FINAL

BASIN MANAGEMENT ACTION PLAN

for the Implementation of Total Maximum Daily Loads for Nutrients by the Florida Department of Environmental Protection in the Middle St. Johns River Basin for Wekiva River, Rock Springs Run, and Little Wekiva Canal

Adopted by the
Florida Department of Environmental Protection
Division of Environmental Assessment and Restoration
Watershed Restoration Program
Tallahassee, FL 32399

in cooperation with the
Wekiva Basin Management Action Plan Working Group

October 2015

ACKNOWLEDGMENTS

The Florida Department of Environmental Protection adopted the Wekiva River, Rock Springs Run, and Little Wekiva Canal Basin Management Action Plan by Secretarial Order as part of its statewide watershed management approach to restore and protect Florida's water quality. The plan was developed in cooperation with the Wekiva River Basin Management Action Plan Working Group, listed below, with participation from affected local, regional, and state governmental interests; elected officials and citizens; and private interests.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Jonathan P. Steverson, Secretary

WEKIVA RIVER BASIN MANAGEMENT ACTION PLAN WORKING GROUP

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City of Apopka
City of Eustis
City of Maitland
City of Mount Dora
City of Oakland
City of Ocoee
City of Orlando
City of Tavares
City of Winter Garden
Florida Department of Agriculture and Consumer Services
Florida Department of Transportation
Florida Expressway
Florida Turnpike Authority
Friends of the Wekiva
Lake County
Lake County Health Department
Orange County
Orange County Health Department
Sanlando Utilities Corp.
Seminole County
Seminole County Health Department
St. Johns River Water Management District
Town of Astatula
Wekiva River Aquatic Preserve (Florida Department of Environmental Protection)
Wekiwa Springs State Park (Florida Department of Environmental Protection)

In addition to the efforts of the Basin Working Group, the Florida Department of Environmental Protection appreciates the contributions of other state agencies, elected officials, private firms and organizations, homeowner associations, and private citizens throughout the development of the plan and wants to express

special appreciation for the participation of representatives from the Florida Department of Health, the Tri-County Association, and the Markham Woods Association.

For additional information on Total Maximum Daily Loads and the watershed management approach in the Wekiva River, Rock Springs Run, and Little Wekiva Canal Basin, contact:

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms Per Liter
µmho/cm	Micromohs Per Centimeter
A-FIRST	Altamonte Springs-FDOT Integrated Reuse and Stormwater Treatment
APRICOT	A Prototype Realistically Innovative Community of Today
ARROW	Apopka Regional Reuse of Water
BMAP	Basin Management Action Plan
BMP	Best Management Practice
BOD	Biological Oxygen Demand
C	Celcius
CDS	Continuous Deflective Seperator
C.F.R.	Code of Federal Regulations
CFS	Cubic Feet Per Second
CIP	Capital Improvement Project
CIPP	Cured in Place Pipe
CMP	Corrugated Metal Pipe
Department	Florida Department of Environmental Protection
DO	Dissolved Oxygen
EMC	Event Mean Concentration
EPA	United States Environmental Protection Agency
ERP	Environmental Resource Permit
F.A.C.	Florida Administrative Code
FAR	Florida Adminsitrative Register
FAW	Florida Administrative Weekly
FDACS	Florida Department of Agriculture and Consumer Services
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FFF	Florida-Friendly Fertilizer
FOWR	Friends of the Wekiva River
F.S.	Florida Statutes
FWRA	Florida Watershed Restoration Act
FYN	Florida Yards and Neighborhoods
GIS	Geographic Information System
H&H	Hydrologic and Hydraulic
HDPE	High-Density Polyethylene
I&I	Inflow and Infiltration
IWR	Impaired Surface Waters Rule
LA	Load Allocation
lbs/yr	Pounds per Year
lbs/mo	Pounds per Month
LCI	Lake Condition Index
LID	Low-Impact Development
LS	Lift Station
LVI	Lake Vegetation Index
MEP	Maximum Extent Practicable
MFL	Minimum Flows and Levels
MG	Million Gallons

MGD	Million Gallons Per Day
mg/L	Milligrams per Liter
MIL	Mobile Irrigation Lab
MS4	Municipal Separate Storm Sewer System
NELAC	National Environmental Laboratory Accreditation Council
NELAP	National Environmental Laboratory Accreditation Program
NNC	Numeric Nutrient Criteria
NO3NO2	Nitrate + Nitrite
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSBB	Nutrient Separating Baffle Box
NSILT	Nitrogen Source Inventory and Loading Tool
NTU	Nephelometric Turbidity Unit
NWRWTF	Northwest Reclaimed Water Treatment Facility
OAWP	Office of Agricultural Water Policy
OCEPD	Orange County Environmental Protection Division
OCU	Orange County Utilities
OFW	Outstanding Florida Water
OOCEA	Orlando–Orange County Expressway Authority
OSTDS	Onsite Treatment and Disposal Systems
P	Phosphorus
PCU	Platinum Cobalt Unit
PLRG	Pollutant Load Reduction Goal
POTW	Publicly Owned Treatment Works
PSA	Public Service Announcement
PUD	Planned Unit Development
QA/QC	Quality Assurance/Quality Control
RCP	Reinforced Concrete Pipe
RIB	Rapid Infiltration Basin
RPS	Rapid Periphyton Survey
R/R	Removal and Relocation
RWM	Reuse Water Main
SAV	Submerged Aquatic Vegetation
SCES	Seminole County Environmental Services
SCI	Stream Condition Index
SJRWMD	St. Johns River Water Management District
SOP	Standard Operating Procedure
SSO	Sanitary Sewer Overflow
STORET	STOrage and RETrieval (Database)
SU	Standard Unit
SWMM	Storm Water Management Model
SWMP	Stormwater Management Program
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids

UCF	University of Central Florida
UF–IFAS	University of Florida–Institute of Food and Agricultural Sciences
USGS	United States Geological Survey
WAVA	Wekiva Aquifer Vulnerability Assessment
WBID	Waterbody Identification
WBWG	Wekiva Basin Working Group
WLA	Wasteload Allocation
WMM	Watershed Management Model
WPPA	Wekiva Parkway and Protection Act
WRF	Water Reclamation Facility
WRM	Water Resource Management
WSA	Wekiva Study Area
WWTF	Wastewater Treatment Facility

EXECUTIVE SUMMARY

THE WEKIVA RIVER, ROCK SPRINGS RUN, AND LITTLE WEKIVA CANAL BASIN

The Wekiva River originates in Wekiwa Springs State Park (Orange County) at the confluence of Wekiva Springs Run and Rock Springs Run. The river meanders for about 14 miles through Lake, Seminole, and Orange Counties before entering the St. Johns River just downstream of Lake Monroe. Along the way, it receives discharges from major tributaries, including the Little Wekiva River and Blackwater Creek. The Little Wekiva Canal has an outfall to the Little Wekiva River approximately 14 miles upstream of the confluence with the Wekiva River.

The Wekiva River, Rock Springs Run, and the Little Wekiva Canal are designated by the state as Class III waters, meaning they must be suitable for recreation and must support the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Both the Wekiva River and Rock Springs Run, and the associated headsprings, are significant recreational resources for activities such as swimming, snorkeling, tubing, canoeing, boating, and fishing. The Wekiva River system (including the main stem of the Wekiva River and Rock Springs Run) is designated by the state as an Outstanding Florida Water (OFW), the Wekiva River and portions of its tributaries are designated as a state Aquatic Preserve worthy of special protection because of their natural attributes, and the river is also designated by the federal government as a Wild and Scenic River.

The dissolution of underlying limestone has shaped the basin's land forms and topography, and closed depressions and water-filled sinks drain much of the area. Lakes in the area are formed in solution depressions (sinkholes), and surface runoff flows to the nearest depression. Spring discharges from multiple vents provide most of the water to the Wekiva River, Rock Springs Run, the Little Wekiva River (north of State Road 434), and Blackwater Creek; however, local stormwater runoff is also a significant source of flow. There are no known springs discharging to the Little Wekiva Canal, and its flow comes from local runoff and shallow ground water inflows. The source of the water discharged by springs in the basin is the upper Floridan aquifer system, which is also the main source of water for potable supply in the area.

Total Maximum Daily Loads

The Wekiva River and Rock Springs Run were verified as impaired in 2007 because of elevated total phosphorus (TP) and nitrate-nitrogen, based on evidence of an imbalance in aquatic flora. The Little Wekiva Canal was verified as impaired for dissolved oxygen (DO) and nutrients based on elevated levels of chlorophyll-*a* and was subsequently verified as impaired for DO attributable to elevated total nitrogen (TN) and biochemical oxygen demand (BOD).

TMDLs must be developed for waterbodies that are verified as impaired, meaning that they do not meet their designated uses. A TMDL is the amount of a pollutant that a waterbody can receive and still maintain its designated uses. In 2008, the Florida Department of Environmental Protection adopted the nutrient TMDLs for the Wekiva River, Wekiwa Springs, and Rock Springs Run (nitrate and TP), as well as the nutrient and DO TMDLs for the Little Wekiva Canal.

The Wekiva River, Rock Springs Run, and Little Wekiva Canal Basin Management Action Plan

TMDLs can be implemented through BMAPs, which contain strategies to reduce and prevent pollutant discharges through various cost-effective means. The department and the affected stakeholders in the various basins jointly develop BMAPs or other implementation approaches.

The BMAP development process is structured to achieve cooperation and consensus among a broad range of interested parties. By statute, the department invites stakeholders to participate in the BMAP development process and encourages public participation.

The planning area encompassed by the Wekiva BMAP covers approximately 513 square miles, situated mainly in Lake and Orange Counties, with smaller portions in Seminole and Marion Counties. The southeastern portion of the BMAP area is highly urbanized and occupied by several municipalities in Seminole and Orange Counties, including the cities of Altamonte Springs, Apopka, Maitland, and Orlando. More rural areas are located in Lake County and a small portion of Marion County.

The Wekiva BMAP area includes roughly half of the Wekiva ground water basin drawn by the St. Johns River Water Management District (SJRWMD) and includes the springs that contribute to the Wekiva River, Rock Springs Run, the Little Wekiva River, and Blackwater Creek. This ground water basin, or springshed, includes most of the combined ground water and surface water contributing area for the Wekiva River system. The portion of the springshed within the BMAP planning area includes a significant recharge area for the springs that are part of the Wekiva River system.

The Wekiva River surface water basin, a large portion of the springshed for the group of springs that contributes flow (and nutrients) to the system, and the Little Wekiva Canal watershed are also part of the BMAP planning area. Although the Little Wekiva River and Blackwater Creek watersheds are not verified as impaired and do not have TMDLs, their contributing areas are included in the BMAP as contributing areas to the Wekiva River (main stem), nutrient reductions made in those watersheds will also benefit the Wekiva River (main stem).

Assumptions and Considerations Regarding TMDL and BMAP Implementation

Projects and management actions described in the BMAP include a range of projects and programs. Many have been completed, and others are under construction, in the design, or conceptual planning stage. A significant effort has already been made by the Wekiva Basin Working Group (WBWG) member organizations, and a further commitment has been made to implement in-process projects and programs during the first five-year phase of the BMAP.

The water quality impacts of BMAP implementation are based on several fundamental assumptions about the parameters targeted by the TMDLs, modeling approaches, waterbody response, and natural processes. In addition, there are important factors to be considered about the nature of the BMAP and its long-term implementation.

This BMAP requires stakeholders to implement their projects set forth here within the first five-year BMAP cycle. However, the full attainment of the TMDL targets will be a long-term process, adaptively managed in iterative five-year BMAP cycles. While some projects and activities contained in this BMAP were completed or are currently ongoing, other projects require time for design, permitting, construction, and to secure funding. Funding limitations do not affect the requirement that every entity must implement the activities committed to in this BMAP.

Achieving the nutrient reduction goals under this BMAP will not be easily attained and will require a sustained effort to implement projects and actions. To meet the TMDL targets established for the Wekiva River, Rock Springs Run, and Little Wekiva Canal, future actions will be needed beyond those identified for the first five-year BMAP cycle. Regular monitoring, follow-up, and continued coordination and communication with stakeholders are essential to ensure the implementation of projects and management actions and assessment of their incremental benefits.

Significant Nutrient Reductions Achieved by Stakeholders

The BMAP provides detailed project lists that will be implemented by each responsible entity in the next five years, and describes monitoring plans to track changes in water quality concurrent with BMAP implementation. Projects and manegement actions completed since January 1, 2000, were eligible for BMAP credit, based on the water quality data used to establish the TMDLs. The actions included in this first BMAP iteration have been completed, are ongoing, or must be completed within the next five years.

Cost estimates were provided by stakeholders for more than 50% of the projects and management actions listed in the BMAP. The total estimated cost for these projects exceeds $262 million, and approximately $202 million have been expended to date (on completed projects). Stakeholders are required to implement additional projects listed in the BMAP, but accurate cost estimates have not yet been developed for these other projects. The total cost estimate for all projects referenced in the BMAP is unknown until more information is known about each project. Over the first five-year phase of the BMAP, stakeholders will achieve significant reductions in annual nutrient loadings to the Wekiva River Basin, including 439,879 pounds of TN and 68,612 pounds of TP, based on conservative estimates.

The BMAP was developed under the department's comprehensive approach to identify polluted waterways and build partnerships with local, regional, and state interests to return the waterbodies to a healthy condition. This effort demonstrates the commitment of local governments and stakeholders to the restoration of waterbodies in their part of the state. To the credit of local governments, many projects have been implemented or were planned in advance of finalizing the BMAP. **Table ES.1** provides examples of load reductions for significant project commitments.

Load reduction estimates provided by planned and completed in the BMAP indicate that the BMAP projects already account for a significant amount of the nitrogen and phosphorus load reductions needed to meet the TMDLs.

TABLE ES.1. LOAD REDUCTIONS FROM SIGNIFICANT PROJECT COMMITMENTS, BY CATEGORY

PROJECT CATEGORY	TN LOAD REDUCTIONS (LBS/YR)	TP LOAD REDUCTIONS (LBS/YR)
Wastewater Treatment, Reuse, and Expanded Collection	374,166	71,653
Stormwater Projects and Stormwater Associated with Dirt Road Paving	33,981	13,323
Stream Stabilization/Erosion Control	4,230	326
Agricultural Best Management Practices (BMPs)	9,015	5,285
Land Preservation	2,092	20
TOTAL REDUCTIONS	**423,484**	**90,517**

BMAP FOLLOW-UP

While the Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP is an important step forward to reduce nutrients, much remains to be accomplished. Onsite sewage treatment and disposal systems (OSTDS), or septic tanks, are a significant source of nutrient loads to the Wekiva system that must be more fully addressed. Consequently, the BMAP includes commitments from the department and stakeholders to work together to prioritize areas where nitrogen reductions from septic tanks are necessary, to evaluate and select projects and management actions in the priority areas, and to develop stakeholder implementation plans. This OSTDS Initiative will provide the basis for implementing projects in this BMAP, and for identifying additional projects in future BMAPs (see **Section 1.3.4**).

