2007 ORANGE CREEK BASIN MANAGEMENT ACTION PLAN

For the Implementation of Total Maximum Daily Loads Adopted by the Florida Department of Environmental Protection

for

Newnans Lake, Orange Lake, Lake Wauberg, Hogtown Creek, Sweetwater Branch, Tumblin Creek, and Alachua Sink

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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ACKNOWLEDGMENTS

The Orange Creek Basin Management Action Plan was prepared as part of a five-year cycle to implement Total Maximum Daily Loads adopted by the Florida Department of Environmental Protection in the Orange Creek Basin. It was developed by the Orange Creek Basin Working Group (BWG), identified below, with participation from affected local, regional, and state governmental interests; elected officials and citizens; and private interests. The BWG would like to give special thanks to Gainesville Regional Utilities for providing a meeting room.

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N/A –Not applicable

LIST OF ACRONYMS

ACT	Alachua Conservation Trust
ARA	Antibiotic resistance analysis
ACHD	Alachua County Health Department
BMAP	Basin Management Action Plan
BMP	Best management practice
BWG	Basin Working Group
CDS	Continuous deflective separation
DACS	Florida Department of Agriculture and Consumer Services
DO	Dissolved oxygen
DOT	Florida Department of Transportation
DEP	Florida Department of Environmental Protection
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
FCT	Florida Communities Trust
FFLP	Federal Forest Legacy Program
FRLPP	Farm & Ranch Land Protection Program
F.S	Florida Statutes
FWC	Florida Fish and Wildlife Conservation Commission
FWRA	Florida Watershed Restoration Act
FY	Fiscal year
GIS	Geographic information system
GRU	Gainesville Regional Utilities
HMMC	Hazardous Materials Management Code
HUC	Hydrologic unit code
I & I	Infiltration & Inflow
LID	Low-impact Development
MOS	Margin of safety
MS4	Municipal separate storm sewer system
MST	Microbial source tracking
N	Nitrogen
NO2	Nitrite
NO3	Nitrate
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OAWP	Office of Agricultural Water Policy
O&M	Operations and Maintenance
OSTDS	On-site sewage treatment and disposal system
QA	Quality assurance
P	Phosphorus
PLRG	Pollutant Load Reduction Goal
SAV	Submerged aquatic vegetation
SJRWMD	St. Johns River Water Management District
SWIM	Surface Water Improvement and Management

SWFWMD	Southwest Florida Water Management District
TN	Total nitrogen
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
TP	Total phosphorus
TSI	Trophic State Index
TSS	Total suspended solids
UF	University of Florida
UF–IFAS	University of Florida–Institute of Food and Agricultural Sciences
ULDC	Unified Land Development Code
WAV	Watershed Action Volunteers
WBID	Waterbody identification
WRF	Water reclamation facility

EXECUTIVE SUMMARY

The Orange Creek Basin Management Action Plan (BMAP) was developed by the Orange Creek Basin Working Group (BWG) over a multiyear period. It addresses waterbodies in the Orange Creek Basin with water quality impairments. The BMAP focuses on reducing nutrient discharges to lakes and fecal coliform discharges to streams verified as impaired under the Florida Watershed Restoration Act (FWRA) (Chapter 403.067, Florida Statutes [F.S.]) and the Impaired Surface Waters Rule (Rule 62-303, Florida Administrative Code [F.A.C.]), and for which total maximum daily loads (TMDLs) were established. TMDLs, which DEP adopts by rule, establish the maximum amount of specific pollutants that a waterbody can assimilate while maintaining water quality standards, including designated uses. All surface waters in the Orange Creek Basin are designated as Class III waters in accordance with Rule 62-302, F.A.C., defined as having suitable water quality for recreational use and for the propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

This BMAP provides for phased implementation pursuant to Section 403.067(7) (a) 1 F. S. The management actions and adaptive management approach described in the BMAP will address fecal coliform bacteria and nutrient reductions needed to meet the TMDLs. This adaptive management process will continue until the TMDL is met.

The Orange Creek Basin BMAP adoption as a phased BMAP allows for implementation of projects designed to achieve incremental reductions while simultaneously monitoring and conducting studies to better understand water quality dynamics (sources and response variables) in each impaired waterbody. Subsequent five-year management cycles will evaluate progress and make adjustments or add new projects, as needed, to meet the TMDLs.

The following streams and lakes have TMDLs and are depicted in Figure ES.1.

- *Hogtown and Tumblin Creeks and Sweetwater Branch: Impaired due to high levels of fecal coliform bacteria exceeding state criteria,*
- *Alachua Sink: Impaired due to excessive nitrogen, based on Trophic State Index (TSI) value above threshold of 60. A lake with a TSI value above 60 is considered impaired by the Impaired Surface Waters Rule because of excess nutrients,*
- *Newnans Lake: Impaired due to excessive nitrogen & phosphorus, based on TSI value above threshold of 60,*
- *Lake Wauberg: Impaired due to excessive nitrogen & phosphorus, based on TSI value above 60,*
- *Orange Lake: Impaired due to excessive phosphorus, based on TSI value above threshold of 60, and*

Management actions addressing these TMDLs were included in one BMAP. This approach was taken for the following reasons: the connectedness of the TMDL waterbodies facilitated more efficient use of local government expertise, the commonality of problems and expected sources, and several local pollution control programs and maintenance and operation activities apply to all waterbodies.

The BMAP process was structured to achieve cooperation and consensus among a broad range of interested parties. The process promoted the engagement of local stakeholders in a coordinated and collaborative manner to address the reductions of loadings of nutrients and bacteria needed to achieve the Orange Creek Basin TMDLs. It built upon existing water quality improvement programs and local partnerships, such as the Gainesville Clean Water Partnership, to address water quality problems. Members of the Orange Creek BWG represent:

- *Alachua County (Public Works and Environmental Protection Departments),*
- *City of Gainesville (Public Works),*
- *Fish and Wildlife Conservation Commission (FWC),*
- *Department of Transportation (DOT),*
- *DEP NE District Office,*
- *DEP Bureau of Invasive Plant Management,*
- *Paynes Prairie Preserve State Park,*
- *Alachua County Health Department,*
- *Gainesville Regional Utilities (GRU),*
- *University of Florida,*
- *St. Johns River Water Management District (SJRWMD),*
- *Department of Agriculture and Consumer Services (Office of Agriculture Water Policy and Division of Forestry),*
- *Florida Forestry Association,*
- *Private timber interests,*
- *Marion County Clean Water Program,*
- *Alachua County and Gainesville citizen environmental advisory committees, and*
- *Community groups including Sustainable Alachua County, Suwannee St. Johns Sierra Club, and Women for Wise Growth.*

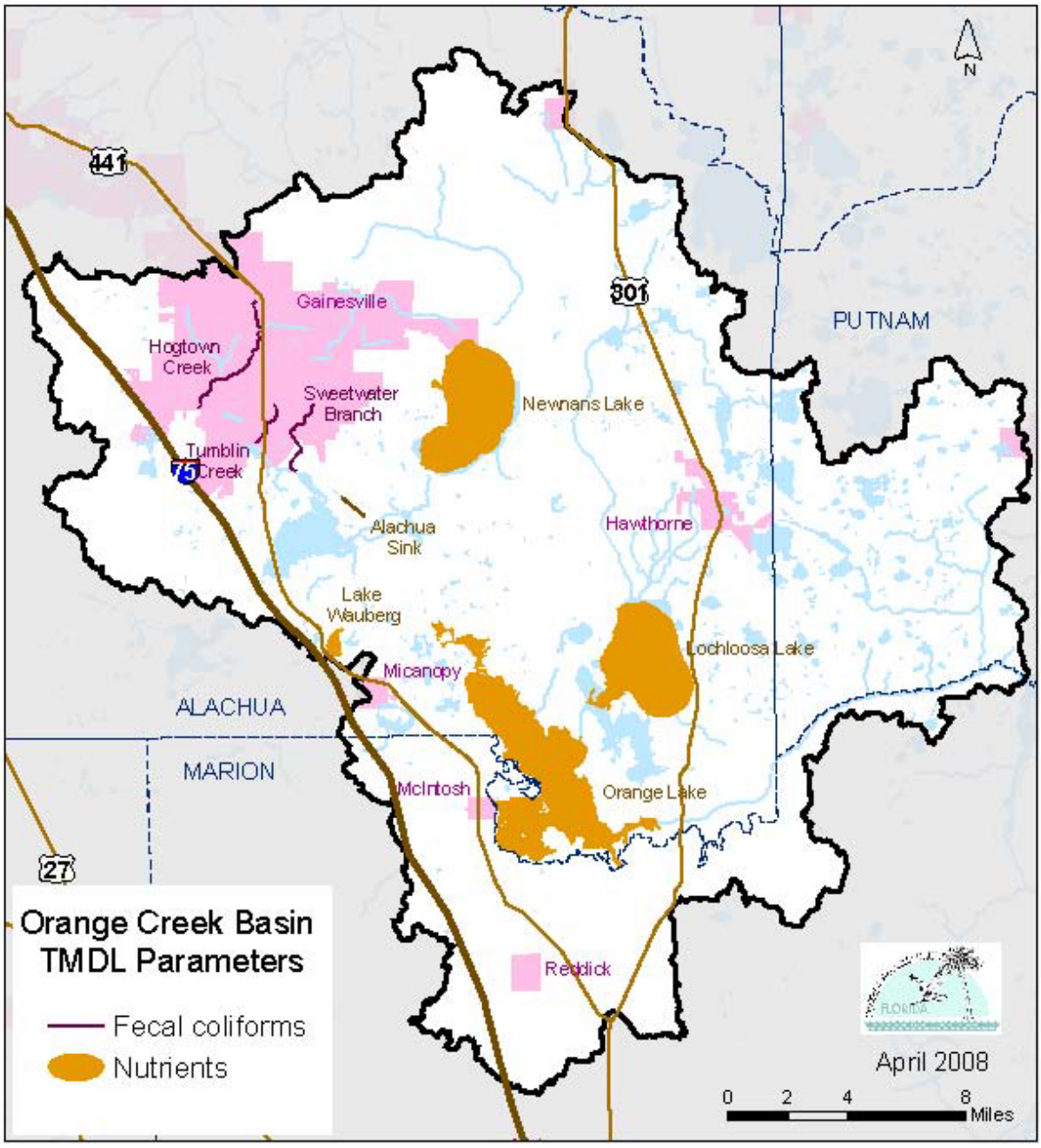


FIGURE ES.1. ORANGE CREEK BASIN BOUNDARY AND LOCATION OF BMAP WATERBODIES

ES.1 Management Actions

The BMAP built upon existing water quality improvement programs and local partnerships, such as the Gainesville Clean Water Partnership (includes Gainesville, Alachua County, and Dept. of Transportation), created to address water quality problems and implement a stormwater management program. State and local governments and community groups have committed to the implementation of the BMAP and signed statements or resolutions to that effect.

The BMAP documents the management actions that have been or will be undertaken by local, regional, state, or private entities to reduce the amount of these pollutants released into waterbodies with established TMDLs. The BMAP also addresses the following:

- *Identification of sources of nutrients and fecal coliform bacteria*
- *Assignment or allocation of loadings to sources*
- *Funding and timeline for projects*
- *Monitoring (water quality) plans for follow-up of BMAP implementation*
- *Tracking of projects*
- *Loadings from future growth*
- *Commitment to plan implementation by local partners*

The basin working group agreed that rather than make detailed allocations, the initial allocations adopted as part of each TMDL were adequate. Several factors influenced this decision. There are only two major point source discharges in the basin, both effecting Alachua Sink, and wasteload allocations were made within the Alachua Sink TMDL. Uncertainty about identification of sources of nutrients and bacteria requires further investigation. The finalization of Pollutant Load Reduction Goals by the St. Johns River Water Management District should help identify nutrient sources to the lakes. The physical interconnectedness of municipal storm sewers managed by Alachua County, Gainesville, and Dept. of Transportation made it extremely difficult and complicated to assign any one entity a percent reduction in stormwater loading. The intermingling of systems requires the sharing of stormwater management responsibilities between these entities.

Over 100 management actions (Tables 10.1 through 10.9) are contained in this BMAP to address elevated fecal coliform levels in streams and nutrient levels in lakes. Many of these projects are part of existing programs, but some were expanded in scope to address the TMDLs (see **Table 6.3**) or undertaken by local partners at their expense for the sole purpose of supporting TMDL development and implementation (**Table 6.2**). Table 1.1 summarizes the number of management actions for each TMDL waterbody by category.

Though a substantial body of scientific literature exists regarding the hydrology, ecology, and function of TMDL waterbodies, the relation of water quality to pollutant sources is not well understood for many of these waterbodies. For waterbodies where scientific understanding is well developed, projects were proposed that will meet the TMDL. For waterbodies where current scientific understanding contains large uncertainties, the BMAP includes focused studies expected to increase the understanding of impaired waterbodies and to support development of

future management actions. Examples of these focused studies are the technical work supporting development of pollutant load reduction goals and fecal coliform water quality sampling and extensive microbial source tracking work (Table 10.5 contains details).

Management actions cover a wide variety of pollutant sources through stormwater retrofits, centralized wastewater infrastructure management, the repair and/or upgrade of on-site sewage treatment disposal systems (OSTDSs, or septic systems), pollution prevention, public education, and related activities. These management actions include the following three projects of note:

1. *Alachua County, the Alachua County Health Department, the City of Gainesville, Gainesville Regional Utilities, Florida Department of Transportation, and DEP initiated a project to identify and remediate sources of fecal coliform bacteria in urban "hot spots" (areas with consistently high fecal counts). The selection of these hot spots was based on fecal coliform monitoring and initial microbial source tracking activities in the Tumblin Creek, Sweetwater Branch, and Hogtown Creek watersheds. This project is expected to improve communication and coordination among the agencies responsible for wastewater and stormwater management and the remediation of problems. It is anticipated that the project will achieve significant localized reductions in fecal coliform levels, with related overall reductions in the urban creeks.*
2. *The proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project is a cooperative effort of local governments, City of Gainesville Public Works, GRU, DEP, DOT, the St. Johns River Water Management District, and others. Its purpose is to return sheetflow to Paynes Prairie and, through the creation of a wetland treatment system, remove nutrients from water in Sweetwater Branch, which currently discharges into Alachua Sink. Feasibility studies and conceptual design plans have been completed. The project is in the early stages of design planning and requires substantial public funding and acquisition of land for its completion. The total nitrogen (TN) load reductions required of point sources identified in the Alachua Sink TMDL would be met when this project is completed.*
3. *The SJRWMD is developing PLRGs for nutrients in Newnans Lake, Lochloosa Lake, and Orange Lake, with input from local stakeholders. PLRGs will identify major sources of nutrient pollutants in each lake that are currently not well-defined, aiding in the selection of management actions to reduce nutrient loadings.*

ES.2 Managing Pollutant Loads from Future Growth

As required by the FWRA, nutrient and fecal coliform loadings associated with future growth were considered as part of the BMAP. These estimates were based on anticipated population growth in the basin obtained from U.S. Census Bureau data gathered and evaluated through the BMAP process. Basinwide, future growth predicted through 2015 is not expected to substantially increase pollutant loads. However, emerging growth patterns in East Gainesville, particularly the Newnans Lake watershed, indicate that Census predictions may not adequately reflect the changes in land use that could occur in that area or other localized parts of the basin.

There are programs in place to ensure that the possible effects are reduced, but extra caution in future permitting may be needed in specific locations within the basin.

The management actions considered by stakeholders include a number of activities that proactively address pollutant loadings from new development (or redevelopment) through regulations, ordinances, or guidelines. The application of Low Impact Development principles is a key management action being advanced and used by stakeholders to offset the effects of future growth.

ES.3 BMAP Implementation and Tracking

BMAP implementation will be a long-term process. Significant unknowns remain regarding nutrient sources for Orange Creek Basin lakes and to a lesser extent bacteria sources for streams. The TMDLs established for basin lakes most likely will not be achieved in the near term. Initial actions taken to identify sources of fecal coliform bacteria have been more successful. The identification of bacteria sources using a variety of techniques, including detailed microbial source tracking, the use of optical brighteners, and field observations, has been completed.

Prior to and during the development of the BMAP, Gainesville Regional Utilities, City of Gainesville, Alachua County Health Department, and Alachua County completed a number of actions pertinent to controlling fecal coliform bacteria and nutrients. These actions included:

- *Strengthening of GRU's sewer line and lift station maintenance and inspection program. GRU increased the mileage of sewer line slip lined and smoke tested in the TMDL watersheds (Table 10.9 contains details),*
- *City of Gainesville completed several stormwater retrofit projects (stormwater parks and ponds) and installation of hydrodynamic separators in the Sweetwater Branch and Tumblin Creek watersheds (Tables 10.1A and B contain details),*
- *City of Gainesville, Dept. of Transportation, and Alachua County received their first five year MS4 permits. The result has been increased and improved maintenance and inspection of storm sewers and detection of illicit discharges driven partly by the BMAP process (Table 10.7) contains details), and*
- *Alachua County Health Department surveyed properties along Sweetwater Branch, Tumblin Creek, and Hogtown Creek expected to have septic systems. The survey identified any sanitary nuisances and provided an evaluation of the potential for a system to be contributing bacteria, based on depth to the water table and distance to water.*

For the first phase of BMAP implementation, the BWG has started a project to better evaluate elevated levels of fecal coliform bacteria in Gainesville's urban creeks. The development of PLRGs and the results of watershed nutrient source identification projects for Newnans Lake, Lochloosa Lake, and Orange Lake by the SJRWMD will identify major sources of nutrient loadings into those lakes.

In this first phase, the BWG will track its projects and other implementation efforts and monitor water quality in TMDL waterbodies (through existing water quality monitoring programs), to ensure that the BMAP is carried out and to measure its effectiveness. The BWG will meet at

least annually to discuss implementation issues, consider new information, and determine other management actions needed for waterbodies that are not projected to meet their TMDLs.

Each entity responsible for implementing management actions as part of the BMAP will complete an annual report for submittal to the BWG and DEP. The report will track the implementation status of any management actions listed in the BMAP and document additional management actions undertaken to further the water quality improvements in the basin.

As part of the BMAP, the BWG designed a strategy for monitoring water quality based on specific indicators and measuring pollutant concentrations and loads to determine if water quality is improving and the TMDL is being met. Table ES.1 outlines proposed water quality indicators and their expected responses to water quality improvements.

Observations of water quality conditions and trends will be reported to the BWG and public at least annually as part of the BMAP annual report. Water quality data will be used to support adaptive management process, assess projects, and identify the need for new actions. A more complete analysis of trends in progress towards achieving designated use will be made on a five-year basis, corresponding with DEP's watershed management cycle.

TABLE ES.1. ANTICIPATED TRENDS IN CORE AND SUPPLEMENTAL WATER QUALITY INDICATORS

Core Indicators*	Lakes	Creeks
Chlorophyll *a*	Decrease in concentration	Not applicable
Total Phosphorus (as P)	Decrease in concentration	Not applicable
Nitrogen, Nitrite (NO2), and Nitrate (NO3) as N	Decrease in concentration	Not applicable
Nitrogen, Kjeldahl (TKN)	Decrease in concentration	Not applicable
Fecal coliform	Not applicable	Decrease in concentration
Supplemental Indicators**	**Lakes**	**Creeks**
Specific conductance	Monitored to facilitate interpretation of core indicator trends	Not applicable
Dissolved oxygen (DO)	Monitored to facilitate interpretation of core indicator trends	Not applicable
Alkalinity	Monitored to facilitate interpretation of core indicator trends	Not applicable
pH	Monitored to facilitate interpretation of core indicator trends	Not applicable
Temperature	Monitored to facilitate interpretation of core indicator trends	Not applicable
Color	Monitored to facilitate interpretation of core indicator trends	Not applicable
Turbidity	Monitored to facilitate interpretation of core indicator trends	Monitored to facilitate interpretation of core indicator trends
Total suspended solids (TSS)	Monitored to facilitate interpretation of core indicator trends	Monitored to facilitate interpretation of core indicator trends
Total organic carbon (TOC)	Monitored to facilitate interpretation of core indicator trends	Monitored to facilitate interpretation of core indicator trends

*Core indicator – Indicator that measures progress made towards achieving TMDL.
**Supplemental indicator – Additional indicators measured to facilitate the interpretation of core indicators.

2007 ORANGE CREEK BASIN MANAGEMENT ACTION PLAN ADDRESSING THE TMDLS FOR NEWNANS LAKE, ORANGE LAKE, LAKE WAUBERG, HOGTOWN CREEK, SWEETWATER BRANCH, TUMBLIN CREEK, AND ALACHUA SINK

1.0 Introduction

The Orange Creek Basin Management Action Plan (BMAP) was developed by the Orange Creek Basin Working Group (BWG) over a multiyear period. It addresses waterbodies in the Orange Creek Basin with water quality impairments. The BMAP focuses on reducing nutrient discharges to lakes and fecal coliform discharges to streams verified as impaired under the Florida Watershed Restoration Act (FWRA) (Chapter 403.067, Florida Statutes [F.S.]) and the Impaired Surface Waters Rule (Rule 62-303, Florida Administrative Code [F.A.C.]), and for which total maximum daily loads (TMDLs) were established. TMDLs were established for Newnans Lake, Orange Lake, Lake Wauberg, and Alachua Sink for nutrients and for Hogtown Creek, Tumblin Creek, and Sweetwater Branch for fecal coliform bacteria.

The BMAP documents the management actions that have been or will be undertaken by local, regional, state, or private entities to reduce the amount of these pollutants released into waterbodies with established TMDLs. Reducing the amounts of nutrients and fecal coliform released in the basin will help achieve water quality standards and designated uses established by the Florida Department of Environmental Protection (DEP). Orange Creek Basin waters have been designated as Class III, suitable for recreational use and for the propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

Management actions addressing these TMDLs were included in one BMAP. This approach was taken for the following reasons: the connectedness of the TMDL waterbodies, the commonality of problems and expected sources, and local pollution control programs and maintenance and operation activities apply to all waterbodies.

This BMAP provides for phased implementation pursuant to Section 403.067(7) (a) 1 F. S. The management actions and adaptive management approach described in the BMAP will address fecal coliform bacteria and nutrient reductions needed to meet the TMDLs. This adaptive management process will continue until the TMDL is met.

