# SUPPORT DOCUMENT APPENDICES

FOR THE

# 2007 Orange Creek Basin Management Action Plan

FOR THE IMPLEMENTATION OF TOTAL MAXIMUM DAILY LOADS
ADOPTED BY THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

*in the*

## Orange Creek Basin

***Developed by the Orange Creek Basin Working Group***
*in Cooperation with the*
*Florida Department of Environmental Protection*
*Division of Water Resource Management*
*Bureau of Watershed Management*

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# APPENDIX A. TARGET POLLUTANTS ACROSS FLORIDA

**Table A-1** summarizes the waters impaired by various causes for each waterbody type in the Group 1- 4 basins; the principal causes of impairment are as follows:

- *Out of 825 river/stream segments assessed: Dissolved oxygen (DO), fecal coliform, chlorophyll, fish advisories for mercury, and total coliform.*
- *Out of 286 lake segments assessed: Trophic State Index (TSI), fish advisories for mercury, DO, historical TSI, and total coliform.*
- *Out of 354 estuarine segments assessed: fish advisories for mercury, chlorophyll, DO, and fecal coliform.*
- *Out of 115 coastal segments assessed: fish advisories for mercury and dioxin.*

**Table A-1. Summary of impairments in Group 1-4 basins**

| Parameter* | Rivers/Streams | | Lakes | | Estuaries | | Coastal Waters | |
|---|---|---|---|---|---|---|---|---|
| | Number of Waterbodies | Miles Impaired | Number of Waterbodies | Miles Impaired | Number of Waterbodies | Miles Impaired | Number of Waterbodies | Miles Impaired |
| DO | 258 | 2,288 | 31 | 119,296 | 64 | 461 | 2 | 1 |
| Fecal Coliform | 153 | 1,132 | 5 | 4,416 | 54 | 641 | 5 | 1 |
| Chlorophyll | 105 | 1,073 | 7 | 29,696 | 74 | 647 | | |
| Mercury–Fish | 46 | 708 | 25 | 92,352 | 40 | 772 | 97 | 1,170 |
| Total Coliform | 78 | 673 | 5 | 24,768 | 22 | 110 | | |
| Historical Chlorophyll | 28 | 503 | 5 | 1,856 | 23 | 191 | | |
| Iron | 30 | 387 | 5 | 26,752 | 15 | 168 | | |
| Turbidity | 16 | 212 | 2 | 704 | | | | |
| Lead | 15 | 97 | 9 | 10,048 | 9 | 137 | | |
| Cadmium | 1 | 15 | 1 | 5,248 | 2 | 67 | | |
| Unionized Ammonia | 8 | 40 | 11 | 22,976 | | | | |
| pH | 24 | 311 | | | 3 | 5 | | |
| Biology | 9 | 211 | | | 2 | 57 | | |
| Alkalinity | 9 | 130 | | | | | | |
| TSS | 10 | 96 | | | | | | |
| Conductance | 9 | 93 | | | | | | |
| Copper | 8 | 50 | | | 15 | 109 | | |
| Dioxins-Fish | 1 | 48 | | | 20 | 678 | 7 | 162 |
| Dissolved Solids | 3 | 38 | | | | | | |
| BOD 5-Day | 2 | 32 | | | | | | |
| TSI | | | 169 | 729,216 | | | | |
| Historical TSI | | | 7 | 30,592 | | | | |
| Silver | | | 1 | 13,760 | 2 | 67 | | |
| Selenium | | | | | 2 | 67 | | |
| Thallium | | | | | 2 | 67 | | |
| Nickel | | | | | 3 | 29 | | |

***Source***: DEP 2006 305(b) Report

* Similar causes of impairments are anticipated for the Group 5 basins.

**Note**: Minimum State surface water criteria (Chapter 62-302.500, F.A.C.) provide that metals shall be measured as total recoverable metal, with specified exceptions.

# APPENDIX B. FLORIDA WATERSHED RESTORATION ACT, CHAPTER 403.067, F.S.

**403.067 ESTABLISHMENT AND IMPLEMENTATION OF TOTAL MAXIMUM DAILY LOADS.**--

(1) LEGISLATIVE FINDINGS AND INTENT.--In furtherance of public policy established in s. 403.021, the Legislature declares that the waters of the state are among its most basic resources and that the development of a total maximum daily load program for state waters as required by s. 303(d) of the Clean Water Act, Pub. L. No. 92-500, 33 U.S.C. ss. 1251 et seq. will promote improvements in water quality throughout the state through the coordinated control of point and nonpoint sources of pollution. The Legislature finds that, while point and nonpoint sources of pollution have been managed through numerous programs, better coordination among these efforts and additional management measures may be needed in order to achieve the restoration of impaired water bodies. The scientifically based total maximum daily load program is necessary to fairly and equitably allocate pollution loads to both nonpoint and point sources. Implementation of the allocation shall include consideration of a cost-effective approach coordinated between contributing point and nonpoint sources of pollution for impaired water bodies or water body segments and may include the opportunity to implement the allocation through nonregulatory and incentive-based programs. The Legislature further declares that the Department of Environmental Protection shall be the lead agency in administering this program and shall coordinate with local governments, water management districts, the Department of Agriculture and Consumer Services, local soil and water conservation districts, environmental groups, regulated interests, other appropriate state agencies, and affected pollution sources in developing and executing the total maximum daily load program.

(2) LIST OF SURFACE WATERS OR SEGMENTS.--In accordance with s. 303(d) of the Clean Water Act, Pub. L. No. 92-500, 33 U.S.C. ss. 1251 et seq., the department must submit periodically to the United States Environmental Protection Agency a list of surface waters or segments for which total maximum daily load assessments will be conducted. The assessments shall evaluate the water quality conditions of the listed waters and, if such waters are determined not to meet water quality standards, total maximum daily loads shall be established, subject to the provisions of subsection (4). The department shall establish a priority ranking and schedule for analyzing such waters.

(a) The list, priority ranking, and schedule cannot be used in the administration or implementation of any regulatory program. However, this paragraph does not prohibit any agency from employing the data or other information used to establish the list, priority ranking, or schedule in administering any program.

(b) The list, priority ranking, and schedule prepared under this subsection shall be made available for public comment, but shall not be subject to challenge under chapter 120.

(c) The provisions of this subsection are applicable to all lists prepared by the department and submitted to the United States Environmental Protection Agency pursuant to s. 303(d) of the Clean Water Act, Pub. L. No. 92-500, 33 U.S.C. ss. 1251 et seq., including those submitted prior to the effective date of this act, except as provided in subsection (4).

(d) If the department proposes to implement total maximum daily load calculations or allocations established prior to the effective date of this act, the department shall adopt those

calculations and allocations by rule by the secretary pursuant to ss. 120.536(1) and 120.54 and paragraph (6)(c).

(3) ASSESSMENT.--

(a) Based on the priority ranking and schedule for a particular listed water body or water body segment, the department shall conduct a total maximum daily load assessment of the basin in which the water body or water body segment is located using the methodology developed pursuant to paragraph (b). In conducting this assessment, the department shall coordinate with the local water management district, the Department of Agriculture and Consumer Services, other appropriate state agencies, soil and water conservation districts, environmental groups, regulated interests, and other interested parties.

(b) The department shall adopt by rule a methodology for determining those waters which are impaired. The rule shall provide for consideration as to whether water quality standards codified in chapter 62-302, Florida Administrative Code, are being exceeded, based on objective and credible data, studies and reports, including surface water improvement and management plans approved by water management districts and pollutant load reduction goals developed according to department rule. Such rule also shall set forth:

1. Water quality sample collection and analysis requirements, accounting for ambient background conditions, seasonal and other natural variations;

2. Approved methodologies;

3. Quality assurance and quality control protocols;

4. Data modeling; and

5. Other appropriate water quality assessment measures.

(c) If the department has adopted a rule establishing a numerical criterion for a particular pollutant, a narrative or biological criterion may not be the basis for determining an impairment in connection with that pollutant unless the department identifies specific factors as to why the numerical criterion is not adequate to protect water quality. If water quality nonattainment is based on narrative or biological criteria, the specific factors concerning particular pollutants shall be identified prior to a total maximum daily load being developed for those criteria for that surface water or surface water segment.

(4) APPROVED LIST.--If the department determines, based on the total maximum daily load assessment methodology described in subsection (3), that water quality standards are not being achieved and that technology-based effluent limitations and other pollution control programs under local, state, or federal authority, including Everglades restoration activities pursuant to s. 373.4592 and the National Estuary Program, which are designed to restore such waters for the pollutant of concern are not sufficient to result in attainment of applicable surface water quality standards, it shall confirm that determination by issuing a subsequent, updated list of those water bodies or segments for which total maximum daily loads will be calculated. In association with this updated list, the department shall establish priority rankings and schedules by which water bodies or segments will be subjected to total maximum daily load calculations. If a surface water or water segment is to be listed under this subsection, the department must specify the particular pollutants causing the impairment and the concentration of those pollutants causing the impairment relative to the water quality standard. This updated list shall be approved and amended by order of the department subsequent to completion of an assessment of each water body or water body segment, and submitted to the United States

Environmental Protection Agency. Each order shall be subject to challenge under ss. 120.569 and 120.57.

(5) REMOVAL FROM LIST.--At any time throughout the total maximum daily load process, surface waters or segments evaluated or listed under this section shall be removed from the lists described in subsection (2) or subsection (4) upon demonstration that water quality criteria are being attained, based on data equivalent to that required by rule under subsection (3).

(6) CALCULATION AND ALLOCATION.--

(a) Calculation of total maximum daily load.

1. Prior to developing a total maximum daily load calculation for each water body or water body segment on the list specified in subsection (4), the department shall coordinate with applicable local governments, water management districts, the Department of Agriculture and Consumer Services, other appropriate state agencies, local soil and water conservation districts, environmental groups, regulated interests, and affected pollution sources to determine the information required, accepted methods of data collection and analysis, and quality control/quality assurance requirements. The analysis may include mathematical water quality modeling using approved procedures and methods.

2. The department shall develop total maximum daily load calculations for each water body or water body segment on the list described in subsection (4) according to the priority ranking and schedule unless the impairment of such waters is due solely to activities other than point and nonpoint sources of pollution. For waters determined to be impaired due solely to factors other than point and nonpoint sources of pollution, no total maximum daily load will be required. A total maximum daily load may be required for those waters that are impaired predominantly due to activities other than point and nonpoint sources. The total maximum daily load calculation shall establish the amount of a pollutant that a water body or water body segment may receive from all sources without exceeding water quality standards, and shall account for seasonal variations and include a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. The total maximum daily load may be based on a pollutant load reduction goal developed by a water management district, provided that such pollutant load reduction goal is promulgated by the department in accordance with the procedural and substantive requirements of this subsection.

(b) Allocation of total maximum daily loads. The total maximum daily loads shall include establishment of reasonable and equitable allocations of the total maximum daily load between or among point and nonpoint sources that will alone, or in conjunction with other management and restoration activities, provide for the attainment of the pollutant reductions established pursuant to paragraph (a) to achieve water quality standards for the pollutant causing impairment. The allocations may establish the maximum amount of the water pollutant that may be discharged or released into the water body or water body segment in combination with other discharges or releases. Allocations may also be made to individual basins and sources or as a whole to all basins and sources or categories of sources of inflow to the water body or water body segments. An initial allocation of allowable pollutant loads among point and nonpoint sources may be developed as part of the total maximum daily load. However, in such cases, the detailed allocation to specific point sources and specific categories of nonpoint sources shall be established in the basin management action plan pursuant to subsection (7). The initial and detailed allocations shall be designed to attain the pollutant reductions established pursuant to paragraph (a) and shall be based on consideration of the following:

1. Existing treatment levels and management practices;

2. Best management practices established and implemented pursuant to paragraph (7)(c);

3. Enforceable treatment levels established pursuant to state or local law or permit;

4. Differing impacts pollutant sources and forms of pollutant may have on water quality;

5. The availability of treatment technologies, management practices, or other pollutant reduction measures;

6. Environmental, economic, and technological feasibility of achieving the allocation;

7. The cost benefit associated with achieving the allocation;

8. Reasonable timeframes for implementation;

9. Potential applicability of any moderating provisions such as variances, exemptions, and mixing zones; and

10. The extent to which nonattainment of water quality standards is caused by pollution sources outside of Florida, discharges that have ceased, or alterations to water bodies prior to the date of this act.

(c) Adoption of rules. The total maximum daily load calculations and allocations established under this subsection for each water body or water body segment shall be adopted by rule by the secretary pursuant to ss. 120.536(1), 120.54, and 403.805. Where additional data collection and analysis are needed to increase the scientific precision and accuracy of the total maximum daily load, the department is authorized to adopt phased total maximum daily loads that are subject to change as additional data becomes available. Where phased total maximum daily loads are proposed, the department shall, in the detailed statement of facts and circumstances justifying the rule, explain why the data are inadequate so as to justify a phased total maximum daily load. The rules adopted pursuant to this paragraph shall not be subject to approval by the Environmental Regulation Commission. As part of the rule development process, the department shall hold at least one public workshop in the vicinity of the water body or water body segment for which the total maximum daily load is being developed. Notice of the public workshop shall be published not less than 5 days nor more than 15 days before the public workshop in a newspaper of general circulation in the county or counties containing the water bodies or water body segments for which the total maximum daily load calculation and allocation are being developed.

(7) DEVELOPMENT OF BASIN MANAGEMENT PLANS AND IMPLEMENTATION OF TOTAL MAXIMUM DAILY LOADS.--

(a) *Basin management action plans.*--

1. In developing and implementing the total maximum daily load for a water body, the department, or the department in conjunction with a water management district, may develop a basin management action plan that addresses some or all of the watersheds and basins tributary to the water body. Such a plan shall integrate the appropriate management strategies available to the state through existing water quality protection programs to achieve the total maximum daily loads and may provide for phased implementation of these management strategies to promote timely, cost-effective actions as provided for in s. 403.151. The plan shall establish a schedule for implementing the management strategies, establish a basis for

evaluating the plan's effectiveness, and identify feasible funding strategies for implementing the plan's management strategies. The management strategies may include regional treatment systems or other public works, where appropriate, to achieve the needed pollutant load reductions.

2. A basin management action plan shall equitably allocate, pursuant to paragraph (6)(b), pollutant reductions to individual basins, as a whole to all basins, or to each identified point source or category of nonpoint sources, as appropriate. For nonpoint sources for which best management practices have been adopted, the initial requirement specified by the plan shall be those practices developed pursuant to paragraph (c). Where appropriate, the plan may provide pollutant load reduction credits to dischargers that have implemented management strategies to reduce pollutant loads, including best management practices, prior to the development of the basin management action plan. The plan shall also identify the mechanisms by which potential future increases in pollutant loading will be addressed.

3. The basin management action planning process is intended to involve the broadest possible range of interested parties, with the objective of encouraging the greatest amount of cooperation and consensus possible. In developing a basin management action plan, the department shall assure that key stakeholders, including, but not limited to, applicable local governments, water management districts, the Department of Agriculture and Consumer Services, other appropriate state agencies, local soil and water conservation districts, environmental groups, regulated interests, and affected pollution sources, are invited to participate in the process. The department shall hold at least one public meeting in the vicinity of the watershed or basin to discuss and receive comments during the planning process and shall otherwise encourage public participation to the greatest practicable extent. Notice of the public meeting shall be published in a newspaper of general circulation in each county in which the watershed or basin lies not less than 5 days nor more than 15 days before the public meeting. A basin management action plan shall not supplant or otherwise alter any assessment made under subsection (3) or subsection (4) or any calculation or initial allocation.

4. The department shall adopt all or any part of a basin management action plan by secretarial order pursuant to chapter 120 to implement the provisions of this section.

5. The basin management action plan shall include milestones for implementation and water quality improvement, and an associated water quality monitoring component sufficient to evaluate whether reasonable progress in pollutant load reductions is being achieved over time. An assessment of progress toward these milestones shall be conducted every 5 years, and revisions to the plan shall be made as appropriate. Revisions to the basin management action plan shall be made by the department in cooperation with basin stakeholders. Revisions to the management strategies required for nonpoint sources shall follow the procedures set forth in subparagraph (c)4. Revised basin management action plans shall be adopted pursuant to subparagraph 4.

(b) *Total maximum daily load implementation.*--

1. The department shall be the lead agency in coordinating the implementation of the total maximum daily loads through existing water quality protection programs. Application of a total maximum daily load by a water management district shall be consistent with this section and shall not require the issuance of an order or a separate action pursuant to s. 120.536(1) or s. 120.54 for adoption of the calculation and allocation previously established by the department. Such programs may include, but are not limited to:

a. Permitting and other existing regulatory programs, including water-quality-based effluent limitations;

b. Nonregulatory and incentive-based programs, including best management practices, cost sharing, waste minimization, pollution prevention, agreements established pursuant to s. 403.061(21), and public education;

c. Other water quality management and restoration activities, for example surface water improvement and management plans approved by water management districts or basin management action plans developed pursuant to this subsection;

d. Pollutant trading or other equitable economically based agreements;

e. Public works including capital facilities; or

f. Land acquisition.

2. For a basin management action plan adopted pursuant to subparagraph (a)4., any management strategies and pollutant reduction requirements associated with a pollutant of concern for which a total maximum daily load has been developed, including effluent limits set forth for a discharger subject to NPDES permitting, if any, shall be included in a timely manner in subsequent NPDES permits or permit modifications for that discharger. The department shall not impose limits or conditions implementing an adopted total maximum daily load in an NPDES permit until the permit expires, the discharge is modified, or the permit is reopened pursuant to an adopted basin management action plan.

a. Absent a detailed allocation, total maximum daily loads shall be implemented through NPDES permit conditions that afford a compliance schedule. In such instances, a facility's NPDES permit shall allow time for the issuance of an order adopting the basin management action plan. The time allowed for the issuance of an order adopting the plan shall not exceed 5 years. Upon issuance of an order adopting the plan, the permit shall be reopened, as necessary, and permit conditions consistent with the plan shall be established. Notwithstanding the other provisions of this subparagraph, upon request by a NPDES permittee, the department as part of a permit issuance, renewal, or modification may establish individual allocations prior to the adoption of a basin management action plan.

b. For holders of NPDES municipal separate storm sewer system permits and other stormwater sources, implementation of a total maximum daily load or basin management action plan shall be achieved, to the maximum extent practicable, through the use of best management practices or other management measures.

c. The basin management action plan does not relieve the discharger from any requirement to obtain, renew, or modify an NPDES permit or to abide by other requirements of the permit.

d. Management strategies set forth in a basin management action plan to be implemented by a discharger subject to permitting by the department shall be completed pursuant to the schedule set forth in the basin management action plan. This implementation schedule may extend beyond the 5-year term of an NPDES permit.

e. Management strategies and pollution reduction requirements set forth in a basin management action plan for a specific pollutant of concern shall not be subject to challenge under chapter 120 at the time they are incorporated, in an identical form, into a subsequent NPDES permit or permit modification.

f. For nonagricultural pollutant sources not subject to NPDES permitting but permitted pursuant to other state, regional, or local water quality programs, the pollutant reduction actions adopted in a basin management action plan shall be implemented to the maximum extent practicable as part of those permitting programs.

g. A nonpoint source discharger included in a basin management action plan shall demonstrate compliance with the pollutant reductions established pursuant to subsection (6) by either implementing the appropriate best management practices established pursuant to paragraph (c) or conducting water quality monitoring prescribed by the department or a water management district.

h. A nonpoint source discharger included in a basin management action plan may be subject to enforcement action by the department or a water management district based upon a failure to implement the responsibilities set forth in sub-subparagraph g.

i. A landowner, discharger, or other responsible person who is implementing applicable management strategies specified in an adopted basin management action plan shall not be required by permit, enforcement action, or otherwise to implement additional management strategies to reduce pollutant loads to attain the pollutant reductions established pursuant to subsection (6) and shall be deemed to be in compliance with this section. This subparagraph does not limit the authority of the department to amend a basin management action plan as specified in subparagraph (a)5.

(c) *Best management practices.*--

1. The department, in cooperation with the water management districts and other interested parties, as appropriate, may develop suitable interim measures, best management practices, or other measures necessary to achieve the level of pollution reduction established by the department for nonagricultural nonpoint pollutant sources in allocations developed pursuant to subsection (6) and this subsection. These practices and measures may be adopted by rule by the department and the water management districts pursuant to ss. 120.536(1) and 120.54, and, where adopted by rule, shall be implemented by those parties responsible for nonagricultural nonpoint source pollution.

2. The Department of Agriculture and Consumer Services may develop and adopt by rule pursuant to ss. 120.536(1) and 120.54 suitable interim measures, best management practices, or other measures necessary to achieve the level of pollution reduction established by the department for agricultural pollutant sources in allocations developed pursuant to subsection (6) and this subsection or for programs implemented pursuant to paragraph (11)(b). These practices and measures may be implemented by those parties responsible for agricultural pollutant sources and the department, the water management districts, and the Department of Agriculture and Consumer Services shall assist with implementation. In the process of developing and adopting rules for interim measures, best management practices, or other measures, the Department of Agriculture and Consumer Services shall consult with the department, the Department of Health, the water management districts, representatives from affected farming groups, and environmental group representatives. Such rules shall also incorporate provisions for a notice of intent to implement the practices and a system to assure the implementation of the practices, including recordkeeping requirements.

3. Where interim measures, best management practices, or other measures are adopted by rule, the effectiveness of such practices in achieving the levels of pollution reduction established in allocations developed by the department pursuant to subsection (6) and this subsection or in programs implemented pursuant to paragraph (11)(b) shall be verified at

representative sites by the department. The department shall use best professional judgment in making the initial verification that the best management practices are reasonably expected to be effective and, where applicable, shall notify the appropriate water management district or the Department of Agriculture and Consumer Services of its initial verification prior to the adoption of a rule proposed pursuant to this paragraph. Implementation, in accordance with rules adopted under this paragraph, of practices that have been initially verified to be effective, or verified to be effective by monitoring at representative sites, by the department, shall provide a presumption of compliance with state water quality standards and release from the provisions of s. 376.307(5) for those pollutants addressed by the practices, and the department is not authorized to institute proceedings against the owner of the source of pollution to recover costs or damages associated with the contamination of surface water or groundwater caused by those pollutants. Research projects funded by the department, a water management district, or the Department of Agriculture and Consumer Services to develop or demonstrate interim measures or best management practices shall be granted a presumption of compliance with state water quality standards and a release from the provisions of s. 376.307(5). The presumption of compliance and release shall be limited to the research site and only for those pollutants addressed by the interim measures or best management practices. Eligibility for the presumption of compliance and release shall be limited to research projects on sites where the owner or operator of the research site and the department, a water management district, or the Department of Agriculture and Consumer Services have entered into a contract or other agreement that, at a minimum, specifies the research objectives, the cost-share responsibilities of the parties, and a schedule that details the beginning and ending dates of the project.

4. Where water quality problems are demonstrated, despite the appropriate implementation, operation, and maintenance of best management practices and other measures according to rules adopted under this paragraph, the department, a water management district, or the Department of Agriculture and Consumer Services, in consultation with the department, shall institute a reevaluation of the best management practice or other measure. Should the reevaluation determine that the best management practice or other measure requires modification, the department, a water management district, or the Department of Agriculture and Consumer Services, as appropriate, shall revise the rule to require implementation of the modified practice within a reasonable time period as specified in the rule.

5. Agricultural records relating to processes or methods of production, costs of production, profits, or other financial information held by the Department of Agriculture and Consumer Services pursuant to subparagraphs 3. and 4. or pursuant to any rule adopted pursuant to subparagraph 2. are confidential and exempt from s. 119.07(1) and s. 24(a), Art. I of the State Constitution. Upon request, records made confidential and exempt pursuant to this subparagraph shall be released to the department or any water management district provided that the confidentiality specified by this subparagraph for such records is maintained.

6. The provisions of subparagraphs 1. and 2. shall not preclude the department or water management district from requiring compliance with water quality standards or with current best management practice requirements set forth in any applicable regulatory program authorized by law for the purpose of protecting water quality. Additionally, subparagraphs 1. and 2. are applicable only to the extent that they do not conflict with any rules adopted by the department that are necessary to maintain a federally delegated or approved program.

(8) RULES.--The department is authorized to adopt rules pursuant to ss. 120.536(1) and 120.54 for:

(a) Delisting water bodies or water body segments from the list developed under subsection (4) pursuant to the guidance under subsection (5);

(b) Administration of funds to implement the total maximum daily load and basin management action planning programs;

(c) Procedures for pollutant trading among the pollutant sources to a water body or water body segment, including a mechanism for the issuance and tracking of pollutant credits. Such procedures may be implemented through permits or other authorizations and must be legally binding. Prior to adopting rules for pollutant trading under this paragraph, and no later than November 30, 2006, the Department of Environmental Protection shall submit a report to the Governor, the President of the Senate, and the Speaker of the House of Representatives containing recommendations on such rules, including the proposed basis for equitable economically based agreements and the tracking and accounting of pollution credits or other similar mechanisms. Such recommendations shall be developed in cooperation with a technical advisory committee that includes experts in pollutant trading and representatives of potentially affected parties;

(d) The total maximum daily load calculation in accordance with paragraph (6)(a) immediately upon the effective date of this act, for those eight water segments within Lake Okeechobee proper as submitted to the United States Environmental Protection Agency pursuant to subsection (2); and

(e) Implementation of other specific provisions.

(9) APPLICATION.--The provisions of this section are intended to supplement existing law, and nothing in this section shall be construed as altering any applicable state water quality standards or as restricting the authority otherwise granted to the department or a water management district under this chapter or chapter 373. The exclusive means of state implementation of s. 303(d) of the Clean Water Act, Pub. L. No. 92-500, 33 U.S.C. ss. 1251 et seq. shall be in accordance with the identification, assessment, calculation and allocation, and implementation provisions of this section.

(10) CONSTRUCTION.--Nothing in this section shall be construed as limiting the applicability or consideration of any mixing zone, variance, exemption, site specific alternative criteria, or other moderating provision.

(11) IMPLEMENTATION OF ADDITIONAL PROGRAMS.--

(a) The department shall not implement, without prior legislative approval, any additional regulatory authority pursuant to s. 303(d) of the Clean Water Act or 40 C.F.R. part 130, if such implementation would result in water quality discharge regulation of activities not currently subject to regulation.

(b) Interim measures, best management practices, or other measures may be developed and voluntarily implemented pursuant to paragraph (7)(c) for any water body or segment for which a total maximum daily load or allocation has not been established. The implementation of such pollution control programs may be considered by the department in the determination made pursuant to subsection (4).

(12) In order to provide adequate due process while ensuring timely development of total maximum daily loads, proposed rules and orders authorized by this act shall be ineffective pending resolution of a s. 120.54(3), s. 120.56, s. 120.569, or s. 120.57 administrative proceeding. However, the department may go forward prior to resolution of such administrative proceedings with subsequent agency actions authorized by subsections (2)-(6), provided that the department can support and substantiate those actions using the underlying bases for the

rules or orders without the benefit of any legal presumption favoring, or in deference to, the challenged rules or orders.

**History.**--s. 3, ch. 99-223; s. 10, ch. 99-353; s. 3, ch. 2000-130; s. 1, ch. 2001-74; s. 1, ch. 2002-165; s. 17, ch. 2002-295; s. 10, ch. 2003-265; s. 6, ch. 2005-166; s. 13, ch. 2005-291; s. 1, ch. 2006-76; s. 10, ch. 2006-289.

# APPENDIX C. TMDL PROGRAM OVERVIEW

TMDLs are developed, allocated, and implemented through a **watershed management approach** (managing water resources within their natural boundaries) that addresses the state's 52 major hydrologic basins in five groups, on a rotating schedule. **Table C-1** shows the hydrologic basins within each of the five groups, with the DEP district office of jurisdiction. **Table C-2** illustrates the repeating five-year basin rotation schedule.

**Table C-1. Major hydrologic basins by group and DEP district office**

| *DEP District* | *Group 1 Basins* | *Group 2 Basins* | *Group 3 Basins* | *Group 4 Basins* | *Group 5 Basins* |
|---|---|---|---|---|---|
| **Northwest** | Ochlockonee–St. Marks | Apalachicola–Chipola | Choctawhatchee–St. Andrews Bay | Pensacola Bay | Perdido Bay |
| **Northeast** | Suwannee | Lower St. Johns | | Nassau–St. Marys | Upper East Coast |
| **Central** | Ocklawaha | Middle St. Johns | Upper St. Johns | Kissimmee | Indian River Lagoon |
| **Southwest** | Tampa Bay | Tampa Bay Tributaries | Sarasota Bay–Peace–Myakka | Withlacoochee | Springs Coast |
| **South** | Everglades West Coast | Charlotte Harbor | Caloosahatchee | Fisheating Creek | Florida Keys |
| **Southeast** | Lake Okeechobee | St.Lucie–Loxahatchee | Lake Worth Lagoon–Palm Beach Coast | Southeast Coast Biscayne Bay | Everglades |

Each group will undergo a cycle of five phases on a rotating schedule, as follows:

***Phase 1**:* Preliminary evaluation *of water quality*
***Phase 2**:* Strategic monitoring and assessment *to verify water quality impairments*
***Phase 3**:* Development and adoption of TMDLs *for waters verified as impaired*
***Phase 4**:* Development of basin management action plan *(BMAP) to achieve the TMDL*
***Phase 5**:* Implementation *of the BMAP and monitoring of results*

**Table C-2. Basin rotation schedule for TMDL development and implementation**

| YEAR | 00/01 | 01/02 | 02/03 | 03/04 | 04/05 | 05/06 | 06/07 | 07/08 | 08/09 | 09/10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | PHASES OF THE CYCLE | | | | | PHASES OF THE CYCLE | | | | |
| GROUP 1 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| GROUP 2 | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 |
| GROUP 3 | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 |
| GROUP 4 | | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 |
| GROUP 5 | | | | | 1 | 2 | 3 | 4 | 5 | 1 |
| | 1st Five-year Cycle – High-priority Waters | | | | | 2nd Five-year Cycle – Medium-Priority Waters | | | | |

* Projected years for Phases 3, 4, and 5 may change due to accelerated local activities, length of plan development, legal challenges, etc.

TMDL development and implementation are ongoing, cyclical processes, as illustrated in **Table C-2**. DEP will re-evaluate impaired waters every five years to determine whether improvements are being achieved, and to refine loading estimates and TMDL allocations using new data. If any changes in a TMDL are required, the applicable TMDL rule will be revised, thereby providing a point of legal entry for interested parties. Changes to a TMDL would prompt revisions to the applicable BMAP, which will be revisited at least every five years and modified as necessary.

# APPENDIX D. SUMMARY OF STATUTORY PROVISIONS GUIDING BMAP DEVELOPMENT AND IMPLEMENTATION

## SECTIONS 403.067(6) AND (7), FLORIDA STATUTES - *Summary of Excerpts*

### *ALLOCATIONS*

- The TMDL shall include reasonable and equitable allocations of the TMDL between or among point and nonpoint sources that will alone, or in conjunction with other management and restoration activities, provide for the attainment of pollutant reductions established pursuant to paragraph (a) to achieve applicable water quality standards.
- The allocations may establish the maximum amount of the pollutant that may be discharged or released in combination with other discharges or releases.
- Allocations may also be made to individual basins and sources or as a whole to all basins and sources or categories of sources of inflow to the water body or water body segments.
- An initial allocation of allowable pollutant loads may be developed as part of the TMDL; in such cases detailed allocations to specific point sources and categories of nonpoint sources shall be established in the basin management action plan.
- The initial and detailed allocations shall be designed to attain pollutant reductions established pursuant to paragraph (a) and shall be based on consideration of:
    1. Existing treatment levels and management practices;
    2. Best management practices established and implemented pursuant to pargraph (7)(c);
    3. Enforceable treatment levels established pursuant to state or local law or permit;
    4. Differing impacts pollutant sources may have on water quality;
    5. The availability of treatment technologies, management practices, or other pollutant reduction measures;
    6. Environmental, economic, and technological feasibility of achieving the allocation;
    7. The cost benefit associated with achieving the allocation;
    8. Reasonable timeframes for implementation;
    9. Potential applicability of any moderating provisions such as variances, exemptions, and mixing zones; and
    10. The extent to which non-attainment of water quality standards is caused by pollution sources outside of Florida, discharges that have ceased, or alterations to water bodies prior to the date of this act.

### *GENERAL IMPLEMENTATION*

- **DEP is the lead agency** in coordinating TMDL implementation, through existing water quality protection programs.
- **Application of a TMDL by a water management** district does not require WMD adoption of the TMDL.
- **TMDL implementation may include**, but is not limited to:
    - Permitting and other existing regulatory programs
    - Non-regulatory and incentive-based programs
    - Other water quality management and restoration activities, such as Surface Water Improvement and Management (SWIM) plans or **basin management action plans**
    - Pollutant trading or other equitable economically based agreements
    - Public works
    - Land acquisition

***BASIN MANAGEMENT ACTION PLAN DEVELOPMENT***

- DEP may develop a basin management action plan that addresses some or all of the watersheds and basins tributary to a TMDL waterbody.
- A basin management action plan **shall**:
  - Integrate appropriate management strategies available to the state through existing water quality protection programs.
  - Equitably allocate pollutant reductions to individual basins, all basins, each identified point source, or category of nonpoint sources, as appropriate.
  - Identify the mechanisms by which potential future increases in pollutant loading will be addressed.
  - Specify that for nonpoint sources for which BMPs have been adopted, the initial requirement shall be BMPs developed pursuant to paragraph (c).
  - Establish an implementation schedule.
  - Establish a basis for evaluating plan effectiveness.
  - Identify feasible funding strategies.
  - Identify milestones for implementation and water quality improvement, and an associated water quality monitoring component to evaluate reasonable progress over time.
  - Be adopted in whole or in part by DEP Secretarial Order, subject to chapter 120.
- A basin management action plan **may**:
  - Give load reduction credits to dischargers that have implemented load reduction strategies (including BMPs) prior to the development of the BMAP. (*Note: this assumes the related reductions were not factored into the applicable TMDL*.)
  - Include regional treatment systems or other public works as management strategies.
  - Provide for phased implementation to promote timely, cost-effective actions.
- An assessment of progress in achieving milestones shall be conducted every 5 years and the basin management action plan revised, as appropriate, in cooperation with basin stakeholders, and adopted by secretarial order.
- DEP shall assure that key stakeholders are invited to participate in the basin management action plan development process, holding at least one noticed public meeting in the basin to receive comments, and otherwise encouraging public participation to the greatest practicable extent.
- A basin management action plan shall not supplant or alter any water quality assessment, TMDL calculation, or initial allocation.

***BASIN MANAGEMENT ACTION PLAN IMPLEMENTATION***

- NPDES Permits
  - Management strategies related to a discharger subject to NPDES permitting shall be included in subsequent applicable NPDES permits or permit modifications when the permit expires (is renewed), the discharge is modified (revised), or the permit is reopened pursuant to an adopted BMAP.
  - Absent a detailed allocation, TMDLs shall be implemented through NPDES permit conditions that include a compliance schedule. The permit shall allow for issuance of an order adopting the BMAP within five years. (***Note**: Intended to apply to individual wastewater permits – not MS4s*)
  - Once the BMAP is adopted, the permit shall be reopened, as necessary, and permit conditions consistent with the BMAP shall be established.
  - Upon request by a NPDES permittee, DEP may establish individual allocations prior to the adoption of a BMAP, as part of a permit issuance, renewal, or modification (revision).
  - To the maximum extent practicable, MS4s shall implement a TMDL or BMAP through the use of BMPs or other management measures.

  - A BMAP does not take the place of NPDES permits or permit requirements.
  - Management strategies to be implemented by a DEP permittee shall be completed according to the BMAP schedule, which may extend beyond the 5-year term of an NPDES permit.
  - Management strategies are not subject to challenge under chapter 120 when they are incorporated in identical form into a NPDES permit or permit modification (revision).
- Management strategies assigned to nonagricultural, non-NPDES permittees (state, regional, or local) shall be implemented as part of the applicable permitting programs.
- Nonpoint source dischargers (e.g., agriculture) included in a BMAP shall demonstrate compliance with the applicable TMDLs by either implementing appropriate BMPs established under paragraph 7(c), or conducting water quality monitoring prescribed by **DEP or a WMD**. (***Note****: this is not applicable to MS4s, as they are considered point sources under the federal Clean Water Act and TMDL Program*.)
  - Failure to implement BMPs or prescribed water quality monitoring may be subject to **DEP or WMD** enforcement action.
- Responsible parties who are implementing applicable BMAP strategies shall not be required to implement additional pollutant load reduction strategies, and shall be deemed in compliance with this section. However, this does not limit DEP's authority to amend a BMAP.

***BEST MANAGEMENT PRACTICES***

- DEP, in cooperation with WMDs and other interested parties, may develop interim measures, BMPs, or other measures for non-agricultural nonpoint sources to achieve their load reduction allocations.
  - These measures may be adopted by **DEP or WMD** rule. If adopted, they shall be implemented by those responsible for non-agricultural nonpoint source pollution.
- DACS may develop and adopt by rule interim measure, BMPs, or other measures necessary for agricultural pollutant sources to achieve their load reduction allocations.
  - These measures may be implemented by those responsible for agricultural pollutant sources. **DEP, the WMDs, and DACS** shall assist with implementation.
  - In developing and adopting these measures, DACS shall consult with DEP, DOH, the WMDs, representatives of affected farming groups, and environmental group representatives.
  - The rules shall provide for a notice of intent to implement the practices and a system to ensure implementation, including recordkeeping.
- Verification of Effectiveness and Presumption of Compliance -
  - DEP shall, at representative sites, verify the effectiveness of BMPs and other measures adopted by rule in achieving load reduction allocations.
  - DEP shall use best professional judgment in making the initial verification of effectiveness, and shall notify **DACS and the appropriate WMD** of the initial verification prior to the adoption of a rule proposed pursuant to this paragraph.
  - Implementation of rule-adopted BMPs or other measures initially verified by DEP to be effective, or verified to be effective by monitoring at representative sites, provides a presumption of compliance with state water quality standards for those pollutants addressed by the practices.
- Reevaluation –
  - Where water quality problems are demonstrated despite implementation, operation, and maintenance of rule-adopted BMPs and other measures, **DEP, a WMD, or DACS**, in consultation with DEP, shall reevaluate the measures. If the practices require modification, the revised rule shall specify a reasonable time period for implementation.