The department will also work with the technical stakeholders to organize the monitoring data and track project implementation. The results will be used to evaluate whether the plan is effective in reducing nutrient loads in the watershed. The technical stakeholders will meet approximately every 12 months after the adoption of the BMAP to follow up on plan implementation, share new information, and continue to coordinate on TMDL-related issues.

PROJECTS AND MANAGEMENT ACTIONS, SUFFICIENCY OF EFFORT, AND ENFORCEMENT

The Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP has been prepared in coordination with the Wekiva Parkway and Protection Act (WPPA) (Chapter 369, Part III, Florida Statutes [F.S.]) and reflects the commitment by stakeholders to implement projects and management actions to reduce nutrient loading during the first five-year implementation period. The management actions and associated projects provide reasonable assurance that progress towards load reductions consistent with TMDL requirements will be sufficiently achieved within the overall BMAP planning area within the five-year period. This does not imply that the entire load reduction required by the applicable TMDLs will be achieved during the first five years, but that estimated load reductions are sufficient to incrementally restore the waterbody and achieve TMDL requirements with future BMAP iterations.

The adopted TMDLs for the Wekiva River, Rock Springs Run, and the Little Wekiva Canal provide the allocations used in this BMAP. For nonpoint sources, these allocations are collectively applied throughout the entire Wekiva BMAP planning area. In association with this and future BMAP updates, the department and stakeholders may use additional science-based tools to reduce loadings more effectively and efficiently. These tools may include the identification of priority areas for additional nutrient reduction projects and agricultural best management practice (BMP) implementation, both of which may include targeted priorities within springsheds, aquifer vulnerability areas, or land activities associated with a higher nutrient loading potential.

The requirements of this BMAP are enforceable by the department . For surface water discharges from wastewater treatment facilities (WWTFs) and municipal separate storm sewer systems (MS4s), the BMAP and required TMDL reductions are enforceable conditions in National Pollutant Discharge Elimination System (NPDES) permits. Pursuant to Section 403.067, F.S., nonpoint sources such as agriculture must demonstrate compliance with required reductions by either implementing the appropriate BMPs or conducting water quality monitoring prescribed by the department or a water management district that demonstrates compliance with state water quality standards.

CHAPTER 1: CONTEXT, PURPOSE, AND SCOPE OF THE PLAN

1.1 WATER QUALITY STANDARDS AND TOTAL MAXIMUM DAILY LOADS

Florida's water quality standards are designed to ensure that surface waters can be used for their designated purposes, such as drinking water, recreation, and shellfish harvesting. Currently, most surface waters in Florida, including those in the Middle St. Johns River Basin, are categorized as Class III waters, meaning they must be suitable for recreation and must support the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. **Table 1.1** shows the state's designated use categories.

TABLE 1.1. DESIGNATED USE ATTAINMENT CATEGORIES FOR FLORIDA SURFACE WATERS

* Surface water classification for waters in the Middle St. Johns River Basin

CATEGORY	DESCRIPTION
Class I	Potable water supplies
Class II	Shellfish propagation or harvesting
Class III*	**Recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife**
Class III-Limited	Fish consumption; recreation or limited recreation; and/or propagation and maintenance of a limited population of fish and wildlife *(no current Class III-Limited designations)*
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use (*no current Class V designations*)

Under Section 303(d) of the federal Clean Water Act, every two years each state must identify its impaired waters, including estuaries, lakes, rivers, and streams, that do not meet their designated uses and are not expected to meet applicable water quality standards within the subsequent two years. The Florida Department of Environmental Protection is responsible for developing this "303(d) list" of impaired waters.

Florida's 303(d) list identifies hundreds of waterbody segments that fall short of water quality standards. The three most common water quality concerns are nutrients, oxygen-demanding substances, and coliforms. The listed waterbody segments are candidates for more detailed assessments of water quality to verify whether they are impaired according to state statutory and rule criteria. The department develops and adopts TMDLs for the waterbody segments it identifies as impaired. A TMDL is the maximum amount of a specific pollutant that a waterbody can receive while still maintaining its designated uses.

The water quality evaluation and decision-making processes for listing impaired waters and establishing TMDLs are authorized by Section 403.067, Florida Statutes (F.S.), known as the Florida Watershed Restoration Act (FWRA), and contained in Florida's Identification of Impaired Surface Waters Rule (IWR), Rule 62-303, Florida Administrative Code (F.A.C.).

The Wekiva River and Rock Springs Run and the associated headsprings are significant recreational resources, providing both direct and indirect contact uses such as swimming, snorkeling, tubing, canoeing, boating, and fishing. In addition to being Class III waters, the Wekiva River and the lower reaches of Rock Springs Run, Blackwater Creek, and the Little Wekiva River are designated by the state as an Aquatic Preserve, the Wekiva River system (including the main stem of the Wekiva River and Rock Springs Run) is designated by the state as an Outstanding Florida Water (OFW),[1] and the federal government has designated the river as a Wild and Scenic River.

TMDLs are developed and implemented as part of a watershed management cycle that rotates through the state's 52 river basins every five years to evaluate waters, determine impairments, and develop and implement projects and management actions to restore impaired waters to their designated uses**. Table 1.2** summarizes the five phases of the watershed management cycle.

TABLE 1.2. PHASES OF THE WATERSHED MANAGEMENT CYCLE

PHASE	ACTIVITY
Phase 1	Preliminary evaluation of water quality
Phase 2	Strategic monitoring and assessment to verify water quality impairments
Phase 3	Development and adoption of TMDL(s) for waters verified as impaired
Phase 4	Development of management strategies to achieve the TMDL(s)
Phase 5	Implementation of TMDL(s), including monitoring and assessment

The impaired waters in the Wekiva River, Rock Springs Run, and Little Wekiva Canal watersheds are Class III waters. The Wekiva River and Rock Springs Run were verified as impaired due to total phosphorus (TP) and nitrate-nitrogen (Gao 2008), based on evidence of imbalance in aquatic flora provided by the St. Johns River Water Management District (SJRWMD). The Little Wekiva Canal was verified as impaired for dissolved oxygen (DO) and for nutrients based on the levels of chlorophyll-*a*

[1] An OFW is a water determined to be worthy of special protection because of its natural attributes. This designation is applied to certain waters through rule adoption by the state's Environmental Regulation Commission and is intended to protect existing good water quality.

found between 1996 and 2002 (Bailey 2008). The canal was subsequently verified as impaired for DO attributable to elevated total nitrogen (TN) and biochemical oxygen demand (BOD).

The department established the following TMDLs for these waters, identifying the amount of nutrients they can receive and still maintain Class III designated uses:

- **Wekiva River, Wekiwa Springs, and Rock Springs Run –** In April 2008, nitrate-nitrogen and TP.
- **Little Wekiva Canal –** In June 2008, TN and BOD, which caused impairment for DO.

1.2 TMDL Implementation

Rule-adopted TMDLs may be implemented through Basin Management Action Plans, which contain projects and management actionsto reduce and prevent pollutant discharges through various cost-effective means. If a BMAP is being developed, then during Phase 4 of the watershsed management process, the department and the affected stakeholders in the various basins jointly develop BMAPs or other implementation approaches. A basin may have more than one BMAP, based on practical considerations. The FWRA contains provisions that guide the development of BMAPs and other TMDL implementation approaches.

Stakeholder involvement is critical to the success of the TMDL Program and varies with each phase of implementation to achieve different purposes. The BMAP development process is structured to achieve cooperation and consensus among a broad range of interested parties. Under statute, the department invites stakeholders to participate in the BMAP development process and encourages public participation to the greatest practicable extent. The department must hold at least one noticed public meeting in the basin to discuss and receive comments during the plan development process. Stakeholder involvement is essential to develop, gain support for, and secure commitments to implement the BMAP.

1.3 The Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP

1.3.1 Stakeholder Involvement

In April 2009, the department convened a Wekiva Basin Working Group (WBWG) comprising key stakeholders. The WBWG met over the past several years to provide information used in the development of the BMAP and to identify projects and management actions to improve water quality.

Except as specifically noted in subsequent sections, this BMAP document reflects the input of the WBWG, along with public input during the WBWG meetings. **Table 1.3** identifies the entities comprising the WBWG.

There were 23 local governments and other entities involved in the WBWG supported by a WBWG member, an alternate, and additional staff and consultants. In addition, more than 75 citizens and representatives from private environmental firms, homeowner associations, other state agencies, and the offices of local and state elected officials participated in the WBWG meetings. **Appendix A** provides further details on the WBWG members.

TABLE 1.3. WBWG MEMBER ORGANIZATIONS

TYPE OF ENTITY	MEMBERS
Cities and Towns	Altamonte Springs, Apopka, Astatula, Eustis, Maitland, Mount Dora, Oakland, Ocoee, Orlando, Tavares, Winter Garden
Counties	Lake, Orange, Seminole (including the Florida Department of Health from each county)
State Agencies	Department, Florida Department of Agricultural and Consumer Services (FDACS), Wekiwa Springs State Park and Wekiva River Aquatic Preserve, Florida Department of Transportation (FDOT) District 5, Florida Expressway, Florida Turnpike, SJRWMD
Environmental Organizations	Friends of the Wekiva River (FOWR)
Private Utilities	Sanlando Utilities Corp./Wekiva Hunt Club Wastewater Treatment Facility (WWTF)

1.3.2 PLAN PURPOSE AND SCOPE

The purpose of this BMAP is to implement nitrate, TN, TP, and BOD reductions for the BMAP planning area to achieve the TMDLs. The plan outlines specific actions and an implementation schedule for load reductions. It also details a monitoring approach to measure progress toward meeting the nutrient load reductions. The stakeholders will meet at least annually to review progress made towards achieving the TMDLs.

The Wekiva River receives discharges from several major tributaries, including Wekiwa Springs Run, Rock Springs Run, the Little Wekiva River, and Blackwater Creek. In 2008, the department adopted nutrient TMDLs for the Wekiva River and Rock Springs Run (Gao 2008). Along with the nutrient TMDLs for the Wekiva River and Rock Springs Run, this BMAP will also address the nutrient and DO TMDL for the Little Wekiva Canal (Bailey 2008). Since the Little Wekiva Canal discharges to the Little Wekiva River, reductions made to achieve the Little Wekiva Canal TMDL should benefit the Little Wekiva River.

In addition, although TMDLs have not been developed for the Little Wekiva River and Blackwater Creek, they are included in this BMAP as contributing areas to the Wekiva River (main stem); reductions made in both watersheds will benefit the Wekiva River (main stem). Many springs contribute flow to this system (including Wekiwa Spring and Rock Spring), and their water quality is also a consideration in this BMAP.

The BMAP planning area includes the Wekiva River surface water basin, a large portion of the springshed for the group of springs that contributes flow (and nutrients) to the system, the Little Wekiva Canal Basin, and the surface water basin of the Little Wekiva River and Blackwater Creek. The BMAP planning area is approximately 513 square miles in size and is situated mainly in Lake and Orange Counties, with smaller portions in Seminole and Marion Counties. The southeastern portion of the BMAP area is highly urbanized and occupied by several municipalities in Seminole and Orange Counties, including the cities of Orlando, Maitland, and Altamonte Springs. More rural areas are located in the northern portion of the BMAP area in Lake County and in a small portion of Marion County. The BMAP planning area also includes a portion of the Blackwater Creek surface water basin, which extends farther north into Lake County and into southwestern Marion County.

The Wekiva BMAP area includes roughly half of the Wekiva ground water basin drawn by the SJRWMD (Toth and Fortich 2002) and contains the springs that contribute to the Wekiva River, Rock Springs Run, the Little Wekiva River, and Blackwater Creek. This ground water basin, or springshed, includes the combined ground water and surface water contributing area for the Wekiva River system. The portion of the springshed within the BMAP planning area includes a significant recharge area for the springs that are part of the Wekiva River system, as shown in **Figure 1.1**.

Figure 1.2 shows that the Wekiva BMAP planning area roughly corresponds to the boundaries of the Wekiva Study Area (WSA). The WSA was established under the Wekiva Parkway and Protection Act (WPPA) (Chapter 369, F.S.), which required the department to study the efficacy and applicability of water quality standards needed to achieve nitrogen reductions to protect surface and ground water in the WSA (Department 2004). Under this legislative mandate, the department also initiated rulemaking to achieve nitrogen reductions in domestic wastewater facilities (discussed in a subsequent chapter of this report).

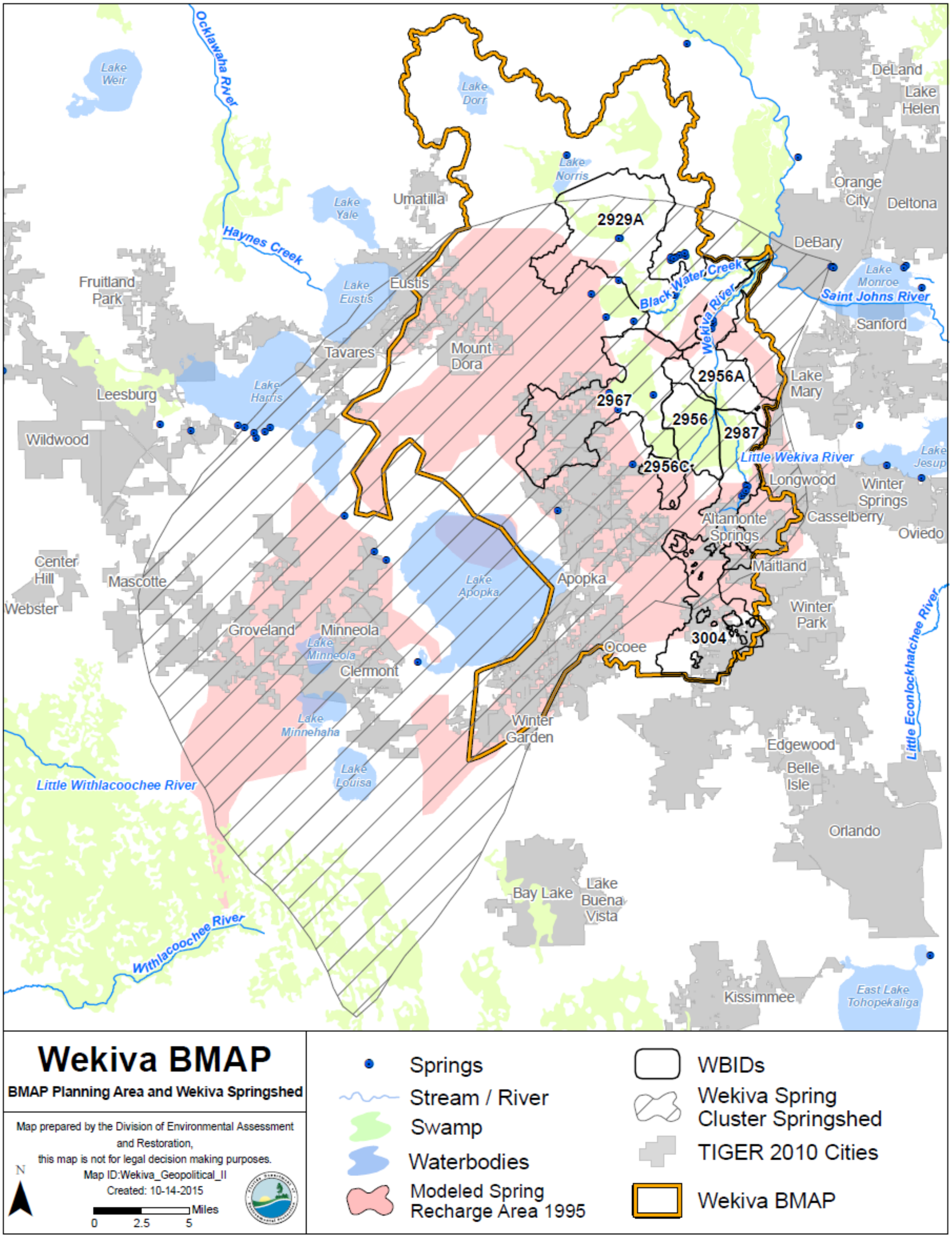

Figure 1.1. Wekiva BMAP Planning Area Superimposed on the Springshed for the Wekiwa Springs Cluster