The Orange Creek Basin BMAP adoption as a phased BMAP allows for implementation of projects designed to achieve incremental reductions while simultaneously monitoring and conducting studies to better understand water quality dynamics (sources and response variables) in each impaired waterbody. Subsequent five-year management cycles will evaluate progress and make adjustments or add new projects, as needed, to meet the TMDLs.

Overview of Management Actions

An important result of the BMAP process in the Orange Creek Basin has been the unprecedented level of local stakeholder participation and commitment. The BMAP process enhanced communication and cooperation among basin stakeholders that will have benefits

beyond the BMAP. Together, stakeholders identified solutions to some of the basin's complex water pollution issues and are taking decisive steps toward realizing those solutions.

Signatories to this BMAP share a common goal: restoring the designated uses of impaired waterbodies in the Orange Creek Basin. Their management actions, including the more than 100 specific projects identified in this BMAP, will improve the water quality of impaired waterbodies. These management actions cover a wide variety of pollutant sources and are categorized as follows:

- *Structural BMPs—Quantifiable and Unquantifiable Load Reductions*
- *Agricultural BMPs*
- *Restoration and Water Quality Improvement Projects*
- *Regulations, Ordinances, and Guidelines*
- *Special Studies and Planning Efforts*
- *Education and Outreach Efforts*
- *Basic Stormwater Management Program Implementation*
- *Conservation Land Acquisition / BMP Land Acquisition*
- *Wastewater Infrastructure Management, Maintenance, Repair, and Upgrade*

Table 1.1 summarizes the number of management actions by category for each TMDL waterbody. The number and type of projects varies by waterbody. Basin wide management actions are counted for each individual waterbody.

Though considerable effort was taken to understand the ecology of and internal dynamics of TMDL waterbodies, the relation of water quality to pollutant sources is not well understood for some of these waterbodies. For some waterbodies, this prevented the Basin Working Group (BWG) from identifying a suite of projects that would fully implement each TMDL. As such the BMAP, with a few exceptions, does not contain quantitative values for project-based pollutant load reductions or an expected date on which the TMDLs will be achieved. Despite these uncertainties, basin stakeholders expect to achieve water quality improvements through the activities outlined in this BMAP.

For waterbodies where scientific understanding is well developed, projects were proposed that will meet the TMDL. For example, the bacteria "hot spot" project began with microbial source tracking (MST) studies that did not provide conclusive results, but provided sufficient certainty to identify geographic areas of concern for human sources of bacteria. The geographic guidance obtained from the MST studies is being used with a field-based source identification and remediation effort of multiple stakeholders. In this way, projects in the BMAP are the BWG's best effort to combine current scientific understanding with a pragmatic and adaptive approach to decrease coliform bacteria in urban streams and nutrients in rural lakes. The BWG is confident that these activities will lead to improvements in BMAP waterbodies.

TABLE 1.1 TMDLS AND PROJECT MANAGEMENT CATEGORIES IN THE ORANGE CREEK BASIN

TMDL CATEGORY	WATERBODY WBID	PARAMETER	ORANGE CREEK BMAP MANAGEMENT CATEGORY	NUMBER OF PROJECTS
Nutrients	Newnans Lake 2705B	TN and TP	Agriculture BMPs	6
			Basic Stormwater Program	8
			Conservation Land Acquisition	3
			Education and Outreach Efforts	3
			Regulation, Ordinances, and Guidelines	1
			Restoration and Water Quality Improvement	5
			Special Studies and Planning Efforts	4
			Structural BMP	2
			Wastewater Infrastructure Management	10
	Orange Lake 2749A	TP	Agriculture BMPs	7
			Basic Stormwater Program	3
			Conservation Land Acquisition	6
			Education and Outreach Efforts	3
			Regulation, Ordinances, and Guidelines	1
			Restoration and Water Quality Improvement	7
			Special Studies and Planning Efforts	6
			Wastewater Infrastructure Management	1
	Lake Wauberg 2741	TN and TP	Special Studies	1
			Education and Outreach Efforts	3
			Regulation, Ordinances, and Guidelines	1
	Alachua Sink 2720A	TN	Basic Stormwater Program	6
			Conservation Land Acquisition	3
			Education and Outreach Efforts	5
			Regulation, Ordinances, and Guidelines	1
			Restoration and Water Quality Improvement	1
			Special Studies and Planning Efforts	14
			Structural BMPs	10
			Wastewater Infrastructure Management	13
Coliform Bacteria	Hogtown Creek 2698	Fecal Coliform	Basic Stormwater Management	8
			Education and Outreach Efforts	3
			Regulation, Ordinances, and Guidelines	1
			Restoration and Water Quality Improvement	3
			Special Studies and Planning Efforts	10
			Structural BMPs	5
			Wastewater Infrastructure Management	10
	Tumblin Creek 2718A	Fecal Coliform	Basic Stormwater Management	9
			Education and Outreach Efforts	4
			Regulation, Ordinances, and Guidelines	1
			Special Studies and Planning Efforts	11
			Structural BMPs	1
			Wastewater Infrastructure Management	11
	Sweetwater Branch 2711	Fecal Coliform	Basic Stormwater Management	8
			Education and Outreach Efforts	4
			Regulation, Ordinances, and Guidelines	1
			Special Studies and Planning Efforts	12
			Structural BMPs	1
			Wastewater Infrastructure Management	11

For waterbodies where current scientific understanding contains large uncertainties, the BMAP includes focused studies expected to increase the understanding of impaired waterbodies and to support development of future management actions. For example, the development of Pollutant Load Reduction Goals (PLRGs) should significantly improve the understanding of nutrient sources to lakes. Management activities will be refined and new projects developed to reduce nutrient sources to the extent practical.

Over 100 documented projects are contained in this BMAP to address elevated coliform levels and nutrient levels in specific basin creeks and lakes, respectively. Many of these projects are part of existing programs, but some were expanded in scope to address the TMDLs (see **Table 6.3**) or undertaken for the sole purpose of supporting TMDL development and implementation (**Table 6.2**). Of the many management actions proposed in this BMAP, the following three projects are significant:

1. *Alachua County, the Alachua County Health Department (ACHD), the City of Gainesville, Gainesville Regional Utilities (GRU), Florida Department of Transportation (DOT), and DEP initiated a project to identify and remediate sources of fecal coliform bacteria in urban "hot spots" (areas with consistently high fecal counts). The selection of these hot spots was based on fecal coliform monitoring and initial MST activities in the basin. This project is expected to improve communication and coordination among the agencies responsible for wastewater and stormwater management and the remediation of problems. It is anticipated that the project will achieve significant localized reductions in fecal coliform levels, with related overall reductions in the urban creeks.*
2. *The proposed Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project is a cooperative effort of local governments, City of Gainesville Public Works, GRU, DEP, DOT, the St. Johns River Water Management District (SJRWMD), and others. Its purpose is to return sheetflow to Paynes Prairie and, through the creation of a wetland treatment system, remove nutrients from water in Sweetwater Branch, which currently discharges into Alachua Sink. Feasibility studies and conceptual design plans have been completed. The project is in the early stages of design planning and requires substantial public funding and acquisition of land for its completion. The total nitrogen (TN) load reductions required of point sources identified in the Alachua Sink TMDL would be met when this project is completed.*
3. *The SJRWMD is developing PLRGs for nutrients in Newnans Lake, Lochloosa Lake, and Orange Lake, with input from local stakeholders. PLRGs will identify major sources of nutrient pollutants in each lake that are currently not well-defined, aiding in the selection of management actions to reduce nutrient loadings.*

Document Organization

Section 2.0 of the Orange Creek BMAP provides a background discussion of the region and targeted waterbodies. **Section 3.0** describes the TMDLs in the basin. The process used to develop the Orange Creek BMAP, including a discussion of how the public and other stakeholders were encouraged to participate in developing the BMAP, is found in **Section 4.0**.

Allocation of pollutant reductions are discussed in **Section 5.0. Section 6.0** describes the pollutant sources and management actions to achieve the TMDLs, including management actions that address future growth. This section is primarily organized by each BMAP waterbody. Monitoring activities (**Section 7.0**) to evaluate reasonable progress and tracking and follow-up actions (**Section 8.0**) are presented next. The signed commitment of the parties to implement and support the BMAP is shown in **Section 9.0**. Lastly, **Section 10.0** presents detailed tables describing the water quality improvement projects to which stakeholders have committed in this BMAP.

The Orange Creek BMAP includes or addresses the elements required by the FWRA (Chapter 403.067, F.S), including the following:

- *Document how the public and other stakeholders were encouraged to participate or participated in developing the BMAP (**Section 4.0**),*
- *Equitably allocate pollutant reductions within the basin (**Section 5.0**),*
- *Identify the mechanisms by which potential future increases in pollutant loading will be addressed (**Section 6.0**),*
- *Document management actions to achieve the TMDLs (**Section 7.0**),*
- *Document the implementation schedule, funding, responsibilities, and milestones (**Tables 10.1A through 10.9**), and*
- *Identify monitoring, evaluation, and a reporting strategy to evaluate reasonable progress over time (**Section 7.0**).*

2.0 Background

The Orange Creek BMAP has been developed as part of DEP's TMDL Program. DEP implements the TMDL Program using a watershed management approach. The approach applies a five-year rotating basin cycle, with each year of the cycle representing a different phase of the basin rotation cycle: (a) Initial Basin Assessment; (b) Strategic Monitoring; (c) Data Analysis and TMDL Development; (d) BMAP Development; and (e) BMAP Implementation. At the end of each five-year cycle, a new cycle begins for each group of basins.

Regional Setting of Orange Creek Basin

The Orange Creek Basin is located in Alachua County, including a significant part of the City of Gainesville, and northern Marion County and is part of the Ocklawaha River Basin (**Figure 2.1**). The Ocklawaha River Basin is a TMDL Group 1 Basin. The BMAP addresses seven Orange Creek Basin waterbodies verified as impaired. TMDLs have been established for each of these waterbodies:

- *Hogtown Creek,*
- *Sweetwater Branch,*
- *Tumblin Creek,*
- *Alachua Sink,*
- *Newnans Lake,*

- *Orange Lake, and*
- *Lake Wauberg.*

Figure 2.2 shows the locations of the TMDL waterbodies discussed in this document.

Management actions addressing these TMDLs were included in one BMAP. This approach was taken for the following reasons: the connectedness of the TMDL waterbodies facilitated more efficient use of local government expertise, the commonality of problems and expected sources, and several local pollution control programs and maintenance and operation activities apply to all waterbodies.

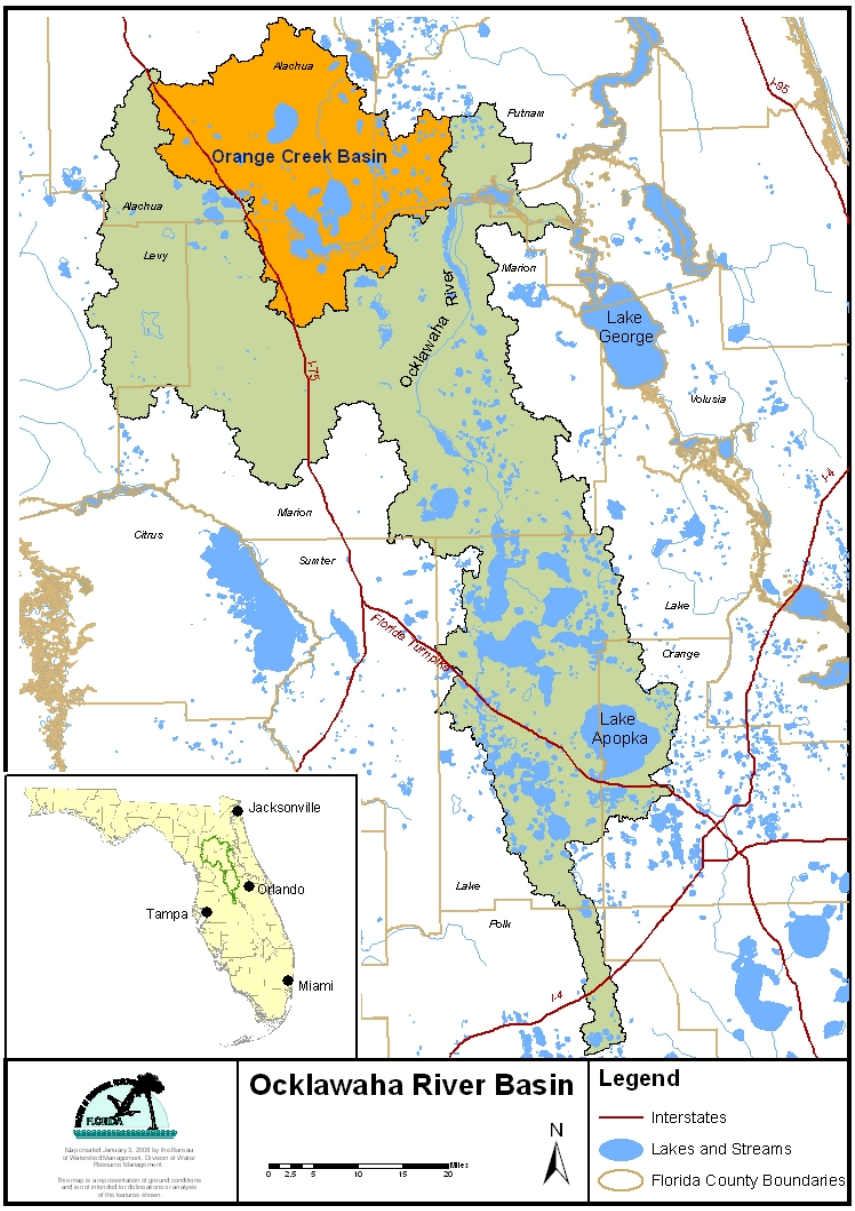


FIGURE 2.1. OCKLAWAHA RIVER BASIN SHOWING LOCATION OF THE ORANGE CREEK BASIN

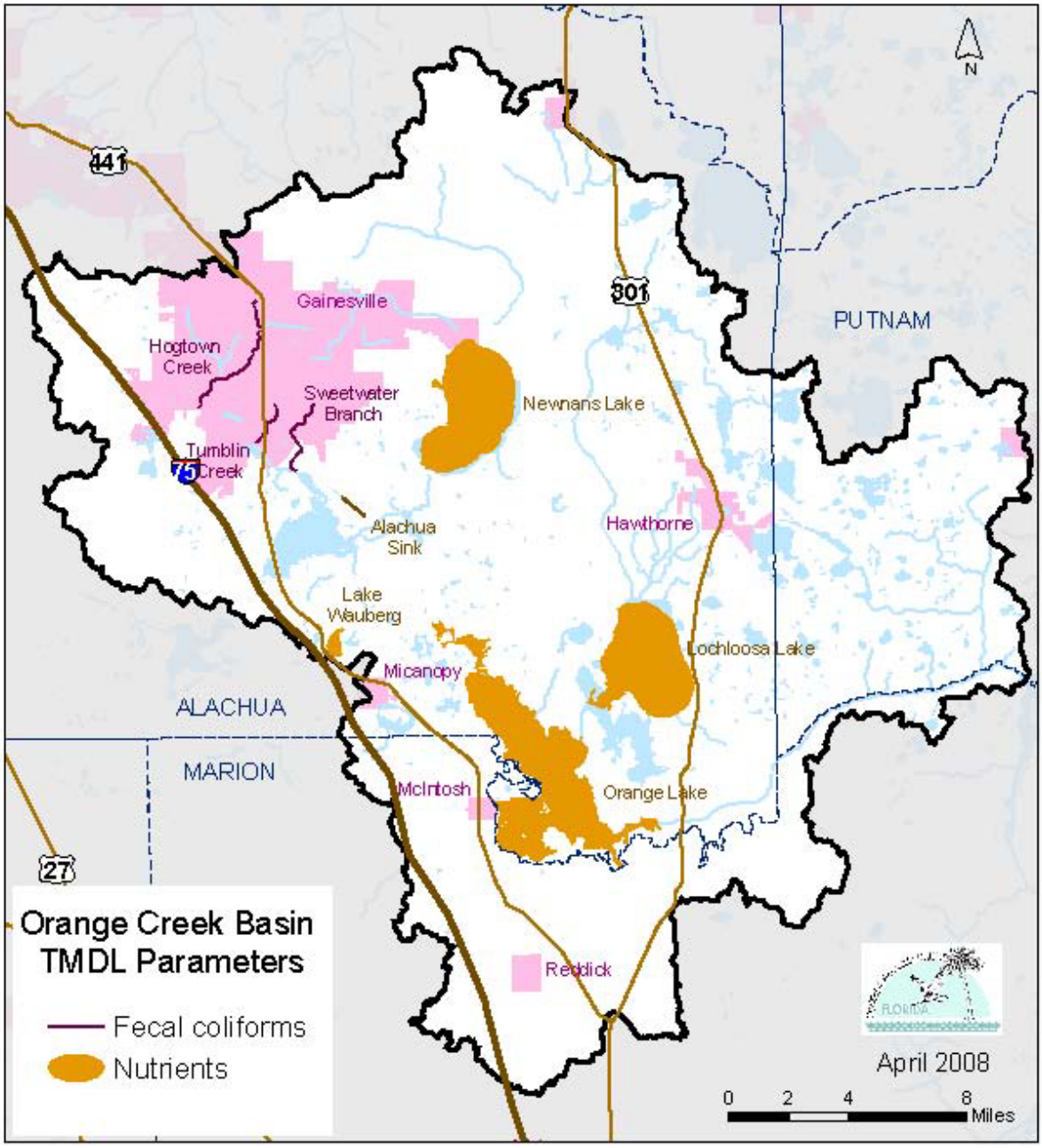


FIGURE 2.2 ORANGE CREEK BASIN BMAP WATERBODIES

3.0 Total Maximum Daily Loads in the Orange Creek Basin

TMDLs, which DEP adopts by rule, establish the maximum amount of specific pollutants that a waterbody can assimilate while maintaining water quality standards, including designated uses. All surface waters in the Orange Creek Basin are designated as Class III waters in accordance with Rule 62-302, F.A.C., defined as having suitable water quality for recreational use and for the propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

TMDLs quantify the pollutant reductions that are needed to achieve water quality targets, based on state water quality standards. A TMDL is expressed as the sum of all point source loads, nonpoint source loads, and an appropriate margin of safety (MOS), which takes into account uncertainty about the relationship between effluent limitations and water quality.

TMDLs are developed by DEP for specific pollutants (such as total nitrogen [TN], total phosphorus [TP], fecal coliform bacteria, and others) in specific waterbodies. To establish a TMDL, DEP assesses each impaired waterbody, the pollutant(s) contributing to the impairment, the amount of pollutant(s) entering the waterbody during a specified period, and the degree to which those pollutant loads must be reduced to meet the TMDL water quality target. DEP uses computer modeling and statistical evaluations as part of the assessment process. DEP determines the level of pollutant(s) that each waterbody can receive while maintaining its goal of Class III designated use and criteria, and identifies the corresponding pollutant reduction needed to achieve the TMDL.

Within the Orange Creek Basin, TP, TN, and fecal coliform bacteria were identified as the primary pollutants causing impairment. In 2003, DEP adopted TMDLs for six of the impaired waterbodies in the Orange Creek Basin and, in 2006, adopted the Alachua Sink TMDL. **Table 3.1** lists the adopted TMDLs. Details on all Orange Creek Basin TMDLs can be found in the following resources:

- *Newnans Lake: Gao, X., and D. Gilbert (2003),*
- *Orange Lake: Gao, X., and D. Gilbert (2003),*
- *Lake Wauberg: Wu, T., A. Baniukiewicz, and D. Gilbert (2003),*
- *Hogtown Creek: Shelley, Z., and W. Magley (2003),*
- *Tumblin Creek: Shelley, Z., and W. Magley (2003),*
- *Sweetwater Branch: Burger, C., and W. Magley (2003), and*
- *Alachua Sink: Gao, X., D. Gilbert, and W. Magley (2006).*

A TMDL was drafted for Lochloosa Lake, but the adoption of the TMDL was deferred due to the lack of supporting data and information needed for its completion. Regardless, the Orange Creek BWG chose to evaluate possible management actions to decrease nutrient loading to Lochloosa Lake because of the potential improvement in water quality that could result in Lochloosa Lake and in downstream Orange Lake.

TABLE 3.1. TMDLS ADDRESSED IN THE ORANGE CREEK BASIN

TMDL CATEGORY	WATERBODY WBID	PARAMETER	TMDL BASELINE LOADING (LBS/YEAR)	TMDL (LBS/YEAR)	WASTELOAD ALLOCATION		LOAD ALLOCATION (LBS/YEAR)	% REDUCTION NEEDED
					WASTEWATER (LBS/YEAR)	NPDES STORMWATER (% REDUCTION)		
Nutrients	Newnans Lake 2705B	TN	315,510	85,470	3,104	-	82,366	74%
		TP	25,732	10,924	386	-	10,538	59%
	Orange Lake 2749A	TP	27,889	15,262	-	-	15,262	45%
	Lake Wauberg 2741	TN	4,064	2,062.4	-	-	2,062.4	51%
		TP	748	374	-	-	374	50%
	Alachua Sink 2720A	TN	462,557	256,322	41,003	45%	215,319	45%

TMDL CATEGORY	WATERBODY WBID	PARAMETER	TMDL BASELINE LOADING (COUNTS / 100ML)	TMDL (COUNTS / 100ML)	WASTELOAD ALLOCATION		LOAD ALLOCATION (COUNTS/100ML OR % REDUCTION)	% REDUCTION NEEDED
					WASTEWATER (COUNTS/DAY)	NPDES STORMWATER (% REDUCTION)		
Coliform	Hogtown Creek 2698	Fecal Coliform	1,633	800	-	51%	51%	51%
	Tumblin Creek 2718A	Fecal Coliform	3,077	800	-	74%	74%	74%
	Sweetwater Branch 2711	Fecal Coliform	2,667	800	2.27E + 11	70%	70%	70%

Notes: WBID – Waterbody identification number; lbs – Pounds; mL – Milliliter; - – Not applicable; NPDES – National Pollutant Discharge Elimination System.

During the second rotation of the basin management cycle in the Orange Creek Basin, DEP will be collecting new water quality data, identifying additional impaired waters, and developing additional TMDLs. This may necessitate the revision of the BMAP in the future to accommodate new TMDL waterbodies and/or pollutants.