# APPENDIX E. LIST OF PROJECTS IN THE ORANGE CREEK BASIN

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| **Orange Creek Basinwide Projects** | | | | | | | |
| ALACHUA02 - Water Quality Protection Public Education and Outreach /<br><br>Addresses Bacteria and Nutrient TMDL | Orange Creek Basin / HUC 03080102 | ACEPD; Alachua County, city of Gainesville, DOT, District 2 (GCWP); SJRWMD / -- | $30,000 annually (WAV Program countywide) / Alachua County, city of Gainesville, DOT, District 2 (GCWP) and SJRWMD cost-share / Ongoing | Alachua County / Public education to promote stormwater nutrient (nitrogen and phosphorus) reduction to protect ground water and surface water resources. **Benefits:** Reduce pollutant concentrations in stormwater runoff; public education effort to demonstrate importance of preventing nonpoint source pollution; implement Alachua County Comp Plan Conservation and Open Space Element - Education and Outreach Objective 2.2; Surface Water Systems Objective 4.6; Alachua County Unified Land Development Code (ULDC) - 406.43 Water Resources Buffers; ULDC 407.56 Requirements for Stormwater Management Areas used as Open Space; ULDC Article 9 Stormwater Management. | Not applicable / Not applicable | Alachua County; city ofGainesville / MS4 Phase II / FLR04E005; FLR04E006 / -- | Education and Outreach Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| ALACHUA03 - Water Quality Protection BMP Training /<br><br>Addresses Nutrient TMDL | Orange Creek Basin / HUC 03080102 | ACEPD / Alachua County, city ofGainesville, DOT, District 2 (GCWP) | $20,000 annually / Alachua County, city ofGainesville, DOT, District 2 (GCWP) Cost-share / Unknown | Alachua County / Training and education for contractors and agricultural interests in sedimentation and erosion control and nutrient management to improve stormwater quality. Newnans Lake is impaired for nutrients. Lake Lochloosa and Orange Lake have deteriorating water quality and increased suspended solids and nutrients. **Benefits:** Reduce pollutant concentrations in stormwater runoff; public education effort to demonstrate importance of preventing nonpoint source pollution; implement Alachua County Comp Plan Conservation and Open Space Element - Education and Outreach Objective 2.2; Surface Water Systems Objective 4.6; Alachua County Unified Land Development Code (ULDC) - 406.43 Water Resources Buffers; ULDC Article 9 Stormwater Management. | Unknown / Unknown | Alachua County; city ofGainesville; / MS4 Phase II / FLR04E005; FLR04E006 / -- | Education and Outreach Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| ALCODE01 - Alachua County Water Quality Code Implementation /<br><br>Addresses Bacteria and Nutrient TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | ACEPD / Alachua County, city ofGainesville, DOT, District 2 (GCWP) | $17,4,00 / Alachua County, city ofGainesville, DOT, District 2 (GCWP) cost-share / Ongoing | Alachua County / Alachua County Water Quality Code Implementation for Tumblin Creek, Sweetwater Branch, and Hogtown Creek. Public education, outreach, and enforcement. **Benefits:** Reduction of pollutant concentrations in stormwater runoff. Implementation of Alachua County Code Chapter 77, Water Quality Standards and Management Practices. | Not applicable / Not applicable | Alachua County; city ofGainesville; / MS4 Phase II / FLR04E005; FLR04E006; / | Regulations, Ordinances, and Guidelines |
| NUTRIENT03 - Silviculture BMP Implementation and Compliance /<br><br>Addresses Nutrient TMDL | Orange Lake; Newnans Lake; Lake Lochloosa; Cross Creek / 2749; 2738A; 2754; 2705B | DACS, Division of Forestry / | Not available / / Ongoing | Silviculture lands in Alachua County and Marion County / BMPs for silviculture applied to industrial, public, and private lands. Silviculture BMP implementation and compliance. Silviculture BMPs were established in mid-1970s in response to Clean Water Act, and revised most recently in 2004. These BMPS are minimum standards for protecting and maintaining water quality and wildlife habitat during forestry activities. BMPs address fertilization, and new projects include annual basinwide BMP survey and targeted training. **Benefits:** Protection of streams and lakes from surface runoff from silviculture activities. | Unknown / Unknown | -- / -- / -- / -- | Agricultural BMPs |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| NUTRIENT06 - Cow/Calf BMPs /<br><br>Addresses Nutrient TMDL | Newnans Lake; Orange Lake; Lake Lochloosa; Cross Creek / 2749A; 2705B; 2738A; 2754 | DACS, OAWP / Private landowners | Not available / General Inspection Trust Fund / Manual under development. Manual adoption expected by early 2008; implementation will be ongoing | Marion County primarily; Alachua County / Cow/Calf BMP implementation and effectiveness verification. BMPs and manual under development. BMP implementation and effectiveness verification will be priority focus for DACS in this basin as result of TMDL Program. **Benefits:** Protection of streams and lakes from surface runoff generated by agricultural operations. | Unknown / Unknown | -- / -- / -- / -- | Agricultural BMPs |
| NUTRIENT07 - Container Nursery BMPs /<br><br>Addresses Nutrient TMDL | Newnans Lake; Orange Lake; Lake Lochloosa; Cross Creek / 2749A; 2705B; 2738A; 2754 | DACS, OAWP / Private landowners | Not available / General Inspection Trust Fund / BMP manual adopted; implementation will be ongoing | Marion County primarily; Alachua County / Container Nursery BMP implementation and effectiveness verification. BMP manual adopted by DACS rule. However, number of container nursery operations in basin is minimal. DACS will evaluate need for BMP enrollment and implementation assurance for container nurseries. **Benefits:** Protection of streams and lakes from surface runoff generated by agricultural operations. | Unknown / Unknown | -- / -- / -- / -- | Agricultural BMPs |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| NUTRIENT08 - Sod BMPs /<br><br>Addresses Nutrient TMDL | Newnans Lake; Orange Lake; Lake Lochloosa; Cross Creek / 2749A; 2705B; 2738A; 2754 | DACS, OAWP / Private landowners | Not available / General Inspection Trust Fund / Draft manual complete. BMP manual adoption expected by early 2008; implementation will be ongoing | Marion County primarily; Alachua County / Sod operation BMP implementation and effectiveness verification. Draft BMP manual complete. BMPs being finalized for rule adoption. However, sod farm acreage in this basin is minimal. DACS will evaluate need for BMP enrollment and implementation assurance for sod operations. **Benefits:** Protection of streams and lakes from surface runoff generated by agricultural operations. | Unknown / Unknown | -- / -- / -- / -- | Agricultural BMPs |
| OCB01 - Community Based Social Marketing Workshop /<br><br>Addresses Bacteria and Nutrient TMDL | Orange Creek Basin / HUC 03080102 | Sustainable Alachua County; DEP; city ofGainesville; Alachua County;GRU / | $25,000 / EPA Section 319 federal funds / January 17-19, 2007 | Orange Creek Basin / Three-day workshop composed of one-day Introductory Workshop and two-day Advanced Workshop to teach principles of social marketing and how to foster sustainable behavior. **Benefits:** Enhance public education and outreach efforts. Also promotes organizational structures that are compatible with sustainability. | Not applicable / Not applicable | -- / -- / -- / -- | Education and Outreach Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| OR05 - Vegetable and Agronomic Crop BMPs /<br><br>Addresses Nutrient TMDL | Orange Lake; Newnans Lake; Lake Lochloosa; Cross Creek / 2749A; 2705B; 2738A; 2754 | DACS, OAWP / Private landowners. | Not available / General Inspection Trust Fund / Manual adopted. Implementation Ongoing | Marion County primarily; Alachua County / Row Crop BMP implementation and effectiveness verification. BMP manual adopted by DACS rule. However, row crop acreage in basin is minimal. DACS will evaluate need for BMP enrollment and implementation assurance for row crops. **Benefits:** Protection of streams and lakes from surface runoff generated by agricultural activities. | Unknown / Unknown | -- / -- / -- / -- | Agricultural BMPs |
| OR06 - Equine BMPs /<br><br>Addresses Nutrient TMDL | Orange Lake; Newnans Lake; Lake Lochloosa; Cross Creek / 2749A; 2705B; 2738A; 2754 | DACS, OAWP / Private landowners | Not available / General Inspection Trust Fund / BMP manual under development. BMP manual adoption expected by early 2008; implementation will be ongoing | Marion County primarily; Alachua County / Horse Farm BMP implementation and effectiveness verification. BMPs and manual under development. BMP implementation and effectiveness verification will be priority focus for DACS in basin as a result of TMDL Program. **Benefits:** Protection of streams and lakes from surface runoff generated by agricultural activities. | Unknown / Unknown | -- / -- / -- / -- | Agricultural BMPs |
| **Orange Creek Basin–Urbanized Area Projects** | | | | | | | |
| BACTERIA07 - Inflow and Infiltration Project - Phases I, II and III /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | GRU / | $2.372 million, FY 2002–06, about $474,000 / yr; $57 million FY 2007 (thru 7/5) / GRU | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / Inflow and Infiltration Project - Phase I, II, and III comprise intensive | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| | | | ratepayers / Ongoing | wastewater collection system integrity testing that utilizes smoke testing, dye testing, closed circuit TV camera, and visual inspection to identify pipes with inflow and infiltration problems. Inspection followed by remedial repair of system defects. Phase III concentrated on covering all GRU wastewater service area in Hogtown Creek, Tumblin Creek, and Sweetwater Branch watersheds. Minimizes possibility of wastewater releases. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area projects. | | | |
| BACTERIA08 - Slip Lining Projects /<br><br>Addresses Bacteria and | Tumblin Creek; Sweetwater Branch; Hogtown | GRU / | $4.7 million FY 1998–2006, about $522,000 / yr; $5,000 FY | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / Trenchless | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| nutrient TMDL | Creek / 2718A; 2711; 2698 | | 2007 (thru 7/5) / GRU ratepayers / Ongoing | restoration of city of Gainesville's Wastewater Collection System through sliplining. Though sliplining has been performed all over Gainesville wastewater service area, major part of sliplining work occurred in Tumblin Creek, Sweetwater Branch, and Hogtown Creek watersheds (>$1 million). Sliplining minimizes possibility of wastewater releases to creek. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area. | | Wastewater / FL0027251 / | |
| BACTERIA09 - GRU Lift Station Annual Operation and Maintenance /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | GRU / | $1.236 million FY 2002–07, about $247,000 / yr; $346,000 FY 2007 (thru 8/1) / GRU ratepayers / Ongoing | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / Maintenance of city of Gainesville's wastewater collection system to maintain system integrity of lift stations. Includes control cabinet | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | replacements, wetwell coating, pump replacements, generators, odor control, soft start replacements, and overall lift station upgrades. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area projects. | | | |
| BACTERIA10 - GRU Wastewater System Future Capital Projects /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | GRU / | $52.542 million FY 2002–06, about $10.508 million / yr; $5.592 million FY 2007 (thru 7/5) / GRU ratepayers / | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / Capital improvements to city of Gainesville wastewater treatment and collection system. Includes all capital projects. Projects may include upgrades to force mains and gravity mains with rehabilitation and restoration force main rerouting, collection system integrity testing, ARV replacement, sliplining, lift station | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | abandonment, manhole replacement, service lateral cleanout, and miscellaneous repair, wastewater treatment facility upgrades and expansion. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area projects. | | | |
| BACTERIA11 - GRU Wastewater Collection System Annual Rehabilitation and Replacement /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | GRU / | $14.129 million FY 2002–06, about $2.826 million / yr; $671,000 FY 2007 (thru 7/5) / GRU ratepayers / Ongoing | GRU WW Collection System Service Area (115 square miles) / Urban Creek Watersheds / Rehabilitation and replacement of city of Gainesville's wastewater collection system to maintain system integrity. Minimizes possibility of wastewater release. Includes rehabilitation and upgrade of existing force mains and gravity mains. **Benefits:** Though no association between background fecal coliform levels and GRU's | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area projects. | | | |
| BACTERIA12 - GRU Lift Station Rehabilitation and Replacement /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | GRU / | $4.29 million FY 2002–06, about $878,000 / yr; $412,000 FY 2007 (thru 7/5) / GRU ratepayers / Ongoing | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / Rehabilitation and replacement of city of Gainesville's wastewater collection system to maintain system integrity. Helps minimize possibility of wastewater release. Includes GRU Lift Station Rehabilitation and Replacement; Upgrades; Abandonment plus extension. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| | | | | project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area projects. | | | |
| BACTERIA13 - GRU Wastewater Collection System Annual Operation and Maintenance /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | GRU / | $8.874 million FY 2002–06, about $1.775 million / yr; $1.342 million FY 2007 (8/1) / GRU ratepayers / Ongoing | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / GRU Wastewater Collection System Annual Operation and Maintenance to maintain system integrity that minimizes possibility of wastewater release. Minimizes possibility of wastewater release. Includes rehabilitation and upgrade of existing force mains and gravity mains. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area projects. | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| BACTERIA14 - Water/Wastewater Engineering Dept. Annual Operation and Maintenance Services /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek; Tumblin Creek; Sweetwater Branch; Alachua Sink / 2698; 2711; 2718A; 2720A | GRU / | $2.737 million FY 2002–06, about $547,000 / yr; $501,000 FY 2007 (thru 8/1) / GRU ratepayers /Ongoing | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / Water/Wastewater Engineering Dept. executes five-year scheduling system for initiating and administrating wastewater capital projects. Projects are timed and prioritized to ensure that facilities are available in timely manner to meet demands as needed to correct existing flow deficiencies, meet existing and future demands, maintain or improve system reliability and maintainability, minimize contamination potential, and comply with Florida Statutes including concurrence requirements. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. | Not applicable / Not applicable | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Special Studies and Panning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| BACTERIA15 - GRU Wastewater Collection System Annual Service Lateral Rehabilitation and Replacement /<br><br>Addresses Bacteria TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek / 2698; 2711; 2718A | GRU / | $1.765 million FY 2002–06, about $353,000 / yr; $295,000 FY 2007 (thru 7/5) / GRU ratepayers / Ongoing | GRU Wastewater Collection System Service Area (115 square miles) / Urban Creek Watersheds / Rehabilitation and replacement of city of Gainesville's wastewater collection system to maintain system integrity, specifically service laterals and cleanouts. **Benefits:** Though no association between background fecal coliform levels and GRU's Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU Wastewater Collection System Service Area projects. | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |
| MSPERMIT01 - City of Gainesville Water Pollution Prevention Program - NPDES MS4 Permit /<br><br>Addresses Bacteria and nutrient TMDL | Tumblin Creek; Sweetwater Branch; Little Hatchet Creek; Lake Forest Creek; Hogtown Creek / 2718A; 2718A; 2695; 2709; 2711; 2698 | City of Gainesville / Alachua County; DOT, District 2; Alachua County, DOT, District 2 | $2,899,500 total; $929,300 is city's share / city ofGainesville Stormwater Management Utility Fee; city ofGainesville, Alachua County, and DOT District 2 | Urbanized area of Gainesville/ Alachua County / Multiple public outreach and education programs, illicit discharge detection and elimination programs, mapping and modeling efforts, construction site pollution prevention programs, and municipal operations pollution prevention programs. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Basic Stormwater Management Program Implementation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | (GCWP) cost-share / Ongoing | **Benefits:** 40% reduction in TN and 49% reduction in TP loadings. Remove illicit connections; BMP implementation. Potential for reduction in loadings. | | | |
| MSPERMIT02 - Alachua County Water Pollution Prevention Program - NPDES MS4 Permit /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2709 | Alachua County Public Works / city ofGainesville; DOT, District 2 | $2,899,500 total; $594,500 is county's share / Cost shared by city of Gainesville, Alachua County, DOT District 2 (GCWP) / Ongoing | Urbanized area of Gainesville/ Alachua County / Multiple public outreach and education programs, illicit discharge detection and elimination programs, mapping and modeling efforts, construction site pollution prevention programs, and municipal operations pollution prevention programs. **Benefits:** Remove illicit connections; BMP implementation. Potential for reduction in loadings. | Unknown / Unknown | Alachua County / MS4 Phase II / FLR04E005 / | Basic Stormwater Management Program Implementation |
| MSPERMIT03 - Florida Department of Transportation, District 2, Alachua County Water Pollution Prevention Program - NPDES MS4 Permit /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2709 | DOT, District 2 / Alachua County, city ofGainesville | $2,899,500 total; $691,500 is DOT District 2's share / Cost shared by city of Gainesville, Alachua County, DOT District 2 (GCWP) / Ongoing | Urbanized area of Gainesville/ Alachua County / Multiple public outreach and education programs, illicit discharge detection and elimination programs, mapping and modeling efforts, construction site pollution prevention programs, and municipal operations pollution prevention programs. **Benefits:** Remove illicit connections; BMP implementation. Potential for reduction in loadings. | Unknown / Unknown | DOT, District 2 / MS4 Phase II / FLR04E018 / | Basic Stormwater Management Program Implementation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| URBAN01 - Street Sweeping /<br><br>Addresses Bacteria and nutrient TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2709 | City of Gainesville / | $568,000 / city ofGainesville Stormwater Management Utility Fee / Ongoing | Urban Area / Benchmark frequency for sweeping downtown area is twice per week in early morning with additional sweeping as needed during special events. Benchmark sweeping frequency for major roads is once every 4 weeks or as needed. Benchmark frequency of sweeping for residential areas is about 9 times annually. Performance measure of debris and sediment collected is 17,000 cubic yards per year. **Benefits:** Remove debris, sediment, and potential pollutants from streets. Prevent entry into storm sewer system. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Basic Stormwater Management Program Implementation |
| URBAN04 - State Roads Street Sweeping /<br><br>Addresses Bacteria and nutrient TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2709 | DOT, District 2 / | Not available / DOT, District 2 / Ongoing | Urban Area / Street sweeping of state roads within urbanized areas that have curb and gutter. Includes US 441, SR 26, SR 20, SR 24, SR 128, SR 222, and SR 121. Areas are swept by city of Gainesville and contract personnel for DOT. Benchmark sweeping frequency is minimum of quarterly. Performance benchmark for debris collected is 125 tons per year. **Benefits:** Remove debris, sediment, and | 2251 / 6110 | DOT, District 2 / MS4 Phase II / FLR04E018 / | Basic Stormwater Management Program Implementation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| | | | | potential pollutants from streets. Prevent entry into storm sewer system. | | | |
| URBAN07 - Assessment Tool for MS4 Pollutant Load Reduction /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2709 | City of Gainesville / UF; Florida Stormwater Association | $13,000 / Florida Stormwater Association / 2007 | Urban Area / UF study to determine load reductions for MS4 operations. Load reductions will be determined for baffle boxes and street sweeping. **Benefits:** Provide methods that will allow calculation of loading reductions from accepted pollutant prevention and removal practices. | Not applicable / Not applicable | City of Gainesville / MS4 Phase II / FLR04E006 / | Special Studies and Planning Efforts |
| URBAN08 - Alachua County Roads Street Sweeping /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2709 | Alachua County / | Not available / / Ongoing | Urban Area / Sweeping of Alachua County–maintained roads within urbanized area. Benchmark frequency for sweeping of roads with curb and gutter is recurring 60-day cycle. **Benefits:** Remove debris, sediment, and potential pollutants from streets. Prevent entry into storm sewer system. | Unknown / Unknown | Alachua County / MS4 Phase II / FLR04E005 / | Basic Stormwater Management Program Implementation |
| URBAN11 - DOT Storm Sewer Geodatabase – Alachua County /<br><br>Addresses Bacteria and Nutrient TMDL | HUC 03080102 / Orange Creek Basin / | DOT, District 2 / Alachua County; city ofGainesville | $272,375 / DOT, District 2 / Ongoing | Alachua County / Maintain comprehensive geodatabase for DOT-related storm sewer system data in Alachua County. Coordinate with city of Gaineville and Alachua County Public Works for data compatibility. **Benefits:** | Not applicable / Not applicable | DOT, District 2 / MS4 Phase II / FLR04E018 / | Basic Stormwater Management Program Implementation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| URBAN12 - Sanitary Sewer System Geodatabase /<br><br>Addresses Bacteria and Nutrient TMDL | HUC 03080102 / Orange Creek Basin / | GRU / | Part of Water/ Wastewater Engineering O&M Budget / Part of Water/ Wastewater Engineering O&M Budget / Ongoing | Gainesville and environs (GRU Service Area) / Maintain comprehensive geodatabase for all GRU sanitary sewer system data. This includes any geodata acquired from studies related to water quality, such as septic tank studies and I&I data. **Benefits:** | Not applicable / Not applicable | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |
| URBAN13 - Gainesville Urban Area Storm Sewer Geodatabase /<br><br>Addresses Bacteria and Nutrient TMDL | HUC 03080102 / Orange Creek Basin / | City of Gainesville and Alachua County Public Works / Alachua County; city ofGainesville; DOT, District 2 | $1,575,000 / Costs shared by city of Gainesville, Alachua County, and DOT District 2 over 7 year period / Ongoing | Gainesville Urban Area / Maintain comprehensive geodatabase for city of Gainesville and Alachua County storm sewer system data, watershed boundaries and hydrologic features in Gainesville Urban Area. Coordinate with DOT for data compatibility. **Benefits:** | Not applicable / Not applicable | Alachua County; city of Gainesville / MS4 Phase II / FLR04E005; FLR04E006 / | Basic Stormwater Management Program Implementation |
| **Urban Creeks Watersheds–Hogtown and Tumblin Creeks and Sweetwater Branch** | | | | | | | |
| BACTERIA01 - Bacterial Source Tracking /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch / 2718A; 2711 | ACEPD / | $24,600 / Alachua County / Aug-03 | City of Gainesville / Bacterial source tracking by antibiotic resistance analysis (ARA) and discriminate ribotype analysis (ribotyping). **Benefits:** Fecal coliform bacteria source identification using ARA, ribotyping, and enumeration of fecal coliform and Enterococci bacteria. Implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| BACTERIA02 - Fecal Coliform Source Assessment /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | ACEPD / Alachua County, city of Gainesville, DOT, District 2 (GCWP) | $45,000 / Currently partially funded; Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share / Sept-07 | City of Gainesville; Alachua County / Fecal coliform source assessment using expanded microbiological sampling and selected MST techniques. **Benefits:** MST – Phased approach assessment with expanded bacteriological monitoring and human-specific MST at selected sites. Implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | Not applicable / Not applicable | Alachua County; city of Gainesville; DOT, District 2 / MS4 Phase II / FLR04E005; FLR04E006; FLR04E018 / | Special Studies and Planning Efforts |
| BACTERIA03 - Coliform Wet and Dry Season Assessment /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | ACEPD / Alachua County, city of Gainesville, DOT, District 2 (GCWP) | $15,000 / Currently partially funded; Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share / Jul-07 | Gainesville urban area / Assessment of wet and dry season fecal coliform concentrations in surface waters at selected stations. **Benefits:** Provide data for wet season and dry season coliform concentrations for use in determining baseline conditions and achievable load reductions; implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | Not applicable / Not applicable | Alachua County; city of Gainesville; / MS4 Phase II / FLR04E005; FLR04E006; / | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| BACTERIA04 - Expanded Fecal Coliform Bacteria Monitoring /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | ACEPD / | $30,000 / Alachua County / Ongoing | Gainesville urban area / Expanded baseflow fecal coliform monitoring to better identify stream segments with high bacterial counts. **Benefits:** Determine current water quality and water level conditions in Tumblin Creek, Hogtown Creek, and Sweetwater Branch. Implement Comp Plan Conservation and Open Space Element -Surface Water Systems Objective 4.6. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| BACTERIA05 - Microbial Source Tracking Study /<br><br>Addresses Bacteria TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698 | GRU / | $315,000 / GRU ratepayers / Ongoing | Gainesville urban creeks within GRU wastewater collection system service area (115 square miles). / MST study to better understand relative contributions of various sources of fecal pollution in creeks. Study applies advanced scientific methods to determine relative contribution of each potential source and identifies locations where human fecal pollution is present or absent. **Benefits:** Better identification of bacterial contamination sources. | Not applicable / Not applicable | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Special Studies and Planning Efforts |
| BACTERIA06 - Optical Brighteners /<br><br>Addresses Bacteria and Nutrient TMDL | Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; | ACEPD / Alachua County, city of Gainesville, DOT, District 2 | $9,000 / Alachua County, city of Gainesville, DOT, District 2 | City of Gainesville / Optical brightener and fecal coliform analyses throughout watershed for illicit discharge detection. **Benefits:** Identify | Not applicable / Not applicable | Alachua County; city of Gainesville / MS4 Phase II / FLR04E005; FLR04E006; / | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| | 2711; 2698 | (GCWP) | (GCWP) cost-share / May-06 | illicit discharges using optical brighteners, dry season (baseflow) and wet season sampling. Implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | | | |
| BACTERIA16 - Evaluation of Fecal Coliforms Bacteria "Hot Spots" in Gainesville Urban Creeks<br><br>Addresses Bacteria TMDL | | DEP; ACEPD; city of Gainesville Public Works; GRU; ACHD | | Urban creeks in the Orange Creek Basin / Project directed to further investigation of locations in urban creeks with continued high fecal coliforms bacteria counts. Part of BMAP implementation to identify sources for continued high fecal counts. Benefits: Identify and remediate sources of fecal coliforms. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| HOG15 - Evaluation of Residential Septic Tanks Systems Adjacent to Hogtown and Possum Creeks, Tumblin Creek, and Sweetwater Branch /<br><br>Addresses Bacteria TMDL | Hogtown Creek; Sweetwater Branch; Tumblin Creek / 2698 | ACHD, Environmental Health Section / | $20,000 / / Sep-05 | Alachua County / Includes identifying parcels with septic tanks, conducting soil borings to check water table, fecal coliform analyses, with full-time temporary OPS position (one year). **Benefits**: Identify potential fecal coliform sources. | Unknown / Unknown | -- / -- / -- / -- | Special Studies and Planning Efforts |
| SWT30 - In-stream Bioassessments in the Hogtown Creek, Sweetwater Branch, Tumblin Creek, Little Hatchet Creek, Hatchet Creek, and Lake Forest Creek Watersheds / | Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Hatchet Creek; Lake | DOT, District, 2; city ofGainesville; Alachua County Public Works; ACEPD (GCWP) | $47,675 / DOT, District 2 / projected start 2008 | Orange Creek Basin /In-stream bioassessments in Hogtown Creek, Sweetwater Branch, Tumblin Creek, Little Hatchet Creek, Hatchet Creek, and Lake Forest Creek watersheds for comparison with historical | Not applicable / Not applicable | Alachua County; city of Gainesville / MS4 Phase II / FLR04E005; FLR04E006 / | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| Addresses Bacteria and Nutrient TMDL | Forest Creek / 2698; 2711; 2718A; 2695; 2688; 2709 | | | BioRecon data. **Benefits:** To determine current status of in-stream biological health in these watersheds; implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | | | |
| **Alachua Sink** | | | | | | | |
| AS03 - Main Street Water Reclamation Facility Reuse System /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | GRU / SJRWMD | $587,288 / $100,000 SJRWMD; $487,288 GRU ratepayers / 2002 | Main Street to Depot Avenue within boundaries of city of Gainesville / Design and construction of 4,910-foot, 24-inch reclaimed water main from Main Street WRF to Depot Avenue. NPDES permit for domestic wastewater discharge. **Benefits:** Wastewater reuse will remove nutrient loading from Alachua Sink. | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |
| AS04 - Expanded Nutrient Monitoring Alachua Sink /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | ACEPD / | $5,600 / Alachua County / Sep-04 | Sweetwater Branch and Paynes Prairie / Expanded nutrient monitoring of Alachua Sink. **Benefits:** Determine current water quality and water level conditions in Alachua Sink. Implement Alachua County Comprehensive Plan (Comp Plan) Conservation and Open Space Element - Surface Water Systems Objective 4.6. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| AS05 - Feasibility Analysis of Sweetwater | Alachua Sink / 2720A | City of Gainesville | $25,000 / Each partner paid 1/3 | Sweetwater Branch at Paynes Prairie / Assess | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| Branch Sheetflow Restoration Project at Paynes Prairie Preserve State Park, Alachua County, Florida /<br><br>Addresses Nutrient TMDL | | Public Works and GRU / DEP Parks and Recreation | of the cost / 9/30/2006 | technical and economic feasibility of restoring historical sheetflow of Sweetwater Branch onto wetlands of Paynes Prairie by diverting flow from Alachua Sink. Determine allowable nutrient concentrations and loading to Paynes Prairie. Evaluate proposed diversion of Sweetwater Branch discharge to wetland flow through system rather than direct discharge to Alachua Sink. Carry out collaborative study with GRU and Paynes Prairie State Preserve. **Benefits:** Rehydration of hundreds of acres of wetlands in Paynes Prairie Preserve State Park and diversion of Sweetwater Branch discharge from Alachua Sink. | | | Efforts |
| AS07 - Bishop and Henderson /<br><br>Addresses Nutrient TMDL | Paynes Prairie / 2718; 2711 | ACEPD / | $225,000 / Alachua County Forever Bond proceeds / August 15, 2006 | Paynes Prairie / Land acquisition - Bishop and Henderson Williston Road adjacent to Paynes Prairie. **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | County Forever Policy 6.2.1. | | | |
| AS10 - Main Street Water Reclamation Facility Future Water Reuse /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | GRU / | $2.875 million; $775,000 for FY 2005–06; $674,000 FY 2007 (7/5) / GRU ratepayers / 2008 | City of Gainesville / Design, permitting, and construction of upgrades for delivering public access to reclaimed water from Main Street WRF. **Benefits:** Wastewater reuse will remove nutrient loading from Alachua Sink. | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |
| AS11 - Alachua Sink Intensive Study and Main Street Water Reclamation Facility Water Reuse Feasibility /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | GRU / | $565,519 / GRU ratepayers; 2003–05 cost $365,519 and 2006–08 cost estimated at $200,000 / 2008 | Alachua Sink/Sweetwater Branch / Intensive water quality study to provide better understanding of nutrient loading to Alachua Sink and evaluation of modeling used in TMDL and to determine reuse feasibility. Includes installation of new reclaimed water pump and high-level disinfection system. **Benefits:** Water quality data collected used in TMDL development. | Not applicable / Not applicable | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Special Studies and Planning Efforts |
| AS12 - Paynes Prairie Vegetative Study /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | Orange Creek Basin Partnership / SJRWMD; Alachua County;GRU; city ofGainesville Public Works;Paynes Prairie State Preserve | $51,479 / / 2002 | Paynes Prairie / Study to determine if nutrients from Sweetwater Branch were correlated with herbaceous vegetation in Paynes Prairie. **Benefits:** Study documents influence of urban surface water on natural ecosystems. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| AS13 - Gainesville Regional Utilities Reclaimed Water Master Plan /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | GRU / | $130,000 / GRU ratepayers / 2007 | City of Gainesville / Alachua County / Strategic planning effort to evaluate future reclaimed water alternatives that will impact options for meeting TMDL **Benefits:** Expanded reuse will reduce nutrient loading to Alachua Sink. | Unknown / Unknown | GRU - Main Street Water Reclamation Facility / NPDES Wastewater / FL0027251 / | Special Studies and Planning Efforts |
| AS15 - Paynes Prairie Sheetflow Restoration Conceptual Plan /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | City of Gainesville, GRU / DEP Division of Parks and Recreation; SJRWMD | $29,500 / GRU; city of Gainesville / 2007 | Paynes Prairie / Develop conceptual plan and estimate of costs for proposed Paynes Prairie Restoration Project. Project to proceed with approval of all regulatory agencies. **Benefits:** Meet TMDL through cooperative treatment alternatives. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| AS16 - Paynes Prairie Sheetflow Restoration /<br><br>Addresses Nutrient TMDL | Alachua Sink / 2720A | GRU / | $27,385 / GRU ratepayers / 2007 | Paynes Prairie / Evaluate Main Street WRF treatment options and off-line wetland performance and sizing in conjunction with proposed Paynes Prairie Sheetflow Restoration Project Develop preliminary wetland sizing and estimate finished water quality from enhanced off-line wetland in conjunction with various Main Street WRF upgrade alternatives **Benefits:** Meet TMDL through cooperative treatment alternatives. | 64,000 / | -- / -- / -- / -- | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| NUTRIENT02 - Main Street Water Reclamation Facilities Annual Operation and Maintenance /<br><br>Addresses Nutrient TMDL | Sweetwater Branch; Alachua Sink / 2720A; 2711 | GRU / | $14.987 million FY 2002–06, about $3 million/yr (includes cost of Kanapaha WRF); $3.456 million FY 2007 (thru 8/1) / GRU ratepayers / Ongoing | City of Gainesville / Alachua County / Maintenance to keep both water reclamation facilities in compliance with existing NPDES permit requirements. NPDES permit for domestic wastewater discharge. **Benefits:** Maintain compliance with NPDES permit. | Unknown / Unknown | -- / -- / -- / -- | Wastewater Infrastructure Management |
| **Newnans Lake Watershed** | | | | | | | |
| HAT01 - Expanded Coliform and Iron Monitoring /<br><br>Addresses Bacteria TMDL | Hatchet Creek / 2688 | ACEPD / Alachua County, city of Gainesville, DOT, District 2 (GCWP) | $5,000 / Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share / Dec-06 | Northeast Alachua County / Additional monitoring to better define spatial distribution of coliform bacteria. Collect samples monthly throughout watershed at estimated 8 sites. **Benefits:** Determine areas in watershed with elevated iron and fecal coliform; implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| NEW01 - Development of Pollutant Load Reduction Goals (PLRGs) for Newnans Lake /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | SJRWMD / | $1,000,000 / SJRWMD ad valorem, Water Management Lands Trust Fund, legislative appropriations, Ecosystems Management | Newnans Lake watershed / Development of science-based estimates of nutrient (N and/or P) external load reductions needed to restore lakes to state water quality standards. Diagnostic studies, water quality data, and hydrologic models used to estimate target nutrient | Not applicable / Not applicable | / / / Orange Creek Basin SWIM Program | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | Trust Fund, SWIM fund / preliminary PLRG 2007; final 2008 | concentrations to meet water quality standards and nutrient load reductions needed to meet targets and restore water quality. **Benefits:** Assist DEP in development of TMDLs for Newnans Lake. | | | |
| NEW02 - Newnans Lake Conservation Area /<br><br>Addresses Nutrient TMDL | Newnans Lake; Hatchet Creek / 2705B; 2688 | SJRWMD / | $5,727,400; $3,000,000 planned / Preservation 2000 / 2001 | Alachua County; land around north and east side of Newnans Lake / Purchase of lands near and around Newnans Lake for conservation and public use. **Benefits:** No increase in surface runoff of pollutants due to land-use change. | Unknown / Unknown | / / / Orange Creek Basin SWIM Program | Land Acquisition for Conservation |
| NEW04 - Widening of SR 20 from 2 Lane to 4 Lane /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | DOT, District 2 / | $10,763,788*-funded along with LOCH04 / DOT, District 2 / 2006 | Eastern urban area of Gainesville/ Alachua County / Widening of SR 20 from 2 lane to 4 lanes with stormwater runoff treatment. Three wet detention ponds installed to treat stormwater runoff along with more than 100 ditch blocks to capture runoff. **Benefits:** Pollutant removal by treatment of stormwater runoff. No previous treatment. | 361.58 / 3665.11 | -- / -- / -- / -- | Structural BMPs-Quantifiable Load Reductions |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| NEW06 - Newnans Lake Addition /<br><br>Addresses Nutrient TMDL | Hatchet Creek; Newnans Lake; Little Hatchet Creek / 2688; 2695; 2705B | ACEPD / SJRWMD; U.S. Dept. of the Interior, Federal Forest Legacy Program (FFLP) | $3,732,126 total cost / Alachua County Forever Bond proceeds ($1,617,000); FFLP and SJRWMD (remainder) cost-share / June 1, 2005 | Newnans Lake / Land acquisition - Newnans Lake Addition. **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1. | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |
| NEW07 - Wainberg /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | ACEPD / | $175,000 / Alachua County Forever Bond proceeds / March 29, 2007 | Newnans Lake / Land acquisition - Wainberg (west side Newnans Lake). **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1. | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |
| NEW08 - Ground Water-Surface Water Interaction Study, Newnans Lake /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | DEP / | $45,000 for 6 lakes; about $7,500 for Newnans Lake / / 2008 | Newnans Lake watershed / Proposed study to examine ground water pathways through which nutrients enter Newnans Lake. **Benefits:** Improve understanding of ground water's role in contributing nutrients to Newnans Lake. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| NEW09 - Nutrient Loading Estimation during Storm Event /<br><br>Addresses Nutrient TMDL | Newnans Lake; Lake Lochloosa / 2688; 2705B; 2728 | SJRWMD / | $198,100 / legislative appropriation / September 2008 | Newnans Lake and Lake Lochloosa watersheds / This study will measure nutrient loading into Newnans Lake and Lake Lochloosa via five tributaries during storms. Stormwater quality and discharge data will be collected from five tributaries in Newnans Lake and Lake Lochloosa watersheds. **Benefits:** Data will be used to refine hydrologic models of nutrient loading to these lakes, critical to PLRG development. | Not applicable / Not applicable | / / / Orange Creek Basin SWIM Program | Special Studies and Planning Efforts |
| NEW10 - Spatial Nutrient Loading Dynamics in the Newnans Lake Watershed /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2688; 2705B; 2728 | SJRWMD / | $151,000 / Legislative appropriation, Water Management Lands Trust Fund / September 2008 | Newnans Lake watershed / To determine external sources of nutrient contributing to Newnans Lake. Data will be collected regarding spatial and temporal dynamics of nutrient pollutant loads in surface waters and ground water in Newnans Lake watershed. **Benefits:** Data will be used to refine hydrologic models of nutrient loading to these lakes, critical to PLRG development. | Not applicable / Not applicable | / / / Orange Creek Basin SWIM Program | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| NEW11 - Newnans Lake Planting-fiscal year 2005/-06 /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | FWC / DEP Cooperative Aquatic Plant Management Program | $19,500 / FWC / Jun-06 | Newnans/east shore, south of Windsor ramp / Transplant 90,000 maidencane, knotgrass, and giant bulrush plants (30,000 of each species) in areas where littoral habitat is sparse. **Benefits:** Promote establishment of beneficial vegetation in areas where habitat is sparse. | Unknown / Unknown | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| NEW12 - Newnans Lake Planting-Fiscal Year 2006-07 /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | FWC / DEP Cooperative Aquatic Plant Management Program | $11,000 / FWC / Jun-07 | Newnans/east shore, south of Windsor ramp / Transplant 20,000 maidencane, 20,000 knotgrass, and 10,000 giant bulrush plants in areas where littoral habitat is sparse. **Benefits:** Promote establishment of beneficial vegetation in areas where habitat is sparse. | Unknown / Unknown | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| NEW13 - Newnans Lake Herbicide /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | FWC / DEP Cooperative Aquatic Plant Management Program | $1,000 / FWC / Jun-06 | Newnans/east shore, near Windsor ramp / Herbicide control of herbaceous tussocks (pennywort, *Scirpus cubensis*, cupscale). East shore near Windsor has some of most suitable bottom substrate for sportfish spawning in Newnans Lake. FWC removed dense mats of herbaceous tussock in order to promote establishment of beneficial SAV and rooted emergent species. **Benefits:** Improve sportfish habitat and promote | Not applicable / Not applicable | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | establishment of SAV. | | | |
| NEW14 - Newnans Lake Planting-Fiscal Year 2007-08 /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | FWC / DEP Cooperative Aquatic Plant Management Program | $21,000 / FWC / Jun-08 | Newnans Lake / east shore / Transplant 20,000 maidencane, 30,000 knotgrass, and 20,000 giant bulrush plants in areas where littoral habitat is sparse. **Benefits:** Promote establishment of beneficial vegetation in areas where habitat is sparse. | Unknown / Unknown | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| NEW15 - Newnans Lake Annual Aquatic Plant Maintenance Program /<br><br>Addresses Nutrient TMDL | Newnans Lake / 2705B | DEP Cooperative Aquatic Plant Management Program / | $35,000 annual cost / DEP Cooperative Aquatic Plant Management Program / Ongoing | Newnans Lake, Alachua County / Annual maintenance program for control of non-native species: hydrilla, waterhyacinth, and waterlettuce. Plant control is by herbicide application. **Benefits:** Protects native plant communities and reduces organic muck buildup from growth of exotic species. | Not applicable / Not applicable | / / / DEP Cooperative Aquatic Plant Management Program | Restoration and Water Quality Improvement Project |
| NEW16 - Duval Neighborhood Stormwater Park Land Acquisition | Newnans Lake; Lake Forest Creek / 2705B | City of Gainesville / Florida Communities Trust | $238,291 total cost; $140,412 FCT; $97,879 Community Development Block Grant | Land acquisition for sub-regional stormwater basin in nature park setting. **Benefits:** Future basin will reduce pollutant load to Newnans Lake. Remainder of site will support ecosystem/habitat preservation, passive recreation, and environmental education. | Not applicable / Not applicable | -- / -- / -- / -- | Land Acquisition for Conservation |
| **Hogtown Creek Watershed** | | | | | | | |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| HOG17 - Fluvial Geomorphologic Assessment and Preliminary Restoration Plan /<br><br>Addresses Bacteria TMDL | Hogtown Creek / 2698 | City of Gainesville / SJRWMD; U.S. Army Corps of Engineers | $107,200 / 206 U.S. Army Corps of Engineers program; SJRWMD Cost Share Grant; city ofGainesville Stormwater Management Utility Fee / 2003 | Northwest Gainesville / Study to determine source of excessive sedimentation in Hogtown Creek and to develop preliminary plan to stabilize creek system. **Benefits:** First step in developing plan to stabilize excessive instream erosion. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| HOG18 - Sediment Removal /<br><br>Addresses Bacteria TMDL | Hogtown Creek / 2698 | DOT, District 2 / | $2,374,166 - construction cost plus $108,000 per year for sediment traps and maintenance dredging / DOT, District 2 / 2005 | NW 34th St. and University Ave. / Removal of excessive sediment at bridges. Construction of 4 sediment sump compartments per management plan. **Benefits:** Reduce sediment being deposited in Sugarfoot Prairie. | Not applicable / Not applicable | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| HOG19 - Sediment Removal /<br><br>Addresses Bacteria TMDL | Hogtown Creek / 2698 | City of Gainesville / | $280,000 / city ofGainesville Stormwater Management Utility Fee; FEMA / 2005 | NW 8th Ave. / Removal of excessive sediment at bridge. **Benefits:** Reduce sediment being deposited in Loblolly floodplain. | Not applicable / Not applicable | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| HOG20 - 39th Ave Basin Rehabilitation /<br><br>Addresses Bacteria TMDL | Hogtown Creek / 2698 | DOT, District 2 / | $1,432,976 / DOT, District 2 / 2004 | NW 39th Ave. from I-75 to the airport./ Dry retention pond modified to function as wet detention pond. Design modification needed to address high water table. **Benefits:** Reduce sediment load and nutrient loads. | 139.72 / 513.9 | DOT, District 2 / MS4 Phase II / FLR04E018 / | Structural BMPs-Quantifiable Load Reductions |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| HOG21 - Widening of SR 26A /<br><br>Addresses Bacteria TMDL | Hogtown Creek / 2698 | DOT, District 2 / | $3,982,382 / DOT, District 2 / 2006 | Urban Gainesville Area / Widening of SR 26A with new stormwater runoff treatment. Pollutant removal by treatment of stormwater runoff from SR 26A. Addition of dry detention pond for treatment of stormwater runoff. Road runoff treatment not previously provided. **Benefits:** Pollutant removal by treatment of stormwater runoff from SR 26A. New treatment. | 28.37 / 63.37 | DOT, District 2 / MS4 Phase II / FLR04E018 / | Structural BMPs-Quantifiable Load Reductions |
| HOG24 - Inlet Protection Pilot Project, Hogtown Creek /<br><br>Addresses Bacteria and nutrient TMDL | Hogtown Creek / 2698 | ACEPD / Alachua County, city of Gainesville, DOT, District 2 (GCWP) | $2,000 / Currently partially funded; Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share / Jul-07 | City of Gainesville / Assessment of stormwater drop inlet geotextile filtering devices at Gainesville Public Works Compound (impervious acreage 9.99 acres) to quantify sediments, particle sizes, and pollutants (Springstead Creek). **Benefits:** Determine effectiveness of drop inlet protection devices in reducing pollutant loading from impervious area stormwater runoff; implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | Unknown / Unknown | Alachua County; city of Gainesville / MS4 Phase II / FLR04E005; FLR04E006 / | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| HOG26 - Forest Park Vegetative Enhancement /<br><br>Addresses Bacteria TMDL | Hogtown Creek / 2698 | ACEPD / NOAA; Alachua County, city of Gainesville, DOT, District 2 (GCWP); Current Problems, Inc. | $7,500 / Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share; partially funded by NOAA CIAP grant / Ongoing | City of Gainesville / Forest Park - stormwater pond vegetative enhancement. **Benefits:** Reduce pollutant concentrations in stormwater runoff; public education effort to demonstrate importance of vegetated buffers in preventing nonpoint source pollution; implement Alachua County Comp Plan Conservation and Open Space Element - Education and Outreach objective 2.2; Surface Water Systems Objective 4.6; Alachua County Unified Land Development Code (ULDC) - 406.43 Water Resources Buffers; ULDC 407.56 Requirements for Stormwater Management Areas used as Open Space; ULDC Article 9 Stormwater Management. | Unknown / Unknown | Alachua County; city of Gainesville; DOT, District 2 / MS4 Phase II / FLR04E005; FLR04E006; FLR04E018 / | Restoration and Water Quality Improvement Project |
| HOG29 - Hydrodynamic Separator Number 4 /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek / 2698 | City of Gainesville / | $11,410 / city ofGainesville Stormwater Management Utility Fee / Ongoing | Unit installed in 2-34 block of SW 23rd Terrace in Gainesville / Installation and operation of Stormceptor Unit on SW 23rd Terrace. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| HOG30 - Hydrodynamic Separator Number 6 /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek / 2698 | City of Gainesville / | $29,211 / city ofGainesville Stormwater Management Utility Fee / Ongoing | Unit installed in 1300 block of NW 29th Road in Gainesville / Installation and operation of Votex Unit #3000 in 1300 block of NW 29th Road. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |
| HOG31 - Hydrodynamic Separator Number 7 /<br><br>Addresses Bacteria and Nutrient TMDL | Hogtown Creek / 2698 | City of Gainesville / | $62,728 / city ofGainesville Stormwater Management Utility Fee / Ongoing | Unit installed in 1300 block of NW 29th Road in Gainesville / Installation and operation of Vortex Unit #11000 in 1300 block of NW 29th Road. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |
| **Orange Lake and Lake Lochloosa Watershed** | | | | | | | |
| LOCH04 - Widening of SR 20 from 2 Lane to 4 Lane. /<br><br>Addresses Nutrient TMDL | Lake Lochloosa / 2738A | DOT, District 2 / | $10,763,788 / DOT, District 2 / 2006 | Eastern urban area of Gainesville/Alachua County / Widening of SR 20 from 2 lanes to 4 lanes with stormwater runoff treatment. Three wet detention pond installed to treat stormwater runoff along with more than 100 ditch blocks to capture runoff. **Benefits:** Pollutant removal by treatment of stormwater runoff. No previous treatment. | 361.58 / 3665.11 | -- / -- / -- / -- | Structural BMPs-Quantifiable Load Reductions |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| LOCH06 - Phifer Flatwoods /<br><br>Addresses Nutrient TMDL | Little Lochloosa Creek / 2705; 2693 | ACEPD / Alachua Conservation Trust (ACT) | $2,882,239 total cost / Alachua County Forever Bond proceeds / February 10, 2006 | Alachua County / Land acquisition - Phifer Flatwoods. **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1. | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |
| LOCH07 - Ground Water -Surface Water Interaction Study Lake Lochloosa Area, Alachua and Marion Counties, Florida /<br><br>Addresses Nutrient TMDL | Orange Lake; Lake Lochloosa / 2749; 2738A | DEP / | $64,000 / federal funds / April 2007 | Lake Lochloosa and Orange Lake watersheds / Study examined ground water pathways through which nutrients enter Lake Lochloosa and Orange Lake. Field investigations to determine levels of TP and TN in different aquifers associated with land use categories. Radon studies performed to estimate ground water seepage into Lake Lochloosa. **Benefits:** Better estimation of ground water inputs of total phosphorus in TMDL models. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| LOCH01 - Development of Pollutant Load Reduction Goals (PLRGs) for Lake Lochloosa | Lake Lochloosa; Cross Creek / 2738A; 2754 | SJRWMD / -- | $1,000,000 / SJRWMD ad valorem, Water Management Lands Trust Fund, legislative appropriations, Ecosystems Management Trust Fund, SWIM fund / preliminary PLRG 2008/final 2009 | Lake Lochloosa watershed / Development of science-based estimates of nutrient (N and/or P) external load reductions needed to restore lakes to state water quality standards. Diagnostic studies, water quality data, and hydrologic models used to estimate target nutrient concentrations to meet water quality standards and nutrient load reductions needed to meet targets and restore water quality. **Benefits:** Assist DEP in development of TMDLs for Lake Lochloosa. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| MARION01 - Clean Farms Initiative /<br><br>Addresses Nutrient TMDL | Orange Lake; Lake Lochloosa / 2749; 2738A | Marion County Clean Water Program / Marion County Planning Department; Marion County Extension Service; Marion County Soil & Water Commission; SWFWMD | $15,000 / Marion County Clean Water Assessment; General Revenue; SWFWMD grant / Ongoing | Marion County-Orange Creek Basin / Clean Farms Initiative is designed to assist Marion County farm owners and managers with implementation of BMPs, and to recognize them for their cooperative efforts. Clean Farms Initiative promotes BMPs for animal waste and nutrient management on agricultural lands. Initiative was begun by passage of Resolution 04-R-384, by Marion County Board of County Commissioners; it recognizes importance of agriculture to county's history and economy, while | Unknown / Unknown | -- / -- / -- / Marion County Clean Water Program | Agricultural BMPs |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | also recognizing need to protect water resources. As part of initiative, more than 7,500 surveys and brochures were mailed in October 2006 to owners of agricultural land, ranging from large operations of several hundred acres to small tracts of land with fewer than a dozen animals. Survey measures current manure management and fertilization practices. Results of survey, and input from focus groups held in February and March, 2007 will be used to direct Initiative's next steps aimed at protecting and preserving water resources. **Benefits:** Protection of ground water and surface water as well as wetlands from runoff from equine activities. | | | |
| MARION02 - Marion County Aquifer Vulnerability Assessment (MCAVA) /<br><br>Addresses Nutrient TMDL | Orange Lake; Lake Lochloosa / 2749; 2738A | Marion County Clean Water Program / | $82,850 / Marion County Clean Water Assessment / Projected completion August 2007 | Marion County-Orange Creek Basin / Identification of vulnerable areas of aquifer. Project provides scientifically defensible water resource management and protection tool that will facilitate planning of human activities to help in minimizing adverse impacts on ground water quality. Aquifer vulnerability maps are displayed in classes of relative vulnerability (one | Not applicable / Not applicable | -- / -- / -- / Marion County Clean Water Program | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | area is more vulnerable than another). Maps benefit local government, planners and developers in guiding growth into more appropriate areas (e.g., ground water recharge areas) and improve site selection for expanding existing or establishing new wellfields. **Benefits:** Identifies areas where aquifer is vulnerable to pollution. Potential for future management of activities in those areas to reduce pollution of ground water. | | | |
| MARION03 - Street Sweeping of Marion County Roads<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | Marion County Clean Water Program / NA | $133,000 per year (County-wide); $1,800 per year in Orange Creek Basin / Marion County Clean Water Assessment / ongoing | Marion County portion of basin / Sweeping of Marion County–maintained roads in Orange Creek Basin. The benchmark frequency for sweeping of roads with curb and gutter is 8 times per year; roads without curb and gutter 4 times per year; chip seal roads one time per year. Effectiveness to be evaluated over 3-year period. **Benefits:** Remove debris, sediment, and potential pollutants from streets. Prevent entry into storm sewer system. | Unknown / Unknown | Marion County Clean Water Program / MS4 Phase II / FLR04E021 | Basic Stormwater Management Program Implementation |
| MARION04 - Orange Creek Watershed Management Plan<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | Marion County Clean Water Program / NA | $196,670 / Marion County Clean Water Assessment / on-going | Orange Creek Basin (part of countywide program) / Watershed management plans (WMPs) will be completed countywide and | Not applicable / Not applicable | -- / -- / -- / Marion County Clean Water Program | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | are used to identify and address Marion County water quality issues. The WMPs will include creation and maintenance of a comprehensive geodatabase for Marion County storm sewer system data, watershed boundaries, and hydrologic features countywide. The WMP for Orange Creek has been initiated. A watershed evaluation will be complete by September 2008. **Benefits:** Identify water quality issues and implement corrective actions. | | | |
| MSPERMIT04 – Marion County Clean Water Program - NPDES | Orange Lake / 2749 | Marion County Clean Water Program / NA | $3,500,000 program annual budget county-wide / Marion County Clean Water Assessment / on-going | Marion County wide / Public outreach and education programs, illicit discharge detection and elimination program, mapping and modeling efforts, construction site pollution prevention program, and municipal operations pollution prevention program. Benefits: Remove illicit connections; BMP implementation. Potential for reduction in loadings. | Unknown / Unknown | Marion County Clean Water Program / MS4 Phase II / FLR04E021 | Basic Stormwater Management Program Implementation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| OR01 - Development of Pollutant Load Reduction Goals (PLRGs) for Orange Lake /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | SJRWMD / | $1,000,000 / SJRWMD ad valorem, Water Management Lands Trust Fund, legislative appropriations, Ecosystems Management Trust Fund, SWIM fund / preliminary PLRG 2008/final 2009 | Orange Lake watershed / Development of science-based estimates of nutrient (N and/or P) external load reductions needed to restore lakes to state water quality standards. Diagnostic studies, water quality data, and hydrologic models used to estimate target nutrient concentrations to meet water quality standards and nutrient load reductions needed to meet targets and restore water quality. **Benefits:** Assist DEP in development of TMDLs for Orange Lake. | Not applicable / Not applicable | / / / Orange Creek Basin SWIM Program | Special Studies and Planning Efforts |
| OR02 - Longleaf Flatwoods Preserve /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | ACEPD / SJRWMD | $2,259,654 / Alachua County Forever Bond proceeds; SJRWMD cost-share / August 28, 2003 | Alachua County / Land acquisition - Longleaf Flatwoods Preserve. **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1. | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |
| OR03 - Lochloosa Wildlife Conservation Area /<br><br>Addresses Nutrient TMDL | Orange Lake; Cross Creek; Lake Lochloosa / 2754; 2738A; 2749 | SJRWMD / Alachua County | $16,058,211 / SJRWMD ad valorem; Preservation 2000; Alachua County cost-share / 2003 | Alachua County; land around Lake Lochloosa and around north side of Orange Lake / Land acquisition for Lochloosa Wildlife Conservation Area. **Benefits:** No increase in | Unknown / Unknown | / / / Orange Creek Basin SWIM Program | Land Acquisition for Conservation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | | | surface runoff of pollutants due to land-use change. | | | |
| OR08 - Freddy Wood Tract /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749; 2749A | ACEPD / U.S. Dept. of Agriculture Farm & Ranch Land Protection Program (FRLPP) | Not available / Alachua County Forever Bond proceeds; FRLPP cost-share / Ongoing | Orange Lake / Land acquisition - Freddy Wood Tract. **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1. | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |
| OR09 - Rayonier Tract (River Styx wetland) /<br><br>Addresses Nutrient TMDL | Orange Lake / 2733; 2744; 2734 | ACEPD / SJRWMD | Not available / Alachua County Forever Bond proceeds / Ongoing | River Styx / Land acquisition - Rayonier Tract River Styx. **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1. | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |
| OR11 - Orange Lake Mechanical Scraping /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | FWC / | $648,403 / FWC / 2002 | Selected areas of Orange Lake / Mechanical scraping of muck from selected areas of Orange Lake. Mechanically scrape muck with upland disposal or deposited on in-lake island **Benefits:** Restore fish spawning substrate | Unknown / Unknown | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| OR12 - Orange Lake Frog's-bit Control /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | FWC / DEP Cooperative Aquatic Plant Management Program | $31,500 / FWC / 2005 | Northern sections of Orange Lake / Herbicide control of floating mats of frog's-bit in northern sections of Orange Lake. **Benefits:** Restore deep marsh habitat | Not applicable / Not applicable | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| OR13 - Orange Lake Tussock Control /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | FWC / DEP Cooperative Aquatic Plant Management Program | $146,057 / FWC / 2005 | Northern sections of Orange Lake / Mechanical shredding of tussocks in north portion of Orange Lake. Mechanically shred acres of tussocks. **Benefits:** Restore deep marsh habitat | Not applicable / Not applicable | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| OR14 - Orange Lake Tussock Harvesting /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | FWC / DEP Cooperative Aquatic Plant Management Program | $346,500 / FWC / 2005 | Southeast section of Orange Lake, Essen Run / Mechanical harvesting of tussocks from Essen Run area of Orange Lake. Harvest 36 acres of tussocks from Orange Lake with upland disposal. **Benefits:** Restore deep marsh habitat | Not applicable / Not applicable | -- / -- / -- / -- | Restoration and Water Quality Improvement Project |
| OR15 - Orange Lake Floating Tussock Control /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | DEP Cooperative Aquatic Plant Management Program / DEP Contractors | $2,252,000 / DEP Cooperative Aquatic Plant Management Program / November 2005 | Orange Lake, in Marion and Alachua Counties / Control of floating tussocks by shredding. Provides for restoration of deep marsh habitat, protection of established emergent vegetation, and provides for navigation. **Benefits:** Improved fish and wildlife habitat and public recreation and navigation. | Not applicable / Not applicable | / / / DEP Cooperative Aquatic Plant Management Program | Restoration and Water Quality Improvement Project |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| OR16 - Orange Lake Annual Aquatic Plant Maintenance Program /<br><br>Addresses Nutrient TMDL | Orange Lake / 2749 | DEP Cooperative Aquatic Plant Management Program / | $750,000 annual cost / DEP Cooperative Aquatic Plant Management Program / Ongoing | Orange Lake, Marion and Alachua Counties / Annual maintenance program for control of non-native species: hydrilla, waterhyacinth, wild taro, and water lettuce. **Benefits:** Protects native plant communities and reduces organic muck buildup from growth of exotic species. | Not applicable / Not applicable | / / / DEP Cooperative Aquatic Plant Management Program | Restoration and Water Quality Improvement Project |
| **Sweetwater Branch Watershed** | | | | | | | |
| SWT02 - Depot Avenue Stormwater Park /<br><br>Addresses Bacteria and Nutrient TMDL | Sweetwater Branch / 2711 | City of Gainesville/DOT / DOT, District 2 | $7,162,000 / SJRWMD; Legislature; DOT, District 2; city ofGainesville Stormwater Management Utility Fee; State Revolving Fund / 2007 | Depot Avenue / 32-acre brownfield restoration site includes 11-acre wet detention pond developed within park. **Benefits:** Reduce sediment load and nutrient loads. | 255.8 / 660.7 | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Quantifiable Load Reductions |
| SWT03 - Duck Pond Restoration /<br><br>Addresses Bacteria and Nutrient TMDL | Sweetwater Branch / 2711 | City of Gainesville / | $1,040,000 / EPA Grant; city ofGainesville Stormwater Management Utility Fee / 2005 | NE 10th avenue to NE 5th Avenue / Creek restoration project to remove concrete channel and add sinuosity and wetland plants to 2,500-foot channel. Two CDS units added to prevent gross pollutants from entering creek. Duck species replaced and existing pond dredged and deepened with addition of littoral zone. **Benefits:** Reduce sediment load, bacteria, and nutrient | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| | | | | loads. | | | |
| SWT04 - Spring Hill Stormwater Park /<br><br>Addresses Bacteria and nutrient TMDL | Sweetwater Branch / 2711 | City of Gainesville / | $170,000 / city ofGainesville Stormwater Management Utility Fee / 2003 | Springhill Community / A 3.6-acre stormwater park designed to treat runoff from residential areas. Water quality improvement from wet detention. Provides compensating treatment for redevelopment sites downtown. **Benefits:** Reduce sediment load and nutrient loads. Improve water quality from wet detention. | 22.1 / 65.8 | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Quantifiable Load Reductions |
| SWT18 - Expanded Nutrient Monitoring Sweetwater Branch /<br><br>Addresses Nutrient TMDL | Sweetwater Branch / 2711 | ACEPD / | $5,600 / Alachua County / Sep-04 | City of Gainesville / Expanded nutrient monitoring of Sweetwater Branch. **Benefits:** Determine current water quality and water level conditions in Sweetwater Branch on Paynes Prairie and Alachua Sink. Implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |
| SWT22 - Springhill Pond Vegetative Enhancement /<br><br>Addresses Bacteria and Nutrient TMDL | Sweetwater Branch / 2711 | ACEPD / UF–IFAS Extension Service; NOAA; city of Gainesville, DOT, District 2, Alachua County (GCWP); Current Problems, Inc. | $7,500 / Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share; partially funded by a NOAA CIAP grant / Ongoing | City of Gainesville / Springhill Park - public education workshop and stormwater pond and seepage wetland vegetative enhancement. **Benefits:** Reduce pollutant concentrations in stormwater runoff; public education effort to demonstrate importance | Not applicable / Not applicable | Alachua County; city ofGainesville; DOT, District 2 / MS4 Phase II / FLR04E005; FLR04E006; FLR04E018 / | Education and Outreach Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| | | (Adopt A River) | | of vegetated buffers in preventing nonpoint source pollution; implement Alachua County Comp Plan Conservation and Open Space Element Education and Outreach -objective 2.2; Surface Water Systems Objective 4.6; Alachua County Unified Land Development Code (ULDC) - 406.43 Water Resources Buffers; ULDC 407.56 Requirements for Stormwater Management Areas used as Open Space; ULDC Article 9 Stormwater Management. | | | |
| SWT24 - Sweetwater Branch Watershed Management Plan Update and Land Acquisition /<br><br>Addresses Bacteria and Nutrient TMDL | Sweetwater Branch / 2711 | City of Gainesville / USEPA | $530,000 / city ofGainesville Stormwater Management Utility Fee; EPA grant / 2006 | Watershed / Study to identify and prioritize new water quality treatment projects and develop stream stabilization plan. Balance of EPA grant funds used for land acquisition of project sites. **Benefits:** Management options identified. Top priority project sites were purchased. Top priority projects were added to city ofGainesville Capital Improvements Project list. Plan information used to successfully apply for Section 319 project funding. | Not applicable / Not applicable | City of Gainesville / MS4 Phase II / FLR04E006 / | Special Studies and Planning Efforts |
| SWT29 - Inlet Protection Pilot Project, Sweetwater | Sweetwater Branch / 2711 | ACEPD / Alachua County, | $2,000 / Currently | City of Gainesville / Assessment of stormwater | Unknown / Unknown | Alachua County; city ofGainesville; | Special Studies and Planning |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| Branch /<br><br>Addresses Bacteria and Nutrient TMDL | | City of Gainesville, DOT, District 2 (GCWP) | partially funded; Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share / Jul-07 | drop inlet geotextile filtering devices at Florida Pest Control (impervious acreage 3.96 acres) to quantify sediments, particle sizes and pollutants. **Benefits:** Determine effectiveness of drop inlet protection devices in reducing pollutant loading from impervious area stormwater runoff; implement Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. | | / MS4 Phase II / FLR04E005; FLR04E006 / | Efforts |
| SWT31 - Sweetwater Preserve /<br><br>Addresses Nutrient TMDL | Sweetwater Branch; Paynes Prairie / 2711; 2722 | ACEPD / Florida Communities Trust (FCT) | $7,700,000 total cost / Alachua County Forever Bond proceeds; FCT cost-share / March 24, 2006 | Paynes Prairie / Land acquisition - Sweetwater Preserve (north rim of Paynes Prairie). **Benefits:** No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1. | Unknown / Unknown | / / / Alachua County Forever | Land Acquisition for Conservation |
| SWT33 - NW 2nd Street Land Acquistion | Sweetwater Branch; Paynes Prairie / 2711; 2722 | City of Gainesville / EPA | $58,470 / EPA / July 10, 2006 | Upper Sweetwater Branch watershed / Land acquisition. **Benefits:** Future site of water quality improvement project. | Not applicable / Not applicable | / / / | Land Acquisition for Conservation |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
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| SWT34 - NW 14th Avenue Land Acquisition | Sweetwater Branch; Paynes Prairie / 2711; 2722 | City of Gainesville / EPA | $57,600 / EPA / June 28, 2004 | Upper Sweetwater Branch watershed / Land acquisition. **Benefits:** Future site of water quality improvement project. | Not applicable / Not applicable | / / / | Land Acquisition for Conservation |
| SWT35 - SE 19th Street, Rosewood Trash Trap Land Acquisition | Sweetwater Branch; Paynes Prairie / 2711; 2722 | City of Gainesville / EPA | $4,135 / EPA / February 29, 2004 | Upper Sweetwater Branch watershed / Land acquisition. **Benefits:** Future site of water quality improvement project. | Not applicable / Not applicable | / / / | Land Acquisition for Conservation |
| URBAN02 - Hydrodynamic Separator Number 1 / Addresses Bacteria and Nutrient TMDL | Sweetwater Branch; Alachua Sink / 2711; 2720A | City of Gainesville / SJRWMD | $26,260 / city ofGainesville Stormwater Management Utility Fee; SJRWMD / Ongoing | 400 block of SE 1st Avenue in Gainesville / Installation and operation of baffle box on SE 1st Avenue in downtown Gainesville and used for sediment collection. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |
| URBAN03 - Hydrodynamic Separator Number 2 / Addresses Bacteria and Nutrient TMDL | Sweetwater Branch; Alachua Sink / 2711; 2720A | City of Gainesville / | $25,200 / city ofGainesville Stormwater Management Utility Fee / Ongoing | 400-500 block of SE 2nd Place in Gainesville / Installation and operation of Vortech Unit in 400-500 block of SE 2nd Place in downtown Gainesville. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |
| URBAN09 - Hydrodynamic Separator Number 3 / Addresses Bacteria and Nutrient TMDL | Sweetwater Branch; Alachua Sink / 2711; 2720A | City of Gainesville / | $11,410 / city ofGainesville Stormwater Management Utility Fee / Ongoing | Unit installed in 1300 block of SE 1st Avenue. / Installation and operation of Stormceptor unit in 1300 block of SE 1st Street in downtown Gainesville. **Benefits:** Prevents sediment and trash from entering | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| | | | | streams and storm sewer system. | | | |
| URBAN10 - Hydrodynamic Separator Number 5 /<br><br>Addresses Bacteria and Nutrient TMDL | Sweetwater Branch; Alachua Sink / 2711; 2720A | City of Gainesville / EPA | $145,180 / city ofGainesville Stormwater Management Utility Fee; EPA grant / Ongoing | Units installed in 700 block of NE West Blvd. and 100 block of NE East Blvd (Duck Pond area). / Installation and operation of 2 CDS units in downtown Gainesville. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Load Reductions Not Quantified |
| **Tumblin Creek Watershed** | | | | | | | |
| TUM01 - SW 5th Avenue Basin /<br><br>Addresses Bacteria and Nutrient TMDL | Tumblin Creek / 2718A | City of Gainesville / | $1,147,818 / city ofGainesville Stormwater Management Utility Fee / | SW 5th Avenue / 4.8 acre site contains 2.5-acre wet detention pond for water quality improvement. Site is located next to 3.5-acre Tumblin Creek Park. **Benefits:** Reduce sediment load and nutrient loads. | 19.9 / 156.8 | City of Gainesville / MS4 Phase II / FLR04E006 / | Structural BMPs-Quantifiable Load Reductions |
| TUM02 - SW 11th Avenue Storm Sewer /<br><br>Addresses Bacteria and Nutrient TMDL | Tumblin Creek / 2718A | City of Gainesville / | $88,000 / city ofGainesville Stormwater Management Utility Fee / | 1200 block SW 11th Avenue / Improvement to storm sewer system. Stabilize creek outfall. **Benefits:** Reduce sediment load. | Unknown / Unknown | City of Gainesville / MS4 Phase II / FLR04E006 / | Basic Stormwater Management Program Implementation |
| TUM03 - Tumblin Creek Watershed Management Plan Update /<br><br>Addresses Bacteria and Nutrient TMDL | Tumblin Creek / 2718A | City of Gainesville / | $246,426 / city ofGainesville Stormwater Management Utility Fee; CP;UH CRA / 2007 | Tumblin Creek Watershed / Study to identify and prioritize new water quality treatment projects and low-impact development options. **Benefits:** Pollutant loading model developed and pollutant load reduction projects have been identified and ranked. | Not applicable / Not applicable | City of Gainesville / MS4 Phase II / FLR04E006 / | Special Studies and Planning Efforts |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| TUM18 - Tumblin Basin Vegetative Enhancement /<br><br>Addresses Bacteria and Nutrient TMDL | Tumblin Creek / 2718A | ACEPD / UF–IFAS Extension Service; city of Gainesville, Alachua County, DOT, District 2 (GCWP); Current Problems, Inc. (Adopt A River) | $7,500 / Alachua County, city of Gainesville, DOT, District 2 (GCWP) cost-share / Ongoing | City of Gainesville / Tumblin Creek Basin (SW 5th Avenue) - public education workshop and stormwater pond vegetative enhancement. **Benefits:** Reduce pollutant concentrations in stormwater runoff; public education effort to demonstrate importance of vegetated buffers in preventing nonpoint source pollution; implement Alachua County Comp Plan Conservation and Open Space Element - Education and Outreach Objective 2.2; Surface Water Systems Objective 4.6; Alachua County Unified Land Development Code (ULDC) - 406.43 Water Resources Buffers; ULDC 407.56 Requirements for Stormwater Management Areas used as Open Space; ULDC Article 9 Stormwater Management. | Not applicable / Not applicable | Alachua County; city of Gainesville; DOT, District 2 / MS4 Phase II / FLR04E005; FLR04E006; FLR04E018 / | Education and Outreach Efforts |
| TUM22 - Tumblin Creek Pedestal Removal /<br><br>Addresses Not applicable TMDL | Tumblin Creek / 2718A | GRU / | $80,000 / GRU rateayers / -- | Tumblin Creek / Removal of abandoned wastewater collection pipe pedestal in Tumblin Creek to reduce bank and bed scour. **Benefits:** Removal of structure helps to control scouring of bank and bed. Reduces suspended solids in water column. | Not applicable / Not applicable | GRU / NPDES Wastewater / FL0027251 / | Wastewater Infrastructure Management |