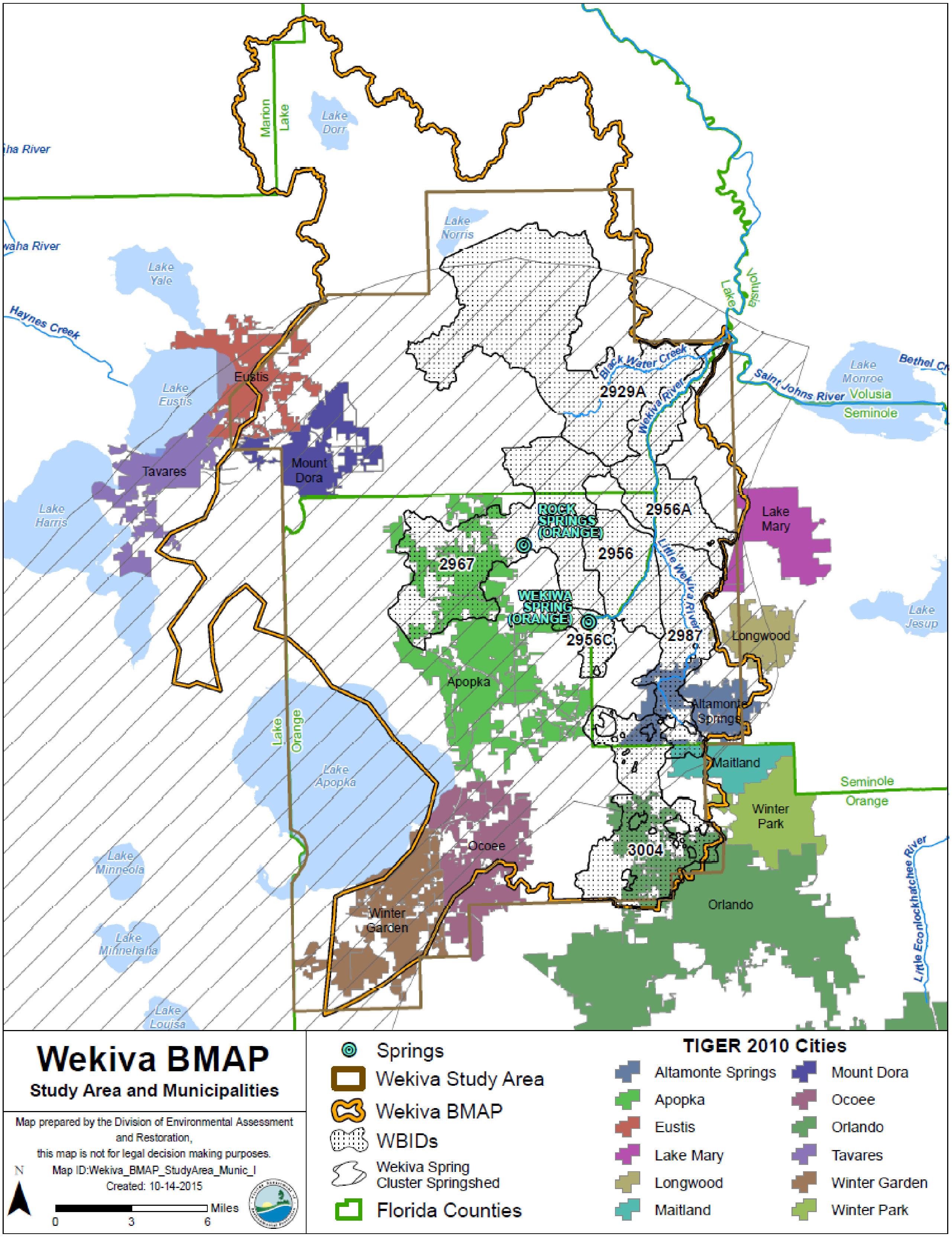

FIGURE 1.2. WEKIVA BMAP PLANNING AREA SUPERIMPOSED ON THE WSA, SURFACE WATERSHEDS, AND SPRINGSHED

Table 1.4 lists the WBWG member jurisdictions (*e.g.*, counties, cities, and towns) and identifies their locations in the BMAP planning area relative to the WSA, the Wekiwa Springs Cluster ground water basin, and the impaired surface water basins that contribute to the Wekiva River. Other WBWG members previously listed in **Table 1.3**, such as the numerous state agencies that participated in the process, are not included in this table.

The Wekiva River system is located in an area where many concurrent and collaborative efforts are under way to protect and restore a vital resource. As noted in **Table 1.4**, many of the WBWG member jurisdictions are also in the WSA and as such have implemented requirements under the WPPA.

TABLE 1.4. LOCATION OF WBWG MEMBER JURISDICTIONS IN THE WEKIVA BMAP PLANNING AREA

[1] This table lists only counties, cities, and towns with geopolitical boundaries. Other WBWG members, such as state agencies, are not included.
[2] Only a small portion of the city of Tavares is located in the BMAP planning area.
WBID = Segment with a **w**ater**b**ody **id**entification number.

County/City/Town[1]	In WSA?	In Spring Cluster Ground Water Basin of BMAP Planning Area?	In Surface Water Basin of the BMAP Planning Area (WBID Number)?
Altamonte Springs	Yes	Yes	Little Wekiva Canal (3004) Little Wekiva River (2987)
Apopka	Yes	Yes	No
Astatula	No	Yes	No
Eustis	Yes	Yes	No
Lake County (unincorporated)	Yes	Yes	Rock Springs Run (2967) Lower Wekiva River (2956A)
Maitland	Edge	Yes	Edge of Little Wekiva Canal (3004)
Mount Dora	Yes	Yes	No
Oakland	Yes	Yes	No
Ocoee	Yes	Yes	No
Orange County (unincorporated)	Yes	Yes	Rock Springs Run (2967) Upper Wekiva River (2956) Lower Wekiva River (2956A) Little Wekiva River (2987) Little Wekiva Canal (3004)
Orlando	Yes	No	Little Wekiva Canal (3004) Little Wekiva River (2987)
Seminole County (unincorporated)	Yes	Yes	Lower Wekiva River (2956A) Little Wekiva River (2987)) Little Wekiva Canal (3004)
Tavares	No	Yes[2]	No
Winter Garden	Yes	Yes	No

WBWG member organizations also participate in other efforts and management plans. For example, many of them are cooperating agencies for the Wekiva National Wild and Scenic River Management Plan finalized in May 2012. That plan outlines goals, objectives, and actions for protecting the 41.6-mile river system from its confluence with the St. Johns River to Wekiwa Springs and its tributaries (Wekiwa Springs Run, Rock Springs Run, and Blackwater Creek), and addresses key issues such as human disturbance and biodiversity loss. Water quality and quantity is one of five areas addressed by the plan; the goals, objectives, and actions identified in the plan are related to many of the efforts outlined in the Wekiva BMAP. However, the Wekiva BMAP is a separate effort, and although the action items are related, the BMAP does not incorporate the actions of the Wekiva National Wild and Scenic River Management Plan as part of the management actions adopted by Secretarial Order. The same is true for any other plan or partnership mentioned in this document.

1.3.3 BMAP Approach

A BMAP often specifies the phased implementation of actions to restore the impaired waters under Paragraph 403.067(7)(a)1, F.S. The projects and management actions and adaptive management approach to be followed under the BMAP will address nutrient reductions, and the process will continue until the waters meet their designated uses. The phased BMAP approach allows for the implementation of projects designed to achieve incremental reductions, while simultaneously monitoring for improving trends and further assessing the influence of sources and conditions affecting those trends in the contributing area.

The effectiveness of the nutrient reduction measures will be monitored throughout the implementation of the BMAP, and stakeholder actions can be added or modified at any time to enhance nutrient reductions. Prior to making modifications in projects, stakeholders must submit the proposed modification to the department in writing for approval. After the first five years of BMAP implementation, stakeholders will formally evaluate progress in project implementation and the results of surface water and ground water monitoring and, based on updated scientific data, will make adjustments and changes in the restoration activities as needed. If necessary, a revised BMAP will be produced at that time to include these changes.

Categories for Rule Allocations

The rules adopting TMDLs must establish reasonable and equitable allocations that will alone, or in conjunction with other management and restoration activities, attain the TMDLs. Allocations are assigned to National Pollutant Discharge Elimination System (NPDES) wastewater sources, as well as NPDES stormwater and nonpoint sources, and may be further allocated to individual sources, source categories, entities, subbasins, individual basins, or basins as a whole. Depending on the type of source, the allocations can be assigned as a pollutant discharge in pounds per year (lbs/yr) or as a percent reduction as measured at the affected resource. Currently, the TMDL allocation falls into the following two broad categories:

- **Wasteload Allocation (WLA)** is the allocation to point sources permitted under the NPDES Program. It includes the following:
  - **Wastewater Allocation:** The discharge allocation to industrial and domestic wastewater facilities.
  - **NPDES Stormwater Allocation:** The allocation to NPDES stormwater permittees that operate municipal separate storm sewer systems (MS4s). These permittees are treated as point sources under the TMDL Program.
- **Load Allocation (LA)** is the allocation to nonpoint sources, including fertilizer, animal waste, domestic wastewater and stormwater loads to ground water, stormwater from an MS4 jurisdiction that does not discharge directly to an impaired water, and stormwater discharges from areas that are not included in an MS4 permit.

Allocations Implemented by the BMAP

The FWRA, Section 403.067, F.S., states that the BMAP must equitably allocate pollutant reductions to individual basins, as a whole to all basins, or to each identified point source or category of nonpoint sources, as appropriate. Allocations are determined based on a number of factors listed in the FWRA, including cost-benefit, technical and environmental feasibility, implementation time frames, and others. The 2008 adopted TMDLs for the Wekiva River, Rock Springs Run, and the Little Wekiva Canal provide the allocations used in this BMAP. Allocations for point sources include specific limitations for NPDES wastewater facilities and load reduction percentages for stormwater discharges from regulated MS4s in each of the subbasins for TP, TN, and/or nitrate, as applicable. For nonpoint sources, the applicable pollutant reductions are allocated to the applicable subbasins in the BMAP planning area. The load allocations apply collectively to all nonpoint sources.

Specific nutrient loads in surface water runoff for nitrate and TP associated with each land use were calculated, based on 2009 land use data, SJRWMD aquifer recharge information, and the event mean concentrations (EMCs) for individual land uses in the basin. Load reduction estimates associated with point and nonpoint source projects and management actions are included in the BMAP in order to consider the basinwide sufficiency of effort for project implementation during the first five-year phase.

1.3.4 Onsite Sewage Treatment and Disposal Systems (OSTDS) Initiative

OSTDS are one of the more difficult sources of nitrogen loading to the Upper Floridan Aquifer (UFA) to address. Solutions are complex and frequently controversial. As population grows in the watershed, the question of how to address and direct the impacts of wastewater disposal becomes more important. A more coordinated planning effort is needed. Connection to central sewer systems is sometimes considered as the option for addressing this source. However, several factors such as the cost-effectiveness of the sewering project and available wastewater treatment facility (WWTF) capacity need to be considered. Conversely, OSTDS do provide needed wastewater treatment in areas where central sewer is not economically feasible or practical. The department understands that the selection of projects and management actions to meet OSTDS reduction requires sufficient time for stakeholders to consult with local decision makers, plan implementation timelines, consider funding sources, and budget available funds.

To reduce this source of loading in the future, the department, with representation from the Florida Department of Health (FDOH), private and public utilities, local governments, community development districts, homeowners, businesses, and other vested interests will develop a comprehensive and sustainable plan with nitrogen reducing projects that focus on OSTDS sources. This plan will be developed through the OSTDS Initiative.

The objective of the OSTDS Initiative is to identify effective, financially feasible strategies to reduce existing and prevent future nutrient loads from OSTDS sources. The department and stakeholders will identify options for addressing OSTDS loading, identify effective management and engineering strategies to reduce loading from OSTDS for the Wekiva River Basin, establish education and outreach programs that provide area residents with information about OSTDS systems and their effect on the Wekiva River system, determine responsibilities and legal parameters, and identify funding sources and an implementation schedule for the projects and management actions and any facility construction.

The OSTDS Initiative will result in comprehensive and sustainable management and engineering strategies for nitrogen reduction from OSTDS for Seminole County, Orange County, and Lake County and the cities of Altamonte Springs, Apopka, Maitland, and Orlando. These projects can be separate, shared, or implemented in collaboration with any combination of these jurisdictions.

1.3.4.1 General Direction for the OSTDS Initiative

The department will facilitate the organization of an advisory committee with representation from FDOH, private and public utilities, local governments, community development districts, businesses, and other vested interests, such as homeowners from the Wekiva BMAP planning area. This advisory committee will be tasked with three main objectives to meet the goal of developing and implementing management strategies necessary to reduce nutrient loading from OSTDS within a realistic time frame:

1. Identify, collect and evaluate credible scientific information pertinent to the nutrient impact of OSTDS on the Wekiva River system;

2. Develop a public education plan that at a minimum provides area residents with reliable and understandable information about OSTDS systems and their effect on the Wekiva River system;

3. Develop an OSTDS Plan that includes the identification of cost-effective and financially feasible projects that targets the reduction of nutrients from OSTDS systems as needed.