4.0 BMAP Development Process

The BMAP process was structured to achieve cooperation and consensus among a broad range of interested parties. The process promoted the engagement of local stakeholders in a coordinated and collaborative manner to address the reductions of loadings of nutrients and bacteria needed to achieve the Orange Creek Basin TMDLs. It built upon existing water quality improvement programs and local partnerships, such as the Gainesville Clean Water Partnership, to address water quality problems.

Meaningful public involvement was a key component of the Orange Creek BMAP development process. In October 2004, DEP convened the Orange Creek BWG, comprising representatives of local, regional, state, business, and community interests, to develop a BMAP to achieve the TMDLs for the basin. Stakeholders established one BWG and created three subcommittees to address specific issues: Lakes/Forestry, Monitoring, and Public Education and Outreach. Members of the BWG comprise these subgroups.

The BWG took a consensus-based, collaborative approach when making decisions on the content of the BMAP. The BWG agreed to make every effort to develop proposals that all members could support.

The members of the BWG met nearly monthly from October 2004 through June 2007, with subsequent meetings in August and September 2007. As discussion with BWG members proceeded to a point where decisions about the specific responsibilities of each partner were discussed, meetings were formally noticed in the *Florida Administrative Weekly*.

In addition to the BWG, a number of focused briefings and general public meetings were held to discuss the BMAP. **Table 4.1** summarizes the Orange Creek BWG structure, membership, and these broader public involvement efforts. Groups or organizations contacted included the Gainesville Water Management Committee, Alachua County Environmental Protection Advisory Committee, Eastside Garden Club, Suwannee St. Johns Sierra Club, Women for Wise Growth, and Sustainable Alachua County.

TABLE 4.1. BASIN WORKING GROUP ORGANIZATIONAL STRUCTURE

BASIN WORKING GROUP (BWG)

Function:

- Develop a consensus-based BMAP to implement TMDLs in the Orange Creek Basin.
- Has final decision-making role on BMAP development.

Makeup:

- Alachua County (Environmental Protection Department, Public Works, and Environmental Protection Advisory Committee)
- Marion County
- City of Gainesville
- Town of McIntosh
- Gainesville Regional Utilities
- Gainesville Clean Water Partnership
- Gainesville Water Management Committee
- University of Florida
- St. Johns River Water Management District
- Florida Department of Transportation
- Florida Fish and Wildlife Conservation Commission
- Florida Department of Agriculture and Consumer Services (includes Division of Forestry)
- Alachua County Health Department, Florida Department of Health
- Florida Department of Environmental Protection
- Plum Creek Timber Company
- Florida Forestry Association
- Women for Wise Growth
- Sustainable Alachua County
- Sierra Club

Meetings/Workshops Held:
Generally monthly meetings were held from October 2004 through June 2007, with subsequent meetings held in August and September 2007.

CITIZEN INPUT

Function:

- Ensure that all interested parties are involved and heard in the TMDL process.
- Ensure the broad dissemination of TMDL information and the BMAP.
- Allow for the public discussion of issues and strategies.

Makeup:

- Interested parties and the public at large. Sierra Club, Women for Wise Growth, Sustainable Alachua County, and Eastside Garden Club invited.

Public Meetings/Workshops held:

- November 7, 2007

Note:
Several interested citizens also attended the BWG meetings regularly.

SPECIAL BRIEFINGS/PRESENTATIONS

Function:

- To brief councils, commissions, special interest groups, community organizations, and others on the TMDL process and the progress of the BWG, as requested or needed.

Meetings/Workshops held:

- Gainesville Water Management Advisory Committee/Alachua County Environmental Protection Advisory Committee – July 25, 2006, and October 25, 2007
- Gainesville Recreation, Cultural Affairs and Public Works Committee – July 26, 2005, and November 1, 2007
- Alachua County Community Planning Group – November 6, 2007
- Alachua County Rural Concerns Citizens Committee – November 15, 2007
- SJRWMD Governing Board's Projects and Lands Committee – December 10, 2007

Makeup:

- Affected and/or interested elected bodies, organizations, and other groups in the basin.

COMMISSION BRIEFINGS

Local Government Commission Briefings:
Alachua County: June 22, 2004, and December 11, 2007
Marion County: December 4, 2007
City of Gainesville: June 14, 2004, and December 10, 2007

5.0 Pollutant Reduction Allocations

The objective of a TMDL is to determine acceptable loads among anthropogenic pollutant sources in a watershed so that appropriate control measures can be implemented and meaningful progress can be made toward achieving water quality standards.

Under the FWRA (Subsection 403.067[7], F.S.), the TMDL allocation may be an "initial" pollutant allocation among point and nonpoint sources. In such cases, the further allocation to specific point sources and specific categories of nonpoint sources is established in a BMAP. The FWRA further states that the BMAP may make detailed allocations to individual "basins" (i.e., sub-basins) or to all basins as a whole, as appropriate. Both initial and detailed allocations must be determined based on a number of factors listed in the FWRA, including cost-benefit, technical and environmental feasibility, implementation time frames, feasible funding strategy, and others.

The Orange Creek BWG agreed that it would be appropriate to use the initial allocations adopted as part of each TMDL. The following factors were considered in making this decision.

- *Only two major point sources are identified in the TMDL wasteload allocations for nutrients: domestic wastewater (GRU) and municipal stormwater discharge. Municipal stormwater discharges also have allocations in the bacteria TMDLs. Allocations to these sources were adequately documented in the TMDL.*
- *Uncertainty about the sources of both fecal coliform bacteria and nutrients requires further source investigation to determine whether it is necessary and feasible to allocate specific responsibility among nonpoint sources. Formulating allocations more detailed than those adopted in the TMDLs, particularly for bacteria, would be speculative with the current data and information available.*
- *The SJRWMD is developing PLRGs for Newnans Lake, Lochloosa Lake, and Orange Lake that should provide additional information on major sources of nutrient pollutants and allowable loadings. Once developed, the PLRGs will help identify where reductions can be made.*
- *Although local governments and DOT have independent permit responsibilities, the interconnectedness of their stormwater infrastructure requires local municipal separate storm sewer system (MS4) permittees to cooperate closely to meet their permit responsibilities. Therefore, the BWG did not assign responsibility for reductions to the specific entities that share common stormwater infrastructure. This cooperation occurs in part through the Gainesville Clean Water Partnership between the City of Gainesville, DOT, and Alachua County. Together the partnership shares NPDES permit responsibilities. The partnership also cooperates in implementing TMDL projects.*

6.0 Pollutant Sources and Management Actions

The Orange Creek BMAP contains a series of current and planned management actions, identified by local entities, whose purpose is to manage loadings of nutrients (lakes and Alachua Sink) and fecal coliform (streams). The management actions (completed, ongoing, and planned) identified in the BMAP are targeted at addressing both the pollutant loads from historical, current, and estimated future sources associated with basin population growth and the resulting land use changes.

This section begins with some general assumptions and considerations, a description of quantifiable nutrient and fecal coliform bacteria reductions, and BMAP implementation costs. Next, the impact of future growth is discussed. The remainder of the section describes the waterbodies, the pollutant sources, and the management actions completed, under way, or planned to achieve the TMDL.

BMAP Assumptions and Considerations

The water quality benefits of BMAP implementation are based on some fundamental assumptions and considerations, as follows:

- ***Multiparameter Impacts*** *– Actions in this BMAP that decrease fecal coliform will also decrease nutrients.*
- ***Unquantified Project Impacts*** *– Some of the projects and activities contained in the BMAP cannot be quantified with regard to the reductions in coliform or nutrients they might achieve. However, because of their positive project impact, it is assumed that these actions will help reduce pollutant loads.*
- ***Source Identification*** *– Fecal coliform impairment sources are particularly difficult to trace. For this reason, source identification studies are included as management actions.*
- ***Future Growth*** *– Based on U.S. Census Bureau data gathered and evaluated through the BMAP process, basinwide future growth predicted through 2015 is not expected to substantially increase pollutant loads. However, emerging growth patterns in the East Gainesville area of the basin indicate that Census predictions may not adequately reflect the changes in land use that could occur in that area or other localized parts of the basin with large tracts of undeveloped land. It is uncertain to what extent future growth in these more localized areas will increase pollutant loads. There are programs in place to ensure that the possible effects are reduced, but extra effort may be needed.*
- ***Water Quality Issues*** *– This BMAP addresses water quality issues in the basin for which impairments were identified at the start of the BMAP process. Other water quality issues (e.g., erosion control, hazardous waste, etc.) are addressed through programs other than the TMDL Program.*
- ***Implementation Schedule*** *– BMAP implementation will be a long-term process. While many of the projects and activities contained in the BMAP are recently completed or currently ongoing, key projects*

and studies may extend beyond the first five-year BMAP cycle. Therefore, TMDLs established for the basin will not necessarily be achieved in the near term. Regular follow-up and continued BWG activity will ensure that management actions are carried out and that their incremental effects are assessed. As each five-year basin cycle is completed and more information is gathered, additional management actions to achieve TMDLs will be developed.

Management Action Overview

As part of this BMAP, stakeholders have committed to a wide variety of management actions. Activities fall into several categories, as follows:

- *Public education and outreach,*
- *Wastewater infrastructure management, maintenance, repair, and upgrade (sewer and septic systems),*
- *Stormwater permit program implementation,*
- *Structural stormwater best management practices (BMPs),*
- *Agriculture and silviculture BMPs,*
- *Land acquisition (conservation and BMP),*
- *A fecal coliform bacteria "hot spot" program,*
- *Restoration and water quality improvements, and*
- *Special studies and planning efforts.*

Table 6.1 summarizes which stakeholders are actively involved in particular types of management actions. In addition to these activities, stakeholders are also implementing regulations, policies, and procedures to minimize pollutant loads to impaired waters in the Orange Creek Basin. The *Orange Creek Basin BMAP Supporting Document* contains descriptions of stakeholder programs.

TABLE 6.1. SUMMARY OF ORANGE CREEK BMAP CATEGORIES, BY STAKEHOLDER

Stakeholders	BMAP Management Action Categories									Comments
	Public Education	Wastewater Infrastructure Management (Sewer and Septic Systems)	Stormwater Permit Program	Structural Stormwater BMPs	Agriculture and Silviculture BMPs	Conservation / BMP Land Acquisition	Bacteria "Hot Spot" Program	Restoration and Water Quality Improvement	Special Studies and Planning Actions	
City of Gainesville	*		*	*		*	*	*	*	• Significant investments have been made in stormwater infrastructure maintenance and retrofits • Partner in Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project • Conservation land acquisition • Partner in urban creeks bacteria "hot spots" project
Alachua County	*		*	*		*	*	*	*	• Ambient surface water quality monitoring, citizen complaint response, investigation of illicit discharges, Water Quality Code implementation, Hazardous Materials Management Code (HMMC) implementation, and facility inspections, along with education and outreach activities • Conservation land acquisition • Partner in Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project • Partner in urban creeks bacteria "hot spots" project

TABLE 6.1. (CONTINUED)

Stakeholders	BMAP Management Action Categories									Comments
	Public Education	Wastewater Infrastructure Management (Sewer and Septic Systems)	Stormwater Permit Program	Structural Stormwater BMPs	Agriculture and Silviculture BMPs	Conservation / BMP Land Acquisition	Bacteria "Hot Spot" Program	Restoration and Water Quality Improvement	Special Studies and Planning Actions	
Marion County	*		*	*	*				*	• Marion County Clean Water Program responsible for implementation of public education and outreach activities, investigation of illicit discharges, compliance for construction site runoff, implementation of watershed management plans to identify water quality issues and BMPs to correct those issues, oversee surface water quality monitoring for select waterbodies, and maintain county's drainage retention areas. • Clean Farms Initiative • Marion County aquifer vulnerability study.
Alachua County Health Department	*	* septic systems					*		*	• Investigate failing septic systems and take appropriate corrective actions • Issue new, repair, and modification septic system permits pursuant to Florida Administrative Code or local ordinance • Partner in Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project • Partner in urban creeks bacteria "hot spots" project

TABLE 6.1. (CONTINUED)

Stakeholders	BMAP Management Action Categories									Comments
	Public Education	Wastewater Infrastructure Management (Sewer and Septic Systems)	Stormwater Permit Program	Structural Stormwater BMPs	Agriculture and Silviculture BMPs	Conservation / BMP Land Acquisition	Bacteria "Hot Spot" Program	Restoration and Water Quality Improvement	Special Studies and Planning Actions	
Gainesville Regional Utilities	*	* Sanitary sewer system only					*	*	*	• Sewer line inspections, testing, and repair • Asset management system • New construction review and inspection programs to meet minimum material standards and design criteria • Spill prevention programs • Achieved wastewater delivery efficiency rate (based on volume) approaching 100% • Spill rate, for 2004–07, less than 25% of national average • Initiated comprehensive bacteria source tracking study • Partner in urban creeks bacteria "hot spots" project. Involved in preventive maintenance portions of the project • Partner in Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project
Gainesville Clean Water Partnership *City of Gainesville, Alachua County, and Florida Department of Transportation*	*		*				*		*	• Unique to Orange Creek Basin • Dedicated to working with community for healthy waterways • Provides foundation for public outreach, BMP implementation, facility inspections, and other pollution prevention programs.

TABLE 6.1. (CONTINUED)

Stakeholders	BMAP Management Action Categories									Comments
	Public Education	Wastewater Infrastructure Management (Sewer and Septic Systems)	Stormwater Permit Program	Structural Stormwater BMPs	Agriculture and Silviculture BMPs	Conservation / BMP Land Acquisition	Bacteria "Hot Spot" Program	Restoration and Water Quality Improvement	Special Studies and Planning Actions	
St. Johns River Water Management District	*			*		*			*	• Watershed Action Volunteers (WAV) Program • Conservation land acquisition • PLRG development for Newnans Lake, Lochloosa Lake, and Orange Lake, including major source identification • Partner in Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project
Florida Department of Agriculture and Consumer Services and Private Landowners	*				*					• Container nursery and row crop BMP manuals adopted • Development of additional BMP manuals in progress
Florida Division of Forestry and Private Landowners	*				*					• Silviculture industry has also been proactive in implementation of BMPs on industrial silviculture operations • Significant participation in silviculture BMP program has been achieved
Florida Department of Transportation	*		*	*				*	*	• Extensive stormwater management facilities have been constructed in association with road maintenance activities

TABLE 6.1. (CONTINUED)

Stakeholders	BMAP Management Action Categories									Comments
	Public Education	Wastewater Infrastructure Management (Sewer and Septic Systems)	Stormwater Permit Program	Structural Stormwater BMPs	Agriculture and Silviculture BMPs	Conservation / BMP Land Acquisition	Bacteria "Hot Spot" Program	Restoration and Water Quality Improvement	Special Studies and Planning Actions	
Florida Fish and Wildlife Conservation Commission	*							*		• Aquatic plant management and research on wildlife issues
Florida Department of Environmental Protection	*					*	*	*	*	• Funding support for specific projects • Invasive aquatic plant management • Paynes Prairie Preserve State Park • Partner in urban creeks bacteria "hot spots" project as funding source

Management Actions

Management actions are the activities or projects that BWG members are implementing to reduce pollutant loadings in TMDL waterbodies. **Tables 10.1** through **10.9,** listed below and located at the end of **Section 10.0**, provide details of the management actions proposed by the BWG to address the TMDLs in the basin. Management actions were grouped in a table by category of activity. Within each table, projects are organized by the waterbodies or geographic area to which the management actions apply. The tables include a description of each project, the lead entity/project partners, cost and funding source(s), schedule, and anticipated benefits and load reductions (if known).

Table 10.1A. Structural BMPs—Quantifiable Load Reductions

Table 10.1B. Structural BMPs—Load Reductions Not Currently Quantified

Table 10.2. Agricultural BMPs

Table 10.3. Restoration and Water Quality Improvement Projects

Table 10.4. Regulations, Ordinances, and Guidelines

Table 10.5. Special Studies and Planning Efforts

Table 10.6. Education and Outreach Efforts

Table 10.7. Basic Stormwater Management Program Implementation

Table 10.8. Conservation Land Acquisition / BMP Land Acquisition

Table 10.9. Wastewater Infrastructure Management, Maintenance, Repair, and Upgrade

Where data were available, the tables list the net estimated nutrient load reductions expected from a management action. Only a small number of structural projects were quantifiable. As future management actions are implemented, nutrient load reductions will be quantified to the extent that data are available.

Management actions proposed in this BMAP to decrease fecal coliform loads to urban creeks (e.g., public education regarding pet waste management) are not conducive to quantitative load reduction estimates. As such, the benefits of coliform management actions were largely evaluated on a qualitative basis.

Cost information is provided for each project listed in the tables. Where the cost of a project could not be adequately defined, it is indicated as unavailable in the tables. Costs for some projects may not be fully developed and are currently unknown. Costs for maintenance and operation activities are generally not accounted for on an individual waterbody basis, but rather cover larger areas that include many waterbodies.

Local Initiatives and Programs

Management actions undertaken by local stakeholders in response to the adoption of TMDLs included both new projects or activities or expansion or revision of existing programs or projects.

BWG members added new projects or programs to better address the understanding of water quality impairments or improvements in water quality required by the TMDLs (**Table 6.2**). Studies undertaken by DEP to investigate the influence of ground water inputs into Orange Lake, Newnans Lake, and Lochloosa Lake, the fecal coliform bacteria hot spot initiative, and investigations by the ACHD into the contributions from OSTDSs in Tumblin Creek, Sweetwater Branch, and Hogtown Creek were the direct result of the adoption of TMDLs. The Alachua Sink TMDL generated a number of studies that addressed the feasibility of restoring Paynes Prairies wetlands by returning sheetflow across the Prairie rather than discharge of water from Sweetwater Branch into Alachua Sink.

Many of the projects that members of the BWG identified for incorporation in the BMAP were part of existing programs but were expanded in scope to help address the TMDLs (**Table 6.3**). Water quality monitoring efforts were expanded to aid TMDL development. The SJRWMD's development of PLRGs for the lakes and more detailed nutrient source identification were expanded in effort as a result of the TMDLs. MST activities and additional bacterial monitoring performed by GRU and Alachua County were expanded to support TMDL implementation.

TABLE 6.2. NEW PROJECTS PROPOSED BY BWG MEMBERS THAT ADDRESS TMDLS

Project Number – Project Name	WBID / Waterbody Name	Lead Entity	Management Category	Project Number – Project Name	WBID / Waterbody Name	Lead Entity	Management Category
HOG15 - Evaluation of Residential Septic Systems along Hogtown and Possum Creeks	2698 / Hogtown Creek	ACHD, Environmental Health Section	Special Studies and Planning Efforts	OCB01 - Community Based Social Marketing Workshop	Hydrologic Unit Code (HUC) 03080102 / Orange Creek Basin	Sustainable Alachua County; DEP; City of Gainesville; Alachua County	Special Studies and Planning Efforts
WAU01 - Evaluation of Septic Systems Surrounding Lake Wauberg	2741 / Lake Wauberg	ACHD, Environmental Health Section	Special Studies and Planning Efforts	NEW08 - Ground Water–Surface Water Interaction Study, Newnans Lake	Newnans Lake / 2705B	DEP	Special Studies and Planning Efforts
LOCH07 - Ground Water – Surface Water Interaction Study Lochloosa Lake Area, Alachua and Marion Counties, Florida	2749; 2738A / Orange Lake; Lochloosa Lake	DEP	Special Studies and Planning Efforts	BACTERIA16 - Evaluation of Fecal Coliform Bacteria "Hot Spots" in Gainesville Urban Creeks	2718A; 2711; 2698 / Tumblin Creek; Sweetwater Branch; Hogtown Creek	DEP; ACEPD; City of Gainesville Public Works; GRU; ACHD	Special Studies and Planning Efforts
S04 - Expanded Nutrient Monitoring Alachua Sink /	Alachua Sink / 2720A	Alachua County Environmental Protection Department (ACEPD) / --	Special Studies and Planning Efforts	AS13 - Gainesville Regional Utilities Reclaimed Water Master Plan /	Alachua Sink / 2720A	GRU / --	Special Studies and Planning Efforts

TABLE 6.2. (CONTINUED)

Project Number – Project Name	WBID / Waterbody Name	Lead Entity	Management Category	Project Number – Project Name	WBID / Waterbody Name	Lead Entity	Management Category
AS05 - Feasibility Analysis of Sweetwater Branch Sheetflow Restoration Project at Paynes Prairie Preserve State Park, Alachua County, Florida /	Alachua Sink / 2720A	City of Gainesville Public Works and GRU / DEP Parks and Recreation	Special Studies and Planning Efforts	AS15 - Paynes Prairie Sheetflow Restoration Conceptual Plan /	Alachua Sink / 2720A	City of Gainesville, GRU / DEP Division of Parks and Recreation; SJRWMD	Special Studies and Planning Efforts
AS11 - Alachua Sink Intensive Study and Main Street Water Reclamation Facility (WRF) Water Reuse Feasibility /	Alachua Sink / 2720A	GRU / --	Special Studies and Planning Efforts	AS16 - Paynes Prairie Sheetflow Restoration Evaluation of Main Street WRF Upgrades	Alachua Sink / 2720A	GRU / --	Special Studies and Planning Efforts

TABLE 6.3. PROJECTS PROPOSED BY BWG MEMBERS THAT WERE ENHANCED TO ADDRESS TMDLS

Project Number – Project Name	WBID / Waterbody Name	Lead Entity / Project Partners	Management Category
AS04 - Expanded Nutrient Monitoring Alachua Sink	2720A / Alachua Sink	ACEPD	Special Studies and Planning Efforts
HAT01 - Expanded Coliform and Iron Monitoring	2688 / Hatchet Creek	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	Special Studies and Planning Efforts
OR06 - Equine BMPs	2749; 2738A; 2754; 2705B / Orange Lake; Newnans Lake; Lochloosa Lake; Cross Creek	DACS' Office of Agricultural Water Policy (OAWP) / Private landowners	Agriculture BMPs
NUTRIENT06 - Cow/Calf BMPs	2749; 2738A; 2754; 2705B / Orange Lake; Newnans Lake; Lochloosa Lake; Cross Creek	DACS' OAWP / Private landowners	Agriculture BMPs
NUTRIENT03 - Silviculture BMP Implementation and Compliance	2749; 2738A; 2754; 2705B / Orange Lake; Newnans Lake; Lochloosa Lake; Cross Creek	DACS' Division of Forestry / SJRWMD; Private landowners	Agriculture BMPs
SWT18 - Expanded Nutrient Monitoring Sweetwater Branch	2711 / Sweetwater Branch	ACEPD	Special Studies and Planning Efforts
BACTERIA02 - Fecal Coliform Source Assessment	2718A; 2711 / Tumblin Creek; Sweetwater Branch; Hogtown Creek ; 2698 /	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	Special Studies and Planning Efforts
BACTERIA03 - Coliform Wet and Dry Season Assessment	2718A; 2711; 2698 / Tumblin Creek; Sweetwater Branch; Hogtown Creek	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	Special Studies and Planning Efforts
BACTERIA04 - Expanded Fecal Coliform Bacteria Monitoring	2718A; 2711; 2698 / Tumblin Creek; Sweetwater Branch; Hogtown Creek	ACEPD	Special Studies and Planning Efforts
BACTERIA06 - Optical Brighteners	2718A; 2711; 2698 Tumblin Creek; Sweetwater Branch; Hogtown Creek /	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	Special Studies and Planning Efforts

TABLE 6.3. (CONTINUED)

Project Number – Project Name	WBID / Waterbody Name	Lead Entity / Project Partners	Management Category
NEW10 – Spatial Nutrient Loading Dynamics in the Newnans Lake Watershed	2688; 2705B; 2728 / Newnans Lake	SJRWMD	Special Studies and Planning Efforts
LOCH01 – Development of Pollutant Load Reduction Goals (PLRGs) for Lochloosa Lake	2738A; 2754 / Lochloosa Lake; Cross Creek	SJRWMD	Special Studies and Planning Efforts
ORO01 – Development of Pollutant Load Reduction Goals (PLRGs) for Orange Lake	2749 / Orange Lake	SJRWMD	Special Studies and Planning Efforts
NEW01 – Development of Pollutant Load Reduction Goals (PLRGs) for Newnans Lake	2705B / Newnans Lake	SJRWMD	Special Studies and Planning Efforts
NEW09 – Nutrient Loading Estimation during Storm Event	2688; 2705B; 2728 / Newnans Lake; Lochloosa Lake	SJRWMD	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	2698; 2711; 2718A; 2695; 2688; 2709 / Hogtown Creek; Tumblin Creek; Sweetwater Branch; Little Hatchet Creek; Hatchet Creek; and Lake Forest Creek	DOT, District 2, Alachua County and ACEPD, City of Gainesville, (Gainesville Clean Water Partnership)	Special Studies and Planning Efforts
BACTERIA05 - Microbial Source Tracking Study	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU	Special Studies and Planning Efforts

Agricultural and forestry BMPs are developed for statewide implementation. However, as a result of the adoption of TMDLs, DACS is strengthening programs that educate private landowners about BMPs, assist them with implementation, and verify their compliance. DACS has BMP projects and programs in place to address current and future agricultural loadings to impaired waters. In cooperation with local agricultural operators, these programs will help decrease nutrient loads from agricultural activities in the basin. Specific management actions for impaired waters are described in the *Orange Creek BMAP Supporting Document*.