| Project Number - Project Name / Which Type of TMDL is Addressed? | Waterbody Name / WBID | Lead Entity / Project Partners | Cost / Source of Funding / Completion or Expected Completion Date | General Location / Project Description and Benefits | TP and / or TN Loading Reduction (lbs per year) | Permitted Entity / Permit Type / Permit Number / or Program (if not permit related) | Category |
|---|---|---|---|---|---|---|---|
| **Lake Wauberg Watershed Projects** | | | | | | | |
| WAU01 - Evaluation of Septic Systems Surrounding Lake Wauberg /<br><br>Addresses Nutrient TMDL | Lake Wauberg / 2741 | ACHD, Environmental Health Section / | $15,000 / / Sep-05 | Lake Wauberg watershed / Includes identifying parcels with septic tanks, conducting soil borings to check water table, and sampling for nutrients. **Benefits:** Locate areas where septic systems or other domestic waste treatment systems may be contributing nitrogen and phosphorus to Lake Wauberg. | Not applicable / Not applicable | -- / -- / -- / -- | Special Studies and Planning Efforts |

# APPENDIX F. 2004 DAILY FLOW DATA FROM THREE SJRWMD MONITORING SITES

**Table F-1: 2004 daily flow data for Camps Canal at Rochelle**

| Date | Time | Discharge (cfs) |
|---|---|---|
| 01/01/2004 | 0:00:00 | 4.89 |
| 01/02/2004 | 0:00:00 | 4.77 |
| 01/03/2004 | 0:00:00 | 4.32 |
| 01/04/2004 | 0:00:00 | 3.88 |
| 01/05/2004 | 0:00:00 | 3.89 |
| 01/06/2004 | 0:00:00 | 4.40 |
| 01/07/2004 | 0:00:00 | 4.77 |
| 01/08/2004 | 0:00:00 | 4.67 |
| 01/09/2004 | 0:00:00 | 4.62 |
| 01/10/2004 | 0:00:00 | 4.65 |
| 01/11/2004 | 0:00:00 | 4.57 |
| 01/12/2004 | 0:00:00 | 4.53 |
| 01/13/2004 | 0:00:00 | 4.80 |
| 01/14/2004 | 0:00:00 | 5.25 |
| 01/15/2004 | 0:00:00 | 5.51 |
| 01/16/2004 | 0:00:00 | 5.55 |
| 01/17/2004 | 0:00:00 | 5.60 |
| 01/18/2004 | 0:00:00 | 5.61 |
| 01/19/2004 | 0:00:00 | 5.54 |
| 01/20/2004 | 0:00:00 | 5.47 |
| 01/21/2004 | 0:00:00 | 5.35 |
| 01/22/2004 | 0:00:00 | 5.23 |
| 01/23/2004 | 0:00:00 | 5.16 |
| 01/24/2004 | 0:00:00 | 5.09 |
| 01/25/2004 | 0:00:00 | 4.99 |
| 01/26/2004 | 0:00:00 | 5.14 |
| 01/27/2004 | 0:00:00 | 5.19 |
| 01/28/2004 | 0:00:00 | 5.06 |
| 01/29/2004 | 0:00:00 | 5.02 |
| 01/30/2004 | 0:00:00 | 4.97 |
| 01/31/2004 | 0:00:00 | 6.06 |
| 02/01/2004 | 0:00:00 | 7.18 |
| 02/02/2004 | 0:00:00 | 6.91 |
| 02/03/2004 | 0:00:00 | 6.52 |
| 02/04/2004 | 0:00:00 | 6.40 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 02/05/2004 | 0:00:00 | 6.33 |
| 02/06/2004 | 0:00:00 | 6.34 |
| 02/07/2004 | 0:00:00 | 6.41 |
| 02/08/2004 | 0:00:00 | 6.43 |
| 02/09/2004 | 0:00:00 | 6.38 |
| 02/10/2004 | 0:00:00 | 6.30 |
| 02/11/2004 | 0:00:00 | 6.28 |
| 02/12/2004 | 0:00:00 | 6.30 |
| 02/13/2004 | 0:00:00 | 6.58 |
| 02/14/2004 | 0:00:00 | 7.05 |
| 02/15/2004 | 0:00:00 | 7.09 |
| 02/16/2004 | 0:00:00 | 6.99 |
| 02/17/2004 | 0:00:00 | 7.00 |
| 02/18/2004 | 0:00:00 | 6.86 |
| 02/19/2004 | 0:00:00 | 6.77 |
| 02/20/2004 | 0:00:00 | 6.74 |
| 02/21/2004 | 0:00:00 | 6.67 |
| 02/22/2004 | 0:00:00 | 6.62 |
| 02/23/2004 | 0:00:00 | 8.21 |
| 02/24/2004 | 0:00:00 | 11.06 |
| 02/25/2004 | 0:00:00 | 11.56 |
| 02/26/2004 | 0:00:00 | 10.44 |
| 02/27/2004 | 0:00:00 | 10.03 |
| 02/28/2004 | 0:00:00 | 9.83 |
| 02/29/2004 | 0:00:00 | 9.57 |
| 03/01/2004 | 0:00:00 | 9.33 |
| 03/02/2004 | 0:00:00 | 9.12 |
| 03/03/2004 | 0:00:00 | 9.01 |
| 03/04/2004 | 0:00:00 | 8.97 |
| 03/05/2004 | 0:00:00 | 8.90 |
| 03/06/2004 | 0:00:00 | 8.75 |
| 03/07/2004 | 0:00:00 | 8.57 |
| 03/08/2004 | 0:00:00 | 8.36 |
| 03/09/2004 | 0:00:00 | 8.15 |
| 03/10/2004 | 0:00:00 | 8.03 |
| 03/11/2004 | 0:00:00 | 7.91 |
| 03/12/2004 | 0:00:00 | 7.77 |
| 03/13/2004 | 0:00:00 | 7.71 |
| 03/14/2004 | 0:00:00 | 7.71 |
| 03/15/2004 | 0:00:00 | 9.64 |
| 03/16/2004 | 0:00:00 | 10.91 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 03/17/2004 | 0:00:00 | 9.95 |
| 03/18/2004 | 0:00:00 | 9.49 |
| 03/19/2004 | 0:00:00 | 9.34 |
| 03/20/2004 | 0:00:00 | 9.24 |
| 03/21/2004 | 0:00:00 | 9.07 |
| 03/22/2004 | 0:00:00 | 8.89 |
| 03/23/2004 | 0:00:00 | 8.73 |
| 03/24/2004 | 0:00:00 | 8.54 |
| 03/25/2004 | 0:00:00 | 8.38 |
| 03/26/2004 | 0:00:00 | 8.22 |
| 03/27/2004 | 0:00:00 | 8.05 |
| 03/28/2004 | 0:00:00 | 7.89 |
| 03/29/2004 | 0:00:00 | 7.81 |
| 03/30/2004 | 0:00:00 | 7.72 |
| 03/31/2004 | 0:00:00 | 7.50 |
| 04/01/2004 | 0:00:00 | 7.26 |
| 04/02/2004 | 0:00:00 | 7.08 |
| 04/03/2004 | 0:00:00 | 6.91 |
| 04/04/2004 | 0:00:00 | 6.78 |
| 04/05/2004 | 0:00:00 | 6.73 |
| 04/06/2004 | 0:00:00 | 6.71 |
| 04/07/2004 | 0:00:00 | 6.68 |
| 04/08/2004 | 0:00:00 | 6.60 |
| 04/09/2004 | 0:00:00 | 6.51 |
| 04/10/2004 | 0:00:00 | 6.45 |
| 04/11/2004 | 0:00:00 | 6.39 |
| 04/12/2004 | 0:00:00 | 6.74 |
| 04/13/2004 | 0:00:00 | 6.73 |
| 04/14/2004 | 0:00:00 | 6.24 |
| 04/15/2004 | 0:00:00 | 6.08 |
| 04/16/2004 | 0:00:00 | 6.03 |
| 04/17/2004 | 0:00:00 | 5.98 |
| 04/18/2004 | 0:00:00 | 5.93 |
| 04/19/2004 | 0:00:00 | 5.87 |
| 04/20/2004 | 0:00:00 | 5.81 |
| 04/21/2004 | 0:00:00 | 5.77 |
| 04/22/2004 | 0:00:00 | 5.74 |
| 04/23/2004 | 0:00:00 | 5.76 |
| 04/24/2004 | 0:00:00 | 5.80 |
| 04/25/2004 | 0:00:00 | 5.79 |
| 04/26/2004 | 0:00:00 | 5.74 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 04/27/2004 | 0:00:00 | 5.66 |
| 04/28/2004 | 0:00:00 | 5.56 |
| 04/29/2004 | 0:00:00 | 5.58 |
| 04/30/2004 | 0:00:00 | 5.67 |
| 05/01/2004 | 0:00:00 | 5.61 |
| 05/02/2004 | 0:00:00 | 5.75 |
| 05/03/2004 | 0:00:00 | 5.86 |
| 05/04/2004 | 0:00:00 | 5.61 |
| 05/05/2004 | 0:00:00 | 5.36 |
| 05/06/2004 | 0:00:00 | 5.21 |
| 05/07/2004 | 0:00:00 | 5.11 |
| 05/08/2004 | 0:00:00 | 4.98 |
| 05/09/2004 | 0:00:00 | 4.87 |
| 05/10/2004 | 0:00:00 | 4.83 |
| 05/11/2004 | 0:00:00 | 4.79 |
| 05/12/2004 | 0:00:00 | 4.71 |
| 05/13/2004 | 0:00:00 | 4.60 |
| 05/14/2004 | 0:00:00 | 4.47 |
| 05/15/2004 | 0:00:00 | 4.37 |
| 05/16/2004 | 0:00:00 | 4.31 |
| 05/17/2004 | 0:00:00 | 4.22 |
| 05/18/2004 | 0:00:00 | 4.06 |
| 05/19/2004 | 0:00:00 | 3.89 |
| 05/20/2004 | 0:00:00 | 3.74 |
| 05/21/2004 | 0:00:00 | 3.62 |
| 05/22/2004 | 0:00:00 | 3.52 |
| 05/23/2004 | 0:00:00 | 3.43 |
| 05/24/2004 | 0:00:00 | 3.37 |
| 05/25/2004 | 0:00:00 | 3.32 |
| 05/26/2004 | 0:00:00 | 3.22 |
| 05/27/2004 | 0:00:00 | 3.12 |
| 05/28/2004 | 0:00:00 | 3.02 |
| 05/29/2004 | 0:00:00 | 2.93 |
| 05/30/2004 | 0:00:00 | 2.86 |
| 05/31/2004 | 0:00:00 | 2.80 |
| 06/01/2004 | 0:00:00 | 2.76 |
| 06/02/2004 | 0:00:00 | 2.88 |
| 06/03/2004 | 0:00:00 | 3.17 |
| 06/04/2004 | 0:00:00 | 3.26 |
| 06/05/2004 | 0:00:00 | 3.20 |
| 06/06/2004 | 0:00:00 | 3.22 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 06/07/2004 | 0:00:00 | 3.13 |
| 06/08/2004 | 0:00:00 | 3.00 |
| 06/09/2004 | 0:00:00 | 2.98 |
| 06/10/2004 | 0:00:00 | 2.97 |
| 06/11/2004 | 0:00:00 | 2.88 |
| 06/12/2004 | 0:00:00 | 2.80 |
| 06/13/2004 | 0:00:00 | 3.06 |
| 06/14/2004 | 0:00:00 | 3.41 |
| 06/15/2004 | 0:00:00 | 3.50 |
| 06/16/2004 | 0:00:00 | 3.39 |
| 06/17/2004 | 0:00:00 | 3.18 |
| 06/18/2004 | 0:00:00 | 3.04 |
| 06/19/2004 | 0:00:00 | 2.92 |
| 06/20/2004 | 0:00:00 | 2.85 |
| 06/21/2004 | 0:00:00 | 2.93 |
| 06/22/2004 | 0:00:00 | 3.26 |
| 06/23/2004 | 0:00:00 | 3.44 |
| 06/24/2004 | 0:00:00 | 3.31 |
| 06/25/2004 | 0:00:00 | 3.23 |
| 06/26/2004 | 0:00:00 | 3.18 |
| 06/27/2004 | 0:00:00 | 3.09 |
| 06/28/2004 | 0:00:00 | 2.99 |
| 06/29/2004 | 0:00:00 | 2.90 |
| 06/30/2004 | 0:00:00 | 2.83 |
| 07/01/2004 | 0:00:00 | 2.77 |
| 07/02/2004 | 0:00:00 | 2.73 |
| 07/03/2004 | 0:00:00 | 2.69 |
| 07/04/2004 | 0:00:00 | 2.65 |
| 07/05/2004 | 0:00:00 | 2.64 |
| 07/06/2004 | 0:00:00 | 2.65 |
| 07/07/2004 | 0:00:00 | 2.68 |
| 07/08/2004 | 0:00:00 | 2.73 |
| 07/09/2004 | 0:00:00 | 2.73 |
| 07/10/2004 | 0:00:00 | 2.70 |
| 07/11/2004 | 0:00:00 | 2.71 |
| 07/12/2004 | 0:00:00 | 2.69 |
| 07/13/2004 | 0:00:00 | 2.60 |
| 07/14/2004 | 0:00:00 | 2.51 |
| 07/15/2004 | 0:00:00 | 2.49 |
| 07/16/2004 | 0:00:00 | 2.67 |
| 07/17/2004 | 0:00:00 | 2.82 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 07/18/2004 | 0:00:00 | 2.96 |
| 07/19/2004 | 0:00:00 | 3.22 |
| 07/20/2004 | 0:00:00 | 3.30 |
| 07/21/2004 | 0:00:00 | 3.24 |
| 07/22/2004 | 0:00:00 | 3.22 |
| 07/23/2004 | 0:00:00 | 3.17 |
| 07/24/2004 | 0:00:00 | 3.07 |
| 07/25/2004 | 0:00:00 | 2.97 |
| 07/26/2004 | 0:00:00 | 2.82 |
| 07/27/2004 | 0:00:00 | 2.73 |
| 07/28/2004 | 0:00:00 | 2.79 |
| 07/29/2004 | 0:00:00 | 2.82 |
| 07/30/2004 | 0:00:00 | 2.77 |
| 07/31/2004 | 0:00:00 | 2.71 |
| 08/01/2004 | 0:00:00 | 2.68 |
| 08/02/2004 | 0:00:00 | 2.74 |
| 08/03/2004 | 0:00:00 | 2.80 |
| 08/04/2004 | 0:00:00 | 2.77 |
| 08/05/2004 | 0:00:00 | 2.78 |
| 08/06/2004 | 0:00:00 | 3.03 |
| 08/07/2004 | 0:00:00 | 3.21 |
| 08/08/2004 | 0:00:00 | 3.15 |
| 08/09/2004 | 0:00:00 | 3.06 |
| 08/10/2004 | 0:00:00 | 3.07 |
| 08/11/2004 | 0:00:00 | 3.15 |
| 08/12/2004 | 0:00:00 | 3.24 |
| 08/13/2004 | 0:00:00 | 3.39 |
| 08/14/2004 | 0:00:00 | 3.48 |
| 08/15/2004 | 0:00:00 | 3.44 |
| 08/16/2004 | 0:00:00 | 3.55 |
| 08/17/2004 | 0:00:00 | 4.00 |
| 08/18/2004 | 0:00:00 | 4.15 |
| 08/19/2004 | 0:00:00 | 3.92 |
| 08/20/2004 | 0:00:00 | 3.98 |
| 08/21/2004 | 0:00:00 | 4.13 |
| 08/22/2004 | 0:00:00 | 4.47 |
| 08/23/2004 | 0:00:00 | 5.11 |
| 08/24/2004 | 0:00:00 | 5.67 |
| 08/25/2004 | 0:00:00 | 6.05 |
| 08/26/2004 | 0:00:00 | 6.37 |
| 08/27/2004 | 0:00:00 | 6.64 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 08/28/2004 | 0:00:00 | 6.86 |
| 08/29/2004 | 0:00:00 | 7.03 |
| 08/30/2004 | 0:00:00 | 7.17 |
| 08/31/2004 | 0:00:00 | 7.29 |
| 09/01/2004 | 0:00:00 | 7.38 |
| 09/02/2004 | 0:00:00 | 7.51 |
| 09/03/2004 | 0:00:00 | 7.69 |
| 09/04/2004 | 0:00:00 | 10.30 |
| 09/05/2004 | 0:00:00 | 23.77 |
| 09/06/2004 | 0:00:00 | 52.78 |
| 09/07/2004 | 0:00:00 | 98.12 |
| 09/08/2004 | 0:00:00 | 161.01 |
| 09/09/2004 | 0:00:00 | 239.50 |
| 09/10/2004 | 0:00:00 | 309.90 |
| 09/11/2004 | 0:00:00 | 351.15 |
| 09/12/2004 | 0:00:00 | 367.82 |
| 09/13/2004 | 0:00:00 | 367.05 |
| 09/14/2004 | 0:00:00 | 348.03 |
| 09/15/2004 | 0:00:00 | 319.14 |
| 09/16/2004 | 0:00:00 | 293.06 |
| 09/17/2004 | 0:00:00 | 268.83 |
| 09/18/2004 | 0:00:00 | 245.59 |
| 09/19/2004 | 0:00:00 | 224.37 |
| 09/20/2004 | 0:00:00 | 207.09 |
| 09/21/2004 | 0:00:00 | 191.98 |
| 09/22/2004 | 0:00:00 | 176.59 |
| 09/23/2004 | 0:00:00 | 162.79 |
| 09/24/2004 | 0:00:00 | 151.95 |
| 09/25/2004 | 0:00:00 | 161.70 |
| 09/26/2004 | 0:00:00 | 232.88 |
| 09/27/2004 | 0:00:00 | 309.23 |
| 09/28/2004 | 0:00:00 | 370.07 |
| 09/29/2004 | 0:00:00 | 432.15 |
| 09/30/2004 | 0:00:00 | 453.38 |
| 10/01/2004 | 0:00:00 | 446.72 |
| 10/02/2004 | 0:00:00 | 425.86 |
| 10/03/2004 | 0:00:00 | 398.69 |
| 10/04/2004 | 0:00:00 | 372.05 |
| 10/05/2004 | 0:00:00 | 344.81 |
| 10/06/2004 | 0:00:00 | 316.94 |
| 10/07/2004 | 0:00:00 | 288.95 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 10/08/2004 | 0:00:00 | 261.92 |
| 10/09/2004 | 0:00:00 | 236.85 |
| 10/10/2004 | 0:00:00 | 217.85 |
| 10/11/2004 | 0:00:00 | 205.21 |
| 10/12/2004 | 0:00:00 | 192.80 |
| 10/13/2004 | 0:00:00 | 176.93 |
| 10/14/2004 | 0:00:00 | 161.20 |
| 10/15/2004 | 0:00:00 | 147.95 |
| 10/16/2004 | 0:00:00 | 134.84 |
| 10/17/2004 | 0:00:00 | 122.58 |
| 10/18/2004 | 0:00:00 | 111.69 |
| 10/19/2004 | 0:00:00 | 102.98 |
| 10/20/2004 | 0:00:00 | 95.87 |
| 10/21/2004 | 0:00:00 | 88.52 |
| 10/22/2004 | 0:00:00 | 81.36 |
| 10/23/2004 | 0:00:00 | 74.62 |
| 10/24/2004 | 0:00:00 | 68.31 |
| 10/25/2004 | 0:00:00 | 62.71 |
| 10/26/2004 | 0:00:00 | 57.73 |
| 10/27/2004 | 0:00:00 | 53.13 |
| 10/28/2004 | 0:00:00 | 49.12 |
| 10/29/2004 | 0:00:00 | 45.62 |
| 10/30/2004 | 0:00:00 | 42.27 |
| 10/31/2004 | 0:00:00 | 39.28 |
| 11/01/2004 | 0:00:00 | 36.71 |
| 11/02/2004 | 0:00:00 | 34.37 |
| 11/03/2004 | 0:00:00 | 32.31 |
| 11/04/2004 | 0:00:00 | 30.42 |
| 11/05/2004 | 0:00:00 | 28.58 |
| 11/06/2004 | 0:00:00 | 26.79 |
| 11/07/2004 | 0:00:00 | 25.11 |
| 11/08/2004 | 0:00:00 | 23.67 |
| 11/09/2004 | 0:00:00 | 22.37 |
| 11/10/2004 | 0:00:00 | 20.93 |
| 11/11/2004 | 0:00:00 | 19.57 |
| 11/12/2004 | 0:00:00 | 18.61 |
| 11/13/2004 | 0:00:00 | 17.88 |
| 11/14/2004 | 0:00:00 | 17.17 |
| 11/15/2004 | 0:00:00 | 16.35 |
| 11/16/2004 | 0:00:00 | 15.33 |
| 11/17/2004 | 0:00:00 | 14.40 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 11/18/2004 | 0:00:00 | 13.69 |
| 11/19/2004 | 0:00:00 | 13.12 |
| 11/20/2004 | 0:00:00 | 12.61 |
| 11/21/2004 | 0:00:00 | 12.06 |
| 11/22/2004 | 0:00:00 | 11.64 |
| 11/23/2004 | 0:00:00 | 11.36 |
| 11/24/2004 | 0:00:00 | 11.53 |
| 11/25/2004 | 0:00:00 | 11.41 |
| 11/26/2004 | 0:00:00 | 10.79 |
| 11/27/2004 | 0:00:00 | 10.65 |
| 11/28/2004 | 0:00:00 | 10.41 |
| 11/29/2004 | 0:00:00 | 10.07 |
| 11/30/2004 | 0:00:00 | 9.97 |
| 12/01/2004 | 0:00:00 | 9.82 |
| 12/02/2004 | 0:00:00 | 9.69 |
| 12/03/2004 | 0:00:00 | 9.56 |
| 12/04/2004 | 0:00:00 | 9.44 |
| 12/05/2004 | 0:00:00 | 9.42 |
| 12/06/2004 | 0:00:00 | 9.36 |
| 12/07/2004 | 0:00:00 | 9.24 |
| 12/08/2004 | 0:00:00 | 9.17 |
| 12/09/2004 | 0:00:00 | 9.32 |
| 12/10/2004 | 0:00:00 | 9.45 |
| 12/11/2004 | 0:00:00 | 9.34 |
| 12/12/2004 | 0:00:00 | 9.18 |
| 12/13/2004 | 0:00:00 | 9.04 |
| 12/14/2004 | 0:00:00 | 8.95 |
| 12/15/2004 | 0:00:00 | 8.94 |
| 12/16/2004 | 0:00:00 | 8.93 |
| 12/17/2004 | 0:00:00 | 8.81 |
| 12/18/2004 | 0:00:00 | 8.68 |
| 12/19/2004 | 0:00:00 | 8.62 |
| 12/20/2004 | 0:00:00 | 8.58 |
| 12/21/2004 | 0:00:00 | 8.49 |
| 12/22/2004 | 0:00:00 | 8.45 |
| 12/23/2004 | 0:00:00 | 8.50 |
| 12/24/2004 | 0:00:00 | 8.59 |
| 12/25/2004 | 0:00:00 | 8.81 |
| 12/26/2004 | 0:00:00 | 8.86 |
| 12/27/2004 | 0:00:00 | 8.70 |
| 12/28/2004 | 0:00:00 | 8.62 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 12/29/2004 | 0:00:00 | 8.62 |
| 12/30/2004 | 0:00:00 | 8.61 |
| 12/31/2004 | 0:00:00 | 8.59 |

