.9	205	34
NW 14th Ave Basin	1.2	342	46
NW 2nd Street Basin	6.7	228	35
Depot Park East Pond	6.5	350	135.6
Total Identified	**26.2**	**1,821**	**387**

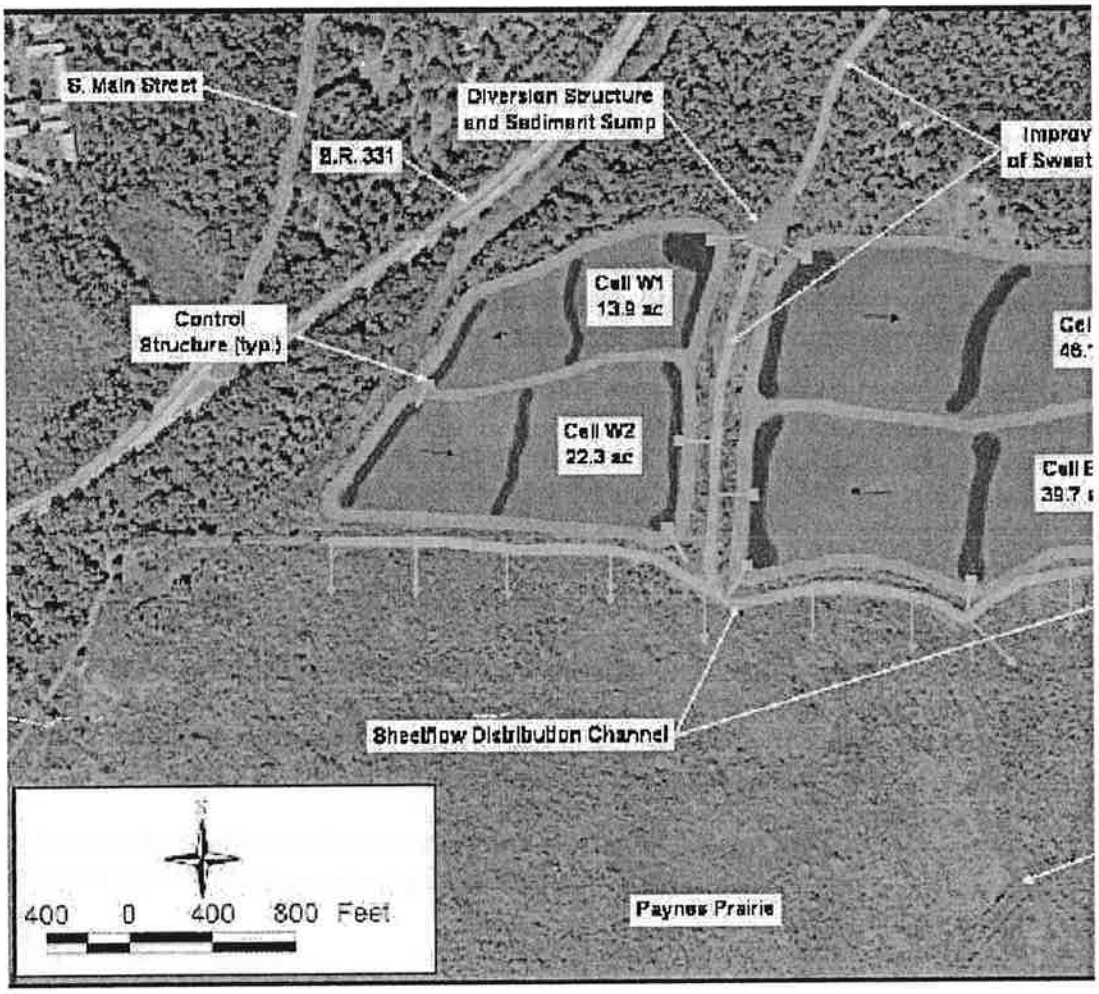
The City of Gainesville currently owns a 30 acre parcel on the west side of Sweetwater Branch in this area. An additional 95 to120 acres may need to be acquired from the PPPSP through a land exchange or long-term lease/easement to allow installation of the proposed Sweetwater Branch Enhancement Wetland.