An initial technical meeting will be held within three months of BMAP adoption to present the methodology and geographic information systems (GIS) data to prioritize areas where OSTDS pose the greatest risk based on the number of OSTDS in aggregate, soil drainage conditions, aquifer and surface water vulnerability, proximity to the spring, and ground water travel time.

1.3.4.2 OSTD Plan Development

Within three years from the date of BMAP adoption, the advisory committee, in conjunction with the department, will finalize an OSTDS Plan that identifies specific projects and schedules to achieve nutrient load reductions. The plan will be adopted as part of the BMAP and will be consistent with BMAP obligations required in a National Pollutant Discharge Elimination (NPDES) MS4 permit. The advisory committee may consider as necessary the following components in order to achieve the load reductions:

1. The inventory and geographic distribution of OSTDS Wekiva BMAP area. Existing systems and areas where future growth is expected should be included.
2. Existing and planned wastewater treatment and collection facilities, including the parcels currently being served and existing and design capacities.
3. The nutrient reductions from OSTDS that are necessary to achieve the TMDL.

4. Projects which are in process, shovel-ready prior to the end of this first five-year BMAP cycle, and in priority geographic areas. A list of these projects and management strategies including a schedule for implementation will be submitted to the department.
5. Reduction goals may be achieved in multiple ways including the connection of existing OSTDS to central wastewater treatment facilities, the use of cluster systems, educational strategies, requirements for new development to be served by central wastewater service, the adoption of technologies recommended by FDOH's Florida Onsite Sewage Nitrogen Reduction Study, or other strategies that may be appropriate. The strategies will be prioritized based on their effectiveness and feasibility, taking into account the financial needs of the local service providers and impacts on homeowners.
6. Projects in any long-range capital plans, including the consideration of wastewater management or facilities plan(s).

The timing of the implementation of plan components may change depending on legislative direction, state and local funding. This OSTDS plan will be reviewed and updated annually to include flexibility to substitute projects due to funding availability.

1.3.5 TMDLs for the Wekiva River, Rock Springs Run, and Little Wekiva Canal

In June 2008, the department adopted the nutrient TMDLs for the Wekiva River and Rock Springs Run (nitrate and TP) and the nutrient and DO TMDL for the Little Wekiva Canal. For assessment purposes, the department has divided the Wekiva River, Rock Springs Run, and Little Wekiva Canal watersheds into water assessment polygons with a unique WBID number for each watershed or stream reach. The upstream and downstream segments of the Wekiva River are WBIDs 2956 and 2956A, respectively. The Little Wekiva Canal is WBID 3004.

Tables 1.5 and **1.6** summarize the nutrient TMDLs and pollutant load allocations to the WLA and LA categories adopted by rule for each of the impaired WBIDs in the Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP area. Additional information is provided in the specific TMDL documents (Gao 2008; Bailey 2008).

The Little Wekiva River (WBID 2987) and Blackwater Creek (WBID 2929A) were not verified as impaired and thus have no associated TMDLs to improve their own water quality. However, according to Section 6.1 of the nutrient TMDL document for the Wekiva River, reducing the nitrate and TP loads in these tributaries will help achieve load reductions in the Wekiva River. **Tables 1.5** and **1.6** show the load reductions needed for these streams to meet the TMDLs for the Wekiva River. Paragraph 403.067(7)(a)(1), F.S., provides for the inclusion of *some or all of the watershed and basins tributary to the waterbody* within a BMAP area. Therefore, the BMAP area includes required reductions in waterbodies and/or tributaries that are necessary to achieve TMDL goals in the Wekiva River.

Table 1.5. Nitrate and TN TMDLs in the Wekiva River, Rock Springs Run, and Little Wekiva Canal

\- = Empty cell/no data
N/A = Not applicable
* = Required reduction as calculated in Gao 2008
Source: *Table 6.1* in Bailey 2008; *Table 6.1* in Gao 2008

WBID Number	WBID Name	Parameter	TMDL Target [Milligrams per Liter (mg/L)]	TMDL (% Reduction)	WLA NDPES Wastewater (lbs/month)	WLA NPDES Stormwater (% Reduction)	LA (% Reduction)
2929A*	Blackwater Creek	Nitrate	0.286	52%	N/A	52%	52%
2956	Wekiva River (upstream)	Nitrate	0.286	68%	2,805	68%	68%
2956A	Wekiva River (downstream)	Nitrate	0.286	47%	N/A	47%	47%
2956C	Wekiwa Spring	Nitrate	0.286	79%	N/A	79%	79%
-	Rock Spring	Nitrate	0.286	81%	N/A	81%	81%
2967	Rock Springs Run	Nitrate	0.286	63%	N/A	63%	63%
2987*	Little Wekiva River	Nitrate	0.286	59%	N/A	59%	59%
3004	Little Wekiva Canal	TN	-	45.2%	N/A	45.2%	45.2%

Table 1.6. TP TMDLs in the Wekiva River and Rock Springs Run

- = Empty cell/no data
N/A = Not applicable
* = Required reduction as calculated in Gao 2008
Source: *Table 6.1* in Bailey 2008; *Table 6.1* in Gao 2008.
Note: There is no TMDL for TP for the Little Wekiva Canal (WBID 3004).

WBID Number	WBID Name (Number)	Parameter	TMDL Target (mg/L)	TMDL (% Reduction)	WLA NDPES Wastewater (lbs/month)	WLA NPDES Stormwater (% Reduction)	LA (% Reduction)
2929A*	Blackwater Creek	TP	0.065	36%	N/A	36%	36%
2956	Wekiva River (upstream)	TP	0.065	61%	40	61%	61%
2956A	Wekiva River (downstream)	TP	0.065	57%	191	57%	57%
2956C	Wekiwa Spring	TP	0.065	64%	N/A	64%	64%
-	Rock Spring	TP	0.065	23%	N/A	23%	23%
2967	Rock Springs Run	TP	0.065	58%	N/A	58%	58%
2987*	Little Wekiva River	TP	0.065	78%	N/A	78%	78%

In the Wekiva River and Rock Springs Run TMDLs, the percent load reductions were calculated to achieve a monthly average nitrate concentration of 0.286 mg/L and a monthly average TP concentration of 0.065 mg/L for the Wekiva River and Rock Springs Run. TMDLs are established for each pollutant of concern in each WBID. They are expressed as the required percent reduction in the affected waterbody and apply to the nitrate and TP inputs from the various sources in the contributing area. That overall percent reduction is allocated to the main categories of the WLA and the LA. For NPDES wastewater facilities, a WLA was established as the allowable discharge load for the facilities expressed as pounds per month (lbs/month).

Flow within a river or spring is not regulated by the department's TMDL process. Statewide, the water management districts are charged with protecting and conserving Florida's water resources through the Minimum Flows and Levels (MFLs) Program. The SJRWMD approach to MFLs defines the frequency and duration of high, intermediate, and low water flows, and/or levels, to prevent significant harm. Rule 40C-8, F.A.C. (revised January 11, 2010), provides the MFLs adopted by the SJRWMD, including Wekiwa and Rock Springs, Blackwater Creek at the State Road 44 bridge in Lake County, and the Wekiva River at the State Road 46 bridge at the boundary of Lake and Seminole Counties. More information on the SJRWMD MFL Program is available online.

1.4 Assumptions and Considerations Regarding TMDL and BMAP Implementation

The water quality impacts of BMAP implementation are based on several fundamental assumptions about the parameters targeted by the TMDLs, modeling approaches, waterbody response, and natural processes. In addition, there are important considerations about the nature of the BMAP and its long-term implementation.

This BMAP requires stakeholders to implement their projects set forth herein within the first five-year BMAP cycle. However, the full attainment of the designated uses will be a long-term process, adaptively managed in iterative five-year BMAP cycles. While some projects and activities contained in the BMAP were completed or are currently ongoing, multiple projects require time for design, permitting, and construction, and to secure funding. Funding limitations do not affect the requirement that every entity must implement the activities committed to in this BMAP.

Reaching the nutrient reduction goals under this BMAP will not be easily attained and will require a sustained effort to implement projects and actions. To meet the designated uses for these waters established for the Wekiva River, Rock Springs Run, and the Little Wekiva Canal, future actions will be needed beyond those identified for the first five-year BMAP cycle. Regular monitoring, follow-up, and continued coordination and communication with stakeholders are essential to ensure the implementation of management strategies and assessment of their incremental benefits.

Chapter 5 describes a monitoring plan for surface water, spring, and ground water quality. Additional assessments and evaluations are also planned as part of ongoing efforts to improve the understanding of nutrient sources and the fate and transport of nutrients in the contributing area. The information collected from these monitoring efforts will help guide the identification and selection of critical management actions that will further the goal of achieving the designated uses for these waters.

1.5 Future Increases in Pollutant Loading

Florida law requires that BMAPs identify mechanisms to address potential future increases in pollutant loading. One mechanism is Environmental Resource Permit (ERP) requirements. The ERP Program, implemented by the SJRWMD or the department, depending on project type, requires stormwater from new development to meet or exceed water quality standards contingent on existing ambient water quality (Paragraph 373.414[1][b]3, F.S.). All ERP applications must include documentation demonstrating compliance with state water quality standards, as well as showing that the project does not adversely affect the quality of receiving waters and result in violations of water quality standards.

The Wekiva River, Rock Springs Run, and Little Wekiva Canal watersheds include impaired waters that do not currently meet state water quality standards; therefore, new development in these watersheds must show a net improvement in nutrient loads to the waterbodies via stormwater discharge. Starting on July 1, 2012, developers have the option of obtaining a general permit for the construction of surface water management systems serving a project area of up to 10 acres, with less than two acres of impervious area and no wetland impacts. Notwithstanding these requirements, increased loads via infiltration into ground water in the spring contributing areas remain a concern.

Since the TMDL reductions include projects based on decreasing the loads from past development, it is important that loads from new development are well-controlled. Although future development may be meeting state stormwater standards, the development may still add a nutrient load to the impaired waterbodies in the basin. To ensure that future growth does not add to the degradation of these waterbodies, local governments must be proactive in controlling loads from future growth.

Other water pollutant loading potentially associated with future growth that may not be addressed by ERP requires a regional perspective, local government coordination, and appropriate land use strategies and development controls. In the Wekiva Basin, the WPPA provides the statutory framework for growth consistent with springs protection and includes guidelines for consistent land development regulation with consideration for adequate open space, recharge areas, water supply, and the management of nutrient sources.

Ongoing initiatives in the area could also help to reduce the water quality effects of future growth on waterbodies. Local governments are encouraged to adopt low impact development (LID) standards and Florida-friendly fertilizer (FFF) and landscaping practices to further minimize the impacts of development through local land development regulations. LID is an approach to development that employs onsite stormwater storage and treatment using natural landscapes and swales, as well as pervious surfaces, and minimizing curbs and gutters. These activities could offset loads from future growth.

Other potential effects of growth that would not be addressed by an existing program such as ERP can be anticipated by local governments and managed to minimize nutrient loads. However, some land use changes will require innovative reduction strategies to achieve the designated uses of these impaired waters.

CHAPTER 2: WEKIVA RIVER, ROCK SPRINGS RUN, AND LITTLE WEKIVA CANAL BASIN SETTING

This chapter provides updated information on the hydrologic setting, land use, and water quality for the impaired waters and their contributing springs.

2.1 BASIN HYDROLOGY

The Wekiva River originates in Wekiwa Springs State Park at the confluence of Wekiwa Springs Run and Rock Springs Run in Orange County. The main tributaries are the Little Wekiva River and Blackwater Creek. The Little Wekiva Canal is a constructed canal that connects several area lakes and has an outfall to the Little Wekiva River approximately 14 miles upstream from the confluence with the Wekiva River. The Wekiva River meanders eastward and then northward through Lake, Seminole, and Orange Counties for about 14 miles before its confluence with the St. Johns River just north (downstream) of Lake Monroe. **Figure 2.1** shows the relationship between these streams in the Wekiva Basin and the impaired waters.

Land forms and topography in the BMAP planning area have been shaped by the dissolution of underlying limestone, and drainage in much of the area is internal, via closed depressions and water-filled sinks. Lakes in the area are formed in solution depressions (sinkholes), and surface runoff is directed to the nearest depression. Direct runoff to the streams in the basin is limited by these characteristics, and the primary mechanism for drainage of the overall area is via ground water flow, although direct surface runoff to the streams does occur in some areas and surface runoff is also responsible for nutrient loading.

Spring discharges from multiple vents provide much of the water to the Wekiva River, Rock Springs Run, the Little Wekiva River (north of State Road 434), and Blackwater Creek. In this basin, springs provide much of the base flow of the river, whereas flood flows are mainly driven by surface runoff. This flow system—with Wekiwa Spring in the Wekiva River, and Rock Spring, the source of Rock Springs Run—is the largest in terms of flow within the BMAP area. There are no known springs discharging to the Little Wekiva Canal, although ground water inflows are a significant source of water based on baseflow analysis (Bailey 2008). **Figure 2.1** shows the named springs in the BMAP planning area. The source of the water discharged by springs is the upper Floridan aquifer system, which is also the main source of water for potable supply in the area.