## Table F-2: 2004 daily flow data for Lochloosa Creek at Grove Park

| Date | Time | Discharge (cfs) |
|---|---|---|
| 01/01/2004 | 0:00:00 | 0.04 |
| 01/02/2004 | 0:00:00 | 0.04 |
| 01/03/2004 | 0:00:00 | 0.04 |
| 01/04/2004 | 0:00:00 | 0.04 |
| 01/05/2004 | 0:00:00 | 0.04 |
| 01/06/2004 | 0:00:00 | 0.04 |
| 01/07/2004 | 0:00:00 | 0.03 |
| 01/08/2004 | 0:00:00 | 0.03 |
| 01/09/2004 | 0:00:00 | 0.04 |
| 01/10/2004 | 0:00:00 | 0.04 |
| 01/11/2004 | 0:00:00 | 0.03 |
| 01/12/2004 | 0:00:00 | 0.03 |
| 01/13/2004 | 0:00:00 | 0.03 |
| 01/14/2004 | 0:00:00 | 0.03 |
| 01/15/2004 | 0:00:00 | 0.03 |
| 01/16/2004 | 0:00:00 | 0.02 |
| 01/17/2004 | 0:00:00 | 0.04 |
| 01/18/2004 | 0:00:00 | 0.09 |
| 01/19/2004 | 0:00:00 | 0.10 |
| 01/20/2004 | 0:00:00 | 0.06 |
| 01/21/2004 | 0:00:00 | 0.05 |
| 01/22/2004 | 0:00:00 | 0.05 |
| 01/23/2004 | 0:00:00 | 0.04 |
| 01/24/2004 | 0:00:00 | 0.04 |
| 01/25/2004 | 0:00:00 | 0.05 |
| 01/26/2004 | 0:00:00 | 0.12 |
| 01/27/2004 | 0:00:00 | 0.29 |
| 01/28/2004 | 0:00:00 | 0.34 |
| 01/29/2004 | 0:00:00 | 0.26 |
| 01/30/2004 | 0:00:00 | 0.19 |
| 01/31/2004 | 0:00:00 | 3.15 |
| 02/01/2004 | 0:00:00 | 7.53 |
| 02/02/2004 | 0:00:00 | 7.85 |
| 02/03/2004 | 0:00:00 | 6.30 |
| 02/04/2004 | 0:00:00 | 5.63 |
| 02/05/2004 | 0:00:00 | 5.29 |
| 02/06/2004 | 0:00:00 | 5.23 |
| 02/07/2004 | 0:00:00 | 4.84 |
| 02/08/2004 | 0:00:00 | 4.13 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 02/09/2004 | 0:00:00 | 3.82 |
| 02/10/2004 | 0:00:00 | 3.64 |
| 02/11/2004 | 0:00:00 | 3.50 |
| 02/12/2004 | 0:00:00 | 3.32 |
| 02/13/2004 | 0:00:00 | 3.78 |
| 02/14/2004 | 0:00:00 | 5.98 |
| 02/15/2004 | 0:00:00 | 6.71 |
| 02/16/2004 | 0:00:00 | 5.58 |
| 02/17/2004 | 0:00:00 | 5.12 |
| 02/18/2004 | 0:00:00 | 4.72 |
| 02/19/2004 | 0:00:00 | 4.35 |
| 02/20/2004 | 0:00:00 | 4.03 |
| 02/21/2004 | 0:00:00 | 3.74 |
| 02/22/2004 | 0:00:00 | 3.38 |
| 02/23/2004 | 0:00:00 | 16.45 |
| 02/24/2004 | 0:00:00 | 47.99 |
| 02/25/2004 | 0:00:00 | 60.27 |
| 02/26/2004 | 0:00:00 | 48.77 |
| 02/27/2004 | 0:00:00 | 38.57 |
| 02/28/2004 | 0:00:00 | 30.78 |
| 02/29/2004 | 0:00:00 | 25.86 |
| 03/01/2004 | 0:00:00 | 22.73 |
| 03/02/2004 | 0:00:00 | 20.39 |
| 03/03/2004 | 0:00:00 | 18.26 |
| 03/04/2004 | 0:00:00 | 15.80 |
| 03/05/2004 | 0:00:00 | 13.40 |
| 03/06/2004 | 0:00:00 | 11.49 |
| 03/07/2004 | 0:00:00 | 9.64 |
| 03/08/2004 | 0:00:00 | 7.98 |
| 03/09/2004 | 0:00:00 | 6.81 |
| 03/10/2004 | 0:00:00 | 5.91 |
| 03/11/2004 | 0:00:00 | 5.17 |
| 03/12/2004 | 0:00:00 | 4.55 |
| 03/13/2004 | 0:00:00 | 4.01 |
| 03/14/2004 | 0:00:00 | 3.89 |
| 03/15/2004 | 0:00:00 | 35.25 |
| 03/16/2004 | 0:00:00 | 61.10 |
| 03/17/2004 | 0:00:00 | 48.88 |
| 03/18/2004 | 0:00:00 | 36.86 |
| 03/19/2004 | 0:00:00 | 28.29 |
| 03/20/2004 | 0:00:00 | 22.68 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 03/21/2004 | 0:00:00 | 18.42 |
| 03/22/2004 | 0:00:00 | 14.72 |
| 03/23/2004 | 0:00:00 | 11.96 |
| 03/24/2004 | 0:00:00 | 10.10 |
| 03/25/2004 | 0:00:00 | 8.75 |
| 03/26/2004 | 0:00:00 | 7.59 |
| 03/27/2004 | 0:00:00 | 6.48 |
| 03/28/2004 | 0:00:00 | 5.51 |
| 03/29/2004 | 0:00:00 | 4.65 |
| 03/30/2004 | 0:00:00 | 3.87 |
| 03/31/2004 | 0:00:00 | 3.17 |
| 04/01/2004 | 0:00:00 | 2.60 |
| 04/02/2004 | 0:00:00 | 2.16 |
| 04/03/2004 | 0:00:00 | 1.77 |
| 04/04/2004 | 0:00:00 | 1.38 |
| 04/05/2004 | 0:00:00 | 1.02 |
| 04/06/2004 | 0:00:00 | 0.78 |
| 04/07/2004 | 0:00:00 | 0.67 |
| 04/08/2004 | 0:00:00 | 0.59 |
| 04/09/2004 | 0:00:00 | 0.38 |
| 04/10/2004 | 0:00:00 | 0.17 |
| 04/11/2004 | 0:00:00 | 0.09 |
| 04/12/2004 | 0:00:00 | 0.77 |
| 04/13/2004 | 0:00:00 | 1.09 |
| 04/14/2004 | 0:00:00 | 0.60 |
| 04/15/2004 | 0:00:00 | 0.35 |
| 04/16/2004 | 0:00:00 | 0.12 |
| 04/17/2004 | 0:00:00 | 0.03 |
| 04/18/2004 | 0:00:00 | 0.01 |
| 04/19/2004 | 0:00:00 | 0.00 |
| 04/20/2004 | 0:00:00 | 0.00 |
| 04/21/2004 | 0:00:00 | 0.00 |
| 04/22/2004 | 0:00:00 | 0.00 |
| 04/23/2004 | 0:00:00 | 0.00 |
| 04/24/2004 | 0:00:00 | 0.00 |
| 04/25/2004 | 0:00:00 | 0.00 |
| 04/26/2004 | 0:00:00 | 0.00 |
| 04/27/2004 | 0:00:00 | 0.00 |
| 04/28/2004 | 0:00:00 | 0.00 |
| 04/29/2004 | 0:00:00 | 0.00 |
| 04/30/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 05/01/2004 | 0:00:00 | 0.00 |
| 05/02/2004 | 0:00:00 | 0.00 |
| 05/03/2004 | 0:00:00 | 0.00 |
| 05/04/2004 | 0:00:00 | 0.00 |
| 05/05/2004 | 0:00:00 | 0.00 |
| 05/06/2004 | 0:00:00 | 0.00 |
| 05/07/2004 | 0:00:00 | 0.00 |
| 05/08/2004 | 0:00:00 | 0.00 |
| 05/09/2004 | 0:00:00 | 0.00 |
| 05/10/2004 | 0:00:00 | 0.00 |
| 05/11/2004 | 0:00:00 | 0.00 |
| 05/12/2004 | 0:00:00 | 0.00 |
| 05/13/2004 | 0:00:00 | 0.00 |
| 05/14/2004 | 0:00:00 | 0.00 |
| 05/15/2004 | 0:00:00 | 0.00 |
| 05/16/2004 | 0:00:00 | 0.00 |
| 05/17/2004 | 0:00:00 | 0.00 |
| 05/18/2004 | 0:00:00 | 0.00 |
| 05/19/2004 | 0:00:00 | 0.00 |
| 05/20/2004 | 0:00:00 | 0.00 |
| 05/21/2004 | 0:00:00 | 0.00 |
| 05/22/2004 | 0:00:00 | 0.00 |
| 05/23/2004 | 0:00:00 | 0.00 |
| 05/24/2004 | 0:00:00 | 0.00 |
| 05/25/2004 | 0:00:00 | 0.00 |
| 05/26/2004 | 0:00:00 | 0.00 |
| 05/27/2004 | 0:00:00 | 0.00 |
| 05/28/2004 | 0:00:00 | 0.00 |
| 05/29/2004 | 0:00:00 | 0.00 |
| 05/30/2004 | 0:00:00 | 0.00 |
| 05/31/2004 | 0:00:00 | 0.00 |
| 06/01/2004 | 0:00:00 | 0.00 |
| 06/02/2004 | 0:00:00 | 0.00 |
| 06/03/2004 | 0:00:00 | 0.00 |
| 06/04/2004 | 0:00:00 | 0.00 |
| 06/05/2004 | 0:00:00 | 0.00 |
| 06/06/2004 | 0:00:00 | 0.00 |
| 06/07/2004 | 0:00:00 | 0.00 |
| 06/08/2004 | 0:00:00 | 0.00 |
| 06/09/2004 | 0:00:00 | 0.00 |
| 06/10/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 06/11/2004 | 0:00:00 | 0.00 |
| 06/12/2004 | 0:00:00 | 0.00 |
| 06/13/2004 | 0:00:00 | 0.01 |
| 06/14/2004 | 0:00:00 | 0.01 |
| 06/15/2004 | 0:00:00 | 0.00 |
| 06/16/2004 | 0:00:00 | 0.00 |
| 06/17/2004 | 0:00:00 | 0.00 |
| 06/18/2004 | 0:00:00 | 0.00 |
| 06/19/2004 | 0:00:00 | 0.00 |
| 06/20/2004 | 0:00:00 | 0.00 |
| 06/21/2004 | 0:00:00 | 0.00 |
| 06/22/2004 | 0:00:00 | 0.00 |
| 06/23/2004 | 0:00:00 | 0.00 |
| 06/24/2004 | 0:00:00 | 0.00 |
| 06/25/2004 | 0:00:00 | 0.00 |
| 06/26/2004 | 0:00:00 | 0.01 |
| 06/27/2004 | 0:00:00 | 0.01 |
| 06/28/2004 | 0:00:00 | 0.00 |
| 06/29/2004 | 0:00:00 | 0.00 |
| 06/30/2004 | 0:00:00 | 0.00 |
| 07/01/2004 | 0:00:00 | 0.00 |
| 07/02/2004 | 0:00:00 | 0.00 |
| 07/03/2004 | 0:00:00 | 0.00 |
| 07/04/2004 | 0:00:00 | 0.00 |
| 07/05/2004 | 0:00:00 | 0.00 |
| 07/06/2004 | 0:00:00 | 0.00 |
| 07/07/2004 | 0:00:00 | 0.00 |
| 07/08/2004 | 0:00:00 | 0.00 |
| 07/09/2004 | 0:00:00 | 0.00 |
| 07/10/2004 | 0:00:00 | 0.00 |
| 07/11/2004 | 0:00:00 | 0.00 |
| 07/12/2004 | 0:00:00 | 0.00 |
| 07/13/2004 | 0:00:00 | 0.00 |
| 07/14/2004 | 0:00:00 | 0.00 |
| 07/15/2004 | 0:00:00 | 0.09 |
| 07/16/2004 | 0:00:00 | 0.23 |
| 07/17/2004 | 0:00:00 | 0.15 |
| 07/18/2004 | 0:00:00 | 0.07 |
| 07/19/2004 | 0:00:00 | 0.10 |
| 07/20/2004 | 0:00:00 | 0.09 |
| 07/21/2004 | 0:00:00 | 0.05 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 07/22/2004 | 0:00:00 | 0.05 |
| 07/23/2004 | 0:00:00 | 0.05 |
| 07/24/2004 | 0:00:00 | 0.01 |
| 07/25/2004 | 0:00:00 | 0.00 |
| 07/26/2004 | 0:00:00 | 1.88 |
| 07/27/2004 | 0:00:00 | 3.30 |
| 07/28/2004 | 0:00:00 | 1.62 |
| 07/29/2004 | 0:00:00 | 0.24 |
| 07/30/2004 | 0:00:00 | 0.06 |
| 07/31/2004 | 0:00:00 | 0.03 |
| 08/01/2004 | 0:00:00 | 0.15 |
| 08/02/2004 | 0:00:00 | 0.38 |
| 08/03/2004 | 0:00:00 | 0.32 |
| 08/04/2004 | 0:00:00 | 0.14 |
| 08/05/2004 | 0:00:00 | 1.22 |
| 08/06/2004 | 0:00:00 | 3.37 |
| 08/07/2004 | 0:00:00 | 2.77 |
| 08/08/2004 | 0:00:00 | 0.87 |
| 08/09/2004 | 0:00:00 | 0.45 |
| 08/10/2004 | 0:00:00 | 0.21 |
| 08/11/2004 | 0:00:00 | 0.12 |
| 08/12/2004 | 0:00:00 | 0.12 |
| 08/13/2004 | 0:00:00 | 0.65 |
| 08/14/2004 | 0:00:00 | 1.46 |
| 08/15/2004 | 0:00:00 | 1.74 |
| 08/16/2004 | 0:00:00 | 1.65 |
| 08/17/2004 | 0:00:00 | 2.07 |
| 08/18/2004 | 0:00:00 | 2.46 |
| 08/19/2004 | 0:00:00 | 2.58 |
| 08/20/2004 | 0:00:00 | 3.33 |
| 08/21/2004 | 0:00:00 | 5.09 |
| 08/22/2004 | 0:00:00 | 22.38 |
| 08/23/2004 | 0:00:00 | 37.23 |
| 08/24/2004 | 0:00:00 | 30.16 |
| 08/25/2004 | 0:00:00 | 24.12 |
| 08/26/2004 | 0:00:00 | 21.71 |
| 08/27/2004 | 0:00:00 | 17.14 |
| 08/28/2004 | 0:00:00 | 13.62 |
| 08/29/2004 | 0:00:00 | 10.71 |
| 08/30/2004 | 0:00:00 | 7.78 |
| 08/31/2004 | 0:00:00 | 5.72 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 09/01/2004 | 0:00:00 | 4.67 |
| 09/02/2004 | 0:00:00 | 5.18 |
| 09/03/2004 | 0:00:00 | 5.77 |
| 09/04/2004 | 0:00:00 | 205.12 |
| 09/05/2004 | 0:00:00 | 1606.36 |
| 09/06/2004 | 0:00:00 | 3023.13 |
| 09/07/2004 | 0:00:00 | 2771.08 |
| 09/08/2004 | 0:00:00 | 1829.99 |
| 09/09/2004 | 0:00:00 | 1077.45 |
| 09/10/2004 | 0:00:00 | 639.56 |
| 09/11/2004 | 0:00:00 | 413.08 |
| 09/12/2004 | 0:00:00 | 288.57 |
| 09/13/2004 | 0:00:00 | 191.46 |
| 09/14/2004 | 0:00:00 | 130.21 |
| 09/15/2004 | 0:00:00 | 97.20 |
| 09/16/2004 | 0:00:00 | 79.98 |
| 09/17/2004 | 0:00:00 | 69.68 |
| 09/18/2004 | 0:00:00 | 61.00 |
| 09/19/2004 | 0:00:00 | 52.85 |
| 09/20/2004 | 0:00:00 | 46.24 |
| 09/21/2004 | 0:00:00 | 40.86 |
| 09/22/2004 | 0:00:00 | 36.06 |
| 09/23/2004 | 0:00:00 | 32.04 |
| 09/24/2004 | 0:00:00 | 28.20 |
| 09/25/2004 | 0:00:00 | 184.51 |
| 09/26/2004 | 0:00:00 | 877.04 |
| 09/27/2004 | 0:00:00 | 1231.02 |
| 09/28/2004 | 0:00:00 | 908.75 |
| 09/29/2004 | 0:00:00 | 628.04 |
| 09/30/2004 | 0:00:00 | 441.20 |
| 10/01/2004 | 0:00:00 | 424.32 |
| 10/02/2004 | 0:00:00 | 331.99 |
| 10/03/2004 | 0:00:00 | 228.53 |
| 10/04/2004 | 0:00:00 | 205.48 |
| 10/05/2004 | 0:00:00 | 133.44 |
| 10/06/2004 | 0:00:00 | 92.32 |
| 10/07/2004 | 0:00:00 | 74.84 |
| 10/08/2004 | 0:00:00 | 65.22 |
| 10/09/2004 | 0:00:00 | 57.08 |
| 10/10/2004 | 0:00:00 | 56.21 |
| 10/11/2004 | 0:00:00 | 65.79 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 10/12/2004 | 0:00:00 | 70.18 |
| 10/13/2004 | 0:00:00 | 63.31 |
| 10/14/2004 | 0:00:00 | 56.45 |
| 10/15/2004 | 0:00:00 | 50.71 |
| 10/16/2004 | 0:00:00 | 43.96 |
| 10/17/2004 | 0:00:00 | 38.06 |
| 10/18/2004 | 0:00:00 | 33.07 |
| 10/19/2004 | 0:00:00 | 29.29 |
| 10/20/2004 | 0:00:00 | 26.33 |
| 10/21/2004 | 0:00:00 | 23.28 |
| 10/22/2004 | 0:00:00 | 20.25 |
| 10/23/2004 | 0:00:00 | 17.53 |
| 10/24/2004 | 0:00:00 | 15.39 |
| 10/25/2004 | 0:00:00 | 13.68 |
| 10/26/2004 | 0:00:00 | 12.16 |
| 10/27/2004 | 0:00:00 | 10.93 |
| 10/28/2004 | 0:00:00 | 10.05 |
| 10/29/2004 | 0:00:00 | 9.33 |
| 10/30/2004 | 0:00:00 | 8.70 |
| 10/31/2004 | 0:00:00 | 8.11 |
| 11/01/2004 | 0:00:00 | 7.48 |
| 11/02/2004 | 0:00:00 | 6.85 |
| 11/03/2004 | 0:00:00 | 6.28 |
| 11/04/2004 | 0:00:00 | 5.91 |
| 11/05/2004 | 0:00:00 | 5.50 |
| 11/06/2004 | 0:00:00 | 5.00 |
| 11/07/2004 | 0:00:00 | 4.53 |
| 11/08/2004 | 0:00:00 | 4.13 |
| 11/09/2004 | 0:00:00 | 3.91 |
| 11/10/2004 | 0:00:00 | 3.70 |
| 11/11/2004 | 0:00:00 | 3.47 |
| 11/12/2004 | 0:00:00 | 3.25 |
| 11/13/2004 | 0:00:00 | 3.01 |
| 11/14/2004 | 0:00:00 | 2.79 |
| 11/15/2004 | 0:00:00 | 2.56 |
| 11/16/2004 | 0:00:00 | 2.32 |
| 11/17/2004 | 0:00:00 | 2.12 |
| 11/18/2004 | 0:00:00 | 1.95 |
| 11/19/2004 | 0:00:00 | 1.82 |
| 11/20/2004 | 0:00:00 | 1.70 |
| 11/21/2004 | 0:00:00 | 1.56 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 11/22/2004 | 0:00:00 | 1.46 |
| 11/23/2004 | 0:00:00 | 1.57 |
| 11/24/2004 | 0:00:00 | 3.57 |
| 11/25/2004 | 0:00:00 | 4.89 |
| 11/26/2004 | 0:00:00 | 4.31 |
| 11/27/2004 | 0:00:00 | 4.91 |
| 11/28/2004 | 0:00:00 | 5.25 |
| 11/29/2004 | 0:00:00 | 4.81 |
| 11/30/2004 | 0:00:00 | 4.55 |
| 12/01/2004 | 0:00:00 | 4.24 |
| 12/02/2004 | 0:00:00 | 3.87 |
| 12/03/2004 | 0:00:00 | 3.59 |
| 12/04/2004 | 0:00:00 | 3.41 |
| 12/05/2004 | 0:00:00 | 3.20 |
| 12/06/2004 | 0:00:00 | 2.97 |
| 12/07/2004 | 0:00:00 | 2.74 |
| 12/08/2004 | 0:00:00 | 2.51 |
| 12/09/2004 | 0:00:00 | 3.72 |
| 12/10/2004 | 0:00:00 | 5.46 |
| 12/11/2004 | 0:00:00 | 5.23 |
| 12/12/2004 | 0:00:00 | 4.29 |
| 12/13/2004 | 0:00:00 | 3.80 |
| 12/14/2004 | 0:00:00 | 3.30 |
| 12/15/2004 | 0:00:00 | 2.91 |
| 12/16/2004 | 0:00:00 | 2.72 |
| 12/17/2004 | 0:00:00 | 2.55 |
| 12/18/2004 | 0:00:00 | 2.34 |
| 12/19/2004 | 0:00:00 | 2.04 |
| 12/20/2004 | 0:00:00 | 1.76 |
| 12/21/2004 | 0:00:00 | 1.60 |
| 12/22/2004 | 0:00:00 | 1.65 |
| 12/23/2004 | 0:00:00 | 1.76 |
| 12/24/2004 | 0:00:00 | 1.99 |
| 12/25/2004 | 0:00:00 | 3.14 |
| 12/26/2004 | 0:00:00 | 3.84 |
| 12/27/2004 | 0:00:00 | 3.41 |
| 12/28/2004 | 0:00:00 | 3.11 |
| 12/29/2004 | 0:00:00 | 2.90 |
| 12/30/2004 | 0:00:00 | 2.68 |
| 12/31/2004 | 0:00:00 | 2.50 |

## Table F-3: 2004 daily flow data for Orange Lake at Citra

| Date | Time | Discharge (cfs) |
|---|---|---|
| 01/01/2004 | 0:00:00 | 0.00 |
| 01/02/2004 | 0:00:00 | 0.00 |
| 01/03/2004 | 0:00:00 | 0.00 |
| 01/04/2004 | 0:00:00 | 0.00 |
| 01/05/2004 | 0:00:00 | 0.00 |
| 01/06/2004 | 0:00:00 | 0.00 |
| 01/07/2004 | 0:00:00 | 0.00 |
| 01/08/2004 | 0:00:00 | 0.00 |
| 01/09/2004 | 0:00:00 | 0.00 |
| 01/10/2004 | 0:00:00 | 0.00 |
| 01/11/2004 | 0:00:00 | 0.00 |
| 01/12/2004 | 0:00:00 | 0.00 |
| 01/13/2004 | 0:00:00 | 0.00 |
| 01/14/2004 | 0:00:00 | 0.00 |
| 01/15/2004 | 0:00:00 | 0.00 |
| 01/16/2004 | 0:00:00 | 0.00 |
| 01/17/2004 | 0:00:00 | 0.00 |
| 01/18/2004 | 0:00:00 | 0.00 |
| 01/19/2004 | 0:00:00 | 0.00 |
| 01/20/2004 | 0:00:00 | 0.00 |
| 01/21/2004 | 0:00:00 | 0.00 |
| 01/22/2004 | 0:00:00 | 0.00 |
| 01/23/2004 | 0:00:00 | 0.00 |
| 01/24/2004 | 0:00:00 | 0.00 |
| 01/25/2004 | 0:00:00 | 0.00 |
| 01/26/2004 | 0:00:00 | 0.00 |
| 01/27/2004 | 0:00:00 | 0.00 |
| 01/28/2004 | 0:00:00 | 0.00 |
| 01/29/2004 | 0:00:00 | 0.00 |
| 01/30/2004 | 0:00:00 | 0.00 |
| 01/31/2004 | 0:00:00 | 0.00 |
| 02/01/2004 | 0:00:00 | 0.00 |
| 02/02/2004 | 0:00:00 | 0.00 |
| 02/03/2004 | 0:00:00 | 0.00 |
| 02/04/2004 | 0:00:00 | 0.00 |
| 02/05/2004 | 0:00:00 | 0.00 |
| 02/06/2004 | 0:00:00 | 0.00 |
| 02/07/2004 | 0:00:00 | 0.00 |
| 02/08/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 02/09/2004 | 0:00:00 | 0.00 |
| 02/10/2004 | 0:00:00 | 0.00 |
| 02/11/2004 | 0:00:00 | 0.00 |
| 02/12/2004 | 0:00:00 | 0.00 |
| 02/13/2004 | 0:00:00 | 0.00 |
| 02/14/2004 | 0:00:00 | 0.00 |
| 02/15/2004 | 0:00:00 | 0.00 |
| 02/16/2004 | 0:00:00 | 0.00 |
| 02/17/2004 | 0:00:00 | 0.00 |
| 02/18/2004 | 0:00:00 | 0.00 |
| 02/19/2004 | 0:00:00 | 0.00 |
| 02/20/2004 | 0:00:00 | 0.00 |
| 02/21/2004 | 0:00:00 | 0.00 |
| 02/22/2004 | 0:00:00 | 0.00 |
| 02/23/2004 | 0:00:00 | 0.00 |
| 02/24/2004 | 0:00:00 | 0.00 |
| 02/25/2004 | 0:00:00 | 0.00 |
| 02/26/2004 | 0:00:00 | 0.00 |
| 02/27/2004 | 0:00:00 | 0.00 |
| 02/28/2004 | 0:00:00 | 0.00 |
| 02/29/2004 | 0:00:00 | 0.00 |
| 03/01/2004 | 0:00:00 | 0.00 |
| 03/02/2004 | 0:00:00 | 0.00 |
| 03/03/2004 | 0:00:00 | 0.00 |
| 03/04/2004 | 0:00:00 | 0.00 |
| 03/05/2004 | 0:00:00 | 0.00 |
| 03/06/2004 | 0:00:00 | 0.00 |
| 03/07/2004 | 0:00:00 | 0.00 |
| 03/08/2004 | 0:00:00 | 0.00 |
| 03/09/2004 | 0:00:00 | 0.00 |
| 03/10/2004 | 0:00:00 | 0.00 |
| 03/11/2004 | 0:00:00 | 0.00 |
| 03/12/2004 | 0:00:00 | 0.00 |
| 03/13/2004 | 0:00:00 | 0.00 |
| 03/14/2004 | 0:00:00 | 0.00 |
| 03/15/2004 | 0:00:00 | 0.00 |
| 03/16/2004 | 0:00:00 | 0.00 |
| 03/17/2004 | 0:00:00 | 0.00 |
| 03/18/2004 | 0:00:00 | 0.00 |
| 03/19/2004 | 0:00:00 | 0.00 |
| 03/20/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 03/21/2004 | 0:00:00 | 0.00 |
| 03/22/2004 | 0:00:00 | 0.00 |
| 03/23/2004 | 0:00:00 | 0.00 |
| 03/24/2004 | 0:00:00 | 0.00 |
| 03/25/2004 | 0:00:00 | 0.00 |
| 03/26/2004 | 0:00:00 | 0.00 |
| 03/27/2004 | 0:00:00 | 0.00 |
| 03/28/2004 | 0:00:00 | 0.00 |
| 03/29/2004 | 0:00:00 | 0.00 |
| 03/30/2004 | 0:00:00 | 0.00 |
| 03/31/2004 | 0:00:00 | 0.00 |
| 04/01/2004 | 0:00:00 | 0.00 |
| 04/02/2004 | 0:00:00 | 0.00 |
| 04/03/2004 | 0:00:00 | 0.00 |
| 04/04/2004 | 0:00:00 | 0.00 |
| 04/05/2004 | 0:00:00 | 0.00 |
| 04/06/2004 | 0:00:00 | 0.00 |
| 04/07/2004 | 0:00:00 | 0.00 |
| 04/08/2004 | 0:00:00 | 0.00 |
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| 04/10/2004 | 0:00:00 | 0.00 |
| 04/11/2004 | 0:00:00 | 0.00 |
| 04/12/2004 | 0:00:00 | 0.00 |
| 04/13/2004 | 0:00:00 | 0.00 |
| 04/14/2004 | 0:00:00 | 0.00 |
| 04/15/2004 | 0:00:00 | 0.00 |
| 04/16/2004 | 0:00:00 | 0.00 |
| 04/17/2004 | 0:00:00 | 0.00 |
| 04/18/2004 | 0:00:00 | 0.00 |
| 04/19/2004 | 0:00:00 | 0.00 |
| 04/20/2004 | 0:00:00 | 0.00 |
| 04/21/2004 | 0:00:00 | 0.00 |
| 04/22/2004 | 0:00:00 | 0.00 |
| 04/23/2004 | 0:00:00 | 0.00 |
| 04/24/2004 | 0:00:00 | 0.00 |
| 04/25/2004 | 0:00:00 | 0.00 |
| 04/26/2004 | 0:00:00 | 0.00 |
| 04/27/2004 | 0:00:00 | 0.00 |
| 04/28/2004 | 0:00:00 | 0.00 |
| 04/29/2004 | 0:00:00 | 0.00 |
| 04/30/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 05/01/2004 | 0:00:00 | 0.00 |
| 05/02/2004 | 0:00:00 | 0.00 |
| 05/03/2004 | 0:00:00 | 0.00 |
| 05/04/2004 | 0:00:00 | 0.00 |
| 05/05/2004 | 0:00:00 | 0.00 |
| 05/06/2004 | 0:00:00 | 0.00 |
| 05/07/2004 | 0:00:00 | 0.00 |
| 05/08/2004 | 0:00:00 | 0.00 |
| 05/09/2004 | 0:00:00 | 0.00 |
| 05/10/2004 | 0:00:00 | 0.00 |
| 05/11/2004 | 0:00:00 | 0.00 |
| 05/12/2004 | 0:00:00 | 0.00 |
| 05/13/2004 | 0:00:00 | 0.00 |
| 05/14/2004 | 0:00:00 | 0.00 |
| 05/15/2004 | 0:00:00 | 0.00 |
| 05/16/2004 | 0:00:00 | 0.00 |
| 05/17/2004 | 0:00:00 | 0.00 |
| 05/18/2004 | 0:00:00 | 0.00 |
| 05/19/2004 | 0:00:00 | 0.00 |
| 05/20/2004 | 0:00:00 | 0.00 |
| 05/21/2004 | 0:00:00 | 0.00 |
| 05/22/2004 | 0:00:00 | 0.00 |
| 05/23/2004 | 0:00:00 | 0.00 |
| 05/24/2004 | 0:00:00 | 0.00 |
| 05/25/2004 | 0:00:00 | 0.00 |
| 05/26/2004 | 0:00:00 | 0.00 |
| 05/27/2004 | 0:00:00 | 0.00 |
| 05/28/2004 | 0:00:00 | 0.00 |
| 05/29/2004 | 0:00:00 | 0.00 |
| 05/30/2004 | 0:00:00 | 0.00 |
| 05/31/2004 | 0:00:00 | 0.00 |
| 06/01/2004 | 0:00:00 | 0.00 |
| 06/02/2004 | 0:00:00 | 0.00 |
| 06/03/2004 | 0:00:00 | 0.00 |
| 06/04/2004 | 0:00:00 | 0.00 |
| 06/05/2004 | 0:00:00 | 0.00 |
| 06/06/2004 | 0:00:00 | 0.00 |
| 06/07/2004 | 0:00:00 | 0.00 |
| 06/08/2004 | 0:00:00 | 0.00 |
| 06/09/2004 | 0:00:00 | 0.00 |
| 06/10/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 06/11/2004 | 0:00:00 | 0.00 |
| 06/12/2004 | 0:00:00 | 0.00 |
| 06/13/2004 | 0:00:00 | 0.00 |
| 06/14/2004 | 0:00:00 | 0.00 |
| 06/15/2004 | 0:00:00 | 0.00 |
| 06/16/2004 | 0:00:00 | 0.00 |
| 06/17/2004 | 0:00:00 | 0.00 |
| 06/18/2004 | 0:00:00 | 0.00 |
| 06/19/2004 | 0:00:00 | 0.00 |
| 06/20/2004 | 0:00:00 | 0.00 |
| 06/21/2004 | 0:00:00 | 0.00 |
| 06/22/2004 | 0:00:00 | 0.00 |
| 06/23/2004 | 0:00:00 | 0.00 |
| 06/24/2004 | 0:00:00 | 0.00 |
| 06/25/2004 | 0:00:00 | 0.00 |
| 06/26/2004 | 0:00:00 | 0.00 |
| 06/27/2004 | 0:00:00 | 0.00 |
| 06/28/2004 | 0:00:00 | 0.00 |
| 06/29/2004 | 0:00:00 | 0.00 |
| 06/30/2004 | 0:00:00 | 0.00 |
| 07/01/2004 | 0:00:00 | 0.00 |
| 07/02/2004 | 0:00:00 | 0.00 |
| 07/03/2004 | 0:00:00 | 0.00 |
| 07/04/2004 | 0:00:00 | 0.00 |
| 07/05/2004 | 0:00:00 | 0.00 |
| 07/06/2004 | 0:00:00 | 0.00 |
| 07/07/2004 | 0:00:00 | 0.00 |
| 07/08/2004 | 0:00:00 | 0.00 |
| 07/09/2004 | 0:00:00 | 0.00 |
| 07/10/2004 | 0:00:00 | 0.00 |
| 07/11/2004 | 0:00:00 | 0.00 |
| 07/12/2004 | 0:00:00 | 0.00 |
| 07/13/2004 | 0:00:00 | 0.00 |
| 07/14/2004 | 0:00:00 | 0.00 |
| 07/15/2004 | 0:00:00 | 0.00 |
| 07/16/2004 | 0:00:00 | 0.00 |
| 07/17/2004 | 0:00:00 | 0.00 |
| 07/18/2004 | 0:00:00 | 0.00 |
| 07/19/2004 | 0:00:00 | 0.00 |
| 07/20/2004 | 0:00:00 | 0.00 |
| 07/21/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 07/22/2004 | 0:00:00 | 0.00 |
| 07/23/2004 | 0:00:00 | 0.00 |
| 07/24/2004 | 0:00:00 | 0.00 |
| 07/25/2004 | 0:00:00 | 0.00 |
| 07/26/2004 | 0:00:00 | 0.00 |
| 07/27/2004 | 0:00:00 | 0.00 |
| 07/28/2004 | 0:00:00 | 0.00 |
| 07/29/2004 | 0:00:00 | 0.00 |
| 07/30/2004 | 0:00:00 | 0.00 |
| 07/31/2004 | 0:00:00 | 0.00 |
| 08/01/2004 | 0:00:00 | 0.00 |
| 08/02/2004 | 0:00:00 | 0.00 |
| 08/03/2004 | 0:00:00 | 0.00 |
| 08/04/2004 | 0:00:00 | 0.00 |
| 08/05/2004 | 0:00:00 | 0.00 |
| 08/06/2004 | 0:00:00 | 0.00 |
| 08/07/2004 | 0:00:00 | 0.00 |
| 08/08/2004 | 0:00:00 | 0.00 |
| 08/09/2004 | 0:00:00 | 0.00 |
| 08/10/2004 | 0:00:00 | 0.00 |
| 08/11/2004 | 0:00:00 | 0.00 |
| 08/12/2004 | 0:00:00 | 0.00 |
| 08/13/2004 | 0:00:00 | 0.00 |
| 08/14/2004 | 0:00:00 | 0.00 |
| 08/15/2004 | 0:00:00 | 0.00 |
| 08/16/2004 | 0:00:00 | 0.00 |
| 08/17/2004 | 0:00:00 | 0.00 |
| 08/18/2004 | 0:00:00 | 0.00 |
| 08/19/2004 | 0:00:00 | 0.00 |
| 08/20/2004 | 0:00:00 | 0.00 |
| 08/21/2004 | 0:00:00 | 0.00 |
| 08/22/2004 | 0:00:00 | 0.00 |
| 08/23/2004 | 0:00:00 | 0.00 |
| 08/24/2004 | 0:00:00 | 0.00 |
| 08/25/2004 | 0:00:00 | 0.00 |
| 08/26/2004 | 0:00:00 | 0.00 |
| 08/27/2004 | 0:00:00 | 0.00 |
| 08/28/2004 | 0:00:00 | 0.00 |
| 08/29/2004 | 0:00:00 | 0.00 |
| 08/30/2004 | 0:00:00 | 0.00 |
| 08/31/2004 | 0:00:00 | 0.00 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 09/01/2004 | 0:00:00 | 0.00 |
| 09/02/2004 | 0:00:00 | 0.00 |
| 09/03/2004 | 0:00:00 | 0.00 |
| 09/04/2004 | 0:00:00 | 0.00 |
| 09/05/2004 | 0:00:00 | 0.00 |
| 09/06/2004 | 0:00:00 | 0.00 |
| 09/07/2004 | 0:00:00 | 0.00 |
| 09/08/2004 | 0:00:00 | 0.00 |
| 09/09/2004 | 0:00:00 | 0.00 |
| 09/10/2004 | 0:00:00 | 0.00 |
| 09/11/2004 | 0:00:00 | 0.00 |
| 09/12/2004 | 0:00:00 | 0.00 |
| 09/13/2004 | 0:00:00 | 0.00 |
| 09/14/2004 | 0:00:00 | 0.00 |
| 09/15/2004 | 0:00:00 | 0.00 |
| 09/16/2004 | 0:00:00 | 0.00 |
| 09/17/2004 | 0:00:00 | 1.81 |
| 09/18/2004 | 0:00:00 | 3.03 |
| 09/19/2004 | 0:00:00 | 4.50 |
| 09/20/2004 | 0:00:00 | 6.58 |
| 09/21/2004 | 0:00:00 | 9.93 |
| 09/22/2004 | 0:00:00 | 15.24 |
| 09/23/2004 | 0:00:00 | 22.04 |
| 09/24/2004 | 0:00:00 | 30.15 |
| 09/25/2004 | 0:00:00 | 49.70 |
| 09/26/2004 | 0:00:00 | 136.97 |
| 09/27/2004 | 0:00:00 | 246.34 |
| 09/28/2004 | 0:00:00 | 300.76 |
| 09/29/2004 | 0:00:00 | 333.24 |
| 09/30/2004 | 0:00:00 | 382.47 |
| 10/01/2004 | 0:00:00 | 0.00 |
| 10/02/2004 | 0:00:00 | 432.85 |
| 10/03/2004 | 0:00:00 | 448.83 |
| 10/04/2004 | 0:00:00 | 484.85 |
| 10/05/2004 | 0:00:00 | 516.94 |
| 10/06/2004 | 0:00:00 | 533.96 |
| 10/07/2004 | 0:00:00 | 540.22 |
| 10/08/2004 | 0:00:00 | 540.82 |
| 10/09/2004 | 0:00:00 | 539.34 |
| 10/10/2004 | 0:00:00 | 539.46 |
| 10/11/2004 | 0:00:00 | 548.58 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 10/12/2004 | 0:00:00 | 555.45 |
| 10/13/2004 | 0:00:00 | 551.43 |
| 10/14/2004 | 0:00:00 | 541.32 |
| 10/15/2004 | 0:00:00 | 526.96 |
| 10/16/2004 | 0:00:00 | 509.58 |
| 10/17/2004 | 0:00:00 | 491.86 |
| 10/18/2004 | 0:00:00 | 476.64 |
| 10/19/2004 | 0:00:00 | 461.92 |
| 10/20/2004 | 0:00:00 | 450.76 |
| 10/21/2004 | 0:00:00 | 440.82 |
| 10/22/2004 | 0:00:00 | 425.24 |
| 10/23/2004 | 0:00:00 | 405.18 |
| 10/24/2004 | 0:00:00 | 385.35 |
| 10/25/2004 | 0:00:00 | 367.21 |
| 10/26/2004 | 0:00:00 | 350.27 |
| 10/27/2004 | 0:00:00 | 334.22 |
| 10/28/2004 | 0:00:00 | 318.36 |
| 10/29/2004 | 0:00:00 | 303.53 |
| 10/30/2004 | 0:00:00 | 291.10 |
| 10/31/2004 | 0:00:00 | 278.06 |
| 11/01/2004 | 0:00:00 | 263.65 |
| 11/02/2004 | 0:00:00 | 248.44 |
| 11/03/2004 | 0:00:00 | 242.16 |
| 11/04/2004 | 0:00:00 | 248.46 |
| 11/05/2004 | 0:00:00 | 255.93 |
| 11/06/2004 | 0:00:00 | 251.55 |
| 11/07/2004 | 0:00:00 | 239.95 |
| 11/08/2004 | 0:00:00 | 232.14 |
| 11/09/2004 | 0:00:00 | 227.03 |
| 11/10/2004 | 0:00:00 | 217.53 |
| 11/11/2004 | 0:00:00 | 206.97 |
| 11/12/2004 | 0:00:00 | 202.28 |
| 11/13/2004 | 0:00:00 | 199.04 |
| 11/14/2004 | 0:00:00 | 197.17 |
| 11/15/2004 | 0:00:00 | 195.16 |
| 11/16/2004 | 0:00:00 | 188.85 |
| 11/17/2004 | 0:00:00 | 180.23 |
| 11/18/2004 | 0:00:00 | 169.34 |
| 11/19/2004 | 0:00:00 | 159.23 |
| 11/20/2004 | 0:00:00 | 150.64 |
| 11/21/2004 | 0:00:00 | 143.71 |

| Date | Time | Discharge (cfs) |
|---|---|---|
| 11/22/2004 | 0:00:00 | 140.88 |
| 11/23/2004 | 0:00:00 | 134.78 |
| 11/24/2004 | 0:00:00 | 129.30 |
| 11/25/2004 | 0:00:00 | 151.97 |
| 11/26/2004 | 0:00:00 | 166.54 |
| 11/27/2004 | 0:00:00 | 154.48 |
| 11/28/2004 | 0:00:00 | 159.91 |
| 11/29/2004 | 0:00:00 | 162.91 |
| 11/30/2004 | 0:00:00 | 153.96 |
| 12/01/2004 | 0:00:00 | 147.12 |
| 12/02/2004 | 0:00:00 | 137.97 |
| 12/03/2004 | 0:00:00 | 128.16 |
| 12/04/2004 | 0:00:00 | 117.76 |
| 12/05/2004 | 0:00:00 | 107.86 |
| 12/06/2004 | 0:00:00 | 102.05 |
| 12/07/2004 | 0:00:00 | 95.67 |
| 12/08/2004 | 0:00:00 | 89.73 |
| 12/09/2004 | 0:00:00 | 86.96 |
| 12/10/2004 | 0:00:00 | 91.05 |
| 12/11/2004 | 0:00:00 | 101.52 |
| 12/12/2004 | 0:00:00 | 99.83 |
| 12/13/2004 | 0:00:00 | 88.02 |
| 12/14/2004 | 0:00:00 | 84.54 |
| 12/15/2004 | 0:00:00 | 78.84 |
| 12/16/2004 | 0:00:00 | 68.75 |
| 12/17/2004 | 0:00:00 | 63.78 |
| 12/18/2004 | 0:00:00 | 59.96 |
| 12/19/2004 | 0:00:00 | 59.11 |
| 12/20/2004 | 0:00:00 | 58.67 |
| 12/21/2004 | 0:00:00 | 51.54 |
| 12/22/2004 | 0:00:00 | 44.08 |
| 12/23/2004 | 0:00:00 | 43.86 |
| 12/24/2004 | 0:00:00 | 48.19 |
| 12/25/2004 | 0:00:00 | 50.42 |
| 12/26/2004 | 0:00:00 | 57.29 |
| 12/27/2004 | 0:00:00 | 57.73 |
| 12/28/2004 | 0:00:00 | 49.38 |
| 12/29/2004 | 0:00:00 | 47.41 |
| 12/30/2004 | 0:00:00 | 45.25 |
| 12/31/2004 | 0:00:00 | 42.92 |

# APPENDIX G. LAND USE INFORMATION FOR ALACHUA COUNTY, THE CITY OF GAINESVILLE, AND MARION COUNTY

## Alachua County Land Use

### *Existing and Future Land Use*

#### Current Land Uses

Most of the Orange Creek Basin in unincorporated Alachua County, 56.8 %, has the Future Land Use of Rural/Agriculture. Policy 6.2 of the Future Land Use Element (FLUE) allows that "Areas identified for Rural/Agriculture on the Future Land Use Map are for rural residential uses, home-based businesses, and agricultural activities including forestry and other agricultural uses, such as cattle grazing, cultivation of field crops, vegetable crops, dairies and those commercial or other uses on a limited scale serving or ancillary to agricultural activities, such as farm equipment and supplies, sales or service, and agricultural products distribution." New residential uses at a maximum density of one dwelling unit per five acres shall be permitted subject to the restrictions in Policy 6.2.7, except that the total allowable dwelling units may be increased pursuant to the incentive bonuses for clustering of rural residential subdivisions in accordance with Policies 6.2.9 - 6.2.14.

Much of the land in the basin, 26.1% of the unincorporated area, is designated Preservation. The 2001–2020 Comprehensive Plan now includes the land use category of Preservation, which is defined as "An environmental land use category that consists of publicly owned lands which are intended for use as natural reserves or managed conservation lands for the preservation of natural resources. Preservation areas include lands owned in fee simple or less-than-fee simple title" (Conservation and Open Space Element Definitions). It is appropriate for the parcels now in public ownership and managed for conservation to receive the land use classification of Preservation.

There are numerous moderate to large acreages of Institutional Land Use in the Orange Creek Basin within the unincorporated portion of Alachua County. These facilities include the University of Florida (UF) Institute of Food and Agricultural Sciences (IFAS) Beef Research Unit; Alachua County Solid Waste Transfer Station; Florida Department of Transportation Maintenance, Construction and Planning Offices; State of Florida Materials Research; North Florida Evaluation and Treatment Center; and Florida Department of Corrections Gainesville Work Camp.

#### Planned Projects that Will Result in Significant Land Use Changes

Many of the recent acquisitions by Alachua County Forever are located in the Orange Creek Basin. Eleven projects totalling 7,945.5 acres of land are in or will soon be in Preservation land use (**Table G-1**). A Comprehensive Plan Amendment (CPA) for approximately 1,389 acres was transmitted to the Florida Department of Community Affairs (DCA) in spring 2006 to change existing Rural/Agricultural land to Preservation land use.

**Table G-1. Land conservation projects through Alachua County Forever**

| WBID | Waterbody Name | Project Number | Name of Project | Project Description | Area *(acres)* |
|---|---|---|---|---|---|
| 2718/ 2711 | Paynes Prairie | AS07 | Bishop and Henderson | Land acquisition – Bishop and Henderson Williston Road adjacent to Paynes Prairie | 25 |
| 2705 | Paynes Prairie | AS08 | Crevasse | Land acquisition – Crevassee (Prairie Creek by Paynes Prairie (owner considering conservation easement) | 661 |
| 2749 | Cross Creek | LOCH05 | Sliver Springs/ McLeod | Land acquisition – Silver Springs/McLeod property in Cross Creek area (working on a conservation easement with owner) | 986 |
| 2705/ 2693 | Little Lochloosa Creek | LOCH05 | Phifer Flatwoods | Land acquisition – Phifer Flatwoods | 600 |
| 2749/ 2749A | Orange Lake | OR08 | Freddy Wood Tract | Land acquisition – Freddy Wood Tract | 600 |
| 2733/ 2744/ 2734 | Orange Lake | OR09 | Rayonier Tract (River Styx wetland) | Land acquisition – Rayonier Tract River Styx | 1,450 |
| 2749 | River Styx | OR09 | Richardson Tract (River Styx) | Land acquisition – Richardson NW corner of Orange Lake to River Styx | 400 |
| 2688/ 2695 | Newnans Lake | NEW06 | Newnans Lake Addition | Land acquisition – Newnans Lake Addition | 1700 |
| 2705 | Newnans Lake | NEW07 | Wainberg | Land acquisition – Wainberg (west side Newnans Lake) | 22 |
| 2749 | Orange Lake | OR02 | Longleaf Flatwoods Preserve | Land acquisition – Longleaf Flatwoods Preserve | 1,388.5 |
| 2711/ 2722 | Sweetwater Branch/ Paynes Prairie | SWT31 | Sweetwater Preserve | Land acquisition – Sweetwater Preserve (north rim of Paynes Prairie) | 113 |
| | | | | **Total Acreage** | **7,945.5** |

One large area of land use change is Plan East Gainesville (PEG), which is located primarily in the Lake Forest Creek watershed. The PEG area is generally the area bounded on the north by Gainesville Regional Airport, on the east by Newnans Lake, on the south by Paynes Prairie, and on the west by Waldo Road. It includes portions of both Gainesville and unincorporated Alachua County.

An important aspect of the PEG transportation plan is the development of a Bus Rapid Transit (BRT) service to link the PEG area to downtown and the Archer Road corridor. A road extension will incorporate a proposed greenway system that is a central component of PEG. The system provides for an integrated land preservation, recreation, and transportation strategy. The greenway system includes a series of interconnected multiuse trails with trailheads at pocket parks or mixed-use activity centers. It provides for greater transportation accessibility to commercial or employment areas.

A complementary benefit of the system is that it provides a buffer between more extensive urban uses and suburban or rural uses. The new road will be located within a greenway corridor that acts as a buffer between the road and environmentally sensitive

land. This would ensure limited access, preclude commercial zoning, and enable multimodal transportation to occur in an environmentally sound manner. A Comprehensive Plan Amendment to add Future Land Use Objective 8.5, Section 8 Special Area Studies and related policies incorporating PEG into the Comp Plan as a Special Area Plan pursuant to Future Land Use Policy 7.1.31 was approved by the Board of County Commissioners and transmitted to DCA for review.

A number of developments are occurring in the unincorporated urban area west of Gainesville. Springhills Development of Regional Impact (DRI), situated on 601 acres in the vicinity of I-75 and NW 39th Avenue, is one of the largest. Springhills includes Commercial/Retail (1,555,500 square feet [sf]), Hotel (625 rooms), Warehouse (460,000 sf), Office (125,000 sf), Multifamily (1,772 units), and single-family (516 units) land uses. The county allows for Planned Developments (PDs). Two such PDs located in the Orange Creek Basin are the 148-acre mixed use Brytan Development at Archer Road and SW 75th Street (Tower Road) and Newberry Villages (a Comprehensive Plan Amendment for land use change) for an 80-acre mixed-use development at Newberry Road and Fort Clarke Boulevard. The county has begun a community planning process for the Rutledge area (east of Santa Fe Community College Main Campus), and it is anticipated that stormwater deficiencies in this area will be addressed.

### Future Land Use Estimates

Areas with a future land use designation for urban development are approximately 10% of the total unincorporated county. The percentages for countywide land use from Future Land Use Map (FLUM) 2020 are as follows:

### Countywide Future Land Use Projections

| | |
|---|---|
| Rural/Agricultural* | 76% |
| Preservation** | 14.2% |
| Urban | 9.7% |
| Commercial | 0.6% |
| Industrial | 0.5% |
| Institutional | 1.7% |
| Recreation/Open | 0.4% |
| Utility | 0.0% |
| Residential | 6.5% |

### Analysis of Future Land Use data for the Orange Creek Basin

| | | |
|---|---|---|
| Rural/Agricultural* | 56.8% | 120,512 acres |
| Preservation** | 26.1% | 55,419 acres |
| Urban | 17.1% | ?????? |
| Commercial/Office/Mixed Use | 0.5% | 981 acres |
| Industrial | 1.6% | 3,445 acres |
| Institutional | 2.2% | 4,761 acres |
| Recreation/Open | 0.6% | 1,280 acres |
| Utility | 0.0% | 22 acres |
| Residential | 9.5% | 20,116 acres |

* Rural/Agriculture category includes Rural Clusters, Rural Commercial Agriculture, and Rural Community Employment Center.
** Additional lands within the Orange Creek Basin that have a FLUM of Rural Agriculture that are publicly owned and managed for conservation.

### Potential Effects of Anticipated Future Growth and Land Uses on Pollutant Loadings

Business Marine zoning district – This new zoning district implements certain elements of the Tourist/Entertainment policies of the Comprehensive Plan and associated designations in areas adjacent to lakes, rivers, or other natural bodies of water. It is anticipated that the regulations will protect water resources.

## *Policies, Programs and Regulations*

### Comprehensive Plan Policies, General Zoning, Overlay Districts, etc.

The Alachua County Comprehensive Plan 2001–2020 (effective May 2, 2005) policies protect water quality in a variety of ways. Policies relating to sanitary sewer availability (Potable Water and Sanitary Sewer Element), stormwater management (Stormwater Management Element), and the Conservation and Open Space Element protect surface waters.

### Regulations, Policies, and Programs that Specifically Address Water Quality Protection (e.g., open space requirements)

**Table G-2** lists Alachua County regulations that address water quality.

**Table G-2. Alachua County regulations that address water quality**

| Alachua County Code | | |
|---|---|---|
| **Regulation** | | **Purpose** |
| Chapter 77 | Water Quality Code | Regulate illicit discharges and reduce nonpoint source pollution |
| **Chapter 406 Natural and Historic Resources Protection** | | |
| Article 5 | Strategic Ecosystems | Protection |
| Article 6 | Surface Waters and Wetlands | Retain buffers and hydrology |
| Article 7 | 100-Year Floodplains | Retain surface water storage |
| Article 12 | Wastewater Treatment Facilities | Monitor plant operations and discharges |
| **Chapter 407 General Development Standards** | | |
| Article 5 | Open Space | Provide habitat and less impervious area |
| Article 9 | Stormwater Management | Improve water quality and reduce flooding |
| Article 11 | Water and Wastewater Service | Improve water quality |

### Managing Potential Water Quality Impacts of Anticipated Growth and Land Use

The Alachua County Comprehensive Plan has numerous policies and programs in separate elements that complement one another in support of broad environmental protections aimed at, among other things, water quality and quantity for citizens and natural resources. Specific Land Development Regulations (LDRs) implement these policies, from enforcing zoning and development activities through identifying criteria for buffers and open space requirements. For example:

- *New land use regulations went into effect January 30, 2006. Springs, Article 8 of Chapter 406, Natural and Historic Resources Protection, was reserved for later completion and adoption. It is anticipated that Article 8 will be completed and adopted within the next year.*
- *Alachua County 2001–2020 Comprehensive Plan includes Conservation and Open Space Element Objective 4.6: Ensure the protection and improvement of the water quality, biological health, and natural functions of surface water systems in Alachua County. The policies create a framework for managing the impact of growth. In particular, Policy 4.6.16. requires increased buffers for septic tanks and other specific land uses. Policy 4.6.18. encourages alternative technologies for wastewater treatment facilities (see attachment). LDRs adopted in December 2005 implement the updated Comprehensive Plan.*

## City of Gainesville Land Use[1]

The city of Gainesville has more than 18,500 parcels comprising low-intensity Single-Family land use, which allows 3.5 to 8 dwelling units per acre. Total Single-Family land area is 9,400 acres. Any new subdivisions of vacant Single-Family land into more than 5 lots require on-site stormwater treatment facilities.

Residential Low, Medium- and High-Density land uses total 9,075 parcels covering 4,725 acres, and allow from 8 to 100 dwelling units per acre. These developed land uses are a mixture of some single-family, duplex, and other low-density residences, up to high-rise apartments and condominiums. Redevelopment could increase impervious surface coverage, but new development standards require improved stormwater treatment.