Additional conceptual engineering of the proposed Sweetwater Branch Enhancement Wetland is currently being conducted to better define the wetland footprint and to lay out the major components of the design. This effort is important to help move the land exchange effort forward and to allow a more accurate estimate of project capital costs.

Figure 8 provides an updated conceptual plan for the proposed Sweetwater Branch Enhancement Wetland. This plan includes the following components:

- Channel maintenance in Sweetwater Branch (sediment removal) to minimize possible back-water impacts of the project;
- A diversion structure and sediment sump in Sweetwater Branch (low-head dam to pool water into the offline wetland cells) that will direct design flows (up to about 25 cfs) to the constructed wetland cells and allow higher flows to overtop and flow downstream directly to the Sheetflow Distribution Channel;
- Four wetland cells arranged in two parallel systems of two cells each, with a combined wet area of about 122 ac;
- Water control structures in each cell to control water surface elevations and to convey water to downstream cells;
- Planted emergent marsh and open water (deep) zones within each of the four wetland cells for improved hydraulic efficiency and optimal water quality improvements; and
- Containment levees (top width = 15 ft) around the cells to effectively retain the stormwater flows while they are receiving water quality improvement and to serve as visitor access hiking trails.

A preliminary estimate of the construction cost for the 122-ac Sweetwater Branch Enhancement Wetland and channel improvements is about $11.7 M. Annual O& M costs are estimated as about $0.3 M. The total estimated footprint area for the Sweetwater Branch Enhancement Wetland is about 150 ac.



Updated Conceptual Plan for the Proposed Sweetwater Branch Enhancement Wetland Located on the Northern Portion of Paynes Prairie. The Estimated Total Project Footprint is About 150 ac. The Proposed Sheetflow Distribution Channel is Just South of the Sweetwater Branch Enhancement Wetland.

FIGURE 8

Sheetflow Distribution Channel

The east-west portion of the existing Tumblin' Creek/Sweetwater Branch channel will be upgraded and modified for the Sheetflow Restoration Project (Figure 8). Approximately 6,700 ft of this existing channel will be cleaned and enlarged to a bottom width of about 40 ft to convey maximum storm flows of up to as much as 500 cfs. The North-South portion of the existing Sweetwater Branch channel from the proposed Sweetwater Branch Enhancement Wetland diversion structure will be upgraded as well to provide a wider and deeper cross section and to tie into the East-West Channel. Eleven concrete reinforced outlet spreader structures will be built at about 500 ft spacing into the downstream levee adjacent to the Sheetflow Channel. The estimated capital cost of the Sheetflow Restoration component of the project is about $5.1 M and annual O&M costs are estimated as $0.08 M.

Most woody vegetation will be removed from the existing levees as they are rebuilt, and finished contours will allow relatively simple maintenance of the levees (routine mowing twice each year) to keep them free of trees and shrubs. Existing undesirable vegetation in the vicinity of the new spreader structures will be cleared and those areas will be deepened and replanted with desirable aquatic and wetland vegetation.

Sweetwater Branch Canal Removal

The remaining unused 10,000 ft of the existing Sweetwater Branch Canal and associated levees will be completely degraded and back filled to ambient grade and this area (about 33 ac) will be replanted with desirable wetland plant species. The estimated capital cost for removal and restoration of the Sweetwater Branch Canal is $2.85 M. There are no anticipated O&M costs associated with this portion of the project.

The Sheetflow Distribution Channel and removal of the canal will help to rehydrate approximately 1,300 ac of Paynes Prairie marsh that is currently isolated from the historic inflows from Sweetwater Branch. This re-hydration will be with water of a much higher quality than has been seen in this area of the Prairie in over 75 years. As documented during the early research by White (1972, 1975) and Zeilinga (1975), this Sheetflow Restoration Area will provide final polishing of the nutrients remaining in this water to background concentrations before it reaches Alachua Lake and Alachua Sink located about 6,000 feet away from the channel.