To meet the intent of the FWRA with regard to agriculture, DACS' OAWP will adopt BMP manuals for cow/calf, equine, and sod operations. OAWP staff will focus efforts on enrolling cow/calf and equine producers to implement BMPs and will provide educational, cost-share, and technical assistance to producers as funding allows. The OAWP will work with DEP to verify the effectiveness of priority cow/calf and equine BMPs.

DACS' Division of Forestry will continue to implement the Silviculture BMP Program, including outreach for nonindustrial silviculture landowners, and other educational efforts. Most of the commercial silviculture acreage in the basin is managed by large industrial operators, all of whom participate in the Division of Forestry BMP implementation program. These BMPs establish minimum standards for protecting and maintaining water quality and wildlife habitat during forestry activities and were adopted as rule under Section 51-6.002, F.A.C. The Division of Forestry routinely performs biennial compliance inspections of BMPs. As part of this BMAP, the inspection rate in the basin was increased to annually.

Local governments also implement operation and maintenance programs to promote long-term infrastructure function and integrity. Examples are provided in the following paragraphs.

GRU wastewater collection system operations and maintenance costs were $1.82 million for fiscal year (FY) 2007. This expenditure funds the following types of activities:

- *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.*

Through its operation and maintenance activities, GRU has achieved a wastewater delivery efficiency rate (based on volume) approaching 100%, and for the 2004–07 period maintained a spill rate of less than 25% of the national average. These are significant achievements that benefit all waterbodies within the GRU service area.

Alachua County, Marion County, the City of Gainesville, University of Florida (UF), and DOT have routine operations and maintenance programs that manage pollutant loads through pollution prevention activities. Regular street sweeping to remove dirt and debris and the maintenance of swales are examples of pollution prevention activities practiced by local governments. Many of their activities are covered under MS4 NPDES stormwater permits and at a minimum cover the detection and elimination of illicit discharges; construction site sediment and erosion control; post construction runoff control; pollution prevention/good housekeeping; and public education, outreach, and participation.

Alachua County and the City of Gainesville have developed BMPs for municipal good-housekeeping activities, including street cleaning, hazardous materials storage, fleet management, and stormwater collection system cleaning. **Table 10.7** provides more complete project descriptions.

The ACHD permits the installation and repair of septic systems. After the ACHD has approved a septic system, the property owner is responsible for maintaining it. The ACHD has statutory authority to enforce corrective actions on failing or improperly maintained septic systems.

Additional information about local government operation and maintenance programs may also be obtained from the *Orange Creek Basin BMAP Supporting Document*.

Managing Pollutant Loads from Future Growth

As required by the FWRA, nutrient and fecal coliform loadings associated with future growth were considered as part of the BMAP. These estimates were based on anticipated population growth in the basin obtained from U.S. Census Bureau data gathered and evaluated through the BMAP process. Basinwide, future growth predicted through 2015 is not expected to substantially increase pollutant loads. However, emerging growth patterns in East Gainesville, particularly the Newnans Lake sub-basin, indicate that Census predictions may not adequately reflect the changes in land use that could occur in that area or other localized parts of the basin. There are programs in place to ensure that the possible effects are reduced, but extra caution in future permitting may be needed in specific locations within the basin.

The management actions considered by stakeholders include a number of activities that proactively address pollutant loadings from new development (or redevelopment) through regulations, ordinances, or guidelines. The application of Low Impact Development (LID) principles is a key management action being advanced and used by stakeholders to offset the effects of future growth. LID is an approach to land development that uses various land planning and design practices and technologies to simultaneously protect natural resource systems and reduce infrastructure costs. Key LID principles include the following:

- *Incorporation of small-scale stormwater treatment systems integrated at the lot level,*
- *Increased infiltration,*
- *Reduction of impervious surfaces,*
- *Preservation/protection of environmentally sensitive features, and*
- *Use of multiple strategies (i.e., treatment train).*

Innovative stormwater management strategies are a significant component of LID. The basic concept is to manage runoff at the source with decentralized techniques that replicate a site's predevelopment hydrology. These design techniques infiltrate, filter, store, evaporate, and detain runoff close to its source. LID is a versatile approach that can be applied to new development, urban retrofits, and redevelopment/revitalization projects. **Table 6.4** lists local examples.

Key components that are part of LID design are as follows:

- *Site design (clustering, decreasing impervious surfaces, disconnected impervious areas),*
- *Swales and filter strips,*
- *Porous pavements,*
- *Green roofs,*
- *Bioretention areas (i.e., rain gardens),*
- *Florida-Friendly Landscaping (including local Florida Yards & Neighborhoods workshops and outreach programs),*
- *Buffers, and*
- *Education and outreach (e.g., Marion County LID Workshop on April 5, 2007; Alachua County's LID and the Benefit to Water Quality Workshop on March 22, 2007).*

TABLE 6.4. LOCAL LID EXAMPLES IN THE ORANGE CREEK BASIN

Site/Development	Location	LID Techniques
Madera	Idyllwild Seronola Area, SW Williston Road	Swales, no curbs, narrow roads, limited land clearing, native vegetated landscapes, use of natural drainage, green construction materials
Hillside Villas	SW Hawthorne Road	Exfiltration vault under volleyball court
UF Buildings: Mary Ann Cofrin-Harn Pavilion UF Orthopedics Surgery & Sports Medicine Institute Rinker Hall	UF Campus	Roof runoff directed to cisterns for storage and slow ground water recharge, native vegetation used for landscaping, and other practices.
Residence Inn	SW 40th Boulevard (east of I-75 and north of Archer Road)	Exfiltration vaults (Atlantis Rain tank) under parking area to supplement stormwater basin as open space
Comfort Suites	Idylwild/Serenola SAS, SW 13th Street north of Williston Road	Exfiltration vaults (Atlantis Rain tank) under parking area

A number of other LID projects have been completed in the basin. Stakeholders intend to continue promoting LID principles, programs, and incentives to limit the pollutant loads associated with new development.

Waterbody Assessments

The next section is organized around the eight impaired waterbodies in the basin. For each waterbody there is a brief overview of the location and hydrology; the sources of pollutant loadings; the completed, ongoing, or planned management actions; key unknowns and future studies; and anticipated results from management actions. The urban creeks are discussed first, followed by Alachua Sink and the three lakes (Newnans, Wauberg, and Orange).

Urban Creeks (Hogtown and Tumblin; Sweetwater Branch)

Three creeks within the Orange Creek Basin are designated by DEP as impaired waters—Hogtown and Tumblin Creeks and Sweetwater Branch—due to high levels of fecal coliform bacteria. Due to the similarities in coliform bacteria sources and management actions, these three urban creeks are discussed as a group in the next section.

Hogtown and Tumblin Creeks and Sweetwater Branch

Parameter Causing Impairment: Fecal Coliform

Hogtown Creek is approximately 5.7 miles long and is located in the City of Gainesville (central Alachua County). It receives stormwater runoff from the City of Gainesville, which it discharges to the Floridan aquifer through Haile Sink.

Approximately 65% of the land use in the Hogtown Creek watershed and surrounding Hogtown Prairie is characterized as low-density residential, 15% is commercial, and the remaining 20% is divided between mixed hardwood forest, forested wetlands, silvicultural, agricultural, and institutional uses (ACEPD, 2004).

Tumblin Creek, also located in the City of Gainesville, is approximately 2.3 miles long. The creek flows to Bivens Arm Lake, whose outflow then travels to Paynes Prairie, where it enters the Floridan aquifer via the Primary Sink Feature adjacent to Alachua Sink. The Tumblin Creek watershed encompasses about 3.8 square miles of urban Gainesville. CH2M HILL (1985) reported 60% of this area to be impervious. The sub-basin is highly urbanized, except for the Bivens Arm floodplain, including some areas of development directly along the creek.

Sweetwater Branch is an urban creek that flows through the City of Gainesville. Its watershed is mainly contained within the city limits. Approximately 2.8 miles long, it drains 3.3 square miles and is one of the smaller creeks in the Orange Creek Basin. It flows into Paynes Prairie Preserve State Park and ultimately discharges to the Floridan aquifer via the Primary Sink Feature adjacent to Alachua Sink. GRU's Main Street WRF is the only permitted domestic wastewater discharge to Sweetwater Branch, and GRU's J.R. Kelly Generating Station is the only permitted industrial wastewater facility.

Census data gathered and evaluated through the BMAP process indicate that future growth predicted through 2015 is not expected to substantially increase pollutant loads in the Hogtown, Sweetwater, and Tumblin sub-basins.

Pollutant Sources and Management Actions

Elevated coliform counts are regularly observed in all three creeks throughout the year. Compared with the state standard of 800 counts/100mL, Tumblin Creek exceeded the standard 75% of the time; Sweetwater, 48%; and Hogtown, 89% (Shelley and Magley, 2003; Burger and Magley, 2003). Potential sources of fecal coliform bacteria detected in the streams may come from many different places, including failing septic systems, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, runoff from the improper disposal of waste material, stormwater from developed areas, domestic pet waste, homeless populations, and wildlife populations. The secondary growth of coliform bacteria in stormwater systems and creek sediments may also contribute to persistent elevated fecal coliform levels. Current data shows that wastewater discharged from the Main Street WRF is not a significant source of fecal coliform bacteria. Additional studies are ongoing or are planned to continue to identify sources of fecal coliform bacteria. The source is important as it dictates the most effective management action to use.

Significant resources have been dedicated to identifying sources and reducing bacteria levels in the urban creeks. GRU and the ACEPD undertook several MST and optical brightener studies in an effort to better define the physical extent of the fecal coliform bacteria problem and identify potential sources. These studies were not conclusive in identifying the relative magnitude or specific location of bacteria sources throughout the urban creeks, but did provide adequate information to locate areas with consistently high fecal coliform counts and the presence or absence of human bacteria sources. The ACHD identified septic systems on properties adjacent to the creeks that potentially could contribute fecal coliform bacteria loading to the creeks.

The BWG has completed or plans to implement a number of different management actions to reduce or manage the sources of fecal coliform bacteria to the urban creeks (**Tables 6.5** and **6.6**). **Tables 10.1 through 10.9** in **Section 10.0** provide details on all projects, including the lead entity, project partners, cost and funding source(s), schedule, and anticipated benefits and load reductions (if known).

Given the uncertainties inherent in addressing elevated fecal coliform levels, a combination of source prevention and additional data-gathering efforts is being taken under a phased approach to address coliform reductions. The basic approach is as follows:

- *Existing monitoring data and source identification projects were used to identify "hot spots."*
- *Primary fecal coliform sources will be investigated in each of these hot spots through the coordinated effort of Alachua County, GRU, the City of Gainesville, DOT, DEP, ACHD, and local residents to address all controllable sources of fecal coliform in one location in a short time before moving onto another priority area.*
- *At the same time, individual fecal coliform load management projects will continue to be implemented. Examples are wastewater infrastructure maintenance and MS4 permit requirements for identifying illicit discharges.*
- *Fecal coliform monitoring will continue to be used to help assess progress and guide the selection of future management actions.*

TABLE 6.5. COMPLETED AND PLANNED PROJECTS TO REDUCE FECAL COLIFORM BACTERIA LEVELS IN URBAN CREEKS AND PREVENT FUTURE DISCHARGES

Fecal Coliform Bacteria Source	Management Action Category	Anticipated Results	Comments
Failing septic systems	Special Studies and Planning Actions	Identify priority locations for on-site wastewater rehabilitation.	Example: ACHD septic system evaluation.
	Public Education and Outreach	Increase rate of septic tank clean-out and maintenance.	Public education on proper septic tank management can lead to significant benefits in management of overflows and leaking tanks.
Leaks and overflows from sanitary sewer systems	Wastewater Infrastructure Management, Maintenance, Repair, or Upgrade	Inspect and rehabilitate infrastructure to minimize the possibility of discharges into urban creeks.	GRU has achieved a wastewater delivery efficiency rate (based on volume) approaching 100% and has maintained a spill rate of less than 25% of the national average (2004–07).
	Cooperative Fecal Coliform Bacteria "Hot Spot" Project	Decrease fecal coliform levels and increase pollution prevention activities in priority creeks.	Unique, cooperative effort of Alachua County, City of Gainesville, GRU, DOT, and DEP that focuses on evaluation and remediation of locations with frequent high bacteria counts.
Illicit discharges of sanitary waste	Special Studies and Planning Actions	Help identify location of illicit discharges and evaluate identification methods.	Example: Optical brighteners study.
	Basic Stormwater Management – Stormwater Permit Program Implementation	Reduce nutrient loadings.	Includes education and outreach and other components of MS4 program implementation.
	Cooperative Fecal Coliform Bacteria "Hot Spot" Project	Decrease fecal coliform levels and increase pollution prevention activities in priority creeks.	Unique, cooperative effort of Alachua County, City of Gainesville, GRU, DOT, and DEP that focuses on evaluation and remediation of locations with frequent high bacteria counts.
Stormwater from developed areas	Basic Stormwater Management – Stormwater Permit Program Implementation	Reduce nutrient loadings.	Includes education and outreach and other components of MS4 program implementation.
	Structural Stormwater BMPs	Reduce fecal coliform levels in stormwater.	Example: 39th Avenue basin rehabilitation, hydrodynamic separators, Spring Hill Stormwater Park.
	Special Studies and Planning Actions	Evaluate technologies to decrease stormwater fecal coliform levels to support better future decision making.	Example: Inlet protection pilot project, Tumblin Creek Watershed Management Plan update.

TABLE 6.5. (CONTINUED)

Fecal Coliform Bacteria Source	Management Action Category	Anticipated Results	Comments
Domestic pets	Basic Stormwater Management – Stormwater Permit Program Implementation	Reduce nutrient loadings.	Includes education and outreach and other components of MS4 Program implementation.
	Public Outreach and Education	Increase rate of pet waste cleanup.	Focused public outreach effort regarding dog waste.
Wildlife	Restoration and Water Quality Improvement	Decrease direct discharge of fecal coliform to Sweetwater Branch.	Example: Duck pond restoration.

TABLE 6.6. SUMMARY OF MANAGEMENT ACTIONS TO REDUCE FECAL COLIFORM BACTERIA IN SPECIFIC URBAN CREEKS

Management Action Category	Hatchet Creek	Hogtown Creek	Tumblin Creek	Sweetwater Branch
Structural Stormwater BMPs	Not applicable	Yes	Yes	Yes
Restoration and Water Quality Improvement Projects	Not applicable	Yes	Not applicable	Yes
Special Studies and Planning Efforts	Yes	Yes	Yes	Yes
Public Education and Outreach	Yes	Yes	Yes	Yes
Basic Stormwater Management – Stormwater Permit Program Implementation	Yes	Yes	Yes	Yes
Wastewater Infrastructure Management, Maintenance, Repair, or Upgrade	Not applicable	Yes	Yes	Yes

Through this approach, Orange Creek Basin stakeholders are using the best information available from their source identification activities (e.g., the MST projects) to identify priority areas. In these priority areas, stakeholders are using a comprehensive approach to address known sources of fecal coliform. Uncertainties regarding precise sources remain to be resolved. However, commitments made to individual projects and the cooperative "hot spot"

project, are anticipated to lead to decreased fecal coliform levels in the urban creeks. Upon the completion of these projects, the ongoing water quality monitoring results will be evaluated to identify the benefits achieved by these projects and guide the selection of future projects.

Key Unknowns and Future Studies

The are a number of unknowns in identifying or better understanding the relative magnitude of different sources of fecal coliform bacteria and the extent to which the regrowth of bacteria occurs in creek sediments. A number of future studies have been identified to improve the scientific understanding of fecal coliform loadings that will lead to additional management actions. The ability to apply advanced scientific methods to accurately distinguish between sources of fecal coliform in the urban creeks will be critical to developing appropriate management strategies and measuring progress for meeting the TMDLs in each creek. However, until these advanced methods become more cost-effective, local stakeholders will continue to develop management strategies using a blend of conventional testing data and advanced source tracking information. Federal, state, and local support of the research and development of cost-effective advanced MST methods will benefit all stakeholders in reducing coliform levels in Gainesville's urban creeks.

Anticipated Results from Management Actions

Extensive management actions have been completed, are under way, and are planned for the future to decrease fecal coliform loads into Tumblin Creek, Sweetwater Branch, and Hogtown Creek. **Tables 6.5** and **6.6** summarize these efforts. Through these efforts, the BWG anticipates that fecal coliform loads in the urban creeks will decrease over time. Given the often erratic behavior of fecal coliform bacteria in the environment, the detailed quantification of load reductions is not possible at this time. However, the BWG will continue to evaluate fecal coliform levels in the streams to track progress. Depending on the results achieved through the implementation of the management actions described above, an approach such as the cooperative fecal coliform reduction "hot spot" project may be expanded to other parts of the watershed dependent on the availability of funding. This adaptive management approach will be used for the evaluation and selection of additional management actions in future iterations of the BMAP.

Alachua Sink

Parameter Causing Impairment: TN

Alachua Sink (WBID 2720A) is located on the northern edge of Paynes Prairie, south of the City of Gainesville and approximately 2.5 miles east of U.S. Highway 441. It consists of a small lake, with a corresponding solution sink that recharges the Floridan aquifer. Alachua Sink has a surface area of about 13.5 acres and a mean depth of around 1 meter.

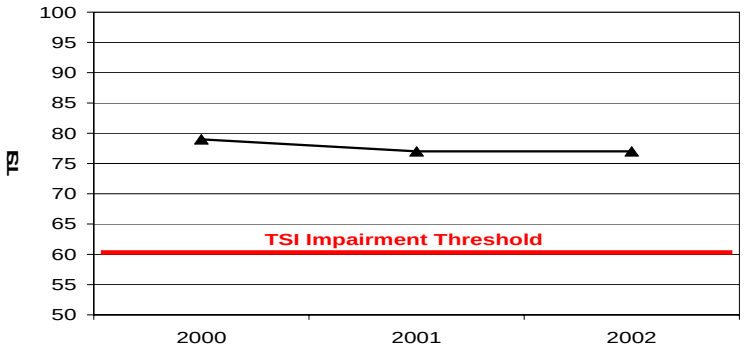
Alachua Sink, Alachua Lake, and Paynes Prairie are part of a dynamic system where major changes in hydrology are observed in periods of extreme wet and dry conditions. Alachua Lake is the inundated portion of Paynes Prairie. Alachua Sink and Alachua Lake are separate waterbodies during periods of average, drought, and/or low rainfall. In wet years, the entire prairie is sometimes flooded, and the two waterbodies coalesce. Alachua Lake periodically refloods such that Alachua sink and Alachua Lake are one waterbody. Such events occurred in 1998 and again in 2004-2005(or 2006?) (J. Weimer, 2006).

The surrounding drainage basin for Alachua Sink is approximately 2,758 acres. There are 2 well-defined inflows into Alachua Sink: Sweetwater Branch and a canal that connects Alachua Lake to Alachua Sink (a combined drainage area of 39,373 acres). Presumably, any runoff coming into Paynes Prairie that does not sink into the ground is incorporated into Alachua Lake, and some portion is shunted to Alachua Sink during high-water conditions. The Alachua Sink waterbody has an outlet stream that discharges to the primary sinkhole.

Sources of surface flow into Paynes Prairie include Sweetwater Branch and Prairie Creek (which discharges from Newnans Lake). About 45% of the flow (as a long-term average) from Newnans Lake flows south into Paynes Prairie through 3 large culverts. The remainder flows south towards Orange Lake by way of Camps Canal and the River Styx swamp (Robinson, 1992). Medium-density residential, forest, and water/wetland areas are the primary land use types in the full watershed (including the Sweetwater and Alachua Lake watersheds). The land area that drains directly to Alachua Sink is 51% forest and 43% water/wetland. Significant land use changes and population growth are not anticipated in the Alachua Sink watershed in the next 5 to 10 years.