The Mixed-Use land uses allow residential, office, and commercial retail uses singly or in combination. There are 2,100 parcels covering approximately 2,000 acres. Residential densities may range from 8 upwards to 150 units per acre (downtown). City policies favor redevelopment and increased densities in appropriate locations, with an emphasis on shared master stormwater basins in some of the Mixed-Use districts.

The Education land use category comprises 80 parcels covering over 3,000 acres. It includes the University of Florida Main Campus and all other public and private K-12 schools. The city does site plan review only for private schools; UF and Alachua County public schools are governed by Florida guidelines.

Agriculture land use lies entirely north of NW 53rd Avenue and NW Highway 441, totalling approximately 1,430 acres. Recreation and Public Facilities Land Uses exceed 3,200 acres. The Conservation Land Use is placed upon passive recreation areas and sensitive wetland or creekside habitat, for a total of 2,700 acres and 180 parcels.

The Office and Commercial land use categories have 1,074 parcels totaling 1,300 acres, and the redevelopment of older sites would also require improved stormwater treatment. Industrial land uses cover more than 1,345 acres, and include older fully developed industrial districts along Main Street and Waldo Road, and vacant land straddling US Highway 441 north of NW 39th Avenue eastward to the north side of the Gainesville Regional Airport.

[1] Gainesville Community Development Department, March 24, 2006.

The Murphree Wellfield Protection Zone adopted by Alachua County prohibits new septic tank installation within the wellfield zone, and requires additional storage and disposal methods for hazardous chemicals. Zoning Compliance Permits issued by the city of Gainesville flag any new business or business relocation for additional scrutiny before an Occupational License can be approved.

The redevelopment of any existing impervious surfaces exceeding 4,000 square feet must meet current regulations for stormwater treatment. The city requires developments needing potable water that have residential densities exceeding two units per acre to connect to the city's potable water and central wastewater systems. (All zoning districts allowing residential uses have density standards exceeding this threshold, except the Agriculture district.) Temporary package wastewater plants must connect to the central wastewater lines within five years after central wastewater lines become available. Lots platted before June 1992 must connect to the central wastewater system unless abutting sewer lines are unavailable.

The city's Land Development Code has strict setback and development requirements for properties adjacent to wetlands, creeks, or lakes. The city has flood control, surface water, wellfield, gateway street, nature park, greenway, and uplands districts designated as overlay districts. Development plans for lots within 150 feet of any regulated creek must demonstrate compliance with erosion and sediment control, runoff control and treatment, and protection of vegetation integral to the creek's ecological value.

The city adopted a Stormwater Utility billing system in 1989 to help fund citywide stormwater treatment improvements. Gainesville has also been designated a Tree City by the National Arbor Day Foundation for 22 years continuously.

## Marion County Land Use

Marion County has delineated 12 planning districts for the entire county (**Figure G-1**). The Orange Creek Basin falls within the northern parts of Planning Districts 9 and 11. **Tables G-3 and G-4** provide information on the overall land use in these two districts.

**Figure G-1. Marion County planning districts, June 2005**

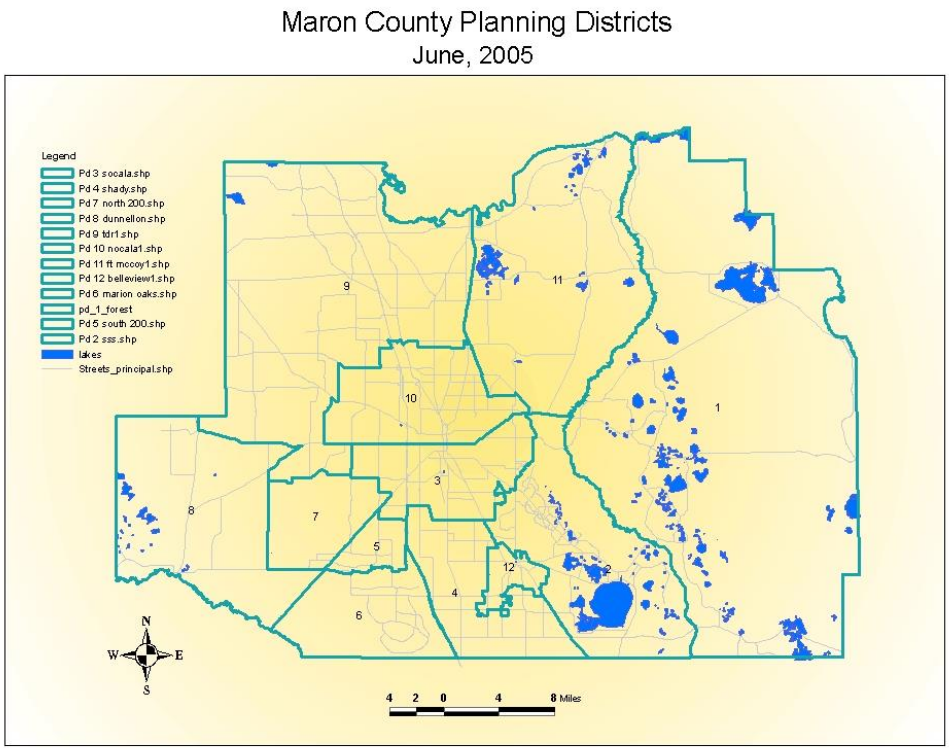


**Table G-3. Planning District 9**

| Land Use | Total Acreage | Improved Acreage | Vacant Acreage | Total Parcels | Improved Parcels | Vacant Parcels |
|---|---|---|---|---|---|---|
| COM | 434.91 | 215.83 | 219.08 | 168 | 122 | 46 |
| CONS | 0 | 0 | 0 | 0 | 0 | 0 |
| CR | 375.51 | 224 | 151.51 | 5 | 3 | 2 |
| DRI | 0 | 0 | 0 | 0 | 0 | 0 |
| HIGH | 58.48 | 47.91 | 10.57 | 35 | 28 | 7 |
| IND | 28.13 | 18.54 | 9.59 | 7 | 3 | 4 |
| LOW | 1387.81 | 688.45 | 699.36 | 361 | 210 | 151 |
| LTD COM | 6.25 | 3.96 | 2.29 | 3 | 2 | 1 |
| MED | 126.57 | 90.56 | 36.01 | 82 | 51 | 31 |
| MFH | 0 | 0 | 0 | 0 | 0 | 0 |
| MFM | 0 | 0 | 0 | 0 | 0 | 0 |
| NAT RES | 0 | 0 | 0 | 0 | 0 | 0 |
| PRO | 0 | 0 | 0 | 0 | 0 | 0 |
| PUB | 3583.99 | 30.19 | 3553.8 | 7 | 1 | 6 |
| RAC | 1346.41 | 190.4 | 1156.01 | 160 | 115 | 45 |
| REC | 0 | 0 | 0 | 0 | 0 | 0 |
| RURAL LAND | 185716.7 | 24210.9 | 161505.78 | 12350 | 5707 | 6643 |
| RVD | 0 | 0 | 0 | 0 | 0 | 0 |
| SCD | 157.48 | 10.41 | 147.07 | 15 | 4 | 11 |
| UCD | 0 | 0 | 0 | 0 | 0 | 0 |
| UND | 0 | 0 | 0 | 0 | 0 | 0 |
| UR | 237.36 | 1.59 | 235.77 | 7 | 1 | 6 |
| City McIntosh | 369.6 | 232.26 | 137.34 | 290 | 227 | 63 |
| City Reddick | 742.9 | 254.81 | 488.09 | 397 | 229 | 168 |
| Totals | 194572.1 | 26219.81 | 168352.27 | 13887 | 6703 | 7184 |

**Source**: M:\\Lisa.Walsh\Land Use\lbp Issues\lbp_updated_011906.shp Property Appraiser data, March 2006.

Planning District 9 encompasses the boundary for Marion County's Farmland Preservation Transfer of Development Rights Sending Area. Criteria have been established to allow parcels outside the sending area to participate in the program as a sending area.

Within the Orange Creek Basin, most of the land use is Rural Land, except for the urban-area cities of McIntosh and Reddick. Both cities are small—approximately 370 acres and 743 acres respectively. Rural Land use allows a density of 1 unit per 10 acres. There is one large parcel east of McIntosh that fronts onto Orange Lake and is designated as Commercial Recreation. It is currently an RV park. Marion County is working with the owner to supply water and sewer facilities to this development.

In addition to McIntosh and Reddick, the unincorporated town of Citra falls on the eastern edge of Planning District 9 and within the Orange Creek Basin. In Citra, the majority of land uses are residential and commercial, with approximately 1,387 acres of Low-Density Residential and 435 acres of Commercial land use.

**Table G-4. Planning District 11**

| Land Use | Total Acreage | Improved Acreage | Vacant Acreage | Total Parcels | Improved Parcels | Vacant Parcels |
|---|---|---|---|---|---|---|
| COM | 135.07 | 36.78 | 98.29 | 44 | 26 | 18 |
| CONS | 0 | 0 | 0 | 0 | 0 | 0 |
| CR | 0 | 0 | 0 | 0 | 0 | 0 |
| DRI | 4018.26 | 46 | 3972.26 | 18 | 2 | 16 |
| HIGH | 15.01 | 6.87 | 8.14 | 4 | 2 | 2 |
| IND | 7.82 | 7.82 | 0 | 4 | 4 | 0 |
| LOW | 851.08 | 242.09 | 608.99 | 205 | 90 | 115 |
| LTD COM | 20 | 0 | 20 | 1 | 0 | 1 |
| MED | 936.75 | 176.07 | 760.68 | 297 | 190 | 107 |
| MFH | 0 | 0 | 0 | 0 | 0 | 0 |
| MFM | 0 | 0 | 0 | 0 | 0 | 0 |
| NAT RES | 15796.18 | 0 | 15796.18 | 194 | 0 | 194 |
| PRO | 0 | 0 | 0 | 0 | 0 | 0 |
| PUB | 0 | 0 | 0 | 0 | 0 | 0 |
| RAC | 183.29 | 106.21 | 77.08 | 102 | 63 | 39 |
| REC | 0 | 0 | 0 | 0 | 0 | 0 |
| RURAL LAND | 115626.7 | 12196.88 | 103429.85 | 11247 | 4335 | 6912 |
| RVD | 0 | 0 | 0 | 0 | 0 | 0 |
| SCD | 0 | 0 | 0 | 0 | 0 | 0 |
| UCD | 0 | 0 | 0 | 0 | 0 | 0 |
| UND | 0 | 0 | 0 | 0 | 0 | 0 |
| UR | 282.45 | 47.06 | 235.39 | 40 | 29 | 11 |
| Totals | 137872.6 | 12865.78 | 125006.86 | 12156 | 4741 | 7415 |

**Source**: M:\\Lisa.Walsh\Land Use\lbp Issues\lbp_updated_011906.shp Property Appraiser data, March 2006

All of the land lying within the Orange Creek Basin in Planning District 11 is designated as Rural Land.

Marion County has established an Environmentally Sensitive Overlay Zone (ESOZ) for various areas in the county. Lands in Marion County adjacent to Orange Lake are in an ESOZ one-half mile from the water's edge. Being within an ESOZ requires, among other things, additional buffering, stormwater management, and stricter standards for sewage disposal systems.

There have been no land use changes within the Marion County portion of the Orange Creek basin within the past 10 years.

# APPENDIX H. GRU OPERATIONS AND MAINTENANCE PROGRAMS

## I. GRU Wastewater Treatment and Collection Systems Overview

### *GRU Wastewater Treatment*

The city of Gainesville's wastewater treatment facilities consist of the Kanapaha Water Reclamation Facility (KWRF) and the Main Street Water Reclamation Facility (MSWRF), which are permitted by the Florida Department of Environmental Protection at combined capacity of 22.4 million gallons per day (mgd). KWRF provides advanced wastewater treatment to incoming wastewater that meets Primary and Secondary Federal Drinking Water Standards. MSWRF also provides advanced treatment, and meets Class III surface water standards. MSWRF was upgraded to advanced treatment in 1990 at a cost of $16 million. KWRF was expanded by 5 mgd to 15 mgd in 2003 at a cost of $13.92 million. KWRF and MSWRF have an Operations and Maintenance Budget of $1.96 million for fiscal year (FY) 2007. **Figure H-1** shows aerial photographs of the KWRF and MSWRF.

**Figure H-1. Aerial photographs of the GRU Kanapaha Water Reclamation Facility and Main Street Water Reclamation Facility**

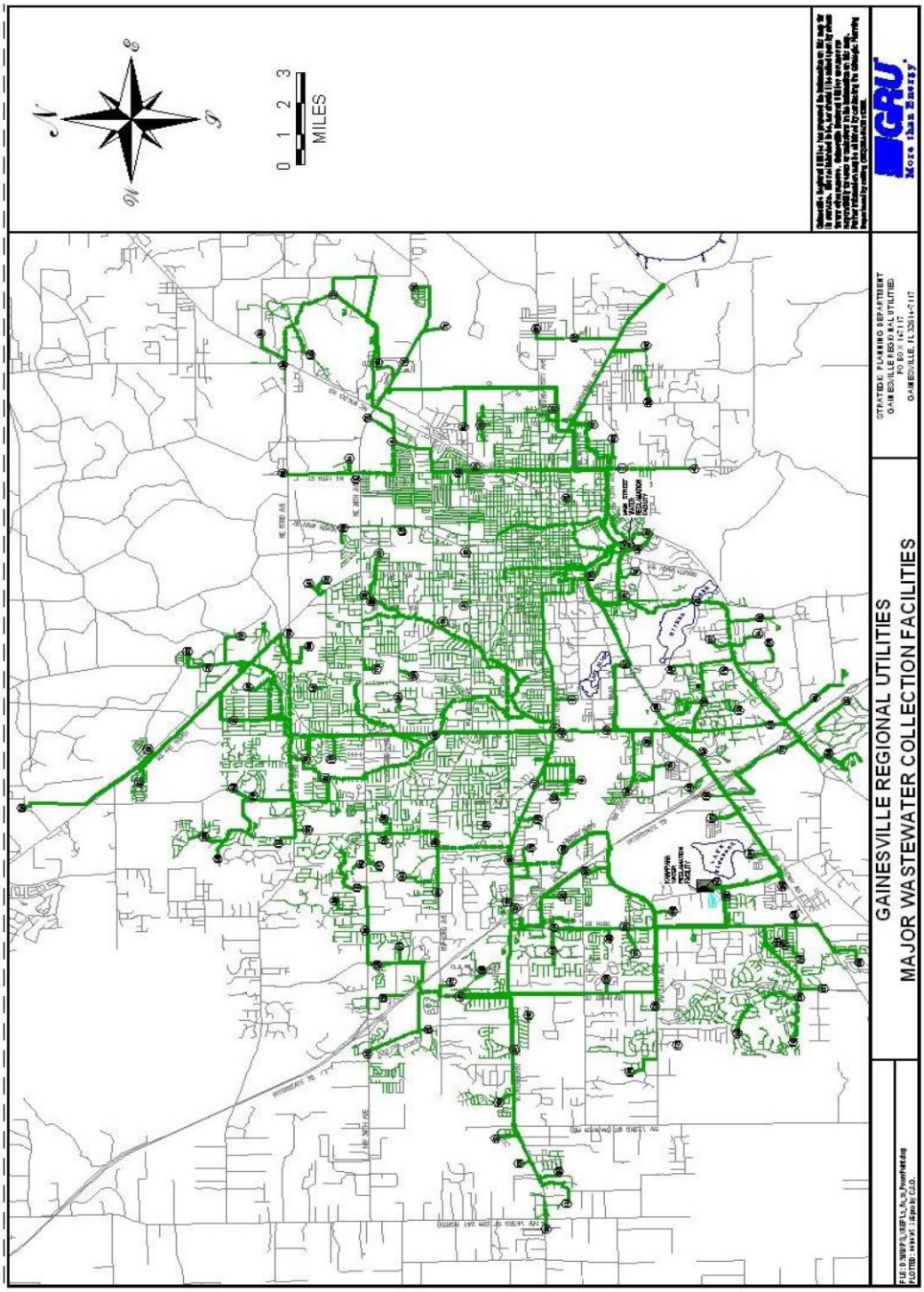
**KWRF** **MSWRF**

### *GRU Wastewater Collection System*

The city of Gainesville's wastewater collection system piping consists of 127 miles of force main where wastewater is conveyed under pressure by pumping stations, and 578 miles of gravity main where the wastewater flows by gravity; for a total of 705 miles of piping. The wastewater collection system also includes 160 lift stations (pumping stations) with 13,888 manholes, and covers a service area of 115 square miles. GRU's Water/Wastewater Systems has 171 budgeted full-time positions, and the wastewater collection and treatment system serves over 160,000 people. GRU wastewater collection system operations and maintenance costs are budgeted at $1.58 million for

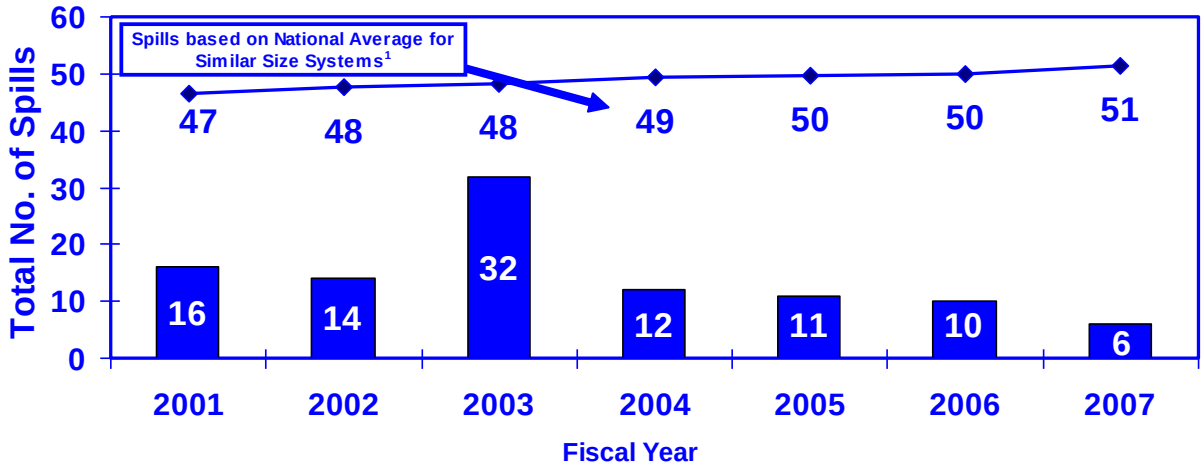
FY 2007. **Figure H-2** shows GRU major wastewater collection facilities serving Gainesville and areas of Alachua County.

**Figure H-2. GRU major wastewater collection facilities**



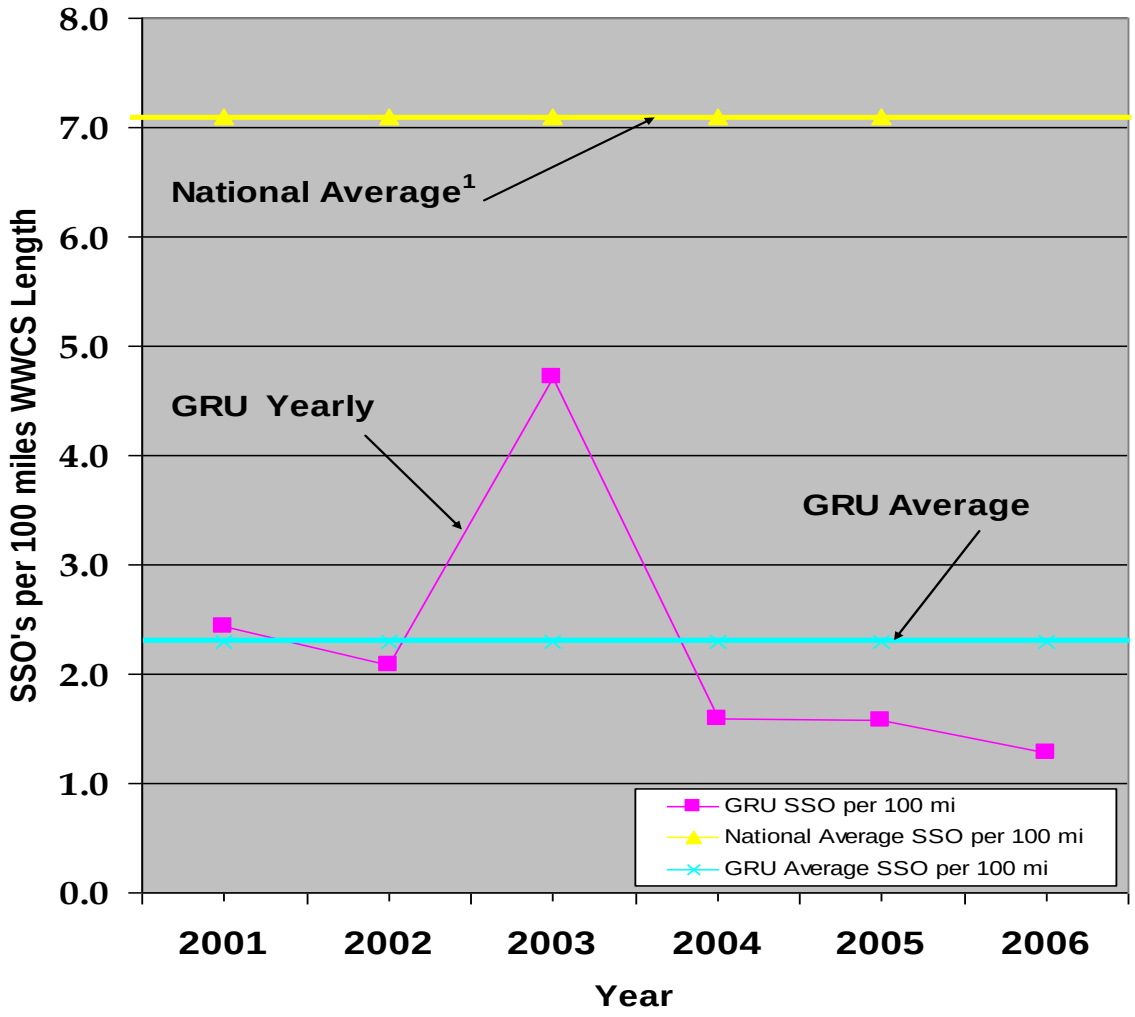
In 2006, GRU systems conveyed and treated over 5.5 billion gallons of wastewater (99.999% efficiency based on volume), and maintained a spill rate of less than 25% of the national average in 2004, 2005, and 2006 (See **Figures H-3** and **H-4**). The national average of 7.1 spills/100 miles of collection system is based on a national survey of comparable utilities conducted by the Water Environment Research Foundation.[1] GRU's average spill rate from 2001 through 2006 was 2.3 spills/100 miles.

**Figure H-3. GRU wastewater system performance—Total number of GRU spills, 2001–06, compared with projected national average per 100 miles wastewater collection system spills**




[1]Source: "Effective Practices for Sanitary Sewer and Collection System Operations and Maintenance" Water Environment Research Federation (June 2003)

**Figure H-4. GRU wastewater system performance compared with national averages—SSO's per 100 miles of collection system length, 2001–06**




## II. GRU Wastewater Collection System Integrity Programs and Projects

GRU's integrity programs and projects continuously protect the public and the urban creeks from wastewater release from the publicly owned and operated wastewater collection system. These programs and projects include the following:

- *Closed-Circuit TV Inspection/Repair and Cleaning,*
- *Infiltration & Inflow (I&I) Testing,*
- *Sliplining of Gravity Mains Adjacent to Urban Creeks,*
- *Force Main Integrity Testing,*
- *GIS Asset Management System – Mapping and Targeted Maintenance,*
- *Plan Review and New Development Inspection – Redundancy, Oversizing, and New Standard Practices to Improve Reliability,*

- *Annual Water/Wastewater Engineering Operation and Maintenance Services, and*
- *Wastewater Spill Prevention Programs.*

The following is a more detailed description of each of these efforts.

## *Closed-Circuit TV Inspection/Repair and Cleaning*

GRU has an ongoing closed-circuit TV inspection/repair and cleaning program, and added a new closed-circuit TV unit (truck and crew) in FY 2006. Crews clean gravity mains with high-pressure water jets prior to closed-circuit TV inspection. As the crews inspect the lines, they log any deficiencies that may inhibit the pipe's performance. A closed-circuit TV/sealing (grout) unit (truck and crew) follows the inspection to make repairs to damaged pipelines as needed. If necessary, additional crews are dispatched to repair the pipe by sliplining techniques or by utilizing some other appropriate repair method to restore the pipeline to optimum condition. GRU has the ability to make joint repairs and sliplining repairs for the pipe diameters up to 12 inches immediately. This eliminates the time and expense of procuring outside contractors to perform the work. **Figure H-5** shows the components of the closed-circuit TV unit.

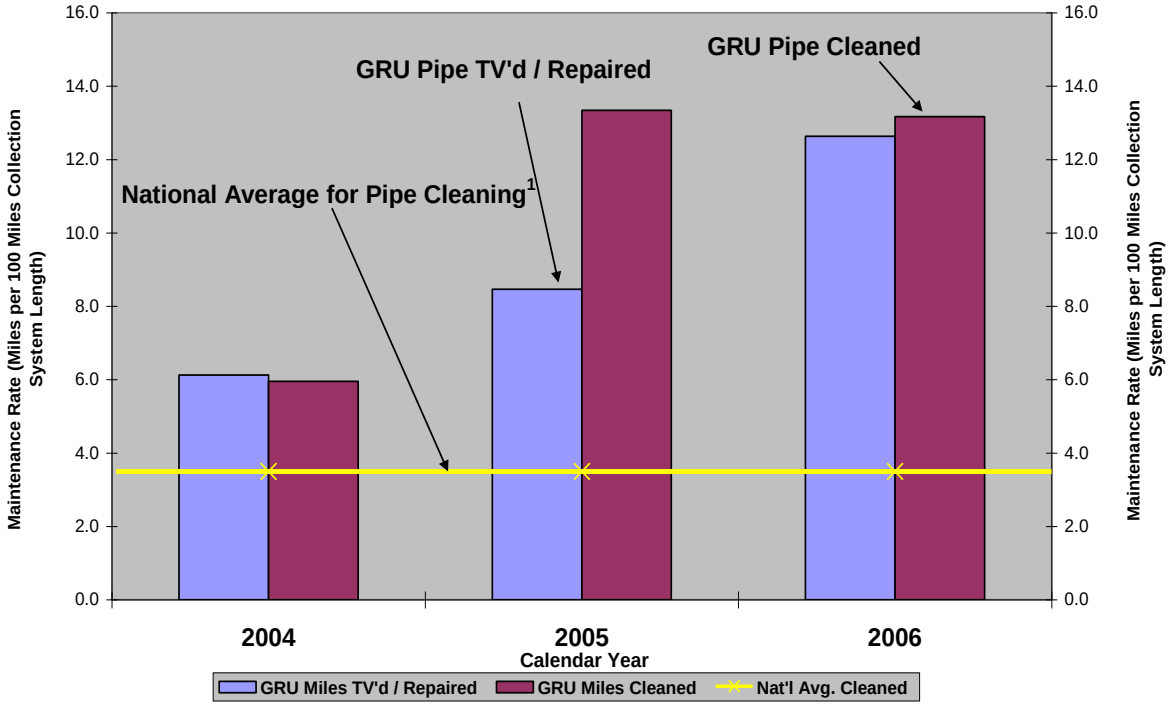
**Figure H-5. Closed-circuit TV unit components**

***Closed-Circuit TV Inspection Crew and Equipment***

***Closed-Circuit TV Inspection Camera***

**Figure H-6,** a bar graph, compares GRU's maintenance rate with the national average.

**Figure H-6. GRU wastewater collection system maintenance rate compared with the national average**




## *Infiltration & Inflow Testing*

GRU's I&I program goal is to prevent all nonwastewater flows from entering the wastewater collection system. Infiltration is water that flows into the wastewater collection system via cracks and joints that are not completely sealed in the pipe system. Inflow is water that flows directly into the wastewater collection system—for example,

through manhole lids, broken cleanouts, or direct illicit connections. Both I&I can have significant impacts on wastewater collection system capacity. Eliminating I&I is a key component of wastewater collection system preventative maintenance.

As part of the I&I elimination program, GRU's crews utilize a number of techniques, including smoke testing, closed-circuit TV inspection, and dye testing, to find potential locations where I&I can occur. **Figure H-7** shows the areas that have been tested since January 2001. In August 2003, GRU commenced with Phase 3, where the focus was on the urban creek areas.

If collection system defects are found, crews immediately repair each defect in the collection system area before moving on the next designated test area. **Figure H-8** shows the use of smoke testing to find sources of I&I, some of the illicit connections that exist, . GRU has tested over 71% of its wastewater collection system since January 2001, with the urban creek areas covered in Phase 3 of the project during 2003, 2004, and 2005. GRU has spent $2.8 million since 2001 on I&I and has budgeted $1.36 million to continue this effort for the 2007 to 2012 budget period.

**Figure H-7. GRU sewer system I&I elimination program**
*(Colored and shaded areas represent the designated wastewater collection system tested areas in the TMDL listed Hogtown, Sweetwater, and Tumblin' Creek basins—as shown in the graph, all of GRU's wastewater collection system in these urban creeks areas has been tested)*

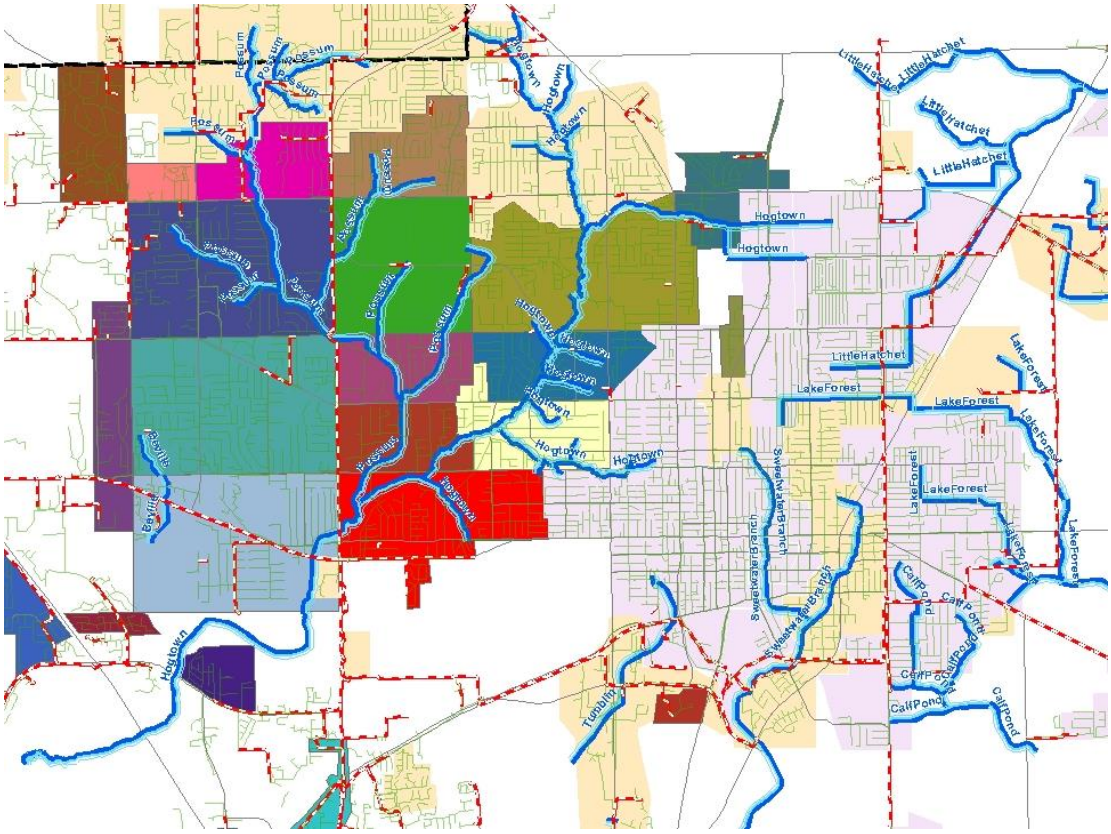


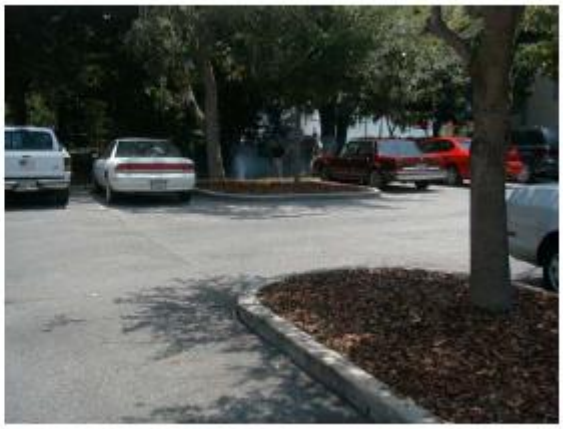
**Figure H-8. Smoke testing used to find I&I**

***Broken Cleanout***

***Broken Service Lateral***

***Illegal Connections to GRU Wastewater Collection System: Apartment Rain Gutter***

***Illegal Connections to GRU Wastewater Collection System: Stormwater Retention Pond***



### *Sliplining of Gravity Mains Adjacent to Urban Creeks*

GRU utilizes sliplining technology to rehabilitate the wastewater gravity mains throughout its collection system. Sliplining pipelines protects the urban creeks by minimizing the possibility of wastewater leakage; essentially, old pipe is replaced with new pipe. The sliplining of gravity sewer interceptor tributary small-diameter lines adjacent to creeks is ongoing. GRU sliplining projects totaled $4.7 million as of 2006, and the projected budget for continuing these efforts is $681,000 over the 2007–12 budget period.

The Insituform® process is the most widely used trenchless method (sliplining) for restoring the structural integrity of gravity mains that can not be restored cost-effectively through digging an open trench. It has been proven in pipes with a wide range of shapes and in diameters of up to nine feet (2.75 meters). In the Insituform® process, a resin-impregnated Insituform® tube is installed into an existing pipe. This process results in a seamless, jointless "pipe-within-a-pipe" with a smooth, continuous inner surface which usually increases flow capacity. Typically installations are completed in a single day, using robotic methods to restore active connections from within the line.

Since the collection system provides 24-hour-per-day service, crews construct “pump arounds” to isolate GRU wastewater collection system lines for cleaning and sliplining. Pump around pipelines are typically assembled using high-density polyethylene (HDPE) where sections are fusion welded to form a continuous pipe. Pumps are set up, attached to a common manifold, and then operated to pump wastewater “around” the work area section to a manhole downgradient where wastewater continues gravity flow. After a pump around is established, the pipe is typically cleaned with a jet truck cleaning crew. Then, a closed-circuit television (CCTV) crew records and documents the wastewater collection system gravity line**.** If tuberculation (corrosion) is found, the pipe is then cleared of the corrosion with a hydraulic chain cutter tool.

To verify that the pipe is properly prepared, the pipe is pressure cleaned and CCTV’d before the sliplining work is performed. Once the pipe is prepared, a polyethylene resin impregnated tube is placed inside the pipe and heated water cures the resin, creating a new pipe within the old pipe, with the installation of the tube typically taking a few hours. The cured pipe is then cut at manholes and laterals are cut open, completing the work to install a new cast-in-place pipe.

**Figure H-9** shows the installation sequence for a Hogtown Creek sliplining project. The sliplining process typically restores the hydraulic and structural integrity of the older pipe to that of a new pipe. While sliplining is an expensive technology, it is less invasive than open trench construction along the urban creek corridors.

**Figure H-9. Installation sequence of a Hogtown Creek sliplining project**

***Pump Around (Hogtown Creek Basin)***




Sliplining Pipe Installation

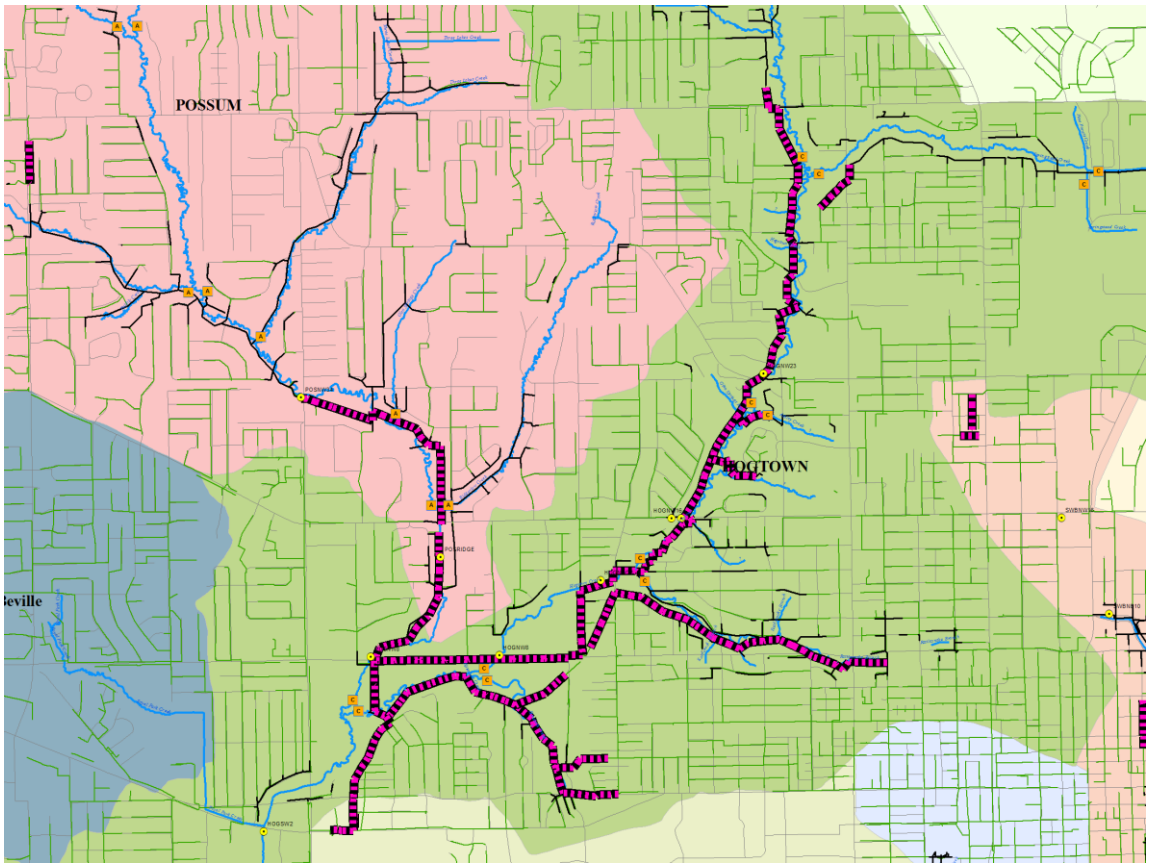
Sliplined Pipe in Manhole



Finished Pipe in Manhole


**Figure H-10** shows GRU major gravity mains adjacent to Hogtown Creek and its tributaries that have been sliplined since 1994.

**Figure H-10. GRU sliplined major gravity mains adjacent to Hogtown Creek and tributaries**




## *Force Main Integrity Testing*

GRU staff have identified more than 25 miles of major force mains that were constructed with ductile iron or cast iron, and are 16 inches in diameter and larger, for inspection and wall thickness testing. A comprehensive program was developed and initiated to test the wall thickness of the 10 major force mains at 48 locations, perform pressure monitoring at 6 strategic locations within the force main system, and inspect 52 air release valves.

Nearly 1,700 pipe wall thickness test measurements have been collected to assess the overall condition of GRU's major force mains. The following conclusions can be made from this effort:

- *GRU's major force mains appear to be in relatively good condition based on the pipe wall thickness and system operating pressure data collected,*
- *No significant loss of pipe wall material was noted for the 10 major force main systems,*

- *Major force mains operate at relatively low pressures and pressure surges do not appear to be detrimental to the system in considering the bursting strength of measured pipe wall thicknesses, and*
- *Air release valves that are not operating to specifications are to be replaced as part of a multiyear rehabilitation program.*

**Figure H-11** shows engineers and crews performing pipe wall thickness testing after accessing the pipeline.

**Figure H-11. GRU engineers and crews performing pipe wall thickness testing**

GRU has initiated a program to test second-tier force main systems that have piping diameters of 14 inches or smaller. As of January 2007, 6 of the 15 miles of force mains have been identified and tested. In addition, GRU has adopted a Standard Operating Procedure (SOP) that requires pipe wall thickness testing prior to all taps (connections) to existing force mains, to ensure quality taps to the force main and to minimize the risk of failure resulting in released wastewater.

### *GIS Asset Management System – Mapping and Targeted Maintenance*

GIS facilities mapping involves efforts associated with incorporating developer and GRU installed wastewater and reclaimed water systems into a GIS database format, including a creek crossing pipeline assessment project that logged the GRU wastewater system creek crossings and is being used for assessment of the infrastructure for targeted maintenance. The GIS-based software system also stores mapping information and facility-specific information such as age, material, maintenance history, and adjacent utilities. It also incorporates new developments into the mapping system and reduces construction accidents due to increased accuracy in the location of underground utilities.

### *Plan Review and New Development Inspection – Redundancy, Oversizing, and New Standard Practices To Improve Reliability*

All new construction requires a plan review process for compliance with all GRU design and construction standards. GRU's requirements exceed industry standards in such areas as improved manhole connection methods, pipe materials and utility crossings (casings), and wastewater collection system oversizing and redundancy. All of these

requirements improve the reliability of GRU's wastewater collection system. Inspections are performed during and after the completion of construction projects to ensure compliance with construction standards. In addition, before GRU accepts any new gravity wastewater infrastructure for ownership and maintenance, it is inspected with closed-circuit TV cameras, flushed, smoked tested, and repaired as necessary. For force main systems, it is standard practice to pressure test all new systems before they are put into service.

### *Annual Water/Wastewater Engineering Department Operation and Maintenance Services for Initiating and Administrating the Capital Budget*

GRU's executes a five-year scheduling system for initiating and administrating wastewater capital projects, at an annual operation and maintenance cost of about $650,000. GRU has budgeted $70 million in capital improvements to the wastewater collection and treatment system over the 2007–11 budget cycle. Projects are timed and prioritized to ensure that facilities are available in a timely manner to meet demands as needed. The major areas of capital improvements include the following:

**WASTEWATER TREATMENT FACILITIES –** This budget category consists of projects associated with expansion, improvement, renewal, and replacement at the Kanapaha and Main Street Water Reclamation Facilities. Projects in the capital budget category include reclaimed water systems; pumping and facility effluent discharge; disinfection; process and efficiency studies and projects; digestion and biosolids management; emergency generation; capacity analysis and future planning; tertiary filter rehabilitation; electrical control systems replacement; process monitoring equipment; transfer pump station evaluation; grit drying facilities; and operator interface software systemwide upgrades.

**LIFT STATIONS –** Work in this capital budget category is associated with improvements; renewal and replacement required to maintain the existing lift stations in a reliable and efficient operating condition, including control cabinet replacement; wetwell and piping rehabilitation, replacement, and oversizing; valve and flow diversion upgrades; pump and motor drive system replacements; retrofits of control communication hardware; emergency portable and permanent generators for power outages to help prevent and/or minimize wastewater releases; communication system frequency conversion; maintenance facility expansion; storage and pumping capacity increases; motor soft start replacements; and float ball replacements.

**WASTEWATER COLLECTION SYSTEM –** This budget category includes wastewater collection system gravity and force main extensions, oversizing, rehabilitation, replacement, and removal to accommodate present and future customers and developments; modification of force main systems to establish redundancy and rerouting options; deepening of gravity mains; manhole rehabilitation or replacement; purchasing of software to analyze gravity sewer and force main systems; a gravity system capacity analysis study; and installation and replacement of wastewater service laterals and cleanouts to new and existing customers that are not associated with new developments.

GRU is working with an independent consultant to evaluate its wastewater collection system integrity programs. The goal of this effort is to increase the reliability of the wastewater collection system by assessing GRU's wastewater collection system procedures and compare them against standard industry practices. Recommendations

will be provided for modifying GRU existing procedures, or if necessary, suggestions will be provided for new procedures to achieve the goal of increased reliability.

### *Specific Examples of Major Capital Projects, Equipment Utilized, and Work Performed*

This section provides examples of recent capital improvement projects to illustrate the types of work performed on GRU's wastewater collection and treatment system.

**Figure H-12** shows the force main replacement on NW 34th Street; this provides an example of a major capital project and the equipment methods utilized to complete a project of this scale. Approximately $4.2 million was spent to replace 10,730 feet of force main piping.

**Figure H-12. Force main replacement on NW 34th Street**

***HDPE Butt Welder Creates Contiguous Force Main Pipe Onsite***

***Pipe Assembly and Installation near 34th Street***




***Trench Boxes Installed and Jack and Bore Method Utilized to Install Pipe Casing under Utility Conflicts such as Roads, Gas Lines, and the Stormwater Sewer System***


***Directional Boring Method Utilized to Install Piping Casing under Utility Conflicts such as NW 34th Street***

***Tie In of New Pipe to Existing Pipe Utilizing Trench Box, Tapping Tool, Valve Assemblies and Excavation***

***Final Steps in Pipeline Installation***

## *Lift Station 10 Renovation*

This capital project replaced the existing pumps, controls, and mechanical equipment. The antiquated station was converted from a Yeomans wetwell/drywell station to a more efficient Flygt submersible station with upgraded controls, variable frequency drives, and mechanical appurtenances. The existing above-ground structure was also demolished. The total cost of the project was $1.4 million. **Figure H-13** shows the project being carried out.

## Figure H-13. LS 10 renovation

***Lift Station before Renovation***

***Lift Station during Renovation with Demolition and External Pumping***

***Renovated Receiving Manhole, Wetwell, Drywell, and Completed Lift Station***

## *Wastewater Spill Prevention Programs*

To further reduce releases from the wastewater collection system to the environment, GRU has implemented an aggressive pretreatment program focused on commercial grease control. The program includes two inspectors who conduct inspections on all food service establishments. In addition, GRU has implemented a campaign focused on residential grease control. As part of the public outreach campaign, staff distributed 5,000 grease trappers; presented at local schools; distributed press releases where local media assisted in getting information out to the public; and provided spill prevention information in the GRU customer bulletin.

## *Wastewater Collection System Performance Monitoring*

GRU funded a Bacterial Source Tracking (BST) at a cost of $325,000. The study is examining the DNA of fecal coliform to determine whether their source is animal or human in origin. Local stakeholders will use the study results in developing practical

indicators for future monitoring and implement appropriate strategies to reduce bacteria in Gainesville's urban creeks. Section 5.4.3 explains this project and the techniques utilized in depth.

## References

Water Environment Research Federation . June 2003. Effective practices for sanitary sewer and collection system operations and maintenance.