Detailed Water Quality Performance Assessment

Upgrades at the MSWRF to meet a total P goal of 0.3 mg/L will result in a total P load reduction to Sweetwater Branch of about 16,000 lbs/yr. The MSWRF will be optimized for N removal to ensure that the average concentration for total N is kept to 8 mg/l or less. If the plant is upgraded in the future to handle additional flow beyond its current design capacity of 7.5 MGD, effluent N concentrations will have to be reduced as part of the upgrade.

A variety of computer models have been utilized to estimate water quality improvements for various wetland project components. For the purposes of this summary report the steady state k-C* model of Kadlec and Knight (1996) was rerun to provide an estimate of performance for each of the major wetland features. Table 3 provides a summary of the updated performance estimates for the project. The proposed 122-ac Sweetwater Branch Enhancement Wetland is estimated to remove an average of about 124,000 lbs/yr of total N and an additional 2,900 lb/yr of total P. Resulting estimated nutrient concentrations at the point of sheetflow onto the PPPSP are estimated as 2.2 mg/L for total N and
0.21 mg/L for total P, well below the goals of 3 and 0.3 mg/L considered to be necessary for habitat restoration.

Natural nutrient assimilation that is expected to occur on the Prairie is estimated to result in the water meeting the background total N concentration of 1.4 mg/L within about 1,000 ft downgradient of the Sheetflow Distribution Channel and within about 2,500 ft to meet the total P background estimate of 0.1 mg/L. These estimates indicate that a large fraction of the Sheetflow Restoration Area will receive extremely low background nutrient concentrations as a result of this project, allowing their gradual recovery to low nutrient status and ultimate dominance by nutrient intolerant wetland plant species.

TABLE 3 Estimated Nutrient Loads and Water Flows in Sweetwater Branch below the Main Street WRF, Entering the Sweetwater Branch Enhancement Wetland, and Reaching the Sheetflow Distribution Channel (1 kg = 2.2 lbs; 1 cfs = 0.65 MGD).

Description	Units	TN	TP
Total Watershed Load (below MSWRF)	lbs/yr	189,207	9,206
Avg Flow to Wetland	MGD	9.1	9.1
FWM Concentration to Wetland	mg/L	6.68	0.30
Avg Load to Wetland	lbs/yr	187,357	8,521
Avg Load Removed by Wetland	lbs/yr	124,368	2,947
% Watershed Load Removed by Wetland		66%	32%
Avg Bypass Flow	MGD	0.70	0.70
FWM Bypass Concentration	mg/L	2.09	0.32
Avg Load Bypassed	lbs/yr	1,850	686
% Watershed Load Bypassed		1.0%	7.4%
Total Load to Prairie	lbs/yr	64,839	6,260
FWM Concentration to Prairie	mg/L	2.19	0.21

Note: FWM = flow-weighted mean

Conceptual Cost Opinion

Table 4 provides a preliminary, planning-level estimate of the capital and recurring O&M costs associated with the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project. The total estimated capital cost (construction + engineering) is about $24.3 M. Annual O&M costs are estimated as about $1.27 M. It is anticipated that project costs will be shared between a number of the participating agencies with interest and responsibility for restoration of Sweetwater Branch and Paynes Prairie. These estimated costs are subject to considerable refinement during project design and optimization.

TABLE 4
Summary of Estimated Planning-Level Construction, Capital, and Operation & Maintenance Costs for the Proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project.