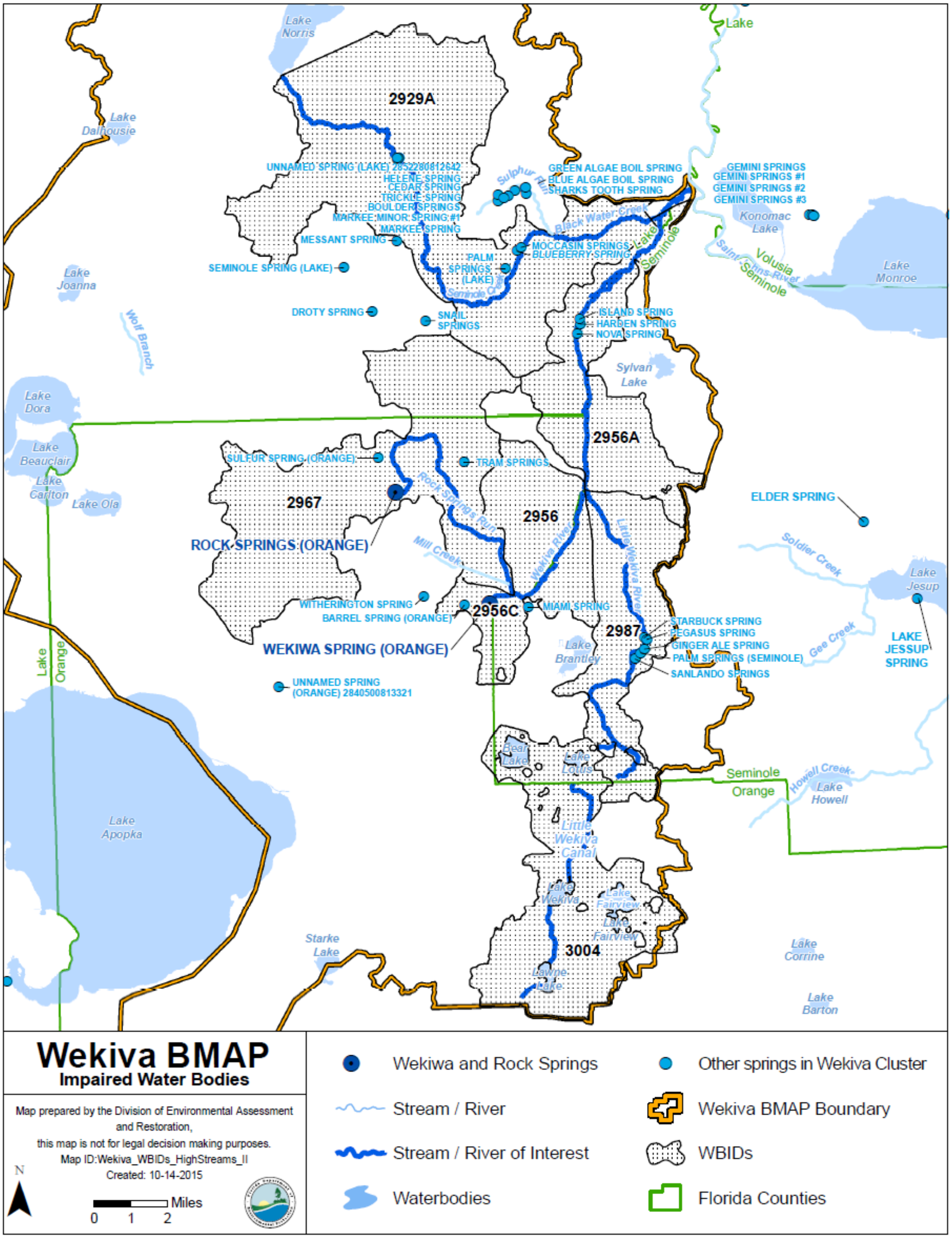

FIGURE 2.1. THE WEKIVA RIVER AND ITS TRIBUTARIES AND SPRINGS
(LOCATIONS OF SPRINGS, TRIBUTARIES, AND IMPAIRED WBIDS ARE SHOWN)

The hydrogeologic units in the BMAP area include the surficial aquifer system (mainly sand), the intermediate aquifer system (which serves as a confining unit and is high in clay content), and the Floridan aquifer system (composed of carbonate rocks). The surficial aquifer is readily recharged by rainfall and interacts with surface water, as it can discharge water to or receive water from lakes, streams, and canals. Water in the surficial aquifer also migrates vertically through the confining unit and recharges the Floridan aquifer.

In some parts of the BMAP planning area, the confining unit is leaky or nearly absent, and in those areas the Floridan aquifer is most vulnerable to contaminants from the surface. As part of the Wekiva Parkway Project, a Floridan aquifer vulnerability assessment model was created by the Florida Geological Survey (Cichon *et al.* 2005), and a vulnerability map was created for the WSA (**Figure 2.2**). The most vulnerable areas are located where the confining unit is leaky or absent and where the rate of recharge to the Floridan aquifer is greatest when it rains. The less vulnerable areas are found where the confining unit is present or where there is not much vertical migration of water downward to the Floridan aquifer. In some of the least vulnerable areas, such as the Wekiva Swamp, there is actually ground water seepage upward from the Floridan aquifer to the surface.

Ground water migrates downgradient within the Wekiva ground water basin from west to east, where it reaches discharge points (springs). These springs provide most of the flow in the Wekiva River system. According to a recent baseflow separation analysis based on United States Geological Survey (USGS) gaging station data, ground water discharge made up 78% to 80% of the flow in the Wekiva River, 63% to 75% of the flow in the Little Wekiva River below the vents of the spring cluster that includes Sanlando and Starbuck Springs, and as much as 75% of the flow in Blackwater Creek. The ground water contribution to the Little Wekiva Canal, which most likely comes from surface water seepage, was also high (61% to 94%, in Bailey 2008).

The higher-recharge portion of the 1995 modeled spring recharge area (McGurk 2000) is inside the Wekiva BMAP planning area. It is thought that restoration activities in this area will be effective in reaching the TMDL goals because local recharge accounts for most of the water to these springs. **Figure 1.1** shows the portion of the historical springshed for the Wekiwa Springs Cluster and the 1995 spring recharge area included in BMAP planning.

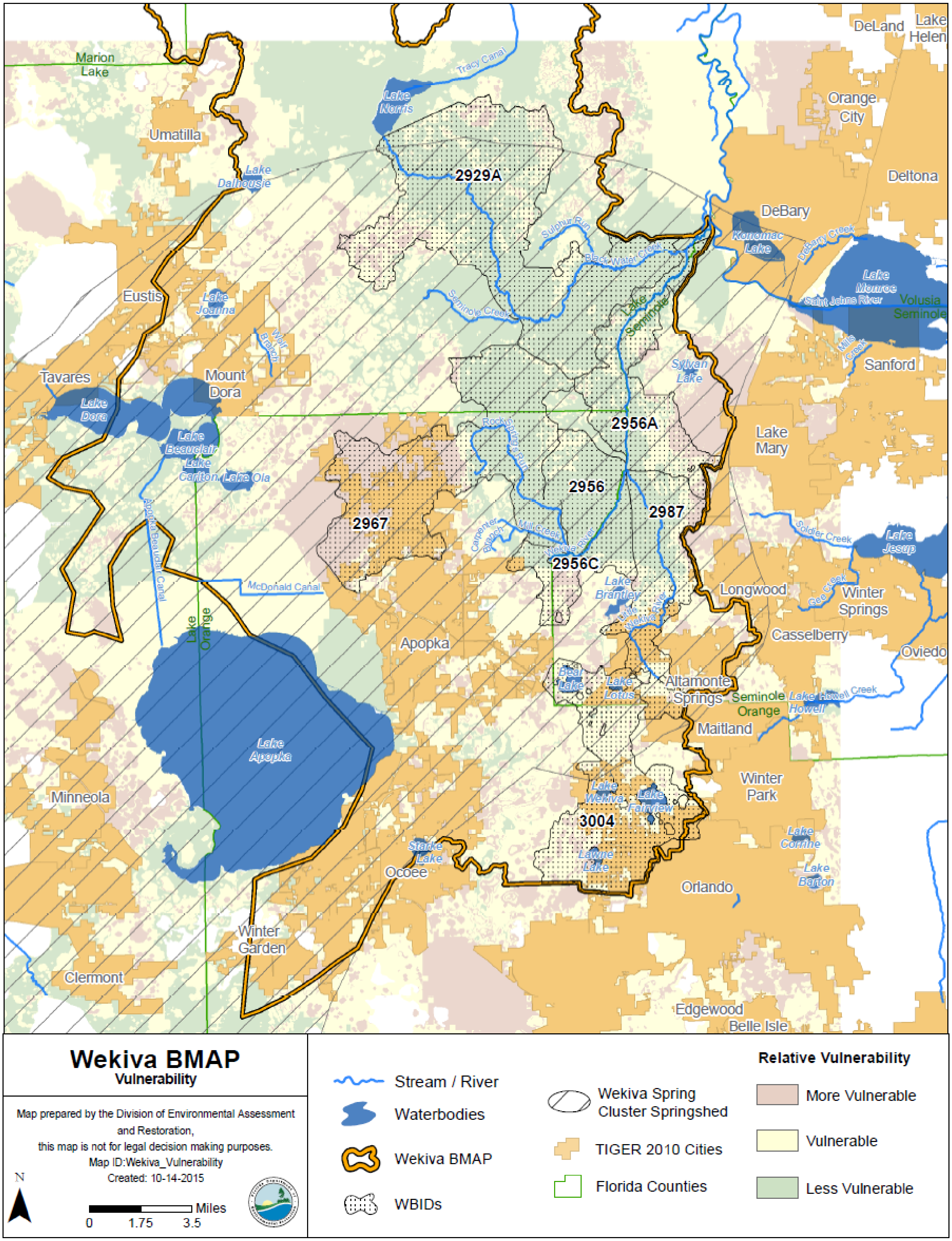

Figure 2.2. Floridan Aquifer Vulnerability Map for the WSA

2.2 LAND USE

The BMAP planning area covers an area of 328,612 acres (about 513 square miles) containing a broad range of land uses. The most current land uses available (SJRWMD 2009) are summarized in **Table 2.1** and shown in **Figure 2.3**.

Rangeland, upland forest, and water and wetlands occupy about 50% of the area. Conservation lands cover many acres in the eastern and northeastern portions of the BMAP planning area. The largest natural areas include portions of the Seminole State Forest, Wekiwa Springs State Park, and Rock Springs Run State Reserve. The conservation areas are generally minimally impacted by human influences.

Agricultural land uses make up approximately 15% of the area. The largest agricultural land uses by total acreage include improved pastureland, container nurseries, cropland, citrus groves, and horse farms.

Urban land uses (urban and built-up, barren land, and transportation, communications, and utilities) account for the remaining 34% of the total area. The largest subcategories of urban lands include low- and medium-density residential (8.57% and 12.51%, respectively).

TABLE 2.1. LAND USE IN THE WEKIVA RIVER, ROCK SPRINGS RUN, AND LITTLE WEKIVA CANAL BMAP PLANNING AREA IN 2009

LAND USE TYPE	ACRES	PERCENT
Low-Density Residential	28,173	8.57%
Medium-Density Residential	41,122	12.51%
High-Density Residential	9,830	2.99%
Urban and Built-Up	24,602	7.49%
Agriculture	48,127	14.65%
Rangeland	13,994	4.26%
Upland Forest	63,082	19.20%
Water	21,000	6.39%
Wetlands	64,430	19.61%
Barren Land	7,059	2.15%
Transportation, Communication, and Utilities	7,194	2.19%
TOTAL	**328,613**	**100.00%**

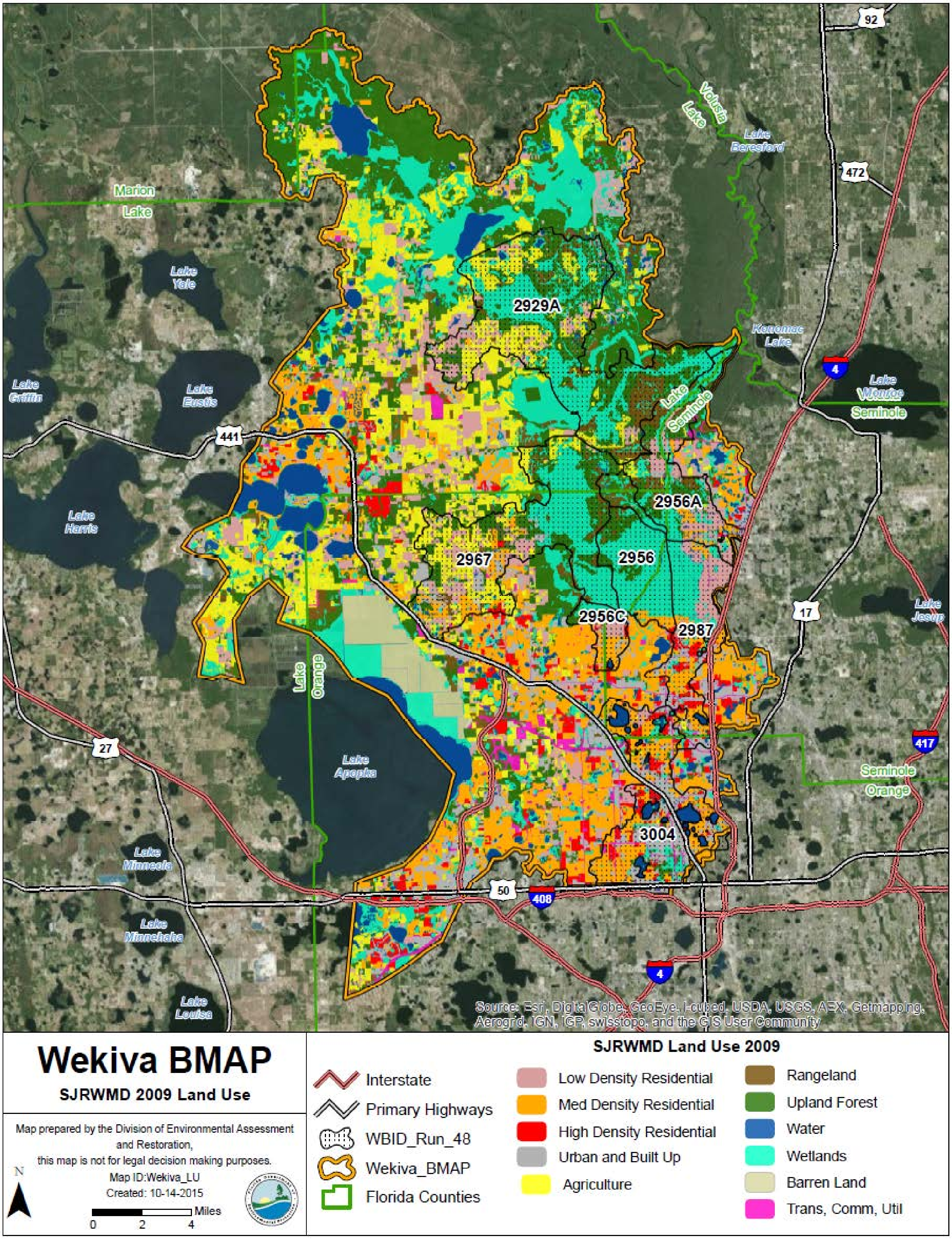

FIGURE 2.3. LAND USE IN THE WEKIVA BMAP PLANNING AREA IN 2009

2.3 WATER QUALITY TRENDS

Before the department developed the TMDLs, the SJRWMD analyzed water quality trends in the Wekiva River and Rock Springs Run as part of the development of Pollutant Load Reduction Goals (PLRGs). Statistically significant decreasing downstream trends in nitrate concentrations in both the Wekiva River and Rock Springs Run were evident in both the wet and dry seasons (Mattson *et al.* 2006). These decreasing trends were attributed to some combination of assimilatory and dissimilatory processes and dilution, with lesser amounts exported downstream to the St. Johns River. There was no downstream trend in TP in either stream; Rock Springs Run showed an increasing downstream trend in TP during the wet season (Mattson *et al.* 2006).

For the Wekiva River and Rock Springs Run nutrient TMDL, the department analyzed the monthly variation of nitrate concentration in an upstream Wekiva River main stem segment (WBID 2956) with high nitrate concentrations, using the data collected from 1999 to 2005. Nitrate concentrations typically trend higher during the winter, early spring, and later fall months, and trend lower during the summer months. This observation is expected because one of the major nitrate contributors to the Wekiva River is spring discharge, and the summer months typically have higher rainfall and associated surface runoff; dilution by surface runoff could play an important role in reducing the in-stream nitrate concentration (Gao 2008).