# APPENDIX I. ORANGE CREEK BASIN ON-SITE WASTEWATER TREATMENT SYSTEM NUTRIENT LOADING ANALYSIS

MARCH 13, 2006

*Jennifer Gihring, Florida Department of Environmental Protection*

## Background

The TMDL documents prepared for the four impaired lakes in the Orange Creek Basin (Newnans, Orange, Lochloosa, and Wauberg) [2] identified on-site wastewater systems (septic tanks and package plants) as sources of nutrient loading. However, loading values from on-site wastewater systems were calculated differently among the four lakes. The Newnans and Orange Lake TMDLs estimated loading from failing septic tanks only. The Lake Wauberg TMDL estimated loading from all septic tanks, with a reduction factor applied to account for nutrient retention in the soil. Septic tank loading was not quantified in the Lake Lochloosa TMDL.

This analysis provides a consistent method for estimating nutrient loading from properly functioning and failing on-site wastewater treatment systems that contribute loading to lakes in the basin. This information is provided to the Orange Creek BWG for its use in developing and prioritizing management actions. Various sources contribute nutrients to the four impaired lakes, and knowledge of the relative magnitude of these sources will help the BWG make informed decisions regarding the type of corrective actions to be implemented.

The results of this analysis are expressed in terms of the TN loading per year that reaches the four impaired lakes through direct surface runoff and/or near-shore ground water flow.

## Approach

The approach for this study is similar to the 2005 Marion County wastewater study.[3] Calculation of loading from on-site systems required determination of (1) the total number and locations of septic tank and package plant systems in the basin; and (2) nutrient loads to lakes associated with each system.

## Number and Location of Systems

Land parcels with activities that require on-site wastewater treatment were identified through a GIS analysis. These included residential, commercial, and public use facilities. For unincorporated Alachua County, map layers derived from the County Property Appraiser's GIS

2 Baniukiewicz, A. 2004. Total Maximum Daily Loads for Lake Lochloosa; Wu, T.S. 2003. Nutrient Total Maximum Daily Load for Lake Wauberg Outlet; Gao, X. 2003. Nutrient Total Maximum Daily Load for Orange Lake; Gao, X. 2003. Draft Nutrient Total Maximum Daily Load for Newnans Lake.

3 Kuphal, T. 2005. Quantification of Domestic Wastewater Discharge and Associated Nitrate Loading in Marion County, Florida. Marion County, Florida, Planning Department.

database were used to identify such parcels. Information provided by GRU and Marion County was used to identify parcels with septic tanks within their service areas. Information from GRU was applicable to the Newnans Lake sub-basin, while the Marion County information was applicable to Orange Lake.

Consistent with the 1995 SJRWMD Nutrient Budget Report, [4] only those systems within 200 meters (m) of the lake shore or the lake's tributaries (e.g., connected wetland, stream, or canal system) were considered to contribute nutrients to the lake. Aerial photos (2005) were used to confirm the presence of structures associated with onsite wastewater systems in the 200m surface water drainage area.

At any given time, a portion of these systems are "failing" septic tanks. Although there are multiple ways in which a septic system can physically fail, for the purposes of this study failed septic tanks were considered to contribute 100% of their loading directly to a surface water, without soil retention. The TMDL documents consistently estimate the rate of septic tank failure at 5%. As such, the total number of septic tanks was split into "functioning" and "failing" at the rate of 95% and 5%, respectively. All calculated loading values applied a soil retention factor for the 95% of functioning systems and did not apply the soil retention factor for the 5% of failing systems.

Two package plants were identified inside the 200m drainage area: Brittany Estates (Newnans Lake sub-basin) and Sportsmans Cove (Orange Lake sub-basin). **Table I-1** contains the estimated total number of on-site systems in each sub-basin.

**Table I-1. Number of septic systems within 200 m drainage area of each lake**

| Lake | Total Number of Septic Systems | Estimated Number of Failing Systems (5%) | Number of Package Plants |
|---|---|---|---|
| Lake Lochloosa | 127 | 6 | 0 |
| Newnans Lake | 397 | 20 | Brittany Estates |
| Orange Lake | 204 | 10 | Sportsmans Cove |
| Lake Wauberg | 26 | 1 | 0 |
| **TOTAL** | **754** | **37** | **2** |

## Total Nitrogen Loading to Lakes

The TN load from septic tanks was calculated with the following formula:

**A x 0.065 x N x 8.337 x (1-S)**

where:

- *A = Number of septic tank systems (including homestead reduction as noted above),*
- *0.065 = Average annual discharge in million gallons (65,000 gallons per system per year/1,000,000 gallons),*
- *N = TN concentration of septic tank effluent (mg/L),*
- *8.337 = Conversion factor (milligrams per liter to pounds per million gallons), and*

4 Fulton, R. 1995. External Nutrient Budget and Trophic State Modeling for Lakes in the Orange Creek Basin. St. Johns River Water Management District Technical Publication SJ95-6.

- *S = Percentage of TN loading from the septic tank effluent retained in the soil.*

This calculation is similar to that used in the 2005 Marion County wastewater study, with two exceptions. First, TN loading was calculated using 30 mg/L and 50 mg/L. The 30 mg/L value is consistent with the TMDL documents. The value of 50 mg/L is consistent with upper-end estimates of TN concentrations in septic effluent, similar to values used in the Marion County study and the best professional judgment of DEP's Watershed Assessment Staff (W. Magley). Second, because the Marion County study focused on loading to ground water and not surface water, retention of TN in the soil was not incorporated into the loading calculations. To estimate the fraction of TN that reaches the surface water from septic tank effluent, a soil retention rate (S) was applied. Because the actual value for soil retention is unknown, TN loading was calculated with 2 soil retention values for comparison: 45% (1995 SJRWMD nutrient study) and 30% (P. Myers, ACHD). These modifications allow for direct comparison with loading values from both the TMDLs and the Marion County wastewater study.

TN loading from the two package plants was also calculated. **Table 17** of the Newnans Lake TMDL provides daily discharge and average TN concentrations for the Brittany Estates outfall from 1996–2000. The daily average discharge and TN concentrations from the TMDL were used to calculate total annual TN loading for Brittany Estates. Loading from Sportsmans Cove was calculated in a similar manner, but with average monthly discharge and TN concentrations reported by the facility as stored in the DEP Wastewater Facility Regulation database. The retention factor (S) was applied to the load from Sportsmans Cove only, as Brittany Estates discharges directly into Little Hatchett Creek.

## Results

**Tables I-2a** through **I-2d** show estimated septic tank TN loadings for each lake. **Table I-3** shows the estimated TN loading from the two package plants.

**Table I-2a. TN Loading from Septic Systems (lbs/year) – Lake Lochloosa**

| Estimated Soil TN Retention | Status | Total TN Loading (lbs/year) | |
|---|---|---|---|
| | | *30 mg/L Effluent TN Concentration* | *50 mg/L Effluent TN Concentration* |
| 30% | Functioning | 1373 | 2288 |
| | Failing | 103 | 172 |
| | **TOTAL** | **1476** | **2460** |
| 45% | Functioning | 1079 | 1798 |
| | Failing | 103 | 172 |
| | **TOTAL** | **1182** | **1970** |

**Table I-2b. TN Loading from Septic Systems (lbs/year) – Newnans Lake**

| Estimated Soil TN Retention | Status | Total TN Loading (lbs/year) | |
|---|---|---|---|
| | | *30 mg/L Effluent TN Concentration* | *50 mg/L Effluent TN Concentration* |
| 30% | Functioning | 4292 | 7153 |
| | Failing | 323 | 538 |
| | **TOTAL** | **4615** | **7691** |
| 45% | Functioning | 3372 | 5620 |
| | Failing | 323 | 538 |
| | **TOTAL** | **3695** | **6158** |

**Table I-2c. TN loading from septic systems (lbs/year) – Orange Lake**

| Estimated Soil TN Retention | Status | Total TN Loading (lbs/year) | |
|---|---|---|---|
| | | *30 mg/L Effluent TN Concentration* | *50 mg/L Effluent TN Concentration* |
| 30% | Functioning | 2205 | 3676 |
| | Failing | 166 | 276 |
| | **TOTAL** | **2371** | **3952** |
| 45% | Functioning | 1733 | 2888 |
| | Failing | 166 | 276 |
| | **TOTAL** | **1899** | **3164** |

**Table I-2d. TN loading from septic systems (lbs/year) – Lake Wauberg**

| Estimated Soil TN Retention | Status | Total TN Loading (lbs/year) | |
|---|---|---|---|
| | | *30 mg/L Effluent TN Concentration* | *50 mg/L Effluent TN Concentration* |
| 30% | Functioning | 281 | 468 |
| | Failing | 21 | 35 |
| | **TOTAL** | **302** | **504** |
| 45% | Functioning | 221 | 368 |
| | Failing | 21 | 35 |
| | **TOTAL** | **242** | **403** |

**Table I-3. TN loading from package plants (lbs/year)**

| Lake | Package Plants in 200m Drainage Area | 30% Soil Retention | 45% Soil Retention |
|---|---|---|---|
| **Lochloosa** | - | - | - |
| **Newnans** | Brittany Estates * | 736 | 736 |
| **Orange** | Sportsman's Cove | 5 | 4 |
| **Wauberg** | - | - | - |

* Brittany Estates discharges directly into Little Hatchett Creek. As such, the soil retention factor was not applied.

**Figure I-1** shows the relative TN loading from on-site wastewater systems for each lake using the most conservative estimates (30% retention rate and 50 mg/L TN concentration). **Figures I-2a** through **I-2d** show TN loading from on-site wastewater systems relative to loading from other sources. In these figures, the on-site wastewater loading was calculated assuming a 30% retention rate and 50 mg/L average TN concentration to provide a maximum loading estimate. Loading from nonwastewater sources and the total baseline loading values were taken directly from the TMDL documents for comparison purposes.

Given the variety of assumptions and data used in TMDL development among the lakes, these estimates of on-site wastewater system loading are rough estimates. Additional loading from on-site systems beyond the 200m drainage area may be occurring. However, without accurate data regarding ground water baseflow into basin lakes, this additional contribution cannot be accurately quantified even within an order of magnitude.

**Figure I-1. Estimated TN loading from functioning septic systems, failing septic systems, and package plants**
***(Calculated with 30% retention rate and 50 mg/L average TN concentration)***

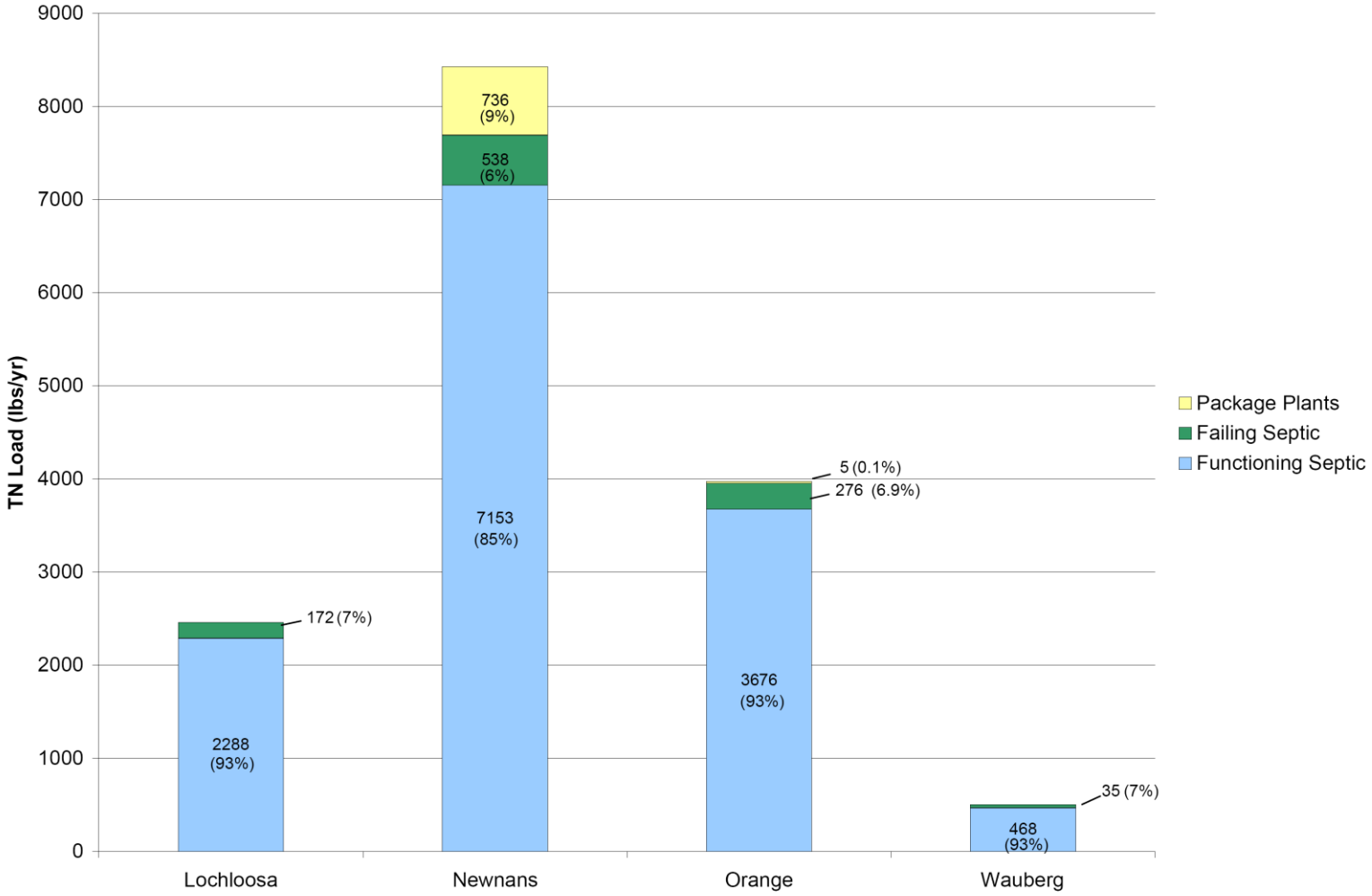
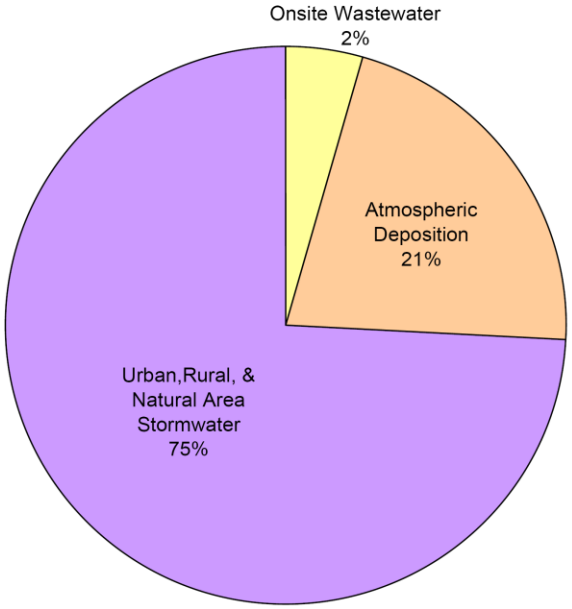


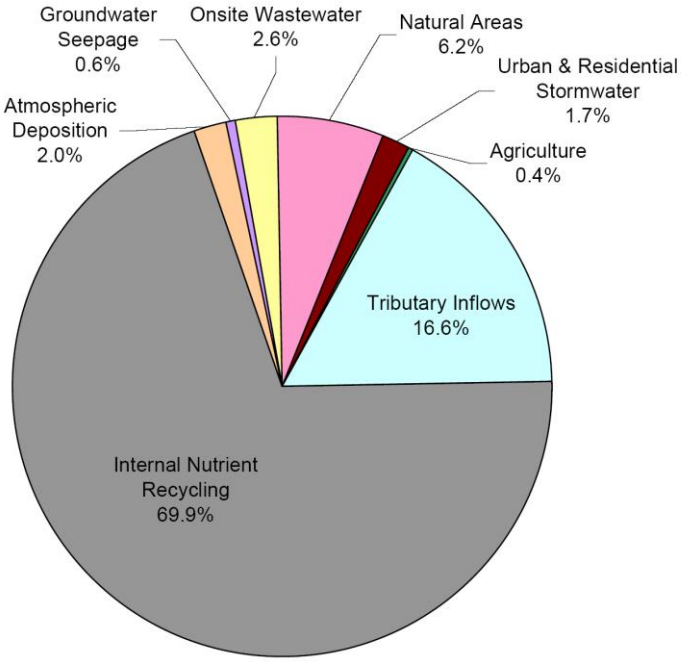
**Figure I-2a. Estimated TN loading (lbs/year) and percentage of baseline loading from various sources – Lake Lochloosa**




**Notes**:

- Stormwater runoff was not separated by land use types in the original TMDL.
- The refined wastewater loading estimate shown in this figure was calculated with a 30% retention rate and 50 mg/L average TN concentration.
- See **Table 6** and **Section 5.8** in the Lake Lochloosa TMDL for more information about nonwastewater sources.

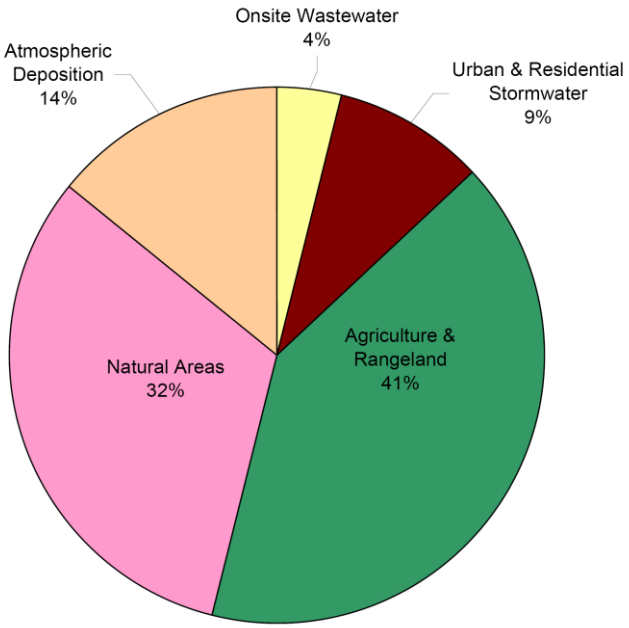
**Figure I-2b. Estimated TN loading (lbs/year) and percentage of baseline loading from various sources – Newnans Lake**




**Notes**:

- The original on-site wastewater loading estimate calculated for the TMDL was 800 lbs/year (0.3% of total TN loading).
- The refined wastewater loading estimate shown in this figure was calculated with a 30% retention rate & 50 mg/L average TN concentration
- See **Tables 23** and **26** in the Newnans Lake TMDL for more information about nonwastewater sources.

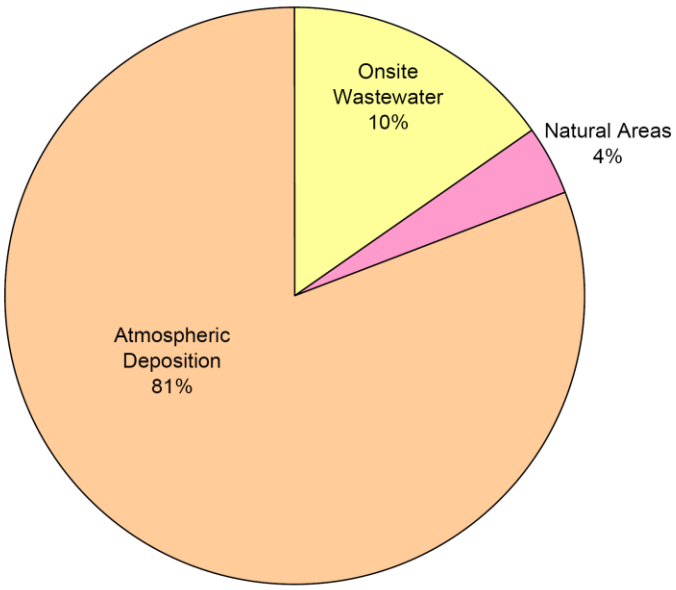
**Figure I-2c. Estimated TN loading (lbs/year) and percentage of baseline loading from various sources – Orange Lake**




**Notes**:

- The original on-site wastewater loading estimate calculated for the TMDL was 4,630 lbs/year (5% of total TN loading).
- The refined wastewater loading estimate shown in this figure was calculated with a 30% retention rate and 50 mg/L average TN concentration
- See **Tables 18** and **21** of the Orange Lake TMDL for more information about nonwastewater loading.

**Figure I-2d. Estimated TN loading (lbs/year) and percentage of baseline loading from various sources – Lake Wauberg**




**Notes**:

- The original on-site wastewater loading estimate calculated for the TMDL was 1,299 lbs/year (32% of total TN loading).
- The refined wastewater loading estimate shown in this figure was calculated with a 30% retention rate and 50 mg/L average TN concentration
- See **Section 5** of the Lake Wauberg TMDL for more information about nonwastewater loading.

## Conclusions

Onsite wastewater systems are frequently identified as a significant source of TN loading to surface waters. However, loading values from on-site systems are often based on the total number of systems in the watershed, and not on the loading from those systems that actually reaches an impaired surface water. The purpose of this analysis was to estimate the fraction of total loading from on-site wastewater system effluent that reaches the four impaired lakes in the Orange Creek Basin. To identify this fraction, only systems within 200m of the lake and its associated surface water drainage features were included.

Based on the information provided above, TN loading from on-site systems in the 200m drainage area ranged from 8,427 lbs/year (maximum estimate for Newnans Lake) to 242 lbs/year (minimum estimate for Lake Wauberg). The maximum estimates of loading from septic tanks alone were as follows: Lochloosa – 2,460 lbs/year, Newnans – 7,691 lbs/year, Orange – 3,952 lbs/year, and Wauberg – 504 lbs/year.

In the four sub-basins, functioning septic systems are estimated to contribute significantly more TN than failing systems and package plants combined (see **Figure I-1**). TN loading from failing septic systems was limited. Loadings from the two package plants in the 200m surface water drainage area (Brittany Estates and Sportsman's Cove) were also minimal relative to loading from functioning septic tanks in their respective sub-basins.

Relative to other sources, loading from on-site wastewater systems was a small fraction of the total TN loading to Lochloosa, Newnans, and Orange Lakes. For these three lakes, loadings from on-site systems were 2-4.5% of the total baseline loading. In Lake Wauberg, loading from on-site systems primarily located on the west-southwest side of the lake represented 10% of the baseline loading. Further, the maximum estimate of TN load from on-site systems in Lake Wauberg (504 lbs/year) represents approximately 25% of the TMDL (2,062.4 lbs/year).

On-site wastewater disposal appears to provide only a small fraction of TN loading to Lake Lochloosa, Newnans Lake, and Orange Lake. Addressing TN loads from on-site wastewater systems would have the greatest benefit for Lake Wauberg, as on-site systems contribute a larger portion of the overall loading for this lake than in the other three impaired lakes. In addition to on-site wastewater systems, all sources need to be considered when developing a plan that will successfully improve water quality in lakes of the Orange Creek Basin.

# APPENDIX J. DRAFT GUIDANCE ON SEPTIC TANK SYSTEM MAINTENANCE AND SEWER HOOKUP

**Contributions from:** Alachua County Health Department, Lake County Health Department, Florida Department of Health

**Preliminary Notes**:

- Note that the term "functioning properly" is qualitative. Basically, if a prior approved system is operating under the same conditions it was permitted for and not causing a sanitary nuisance, then it is "functioning properly."

- Systems that were permitted prior to 1983 may not meet the scientifically researched basis for the 24" vertical separation from the absorption surface (bottom of drainfield) to the seasonal high water table. Those systems meeting the 24" vertical separation to the seasonal high water table and the 75' lateral setback to surface waters are unlikely to pose a risk for fecal coliform loading to the creeks.

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**Septic Tank Maintenance:**
Unless a system is required to have an operating permit, there is no State mandate for maintenance other than insuring that the Onsite Sewage Treatment and Disposal System (OSTDS) functions properly and does not cause a sanitary nuisance.

Operating permits are required for OSTDS:

- Located in an area zoned industrial or manufacturing, or its equivalent.
- Where a business will generate commercial sewage waste.
- That utilize aerobic treatment units.
- That are performance-based treatment systems.

The current **recommendations** are that a typical residential OSTDS have its tank(s) inspected every three to five years to determine if they need to be pumped. Owners may consider increasing this inspection frequency if they have a garbage disposal.

**See**: Chapter 64E-6.003(5), Florida Administrative Code.

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**Conditions for Sewer Hook-up**:
An owner of an OSTDS that is functioning properly has 365 days from the time a utility notifies* them that a sewer is "available" to connect to the central sewage system. The definition of "available" can be found in s. 381.0065(2)(a), Florida Statutes (F.S.) – see below.

An owner of an OSTDS that is in need of repair or modification in order to function properly has 90 days to connect to an "available" sewer system after written notification from the Health Department. The Health Department would issue an order to abate a sanitary nuisance.

These are two separate and distinct scenarios. County health departments do not have authority to issue permits or grant system approvals for septic tanks where a sewer is available per the s. 381.0065, F.S., definition of “available.”

**Guidance for this issue is provided by**: s. 381.0065, F.S.

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**Incentives for Local Governments to Connect Citizens to Central Sewer:**

Economics generally has been the primary driving force for communities to require central sewer connections. Sewerage results in higher densities and more intense use of commercial properties (especially restaurants) that OSTDS do not support or allow.

- In the Orange Creek Basin, with regards to the creek project, environmental concerns are the impetus for the efforts currently underway by the Alachua County Health Department, Gainesville Regional Utilities, and Alachua County Environmental Protection Department.
    - Where OSTDS are found that pose a significant potential or confirmed contribution to fecal coliform loading, the option of repairing the OSTDS or extending/connecting sewer lines is being assessed.
    - A challenge is going to be in how we address those systems that pose a potentially significant problem; if they are not obviously failing, we cannot impose a fix. We can explore options to mitigate their impact.

**Related Statutes**

**381.0065**

(2) **DEFINITIONS**.--As used in ss. 381.0065-381.0067, the term:

(a) "Available," as applied to a publicly owned or investor-owned sewerage system, means that the publicly owned or investor-owned sewerage system is capable of being connected to the plumbing of an establishment or residence, is not under a Department of Environmental Protection moratorium, and has adequate permitted capacity to accept the sewage to be generated by the establishment or residence; and:

1. For a residential subdivision lot, a single-family residence, or an establishment, any of which has an estimated sewage flow of 1,000 gallons per day or less, a gravity sewer line to maintain gravity flow from the property's drain to the sewer line, or a low pressure or vacuum sewage collection line in those areas approved for low pressure or vacuum sewage collection, exists in a public easement or right-of-way that abuts the property line of the lot, residence, or establishment.

2. For an establishment with an estimated sewage flow exceeding 1,000 gallons per day, a sewer line, force main, or lift station exists in a public easement or right-of-way that abuts the property of the establishment or is within 50 feet of the property line of the establishment as accessed via existing rights-of-way or easements.

3. For proposed residential subdivisions with more than 50 lots, for proposed commercial subdivisions with more than 5 lots, and for areas zoned or used for an industrial or manufacturing purpose or its equivalent, a sewerage system exists within one-fourth mile of the development as measured and accessed via existing easements or rights-of-way.

4. For repairs or modifications within areas zoned or used for an industrial or manufacturing purpose or its equivalent, a sewerage system exists within 500 feet of an establishment's or residence's sewer stub-out as measured and accessed via existing rights-of-way or easements.

**381.0016 Municipal regulations and ordinances.**--Any municipality may enact, in a manner prescribed by law, health regulations and ordinances not inconsistent with state public health laws and rules adopted by the department.

# APPENDIX K. AQUATIC PLANT MANAGEMENT REVIEW PROCESS

Section 369.20 (2), F.S., authorizes DEP to "…direct the control, eradication, and regulation of noxious aquatic weeds…so as to protect human health, safety, and recreation, and to the greatest degree practicable, prevent injury to plant and animal life and property." Further, Section 369.22 (3) requires that "…the control of nonindigenous aquatic plants be carried out primarily by means of maintenance programs, rather than eradication or complaint spray programs, "…for the purpose of achieving more effective control at a lower long-range cost. It is also the intent of the Legislature that the department guide, review, approve, and coordinate all non-indigenous aquatic plant control programs within each of the water management districts..."

The DEP Bureau of Invasive Plant Management (BIPM) carries out aquatic plant management control responsibilities via a permitting program and by providing funds to contractors for managing aquatic plants in Florida public waters. Public waters are defined as sovereignty lands with access via a public boat ramp. There are 450 public waters with a combined surface area of about 1.27 million acres. Contractors include private companies, county governments, and water management districts. In the early 1980s, much of the aquatic plant control was conducted by water management district crews. Since then, the Northwest and Suwannee River Water Management Districts no longer participate and crews from the other three districts manage plants in relatively few waters within district boundaries; replaced by private sector and county government contractors. For example, the SJRWMD controls aquatic plants under BIPM contract in only 8 of the 153 public waters eligible for funding through the BIPM within district boundaries.

Each February–March, agency field representatives with aquatic plant management responsibilities draft basic management plans and propose budgets for the ensuing state fiscal year (July 1 – June 30). Agencies include BIPM, FWC, and participating water management districts and county governments. These work plan requests are submitted to the BIPM and are forwarded to agencies such as the FWC, U.S. Fish and Wildlife Service, and U.S. Army Corps of Engineers during April–May for review and comments related to their missions in Florida public waters. BIPM administrative and field staff meet with field representatives from affected government agencies and government contractors during the second week of May to authorize general aquatic plant management work plans for the fiscal year and to establish a budget for this work.

Management allocations are established for about 350 waters each year. Funds are allocated on a statewide priority basis, with the invasive floating plants water hyacinth and water lettuce as the BIPM's primary management objective. The submersed invasive plant hydrilla is represented in the next four priority categories. Waters eligible for aquatic plant management funding and funding priorities are addressed in Rule 62C-54, F.A.C. Work plans and budget allocations are incorporated into Task Assignments and executed on July 1.

Aquatic plant control applies the concept of adaptive management. Plant growth is highly variable with prime influences from weather, water clarity, and chemistry.

Therefore, while management concepts are agreed upon at the beginning of the year, management operations and budgets are flexible and adapt to changing conditions. Agency personnel with aquatic plant management responsibilities conduct routine inspections of public waters and are in frequent communication. If additional plants need to be controlled requiring additional funding, the same agencies that commented on the original work plan are consulted regarding the proposed change. If anticipated plant problems do not materialize, then funds are reallocated elsewhere in the state.

Responsible participation in developing aquatic plant management plans requires a detailed understanding of potential invasive plant impacts as well as the more than 50 biological, chemical, mechanical, and physical management tools that are available to integrate into programs that consider all of the uses and functions of the infested water body. Additionally, participants are asked to consider aquatic plant management plans from an ecosystem level perspective rather than from a single issue focus, since invasive aquatic plants usually impact multiple uses and functions of Florida public waters. Since most stakeholders do not have this level of expertise, their input is best addressed at lake association meetings or task forces that meet regularly and have the time for in-depth discussion on various management tools and strategies, including the consequences of not managing, or ineffectively managing, invasive aquatic plants. BIPM, FWC, and government contractor staff usually attend these stakeholder meetings throughout the year, and their draft work plans reflect meaningful input received at these meetings.

For more information on aquatic plant management funded by BIPM, refer to the BIPM website at http://www.dep.state.fl.us/lands/invaspec/2ndlevpgs/Aquaticplnts.htm. Also, consult the BIPM general website on aquatic plants and their management in Florida waters at http://plants.ifas.ufl.edu/guide.

# APPENDIX L. PROJECTS UNDER DEVELOPMENT

| Project Number | Project Name | General Location / Waterbody Name / WBID | Project Description | Lead Entity / Project Partners |
|---|---|---|---|---|
| URBAN06 | Urban Creek Septic System Removal or Upgrade | City of Gainesville / Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2709 | Provide municipal sanitary sewer service to residents with inadequate or failing septic systems along Sweetwater Branch, Tumblin Creek and Hogtown Creek. The ACHD is conducting an inventory to assess existing septic system failure/adequacy in the urban area. | ACHD; GRU / ACEPD; SJRWMD |
| ALACHUA04 | Alachua County Environmental Geodatabase | Alachua County-Orange Creek Basin / Orange Creek Basin / HUC 03080102 | Maintain a centralized geodatabase for septic tank information, watershed boundaries, hydrologic features, locations and information on nonpoint source pollutants, riparian buffers, drainage easements and other related information. | ACEPD / ACPW, city of Gainesville Public Works, DOT, GRU, ACHD |
| ALACHUA01 | Alachua County Parks Septic Tank System Upgrades | Alachua County / Newnans Lake; Lake Lochloosa; Cross Creek / 2705B; 2738; 2754 | There is a need for performance-based system upgrades to older septic systems and the installation of new nitrogen-reducing performance based septic systems at the county parks located on or near waterbodies. Countywide, 10 systems need upgraded or newly installed septic systems. | ACEPD / Alachua County Public Works; DEP |
| ALACHUA05 | Stormwater Management in Karst Areas | Alachua County / Orange Creek Basin / HUC 03080102 | Stormwater treatment in karst areas can negatively impact ground water quality. Improved designs and sinkhole management can improve water quality and protect the Floridan aquifer. | ACEPD / Alachua County Public Works; SJRWMD |
| ALACHUA06 | Shoreline Buffer Restoration | Alachua County / Orange Creek Basin / HUC 03080102 | Conduct shoreline buffer restoration activities through educational workshops using participants as volunteer labor for restoration. Three workshops were successfully conducted at Poe Springs Park in 2005 and four others followed in 2005 and 2006. ACEPD proposes to conduct additional workshops targeting eight stream corridors or retention ponds in Alachua County to educate the public and reduce | ACEPD / DEP; Alachua County, city of Gainesville, DOT, District 2 (GCWP); SJRWMD |

| Project Number | Project Name | General Location / Waterbody Name / WBID | Project Description | Lead Entity / Project Partners |
|---|---|---|---|---|
| | | | nonpoint source pollution. | |
| ALACHUA08 | Stormwater Retrofit for Disturbed Wetlands | Alachua County / Orange Creek Basin / HUC 03080102 | Disturbed wetlands have often lost primary functions such as water quality enhancement. Restoration or "retrofit" of these disturbed wetlands will provide enhanced water quality in the entire watershed. | ACEPD / Alachua County Public Works; SJRWMD |
| OR07 | Wetland Restoration Lochloosa Slough/Little Orange Creek | Southeastern Alachua County / Lochloosa Slough;Little Orange Creek / 275; 2713; 2702 | Roadways and stormwater have impacted natural wetlands in much of southeast Alachua County; two particular areas include Lochloosa Slough (east of U.S. Highway 301) and Little Orange Creek (near CR 219A). These areas need restoration and may serve as mitigation sites. | ACEPD / Alachua County Public Works; SJRWMD |
| AS06 | Alachua Sink Dye Trace | Paynes Prairie / Alachua Sink and Paynes Prairie / 2720A; 2721; 2722 | Proposed dye trace study for the water entering Alachua Sink, located on Paynes Prairie Preserve. This study would show the fate of water entering the Floridan aquifer and the impacts on ground water and other surface waterbodies. The estimated cost includes the dye, lab analysis, investigative modeling, and limited well installation. | ACEPD / DEP |
| AS09 | Paynes Prairie Water Quality Improvement - Prairie View Apartments WWTP | City of Gainesville / Paynes Prairie / 2721 | The Prairie View Apartments in southeast Gainesville has a privately owned and operated domestic waste sewage treatment plant, with a permitted plant capacity of 0.0042 mgd, which is located adjacent to Paynes Prairie State Preserve and discharges the treated effluent to two rapid infiltration basins. Under periods of high water these basins are connected to Paynes Prairie, an OFW. | ACEPD / DEP |
| HOG28 | Haile Sink Dye Trace | Hogtown Prairie / Haile Sink and Hogtown Prairie (WBID includes Lake Kanapaha) / 2717 | A dye trace study is needed for the water entering Haile Sink located on Hogtown Prairie. This study would show the fate of water entering the Floridan aquifer and the impacts on ground water and other surface waterbodies. The estimated cost includes the dye, lab analysis, investigative modeling, and limited well installation. | ACEPD / DEP |

| Project Number | Project Name | General Location / Waterbody Name / WBID | Project Description | Lead Entity / Project Partners |
|---|---|---|---|---|
| NEW05 | Little Hatchet Creek Water Quality Improvement - Brittany Estates WWTP | City of Gainesville / Little Hatchet Creek; Newnans Lake / 2695; 2705B | The Brittany Estates Mobile Home Park in northeast Gainesville has a privately owned and operated domestic waste sewage treatment plant, which is located on and discharges treated effluent to Little Hatchet Creek, a tributary to Newnans Lake. | ACEPD / DEP |
| ALACHUA07 | Wetland Buffer Protection | Alachua County / Orange Creek Basin / HUC 03080102 | Conduct wetland buffer preservation and restoration through public education and regulatory requirements. | ACEPD / DEP; SJRWMD |
| HOG25 | Instream Bioassessments in the Hogtown Creek Watershed | City of Gainesville / Hogtown Creek / 2698 | Seasonal (winter and summer) bioassessments of 10 sites in the Hogtown Creek watershed for comparison with historical BioRecon data | ACEPD |
| URBAN05 | Assessment of Coliform Bacteria in Sediments | City of Gainesville / Hogtown Creek; Sweetwater Branch; Tumblin Creek / 2698; 2718A; 2711 | Assessment of coliform bacteria persistence and potential regrowth in instream sediment under varying hydrologic and climatic conditions. | ACEPD / Potential for funding through DEP |
| HOG01 | Hogtown Creek Stream Restoration | Gainesville Urban Area / Hogtown Creek / 2698 | Aquatic ecosystem restoration plan to stabilize creek and reduce erosion and transport of sediment. Plan relies on a series of grade control structures to halt bed degradation and stabilize upstream reaches of creek. Removal of invasive exotic species | City of Gainesville / |
| SWT01 | NW 14th Avenue Stormwater Park | NW 14th Avenue / Sweetwater Branch / 2711 | Stormwater retrofit on 2.3-acre parcel to provide treatment and attenuation. | City of Gainesville / DEP 319 grant program |
| SWT05 | Rosewood Creek Trash Trap | SE 9th Street at Rosewood Branch / Sweetwater Branch / 2711 | Instream floating diversion weir to remove floating debris. | City of Gainesville / DEP 319 grant program |
| SWT06 | SE 2nd Avenue Stormwater Park - Rosewood Creek Stormwater Pond | SE 2nd Avenue / Sweetwater Branch / 2711 | Stormwater retrofit on 3 acres to provide treatment and attenuation. | City of Gainesville / DEP 319 grant program |
| SWT07 | Sweetwater Branch Stream Restoration and Bank Stabilization | / Sweetwater Branch / 2711 | Aquatic ecosystem restoration to stabilize the creek to reduce erosion. | City of Gainesville / DEP 319 grant program |

| Project Number | Project Name | General Location / Waterbody Name / WBID | Project Description | Lead Entity / Project Partners |
|---|---|---|---|---|
| AS14 | Sheetflow Restoration and Wetlands System for Paynes Prairie Restoration | Mouth of Sweetwater Branch at Paynes Prairie Preserve State Park / Alachua Sink; Paynes Prairie / 2720A | Restore historical sheetflow for Sweetwater Branch onto Paynes Prairie. Implement treatment improvements at Main Street WRF and construct enhanced wetland and sheetflow structure to meet Alachua Sink TMDL loading from Sweetwater Branch and restore wetlands on Paynes Prairie. | City of Gainesville, GRU / GRU; DOT; DEP Division of Parks and Recreation; SJRWMD; city of Gainesville |
| NEW17 | Duval Neighborhood Stormwater Park | City of Gainesville / Lake Forest Creek; Newnans Lake / 2705B | Subregional stormwater retrofit project to reduce pollutant loads to Lake Forest Creek and Newnans Lake. | City of Gainesville / DOT, District 2; DEP;SJRWMD |

# APPENDIX M. A CONCEPTUAL PLAN FOR SWEETWATER BRANCH/PAYNES PRAIRIE SHEETFLOW RESTORATION

*Draft 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**

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# 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 M-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 M-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 M-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.

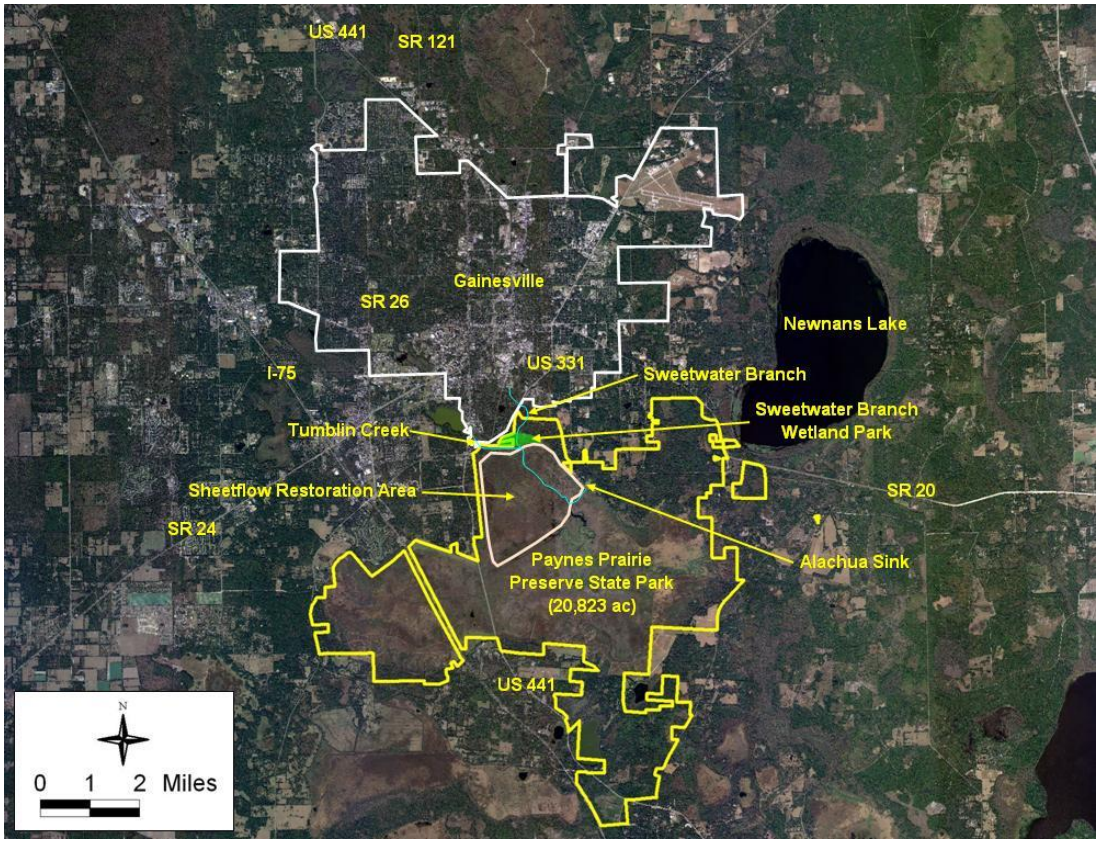


**Figure M-1. Approximate boundary map for the Paynes Prairie Preserve State Park illustrating the location of the city of Gainesville north of the prairie and Sweetwater Branch draining to Alachua Sink.**

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 M-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 re-establishment 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.

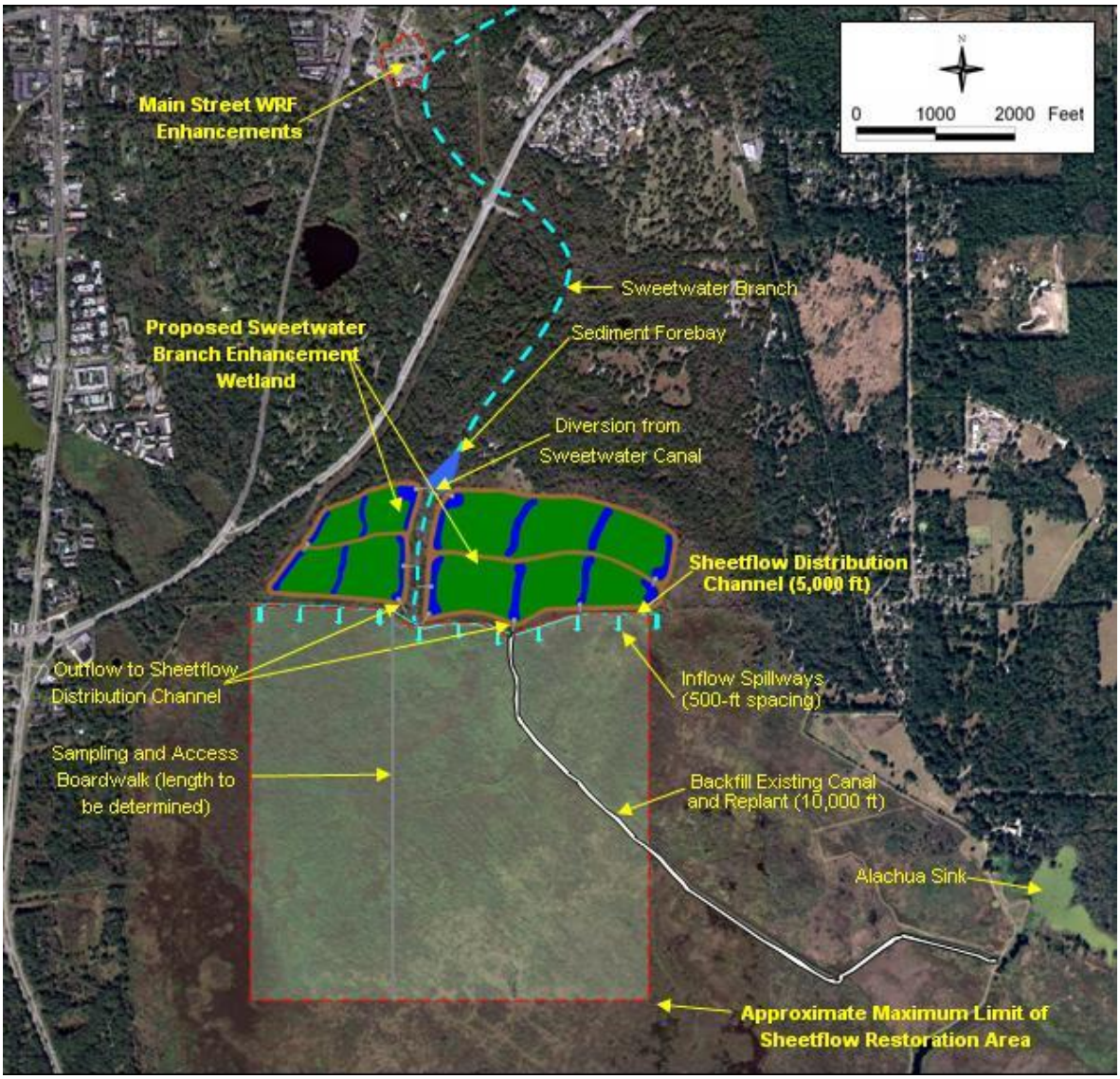


**Figure M-2. Proposed plan illustrating the overall conceptual project, including upgrades at the Main Street WRF, the Sweetwater Branch Enhancement Wetland, and the Sweetwater Branch/Paynes Prairie**

### *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 M-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 M-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 M-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 M-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.