There are three point sources in the watershed: the Main Street Domestic WRF, the John R. Kelly Generating Station, and the City of Gainesville MS4. The Main Street WRF is an advanced, tertiary-level, activated sludge domestic wastewater treatment facility that discharges treated wastewater to Sweetwater Branch. The John R. Kelly Generating Station discharges cooling tower water and small volume of industrial wastewater into Sweetwater Branch. The City of Gainesville's MS4 drains contributing urbanized areas of Sweetwater Branch. Other nonpoint sources to Sweetwater Branch, and ultimately Alachua Sink, include stormwater from the eastern portions of Gainesville.

Alachua Sink is verified as impaired for nutrients, based on Trophic State Index (TSI) values well above the threshold of 60 (see **Figure 6.1**). Lakes with a TSI value above 60 are considered to have poor water quality. Based on phytoplankton communities and the TN/TP ratio, Alachua Sink is considered nitrogen limited, meaning that the amount of nitrogen governs the growth of phytoplankton. Thus, the TMDL for Alachua Sink was expressed in terms of TN reductions to achieve water quality standards.

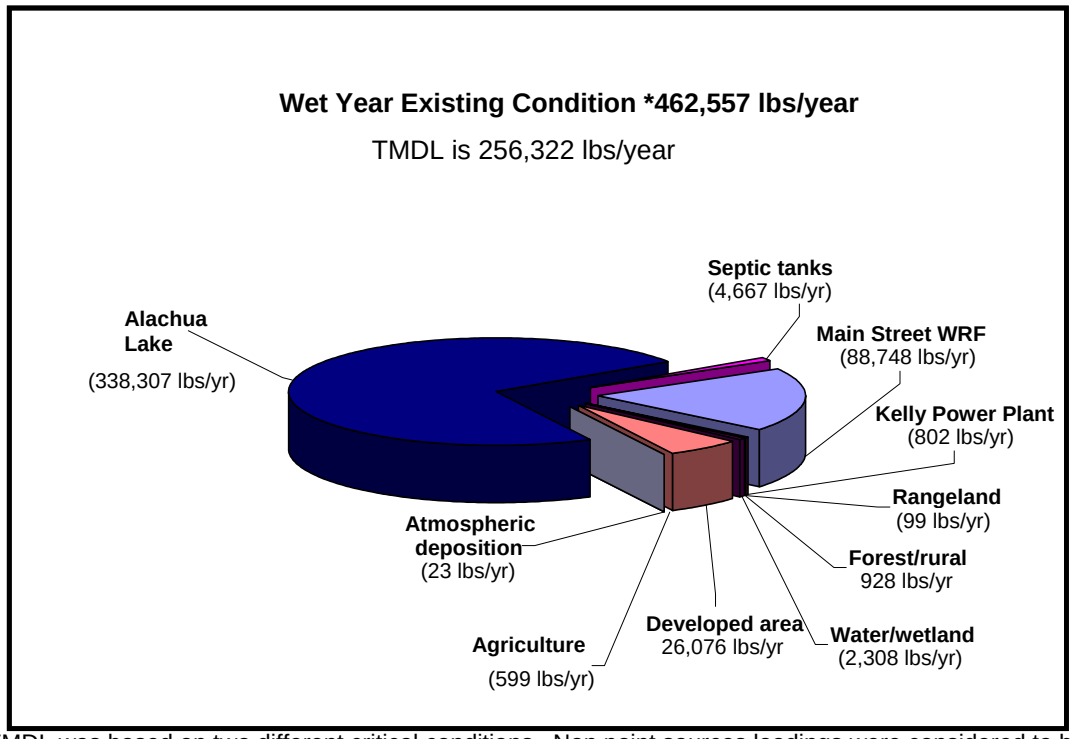


Source: Gao et al., 2006, Table 1.

FIGURE 6.1. ALACHUA SINK TSI VALUES, 2000–02

Pollutant Sources and Management Actions

The Alachua Sink TMDL point and nonpoint source loadings are allocated based on wet and dry year conditions. Wet years are the critical condition when non point source impacts are the greatest, while in dry years the greatest source of nutrients is point sources. Alachua Lake and the Main Street WRF are the major nonpoint and point sources of nutrient loading to Alachua Sink. **Figure 6.2** shows that the nutrient load from the Alachua Lake watershed is the largest single nutrient source, contributing 73.1% of the TN loading for wet years. Nutrient sources to Alachua Lake include stormwater runoff into the Paynes Prairie Basin and nutrients from Newnans Lake, which are transported via Prairie Creek. The second largest source (19.1%) is the point source discharge from the Main Street WRF. The plant discharges treated wastewater to Sweetwater Branch, which enters Alachua Sink through Paynes Prairie via the Sweetwater Canal. Sweetwater Branch also conveys stormwater to Alachua Sink from portions of the urban watershed of east Gainesville, much of which was developed prior to the implementation of current stormwater regulations. Nonpoint source stormwater from these urbanized areas accounts for 5.6% of TN inputs to Alachua Sink. Various other identified sources contribute the remaining TN loading.



* The TMDL was based on two different critical conditions. Non point sources loadings were considered to be at their highest during wet years. Dry years are the critical condition for point sources.

FIGURE 6.2. WET YEAR BASELINE TN LOADING TO ALACHUA SINK

The BWG has completed or plans to implement a number of management actions to reduce or manage the sources of TN to Alachua Sink (**Table 6.7**). **Tables 10.1** through **10.9** provide details on all projects, including the lead entity/project partners, cost and funding source(s), schedule, and anticipated benefits and load reductions (if known).

The Paynes Prairie Sheetflow Restoration Project has the potential to become the most significant project designed to address the Alachua Sink TMDL. To date, a conceptual plan has been developed, and a feasibility analysis of restoring sheetflow to Sweetwater Branch and Paynes Prairie (Project # AS05) and the *Paynes Prairie Sheetflow Restoration Conceptual Plan* (Project # AS15) have been completed. Additional studies were performed to evaluate treatment upgrades needed at the Main Street WRF (Project # AS16) and opportunities for using treated wastewater from that plant for reuse. Details about these projects are contained in **Table 10.5**. Gainesville's City Commission has authorized staff to begin the process of selecting a consultant to obtain professional design services and develop the necessary interagency agreements needed for land acquisition and cost sharing.

Other activities that will benefit Alachua Sink include improved stormwater management in the Sweetwater Branch watershed, 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 also offer some opportunities for loading reduction.

TABLE 6.7. COMPLETED AND PLANNED PROJECTS TO REDUCE TOTAL NITROGEN TO ALACHUA SINK

Nutrient Source	Management Action Category	Anticipated Results	Comments
Stormwater from developed areas (including nutrient load in Alachua Lake)	Restoration and Water Quality Improvement	Reduce TN loadings through nutrient uptake and attenuation.	Sweetwater Branch/Paynes Prairie Sheetflow Restoration Project.
	Conservation Land Acquisition	Minimize future loading increases by controlling future land development.	Example: Sweetwater Preserve.
	Structural Stormwater BMPs	Reduce TN loadings.	Example: Hydrodynamic separators.
	Special Studies and Planning Efforts	• Improve scientific understanding of nutrient loadings due to recycling. • Improve understanding of ground water nutrient inputs.	Not applicable
	Basic Stormwater Management – Stormwater Permit Program Implementation	Reduce nutrient loadings.	Includes education and outreach and other components of MS4 Program implementation.
Main Street WRF	Wastewater Infrastructure Management, Maintenance, Repair, or Upgrade	Inspect and rehabilitate infrastructure to decrease the possibility of wastewater exfiltration and spills.	GRU has achieved a wastewater delivery efficiency rate (based on volume) approaching 100% and has maintained a spill rate of less than 25% of the national average (2004–07).
	Special Studies and Planning Efforts	• Facilitate use of reclaimed water to minimize discharges to Sweetwater Branch. • Improve scientific understanding of nutrient loadings due to recycling. • Improve understanding of ground water nutrient inputs.	• Intensive Water Quality Study of Alachua Sink; Reclaimed Water Master Plan. • Feasibility Analysis of Sweetwater Branch/Paynes Prairie Sheetlfow Restoration Project Conceptual Plan for Sweetwater. Branch/Paynes Prairie Sheetfow Restoration Project.
Atmospheric deposition	None	Not applicable	Considered an uncontrollable source.

The City of Gainesville has 3 stormwater retrofits that have been completed or are near completion in the Sweetwater Branch and Tumblin Creek watersheds. Together, the Depot Avenue Stormwater Park, Spring Hill Stormwater Park, and SW 5th Avenue Basin will reduce TN loading by more than 880 lbs/yr when fully operational. Additional projects are planned that will provide further reduction of TN loading. The city has also installed hydrodynamic separator units at different locations within the Sweetwater Branch watershed. The units prevent sediment and trash from entering Sweetwater Branch and may also provide some nutrient

reduction, though that reduction is currently not quantified. Details about these projects are provided in **Table 10.1B**.

Key Unknowns and Future Studies

There is a lack of a detailed understanding of Alachua Sink's hydrodynamics and response to nutrient inputs. Hydrologic variation in Alachua Lake may affect TN and TP concentrations in the water column of Alachua Sink and Alachua Lake, through the oxidation of exposed sediment during periods of low water and the resuspension of this material during high lake stage. Nitrogen fixation studies being conducted by SJRWMD on two lakes in central Florida may provide insight into the nitrogen fixation processes in Alachua Sink. Nutrient loads also enter Alachua Lake and ultimately Alachua Sink from Newnans Lake. The achievement of TMDL reductions upstream in the Newnans Lake watershed may reduce nutrient levels in Alachua Sink through hydrologic connection between Newnans Lake and Paynes Prairie.

Anticipated Results of Management Actions

The BWG will work toward improvements in TSI values by implementing management actions in the Alachua Sink watershed. At this time, the completion of the Sweetwater Branch/Paynes Prairie Sheetflow Restoration project will meet the TN load reductions contributed by point sources identified in the TMDL for Alachua Sink. However, achieving this project will require completing the necessary land acquisition and project design before full implementation. The cost of this project is substantial and dependent on available funding; thus the City of Gainesville is seeking potential grant opportunities or other intergovernmental cost-sharing options.

Newnans Lake

Parameters Causing Impairment: TN, TP

Newnans Lake is located in a topographical region of the state known as the Central Lowlands. The geology of the area is dominated by the Hawthorn Group, which is relatively impermeable and acts as a confining layer separating surface water from the influence of the Floridan aquifer. This geologic formation is also rich in phosphatic clays.

The lake is a shallow basin lake that covers 6,399 acres at median stage and naturally fluctuates between 4,730 and 8,087 acres during drought and heavy rainfall, respectively. The maximum depth is no more than 12 feet, and the mean depth is approximately 5 feet.

The lake's single major surface water outlet is Prairie Creek. Once water leaves the lake, about 45% of the flow (long-term average) goes to the south into Paynes Prairie through 3 large culverts. The remainder flows south towards Orange Lake by way of Camps Canal and the River Styx swamp (Robinson, 1992).

A large drainage area north and west of the lake supplies inflow via 3 streams: Hatchet Creek, Little Hatchet Creek, and Lake Forest Creek. The headwater for Lake Forest Creek is located in eastern Gainesville and enters Newnans Lake from the west side of the lake. Hatchet Creek has the greatest flow to the lake. Hatchet Creek and Little Hatchet Creek are "blackwater" streams with naturally high color and frequently have high levels of TN. The Hatchet Creek watershed is approximately 64% natural forest and rural open land uses, with about 50% of the acreage in silviculture.

High iron concentrations are found in Hatchet Creek. Based on the information collected thus far, the iron present in Hatchet Creek is believed to be naturally occurring and does not negatively impact the Hatchet Creek watershed aquatic ecosystem. This naturally occurring iron concentration is not a controllable source.

Census data gathered and evaluated through the BMAP process predicted that future growth through 2015 was not expected to substantially increase pollutant loads in the sub-basin. However, emerging growth patterns, particularly for the Hatchet and Little Hatchet Creek watersheds, indicate that Census predictions may not adequately reflect the changes in land use that could occur. It is uncertain to what extent future growth in the Newnans Lake sub-basin will increase pollutant loads. There are programs in place to ensure that the possible effects are reduced, but extra effort may be needed.

Pollutant Sources and Management Actions

Water quality in Newnans Lake has been declining since 1969. Newnans Lake has been hypereutrophic since at least 1999. The mean annual TSI, a measure of water quality, for Newnans Lake from 1999 to 2003 was 93. Lakes with a TSI value above 60 are considered to have fair water quality and above 70 to have poor water quality. Newnans Lake has higher TN, TP, and chlorophyll *a* concentrations than 75% of the Central Valley region lakes. Blue-green algae are the dominant phytoplankton species in Newnans Lake (92%), at a biovolume consistently twice that of Orange Lake and Lochloosa Lake.

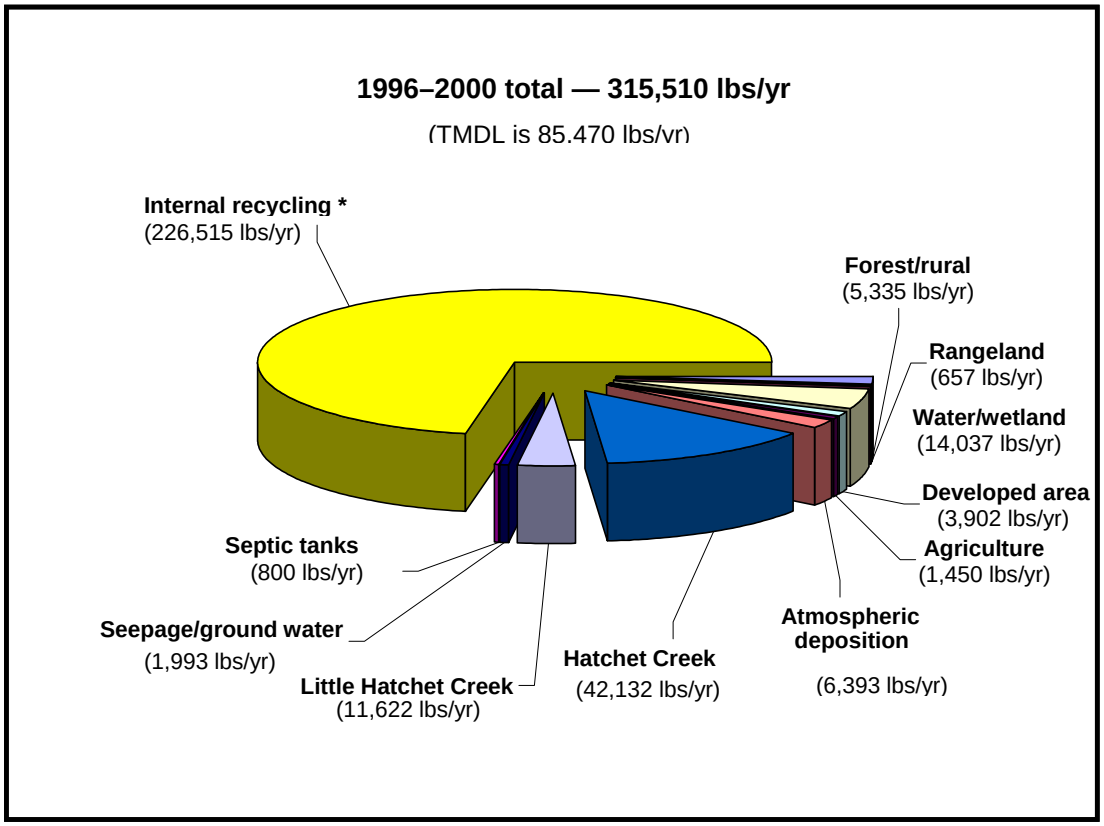
In the Newnans Lake TMDL, for the period from 1996 to 2000, the internal recycling of nutrients stored in lake sediments contributed the largest proportion of the TN and TP load. This assumption was based on mass balance calculations comparing the in-lake nutrient loading to contributions from its watershed and a lack of other identifiable sources. **Figures 6.3** and **6.4** reflect the dominance of internal recycling as a nutrient source: 71.8% of the TN load and 52.4% of the TP load. Tributary inflows from Hatchet and Little Hatchet Creeks are the next largest sources, contributing 17.1% of the TN load and 22.1% of the TP load; this includes the loading from the Brittany Estates WRF. Brittany Estates was allocated TN and TP loadings as part of the TMDL at the facility's current permitted rate of discharge, because the removal of loadings from Brittany Estates had a minimal impact on the water quality of Newnans Lake, even under drought conditions. Atmospheric deposition contributes 12.4% of the TP loading. OSTDS's are a small portion of the TN load to Newnans Lake.

A large part of the Newnans Lake watershed is commercial silviculture property. Despite its prominence in acreage, silviculture land contributes a very small portion of the overall nutrient load to Newnans Lake, compared with the other land use types in the watershed. Most of the commercial silviculture acreage in the Newnans Lake watershed is managed by several large industrial silviculture operators, all of whom are participating in the Division of Forestry BMP implementation program. Other agricultural activities are minimal in this watershed.

In the calculation of the TMDL, a significant portion of the baseline load was assigned to the internal recycling of nutrients between the sediments and water column. This assignment was based primarily on mass balance calculations, from data collected from 1996 to 2000, indicating that more of the nutrient load was contributed from within the lake than was contributed from its watershed. The nutrient recycling load was based on the assumption that recycling is responsible for the difference between nutrient loads from stormwater runoff and in-lake concentrations. Other sources of nutrients could not be identified, precluding the development of a more detailed nutrient analysis. Additional studies are needed to better define the role of sediment resuspension and deposition as a nutrient source.

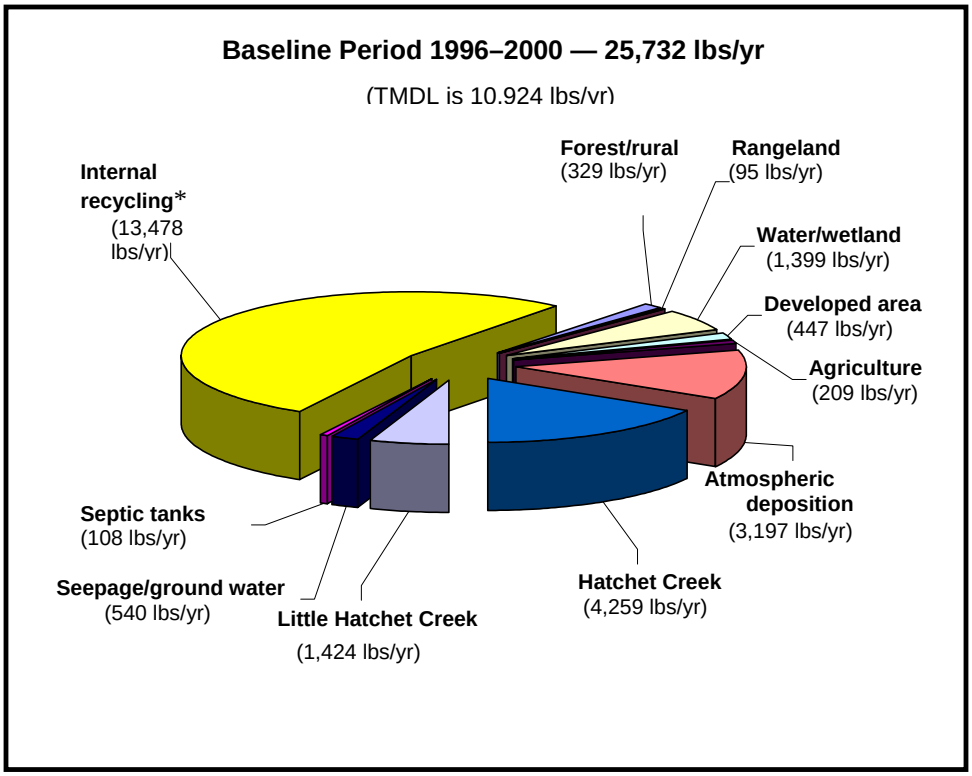
The extent to which nutrient recycling acts as a nutrient load in Newnans Lake could significantly affect the effectiveness of nutrient load reduction projects. Despite these unknowns, the general consensus by the BWG was that the lake was nutrient impaired. The BWG proposed a variety of projects to decrease nutrient loading into Newnans Lake. For instance, stormwater improvements made during the widening of State Road (SR) 20 reduce the loading of TN and TP from the watershed to Newnans Lake. The FWC has done several plantings of aquatic vegetation in an effort to improve habitat for fish with the additional benefit of potentially improving water quality in parts of the lake. Future stormwater management improvements in eastern Gainesville will also benefit Newnans Lake. Several parcels of land

north of and surrounding Newnans Lake have been purchased for conservation purposes by Alachua County or the SJRWMD.



* See text for discussion of internal recycling.

FIGURE 6.3. BASELINE TN LOADING TO NEWNANS LAKE



* See text for discussion of internal recycling.

FIGURE 6.4. BASELINE TP LOADING TO NEWNANS LAKE

Table 6.8 summarizes the management actions. **Tables 10.1** through **10.9** in **Section 10.0** provide details on all projects, including the lead entity/project partners, cost and funding source(s), schedule, and anticipated benefits and load reductions (if known).

Key Unknowns and Future Studies

The ACEPD completed storm event sampling of the three tributary basins in 2003 (ACEPD, January 2004). This study will help better define the contributions of nutrients from stormwater inputs in the watershed. Studies are also under way as part of PLRG development for Newnans Lake and ground water investigations that will better define and quantify watershed and ground water sources of nutrients. PLRG development is addressing the identification of external nutrient sources, both spatially and temporally. Another key area for study is quantifying load reduction from proposed or potential management actions.

A number of future studies have been identified to improve the scientific understanding of the impact on water quality of internal nutrient recycling, external nutrient loadings, and the historical alteration of wetlands. Future studies include the following:

- *Internal recycling rates (i.e., TP movement between lake sediments and the water column), and*
- *A literature review to document the effects of aquatic plant management, including options for improving management strategies to restore and protect water quality and promote natural lake functions.*

Tables 10.1 through **10.9** in **Section 10.0** provide greater detail on these studies.