Project Component	Construction Cost ($)	Mobilization, Contingency, Engineering ($)	Capital Cost ($)	Operation & Maintenance Costs ($/yr)
Main Street WRF Upgrades	$ 1,300,000	$ 650,000	$ 1,950,000	$ 640,000
Sweetwater Branch Channel Improvements	$ 831,600	$ 415,800	$ 1,247,400	$ -
Forebay/Trashrack/Weir Diversion Structure/Sediment Removal	$ 585,450	$ 292,725	$ 878,175	$ 150,000
Sweetwater Branch Constructed Wetland	$ 8,378,200	$ 4,189,100	$ 12,567,300	$ 150,000
Sheetflow Distribution Channel	$ 2,160,000	$ 1,080,000	$ 3,240,000	$ 75,000
Sweetwater Branch Canal Restoration	$ 1,326,087	$ 663,044	$ 1,989,131	$ -
Public Use Amenities	$ 1,575,000	$ 787,500	$ 2,362,500	$ 150,000
Estimated Total	**$ 16,170,337**	**$ 8,085,169**	**$ 24,255,506**	**$ 1,265,000**
Note: Assumes mobilization, contingency, engineering = 0.5 x construction cost				
Project Monitoring	$ 14,000	$ 7,000	$ 21,000	$ 100,000

Environmental Assessment

Water Quality Benefits Analysis

This project will significantly improve water quality in PPPSP and the Floridan Aquifer. Water quality in Alachua Sink and the Floridan Aquifer will be improved by elimination of direct inflows from Sweetwater Branch through the Sweetwater Branch Channel, providing a significant reduction in loading of total N as required to meet the TMDL for Alachua Sink. These nutrient reductions will help to lower the trophic status of Alachua Sink, resulting in lower concentrations of algal chlorophyll *a* and reduced dominance by floating aquatic plants. Other upstream N sources such as Newnans Lake, will not be eliminated through this project, but should be addressed through other efforts.

Under the existing artificial channelization of Sweetwater Branch directly to Alachua Sink, there is no protection against spills of hazardous substances at SR 331 (Williston Road). Construction of the proposed Sweetwater Branch Enhancement Wetland provides a controllable containment environment for any spills that may possibly occur in the future. Also, removal of the Sweetwater

Branch Channel eliminates the possible short-circuiting of any hazardous substances from the City of Gainesville to the aquifer via Alachua Sink.

Additionally, approximately 1,300 ac of degraded wetlands immediately downstream of Sweetwater Branch will be re-hydrated with water at low nutrient concentrations. Lower nutrients should be conducive to re-establishment of desirable herbaceous wetlands where less desirable woody vegetation currently exists. Additional nutrient assimilation will occur in these wetlands, so that the unimpacted wetlands further downstream in the park will receive water at ambient (background) nutrient concentrations as measured on the Prairie in the 1970s.

Wetland Hydrologic Restoration Benefits Analysis

This project will benefit PPPSP by increasing the depth, frequency, and duration of water flow in approximately 1,300 acres of degraded wetlands on the Prairie's northern side. Historically, Sweetwater Branch's flow hydrated these wetlands. With excavation of the Sweetwater Branch Channel beginning in the1930s, the Sweetwater Branch discharge was diverted directly to Alachua Sink. This diversion de-watered the wetlands, which receive the Sweetwater Branch flow only during occasional high-water periods when water overtops the channel bank and resulted in the replacement of the natural herbaceous wetland vegetation previously dominant in this portion of the prairie by woody shrubs and trees tolerant of this altered hydroperiod. Since the PPPSP was acquired, the Sweetwater Branch Channel has been recognized as the greatest ecological threat to the Preserve. The proposed project will improve these degraded wetlands by allowing all of the Sweetwater Branch flow to re-hydrate the wetlands all of the time. This will create a permanent wetland refuge where wetland-dependent plant and animal species can survive, even during the driest of times. Also, the Sweetwater Branch Enhancement Wetland will directly replace approximately 122 acres of degraded wetlands by a higher quality functional wetland of the same area.