The department also analyzed the relationship between phosphorus concentration and percent biovolume of blue-green and green algae in the Wekiva River using data collected from 1999 to 2005. There was no seasonal pattern for the percentage of blue-green and green algae that indicated a critical season or month. However, an analysis of the monthly distribution of phosphorus concentrations in the Wekiva River indicated that high phosphorus concentrations were typically observed during the summer months, which are the typical growth season (Bailey 2008). One complicating factor in managing phosphorus loadings to the system is that orthophosphate is naturally abundant in some of the geologic material in the Wekiva Basin, and the concentrations of phosphorus from the contributing springs include a natural phosphorus load. The historical (1985–2006) median orthophosphate concentration in the Floridan aquifer in the Middle St. Johns River Basin was 0.067 mg/L (Harrington *et al.* 2010).

The department analyzed the long-term seasonal variation of DO, nitrogen, and phosphorus in the Little Wekiva Canal for the period of record (1996–2000) for the nutrient and DO TMDL. Data were used from three major sampling stations (Orange County stations: LWA, LWB, and LWD). At LWA, one of the two upstream locations, DO values were lower in April through August, as well as in November and December. At the other upstream location (LWB) and the downstream location (LWD), DO values were lowest in July and August. There was no obvious seasonal trend in nitrogen and phosphorus concentrations. An inverse relationship between phosphorus and DO was observed at one station (LWA). This could be due to the fact that Lake Lawne, which is immediately upstream of LWA, is a phosphorus-limited system (Department 2008).

The SJRWMD monitors stream vegetation as a general indicator of water quality along Rock Springs Run and the Wekiva River (SJRWMD 2011). Once a year, it surveys the distribution and coverage of submerged aquatic vegetation (SAV) and benthic algae in the two headsprings and along the stream segments. Samples are collected in late spring/early summer (April through June). Concurrent with vegetation surveys, field water quality parameters (water temperature, pH, conductivity, and DO) are collected. As additional years of data are gathered, future analyses will compare year-to-year variation among and within the streams to establish water quality trends.

Tables 2.2a and **2.2b** compare recent data for the waterbodies of interest with the historical median values. In general, recent concentrations are similar to those used in the development of the TMDLs in 2008. One exception is an apparent decrease in nitrate concentrations in the lower segment of the Wekiva River (WBID 2956A). All the nitrate and TP concentrations in the segments contributing loading to the Wekiva impairements remain well above the TMDL targets.

TABLE 2.2A. NUTRIENT CONCENTRATIONS IN SELECTED WATERS FOR BLACKWATER CREEK, WEKIVA RIVER, WEKIWA SPRING, ROCK SPRINGS RUN, AND LITTLE WEKIVA RIVER

\- = Empty cell/no data
$N0_2NO_3$= Nitrate + nitrite
[1]1995–2012
[2] 2011–2012

WBID	WATERBODY NAME	NO_2NO_3 (MG/L) MEDIAN[1]	NO_2NO_3 (MG/L) RECENT MEDIAN[2]	TP (MG/L) MEDIAN[1]	TP (MG/L) RECENT MEDIAN[2]
2929A	Blackwater Creek	0.20	0.28	0.05	0.052
2956	Wekiva River (upstream)	0.67	0.55	0.109	0.105
2956A	Wekiva River (downstream)	0.3	0.178	0.111	0.11
2956C	Wekiwa Spring	0.97	0.917	0.12	0.113
2967	Rock Springs Run	0.96	0.98	0.087	0.083
2987	Little Wekiva River	0.31	0.38	0.139	0.142
-	**TMDL TARGETS**	**0.286 mg/L**	**0.286 mg/L**	**0.065 mg/L**	**0.065 mg/L**

TABLE 2.2B. NUTRIENT CONCENTRATIONS IN TARGETED WATERS FOR LITTLE WEKIVA CANAL

\- = Empty cell/no data
[1]1995–2012
[2] 2011–2012
[3] Loading estimate is based on median concentrations and USGS gage-based flow calculation of 32.4 cubic feet per second (cfs) as presented in Table 4.13 of the Little Wekiva Canal TMDL (Bailey 2008).

WBID	WATERBODY NAME	TN (MG/L) MEDIAN[1]	TN (MG/L) RECENT MEDIAN[2]	BOD (MG/L) MEDIAN[1]	BOD (MG/L) RECENT MEDIAN[2]
3004	Little Wekiva Canal	1.14 mg/L 75,652 lbs/yr[3]	0.85 mg/L 56,407 lbs/yr[3]	2.1 mg/L 139,359 lbs/yr[3]	2.0 mg/L 132,723 lbs/yr[3]
-	**TMDL TARGETS**	**42,624 lbs/yr**	**42,624 lbs/yr**	**76,554 lbs/yr**	**76,554 lbs/yr**

Chapter 3: Pollutant Sources and Anticipated Outcomes

As part of the TMDL development process, the analysis for the Wekiva River, Rock Springs Run, and Little Wekiva Canal TMDLs included the identification of nutrient source categories, subcategories, or individual sources in the basin. The sources were categorized as "point sources" and "nonpoint sources."

Historically, point sources are defined as discharges to surface waters that have a continuous flow via a discernible, confined, and discrete conveyance (such as a pipe). Traditional point sources include domestic and industrial wastewater discharges. The point source category also includes stormwater systems requiring an NPDES stormwater permit.

Nonpoint sources of nutrients include stormwater runoff that is not covered under an MS4 permit, as well as sources that discharge to ground water and reach the impaired waters via a diffuse pathway or springs. Nutrient sources in this category include agricultural and residential fertilizer use areas, areas where animal waste concentrates, domestic wastewater application sites, septic systems, and atmospheric deposition. They also may include discharges from stormwater ponds that infiltrate into the ground and infiltration areas that recharge ground water. All these sources contribute nutrients to the springs that provide flow to the Wekiva River and its tributaries as well as direct runoff in areas closer to the streams.

3.1 Information on Nutrient Sources in the Wekiva Basin

The Wekiva River, Rock Springs Run, and Little Wekiva Canal TMDLs include estimates of nutrient pollutant loads in the basin from atmospheric deposition, point source facilities, and watershed stormwater sources. In the TMDL analysis, atmospheric deposition was considered to be a background, uncontrollable source. Some sources are local, but much of the deposition may come from outside the basin; therefore, the 2008 TMDLs for the basin did not require any reductions from this source. In implementing the TMDL Program, the department has traditionally focused on load reductions from point source facilities and stormwater sources regulated by the NPDES Program, but contributions of nutrients from nonpoint sources in this area are very significant and will need to be addressed.

Some of the information on sources, particularly point sources, presented in this section is based on the TMDLs adopted by the department. Other information on nonpoint source contributions was obtained from work done to categorize nitrogen inputs for the WSA and from a nutrient input study funded by the department.

Nutrient sources that have been identified include the following:

- Domestic wastewater discharges (**Section 3.1.1**).
- Septic systems (**Section 3.1.2**).
- Urban fertilizer (**Section 3.1.3**).
- Atmospheric deposition (**Section 3.1.4**).
- Agricultural land use in the basin (**Section 3.1.5**).
- Stormwater loadings (**Section 3.1.6**).

Stormwater discharges are a vehicle for transporting nutrients from these sources to the impaired waters. In the same manner, ground water also conveys nutrients that discharge via springs or seepage. **Section 3.2** discusses the overall estimate of nutrient loads to surface waters from runoff, and in the discharge from the Wekiwa Springs Cluster springshed.

3.1.1 Domestic Wastewater

Domestic wastewater is a source of nutrients that is being addressed by this BMAP, but also by action taken under the WPPA. Treated domestic wastewater is disposed of in sprayfields and rapid infiltration basins (RIBs), or by discharging the effluent to surface waters. Approximately 43 permitted WWTFs treat and/or discharge domestic wastewater in the BMAP area, and 12 of these have design flows of greater than 1 million gallons per day (MGD).

An assessment of nitrate sources in the Wekiva River Basin conducted for the department and the SJRWMD (MACTEC 2010) used a contributing area that includes the Wekiva BMAP planning area. According to this assessment, domestic wastewater loadings accounted for approximately 12% of the total nitrate load from all sources to the Wekiva River system (MACTEC 2010). This percentage may actually be larger, as MACTEC did not include wastewater application associated with the CONSERV II water reclamation project, a portion of which is also located in the BMAP planning area. The MACTEC study did not evaluate phosphorus loading, and these loads have not been estimated. The TP concentration in domestic wastewater can range from six to 20 mg/L, but it can be readily attenuated by clay and organic material in the environment. The most likely loads of wastewater-derived phosphorus would come from point source discharges.

3.1.1.1 Facilities Subject to the WPPA Requirements

Wastewater facilities in the WSA may be subject to nitrogen reduction requirements in their permits based on aquifer vulnerability. Since 2011 the department has issued all of the impacted facilities revised permits regulating their reclaimed water and effluent. The new permits include limits based on Section 62-600.550, F.A.C. This rule implements the specific recommendations set forth in Sections c.2 (Delineation of Protection Zones) and c.4 (Wastewater Recommendations) of the report, *A Strategy for Water Quality Protection–Wastewater Treatment in the Wekiva Study Area* (Department 2004).

The department established protection zones for use in decision making and the development of rules or policies regarding environmental conservation, protection, growth management, and planning. These protection zones were based on the relative vulnerability of the Floridan aquifer to contamination from surface sources. The zones were developed using the Wekiva Aquifer Vulnerability Assessment (WAVA) model (Chichon *et al.* 2005). The zones consist of a primary protection zone (more vulnerable), a secondary protection zone (vulnerable), and a tertiary protection zone (less vulnerable). (**Figure 2.2** depicts the aquifer vulnerability zones.)

These protection zones are used in Section 62-600.550, F.A.C., to establish the general discharge requirements for all wastewater discharges in each zone. The general requirements are implemented through the permits issued to the domestic WWTFs and are intended to reduce nitrate inputs to ground water in the more vulnerable areas. **Chapter 4** provides more information on the permit conditions and anticipated changes in nitrate loading to the basin, identifies WWTFs and water reclamation facilities (WRFs) in the basin, and also highlights the significant efforts that WWTF and WRF operators have made to reduce nutrient pollutant loadings to the Wekiva Basin.

3.1.1.2 Domestic Wastewater Point Sources

During the development of the Wekiva River and Rock Springs Run TMDL for nutrients, only three point source discharge domestic wastewater facilities were considered potential nutrient sources. No WWTFs with surface water discharges were identified in the Rock Springs Run subbasin during the TMDL analysis. **Table 3.1** lists the WWTFs that discharge to surface water identified in the Wekiva River nutrient TMDL.

For the three NPDES WWTFs authorized to discharge in the Wekiva Basin, the TMDL analysis considered the permitted discharge daily flow capacity, the type of treatment facilities, and discharge locations. The analysis used information (*e.g.*, treatment design, capacity, discharge/disposal options, and permit limits) available at the time.

TABLE 3.1. DOMESTIC WWTFS IDENTIFIED IN THE WEKIVA RIVER AND ROCK SPRINGS RUN TMDL WITH DIRECT DISCHARGES TO IMPAIRED WATERS

Note: These three facilities were identified in the development of the TMDL. The Seminole County Environmental Services (SCES)/Yankee Lake WRF ceased surface water discharges voluntarily in June 2011. The facility is currently permitted as FLA042625 Seminole County Northwest WRF for reclaimed water reuse.

PERMIT NUMBER	FACILITY NAME	PERMITTEE
FL0033251	Altamonte Springs Regional WRF	City of Altamonte Springs
FL0042625	SCES/Yankee Lake WRF	Seminole County Environmental Services
FL0036251	Wekiva Hunt Club WWTF	Sanlando Utilities Corp.

3.1.2 OSTDS

Septic systems, also known as onsite sewage treatment and disposal systems (OSTDS), can be significant sources of nutrients to receiving waters when they occur in high density and numbers close to springs or surface waters. According to MACTEC (2010), septic systems account for approximately 26% of the total load of nitrate to ground water in the Wekiva River system. However, there is great uncertainty as to the complex fate and transport of nutrients from septic systems in ground water to springs. Additional research is needed to better understand these processes in the Wekiva basin.

Estimates of septic system numbers and potential nutrient loading in the BMAP area vary significantly depending on the methodology used. Each method of estimating the numbers of septic systems is based on unique assumptions and may not accurately represent actual numbers in the BMAP planning area at a specific point in time. For example, estimates of septic systems derived from the Florida Department of Health (FDOH) permitting data may not account for all existing systems, but only those installed more recently. Therefore, the estimate of 19,000 septic systems in the BMAP area, based on FDOH permitting data and SJRWMD land use data, may represent the low end of the range. At the other extreme, as many as 97,000 septic systems may be operating in the BMAP area, based on the methodology (modeling) used in a 2009 statewide inventory of septic systems by Hall and Clancy. Similar ranges exist for estimates of effluent concentrations from septic systems, and therefore the estimated loadings, of TN and phosphorus.

Consequently, more accurate estimates of the number of operating septic systems and the associated nutrient load reductions may be attainable and more useful as stakeholders, working with the department and FDOH, propose projects to reduce nutrient loadings from septic systems on a regional or project-specific scale. Strategies to address the OSTDS loading will be determined through the OSTDS Initiative (refer to **Section 1.3.4**).

3.1.3 Urban Fertilizer

Fertilizer use on residential sites may account for 15% (commercial agriculture may account for 26%) of the nitrate loads to the Wekiva River system (MACTEC 2010).

Residential yards, ornamentals, and flower beds may be fertilized. A department-funded survey conducted by the University of Central Florida (UCF) in a 36-square-mile area in the Wekiwa Springs vicinity showed that 84% of a total of 740 residents surveyed used lawn fertilizer, and 25% of them were fertilizing at higher-than-recommended rates (UCF 2009). Shallow ground water monitoring conducted at 24 residential sites in this area determined that the average nitrate concentration in shallow ground water beneath a residential site was three mg/L.

Prolonged excessive applications of phosphorus in fertilizer can run off or leach. The contribution of phosphorus to the Wekiva Basin from fertilizer use has not been assessed.

3.1.4 Atmospheric Deposition

Atmospheric deposition, via both wet deposition and dry deposition, constitutes a significant nitrogen input, but due to attenuation by plants and soil, the actual load is minor. According to MACTEC (2010), atmospheric deposition accounted for only two percentof the load of nitrate to the Wekiva River system. Several sources indicate that the atmospheric deposition of phosphorus would also not significantly contribute to the Wekiva River system because of the natural tendency of phosphorus to adsorb to soil.

3.1.5 Agricultural Land Use in the Basin

The primary agricultural land use in the Wekiva Basin is cow-calf operations (pasture). Other agricultural land uses include nurseries, row/field crops, citrus, and horse farms. The majority of the horse farms are small, noncommercial farms/ranchettes scattered throughout residential areas, with a concentration in the Sorrento area.