TABLE 6.8. COMPLETED AND PLANNED PROJECTS TO REDUCE NUTRIENTS IN NEWNANS LAKE

Nutrient Source	Management Action Category	Anticipated Results	Comments
Internal recycling and Water/wetlands	Restoration and Water Quality Improvement Projects	Reduce nutrient recycling through vegetative uptake.	Planting of maidencane, knotgrass, and giant bulrush.
	Special Studies and Planning Efforts	• Improve scientific understanding of nutrient recycling. • Better understanding of ground water nutrient inputs.	• PLRG development, including better-defined source identification. • Storm event nutrient loading estimates. • Spatial nutrient loading dynamics in the watershed. • Ground water–surface water interaction study.
Hatchet and Little Hatchet Creeks	Conservation Land Acquisition	Minimize future loading increases by controlling future land development.	Example: Newnans Lake Conservation Area.
	Silviculture BMPs	Reduce nutrient loadings.	• All large industrial silviculture operators are participating in the BMP program, covering the majority of silviculture property in the watershed. • Additional outreach to small private operations to enroll them in BMP programs. • Increased frequency of compliance inspections.
	Agricultural BMPs	Reduce nutrient loadings.	Rowcrop BMPs being implemented. BMP manuals for cow/calf, nursery, sod, and equine operations under development.
	Basic Stormwater Management – Stormwater Permit Program Implementation	Reduce nutrient loadings.	Education and outreach and other components of MS4 program implementation.
	Structural Stormwater BMPs	Reduce nutrient loadings.	Dry detention ponds installed during SR 20 widening.
Direct stormwater discharge	Basic Stormwater Management – Stormwater Permit Program Implementation	See above.	See above.
	Silviculture BMPs	See above.	Not applicable.
	Agricultural BMPs	See above.	Not applicable.
Atmospheric deposition	Not applicable	Not applicable	Considered an uncontrollable source.

Anticipated Results of Management Actions

To achieve the TMDLs for Newnans Lake, management actions need to reduce TN and TP from baseline loadings by 74% and 59%, respectively. The BWG will work toward improvements in water quality as a result of implementing management actions in the Newnans

Lake watershed. At this time, the degree of water quality improvement is difficult to predict, as insufficient data are available to determine the effects of reduced nutrient inputs on internal recycling in the lake. Project benefits will be evaluated through data collected during project implementation and the implementation of the basin monitoring strategy. Future research that resolves current unknowns may allow for the implementation of additional management actions with greater certainty about the anticipated outcome. Because of the uncertainty associated with internal recycling, it is not anticipated that the TMDLs for Newnans Lake will be achieved within the first 5-year cycle of TMDL implementation.

Lake Wauberg

Parameters Causing Impairment: TN and TP

Lake Wauberg is located in the Central Valley of the Ocklawaha River Basin (Alachua County), approximately 8 miles south of Gainesville. It has a surface area of 248 acres, with a mean depth of 12 feet. The lake receives most of its recharge directly from rainfall and discharges to the east through Sawgrass Pond to Chacala Pond (Opper, 1982). During periods of low or normal water levels, Lake Wauberg, Burnt Pond Marsh, and George's Pond remain unconnected. The waterbodies may interconnect during periods of extremely high water levels.

Pollutant Sources and Management Actions

Lake Wauberg has been hypereutrophic since at least 1990, based on TN, TP, and chlorophyll *a* data. From 1990 to 2000, water quality was consistently poor, as indicated by a mean annual TSI of 72.3 during this period. Lakes with a TSI value above 60 are considered to have poor water quality.

Atmospheric deposition is the dominant nutrient source, contributing 65% of both the TN and TP loadings. The other primary source is septic systems (OSTDS's), contributing 32.0% of the TN load and 32.2% of the TP load. The remaining nutrient loading (3%) is from runoff from natural areas. The Lake Wauberg watershed is largely undeveloped, with limited rural residential and university-owned recreation areas near the lake, all of which rely on OSTDS's for wastewater management. The management of OSTDS's is the primary controllable factor for nutrient load reduction in the Lake Wauberg watershed (**Table 6.9**). The ACHD has evaluated the on-site wastewater disposal and treatment systems located on residential properties surrounding Lake Wauberg. **Table 10.5** provides details of the ACHD project, including the project partners, cost and funding source(s), schedule, and anticipated benefits and load reductions (if known).

TABLE 6.9. PLANNED PROJECTS TO REDUCE NUTRIENTS IN LAKE WAUBERG

Nutrient Source	Management Action Category	Anticipated Results	Comments
Septic Systems (OSTDS's)	Special Studies and Planning Efforts	Identify priority locations for on-site wastewater rehabilitation.	• Septic systems identified as the primary controllable nutrient source for Lake Wauberg. • UF Lake Wauberg south shore facility septic tank upgraded in 2000. • ACHD evaluation of septic systems located on residential properties. • Additional resources may be needed to rehabilitate failing tanks.
Atmospheric deposition	None	Not applicable.	Considered an uncontrollable source.

Key Unknowns and Future Studies

No future studies are specifically identified for Lake Wauberg. However, water quality monitoring will continue in the lake to track trends in water quality changes associated with improved on-site wastewater management.

Anticipated Results of Management Actions

To achieve the TMDLs for Lake Wauberg, management actions need to reduce baseline loadings of TN and TP by 51% and 50%, respectively. As UF, Paynes Prairie Park, and the ACHD continue to work on identifying and upgrading on-site wastewater systems, nutrient inputs to Lake Wauberg should decrease. However, no data are available to quantify the anticipated nutrient loading reductions associated with Lake Wauberg management actions. It is not anticipated that the TMDLs for Lake Wauberg will be achieved solely through upgrading OSTDS's. It is estimated that the complete removal of these systems' input to Lake Wauberg will only result in a 32% reduction in TN and TP.

Orange Lake

Parameter Causing Impairment: TP

The Orange Lake watershed is located in southeastern Alachua and northern Marion Counties. Orange Lake, a shallow lake with a relatively large surface area of 12,703 acres at median stage, naturally fluctuates between 2,745 acres and 15,600 acres during drought and heavy rainfall, respectively (SJRWMD, 2006). Major sources of water to the lake include interflow via Camps Canal and the River Styx from Newnans Lake and via Cross Creek from Lochloosa Lake; surface runoff from the watershed; and direct precipitation into the lake. Water flows out of the lake through a group of sinkholes located in the southwest part of the lake and a notched, fixed-crest weir at the U.S. Highway 301 bridge into the headwater wetlands of Orange Creek. Orange Creek drains into the lower Ocklawaha River Basin. The Orange Lake watershed drains an area of about 87,339 acres.

A large portion of the Orange Lake watershed is involved in commercial silviculture activity, with most of this acreage held by several large industrial silviculture operators. All of these large silviculture operators are participating in the Division of Forestry BMP implementation program mentioned above.

Orange Lake has had aquatic plant management programs in place for several decades. Management efforts have ranged from the annual control of invasive exotics to removal of floating tussocks to restore deep water habitat. Selected areas of the lake bottom were mechanically scraped in an effort to remove muck and enhance fish habitat (Project # OR11). **Table 10.3** lists aquatic plant management projects. Some uncertainties exist regarding the potential for aquatic plant management practices to add to the nutrient loading of the lake.

Large parcels of land surrounding Orange Lake and Lochloosa Lake have been purchased as conservation lands by either Alachua County or the SJRWMD. Approximately % of the watershed is held as conservation and recreation lands. These include Lochloosa Wildlife Conservation Area and River Styx Wetland.

Census data gathered and evaluated through the BMAP process indicated that future growth predicted through 2015 was not expected to substantially increase pollutant loads in the sub-basin. Some limited development may occur with the construction of condominiums and associated land clearing and septic tank installation on the west side of the lake.

Pollutant Sources and Management Actions

Water quality in Orange Lake has been declining since 1985. Statistically significant decreases in Secchi depth and increases in chlorophyll *a*, TN, TP, total suspended solids (TSS), and turbidity have been observed since 1985. Data for trend analysis prior to that date are unavailable. Orange Lake has been hypereutrophic since at least 1999, based on TN, chlorophyll *a*, and Secchi depth data. The mean annual TSI for Orange Lake from 1999 to 2003 was 77. Lakes with a TSI value above 60 are considered to have poor water quality. Orange Lake has higher TP and chlorophyll *a* concentrations than 75% of the Central Valley region lakes.

Baseline loadings of TP to Orange Lake are 25,732 lbs/yr. Inflow from Camps Canal and the River Styx swamp is the most significant TP source in Orange Lake, contributing 37.1% of the TP load (**Figure 6.5**). Together with inflow from Lochloosa Lake via Cross Creek (11.9%), loading from upstream waterbodies and wetlands contributes 49% of the TP load into Orange Lake. Loading from water and wetland areas, as well as atmospheric deposition ("uncontrollable" sources), comprises 32% of the TP load into Orange Lake. In the initial TMDL calculations, 21.5% of the TP load in the Orange Lake watershed was attributed to agricultural land. However, analyses conducted subsequent to the TMDL indicated that nutrient loading from silviculture areas applying appropriate BMPs is roughly equivalent to loads from natural forest land uses. The proper use of silviculture BMPs, as implemented through the Division of Forestry BMP Program, is expected to manage the loadings associated with silviculture activities.

The BWG has completed or plans to implement different management actions to reduce or manage the sources of TP to Orange Lake (**Table 6.10**). DOT road improvement projects have provided stormwater treatment to previously untreated roadway. As much as 360 pound per year of TP will be removed from Newnans Lake, Orange Lake, and Lochloosa Lake collectively. Management actions proposed for Newnans Lake and Lochloosa Lake will help achieve the necessary TP load reductions that will in turn improve Orange Lake water quality. **Tables 10.1** through **10.9** provide details on all projects, including the lead entity/project partners, cost and funding source(s), schedule, and anticipated benefits and load reductions (if known).

Besides silviculture, other primary agriculture activities in the watershed include horse farms and cattle grazing. DACS has equine and cow/calf BMPs in development and when these are adopted will work with local agriculture interests to implement them. Marion County has started the Clean Farms Initiative to assist local farmers with the implementation of BMPs, primarily for the management of animal waste and nutrients. Focus of this initiative is horse farms. The proper use of BMPs is expected to help reduce nutrient loadings delivered by the watershed to Orange Lake.

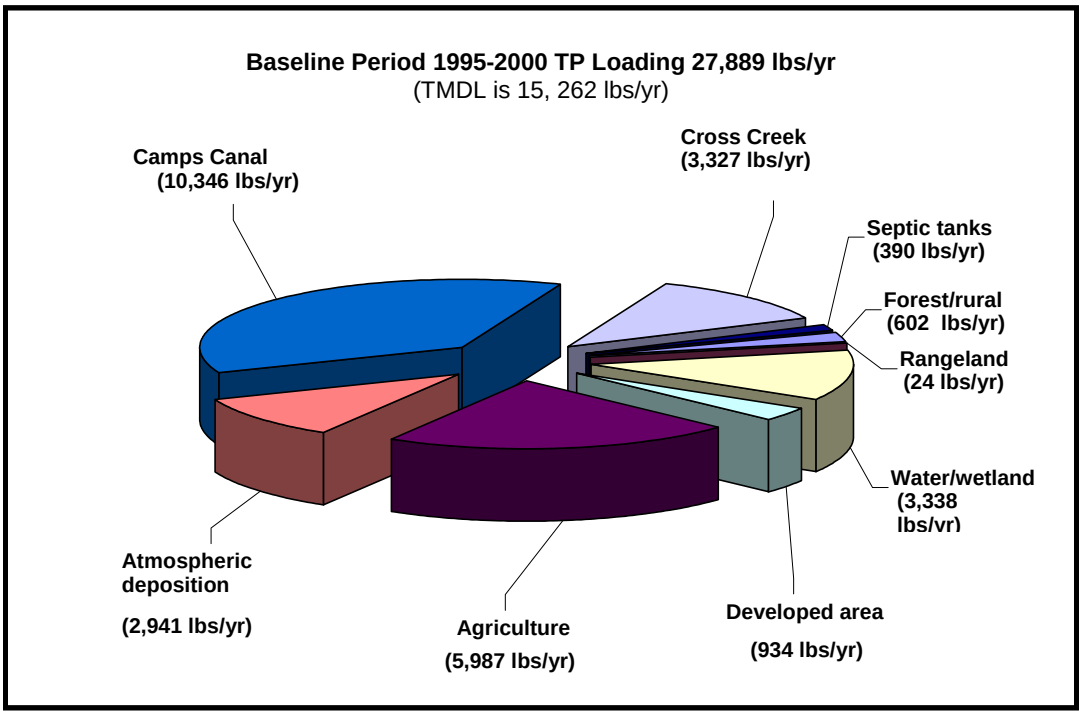


FIGURE 6.5. BASELINE TP LOADING TO ORANGE LAKE

TABLE 6.10. COMPLETED AND PLANNED PROJECTS TO REDUCE NUTRIENTS IN ORANGE LAKE

Nutrient Source	Management Action Category	Anticipated Results	Comments
Inflow from Camps Canal/River Styx	Special Studies	Improve scientific understanding of nutrient sources.	PLRG development for Orange Lake may identify this as a natural source of nutrients originating in River Styx swamp
Silviculture and other agricultural sources	Silviculture BMPs	Reduce nutrient loadings.	• All large industrial silviculture operators are participating in the BMP program, covering the majority of silviculture property in the watershed. • Additional outreach to small private operations to enroll them in BMP programs. • Increased frequency of compliance inspections.
	Agricultural BMPs	Reduce nutrient loadings.	• Rowcrop BMPs being implemented; BMP manuals for cow/calf, nursery, sod, and equine operations under development. • Marion County Clean Farms Program targeted at horse farms.
	Conservation Land Acquisition	Minimize future loading increases by controlling future land development.	Example: Longleaf flatwoods preserve
Water/wetlands	Restoration and Water Quality Improvement Projects	Reduce nutrient loadings through natural nutrient uptake and attenuation.	Not applicable.
Inflow from Lochloosa Lake via Cross Creek	Conservation Land Acquisition	Minimize future loading increases by controlling future land development.	Lochloosa Wildlife Conservation Area.
	Silviculture BMPs	Reduce nutrient loadings.	All large industrial silviculture operators are participating in the BMP program, covering the majority of silviculture property in the watershed.
	Agricultural BMPs	Reduce nutrient loadings.	Rowcrop BMPs being implemented; BMP manuals for cow/calf, nursery, sod, and equine operations under development.
	Special Studies and Planning Efforts	Improve scientific understanding of nutrient sources; Better understanding of ground water nutrient inputs in future iterations of TMDL.	• PLRG development for both Lochloosa Lake and Orange Lake; • Ground water–surface water interaction study.
Roadway inputs of TP	Structural BMPs (quantified)	Stormwater treatment of roadway runoff removes nutrient loadings.	Removes 361 lbs TP/year and 3,665 lbs TN per year. Removal is for Lakes Orange, Newnans, and Lochloosa collectively.

Nutrient Source	Management Action Category	Anticipated Results	Comments
Other identified sources	Basic Stormwater Management – Stormwater Permit Program Implementation	Reduce nutrient loadings.	• Includes education and outreach and other components of MS4 program implementation for both Marion and Alachua Counties. • Marion County Orange Creek Watershed Management Plan
	Public Education and Outreach	Not applicable.	Not applicable.
Atmospheric deposition	None	Not applicable.	Considered an uncontrollable source.

Key Unknowns and Future Studies

A number of unknowns exist related to identifying or better understanding significant external loads of TN and TP, nutrient loads in lake sediment, and internal recycling rates. A number of future studies, including the following, have been identified to improve the scientific understanding of nutrient loadings that will lead to additional management actions:

- *PLRG development: Target TP concentrations and TP load reductions needed to meet the target will be calculated. PLRG development will identify major sources of TP in the watershed.*
- *Internal recycling rates (i.e., TP movement between lake sediments and the water column).*
- *A literature review to document the effects of aquatic plant management, including options for improving management strategies to restore and protect water quality and promote natural lake functions.*

Anticipated Results of Management Actions

To achieve the TMDL of 15,262 lbs/year for Orange Lake, management actions need to reduce TP baseline loadings by 45%. When implemented, all Orange Lake projects outlined in **Tables 10.1** through **10.9** are expected to decrease TN and TP loadings. However, the degree of water quality improvement is difficult to predict, as insufficient data were available to quantify TP nutrient reductions from the majority of projects. As the recipient of water from both Lochloosa Lake and Camps Canal/River Styx, Orange Lake will also benefit from projects implemented in these two sub-basins that will decrease nutrient loading through Cross Creek and Camps Canal/River Styx. The BWG expects to see improvements in Orange Lake water quality as a result. As for Newnans Lake, project benefits will be evaluated through data collected during project implementation and basin water quality monitoring.

7.0 Monitoring Program

Implementing the management actions contained in this BMAP will lead to water quality improvements. **Table 7.1** shows indicators of water quality and the anticipated trend in these indicators. As part of the BMAP, the BWG designed a strategy for monitoring water quality based on these indicators and measuring pollutant concentrations and loads to determine if water quality is improving and the TMDL is being met.

TABLE 7.1. ANTICIPATED TRENDS IN CORE AND SUPPLEMENTAL WATER QUALITY INDICATORS

Core Indicators	Lakes	Creeks
Chlorophyll *a*	Decrease in concentration	Not applicable
Total Phosphorus (as P)	Decrease in concentration	Not applicable
Nitrogen, Nitrite (NO2), and Nitrate (NO3) as N	Decrease in concentration	Not applicable
Nitrogen, Kjeldahl (TKN)	Decrease in concentration	Not applicable
Fecal coliform	Not applicable	Decrease in concentration
Supplemental Indicators	**Lakes**	**Creeks**
Specific conductance	Monitored to facilitate interpretation of core indicator trends	Not applicable
Dissolved oxygen (DO)	Monitored to facilitate interpretation of core indicator trends	Not applicable
Alkalinity	Monitored to facilitate interpretation of core indicator trends	Not applicable
pH	Monitored to facilitate interpretation of core indicator trends	Not applicable
Temperature	Monitored to facilitate interpretation of core indicator trends	Not applicable
Color	Monitored to facilitate interpretation of core indicator trends	Not applicable
Turbidity	Monitored to facilitate interpretation of core indicator trends	Monitored to facilitate interpretation of core indicator trends
Total suspended solids (TSS)	Monitored to facilitate interpretation of core indicator trends	Monitored to facilitate interpretation of core indicator trends
Total organic carbon (TOC)	Monitored to facilitate interpretation of core indicator trends	Monitored to facilitate interpretation of core indicator trends

*Core indicator – Indicator that measures progress made towards achieving TMDL.
**Supplemental indicator – Additional indicators measured to facilitate the interpretation of core indicators.

This strategy builds on existing water quality monitoring program commitments made by DEP, the SJRWMD, ACEPD, and WAV volunteers. The monitoring strategy will involve an investment of resources and funding by these stakeholders. The strategy addresses monitoring design, quality assurance (QA), data management, and data interpretation that measure progress in achieving the TMDLs, while allowing for evaluation and feedback that better refine the monitoring strategy and provide information to better define how to achieve the TMDLs. The primary and secondary objectives of the monitoring strategy are as follows:

Primary Objectives

1. *Identify and track water quality trends in BMAP waterbodies to determine if water quality standards are being achieved, and*

2. *Where feasible, measure the effectiveness of specific BMPs in reducing external loadings of target pollutants.*

Secondary Objectives

1. *Measure reductions in watershed loadings of TMDL target pollutants, and*
2. *Refine understanding of the type and relative magnitude of pollutant loading sources.*

A network of lake and creek stations representative of the inflow and outflow of each impaired lake will be monitored for the water quality indicators listed in **Table 7.1.** Information provided by the monitoring network will be used for the following purposes:

- *Evaluate progress toward achieving the primary and secondary objectives listed above,*
- *Demonstrate stakeholders' progress toward meeting their individual TMDL obligations,*
- *Facilitate comparisons of water quality before and after BMP implementation, and*
- *Inform the selection of future BMPs or management actions to address water quality.*

Data collected by the network are maintained by DEP in a central database available to partners and must meet QA requirements set by DEP. Additional interagency data comparisons and QA checks will be conducted as practical.

Observations of water quality conditions and trends will be reported to the BWG and public at least annually as part of the BMAP annual report. Water quality data will be used to support adaptive management process, assess projects, and identify the need for new actions. A more complete analysis of trends in progress towards achieving designated use will be made on a five-year basis, corresponding with DEP's watershed management cycle.

8.0 Tracking and Follow-up Actions

BMAP implementation will be a long-term process. Significant unknowns remain regarding nutrient sources for Orange Creek Basin lakes and to a lesser extent bacteria sources for streams. The TMDLs established for basin lakes most likely will not be achieved in the near term. Initial actions taken to identify sources of fecal coliform bacteria have been more successful. The identification of bacteria sources using a variety of techniques, including detailed MST, the use of optical brighteners, and field observations, has been completed.

The FWRA provides for flexibility in the implementation of a BMAP by allowing a phased approach. As a first phase of implementation, the BWG is implementing a project to better evaluate elevated fecal coliform bacteria in Gainesville urban creeks. The development of PLRGs and the results of watershed nutrient source identification projects for Newnans Lake, Lochloosa Lake, and Orange Lake by the SJRWMD will identify major sources of nutrient loadings into those lakes.

In this first phase, the BWG will track its projects and other implementation efforts and monitor water quality in TMDL waterbodies (through existing water quality monitoring programs), to ensure that the BMAP is carried out and to measure its effectiveness. The BWG will meet at least annually to discuss implementation issues, consider new information, and determine other management actions needed for waterbodies that are not projected to meet their TMDLs.

Each entity responsible for implementing management actions as part of the BMAP will complete an annual report for submittal to the BWG and DEP. The report will track the implementation status of any management actions listed in the BMAP and document additional management actions undertaken to further the water quality improvements in the basin. The report will primarily comprise a table of data elements such as the following:

- *BMAP project name,*
- *Affected area,*
- *Brief description,*
- *Project start/end,*
- *Project/activity status,*
- *TP/TN/fecal coliform removal estimate when available,*
- *Project monitoring results, and*
- *Comments.*

The BWG will review the reports once per year to assess progress in meeting the goals of the BMAP. As part of its annual BMAP assessment and meeting, the BWG will evaluate the findings of ongoing studies and apply this new information to refine existing and developing new management actions as part of an adaptive management approach to achieve the targeted pollutant reductions. The results from projects implemented to identify sources of nutrients and bacteria will play a particularly critical role in shaping future management actions taken by members of the BWG.