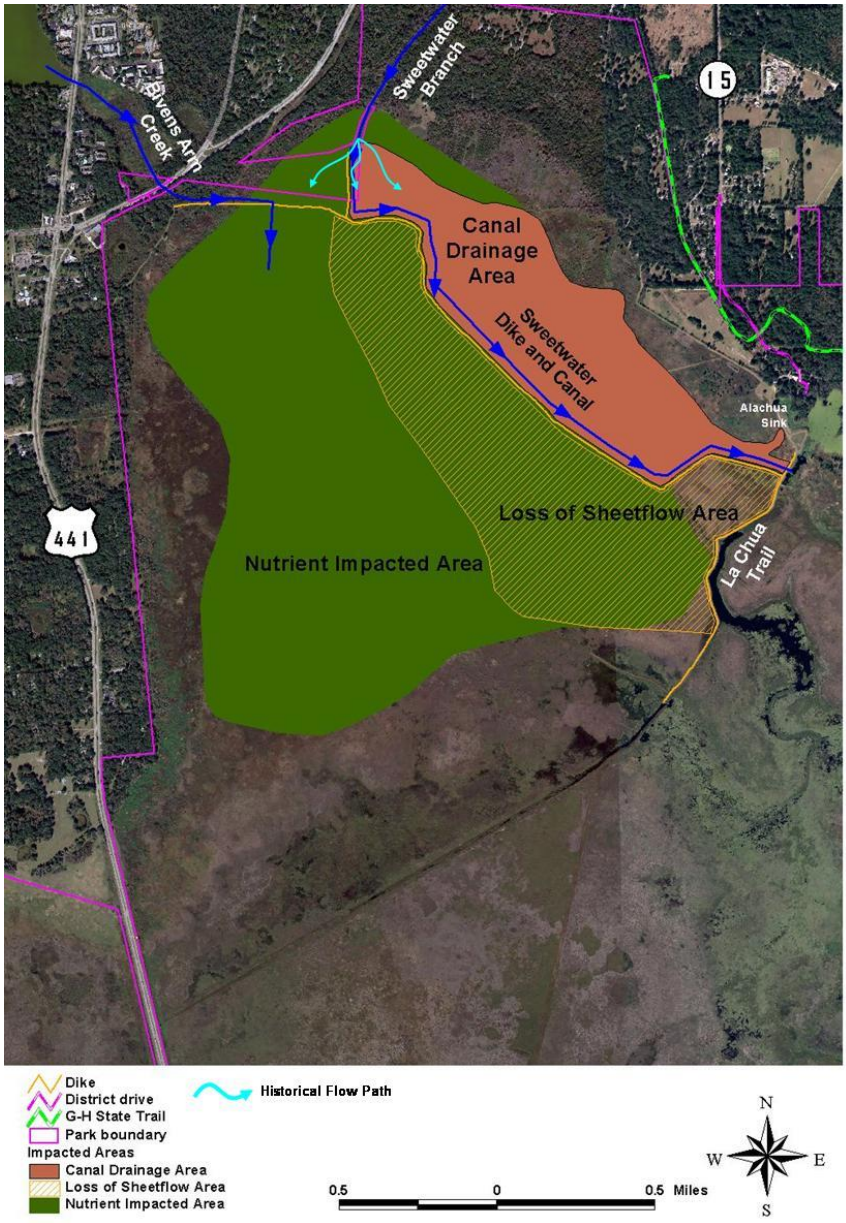


**Figure M-3. Estimated area of water quality and hydrological impacts in the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area (source: PPPSP)**

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 M-3**).

From this study, it became clear that the proposed Sheetflow Restoration Project would have to contain four major components to be successful (**Figure M-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.

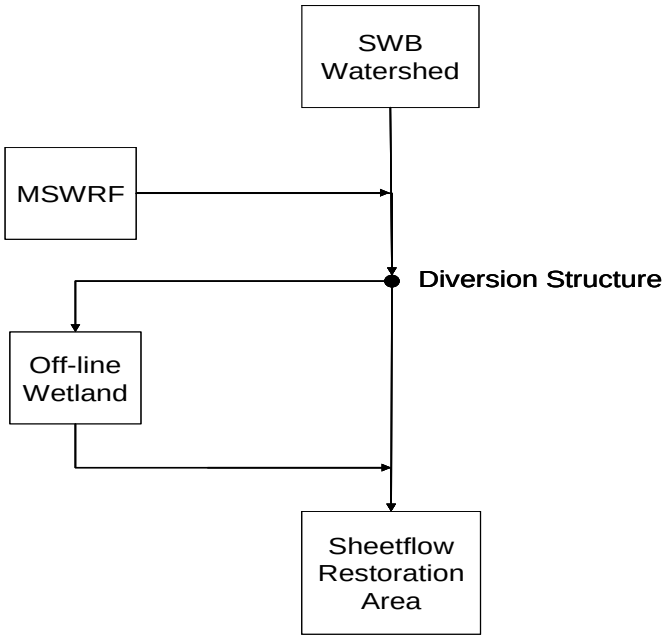


**Figure M-4. Conceptual diagram of the principal components of the proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project (see text for full description)**

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 M-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 M-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 M-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 M-1**.

**Figure M-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 loint in the lrocess before discharge to Sweetwater Branch.**

**Table M-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 5-Stage Process | 4.0 | 0.3 | $40.8M | $0.6M | $41.3M |
| 2. MLE Process w/ P removal | 6.2 | 0.3 | $29.4M | $0.4M | $33.4M |
| 3. N Optimization w/ P Removal | 8.0 | 0.3 | $2.0M | $0.4M | $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 M-7** illustrates these proposed project enhancements.

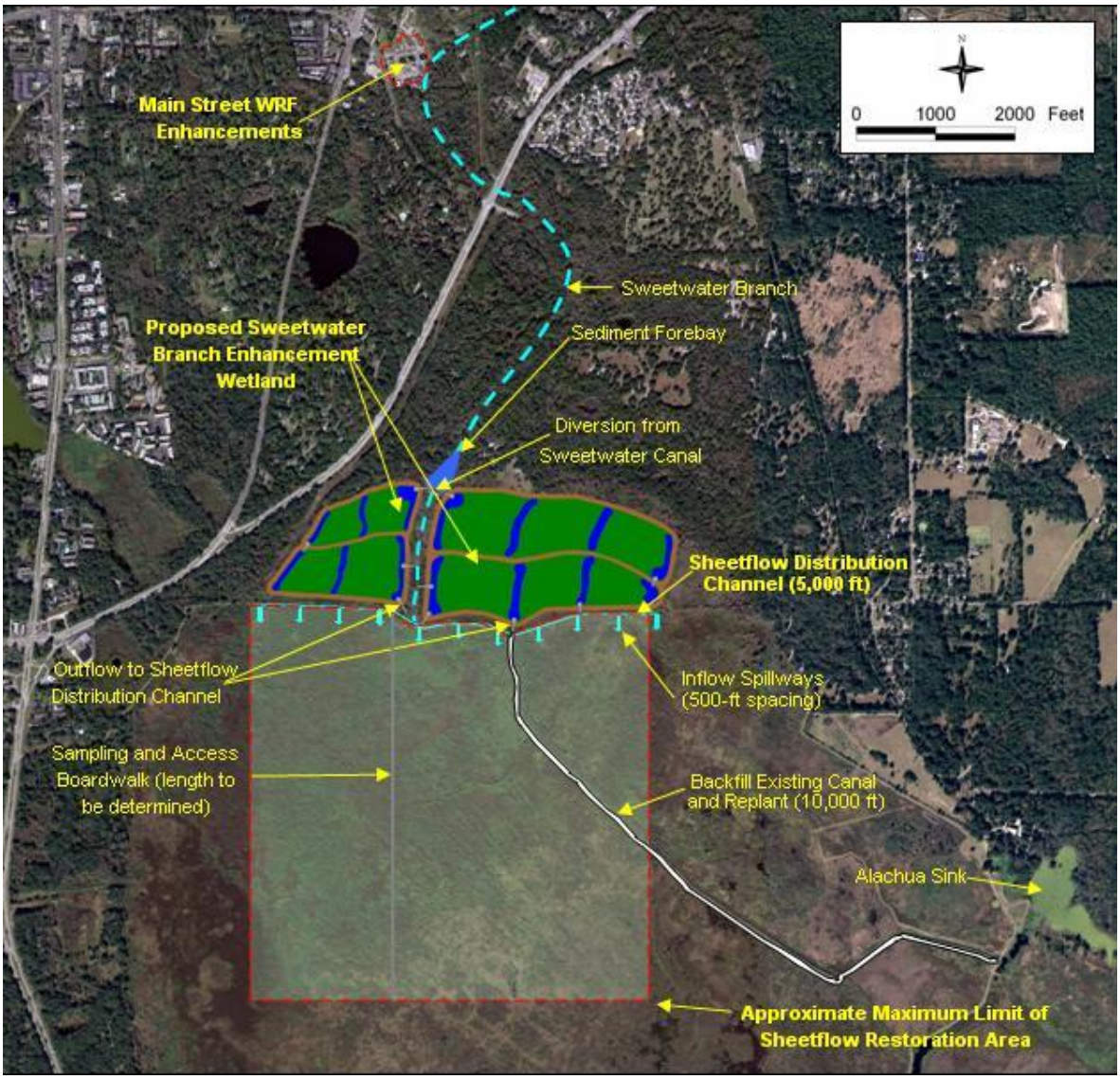


**Figure M-7. Proposed plan illustrating the overall conceptual project including upgrades at the Main Street WRF, the Sweetwater Branch Enhancement Wetland, and the Sweetwater Branch/Paynes Prairie Sheetflow Restoration Area**

### *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 M-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 M-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.**

| Tumblin Creek Sub-Regional Water Quality Improvement Projects | | | |
|---|---|---|---|
| | | 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** |
| **Grand Total Existing** | **5.9** | **676** | **179** |
| **Grand Total Identified** | **73.9** | **5,558** | **1,028** |
| **Grand Total** | **79.8** | **6,234** | **1,207** |

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 M-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.

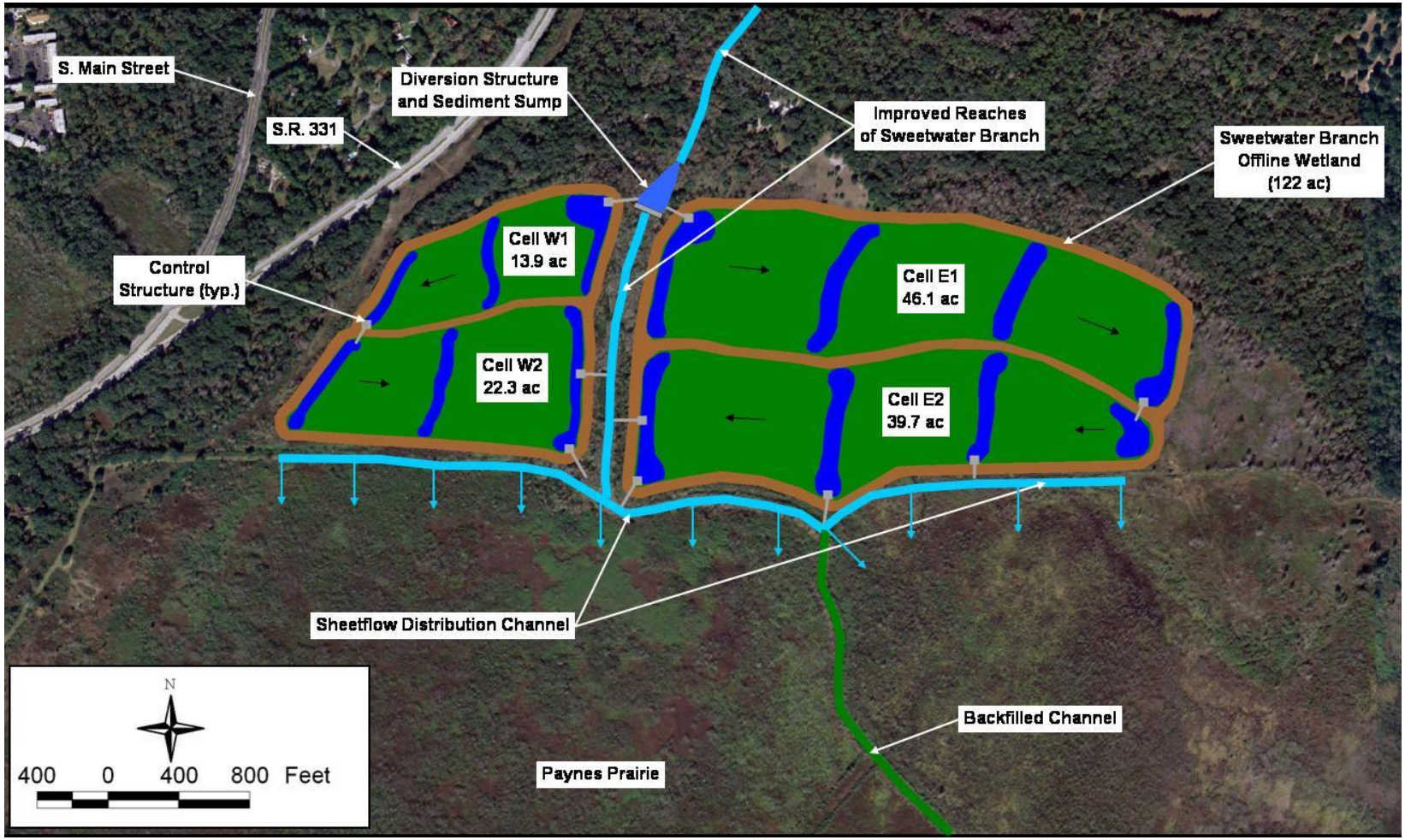


**Figure M-8. Updated conceptual plan for the proposed Sweetwater Branch Enhancement Wetland located on the northern portion of Paynes Prairie. The estimated total project footprint is about 150 ac. The proposed sheetflow distribution channel is just south of the Sweetwater Branch Enhancement Wetland.**

### *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 M-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 re-built, 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 re-hydrate 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 re-run to provide an estimate of performance for each of the major wetland features. **Table M-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 M-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 M-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 M-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 |
| Project Monitoring | $ 14,000 | $ 7,000 | $ 21,000 | $ 100,000 |
| **Estimated Total** | **$ 16,170,337** | **$ 8,085,169** | **$ 24,255,506** | **$ 1,265,000** |

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

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

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# APPENDIX N. DETAILS FOR SELECTED ALACHUA SINK NUTRIENT LOAD REDUCTION PROJECTS (NOT INCLUDING THE SWEETWATER BRANCH/PAYNES PRAIRIE SHEETFLOW PROJECT)

## Point source load reduction projects

Two traditional point sources affect Alachua Sink: GRU's Main Street Water Reclamation Facility (MSWRF), and the J.R. Kelly Generating Station. TN loading from the J.R. Kelly Generating Station contributes less than 1% of the TN load to Alachua Sink, and therefore further reductions are not discussed in this BMAP.

The MSWRF is operated by GRU, whose service area is 115 square miles. Approximately 35% of this area is served by the Main Street plant, from which treated wastewater discharges into Sweetwater Branch. The plant underwent a $16 million upgrade in 1989–92.

GRU projects with significant promise for reducing TN loading to Alachua Sink are:

- ***MSWRF water reuse through diversion to new Depot Avenue Stormwater Park (2003).*** *The Depot Avenue Stormwater Park is described in more detail in Section 3.4.4.1.2. Once the public access reuse is available from the MSWRF, it is estimated that between 5 and 9 million gallons per year will be delivered to the Depot Avenue Stormwater Park. Under current effluent conditions, this volume of water represents as much as 400 lb/year of TN, which now has the opportunity for better uptake and attenuation through the wetland system at Depot Park, compared with direct discharge into Sweetwater Branch and Alachua Sink.*
- ***MSWRF design, permitting and construction of water reuse infrastructure.*** *GRU has nearly completed a Reclaimed Water Master Plan whose recommendations have the potential to affect Alachua Sink loading through diverting treated wastewater for reuse rather than discharge into Sweetwater Branch. In addition, in 2003 GRU began an intensive study of nutrient loading at Alachua Sink and water reuse feasibility, which is still under way. GRU will spend an estimated $1 mllion in capital improvements by December 2006 to make up to 1.3 mgd of public access reuse from the MSWRF.*
- ***MSWRF Annual Operation and Maintenance.*** *The MSWRF is currently achieving relatively high removal of TN, despite the fact that its equipment does not include advanced TN removal capabilities. TN concentrations discharged to Sweetwater Branch ranged from 3.94 to 5.56 mg/L during the TMDL development period. This compares with effluent concentrations of around 3 mg/L for advanced treatment with TN removal. GRU is currently considering advanced wastewater treatment at the MSWRF and reclaimed*

*water as a potential means of achieving nutrient loading reductions to Alachua Sink and Sweetwater Branch.*

## Nonpoint source load reduction projects

The majority of the TN load to Alachua Sink is in the form of nonpoint sources. The most controllable of these sources is improved stormwater management, especially projects to retrofit areas with inadequate stormwater treatment. Most of the opportunities for this type of improvement are within the city of Gainesville, although urban areas outside the city may offer some opportunities for loading reductions as well.

### *Alachua County*

- *Land acquisition in Sweetwater Preserve. This property was purchased by the Alachua Forever land acquisition program. The 121-acre Sweetwater LTD property is located off Williston Road, and a portion of the property falls within the Gainesville city limits. The Sweetwater LTD property is adjacent to Paynes Prairie Preserve State Park, the City of Gainesville Boulware Springs Park and the Gainesville-Hawthorne Trail State Park. The key features of the property are its connectivity to adjacent conservation areas; its protection of water resources, including Sweetwater Branch, which transverses the property; and high-quality seepage wetlands and floodplain forest.*
- *The Alachua County water quality code, expanded nutrient monitoring, and buffer restoration projects also help to decrease nutrient loads into Alachua Sink.*

### *City of Gainesville Stormwater Projects*

#### Sweetwater Branch Watershed Management Plan

The city of Gainesville developed the Sweetwater Branch Watershed Management Plan in June of 2004 to update the Sweetwater Branch Stormwater Management Master Plan developed in April 1993. While the 1993 plan focused primarily of flood control in the watershed, the primary goal of the 2004 update was to incorporate the improvement of surface water quality of the baseflow and stormwater in the watershed by reducing nutrient and sediment loads. This improvement of water quality is essential to the sensitive and diverse ecosystem of Paynes Prairie, ground water quality as it enters the Floridian aquifer, and the health of the streams themselves. As outlined in this plan, the most noted water quality concerns in the watershed and its receiving waterbody includes elevated nutrients and fecal coliform, along with excessive erosion and deposition.

The initial effort of a management plan update included the collection and synthesis of existing information on the watershed, followed by field data collection efforts to characterize the stream system and the hydrology of the watershed. The data were then used to perform a geomorphic analysis, a hydrologic and hydraulic analysis, and a water quality analysis of the stream system. Findings from these analyses were used to formulate the restoration alternatives.

The plan's recommended alternatives comprise 11 projects that include 8 subregional ponds, a trash trap, grade control structures and other localized stabilization measures, and a regional wetland treatment system with a second trash trap. The TN reduction from the recommended alternatives is estimated to be approximately 45%, not including any reductions that would result from advanced nitrogen treatment at the Main Street Wastewater Treatment Plant (MSWWTP). The total nutrient load with the recommended alternatives in place may be low enough to restore sheet flow to Paynes Prairie from the Sweetwater Branch watershed without causing a significant adverse impact to the ecological community, in the Prairie while significantly restoring the historical hydrology in the Prairie.

This plan serves a guide for potential future city of Gainesville projects to improve water quality in the Sweetwater Branch watershed. All of the projects in the plan depend on commission approval.

### Duck Pond Restoration Project

Duck Pond is a linear city park located on Sweetwater Branch Creek in the northeast portion of Gainesville. The Duck Pond Restoration Project, which began in 2002 and was completed in 2005, was designed to restore a series of small wetlands along a 2,600-foot reach of Sweetwater. This project focused on a section of Sweetwater Branch paralleling East Boulevard between 10$^{th}$ Avenue and 5$^{th}$ Avenue. It attempted to correct several problems, including poor water quality, rapid sediment transport, poor flow management, and detrimental aesthetic quality.

Before restoration, the upper 2,100 feet of the stream channel was lined with concrete that had numerous breaks and fractures. This channelized condition contributed to higher velocities and transport of more sediment than a comparable natural stream. Frequently, storm events caused flooding of residential property in a historic district that adjoins the park. The lower 500 feet of the stream was a shallow "pond" (1 foot deep) with 3-to-4-foot-high, vertical walls constructed of stacked bags filled with concrete mix. The pond was filled with sediments transported by the stormwater, and hydrilla choked the water column with excessive growth. A resident duck population also contributed to the organic loading of the pond. Algal blooms, anoxic conditions, and odor occurred throughout the year, creating unacceptable eutrophic conditions.

Specifically, the project was designed to (1) increase water storage capacity during peak storm events; (2) increase the collection of waterborne sediments; (3) decrease the nutrient (nitrogen and phosphorus) loading from stormwater through selective native plantings; and (4) provide a setting where educational restoration information can be presented. Additionally, the park area surrounding the improvements was designed to continue neighborhood use of the park as well as serve as a connector to adjoining parks/recreational facilities.

Restoring this section of Sweetwater Branch began with a series of wetlands, pools, and natural stream segments in the upper section to improve water quality and flow regulation in this section of the creek. Additionally, two CDS units were added to prevent gross pollutants from entering the creek. The pond was dredged and deepened and a littoral zone was added for natural treatment of pollutants. Design and completion of this project required hydrologic and hydraulic modeling of the existing and proposed stream components; sampling and testing for key chemical parameters of the water both before and postrestoration; selecting native wetland plant species with an affinity for

specific nutrients; and meeting with neighborhood representatives in developing the conceptual plan for the project that included the park and educational components of the project proposal. Project plans include future monitoring to determine the effectiveness of nutrient removal.

### Sweetwater Branch Sediment Traps

Several sediment traps have been installed in the Sweetwater Branch watershed for purposes of water quality improvement.

The first device installed was a baffle box. This device employs the fundamental principle that things more dense than water sink. The main section of this device is a reservoir that spans the entire structure from side to side and nearly to the bottom. Baffles block the flow from going directly to the outlet. Instead the water is slowed and suspended particles have a chance to settle. Once the water level is high enough, it flows over the edge into the next chamber and more particulates can settle. Screens at these overflow points trap large pieces of trash and debris preventing them from continuing into the natural hydrological network. After flowing through the series of baffles, runoff is then relatively sediment free. The box is located near the intersection of the creek and SE 1st Avenue. The installation was a joint venture between the ACEPD, the SJRWMD, and the city of Gainesville.

The sediment trap was installed in November 1996 on a 24-inch stormwater pipe. The trap catches the coarser sediments from 10 acres of downtown. In conjunction with the project, a kiosk was placed at the site that explains the function of the unit, its construction, and the benefits. Brochures are also available at the kiosk that present additional information. Quarterly, the unit is cleaned. The city transports all of the collected material to a storage yard and maintains a data log on the quantities removed from each of the three cells in the trap. Since its installation, several environmentally oriented citizen tours have featured the sediment trap as one of the stops on their program.

The second sediment trap was installed in 2002 near the intersection of the creek and SE 2nd Avenue. There, a new type of trap, called a Vortech box, was installed. This is an EPA award-winning design that efficiently removes contaminated sediment, floating oil, and debris from surface runoff. It is a compact, below-grade system that is fabricated near the job site from precast concrete and marine grade aluminum. Its unique design allows for easy inspection and unobstructed maintenance access. Features include low capital cost per unit of treatment and a shallow excavation depth that reduces installation costs. The Vortech System's swirl concentrator and flow controls work together to prevent pollutant resuspension and washout. This works even during high-intensity storm events. Annual Total Suspended Solids (TSS) removal efficiencies have been shown to be 80% for typical urban runoff particle distributions. Each system is custom-designed to suit site conditions and local regulatory requirements, treating design flows from 1.6 to 25 cfs. Larger flows are treated using Vortech Systems that are cast in place.

In 2003, yet another type of sediment trap was introduced to the Sweetwater Branch's stormwater system. Two CDS units were added to the Sweetwater Branch at NE West Boulevard and NE East Boulevard in the Duckpond Neighborhood. Polluted runoff enters the unit and is introduced at a tangent inside the separation screen, forming a vortex. The slow-moving center of the vortex pulls in floatables and suspended solids.

The solids settle out to an undisturbed sump chamber below. The water then passes countercurrently through a separation screen. Floatables remaining at the water surface are trapped within the screen. The separation screen is hydraulically designed to be self-cleaning and nonblocking. CDS systems are easy to maintain because they have no moving parts and require no power or supporting infrastructure. However, other sediment traps may be more effective in areas where additional storm water pollutants, such as dissolved nutrients, oil and grease, or metals, are prevalent.

**Springhill Regional Stormwater Park Project**

This 3.6-acre stormwater park provides treatment for approximately 7 acres of untreated stormwater runoff from residential areas of the Springhill neighborhood. The retrofit project was completed in 2001. Water quality treatment is provided by wet detention.

**Depot Park Regional Stormwater Park Project**

The Depot Park Regional Stormwater Project is an EPA- and DEP-designated brownfield pilot project. The EPA and the state of Florida awarded grants to determine the feasibility of developing a 38-acre site as a park/wetlands augmented stormwater facility. Conceptually, the stormwater facility will provide quality and flow regulation improvements for 50 to 100 acres of downtown Gainesville. Additionally, there are petroleum plumes migrating in the direction of the proposed basin. It is anticipated that these plumes can be intercepted and directed to the basin for bioremediation. The project includes the cleanup of contaminated soils, construction of the regional stormwater management facilities, installation of a reuse water system for irrigation, and development of the recreational components of the park.

This downtown revitalization project is a $30.2 million project to revitalize the traditional heart of Gainesville by reclaiming a brownfield site and creating an urban park with stormwater management facilities.

*Aerial View of Depot Park Site in 2004*


This project will do the following:

- *Capture and treat stormwater runoff from downtown Gainesville,*
- *Improve the quality of surface and ground water affecting the Floridan aquifer,*
- *Provide recreation amenities for skateboarding, walking, jogging, and biking,*

- *Provide passive recreation and culture, including nature observation and concerts,*
- *Revitalize adjacent, historically minority neighborhoods, and*
- *Preserve and restore the historic Gainesville Train Depot as an activity center.*

The project is located on the southern boundary of downtown Gainesville. Downtown Gainesville is located within the Sweetwater Branch watershed, which covers approximately 3 square miles. Stormwater discharges into Sweetwater Branch, which drains into Payne's Prairie Preserve, a part of the Florida park system and designated an OFW. The branch discharges into a part of the prairie where Alachua Sink, a natural sinkhole located on the northeast boundary of the prairie, directly discharges to the Floridan aquifer, Florida's main drinking water source.

The urbanization of east Gainesville took place prior to implementation of regulations requiring on-site treatment of stormwater. As a consequence, most of the stormwater runoff is discharged from commercial, industrial and residential land use areas directly to the creek without receiving treatment. These stormwater discharges cause significant pollution loads to enter the creek. The SJRWMD nonpoint source-screening model indicates that the stormwater impact to Sweetwater Branch is significant. Water quality within Sweetwater Branch adversely impacts the Payne's Prairie ecosystem and contributes to the degradation of the Floridan aquifer.

Depot Park Phase 1 stormwater pond under construction


The Depot Park concept

The construction of the stormwater facility, now under way, will reduce contaminant levels discharging to Sweetwater Branch, resulting in greater environmental protection of Payne's Prairie State Preserve and the Floridan aquifer. Protection of the Floridan aquifer decreases a known threat to the source of drinking water in the region, helping to protect this essential resource. Stormwater ponds on the site will help sustain downtown redevelopment by providing stormwater treatment for approximately 100 acres of the urban area.

While no official pollutant loading strategy has been completed as yet for these ponds, plans are to reserve the West Pond for retrofit of the largely developed downtown area; this pond will not be available for redevelopment credits. The East Pond will serve as a new and redevelopment credit bank. The system for development stormwater credits is currently being developed. In the future, this park will also serve to provide educational outreach

program opportunities with informational kiosks as an integral part of the setting, providing information about wetlands and stormwater and how they become mutually beneficial in this setting.

# APPENDIX O. COLIFORM CHARACTERISTICS AND ANALYSIS METHODS

Coliform bacteria are commonly divided into two categories based on controlled growth in the laboratory. Total coliform is a large group of bacteria that belong to the family Enterobacteriaceae and includes all aerobic and facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35° C. (APHA, 1998).

The two standard methods for coliform analyses are multiple tube fermentation, where replicate tubes and dilutions are reported in terms of the most probable number (MPN), and the direct plating technique of membrane filtration (MF) (APHA, 1998). In either case, results are reported relative to a 100-mL sample. Results of multiple tube fermentation tests are reported in terms of MPN, which is determined from probability formulas that estimate the average density of coliform bacteria in a sample based on the results of a number of dilutions from a single sample (APHA, 1998). MF results are based on colony counts and are reported relative to the 100-mL sample.

Results from MPN analyses may differ considerably from results derived from MF methodologies for a number of reasons. The two most commonly reported reasons are (1) the multiple tube fermentation media and incubation temperature allow nontarget bacteria from other groups to grow, and (2) the media used in multiple tube fermentation analyses revives stressed or injured organisms that would not be enumerated by MF techniques (Griffin, 2004). Although MF methodologies may result in a lower number of bacteria reported, the results are highly reproducible. Constraints with MF techniques include poor results with turbid water samples and the growth of nontarget bacteria on the growing medium, which results in samples where the number of colonies grown cannot accurately be determined. The presence of large quantities of algal cells can interfere with MF analyses, making MPN methodologies more representative for some natural waters (APHA, 1998).

The Class III Fresh Water State Standards for coliforms reported in coliform forming units (cfu) that applies to Gainesville's urban creeks are as follows:

> *Fecal counts shall not exceed a monthly average of 200 cfu/100 mL, nor exceed 400 cfu/100 mL in 10% of the samples, nor exceed 800 cfu/100 mL on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period (Rule 62-302, F.A.C., DEP, 2002).*
>
> *Total coliform counts shall be ≤1,000 cfu/100 mL as a monthly average; ≤1,000 cfu/100 mL in 20% of the samples examined during any month; ≤ 2,400 at anytime. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period, using either MPN or MF counts (Rule 62-302, F.A.C., DEP, 2002).*

# APPENDIX P. PROPOSAL FOR EVALUATING FECAL COLIFORM BACTERIA "HOT SPOTS" IN THE GAINESVILLE URBAN CREEKS

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**May 1, 2007**

## Introduction

Fecal coliform bacteria, a microbiological indicator of human and warm-blooded animal fecal pollution, continue to be found at elevated levels in our streams. In the Orange Creek Basin (OCB), three streams in urban Gainesville, Hogtown Creek, Tumblin Creek and Sweetwater Branch, are designated by the Florida Department of Environmental Protection (FDEP) as Impaired Waters due to elevated levels of fecal coliform bacteria. Alachua County Environmental Protection Department (ACEPD) continues to monitor ambient, baseflow fecal coliform bacteria levels in the Gainesville urban creeks within the OCB. Fecal coliform levels vary widely in Alachua County's waters under differing hydrologic conditions. Typically, baseflow levels in our streams are one or more orders of magnitude lower than samples collected under stormflow conditions.

Based on the results of ambient fecal coliform monitoring, microbial source tracking (MST), alternative bacteriological monitoring, and optical brighteners analyses, a number of sites warrant further evaluation. There are 10 sites with consistently high levels of fecal coliform bacteria, eight of which have shown a presence of human markers in MST samples. The evidence of human markers is a specific concern, as there may be a continuing source of fecal coliform bacteria from humans, such as failing infrastructure, impacting the creeks. These sources of bacteria may be preventable and must be defined in order to develop strategies to reduce fecal pollution in the creeks.

The FDEP in cooperation with the ACEPD, Alachua County Health Department (ACHD), City of Gainesville Public Works Department (COGPWD), Florida Department of Transportation (FDOT) and Gainesville Regional Utilities (GRU), collectively referred to as "OCB TMDL stakeholders," propose to evaluate and remediate the sources.

## Background

The 10 locations where elevated fecal coliform bacteria persist under baseflow conditions include four areas in the Sweetwater Branch watershed, three areas in the Hogtown Creek watershed and one area in each of the Tumblin Creek, Lake Forest Creek and Little Hatchet Creek watersheds (**Figure P-1** and **Table P-1**). Each of these areas has unique considerations that may require specific techniques to evaluate the areas and determine the best solution for reducing fecal coliform bacteria concentrations.

The work conducted in evaluating the fecal coliform "hot spots" may cover large portions of a given watershed. It is estimated the approximately 30 to 40% of the Hogtown Creek watershed, including Elizabeth Creek and Rattlesnake Branch and excluding Possum Creek), will be evaluated (Tasks 3 and 6). The area of concern for the Possum Creek watershed is in the area of the lower 10% of watershed; the upper 90% will be screened to further identify the area(s) of concern and percentage of the watershed to further evaluate. Approximately 30% of the Tumblin creek watershed will be evaluated (Task 4). An estimated 50% of Sweetwater Branch watershed will be evaluated, including Rosewood Branch (Task 5). The area of concern on Lake Forest Creek includes approximately 15% of the watershed. The area of concern on Little Hatchet creek is downstream of approximately 40% of the watershed; this area will also be refined based on additional baseflow monitoring. All these percentages are estimates and will be refined during GIS mapping the field activities.

## Tasks

The OCB TMDL stakeholders propose a series of tasks to further evaluate elevated fecal coliform bacteria levels and infrastructure in the Gainesville urban creek watersheds. Tasks include:

- *Performing initial confirmatory baseflow fecal coliform sampling;*
- *Assessing existing programs and activities focused on reducing coliforms in the creeks and identifying areas needing improvement;*
- *Mapping infrastructure components into a GIS format within specific study areas;*
- *Conducting coordinated field evaluations of public and private sanitary sewer lines (including connection and laterals), septic systems, and storm sewer lines;*
- *Repairing infrastructure as necessary; and*
- *Performing post evaluative sampling to document water quality improvements.*

**Task 1 – Initial Confirmatory Baseflow Fecal Coliform and MST Sampling** – In addition to quarterly monitoring of fecal coliform bacteria levels in Gainesville's creeks, ACEPD conducts high frequency, short duration intensive sampling during selected weeks in the summer and winter to evaluate trends. The routine baseflow sampling does not allow detailed evaluation of the fecal coliform levels in the vicinity of each of the "hot spots." ACEPD proposes to conduct an initial baseflow sampling event, consisting of sample collection at ~30 sites, with 2-5 sites in proximity to each of the "hot spots" (**Table P-2**). This initial baseflow sampling would include sampling each of the sites daily for three consecutive days, collecting samples for fecal coliform each day, measuring flow once, setting and retrieving samplers for analyses of optical brighteners, and collecting samples for selected MST parameters to verify the presence of human markers. This work is proposed to be conducted in the dry season, April and May 2007, by ACEPD and is currently funded. Upon completion of the sampling efforts, a stakeholders meeting will be held to present the results.

There are two locations, one in each of the Little Hatchet Creek and Lake Forest Creek and watersheds (**Figure P-1**) that warrant further evaluation and assessment for fecal coliform bacteria. These locations are Little Hatchet Creek at Waldo Road and Lake Forest Creek at NE25th Street. At the present time, no human markers have been found as part of the MST work conducted in these areas. It is likely that the levels of fecal coliform at these sites are related to animals (wild and/or domestic) in these areas. Prior to developing plans for evaluating the infrastructure in these two areas additional confirmatory sampling will be conducted. If human markers are found, additional work will be conducted in these locations.

**Task 2 – Assessment of Existing Programs –** The OCB TMDL stakeholders have been working collaboratively for a number of years to address elevated levels of fecal coliform in Gainesville's urban creeks. Past and existing efforts being taken by all the OCB TMDL stakeholders will be reviewed and summarized to provide a point of reference for future studies. The summary will include dates of activities, goal of activities, results of activities, and potential use for future efforts. In addition, an assessment of existing efforts to reduce fecal coliform will be made. Current outreach activities (i.e. pet waste BMPs) related to fecal coliform bacteria in each of "hot spots" will be evaluated. Based on the evaluation of existing outreach programs

and the source(s) of fecal coliform bacteria present, targeted outreach programs may be developed. The assessment will identify data needs and make recommendations for adding new efforts or improving existing efforts. The assessment will include a detailed plan for conducting the pilot study to be completed in Task 3.

**Task 3 - Pilot Study in the Upper Elizabeth Creek Watershed** – In order to develop a protocol for evaluating the fecal coliform "hot spots" a pilot study is proposed for the upper reaches or headwaters of Elizabeth Creek (**Figure P-1**) in the Hogtown Creek watershed. The pilot study will begin with detailed GIS mapping of all infrastructure in the area from available data. Following the mapping, coordinated field evaluations of area private and public sanitary sewer lines (including connection and laterals), septic systems and storm sewer (MS4) lines will be conducted. Work conducted to evaluate the sanitary sewer and MS4 lines will likely consist of techniques such as camera surveys to evaluate line integrity and locate cross connections, dye studies to determine the natural and man-made flow paths, and smoke testing to locate inappropriate connections to the systems. It is proposed that GRU will conduct the evaluation of their wastewater system lines. The ACHD will conduct inspections of vicinity septic systems to determine system functionality, soil characteristics, horizontal setback to creek, and vertical setback to estimated "Season High Water Table" (SHWT). The ACHD will also create a GIS map of the evaluated septic systems. Camera surveys of storm sewer systems (MS4) will be contracted out to a private vendor. COGPWD staff will assist the other entities by providing access to the MS4 for sample collection and camera surveys. Additional fecal coliform and/or MST sampling may be needed to further define source areas. Any failing infrastructure detected through these surveys or by other means will be reported. An evaluation of stream corridor pet and wildlife usage will be conducted, and may include transects through representative areas adjacent to the creek to evaluate those contributions. Public education and outreach support materials will be developed and programs implemented based the results of the sampling and findings of the infrastructure assessment(s). Follow-up baseflow sampling to evaluate fecal coliform levels after repairs are made will be conducted by ACEPD. Upon completion of the pilot study, a stakeholders meeting will be held to present the results, evaluate the field efforts, and make modifications to the approach for addressing other hot-spot areas.

**Task 4– Evaluation of Fecal Coliform in the Tumblin Creek Watershed –** There is one location in the Tumblin Creek watershed that warrants further evaluation and assessment for fecal coliform bacteria. This area extends from the headwaters that exit the MS4 beneath SW 5$^{th}$ Avenue to PK Yonge School on the University of Florida campus. High levels of fecal coliform bacteria have plagued this area, due in part to the highly urbanized character of the watershed. The techniques described in Task 3 (GIS mapping of all infrastructure from available data; field evaluation of area public and private sanitary sewer lines, septic systems and storm sewer lines; and repairing infrastructure) will be used to at each location. The University of Florida Physical Plant and Planning staff will be encourage to participate in this evaluation to assure that the area is completely evaluated. The domestic wastewater system that serves the PK Yonge campus is owned and operated by the University of Florida. In addition to the University involvement, additional efforts are anticipated to involve a number of private wastewater systems within this area. Prior to commencing with this task, a plan will be developed for evaluating private wastewater systems. An evaluation of stream corridor pet and wildlife usage will be conducted, and may include transects through representative areas adjacent to the creek to evaluate those contributions. Public education and outreach support materials will be developed and programs implemented based the results of the sampling and findings of the infrastructure assessment(s). Baseflow fecal coliform monitoring will be conducted by ACEPD as a follow-up to surveys and repairs. Upon completion of the efforts in the Tumblin Creek watershed, a stakeholders meeting will be held to present the results,

evaluate the field efforts, and make modifications to the approach for addressing other hot-spot areas.

**Task 5 – Evaluation of Fecal Coliform in the Sweetwater Branch Watershed –** There are three locations in the Sweetwater Branch watershed that warrant further evaluation and assessment for fecal coliform bacteria. These areas are Sweetwater Branch at NE10 Avenue (extending Sweetwater Branch at SE1st Avenue), Sweetwater Branch at SE 8th Avenue and Rosewood Branch mid-point in the watershed to the confluence with Sweetwater Branch. Some of these areas may be combined for assessment, as are close to one another (i.e. Sweetwater Branch at SE 8th Avenue and Rosewood Branch). The techniques described in Task 3 (GIS mapping of all infrastructure from available data; field evaluation of area public and private sanitary sewer lines, septic systems and storm sewer lines; and repairing infrastructure) will be used to at each location. An evaluation of stream corridor pet and wildlife usage will be conducted, and may include transects through representative areas adjacent to the creek to evaluate those contributions. Public education and outreach support materials will be developed and programs implemented based the results of the sampling and findings of the infrastructure assessment(s). Baseflow fecal coliform monitoring will be conducted by ACEPD as a follow-up to surveys and repairs. Upon completion of the efforts in the Sweetwater Branch watershed, a stakeholders meeting will be held to present the results, evaluate the field efforts, and make modifications to the approach for addressing other hot-spot areas.

**Task 6 – Evaluation of Fecal Coliform at two sites in the Hogtown Creek Watershed** There are three additional locations in the Hogtown Creek watershed (**Figure P-1**) that warrant further evaluation and assessment for fecal coliform bacteria. These areas are Possum Creek from NW 16$^{th}$ Avenue to its confluence with Hogtown Creek, Hogtown Creek from NW 23$^{rd}$ Avenue south and Rattlesnake Branch. These areas are relatively large, and are generally less urbanized than Tumblin Creek and Sweetwater Branch. The techniques described in Task 3 (GIS mapping of all infrastructure from available data; field evaluation of area public and private sanitary sewer lines, septic systems and storm sewer lines; and repair of failing infrastructure) will be used to at each location. It is anticipated that the efforts in the Hogtown Creek watershed with involve evaluating a number of privates systems in the area. Prior to commencing with this task, a plan will be developed for evaluating private wastewater systems. An evaluation of stream corridor pet and wildlife usage will be conducted, and may include transects through representative areas adjacent to the creek to evaluate those contributions. Public education and outreach support materials will be developed and programs implemented based the results of the sampling and findings of the infrastructure assessment(s). Evaluative baseflow fecal coliform monitoring will be conducted by ACEPD as a follow-up to surveys and repairs. Upon completion of the efforts in the Hogtown Creek watershed, a stakeholders meeting will be held to present the results, evaluate the field efforts, and make modifications to the approach for addressing other hot-spot areas.

**Task 7 – Post Survey and Retrofit Confirmatory Baseflow Fecal Coliform and MST Sampling –** ACEPD proposes to conduct a follow-up baseflow sampling event, consisting of sample collection at ~30 sites, 2-5 selected sites in proximity to each “hot spot” (**Table P-2**). The purpose of the sampling is to evaluate water quality improvements as a whole in the entire Gainesville urban area. This confirmatory baseflow sampling would follow the protocols and include all the sites sampled in Task 1. This work is proposed to be conducted in the dry season, November and December 2007 (if work is complete) or April and May 2008 by ACEPD. An evaluation of outreach and public education efforts through a follow-up survey of participation will be conducted for each watershed area evaluated. A summary of outreach programs specific to these watershed areas and the source(s) of fecal coliform bacteria present

will be provided and their successes or failures discussed in the final report (Task 8). Upon completion of the sampling efforts, a stakeholders meeting will be held to present the results.

**Task 8 – Report –** Upon completion of Tasks 1 through 7, a report will be prepared for distribution by FDEP that integrates the results of the tasks. The budget, which has yet to be determined, must allow for a minimum of one round of editing after FDEP and OCB TMDL stakeholder review. Once the report is complete, a final presentation will be made to FDEP and the OCB TMDL stakeholders.

## Deliverables

The deliverable for this project will include a written report that has the following:

- *A summary of the pre- and post-sampling results completed in Tasks 1 and 7;*
- *A summary of the assessment of existing efforts performed under Task 2 literature review and synthesis of previous investigations;*
- *A summary of the pilot study conducted in Task 3 with discussion of investigative methods, surveys and field investigations performed and a detail of all repairs, upgrades, retrofits and remedial measures taken to reduce fecal coliform levels,*
- *Summaries for efforts completed for each hot-spot area conducted in Tasks 4 through Task 6 with details of all repairs, upgrades, retrofits and remedial measures taken to reduce fecal coliform levels.*
- *Recommendations for future activities*

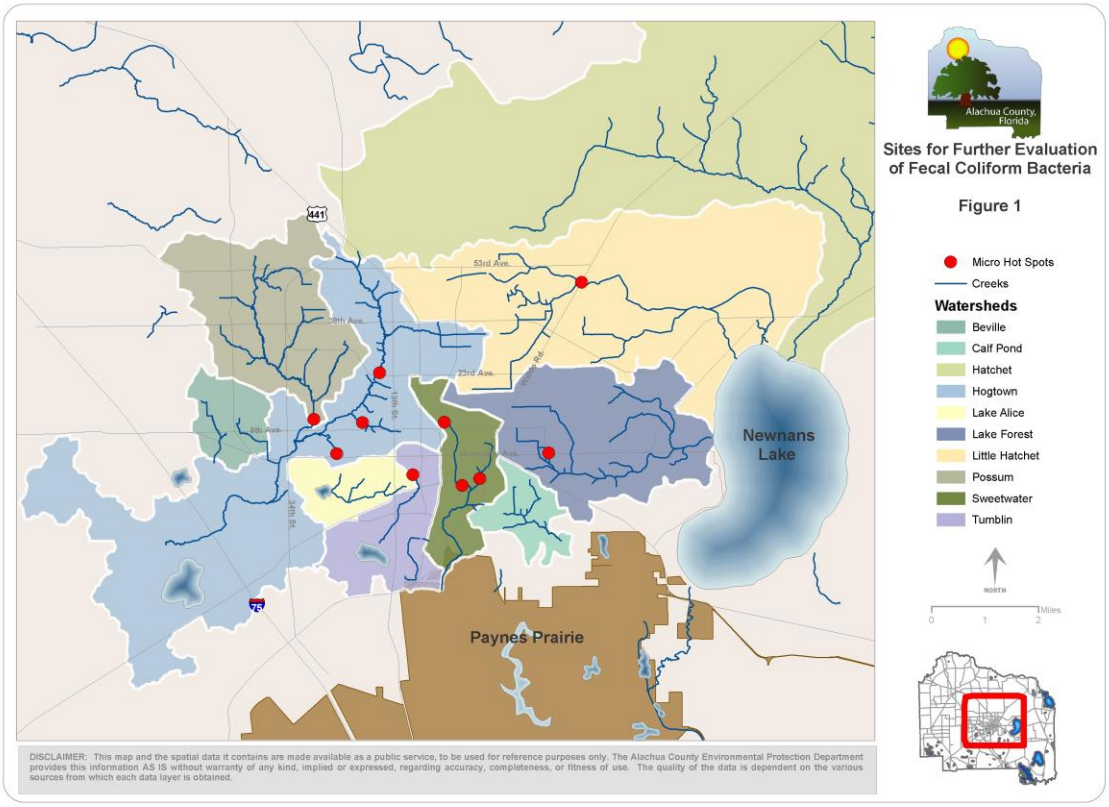
In addition to the report, GIS based maps will be prepared to depict each of the “hot spots” and will detail the infrastructure in those areas. The GIS coverages will be made available to the OCB TMDL stakeholders.