Due to urban encroachment, citrus health issues (freeze/disease), and the downturn in the economy, many citrus, row crop, poultry, and nursery operations either have been abandoned or have significantly lowered their production acreage. In recent years, some of this acreage may have been shifted to other commodities, but a comparison of agricultural land use from the year 2000 and recent aerial imagery for the basin show a significant conversion to urban uses, as well as a large number of abandoned/out-of-production citrus acres. These changes in agricultural land use equate to approximately a nine percent reduction in acreage between the 2000 and 2009 land use.

As it is difficult to identify out-of-production operations for most other types of agricultural land use from aerial imagery, FDACS will consult with field staff and local contractors during the first five year phase of the BMAP to provide additional information on agriculture in the basin. **Table 3.2** contains a breakdown of agricultural land uses in the Wekiva Basin, according to 2009 SJRWMD land use data. **Figure 3.1** shows the approximate location of these agricultural lands in the basin.

Land use data are helpful as a starting point for estimating agricultural acreage and developing best management practice (BMP) implementation strategies; however, their inherent limitations must be noted. To begin with, the time of year when land use data are collected (through aerial photography) affects the accuracy of photo interpretation. This can result in inappropriate analysis of the data and can hamper decision making. Another limitation is that the specific agricultural activity being conducted is not always apparent. For example, some acreage classified as improved pasture may be used for cattle grazing, some may consist of forage grass that is periodically harvested and sold for hay, and/or some may comprise a fallow vegetable field awaiting planting. Operations that may fall into this land use category fertilize at different rates (*e.g.*, hay operations and some other commodities typically fertilize at or below rates recommended by the University of Florida–Institute of Food and Agricultural Sciences [UF–IFAS]); therefore, it would be meaningful for the purposes of evaluating potential nutrient impacts to know specific land uses.

Because of error in the collection and characterization of land use data and changes in land use over time, land use acreage estimates are subject to adjustment, as discussed later in this section.

Table 3.2. Agricultural Land Uses in the Wekiva Basin (2009 SJRWMD land use data)
(Primary agricultural land uses in the Wekiva Basin are highlighted and shown in boldface type)

- = Empty cell/no data

Land Use/ Land Cover Code	Code Description	Total Acres
2110	**Improved Pasture**	**21,819.80**
2431	**Ornamentals**	**5,072.40**
2210	**Citrus**	**4,191.40**
2150	**Field Crops**	**4,035.00**
2130	**Woodland Pasture**	**3,614.00**
2510	**Horse Farms**	**3,437.10**
2120	**Unimproved Pasture**	**2,767.80**
2140	**Row Crop**	**1,084.30**
2420	Sod Farms	577.3
2432	Shade Ferns	346.6
2500	Specialty Farms	174.7
2200	Tree Crops	160.6
2430	Tree Nurseries	156.8
2240	Abandoned Tree Crops (citrus)	129.9
2600	Other Open Land	109.6
2410	Nurseries and Vineyards	97.9
2320	Poultry Feeding Operation	90
2432	Hammock Ferns	87.6
2610	Fallow Cropland	77.5
2160	Mixed Crops	62
2540	Aquaculture	37.1
2450	Floriculture	15.3
2520	Dairies	7.2
-	**Total**	**48,152.1**

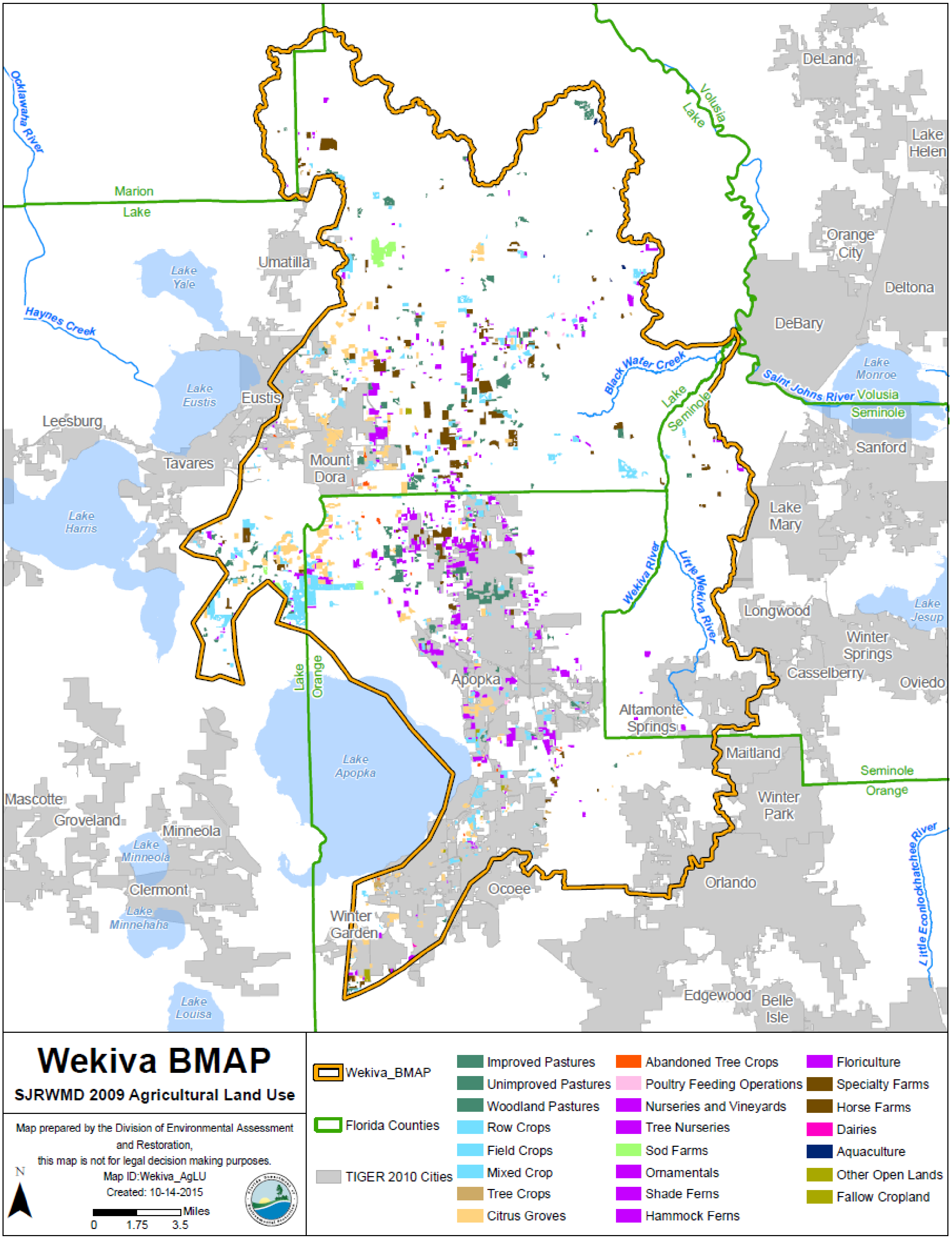

Figure 3.1. Agricultural Lands in the Wekiva Basin in 2009

3.1.6 Stormwater Loadings

3.1.6.1 MS4s – Definition and Background

Most of the municipalities in the basin are subject to the federal NPDES stormwater permitting program because they discharge stormwater to surface waters of the state from point sources and were designated as MS4s by the United States Environmental Protection Agency (EPA).

An MS4 is defined as a conveyance or system of conveyances (such as roads with stormwater systems, municipal streets, catch basins, curbs, gutters, ditches, constructed channels, or storm drains) that is designed or used for collecting or conveying stormwater, discharges to surface waters of the state, and is:

1. Owned or operated by a state, city, town, county, special district, association, or other public body (created by or under state law) having jurisdiction over management and discharge of stormwater and that discharges to surface waters of the state.

2. Designed or used for collecting or conveying stormwater.

3. Not a combined sewer.

4. Not part of a Publicly Owned Treatment Works (POTW). POTW means any device or system used in the treatment of municipal sewage or industrial wastes of a liquid nature that is owned by a "state" or "municipality." This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

An MS4 can be operated by municipalities, counties, drainage districts, colleges, military bases, or prisons, to name a few examples. By definition, the components of an MS4 system do not include waters of the state or of the United States. Instead, the MS4 ultimately discharges into such waters.

The basic requirements of this program serve as a foundation for the stormwater management efforts of these communities. In October 2000, the EPA authorized the department to implement the NPDES stormwater permitting program in the state. This permitting has remained separate from state stormwater/ERP programs and local stormwater/water quality programs, which have their own regulations and permitting requirements. Florida's rules for MS4s can be found in Rules 62-4, 62-620, 62-621, and 62-624, F.A.C. **Table 3.3** lists the Phase I and II MS4s in the Wekiva River, Rock Springs Run, and Little Wekiva Canal Basin.

TABLE 3.3. PHASE I AND II MS4S IN THE WEKIVA RIVER, ROCK SPRINGS RUN, AND LITTLE WEKIVA CANAL BASIN

MS4 PERMIT PHASE	PERMIT NUMBER	PERMITTEE
I	FLS000011	Orange County
I	FLS000011	City of Apopka
I	FLS000011	City of Maitland
I	FLS000011	City of Ocoee
I	FLS000011	City of Winter Garden
I	FLS000014	City of Orlando
I	FLS000038	Seminole County
I	FLS000038	City of Altamonte Springs
I and II	FLS000011, FLS000038 and FLR04E024	FDOT District 5
II	FLR04E049	Florida Turnpike Enterprise
II	FLR04E100	City of Eustis
II	FLR04E106	Lake County
II	FLR04E112	City of Mount Dora
II	FLR04E113	City of Tavares
II	FLR04E152	Town of Oakland

3.2 ESTIMATED BASELINE LOADS FOR NUTRIENTS BASED ON NONPOINT SOURCE RUNOFF AND SPRING DISCHARGES

Additional nitrate and TP loadings to the Wekiva River system can be generated from watershed stormwater sources (*i.e.*, nonpoint sources) in the basin that do not directly discharge to the impaired waters. Major nonpoint sources may include, but are not limited to, loadings from surface runoff and ground water input from the surficial aquifer as stream seepage, as well as spring flows from the Floridan aquifer.

3.2.1 ESTIMATED BASELINE LOADS FOR NUTRIENTS BASED ON NONPOINT SOURCE RUNOFF

Estimates of nutrient loading via stormwater runoff were provided in the TMDL reports (Gao 2008; Bailey 2008). In the Wekiva River and Rock Springs Run nutrient TMDL, stormwater runoff loadings were calculated using the Camp Dresser McKee (CDM) Watershed Management Model (WMM) (CDM 2005), the entire watershed areas for the waterbodies of interest, and the 2000 SJRWMD land use coverage. In the Little Wekiva Canal TMDL, land use categories and the corresponding EMCs were calculated, and the Storm Water Management Model (SWMM), Version 5.0, was used to simulate the Little Wekiva Canal's water quantity and quality and to predict loads of TN and BOD (Bailey 2008).

To provide a more accurate estimate of nonpoint source discharges from runoff, the runoff-contributing areas were recalculated to exclude subbasin-scale high-recharge areas in which most or all of the water would infiltrate to ground water and not run off. The recalculation was also based on the most recent SJRWMD land use coverage, which was for 2009, rather than the 2000 land use used for the Wekiva River and Rock Springs Run TMDL report. The runoff-based values in the Wekiva BMAP are to be used for planning purposes and to assist stakeholders.

The BMAP planning area includes six subbasins contributing to the flow and nutrient loads of the Wekiva River. These subbasins represent the entire watershed of the major surface water features of the Wekiva River and its major tributaries (*i.e.*, Blackwater Creek, Rock Springs Run, Little Wekiva River, and Little Wekiva Canal). Four of the six subbasins include WBIDs that are impaired and thus have TMDL requirements specified in the Wekiva River, Rock Springs Run, and Little Wekiva Canal TMDLs. All of the subbasins include the contributing areas to the specific WBIDs identified in the TMDL documents.

The areal extent of the upstream and downstream Wekiva River subbasins aligns with WBIDs 2956 and 2956A, respectively. The Rock Springs Run subbasin includes the contributing runoff from bothWBID 2967and its remaining watershed. The Little Wekiva Canal subbasin includes WBID 3004 and portions of WBID 3002 for purposes of the BMAP. The Blackwater Creek and Little Wekiva River subbasins, which are tributary to the Wekiva River, are not impaired and therefore do not include a designated WBID area; however, surface water from these subbasins contributes to the impaired status of the downstream segment of the Wekiva River.

Figure 3.2 and **Table 3.4** illustrate how the nutrient loads associated with runoff were calculated for the Wekiva BMAP. The subbasin-level calculation of runoff loading excluded portions of the subbasins that are high-recharge areas to the Floridan aquifer (12 to more than 20 inches per year, based on the SJRWMD 2005 recharge map) that would not contribute to runoff. Pollutant loading from these high-recharge areas (consisting of approximately 30% of the combined subbasin area) would be accounted for as part of the load from spring discharge (**Figure 3.2**).

Table 3.4 lists the calculated baseline loads from anthropogenic as well as natural sources of runoff-derived loads in the Little Wekiva Canal, Little Wekiva River, Rock Springs Run, Blackwater Creek, and upstream and downstream segments of the Wekiva River. The nitrate and TP loads from these subbasins listed in **Table 3.4** are lower than the baseline loads provided in the TMDL documents because the loadings in the table are based on loads generated from areas where runoff would most likely occur, not the entire subbasins. These loading estimates did not take into consideration attenuation during pollutant transport across the basin. Differentiation by subbasin provided a greater opportunity to assess BMAP efforts for this first five-year implementation phase.