Adaptive management involves setting up a mechanism for making course corrections in the BMAP when circumstances change or feedback mechanisms indicate that a more effective strategy is needed. Key components of adaptive management are tracking implementation, monitoring water quality and pollutant loads, and holding periodic BWG meetings to share information and expertise. The FWRA requires that the plan be revised, as appropriate, in collaboration with basin stakeholders. All or part of a revised BMAP must be adopted by secretarial order. Adaptive management measures include the following:

- *Procedures to determine whether additional cooperative actions are needed;*
- *Criteria/process for determining whether and when plan components need to be revised due to changes in costs, environmental impacts, social effects, watershed conditions, or other factors; and*
- *Descriptions of the BWG's role after BMAP completion.*

9.0 Commitment to Plan Implementation

While the BMAP is linked by statute to permitting and other enforcement processes that affect individual entities, successful implementation requires that local stakeholders willingly and consistently work together to achieve adopted TMDLs. This collaboration fosters the sharing of ideas, information, and resources. The members of the Orange Creek BWG have demonstrated their willingness to confer and coordinate with and support each other in their efforts.

On a practical level, BMAP implementation also depends on adequate resources and necessary authorizations. The management actions contained in the BMAP are either under way or are planned in good faith. Current and future actions are contingent on necessary funding and approvals for their initiation and/or continuation.

BWG members have signed individual statements or letters of commitment to BMAP implementation or adopted resolutions that will be included as part of this adopted BMAP. These commitments address the following actions:

- *Continue to use an equitable and cost-effective, coordinated, comprehensive watershed management approach that applies the best available science to achieve TMDL-related pollutant load reductions and water quality improvements within a BWG member's authority,*
- *Seek necessary approvals and funding to implement consensus management actions identified in the BMAP and implement those actions as required approvals and funding are secured,*
- *Track the implementation of management actions for which a BWG member is responsible to assure that the BMAP is carried out,*
- *Inform DEP and the BWG of any permanent obstacles to carrying out management actions for which they are responsible, including technical, funding, and legal obstacles;*
- *Conduct water quality monitoring (if applicable) according to the monitoring strategy approved by the BWG, and*
- *Continue to communicate and coordinate actions and funding across BWG member agencies and community groups with regard to BMAP implementation.*

Table 9.1 lists the governments, agencies, and community groups that have made a commitment to the implementation of this BMAP.

TABLE 9.1. SIGNATORIES

ENTITY	SIGNATORY	TITLE	DATE
ALACHUA COUNTY BOARD OF COUNTY COMMISSIONERS	Rodney J. Long	Chairman	December 11, 2007
ALACHUA COUNTY HEALTH DEPARTMENT	Thomas R. Belcuore	Director	
CITY OF GAINESVILLE			
MARION COUNTY BOARD OF COUNTY COMMISSIONERS	Charlie Stone	Chairman	December 3, 2007
GAINESVILLE REGIONAL UTILITIES			
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION • *NORTHEAST DISTRICT* • *PAYNES PRAIRIE PRESERVE STATE PARK* • *INVASIVE PLANT MANAGEMENT*	Gregory J. Strong	District Director NE	
FLORIDA DEPARTMENT OF TRANSPORTATION			
FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION			
FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES • *DIVISION OF FORESTRY* • *OFFICE OF AGRICULTURAL WATER POLICY*	Michael C. Long Richard J. Budell	Director Director	March 19, 2008
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT	Kirby Green	Executive Director	February 6, 2008
UNIVERSITY OF FLORIDA			
SUWANNEE ST. JOHNS SIERRA CLUB			
WOMEN FOR WISE GROWTH	Carol Higman	Board of Directors, Policy Committee	January 2, 2008
SUSTAINABLE ALACHUA COUNTY			
FLORIDA FORESTRY ASSOCIATION	Philip Gornicki	Director of Responsible Forestry	April 8, 2008

10.0 Detailed Project Information

Introduction

Tables 10.1 though **10.9** summarize the management actions for the impaired waterbodies by management type. Each table describes projects, identifies project partners, identifies anticipated load reductions (where practical) from implementing the management actions, and estimates the cost of implementing the project. The management actions in the tables are organized by each waterbody and for watershed wide or sub-basinwide actions in the Orange Creek Basin.

This section also discusses the implementation of agricultural BMPs, the quantification of nutrient and fecal coliform loads, and the cost of BMAP implementation.

DACS' Process of BMP Implementation

DACS' OAWP BMP implementation role involves assisting agricultural producers in selecting, funding, properly implementing, and maintaining BMPs. The OAWP employs field staff and contracts with service providers[1] to work with producers to submit notices of intent (NOIs) to implement BMPs; these identify the measures appropriate for their operations. Service providers also provide technical assistance to producers and help implement cost-share programs that leverage regional, state, and federal funds.

Although DACS' BMP programs are not regulatory requirements, Subsection 403.067(7)(b), F.S., requires that nonpoint pollutant sources (such as agriculture) included in a BMAP demonstrate compliance with pollutant reductions established to meet a TMD,L either by implementing BMPs or by conducting water quality monitoring prescribed by DEP or a water management district.

Quantifiable Nutrient Load Reductions

The tables list the net estimated load reductions expected from selected management actions. These represent the subset of management actions that were quantifiable. The vast majority of management actions considered to be effective in managing nutrient loads (e.g., public education on fertilizer use) are not included in these load reduction estimates, as quantitative load reduction values were not available. As future management actions are implemented, load reductions will be quantified to the extent that data are available.

Quantifiable Fecal Coliform Bacteria Load Reductions

Management actions proposed in this BMAP to decrease coliform loads to urban creeks (e.g., public education regarding pet waste management) are not conducive to quantitative load reduction estimates. As such, the benefits of coliform management actions were largely evaluated on a qualitative basis.

BMAP Implementation Costs

Cost information is provided for each project listed in the tables. Where the cost of a project could not be adequately defined, it is indicated as unavailable in the tables. Certain types of

[1] Soil and Water Conservation Districts, University of Florida Institute of Food and Agricultural Sciences (UF–IFAS), Natural Resources Conservation Service (NRCS), Development Councils, etc.

projects (such as nonstructural BMP implementation, land acquisition, and maintenance) do not easily lend themselves to a full accounting of costs for the waterbody addressed by the project. In the case of BMP implementation and land acquisition, some of the true cost of implementation is carried by private landowners and is not readily available, or involves in-kind service, or the transactions are still ongoing and the complete cost is still not known. Other costs for maintenance and operation activities are generally not accounted for on an individual waterbody basis, but rather cover larger areas, as indicated in the tables, including many waterbodies. Similarly, some special study projects are not fully developed, and the final costs are not known at this time.

TABLE 10.1A. 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)
Hogtown Creek					
HOG20 - 39th Ave Basin Rehabilitation / Addresses Bacteria TMDL	Hogtown Creek / 2698	DOT, District 2 / --	$1,432,976 / DOT, District 2 / 2004	NW 39th Ave from I-75 to 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
HOG21 - Widening of SR 26A / 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
Lochloosa Lake					
LOCH04 - Widening of SR 20 from 2 Lane to 4 Lane / Addresses Nutrient TMDL	Lochloosa Lake / 2738A	DOT, District 2 / --	$10,763,788 / DOT, District 2 / 2006	Eastern urban area of Gainesville/ Alachua County / Widening of SR 20 from 2-lane to 4-lane road 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

TABLE 10.1A. (CONTINUED)

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)
Newnans Lake					
NEW04 - Widening of SR 20 from 2 Lane to 4 Lane / 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 lanes 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
Sweetwater Branch					
SWT02 - Depot Avenue Stormwater Park / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch / 2711	City of Gainesville/DOT / DOT, District 2	$7,162,000 / SJRWMD; Legislature; DOT, District 2; City of Gainesville Stormwater Management Utility Fee; State Revolving Fund / 2007	Depot Avenue / 32-acre brownfield restoration site includes 11-acre wet detention pond developed within a park. **Benefits:** Reduce sediment load and nutrient loads.	255.8 / 660.7
SWT04 - Spring Hill Stormwater Park / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch / 2711	City of Gainesville / --	$170,000 / City of Gainesville Stormwater Management Utility Fee / 2003	Springhill Community / 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
Tumblin Creek					
TUM01 - SW 5th Avenue Basin / Addresses Bacteria and Nutrient TMDL	Tumblin Creek / 2718A	City of Gainesville / --	$1,147,818 / City of Gainesville 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

TABLE 10.1B. STRUCTURAL BMPS—LOAD REDUCTIONS NOT CURRENTLY 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
Hogtown Creek				
HOG29 - Hydrodynamic Separator Number 4 / Addresses Bacteria and Nutrient TMDL	Hogtown Creek / 2698	City of Gainesville / --	$11,410 / City of Gainesville 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.
HOG30 - Hydrodynamic Separator Number 6 / Addresses Bacteria and Nutrient TMDL	Hogtown Creek / 2698	City of Gainesville / --	$29,211 / City of Gainesville Stormwater Management Utility Fee / Ongoing	Unit installed in 1300 block of NW 29th Road in Gainesville. / Installation and operation of Votech Unit #3000 in 1300 block of NW 29th Road. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system.
HOG31 - Hydrodynamic Separator Number 7 / Addresses Bacteria and Nutrient TMDL	Hogtown Creek / 2698	City of Gainesville / --	$62,728 / City of Gainesville Stormwater Management Utility Fee / Ongoing	Unit installed in 1300 block of NW 29th Road in Gainesville. / Installation and operation of Vortech Unit #11000 in 1300 block of NW 29th Road. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system.
Alachua Sink and Sweetwater Branch				
URBAN03 - Hydrodynamic Separator Number 2 / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch; Alachua Sink / 2711; 2720A	City of Gainesville / --	$25,200 / City of Gainesville 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.
URBAN02 - Hydrodynamic Separator Number 1 / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch; Alachua Sink / 2711; 2720A	City of Gainesville / SJRWMD	$26,260 / City of Gainesville 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, used for sediment collection. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system.
URBAN09 - Hydrodynamic Separator Number 3 / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch; Alachua Sink / 2711; 2720A	City of Gainesville / --	$11,410 / City of Gainesville 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 streams and storm sewer system.

TABLE 10.1B. (CONTINUED)

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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
URBAN10 - Hydrodynamic Separator Number 5 / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch; Alachua Sink / 2711; 2720A	City of Gainesville / U.S. Environmental Protection Agency (EPA)	$145,180 / City of Gainesville 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 continuous deflective separation (CDS) units in downtown Gainesville. **Benefits:** Prevents sediment and trash from entering streams and storm sewer system.
SWT03 - Duck Pond Restoration / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch / 2711	City of Gainesville / EPA	$1,040,000 / EPA Grant; City of Gainesville 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 loads.

TABLE 10.2. 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
Orange Creek Basin				
NUTRIENT03 - Silviculture BMP Implementation and Compliance / Addresses Nutrient TMDL	Orange Lake; Newnans Lake; Lochloosa Lake; 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.
NUTRIENT06 - Cow/Calf BMPs / Addresses Nutrient TMDL	Newnans Lake; Orange Lake; Lochloosa Lake; 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.
NUTRIENT07 - Container Nursery BMPs / Addresses Nutrient TMDL	Newnans Lake; Orange Lake; Lochloosa Lake; 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 this 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.
NUTRIENT08 - Sod BMPs / Addresses Nutrient TMDL	Newnans Lake; Orange Lake; Lochloosa Lake; 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.

TABLE 10.2. (CONTINUED)

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
OR05 - Vegetable and Agronomic Crop BMPs / Addresses Nutrient TMDL	Orange Lake; Newnans Lake; Lochloosa Lake; 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 this 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.
OR06 – Equine BMPs / Addresses Nutrient TMDL	Orange Lake; Newnans Lake; Lochloosa Lake; Cross Creek / 2749A; 2705B; 2738A; 2754	DACS, OAWP / Private landowners	Not available / General Inspection Trust Fund / 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 this basin as result of TMDL Program. **Benefits:** Protection of streams and lakes from surface runoff generated by agricultural activities.
Orange Lake, Marion County				
MARION01 - Clean Farms Initiative / Addresses Nutrient TMDL	Orange Lake; Lochloosa Lake / 2749; 2738A	Marion County Clean Water Program / Marion County Planning Department; Marion County Extension Service; Marion County Soil & Water Commission; Southwest Florida Water Management District (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, recognizing importance of agriculture to county's history and economy, while 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. The 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.

TABLE 10.3. RESTORATION AND WATER QUALITY IMPROVEMENT PROJECTS

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
Hogtown Creek				
HOG18 - Sediment Removal / 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.
HOG19 - Sediment Removal / Addresses Bacteria TMDL	Hogtown Creek / 2698	City of Gainesville / --	$280,000 / City of Gainesville Stormwater Management Utility Fee; Federal Emergency Management Association (FEMA) / 2005	NW 8th Ave. / Removal of excessive sediment at bridge. **Benefits:** Reduce sediment being deposited in Loblolly floodplain.
HOG26 - Forest Park Vegetative Enhancement / Addresses Bacteria TMDL	Hogtown Creek / 2698	ACEPD / National Oceanic and Atmospheric Administration (NOAA); Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership); Current Problems, Inc.	$7,500 / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share; partially funded by NOAA Coastal Impact Assistance Program (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.
Newnans Lake				
NEW11 - Newnans Lake Planting-Fiscal Year (FY) 2005–06 / Addresses Nutrient TMDL	Newnans Lake / 2705B	Florida Fish and Wildlife Conservation Commission (FWC) / DEP Cooperative Aquatic Plant Management Program	$19,500 / FWC / June 2006	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.

TABLE 10.3. (CONTINUED)

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
NEW12 - Newnans Lake Planting-FY 2006–07 / Addresses Nutrient TMDL	Newnans Lake / 2705B	FWC / DEP Cooperative Aquatic Plant Management Program	$11,000 / FWC / June 2007	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.
NEW13 - Newnans Lake Herbicide / Addresses Nutrient TMDL	Newnans Lake / 2705B	FWC / DEP Cooperative Aquatic Plant Management Program	$1,000 / FWC / June 2006	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 to promote establishment of beneficial submerged aquatic vegetation (SAV) and rooted emergent species. **Benefits:** Improve sportfish habitat and promote establishment of SAV.
NEW14 - Newnans Lake Planting-FY 2007–08 / Addresses Nutrient TMDL	Newnans Lake / 2705B	FWC / DEP Cooperative Aquatic Plant Management Program	$21,000 / FWC / June 2008	Newnans/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.
NEW15 - Newnans Lake Annual Aquatic Plant Maintenance Program / 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.

TABLE 10.3. (CONTINUED)

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
Orange Lake				
OR11 - Orange Lake Mechanical Scraping / 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 deposit on in-lake island. **Benefits:** Restore fish spawning substrate.
OR12 - Orange Lake Frog's-bit Control / 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.
OR13 - Orange Lake Tussock Control / 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.
OR14 - Orange Lake Tussock Harvesting / 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.
OR15 - Orange Lake Floating Tussock Control / Addresses Nutrient TMDL	Orange Lake / 2749	DEP Cooperative Aquatic Plant Management Program / DEP Contractors	$2,252,000 / DEP Cooperative Aquatic Plant Management Program / Nov. 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 navigation. **Benefits:** Improved fish and wildlife habitat and public recreation and navigation.
OR16 - Orange Lake Annual Aquatic Plant Maintenance Program / 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.

TABLE 10.4. REGULATIONS, ORDINANCES, AND GUIDELINES

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
Orange Creek Basin within Alachua County				
ALCODE01 - Alachua County Water Quality Code Implementation / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$17,400 / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) 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.

TABLE 10.5. 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
Orange Creek Basin				
URBAN07 - Assessment Tool for MS4 Pollutant Load Reduction / 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.
Alachua Sink				
AS04 - Expanded Nutrient Monitoring Alachua Sink / Addresses Nutrient TMDL	Alachua Sink / 2720A	ACEPD / --	$5,600 / Alachua County / Sept. 2004	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.

TABLE 10.5. (CONTINUED)

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
AS05 - Feasibility Analysis of Sweetwater Branch Sheetflow Restoration Project at Paynes Prairie Preserve State Park, Alachua County, Florida / Addresses Nutrient TMDL	Alachua Sink / 2720A	City of Gainesville Public Works and GRU / DEP Parks and Recreation	$25,000 / Each partner paid 1/3 of cost / 9/30/2006	Sweetwater Branch at Paynes Prairie / Assess 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. Collaborative study with GRU and Paynes Prairie Preserve State Park. **Benefits:** Rehydration of hundreds of acres of wetlands in Paynes Prairie Preserve State Park and diversion of Sweetwater Branch discharge from Alachua Sink.
AS11 - Alachua Sink Intensive Study and Main Street Water Reclamation Facility Water Reuse Feasibility / Addresses Nutrient TMDL	Alachua Sink / 2720A	GRU / --	$445,299 / GRU ratepayers; FY 2003–07	Alachua Sink/Sweetwater Branch / Intensive water quality study to provide better understanding of nutrient loading to Alachua Sink and evaluation of modeling utilized in TMDL and to determine reuse feasibility. **Benefits:** Water quality data collected utilized in TMDL development.
AS12 - Paynes Prairie Vegetative Study / Addresses Nutrient TMDL	Alachua Sink / 2720A	Orange Creek Basin Partnership / SJRWMD; Alachua County; GRU; City of Gainesville 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 systems.

TABLE 10.5. (CONTINUED)

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
AS13 - Gainesville Regional Utilities Reclaimed Water Master Plan / 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.
AS15 - Paynes Prairie Sheetflow Restoration Conceptual Plan / 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.
AS16 - Paynes Prairie Sheetflow Restoration Evaluation of Main Street Water Reclamation Facility Upgrades / Addresses Nutrient TMDL	Alachua Sink / 2720A	GRU / --	$27,385 / GRU ratepayers / 2007	Paynes Prairie / Evaluate Main Street WRF treatment options and offline wetland performance and sizing in conjunction with proposed Paynes Prairie Sheetflow Restoration Project. Develop preliminary wetland sizing and estimate finished water quality from enhanced offline wetland in conjunction with various Main Street WRF upgrade alternatives. **Benefits:** Meet TMDL through cooperative treatment alternatives.
Urban Creeks: Hogtown Creek, Sweetwater Branch, Tumblin Creek bacteriological studies				
BACTERIA01 - Bacterial Source Tracking / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch / 2718A; 2711	ACEPD / --	$24,600 / Alachua County / Aug. 2003	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. Implements Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6.

TABLE 10.5. (CONTINUED)

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
BACTERIA02 - Fecal Coliform Source Assessment / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$45,000 / Currently partially funded; Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share / Sept. 2007	City of Gainesville; Alachua County / Fecal coliform source assessment using expanded microbiological sampling and selected MST techniques. **Benefits:** MST project-phased approach assessment with expanded bacteriological monitoring and human-specific MST at selected sites. Implements Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6.
BACTERIA03 - Coliform Wet and Dry Season Assessment / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$15,000 / Currently partially funded; Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share / July 2007	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.
BACTERIA04 - Expanded Fecal Coliform Bacteria Monitoring / 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. Implements Comp Plan Conservation and Open Space Element -Surface Water Systems Objective 4.6.

TABLE 10.5. (CONTINUED)

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
BACTERIA05 - Microbial Source Tracking Study / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$419,000 / GRU ratepayers / June 2007	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.
BACTERIA06 - Optical Brighteners / Addresses Bacteria and Nutrient TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$9,000 / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share / May 2006	City of Gainesville / Optical brightener and fecal coliform analyses throughout watershed for illicit discharge detection. **Benefits:** Identify illicit discharges using optical brighteners, dry season (baseflow) and wet season sampling. Implements Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6.
BACTERIA16 - Evaluation of Fecal Coliform Bacteria "Hot Spots" in Gainesville Urban Creeks Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	DEP; ACEPD; City of Gainesville Public Works; GRU; ACHD	Unavailable / Water Quality Restoration / Pending	Urban creeks in Orange Creek Basin / Project directed to further investigation of locations in urban creeks with continued high fecal coliform bacteria counts. Part of BMAP implementation to identify sources for continued high fecal counts. **Benefits:** Identify and remediate sources of fecal coliform.
HOG15 - Evaluation of Residential Septic Tanks Systems Adjacent to Hogtown and Possum Creeks, Tumblin Creek, and Sweetwater Branch / Addresses Bacteria TMDL	Hogtown Creek; Sweetwater Branch; Tumblin Creek / 2698	ACHD, Environmental Health Section /	$20,000 / / Sept. 2005	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.

TABLE 10.5. (CONTINUED)

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
Sweetwater Branch				
SWT18 - Expanded Nutrient Monitoring Sweetwater Branch / Addresses Nutrient TMDL	Sweetwater Branch / 2711	ACEPD / --	$5,600 / Alachua County / Sept. 2004	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. Implements Alachua County Comp Plan Conservation and Open Space Element -Surface Water Systems Objective 4.6.
SWT24 - Sweetwater Branch Watershed Management Plan Update and Land Acquisition / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch / 2711	City of Gainesville / EPA	$530,000 / City of Gainesville 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 were identified. Top-priority project sites were purchased. Top-priority projects were added to City of Gainesville Capital Improvements Project list. Plan information used to successfully apply for Section 319 funding.
SWT29 - Inlet Protection Pilot Project, Sweetwater Branch / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch / 2711	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$2,000 / Currently partially funded; Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share / July 2007	City of Gainesville / Assessment of stormwater 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.

TABLE 10.5. (CONTINUED)

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
Sweetwater Branch				
SWT30 - In-stream Bioassessments in the Hogtown Creek, Sweetwater Branch, Tumblin Creek, Little Hatchet Creek, Hatchet Creek, and Lake Forest Creek Watersheds / Addresses Bacteria and Nutrient TMDL	Hogtown Creek; Sweetwater Branch; Tumblin Creek; Little Hatchet Creek; Hatchet Creek; Lake Forest Creek / 2698; 2711; 2718A; 2695; 2688; 2709	Alachua County / City of Gainesville, DOT, District 2, (Gainesville Clean Water Partnership)	$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 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.
Tumblin Creek				
TUM03 - Tumblin Creek Watershed Management Plan Update / Addresses Bacteria and Nutrient TMDL	Tumblin Creek / 2718A	City of Gainesville /	$246,426 / City of Gainesville 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.
Hogtown Creek				
HOG17 - Fluvial Geomorphologic Assessment and Preliminary Restoration Plan / Addresses Bacteria TMDL	Hogtown Creek / 2698	City of Gainesville / SJRWMD; U.S. Army Corps of Engineers (USACOE)	$107,200 / 206 USACOE program; SJRWMD Cost-share Grant; City of Gainesville 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 in-stream erosion.