This project also reduces a current water deficit in Paynes Prairie compared to historic conditions. The deficit occurs at the inflow from Prairie Creek, which drains from Newnans Lake into Paynes Prairie. Prairie Creek historically contributed about one third of the water entering Paynes Prairie. It was entirely diverted in the 1920s southward towards Orange Lake. Inflow from Prairie Creek was partially restored in the 1970s when the PPPSP installed culverts in the berm along Prairie Creek. Inflow through the culverts is reserved by state rule so that 45% (long-term average) of the Prairie Creek flow enters Paynes Prairie. While the reservation rule is beneficial to the park, there is still a net deficit at the historic inflow from Prairie Creek.

This water deficit will be reduced by restoring Sweetwater Branch sheetflow onto the prairie basin because its baseflow is augmented by the MSWRF. If the facility were to discharge at its highest permitted rate, the water deficit for the park would be further reduced. This project will allow the MSWRF to continue

discharging to Paynes Prairie, reducing the overall water deficit in the park and enhancing about 1,300 acres of degraded wetlands on the north side of the park.

Public Use Benefits Analysis

The proposed Sheetflow Restoration Project will provide significant opportunities for public use. The location of the Sweetwater Branch Enhancement Wetland and the Sheetflow Distribution Channel are ideal for access from Williston Road. It is envisioned that a City park (Sweetwater Branch Wetland Park) may be opened at this location allowing hiking and bird watching from trails located on the earthen levees around the wetland cells and from a boardwalk located within the Sheetflow Restoration Area of PPPSP. Similar public use facilities have been built throughout Florida at constructed wetlands (e.g., the Orlando Easterly Wetland, Titusville Blue Heron Wetland, Wakodahatchee and Green Cay Wetlands in Palm Beach County, Brevard County Wetland, etc.) and a comparable facility at the Indian River County Wetland is illustrated earlier in this document (Figure 5). Once the woody vegetation is removed from the existing levees along the Sweetwater Branch/Tumblin Creek Canal, this location will offer an outstanding view of the northern portion of Paynes Prairie.

Implementation

State Land Exchange

The 100 -125 ac Sweetwater Branch Enhancement Wetland and associated sheetflow distribution structures would be managed and maintained by the City of Gainesville (PWD and GRU) and FDOT. As such, the City will need to lease or own the land where these project components are located. The City currently owns a 30-acre parcel adjacent to the park boundary where Sweetwater Branch flows into the park's wetlands. An additional 95 to 120 acres would need to be acquired or leased by the City from the PPPSP in order to construct the enhancement wetland and sheetflow distribution structures.

The City in 2004 requested that FDEP assist in acquiring use of lands for this project. The Director of FDEP Division of Recreation & Parks wrote that the proposed project would be highly beneficial to the PPPSP and that they strongly support an appropriate value-for-value land exchange. The SJRWMD agreed to facilitate an appropriate value-for-value land exchange with the PPPSP, including obtaining state approvals. The City would cost-share with the SJRWMD on purchase of a exchange parcel adjacent to the PPPSP. The SJRWMD would seek approval for a land exchange from the Acquisition and Restoration Council and the Governor and Cabinet, sitting as the Board of Trustees of the Internal Improvement Trust Fund. If an exchange were to be approved, the City could obtain a lease or purchase the land from the PPPSP that is needed for this project.

Environmental Resource Permitting

An Environmental Resource Permit (ERP) from the SJRWMD is required for the project (Chapters 40C-4, F.A.C. through 40C-400 FAC). The City of Gainesville

will need to obtain an individual ERP (Chapter 40C-4, F.A.C.) from SJRWMD for portions of the project on City-owned land. FDEP will need to obtain an ERP permit from SJRWMD for portions of the project that occur in PPPSP. All portions of the project in the park may qualify for a noticed general permit, Chapter 40C-400.485, F.A.C.: General Permit to the Department for Environmental Restoration or Enhancement. Portions that do not qualify for a noticed general permit will require an individual or standard ERP.