## Timeframe

It is estimated that the project will be conducted in a phased approach, as local government resources are not available to concentrate efforts on all sites at one time. The literature review and synthesis of previous investigations shall be completed and made available for review by July 1, 2007. The results of the pilot study on Elizabeth Creek should be made available to within six to eight weeks of the completion of the work.

A one-year time frame is proposed for project completion, as many of the tasks must be conducted in the dry portions of the year. I think this will take longer, but it will depend on funding and who facilitates the work.

## Figure P-1. Sites for further evaluation of fecal coliform bacteria




## Table P-1. Sites for further evaluation of fecal coliform bacteria

| Watershed | Location | Area |
|---|---|---|
| Hogtown Creek | ELIZNW7DS | Headwaters near University Avenue |
| Hogtown Creek | HOGNW23 | NW 23rd Avenue to 8th NW Avenue |
| Hogtown Creek | POSNW16 | NW 16th Avenue to confluence with Hogtown Creek |
| Hogtown Creek | RATTLESNAKE | Entire creek |
| Sweetwater Branch | SWBNE10 | NE 10th Avenue to SE 1st Avenue |
| Sweetwater Branch | SWBSE8 | SE 8th Avenue |
| Sweetwater Branch | ROSEWOOD | Mid-point in the watershed to confluence with Sweetwater |
| Tumblin Creek | TUMBLIN | SW 5th Avenue to PK Yonge School |
| Little Hatchet Creek | LHTWALDO | Vicinity of Waldo Road |
| Lake Forest Creek | LFCNE25 | NE 25th Street north of University Avenue |

**Table P-2. Selected sites for initial baseflow fecal coliform sampling by watershed**

| Elizabeth Creek | Tumblin Creek | Sweetwater Branch* | Hogtown Creek** | Lake Forest Creek | Little Hatchet Creek |
|---|---|---|---|---|---|
| ELIZ UNIV | TUMPorters | SWB NE 10 AVE | HOG NW 23 | LFC NE 25 | LHAT WALDO |
| ELIZ ARBOR | TUM SW5 | SWBSE1 | HOGCETRIB | (No flow in additional sites) | LHATNB |
| ELIZ NW 23 | TUMSW11 | SWBSE8 ST | HOG GHSN | | |
| ELIZ NW 7 DS | TUM441 | SWBLF | HOGNW23 | | |
| | | SWB 331 | HOGNW8 | | |
| | | ROSE UNIV | RATNW8 | | |
| | | ROSE SE 7 | RAT US HOG | | |
| | | ROSE SE9 | HOG US RAT | | |
| | | | POSNW16 | | |
| | | | POSNW36DR | | |
| | | | POSNW8 | | |

* Includes Rosewood Branch

** Includes Possum Creek and Rattlesnake Branch

# APPENDIX Q. PUBLIC EDUCATION/OUTREACH ACTIVITIES IN THE ORANGE CREEK BASIN

There are numerous public education/outreach activities under way within the Orange Creek Basin. Public education programs in the basin are diverse, with many of the programs related to the requirements of NPDES permits, local ordinances, comprehensive plans, or other planning efforts.

Government public education efforts include activities run by the ACEPD, city of Gainesville, GRU, Marion County, UF–IFAS Florida Yards and Neighborhoods Program, DACS, and ACHD. WAV is a SJRWMD-sponsored citizen volunteer organization that partners with local governments. Private initiatives are run by the Florida Forestry Association and the environmental advocacy organization, Current Problems, Inc., frequently in collaboration with local government.

## Alachua County Environmental Protection Department Public Outreach

1. *ACEPD is partners with the following outreach oriented programs:*
   a. WAV Program. Alachua County cofunds this program with the GCWP and SJRWMD)
   b. GCWP. Alachua County is a funding partner and ACEPD assists the GCWP with some outreach activities contractually and as in-kind service.
   c. Current Problems, Inc.
   d. UF–IFAS Extension

2. *Current ACEPD outreach campaigns:*
   a. Countywide (includes the Orange Creek Basin):
      ***i. Pet Waste –*** *Currently the county is working on a campaign to educate pet owners on the importance of properly disposing of pet waste. The campaign will include a targeted mailing and public relations campaign, installation of dog waste collection stations in select county and city parks, and a study to monitor the success of the campaign. In the Gainesville urban area, this program is a partnership with the GCWP.*

      ***ii. Erosion and Sediment Control –*** *Biannually, the Florida Stormwater, Erosion, and Sedimentation Control Inspector Training certification course is offered. The goal of the program is to increase the proper design, construction, and maintenance of erosion and sediment controls during construction and to ensure the proper long-term operation and maintenance of stormwater systems after construction is completed. A free Advanced Erosion and Sediment Control Workshop is offered annually, in which local regulations and the most successful regional BMPs are reviewed. Included in the workshop are experts in the stormwater field and local vendors to demonstrate their erosion control*

*products. The advanced workshop expands on DEP's Stormwater Inspector Training program.*

***iii. Vegetative Enhancement of Stormwater Ponds –*** *The county partnered with various organizations to conduct four public outreach workshops focused on water quality and the enhancement of stormwater basins. The workshops featured water quality presentations by Dr. Mark Clark and hands-on restoration work. Participants planted over a thousand plants and received packets stocked with outreach materials. The county plans to conduct additional workshops and is working with Dr. Clark to develop educational videos for pond and shoreline restoration.*

***iv. Reducing Nutrient Loading –*** *The ACEPD is promoting the use of enhanced septic systems in targeted areas (impaired waterways, OFW's, and springsheds). We are also discouraging the use of fertilizers and recommending the use of slow-release fertilizers, if fertilizer must be applied. Efforts target new waterfront homeowners by providing information to these residents when they come in for permits to construct new homes or redevelop property.*

*b. Santa Fe River Basin*

***i. Springs Protection-*** *The county increased water quality outreach in the springsheds of the Lower Santa Fe River springs. Alachua County funded the Mill Creek and Lee Sinks Dye Trace Study to further the understanding of the connectivity of water resources in the Alachua/High Springs region. Knowledge of water resources in this area will be expanded upon with a second study titled: "Mill Creek Sink, Mill Creek Cave system and Hornsby Spring Hydrogeologic, Chemical and Biological Systems Evaluation." The study will collect data to establish the present chemical, physical, and biological condition of the springs and all known karst features that directly influence the Floridan aquifer. Additionally, ACEPD helped organize the Spring Summit on September 20, 2006, in which over 100 people gathered to discuss the future of the lower Santa Fe River springs. ACEPD is in the process of securing funds to install Springs Protection signs in the areas surrounding the springs and is an active participant in the Santa Fe Springs Working Group, helping to organize the removal of 18.4 tons of garbage out of an abandoned phosphate pit located along the Alachua/Gilchrist County line. The pit, which is a direct conduit to the Floridian aquifer, will soon be fenced off to prevent future pollution of ground water resources*

***ii. Shoreline Restoration-*** *ACEPD partnered with Alachua County Public Works, Current Problems Inc, North Central Florida YMCA, and UF–IFAS to host three workshops to raise awareness about the need for healthy stream corridors and to foster future restoration efforts around the region. The workshops featured water quality presentations by Dr. Mark Clark and hands-on restoration work. Participants received a folder stocked with outreach materials and planted over 800 trees and shrubs, stabilized eroding banks using natural materials, and created*

*"No mowing" zones to reduce further erosion. Educational signs were installed to explain the restoration strategy to the public.*

3. *The following fact sheets were created and are distributed via the ACEPD website, at special events, through mailings, and are handed out on an as-needed basis:*

   a. BMPs for Painting Contractors and Handymen,
   b. BMPs for Erosion and Sediment Control,
   c. BMPs for Pool Maintenance,
   d. BMPs for Apartment Complex Management,
   e. BMPs for the Food Service Industry,
   f. BMPs for Landscaping and Lawn Services,
   g. Alachua County Water Quality Code and Laundry Services,
   h. BMPs for pressure washing activities,
   i. BMPs for controlling Runoff from Gas Stations,
   j. BMPs for Controlling Runoff from Car wash Fundraisers,
   k. Lets Work Together to Reduce Non-point source Pollution,
   l. BMPs for controlling Runoff during Remediation of Contaminated Sites,
   m. Alachua County Water Quality Code,
   n. Surface Waters and Wetlands Code, and
   o. BMPs for Sinkholes.

4. *The county outreach website (http://www.alachuacounty.us/government/depts/epd) is a great tool and contains outreach materials, reports, maps, presentations, upcoming events, and links to other environmental websites.*

5. *ACEPD funded the filming of the DVD,* Alachua County's Water Resources – Making the Connection, *which demonstrates the connectivity and vulnerability of local water resources.* Alachua Waters *has been screened at local events and on Community 12 Television. DVDs are available for distribution to community groups, teachers, and individuals.*

6. *During the development review process, the following materials will be distributed to new property owners in close proximity to waterbodies:*

   a. BMPs for Basic and Enhanced Septic Tank Systems,
   b. Map of local water resources,
   c. Surface Water and Wetlands Code Fact Sheet,
   d. Alachua County Household Hazardous Waste Collection Center Information Sheet, and
   e. Home Tips for Clean Water brochure.

7. *Presentations on special projects, pollution prevention, local geography and geology, department activities, and general watershed concepts are made to the following:*

   a. School groups,
   b. Civic groups,
   c. Advisory boards, and
   d. Other groups requesting such service.

8. *During special events (art festivals, environmental gatherings, etc.), ACEPD sets up a booth to distribute environmental fact sheets. At least one ACEPD employee remains at the table to discuss the program and any environmental issues with concerned citizens.*

## Watershed Action Volunteers

The WAV Program is active in 14 counties within the SJRWMD's 18-county service area. In Alachua County, the program is a partnership between the district, ACEPD, and GCWP, which is a partnership of the city of Gainesville, Alachua County, and DOT.

The program's main focus is education and outreach to the community regarding water quality and water conservation to encourage better stewardship of water resources. This is done through a volunteer initiative that allows local people to become involved in the process of sharing and teaching about water in a variety of ways, including booths at special events and festivals, classroom programs for Grades K-12, presentations to civic groups and adult programs, workshops, and water quality testing.

The Alachua County WAV Program has a number of resources for educating the public on water quality and conservation. In addition to numerous brochures, and those of its partners, it has an interactive model of a watershed that demonstrates stormwater runoff and pollution, and an aquifer model that demonstrates how water and pollution move underground. WAV also has an entire curriculum of activities for children in Grades K-12.

Activities include the following:

1. *Storm drain marking,*
2. *Water quality monitoring,*
3. *Clean-ups, and*
4. *Outreach to developers and contractors.*

## Florida Yards and Neighborhoods Program

## Alachua County, Institute of Food and Agricultural Sciences

The purpose of the Florida Yards and Neighborhoods (FYN) Program is to educate and help homeowners, builders, and developers to conserve energy and water, minimize fertilizer and pesticide use, and decrease nonpoint source pollution originating in home landscapes. This is achieved by educating them to the FYN principles and helping them to adopt those practices.

### *Current Situation*

There are over 81,000 single family homes in Alachua County. Current trends show a 10% increase in family homes in the last decade. Homeowners have many misconceptions about proper landscape management, care, and maintenance. They often do not realize that they are wasting water, fertilizer, and pesticides by poor management practices and landscape design. Further, they are not aware that poor

management practices can contribute to the degradation of the environment through runoff and the leaching of fertilizers and pesticides.

Homeowners are often unaware of water conservation, integrated pest management, yard waste recycling, and other environmental landscape management practices that can be used in their landscapes and gardens. Poorly maintained landscape can reduce property values 15%, and contribute to stormwater runoff and nonpoint source pollution.

### *Major annual program objectives*

Fifteen percent of Alachua County homeowners will become aware of the FYN Program, and 600 homeowners will implement FYN practices.

### *Annual objectives:*

*a. FYN workshop participants (75%) will increase their knowledge in 4 of the 9 FYN principles. 50% will implement practice changes of 2 principles such as water efficiency, proper plant selection, stormwater runoff reduction, and integrated pest management. Knowledge gained will be measured by a survey given at the end of the workshop. Behavior change will be measured by a follow-up survey.*

*b. Homeowners (75%) participating in Waterwise workshops will learn and adopt recommend practices for efficient irrigation, water conservation, and stormwater run off. They will further understand how their landscaping practices impact the local creeks, Floridan aquifer, and drinking water. Practice adoption will be evaluated by a postclass survey.*

*c. Homeowners (2000) will become aware of FYN principles and practices by means of exhibits and demonstration gardens. These demonstrations and exhibits will raise awareness of FYN practices and increase the knowledge of environmentally sound landscape practices that decrease water and fertilizer usage, and reduce stormwater runoff and nonpoint source pollution..*

*g. Participants (75%) attending the beneficial insect program will be able to identify 7 beneficial insects in the home landscape. They will adopt FYN practices to encourage beneficial insects in their landscape, and not to blanket spray insecticide. Practice adoption will be evaluated by post class survey.*

*h. Participants (95%) that attend the Landscaping for Newcomers program will learn about the growing conditions in Alachua County. Seventy five percent will adopt current 4 FYN principles or landscape BMPS to effectively care for their home landscapes. Practice adoption will be evaluated by post class survey.*

*i. Homeowners (75%) participating in the entire Great Gainesville Gardening (6 classes) will adopt practice changes in the areas of: Turf care, appropriate plant selection.*

### *FYN Educational Activities for 2006*

FYN implemented and completed the following projects in 2006:

- *Waterwise seminars were given in conjunction with WAV (2).*
- *FYN seminar on Creating and Maintaining a Florida Friendly Yard (6) was attended by over 350 Alachua County residents. FYN handbooks, plant lists, and www.floridayards.org information were distributed to all attendees.*
- *FYN seminar to introduce appropriate plant selection and lessen the adverse environmental impact of landscape and garden (6) was attended by 300 Alachua County residents and 37 landscape maintenance professionals. FYN handbooks, plant lists, and www.floridayards.org information were distributed to all attendees.*
- *FYN exhibits (7) were held in public places—i.e., local libraries, Home Depot, Kanapaha Botanical Garden, Morningside Nature Center, Gainesville Home Show, Paynes Prairie.*
- *Seminar on maintaining turf grass following BMPs to reduce pollution (2) was attended by 50 homeowners and 50 landscape professionals. FYN handbooks, plant lists, and www.floridayards.org information were distributed to all attendees.*
- *FYN demonstration gardens were maintained at Westside Park in Gainesville and City Hall in High Springs.*
- *Newsletter mailing to 2,500 residents highlighted FYN's practice adoption and successes.*
- *Consultation was held with 3 area builders/developers on creating Florida Friendly workshops for new neighborhoods. Two new developments were built in 2006 with FYN-certified yards. Seminars were planned with new homeowners for 2007.*

## University of Florida

1. *Volunteer monitoring through Wetland Club.*
2. *Erosion issues on campus, led to new stormwater management.*
3. *Target audience is students on campus. Primary issues are student pet ownership and parking. BMP practices part of parking permit.*
4. *Dorm programs*
5. *Campus landscape management.*
6. *Reclaimed water for irrigation.*

## Marion County Programs

Public outreach and education for water resource issues are led by three departments or programs in Marion County: the Clean Water Program, the Utilities Department, and the Planning Department.

The Clean Water Program was initiated in 2002 to address compliance with the county NPDES Phase II MS4 permit, and to perform routine maintenance of the county's stormwater management system. The program is also tasked with representing the county in the TMDL basin working groups.

The Utilities Department focuses much of its outreach in the water conservation area, and sponsors the SJRWMD WAV Program to facilitate this outreach.

The Planning Department's Water Resource Manager is tasked with looking at short-term and long-term issues that could affect water resources in the county and assisting in various initiatives associated with these issues.

All of these departments participate on the Water Resource Committee, which serves to coordinate efforts in advancing the county's priorities for managing and protecting local water resources.

### *Marion County Public Education and Outreach*

The Clean Water Program works to educate residents through multiple initiatives, including presentations to civic and homeowner groups, participation in festivals and events, use of mass media, distribution of printed materials promoting water resource preservation and protection, and partnerships. The program partners with many agencies, including SJRWMD, SWFWMD, DEP, UF–IFAS Extension Service, State and County Parks, and other Marion County departments.

Current major outreach projects include kickoff of the Springs Protection Program and the ongoing Clean Farms Initiative.

### *Springs Protection*

With three springs of first magnitude and five of second magnitude in Marion County, springs are important to the county's water quality and quality of life.

The Clean Water Program is a major sponsor of the annual Marion County Springs Festival, an annual event designed to entertain and educate adults and children about the importance of springs as a water resource, economic benefit, and asset to quality of life. A walk-in model of a sinkhole is a popular feature of the program's display at the festival and at other events. The model helps to educate residents about the link between sinkholes and the Floridan aquifer. As part of the Springs Festival, the program sponsors an annual art contest for schoolchildren. Selected artwork is produced in the annual calendar focusing on water resources in Marion County.

Water quality in the springs in promoted via two billboards, which rotate throughout the county. New designs for the billboards in 2007 promote appropriate fertilizer use and septic system maintenance. To extend the value of the outdoor promotion, a radio campaign to promote appropriate fertilizer use and septic system maintenance is planned for 2007.

Springs protection zone signage has been designed and will be fabricated and installed in both the Rainbow and Silver springsheds.

A brochure promoting the importance of maintaining septic systems will be designed and mailed to approximately 75,000 households in the Rainbow and Silver Springs Protection Zones.

A springs protection presentation is available for civic and homeowner groups; these groups will be solicited for speaking opportunities.

### *Clean Farms Initiative*

The Clean Farms Initiative promotes BMPs for animal waste and nutrient management on agricultural lands. The initiative, begun by passage of Resolution 04-R-384 by the Marion County Board of County Commissioners, recognizes the importance of agriculture to the county's history and economy, while also recognizing the need to protect water resources. As part of the initiative, more than 7,500 surveys and brochures were mailed in October 2006 to owners of agricultural land, ranging from large operations of several hundred acres to small tracts of land with fewer than a dozen animals. The survey measures current manure management and fertilization practices. Results of the survey, and input from focus groups planned for the first quarter of 2007, will be used to direct the initiative's next step aimed at protecting and preserving water resources.

### *Other Outreach*

The Clean Water Program has developed a variety of print materials, which are distributed at programs and events, including the following:

1. *Annual Calendar (which includes monthly Clean Water Tips),*
2. *Clean Water Program Brochure,*
3. *Construction Entrance & Silt Fence Brochure (for developers, engineers, and contractors),*
4. *Clean Farms Initiative Brochure,*
5. *Clean Water Tips: Retention Ponds,*
6. *Clean Water Tips: Car Washing,*
7. *Clean Water Tips: Septic Systems,*
8. *Clean Water Tips: Home Water Conservation, and*
9. Water: From Here to Eternity and Back Again, *a 16-page tabloid newspaper section for upper elementary and middle school children.*

Print materials in the pipeline include Clean Water Tip Sheets for Lake Bryant and Lake Weir TMDLs, Used Motor Oil Disposition, Lakefront Guide for Homeowners, and Waterwise Landscaping, as well as laminated BMP cards for landscape companies and lawn services.

The program also distributes a variety of high-quality print collateral produced by SWFWMD and SJRWMD, both of which cover a portion of Marion County in their program area.

The county and city of Ocala sponsor the SJRWMD's WAV Program in Marion County. The Marion County WAV coordinator works with volunteers to educate the community about water quality and water conservation. This is done in a variety of ways, including displays at special events, classroom programs for Grades K-12, presentations to civic groups and adult programs, workshops, and water quality testing.

### *Training and Seminars*

Twice annually, the Clean Water Program teaches DEP's Stormwater, Erosion, and Sedimentation Control Inspector Training certification course. The goal of the course is to increase the proper design, construction, and maintenance of erosion and sediment controls during construction.

Plans are in the works for a Low Impact Development seminar for developers, engineers and construction industry professionals to be held in April 2007.

## Gainesville Clean Water Partnership

The GCWP is a collaborative effort to meet requirements of the Clean Water Act between the city of Gainesville, Alachua County, and DOT. The primary focus of this effort is water pollution prevention in the Gainesville Urban Area.

### *Public Education and Outreach Activities*

Since 2001, the GCWP has promoted pollution prevention through its own materials and has also contracted with several organizations to assist in their efforts. A brief description of the activities associated with each program is listed below. For a more detailed description, visit the websites given. Information about specific activities performed by these programs are contained in the agencies' respective NPDES MS4 permits and annual reports located at www.gainesvillecreeks.org, or in the MS4 permit summaries.

### *Watershed Action Volunteers Program*

The WAV Program is overseen by the SJRWMD. In Alachua County, the program is locally administered by the city of Gainesville and the ACEPD. For a description of the program, see the full summary below, or visit http://www.alachuacounty.us/government/depts/epd/natural/waterquality/wavinfo.aspx or http://sjr.state.fl.us/education/wav/about.html.

### *Current Problems, Inc.*

Current Problems, Inc. (CP) is a nongovernmental organization focused on the connection between surface waters, pollution, and the drinking water supply, and on cleaning up local waterways. The organization is employed by the city of Gainesville and the ACEPD to assist in involving county residents in pollution prevention through community outreach, creek, pond and sinkhole cleanups, and shoreline restoration programs. These programs encourage and assist residents to better protect local waterways by providing tools to change landscaping, lifestyle, and living habits. For more information, visit http://www.currentproblems.org/.

### *Elvis Otter Program*

In 2003, the GCWP worked with talented local puppeteer Nancy Kenton to develop an elementary level puppet show that would help to educate children about stormwater.

Nancy Kenton Puppet Productions (NKPP) created *Elvis Otter & The Creekside Gang,* a 40-minute program aimed at elementary school age students to take place in an intimate classroom or small auditorium setting, for the GCWP. The purpose of the program is to teach elementary school age students about pollution prevention. Topics include, but are not limited to, watersheds, creeks, creek crossings, ditches and storm drains, littering, pets, pollution, lawns and gardens, trees and plants, leaves, ground water/aquifer, and sinkholes. The students learn the connection between the storm drain system and waterways of Alachua County, how water pollution occurs, what they can do to help prevent it, and what they can do to help Elvis and friends stay alive and safe. Nancy and Elvis filmed 4 commercials for the GCWP addressing trash, pet waste, yard chemicals/ wastes, and auto fluids. These commercials air on the local Alachua County/city of Gainesville cable station Channel 12. After two successful program years performing the program in 44 Alachua County schools each year, Ms. Kenton has relocated to Virginia. The GCWP is working to record the performance to be shown on Channel 12 to keep Elvis's important message in the public conscience. For more information, visit http://www.gainesvillecreeks.org/get_involved/elvis1.htm.

### *Additional GCWP Outreach Activities*

In 2004, the NPDES Partners developed and released a new logo and a more descriptive public name—the GCWP. The GCWP makes additional public outreach efforts to work with the Gainesville community for healthy waterways. Through involvement in various public information campaigns, annual festivals, special events like "Creeks Summit" of 2002 and 2004 and "Creeks Week" of 2006, and partnerships with other Gainesville organizations and businesses, the GCWP strives to acquaint Gainesville and Alachua County residents with the issues involved in caring for and protecting local waterways and recognizing the contributions that these waterways make every day to the community's health, safety, comfort, and quality of life. Residents can find information about these activities and programs by visiting the GCWP's website at www.gainesvillecreeks.org. The site describes the interdependent creeks, watersheds, and wetlands in Gainesville, Florida. Visitors to the site can learn how the Gainesville community cares for water through stormwater management, and learn what they can do to help keep local waterways healthy.

### *Illicit Discharge Detection and Elimination Activities*

The GCWP has employed the ACEPD to implement the illicit discharge detection and elimination program to satisfy NPDES Phase II MS4 permit requirements of Alachua County, city of Gainesville, and DOT. The program strives to reduce coliform, nutrient, and other pollutant loads in local waters. Elements of the program include the following:

#### Best Management Practices Program

The ACEPD and GCWP develop pollution prevention BMPs for governmental and business activities and distribute fact sheets. ACEPD staff provides compliance assistance information and distribute BMP fact sheets as part of the facility inspection and complaint and spill investigation programs (see below). BMPs and fact sheets developed and distributed to relevant parties to date include the following (pollutants addressed in each fact sheet/bmp are in parentheses):

- *Water Quality Code (nutrients and coliform),*

- *Erosion and Sedimentation Control at Construction Sites (sediments),*
- *Controlling Runoff from Car Wash Fundraisers (nutrients),*
- *Controlling Runoff from Gas Stations (nutrients, other various pollutants),*
- *Controlling Runoff from Commercial Outdoor Car Washing (nutrients),*
- *Water Quality Protection at Apartment Complexes (nutrients and coliform),*
- *Landscaping & Lawn Maintenance Services (nutrients),*
- *Controlling Runoff during the Remediation of Contaminated Sites (various pollutants),*
- *Managing Pet Wastes (coliform),*
- *Residential Swimming Pool Maintenance (sediments, various pollutants),*
- *Pressure Washing Activities (sediments, various pollutants),*
- *Laundry Services (nutrients, other various pollutants),*
- *Food Service Industry (grease, other various pollutants), and*
- *Paint contractor (various pollutants).*

For an updated listing of BMPs and fact sheets, visit www.gainesvillecreeks.org.

**Water Quality Code Complaint and Spill Response Program**

On August 27, 2002, Alachua County adopted the Water Quality Code. The Water Quality Code provided the regulatory framework for the implementation of the illicit discharge detection and elimination program in Alachua County. Specifically, Section 77.10 contains regulations regarding prohibitions on nonstormwater discharges into the MS4 system. The Water Quality Code became effective on January 1, 2003. ACEPD expanded its existing complaint and spill investigation program to include compliance with the requirements of Section 77.10 of the Alachua County Water Quality Code. In addition to the complaints received via phone and email, ACEPD staff are also part of the Alachua County notification system that provides 24-hour-a-day response to spills in the county.

**Facility Inspection Program**

To improve pollution prevention, the ACEPD expanded its existing Hazardous Materials Management Code (HMMC) and Small Quantity Generator (SQG) inspection program to include compliance with the requirements of Section 77.10 of the Alachua County Water Quality Code. The expanded inspection program includes the visual inspection of storm drains and stormwater management system in the vicinity of each facility, the visual inspection of floor drains inside the facility, and when necessary, the collection of water quality samples.

## *Construction Pollution Prevention Activities*

The GCWP has been active in the construction community since the initiation of the respective agencies' NPDES permits. In 2003–04, it took part in seven erosion and sediment control related training sessions. During 2004–05, it sponsored one erosion

and sedimentation control class for utilities and took part in another E&S control training class at the Treeo Center. For the 2005–06 permit period, two erosion control–related courses were held for local construction companies. In addition to courses, the ACEPD's Illicit Discharge Detection and Elimination Program, the city of Gainesville's Stormwater Construction Program, and the SJRWMD have all been active in educating the construction community on a daily basis. Through inspections, education, and enforcement, members of the GCWP are working together to make the local building community aware of pollution issues associated with construction.

### *Municipal Good Housekeeping Activities*

In 2003, good housekeeping BMPs were determined for Alachua County and City of Gainesville. The GCWP is working on a BMP manual for use by city and county staff in municipal activities that will include and expand on these BMPs. Since 2003, divisions have been following and reporting on the following BMPs:

**City of Gainesville Fleet Management Department BMPs**
Fleet Management Facilities Maintenance
Car Wash Facilities Maintenance
Materials Management

**City of Gainesville Public Works Department, Engineering Division BMPs**
Pre-Construction Meetings

**City of Gainesville Public Works Department, Operations Division BMPs**
Public Works Center Maintenance
Water Quality Treatment
Materials Management
Materials Inventory
Materials Protection
Small Engine Maintenance
Vehicle Rinsing
Hazardous Materials Storage
Spill Response and Prevention
Illegal Dumping Control
Mosquito Control
Mechanical Open Water Course Maintenance
Integrated Management Open Water Course Maintenance
Street Cleaning
Roadway and Bridge Maintenance
Stormwater System Cleaning
Catch Basin Cleaning
Sediment Trap Cleaning
Stormwater Pond Cleaning
Employee Training

**City of Gainesville Recreation and Parks Department BMPs**
Dog Parks

**Alachua County Public Works Department, Engineering Division BMPs**
Pre-Construction Meetings

**Alachua County Public Works Department, Operations Division BMPs**
Fleet Management Facilities Maintenance
Public Works Center Maintenance
Materials Management
Materials Inventory
Small Engine Maintenance
Spill Response and Prevention
Street Cleaning
Stormwater System Cleaning
Stormwater Pond Cleaning
Employee Training

**Alachua County Public Works Department, Parks Division BMPs**
Dog Parks

## Florida Forestry Industry

The Florida Forestry Association (FFA) is a trade association representing public and private landowners dedicated to preserving Florida's forest industry. The association is involved in several initiatives, as follows:

- Florida's Disappearing Forests, *now airing on the state's public broadcasting stations, shows Florida's top agribusiness industry in a positive light, despite a shrinking land base. From tree planting and land management to the manufacturing of many useful forest products, it is one of the best snapshots of the forest business ever produced. Throughout 2005 and into 2006, the FFA worked with Florida landowners, loggers, and mill personnel to help the Florida Channel to produce the show. A major theme that runs throughout the story is the danger that forestry faces from the state's escalating land development pressure. The main focus is that, without a healthy forest industry, Florida's forestlands will be converted to other uses—a message that the FFA has been working hard to spread. Florida's Disappearing Forests was featured at the 2006 Annual Meeting, and copies were made available on DVD for members to distribute to schools or to use in other venues to help others better understand the business.*
- *A mix of Florida's agribusiness industry met with the seven editors of Florida Trend magazine in February to provide story ideas on the changing face of agriculture in Florida. Representing forestry was Denice Higman, a Madison County landowner. During the visit, Higman provided insight into Florida's forest industry, including emerging technologies and trends. She also shared her experiences as a landowner, the financial returns she enjoys from her investment, and the recreational and aesthetic benefits. According to Higman, the visit went very well and the magazine plans to run a cover story featuring Florida agriculture at a later date.*
- *Again in February the FFA was a partner in the Florida Forest Discovery Center at the State Fair in Tampa. The center welcomed over 35,600 guests during its 10-day run. The FFA hosts a* Goods from the Woods *exhibit that showcases some of the 5,000 products made from wood and*

*wood byproducts. The Discovery Center space will double in 2007 with exciting new exhibits.*

- *A feature story written by the FFA featuring reforestation issues and FFA member Johnny Mack Brown was published in the Perry News-Herald on March 17. The story showed the side of forestry that does not get as much attention—the thousands of acres of forestland that are replanted each year.*
- *Following March's Master Logger class, the FFA sent out news releases to each of the participants' home newspapers. The Chiefland Citizen ran a story on 3 of its loggers who attended the class. The releases emphasized the program's focus on sustainability and responsible logging practices.*
- *The FFA is again involved in organizing, running, and recruiting for the Florida Forestry Teachers' Tour, an annual tour in the Fernandina Beach area. The tour gives teachers from across the state the opportunity to see sustainable forestry practices firsthand--from the planting to the growing processes, to the mills, and finally to the end products. Tour stops include a research forest, a privately owned forest, a paper mill, a saw mill, and a chemical lab that manufactures fragrances from tree byproducts.*
- *FFA's* Trees Make Life Better *outdoor advertising campaign was extended through summer 2006. Eight billboards showing the benefits of forestry in Florida appeared throughout the state, in locations such as Lakeland, Miami, Pensacola, Tampa, Daytona, Ft. Myers, and Tallahassee.*

## Current Problems, Inc

Current Problems is a 501(c)(3) nonprofit organization working in north central Florida whose mission is to preserve and protect North Florida's water resources for the use and enjoyment of humans and wildlife through action, education, and awareness. Programs focus on waterway trash removal, shoreline revegetation, and stormwater pond vegetative enhancement. The organization offers occasional education programs, and reports environmental violations that come to its attention, so that people can continue to live in peace with their neighbors. Current Problems is a member of the Ichetucknee Springs Working Group, the Santa Fe Springs Working Group, and the Suwannee River Partnership Steering Committee. The focus of the group is conducting and promoting stewardship, rather than mediating the political process. Other interests include low-impact development practices, endocrine disruptors, and nutrient level reduction.

Current Problems has partnered with the ACEPD and UF–IFAS Extension Wetlands & Water Quality in several projects involving shoreline restoration and stormwater pond vegetative enhancement; with the Santa Fe Springs Working Group and Florida Wildlife Federation in conducting an abandoned phosphate pit cleanup; and with the GCWP in stormwater pond workshops within the city and with numerous creek cleanups.

At every opportunity it adopts out segments of waterways for litter maintenance, asking groups to conduct two cleanups yearly. Current Problems will also assist interested property owners wanting to revegetate their shorelines along streams and lakes, and is seeking funding with which to provide interested parties appropriate native starter plants for their buffer projects.

Currently in its infancy, Plant A Pond is now being implemented in an effort to improve the water quality of stormwater, and as a result, surface and ground water. In addition, planted ponds improve wildlife habitat and ecological diversity. Ponds have been planted; workshops have been conducted in partnership with ACEPD, GCWP, and UF–IFAS; and now the organization will recruit neighborhoods and interested individuals to adopt their ponds and take the opportunity of assuming responsibility for enhancing and maintaining their ponds. Adopting groups will receive appropriate native starter plants with which to begin their pond planting effort. Every pond adopted will contribute to the welfare of the entire community as well as the immediate neighborhood. This program is funded by Alachua County.

Relevant educational materials include or will include the following:

- Ribbons of Life—*a booklet produced for ACEPD about the value of buffer zones of vegetation,*
- Living On the Waterfront—*a simple, single-panel flyer of BMPs developed with the waterfront property owner in mind; the connection between humans' daily activities is the focus of this flyer; developed in partnership with UF–IFAS Extension Wetlands and Water Quality,*
- *A shoreline living guide—also a joint effort of Current Problems and UF–IFAS, an as-yet-untitled booklet that is an expanded version of the flyer discussed above,*
- *An informational CD that includes many useful materials regarding shoreline restoration and preservation, benefits of shoreline vegetation of all types, and waterside lifestyle activity, geared toward the waterfront property owner,*
- *Various informational sheets regarding shoreline life and shoreline vegetation, and*
- Plant A Pond Manual—*a guide for groups adopting stormwater ponds through the Plant A Pond program.*

## Alachua County Health Department

The ACHD regularly makes presentations on the function, performance, and maintenance of OSTDSs at the University of Florida, EPAC, and APHA.

The ACHD also makes presentations at various community meetings throughout the county when OSTDS are of concern.

The ACHD continuously educates citizens on the function, performance, and maintenance of OSTDS verbally while on-site during the permitting process and through a variety of brochures that are included with permits or are available at its office. These brochures include *Septic Tank Systems, Tips for a Safer Septic System, Homebuyer's Guide to Septic Systems, Commercial Wastewater Onsite Systems, and Onsite Sewage Research Program*, all published by the Florida Department of Health, and *The Magic Box,* published by the Florida Septic Tank Association, Inc.

# APPENDIX R. STATEMENTS OF COMMITMENT FROM BWG MEMBERS

Pending

# APPENDIX S. GLOSSARY OF TERMS

**303(d) list:** The list of Florida's waterbodies that do not meet or are not expected to meet applicable water quality standards with technology-based controls alone.

**Atmospheric deposition:** Pollutants, from a variety of sources, which settle out of air by gravity or are deposited onto land or into lakes, rivers and other bodies of water by wind and rain.

**Background**: The condition of waters in the absence of man-induced alterations.

**Baffle box:** An underground stormwater management device that uses barriers (or baffles) to slow the flow of untreated stormwater, allowing particulates to settle out in the box before the stormwater is released into the environment.

**Baseline period:** A period of time used as a basis for later comparison.

**Baseline loading:** The quantity of pollutants in a waterbody, used as a basis for later comparison.

**Basin Management Action Plan (BMAP):** The document that describes how a specific TMDL will be implemented; the plan describes the specific load and wasteload allocations as well as the stakeholder efforts that will be undertaken to achieve an adopted TMDL.

**Best management practices (BMPs):** Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

**Biochemical oxygen demand (BOD):** The amount of dissolved oxygen utilized by aquatic microorganisms.[5]

**Biomass:** The total living biological material in a given area.

**Continuous deflective separation (CDS) unit:** A patented stormwater management device which uses the available energy of the storm flow to create a vortex to cause a separation of solids from fluids. Pollutants are captured inside the separation chamber while the water passes out through the separation screen.

**Designated use:** Uses specified in water quality standards for each waterbody or segment (such as drinking water, swimmable, fishable).

[5] Microorganisms such as bacteria are responsible for decomposing organic waste. When organic matter such as dead plants, leaves, grass clippings, manure, sewage, or even food waste is present in a water supply, the bacteria will begin the process of breaking down this waste. When this happens, much of the available DO is consumed by aerobic bacteria, robbing other aquatic organisms of the oxygen they need to live. BOD is a measure of the oxygen used by microorganisms to decompose this waste. If there is a large quantity of organic waste in the water supply, there will also be a lot of bacteria present working to decompose this waste. In this case, the demand for oxygen will be high (due to all the bacteria), consequently the BOD level will be high. As the waste is consumed or dispersed through the water, BOD levels will begin to decline.
Nitrates and phosphates in a body of water can contribute to high BOD levels. Nitrates and phosphates are plant nutrients and can cause plant life and algae to grow quickly. When plants grow quickly, they also die quickly. This contributes to the organic waste in the water, which is then decomposed by bacteria. This results in a high BOD level. When BOD levels are high, DO levels decrease, because the oxygen that is available in the water is being consumed by the bacteria. Since less DO is available in the water, fish and other aquatic organisms may not survive.

**Detention pond:** A stormwater system that delays the downstream progress of stormwater runoff in a controlled manner, typically by using temporary storage areas and a metered outlet device.

**Development of regional impact (DRI):** A large development (such as a regional transportation facility, shopping center, commercial building, large subdivision, etc.) which generates effects that cross political jurisdictional lines.

**Dissolved oxygen (DO):** The amount of oxygen gas dissolved in a given volume of water at a particular temperature and pressure, often expressed as a concentration in parts of oxygen per million parts of water.

**Effluent:** Wastewater that flows into a receiving stream by way of a domestic or industrial discharge point.

**Event mean concentration (EMC):** The flow-weighted mean concentration of an urban runoff pollutant measured during a storm event.

**Exfiltration:** Loss of water from a drainage system as the result of percolation or absorption into the surrounding soil.

**External loading:** Pollutants originating from outside of a waterbody that contribute to the pollutant load of the waterbody.

**Flocculent:** A liquid which contains loosely aggregated, suspended particles.

**Impairment:** The condition of a waterbody that does not achieve water quality standards (designated use) due to pollutants or an unknown cause.

**Karst:** An area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns.

**Land development regulations (LDRs):** Ordinances enacted by governing bodies for the regulation of any aspect of development and includes any local government zoning, rezoning, subdivision, land assembly or adjustment of platted or subdivided lands, building construction, or sign regulations or any other regulations controlling the development of land.

**Loading:** The total quantity of pollutants in stormwater runoff which contributes to the water quality.

**Load allocations:** The portions of a receiving water's loading capacity that are allocated to one of its existing or future nonpoint sources of pollution.

**Macrophyte:** Rooted and floating aquatic plants that are large enough to be perceived or examined by the unaided eye.

**Margin of safety (MOS):** An explicit or implicit assumption used in the calculation of a TMDL that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. An explicit MOS is typically a percentage of the assimilative capacity or some other specific amount of pollutant loading (e.g., the loading from an out-of-state source). Most DEP-adopted TMDLs include an implicit MOS based on the fact that the predictive model runs incorporate a variety of conservative assumptions (they examine worst-case ambient flow conditions, worst-case temperature, and assume that all permitted point sources discharge at their maximum permittable amount).

**National Pollutant Discharge Elimination System (NPDES):** The permitting process by which technology-based and water quality–based controls are implemented.

**Nonpoint source (NPS):** Diffuse runoff without a single point of origin that flows over the surface of the ground by stormwater and is then introduced to surface or ground water. NPSs include atmospheric deposition and runoff or leaching from agricultural lands, urban areas, unvegetated lands, on-site sewage treatment and disposal systems, and construction sites.

**Outfall:** The place where a sewer, drain, or stream discharges.

**Particulate:** A minute separate particle, as of a granular substance or powder.

**Pollutant Load Reduction Goals (PLRGs):** PLRGs are defined as estimated numeric reductions in pollutant loadings needed to preserve or restore designated uses of receiving bodies of water and maintain water quality consistent with applicable state water quality standards. PLRGs are developed by the water management districts.

**Point Source:** An identifiable and confined discharge point for one or more water pollutants, such as a pipe, channel, vessel, or ditch.

**Pollutant**: Generally any substance, such as a chemical or waste product, introduced into the environment that adversely affects the usefulness of a resource.

**Pollution**: An undesirable change in the physical, chemical, or biological characteristics of air, water, soil, or food that can adversely affect the health, survival, or activities of humans or other living organisms.

**Polycyclic aromatic hydrocarbons (PAHs):** Hydrocarbon compounds with multiple benzene rings. PAHs are typical components of asphalts, fuels, oils, and greases.

**Removal efficiency:** A description of how much of a given substance (metals, sediment, etc.) has been extracted from another substance.

**Retention pond:** A stormwater management structure whose primary purpose is to permanently store a given volume of Storm Water runoff, releasing it by infiltration and /or evaporation.

**Reuse:** The deliberate application of reclaimed water for a beneficial purpose. Criteria used to classify projects as “reuse” or “effluent disposal” are contained in Section 62-610.810, F.A.C.

**Rough fish:** A fish that is neither a sport fish nor an important food fish.

**Runoff curve:** A calculated number representing the percentage of rainfall which becomes runoff for a given area.

**Quality assurance (QA):** An integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, product, or service meets defined standards of quality.

**Quality control (QC):** The overall system of technical activities that measures the attributes and performance of a process, product, or service against defined standards to verify that they meet the established data quality objectives.

**Septic tank:** A watertight receptacle constructed to promote separation of solid and liquid components of wastewater, to provide limited digestion of organic matter, to store solids, and to allow clarified liquid to discharge for further treatment and disposal in a soil absorption system.

**Silviculture:** The science of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values of landowners and society on a sustainable basis.

**Springs protection zones:** A geographical area around a spring, in which land use and activities are limited, in order to reduce the pollutant load to the spring.

**STORET**: The U.S. Environmental Protection Agency STOrage and RETrieval database, used nationally for water quality data storage.

**Stormwater:** Water that results from a rainfall event.

**Stormwater runoff:** The portion of rainfall which hits the ground and is not evaporated, percolated or transpired into vegetation, but rather flows over the ground surface seeking a receiving water body.

**Submersed:** Growing or remaining under water.

**Sub-basin:** Hydrologic units within a watershed that function as a mini-watershed, the boundaries of which are defined by topography and drainage patterns.

**Surface Water Improvement and Management (SWIM) Waterbody:** A waterbody designated by statute or by a water management district for priority management to restore and maintain water quality, habitat, and other natural features of the waterbody.

**Total Maximum Daily Loads (TMDLs):** The sum of the individual wasteload allocations for point sources and the load allocations for nonpoint sources and natural background. Prior to determining individual wasteload allocations and load allocations, the maximum amount of a pollutant that a waterbody or waterbody segment can assimilate from all sources while still maintaining its designated use must first be calculated. TMDLs are based on the relationship between pollutants and in-stream water quality conditions.

**Total nitrogen (TN):** TN is the combined measurement of nitrogen in nitrate ($NO_3$), nitrite ($NO_2$), ammonia, and organic compounds found in water. Nitrogen compounds function as important nutrients to many aquatic organisms and are essential to the chemical processes that occur between land, air, and water. The most readily bio-available forms of nitrogen are ammonia and nitrate. These compounds, in conjunction with other nutrients, serve as an important base for primary productivity.

**Total phosphorus (TP):** TP is the combined measurement of phosphorus in phosphate ($PO_4$**)** and organic compounds found in water. TP is one of the primary nutrients that regulates algal and macrophyte growth in natural waters, particularly in fresh water. Phosphate, the form in which almost all inorganic TP is found in the water column, can enter the aquatic environment in a number of ways. Natural processes transport phosphate to water through atmospheric deposition, ground water percolation, and terrestrial runoff. Municipal treatment plants, industries, agriculture, and domestic activities also contribute to phosphate loading through direct discharge and natural transport mechanisms. The very high levels of TP in some of Florida's streams and estuaries are usually caused by phosphate-mining and fertilizer-processing activities.

**Total suspended solids (TSS):** The measurement of TSS consists of determining the dry weight of particulates in the water column. Both organic and inorganic materials contribute to TSS in water.

**Trophic State Index (TSI)**: The TSI measures the potential for algal or aquatic weed growth, and is used to indicate the water quality of lakes and estuaries. Its components include TN, TP, and chlorophyll.

**Turbidity:** The presence of suspended material such as clay, silt, finely divided organic material, plankton, and other inorganic material in the water.

**Wasteload allocations:** Pollutant loads allotted to existing and future point sources, such as discharges from industry and sewage facilities.

**Wastewater:** The combination of liquid and pollutants from residences, commercial buildings, industrial plants, and institutions, together with any ground water, surface runoff, or leachate that may be present.

**Waterbody identification (WBID) numbers:** WBIDs are numbers assigned to hydrologically based drainage areas within a river basin.

**Water column:** The water within a waterbody between the surface and sediments.

**Water quality standards:** (1) Standards comprised of designated most beneficial uses (classification of water), the numeric and narrative criteria applied to the specific water use or classification, the Florida Anti-degradation Policy, and the moderating provisions contained in Chapters 62-302 and 62-4, F.A.C. (2) State-adopted and EPA-approved ambient standards for waterbodies. The standards prescribe the use of the waterbody (such as drinking, fishing and swimming, and shellfish harvesting) and establish the water quality criteria that must be met to protect designated uses.

**Watershed:** Topographic area that contributes or may contribute runoff to specific surface waters or an area of recharge.

**Watershed management approach:** The process of addressing water quality concerns within their natural boundaries, rather than political or regulatory boundaries. The process draws together all the participants and stakeholders in each basin to decide what problems affect the water quality in the basin, which are most important, and how they will be addressed.