TABLE 10.5. (CONTINUED)

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
HOG24 - Inlet Protection Pilot Project, Hogtown Creek / Addresses Bacteria and Nutrient TMDL	Hogtown Creek / 2698	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$2,000 / Currently partially funded; Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share / July 2007	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.
Newnans Lake				
HAT01 - Expanded Coliform and Iron Monitoring / Addresses Bacteria TMDL	Hatchet Creek / 2688	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$5,000 / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share / Dec. 2006	Northeast Alachua County / Additional monitoring to better define spatial distribution of coliform bacteria. Collect samples on monthly basis throughout watershed at an 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.
NEW01 - Development of Pollutant Load Reduction Goals (PLRGs) for Newnans Lake / Addresses Nutrient TMDL	Newnans Lake / 2705B	SJRWMD / --	$1,000,000 / SJRWMD ad valorem, Water Management Lands Trust Fund, legislative appropriations, Ecosystems Management Trust Fund, Surface Water Improvement and Management (SWIM) fund / preliminary PLRG 2007; final 2008	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 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.

Table 10.5. (Continued)

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
NEW08 - Ground Water-Surface Water Interaction Study, Newnans Lake / 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.
NEW09 - Nutrient Loading Estimation during Storm Event / Addresses Nutrient TMDL	Newnans Lake; Lochloosa Lake/ 2688; 2705B; 2728	SJRWMD / --	$198,100 / Legislative appropriation / Sept. 2008	Newnans Lake and Lochloosa Lake watersheds / This study will measure nutrient loading into Newnans Lake and Lochloosa Lake via five tributaries during storms. Stormwater quality and discharge data will be collected from five tributaries in Newnans Lake and Lochloosa Lake watersheds. **Benefits:** Data will be used to refine hydrologic models of nutrient loading to these lakes, critical to PLRG development.
NEW10 - Spatial Nutrient Loading Dynamics in the Newnans Lake Watershed / Addresses Nutrient TMDL	Newnans Lake / 2688; 2705B; 2728	SJRWMD / --	$151,000 / Legislative appropriation, Water Management Lands Trust Fund / Sept. 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.

TABLE 10.5. (CONTINUED)

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
Orange Lake and Lochloosa Lake				
LOCH07 - Ground Water - Surface Water Interaction Study Lochloosa Lake Area, Alachua and Marion Counties, Florida / Addresses Nutrient TMDL	Orange Lake; Lochloosa Lake/ 2749; 2738A	DEP /	$64,000 / federal funds / April 2007	Lochloosa Lake and Orange Lake watersheds / Study examined ground water pathways through which nutrients enter Lochloosa Lake 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 Lochloosa Lake. **Benefits:** Better estimation of ground water inputs of TP in TMDL models.

TABLE 10.5. (CONTINUED)

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
LOCH01 - Development of Pollutant Load Reduction Goals (PLRGs) for Lochloosa Lake	Lochloosa Lake; 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	Lochloosa 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 development of TMDLs.
MARION02 - Marion County Aquifer Vulnerability Assessment (MCAVA) / Addresses Nutrient TMDL	Orange Lake; Lochloosa Lake/ 2749; 2738A	Marion County Clean Water Program / --	$82,850 / Marion County Clean Water Assessment / Projected completion Aug. 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 minimize adverse impacts on ground water quality. Aquifer vulnerability maps are displayed in classes of relative vulnerability (one 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.

TABLE 10.5. (CONTINUED)

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
MARION04 - Orange Creek Watershed Management Plan Addresses Nutrient TMDL	Orange Lake / 2749	Marion County Clean Water Program / --	$196,670 / Marion County Clean Water Assessment / ongoing	Orange Creek Basin (part of countywide program) / Watershed management plans (WMPs) will be completed countywide and are used to identify and address Marion County water quality issues. WMPs will include creation and maintenance of comprehensive geodatabase for Marion County storm sewer system data, watershed boundaries, and hydrologic features countywide. WMP for Orange Creek has been initiated. Watershed evaluation will be complete by September 2008. **Benefits**: Identify water quality issues and implement corrective actions.
OR01 - Development of Pollutant Load Reduction Goals (PLRGs) for Orange Lake / 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.
Lake Wauberg				
WAU01 - Evaluation of Septic Systems Surrounding Lake Wauberg / Addresses Nutrient TMDL	Lake Wauberg / 2741	ACHD, Environmental Health Section / --	$15,000 / -- / Sept. 2005	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 N and P to Lake Wauberg.

TABLE 10.6. 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
Orange Creek Basin				
ALACHUA02 - Water Quality Protection Public Education and Outreach / Addresses Bacteria and Nutrient TMDL	Orange Creek Basin / HUC 03080102	ACEPD; Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership);SJRWMD / --	$40,000 annually (WAV program countywide) / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) and SJRWMD cost-share / Ongoing	Alachua County / Public education to promote stormwater nutrient (N and P) 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 ULDC - 406.43 Water Resources Buffers; ULDC 407.56 Requirements for Stormwater Management Areas used as Open Space; ULDC Article 9 Stormwater Management.
ALACHUA03 - Water Quality Protection BMP Training / Addresses Nutrient TMDL	Orange Creek Basin / HUC 03080102	ACEPD / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership)	$20,000 annually / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) 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. Lochloosa Lake 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 ULDC - 406.43 Water Resources Buffers; ULDC Article 9 Stormwater Management.
OCB01 - Community Based Social Marketing Workshop / Addresses Bacteria and Nutrient TMDL	Orange Creek Basin / HUC 03080102	Sustainable Alachua County; DEP; City of Gainesville; Alachua County; GRU / --	$25,000 / EPA Section 319 federal funds and local support / Jan. 17–19, 2007	Orange Creek Basin / Three-day workshop composed of 1-day Introductory Workshop and 2-day Advanced Workshop to teach principles of social marketing and how to foster sustainable behavior. **Benefits:** Enhance public education and outreach efforts. Also promote organizational structures that are compatible with sustainability.

TABLE 10.6. (CONTINUED)

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
Sweetwater Branch				
SWT22 - Springhill Pond Vegetative Enhancement / Addresses Bacteria and Nutrient TMDL	Sweetwater Branch / 2711	ACEPD / UF–IFAS Extension Service; NOAA; City of Gainesville, DOT, District 2, Alachua County (Gainesville Clean Water Partnership); Current Problems, Inc. (Adopt A River)	$7,500 / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share; partially funded by 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 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 ULDC - 406.43 Water Resources Buffers; ULDC 407.56 Requirements for Stormwater Management Areas used as Open Space; ULDC Article 9 Stormwater Management.
Tumblin Creek				
TUM18 - Tumblin Basin Vegetative Enhancement / Addresses Bacteria and Nutrient TMDL	Tumblin Creek / 2718A	ACEPD / UF–IFAS Extension Service; City of Gainesville, Alachua County, DOT, District 2 (Gainesville Clean Water Partnership); Current Problems, Inc. (Adopt A River)	$7,500 / Alachua County, City of Gainesville, DOT, District 2 (Gainesville Clean Water Partnership) cost-share / Ongoing	City of Gainesville / Tumblin 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 ULDC - 406.43 Water Resources Buffers; ULDC 407.56 Requirements for Stormwater Management Areas used as Open Space; ULDC Article 9 Stormwater Management.

TABLE 10.7. 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)
Orange Creek Basin					
MSPERMIT01 - City of Gainesville Water Pollution Prevention Program - NPDES MS4 Permit / 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	$2,899,500 total; $929,300 is city's share / City of Gainesville Stormwater Management Utility Fee; City of Gainesville, Alachua County, and DOT District 2 (Gainesville Clean Water Partnership) cost-share / 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
MSPERMIT02 - Alachua County Water Pollution Prevention Program - NPDES MS4 Permit / 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 of Gainesville; DOT, District 2	$2,899,500 total; $594,500 is county's share / Cost shared by City of Gainesville, Alachua County, DOT District 2 (Gainesville Clean Water Partnership) / 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
MSPERMIT03 - Florida Department of Transportation, District 2, Alachua County Water Pollution Prevention Program - NPDES MS4 Permit / 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 of Gainesville	$2,899,500 total; $691,500 is DOT District 2's share / Cost shared by City of Gainesville, Alachua County, DOT District 2 (Gainesville Clean Water Partnership) / 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

TABLE 10.7. (CONTINUED)

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)
URBAN01 - Street Sweeping / 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 of Gainesville 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
URBAN04 - State Roads Street Sweeping / 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 US441, SR26, SR20, SR24, SR128, SR 222, and SR121. Areas are swept by City of Gainesville and contract personnel for DOT. Minimum benchmark sweeping frequency is quarterly. Performance benchmark for debris collected is 125 tons per year. **Benefits:** Remove debris, sediment, and potential pollutants from streets. Prevent entry into storm sewer system.	2251 / 6110

TABLE 10.7. (CONTINUED)

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)
URBAN08 - Alachua County Roads Street Sweeping / 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
URBAN11 - DOT Storm Sewer Geodatabase – Alachua County / Addresses Bacteria and Nutrient TMDL	HUC 03080102 / Orange Creek Basin /	DOT, District 2 / Alachua County; City of Gainesville	$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 Gainesville and AC Public Works for data compatibility. **Benefits:** Provide location information of storm sewer infrastructure and allow for flow modeling and illicit discharge tracking.	Not applicable / Not applicable
URBAN13 - Gainesville Urban Area Storm Sewer Geodatabase / Addresses Bacteria and Nutrient TMDL	HUC 03080102 / Orange Creek Basin /	City of Gainesville / Alachua County, DOT, District 2 (Gainesville Clean Water Partnership)	$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:** Provide location information of storm sewer infrastructure and allow for flow modeling and illicit discharge tracking.	Not applicable / Not applicable

TABLE 10.7. (CONTINUED)

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)
MSPERMIT04 - Marion County Clean Water Program- NPDES MS4 Permit / Addresses Nutrient TMDL	Orange Lake / 2749	Marion County Clean Water Program /	$3,500,000 program annual budget countywide / Marion County Clean Water Assessment / ongoing	Marion County, countywide / 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. Remove illicit connections; BMP implementation. Potential for reduction in loadings.	Unknown / Unknown
MARION03 - Street Sweeping of Marion County Roads Addresses Nutrient TMDL	Orange Lake / 2749	Marion County Clean Water Program /	$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. 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 once 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
Tumblin Creek					
TUM02 - SW 11th Avenue Storm Sewer / Addresses Bacteria and Nutrient TMDL	Tumblin Creek / 2718A	City of Gainesville / --	$88,000 / City of Gainesville Stormwater Management Utility Fee /	1200 block SW 11th Avenue / Improvement to storm sewer system. Stabilize creek outfall. **Benefits:** Reduce sediment load.	Unknown / Unknown

TABLE 10.8. CONSERVATION LAND ACQUISITION / BMP LAND ACQUISITION

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
Alachua Sink and Paynes Prairie				
AS07 - Bishop and Henderson / Addresses Nutrient TMDL	Paynes Prairie / 2718; 2711	ACEPD / --	$225,700 / 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 County Forever Policy 6.2.1.
SWT31 - Sweetwater Preserve / 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.
SWT33 - NW 2nd Street Land Acquisition	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.
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.
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.
Newnans Lake				
NEW02 - Newnans Lake Conservation Area / 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.

TABLE 10.8. (CONTINUED)

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
NEW06 - Newnans Lake Addition / 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 cost-share for remainder / 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.
NEW07 - Wainberg / 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.
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 subregional stormwater basin in nature park setting. **Benefits:** Future stormwater basin will reduce pollutant load to Newnans Lake. Remainder of site will support ecosystem/habitat preservation, passive recreation, and environmental education.
Orange Lake and Lochloosa Lake				
LOCH06 - Phifer Flatwoods / 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.
OR02 - Longleaf Flatwoods Preserve / 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.

TABLE 10.8. (CONTINUED)

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
OR03 - Lochloosa Wildlife Conservation Area / Addresses Nutrient TMDL	Orange Lake; Cross Creek; Lochloosa Lake / 2754; 2738A; 2749	SJRWMD / Alachua County	$16,058,211 / SJRWMD ad valorem; Preservation 2000; Alachua County cost-share / 2003	Alachua County; land around Lochloosa Lake and around north side of Orange Lake / Land acquisition for Lochloosa Wildlife Conservation Area. **Benefits:** No increase in surface runoff of pollutants due to land use change.
OR08 - Freddy Wood Tract / 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.
OR09 - Rayonier Tract (River Styx wetland) / 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.

TABLE 10.9. WASTEWATER INFRASTRUCTURE MANAGEMENT, MAINTENANCE, REPAIR, AND UPGRADE

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
Orange Creek Basin within GRU Service Area				
URBAN12 - Sanitary Sewer System Geodatabase / Addresses Bacteria and Nutrient TMDL	HUC 03080102 / Orange Creek Basin /	GRU / --	Part of Water/Wastewater Engineering Operations and Maintenance (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 inflow and infiltration data. **Benefits:** Provide location information of sewer infrastructure.
Alachua Sink				
AS03 - Main Street Water Reclamation Facility Reuse System / 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.
AS10 - Main Street Water Reclamation Facility Future Water Reuse / Addresses Nutrient TMDL	Alachua Sink / 2720A	GRU / --	$1.548 million for completion of project, $674,000 FY 2007/ GRU ratepayers / 2007	City of Gainesville / Design, permitting, and construction of upgrades for delivering public access to reclaimed water from Main Street WRF. Includes installation of new reclaimed water pump and high-level disinfection system. **Benefits:** Wastewater reuse will remove nutrient loading from Alachua Sink.
NUTRIENT02 - Main Street Water Reclamation Facilities Annual Operation and Maintenance / 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); $4.972 million FY 2007 / 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.

TABLE 10.9. (CONTINUED)

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
Urban Creeks: Hogtown, Sweetwater, Tumblin				
BACTERIA07 - Inflow and Infiltration Project - Phases I, II and III / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$2.372 million, FY 2002–07, about $474,000 /yr; $67,523 FY 2007 / GRU ratepayers / Ongoing	GRU WW Collection System Service Area (115 square miles) / Urban Creek Watersheds / Inflow and Infiltration Project - Phases I, II, and III comprise intensive 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 of 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 this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU wastewater collection system service area projects.
BACTERIA08 - Sliplining Projects / Addresses Bacteria and Nutrient TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$4.7 million FY 1998–2006, about $522,000 / yr; $203,922 FY 2007 / GRU ratepayers / Ongoing	GRU WW Collection System Service Area (115 square miles) / Urban Creek Watersheds / Trenchless 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 work was performed 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 this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU wastewater collection system service area.

TABLE 10.9. (CONTINUED)

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
BACTERIA09 - GRU Lift Station Annual Operation and Maintenance / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$1.236 million FY 2002–07, about $247,000/yr; $435,811 FY 2007 / GRU ratepayers / Ongoing	GRU WW 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 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 this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU WW collection system service area projects.
BACTERIA10 - GRU Wastewater System Capital Projects / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$52.542 million FY 2002–06, about $10.508 million/yr; $7.919 million FY 2007 / GRU ratepayers /	GRU WW 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 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 this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU WW collection system service area projects.

TABLE 10.9. (CONTINUED)

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
BACTERIA11 - GRU Wastewater Collection System Annual Rehabilitation and Replacement / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$14.129 million FY 2002–06, about 2.826 million/yr; $906,043 FY 2007 / 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 Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU WW collection system service area projects.
BACTERIA12 - GRU Lift Station Rehabilitation and Replacement / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$4.29 million FY 2002–06, about $878,000/yr; $567,971 FY 2007 / 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. 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 this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU WW collection system service area projects.

TABLE 10.9. (CONTINUED)

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
BACTERIA13 - GRU Wastewater Collection System Annual Operation and Maintenance / Addresses Bacteria TMDL	Tumblin Creek; Sweetwater Branch; Hogtown Creek / 2718A; 2711; 2698	GRU / --	$8.874 million FY 2002–06, about $1.775 million/yr; $1.819 million FY 2007 / GRU ratepayers / Ongoing	GRU WW Collection System Service Area (115 square miles) / Urban Creek Watersheds / GRU Wastewater Collection System Annual Operation and Maintenance 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 Wastewater Collection System has been established, decreased probability of any contribution to fecal background levels is benefit of this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU WW collection system service area projects.
BACTERIA14 - Water/Wastewater Engineering Dept. Annual Operation and Maintenance Services / 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; $649,999 FY 2007 / GRU ratepayers / Ongoing	GRU WW 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 this project.

TABLE 10.9. (CONTINUED)

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
BACTERIA15 - GRU Wastewater Collection System Annual Service Lateral Rehabilitation and Replacement / Addresses Bacteria TMDL	Hogtown Creek; Sweetwater Branch; Tumblin Creek / 2698; 2711; 2718A	GRU / --	$1.765 million FY 2002-6, about $353,000/yr; $414,653 295,000 FY 2007 / 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, 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 this project. ***Separation of project areas and benefits not feasible due to complexity and extent of GRU WW collection system service area projects.
TUM22 - Tumblin Creek Pedestal Removal / Addresses Bacteria TMDL	Tumblin Creek / 2718A	GRU / --	$80,000 / GRU ratepayers / --	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.

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APPENDIX A. GLOSSARY OF TERMS

Antibiotic resistance analysis (ARA): A type of microbial source tracking in which fecal samples from known sources—such as humans, pets, livestock, and wildlife—are tested for antibiotic resistance.

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

Background: The condition of waters in the absence of human-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.

Baseflow: The portion of a river or stream's flow that comes from ground water.

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.

Biological oxygen demand (BOD): The amount of dissolved oxygen (DO) used by aquatic microorganisms.[2]

Continuous deflective separation (CDS) unit: A patented stormwater management device that uses the available energy of the storm flow to create a vortex to separate 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 waterbody segment (such as drinking water, swimming, or fishing).

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.

[2] 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, bacteria begin the process of breaking down the waste. When this happens, aerobic bacteria consume much of the available DO, 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, a lot of bacteria will be 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, resulting in a high BOD level. When BOD levels are high, DO levels decrease, because bacteria are consuming the oxygen that is available in the water. Since less DO is available in the water, fish and other aquatic organisms may not survive.

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.

Emergent: Emerging to the surface of a waterbody.

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

External loading: Pollutants originating from outside a waterbody that contribute to its pollutant load.

Geodatabase: A database used to store and manipulate geographic information and spatial data.

Hydrodynamic separator: Any device used to slow the flow of untreated stormwater, allowing particulates to settle out before the stormwater is released into the environment. Baffle box and CDS devices described above are some examples.

Hypereutrophic: The accelerated aging and filling in of a waterbody, caused by increased levels of nutrients that result in frequent and severe algal blooms and low transparency.

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

Infiltration & Inflow (I&I): Stormwater or ground water that enters municipal wastewater systems through cracked pipes, leaking manholes, residential sump pumps, downspouts, and other sources.

Internal recycling: The process through which nitrogen and phosphorus are returned to the water column from decomposing organic matter in sediments.

Littoral: The banks of a river, lake, or estuary.

Loading: The total quantity of pollutants in stormwater runoff that contributes to water quality.

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

Low-impact Development (LID): An approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs. LID facilitates land development in a cost-effective manner that helps mitigate potential environmental impacts.

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).

Mass balance calculation: The quantification of the amount of material going into and out of a process; the difference between the two is assumed to be discharged to the environment.

Microbial source tracking (MST): Also called bacterial source tracking, MST is a group of scientific methods used for determining the source of fecal contamination (i.e., human, wildlife, agricultural, or pet wastes).

Municipal separate storm sewer system (MS4): A publicly owned conveyance or system of conveyances (i.e., ditches, curbs, catch basins, underground pipes, etc.) that is designed or used for collecting or conveying stormwater and that discharges to surface waters of the state. An MS4 can be operated by municipalities, counties, drainage districts, colleges, military bases, or prisons, to name a few examples.

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.

Notice of intent (NOI): A formal notice of an action to be taken, usually the filing of a permit.

On-site sewage treatment and disposal system (OSTDS): A septic system.

Optical brightener: A dye that absorbs light in the ultraviolet and violet region of the electromagnetic spectrum and increases the amount of reflected light. These additives are used n detergents to brighten white clothing. When released into water, they can be traced and used as an indicator of wastewater releases, provided the wastewater contains laundry discharges.

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

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

Phytoplankton: Single-celled aquatic algae.

Pollutant load reduction goals (PLRGs): PLRGs are defined as estimated numeric reductions in pollutant loadings needed to preserve or restore the 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.

Retention pond: A stormwater management structure whose primary purpose is to permanently store a given volume of stormwater 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.

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.

Ribotyping: DNA analysis used to determine the probable source of E. coli or other bacterial contamination.

Septic tank: A watertight receptacle constructed to promote the separation of solid and liquid components of wastewater, to provide the 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.

Stormceptor: A type of hydrodynamic separator manufactured by the Stormceptor Corporation.

Stormwater: Water that results from a rainfall event.

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

Submersed: Growing or remaining under water.

Sub-basin: Hydrologic units in a watershed that function as a miniwatershed, 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.

Tertiary treatment: The final stage of wastewater treatment to improve effluent quality before it is discharged to the environment.

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. Before 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, measured in milligrams per liter. 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 bioavailable 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 as phosphate (PO_4) and organic compounds found in water, measured in milligrams per liter. It is one of the primary nutrients regulating algal and macrophyte growth in natural waters, particularly in

fresh water. While it is essential to the growth of plants and other organisms in aquatic systems, excessive amounts increase the rate of plant growth and cause accelerated eutrophication and algal blooms. Phosphorus is a limiting nutrient in many ecosystems, meaning that its availability controls the growth rate of plants and other organisms. 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.

Vortech: A type of hydrodynamic separator manufactured by the Vortechnics Company.

Wasteload allocations (WLAs): 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 in a river basin.

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

Water quality standards: (1) Standards comprising 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 Rules 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 (e.g., drinking, fishing and swimming, and shellfish harvesting) and establish the water quality criteria that must be met to protect designated uses.

Watershed: A 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 water quality in the basin, which are most important, and how they will be addressed.