MSWRF Permitting

The discharge from the MSWRF is currently regulated at the state and federal levels under the National Pollutant Discharge Elimination System (NPDES) permit. NPDES permits are granted for a five-year period and updated at the end of each permit period based on any necessary changes at the wastewater treatment facility. The MSWRF NPDES permit regulates the amount and quality of the discharge from the WRF to Sweetwater Branch. The proposed upgrade of the MSWRF for additional nutrient removal will require a major modification to the existing NPDES permit.

USACE 404 Permitting

Section 404 of the Clean Water Act (CWA) mandates the U.S. Army Corps of Engineers (USACE) to require a permit for certain activities occurring in Waters of the U.S. Existing wetlands are considered to be Waters of the U.S. under this CWA requirement and a Section 404 permit will likely be needed in addition to the state of Florida ERP permit described above. Guidelines for review of Section 404 permits require that filling of wetlands be avoided as much as possible and that unavoidable impacts must be mitigated. Considering the impacted status of the existing wetlands in the proposed project footprint and also the ecological lift expected to occur through all of the features of the project, it is feasible that project-related wetland impacts will be temporary and will be fully offset by the created enhancement wetland, resulting in an overall positive net environmental benefit.

Monitoring/Evaluation

Monitoring, evaluation, and adaptive management of the Sheetflow Restoration Project will be an important component of project success. Table 5 presents an overview of the preliminary recommended monitoring program. This monitoring plan is intended to document hydrology, water quality, and biology within and adjacent to the proposed Sheetflow Restoration Project. Hydrology needs to be monitored continuously throughout the life of the project to be able to interpret water quality improvement benefits and plant community successional changes. This information is needed to anticipate maintenance needs and to adaptively manage the overall project.

Although water quality will be monitored on a regular basis to assess performance, the number of stations sampled can be reduced for periods of up to four years, with a higher intensity of sampling every fifth year. Plant cover should be rapidly assessed each year but intensive sampling of the plant and wildlife

communities can be conducted less frequently (e.g., five year intervals). The estimated cost of the proposed monitoring plan is about $0.65 M over a five-year period (estimated average annual cost of $0.13 M per year).

TABLE 5
Preliminary Recommended Monitoring Program for the Paynes Prairie/Sweetwater Branch Sheetflow Restoration Project. This Level of Intensive Monitoring May Be Conducted for One Year During Each Five-Year Interval With Certain Elements Such as Hydrology and Water Quality Monitored Each Year.

Project Component	Data Type	Parameters	Stations	Frequency
Sweetwater Branch Wetland Sheetflow Restoration Area	Hydrology	Water Levels Flows Temp,	SB @ Diversion Structure	Continuous
	Water Quality	pH, DO, Sp. Cond.	Cells 1-4 West Diversion	Continuous
	Biology	Cations, anions, metals	Inlet East Diversion Inlet	Continuous
	Hydrology	Nutrients Plant Cover	Cells 1-4 Outlets SB @	Continuous
	Water Quality	Macroinvertebrates Fish	Diversion Structure West	Continuous
	Biology	Birds Water Levels Flows	SBW Outlet East SBW	Weekly Monthly
		Temp, pH, DO, Sp. Cond.	Outlet Cells 1-4 Cells 1-4	Monthly Quarterly
		Cations, anions, metals	Cells 1-4 Cells 1-4	Quarterly
		Nutrients Plant Cover	Distribution Channel	Quarterly
		Macroinvertebrates Fish	Restoration Area (1,000 ft)	Quarterly
		Birds	Restoration Area (3,000 ft)	Continuous
			Outlet 1, 5, 11 Outlets	Continuous
			1,5,11 Outlets 1,5,11	Continuous
			Outlets 1,5,11 Transect 0-	Continuous
			5,000 ft Transect 0-5,000 ft	Weekly Monthly
			Transect 0-5,000 ft	Monthly Quarterly
			Transect 0-5,000 ft	Quarterly
				Quarterly
				Quarterly

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