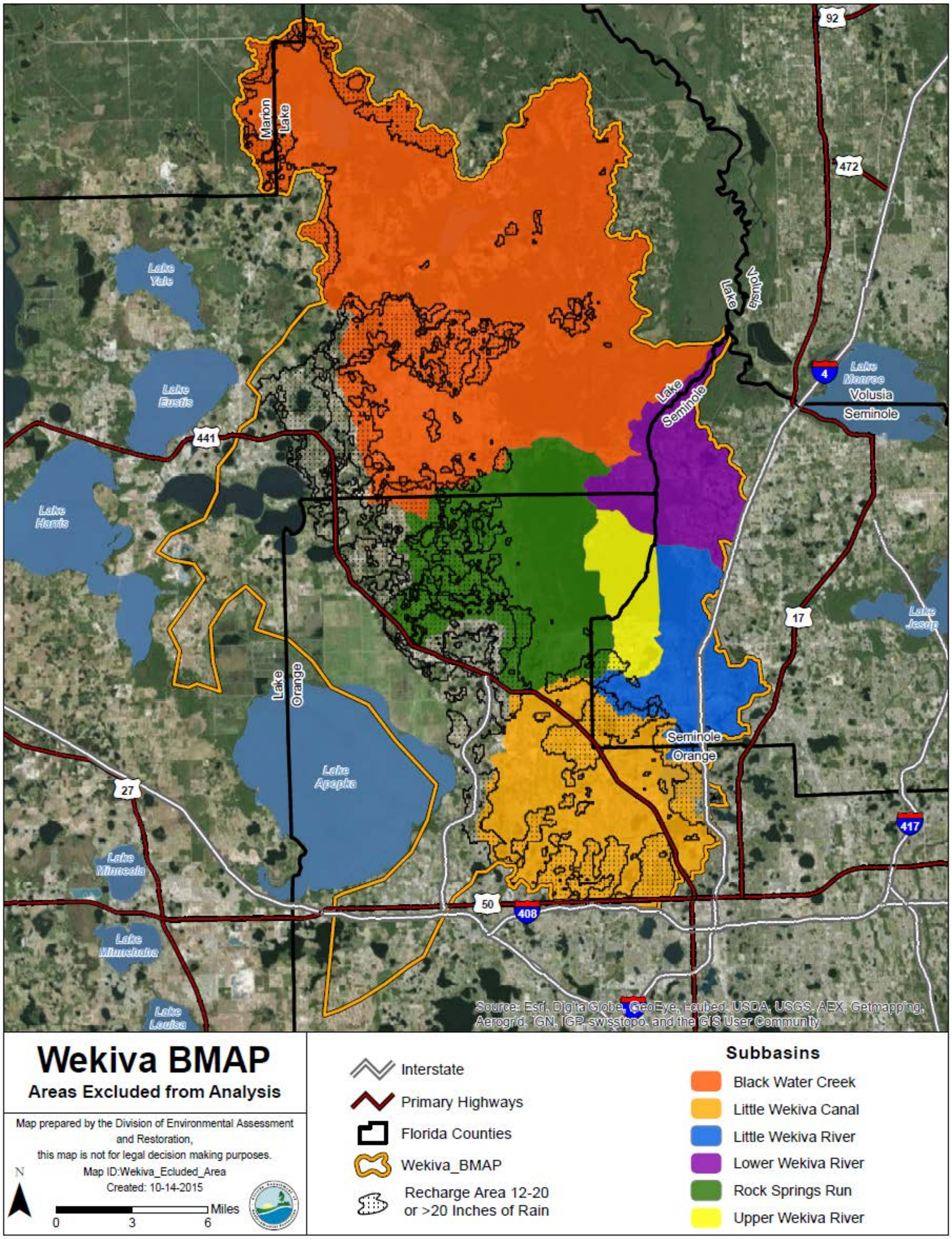

Figure 3.2. Subbasin Areas Used To Calculate Baseline Nutrient Loading from Runoff
(RECHARGE AREAS OF 12 – 20 OR >20 INCHES OF RAIN PER YEAR WERE EXCLUDED FROM THE NUTRIENT LOADING CALCULATIONS)

TABLE 3.4. ESTIMATED NUTRIENT BASELINE LOADS IN THE WEKIVA BMAP PLANNING AREA SUBBASINS

(SURFICIAL NUTRIENT LOADING ESTIMATES BY SUBBASIN, EXCLUDING AREAS OF HIGH RECHARGE)

N/A = Not applicable

Wekiva BMAP Planning Area Subbasins	Acres in Subbasin Contributing Runoff	Nitrate Baseline Load (lbs/yr)	TP Baseline Load (lbs/yr)	Typical Land Use
Blackwater Creek	96,582	108,108	55,190	Agriculture/golf course had the highest nutrient loads.
(Upstream) Wekiva River	10,415	15,397	8,114	Wetlands had the highest nutrient loads; medium-density residential had the highest loads from anthropogenic sources.
(Downstream) Wekiva River	17,035	25,165	13,385	Low and medium-density residential had the highest loads from anthropogenic sources; wetland loads were significant.
Rock Springs Run	21,617	28,462	14,959	Wetlands had the highest nutrient loads; medium-density residential and agriculture/golf course had the highest loads from anthropogenic sources.
Little Wekiva River	14,914	45,318	24,692	Commercial and medium-density residential had the highest nutrient loads.
Little Wekiva Canal	23,093	68,793	37,747	Medium-density residential and commercial had the highest nutrient loads.
TOTAL BMAP PLANNING AREA	**183,656**	**291,243**	**154,087**	**N/A**

3.2.2 SPRING DISCHARGES

Nonpoint source loading to ground water is the pathway responsible for the nitrate and TP loading discharging from the spring vents. Nutrient loading associated with land use contributes the nutrient load in ground water and subsequently to the springs.

As previously noted, there are about 30 named springs in the Wekiva River and Rock Springs Run drainage basin. **Table 3.5** lists the named springs, their discharges, and nutrient concentrations. The TMDL report provided the magnitude, discharge rate, and nitrate and TP concentrations, loadings, and percent loading from these springs (*Tables 4.11* and *4.12* in Gao 2008). The top five springs (by discharge flow) are highlighted. The total nitrate and TP loadings from all 30 springs are 511,433 and 78,952 lbs/yr, respectively (**Table 3.6**). Total nitrate loading from the springs is greater than the loading estimated from surface runoff (383,959 lbs/yr per *Table 4.13* in Gao 2008). The TP loading from the springs is significant compared with the TP loading from surface water (208,819 lbs/yr per *Table 4.13* in Gao 2008). The springs are very significant sources of nutrients to the Wekiva River system.

TABLE 3.5. MEDIAN NUTRIENT CONCENTRATIONS AND DISCHARGE IN SPRINGS

(TOP FIVE SPRINGS [BY DISCHARGE] ARE HIGHLIGHTED AND IN BOLDFACE TYPE)

- = Empty cell/no data
N/A = Not available
Source: SJRWMD springs website

SUBBASIN	SPRING NAME	DISCHARGE (CFS)	NO3+NO2 (MG/L)	TP (MG/L)
Blackwater Creek	Blackwater Spring	1.4	N/A	N/A
Blackwater Creek	Blue Algae Boil	0.14	0.03	0.05
Blackwater Creek	Blueberry Spring	0.07	0.03	N/A
Blackwater Creek	Boulder Spring	0.23	0.08	0.18
Blackwater Creek	Camp La-No-Che Spring	0.7	N/A	0.06
Blackwater Creek	Cedar Spring	0.03	0.03	0.05
Blackwater Creek	Droty Spring	0.65	0.03	0.08
Blackwater Creek	Green Algae Boil	0.14	N/A	0.06
Blackwater Creek	Markee Spring	0.24	0.02	0.06
Blackwater Creek	Messant Spring	14.7	0.51	0.04
Blackwater Creek	Mocassin Spring	0.29	0.01	N/A
Blackwater Creek	Palm Spring	0.68	0.01	0.02
Blackwater Creek	**Seminole Spring**	**35.2**	**1.33**	**0.08**
Blackwater Creek	Sharks Tooth Spring	0.18	0.15	0.06
Blackwater Creek	Snail Springs	0.26	0.02	N/A
Blackwater Creek	Trickle Spring	N/A	N/A	N/A
Little Wekiva River	Ginger Ale Springs	0.11	N/A	0.04
Little Wekiva River	Palm Spring	6.61	0.68	0.12
Little Wekiva River	Pegasus Spring	2.8	0.54	0.22
Little Wekiva River	**Sanlando Spring**	**19.65**	**0.62**	**0.18**
Little Wekiva River	**Starbuck Springs**	**13.78**	**0.41**	**0.15**
Rock Springs Run	**Rock Spring**	**57.58**	**1.41**	**0.08**
Rock Springs Run	Sulphur Spring	0.74	N/A	0.03
Rock Springs Run	Tram Springs	N/A	N/A	N/A
Wekiva River	Barrel Spring	0.25	0.05	N/A
Wekiva River	Island Spring	8.29	0.24	0.11
Wekiva River	Miami Springs	5.13	0.16	0.11
Wekiva River	Nova Spring	8.52	0.12	0.1
Wekiva River	**Wekiwa Spring**	**66.68**	**1.21**	**0.14**
Wekiva River	Witherington Spring	4.7	0.38	N/A

Wekiwa and Rock Springs, the two largest springs, represent more than 70% of the nitrate loading from springs and nearly 60% of the TP loading. The second-largest subset of springs comprises Seminole Spring, Sanlando Spring, and Starbuck Spring, because of their discharge and nutrient concentrations. Together with Wekiwa and Rock Springs, the top five springs represent 95.5% of the nitrate and 80% of the TP load to the Wekiva River system.

Table 3.6 lists the relative percentage contributions of these five springs to the total nitrate and TP load estimated to come from spring discharges to the Wekiva River system (Gao 2008). Additional research on the nitrate and TP loadings in the recharge areas would help to target future projects and management actions .Efforts to reduce nitrate and TP loads in the recharge areas of these springs will be very important. In addition, as part of future monitoring and research efforts, a better understanding of how geologic sources of phosphorus contribute to the springs is essential to determine the total load and anthropogenic fraction of the load.

TABLE 3.6. ESTIMATED PERCENT CONTRIBUTIONS OF THE TOP FIVE SPRINGS TO THE TOTAL SPRING NUTRIENT LOADS TO THE WEKIVA RIVER SYSTEM

(TOP FIVE SPRINGS ACCOUNT FOR THE MAJORITY OF THE DISCHARGE AND NUTRIENT LOAD FROM THE WEKIWA SPRING CLUSTER SPRINGSHED)

- = Empty cell/no data

Source: *Table 4.12* in Gao 2008

SPRING NAME	NO3+NO2 (LBS/YR)	NO3*NO2 (%)	TP (LBS/YR)	TP (%)
Wekiwa	188,959	36.9%	36,999	46.9%
Rock	171,032	33.4%	9,122	11.6%
Seminole	94,967	18.6%	5,546	7%
Sanlando	22,773	4.5%	6,948	8.8%
Starbuck	10,983	2.1%	4,506	5.7%
TOTAL FOR TOP FIVE SPRINGS	**488,714**	**95.5%**	**63,121**	**80%**
TOTAL FOR ALL SPRINGS WITH DATA	**511,433**	**-**	**78,952**	**-**

3.2.3 SUMMARY OF BASELINE LOADINGS IN THE BMAP PLANNING AREA

Many studies have used a variety of methodologies to estimate the baseline load of nutrients to the Wekiva River system, including the Wekiva Basin nutrient TMDLs (Gao 2008; Bailey 2008), MACTEC (2010), and others. All efforts have tried to characterize the loadings and sources with an end goal of controlling the sources and reducing the loads of nutrients to the system. The baseline nutrient loads presented in **Section 3.3** have been calculated to provide some scale to the load reduction efforts of the WBWG. For purposes of the BMAP, the department has acknowledged those past efforts to quantify the nutrient loads within the basin but also recognized that none of those studies excluded any sources from consideration. As such, the BMAP focused on identifying projects and management actions from all sources and across the entire BMAP planning area during this first BMAP phase. **Table 3.7** summarizes the baseline loadings from runoff and spring discharge in the planning area. **Chapter 4** discusses the WBWG projects and management actions.

TABLE 3.7. SUMMARY OF ESTIMATED NITRATE AND TP LOADS FROM RUNOFF AND SPRING DISCHARGE IN THE WEKIVA BMAP PLANNING AREA

(THIS TABLE SUMMARIZES THE INFORMATION PRESENTED IN TABLES 3.5 AND 3.6)

- = Empty cell/no data

[1] Calculated based on Gao (2008) using the WMM and updated by R. Hicks in 2013 using SJRWMD 2009 land uses and excluding high-recharge areas.

[2] Calculated in Gao (2008) using spring discharge and concentration.

SOURCE CATEGORY	SUBBASIN	NITRATE LOAD (LBS/YR)	TP LOAD (LBS/YR)
Baseline Runoff[1]	Blackwater Creek	108,108	55,190
Baseline Runoff[1]	Little Wekiva Canal	68,793	37,747
Baseline Runoff	Little Wekiva River	45,318	24,692
Baseline Runoff[1]	Rock Springs Run	28,462	14,959
Baseline Runoff[1]	(Upstream) Wekiva River	15,397	8,114
Baseline Runoff[1]	(Downstream) Wekiva River	25,165	13,385
-	**TOTAL BASELINE RUNOFF**	**291,243**	**154,087**
-	**TOTAL SPRING DISCHARGE[2]**	**511,433**	**78,952**
-	**TOTAL COMBINED BASELINE RUNOFF AND SPRING DISCHARGE LOAD**	**802,676**	**233,039**

3.3 NITROGEN SOURCE INVENTORY LOADING TOOL (NSILT)

To help identify and quantify the most significant contributing nitrogen sources to ground water in springsheds where BMAPs are being implemented, the department is developing an NSILT to estimate nitrogen loading to ground water. This tool, which will bebased on the current best available data, will provide summary information on nitrogen inputs and estimated loads of nitrogen to ground water, as well as information on the relative loads from regions within spring contributing areas based on their ground water recharge rates and the attenuation of nitrogen from various sources.

The technical approach in applying this tool involves the following steps: identifying the area to be assessed, characterizing the ground water recharge within that area, identifying specific land uses and categories of land use that are potential nitrogen sources, calculating estimated nitrogen inputs to the land surface from those potential sources, and, finally, calculating estimated nitrogen loads to the aquifer. The NSILT will provide the best available assessment of where nitrogen is currently being applied in the BMAP planning area relative to aquifer recharge rates.

The NSILT, a GIS- and spreadsheet-based tool, will provide estimates of the relative contribution of nitrogen from the following sources:

- Atmospheric deposition.
- Wastewater land applications.
- OSTDS.
- Livestock waste
- Agricultural and nonagricultural (urban) fertilizers.
- Stormwater runoff to drainage wells.

The results of this tool can be used in the development and implementation of the Wekiva BMAP to help focus on specific areas and nitrogen source categories to achieve the greatest improvement in water quality, and to assist in the selection and targeting of projects to reduce nitrogen loading. The results can also provide stakeholders with information on the comparative importance of different sources.

3.4 Anticipated Actions and Outcomes of BMAP Implementation

The first five-year phase of the BMAP is anticipated to generate the following actions:

- Development of the NSILT to identify and quantify the major sources contributing nitrogen to the Wekiva River system in the spring contributing area focused on the BMAP planning area.
- Completion of proposed or in-process management projects, maintenance of existing projects, and ongoing implementation of strategies and programs for nutrient load reduction.

- Additional research and investigations on sources of nutrients to the Wekiva River system and details regarding the springshed, as well those that will help measure and predict the effects of projects and activities.
- Collection of monitoring data as part of a basinwide monitoring network to track inputs and concentration trends in nutrients through ground water, surface water, and spring sampling, as well as biological assessments and flow measurement.
- Identification of priority focus areas within the BMAP planning area to better focus the future management efforts (*e.g.*, areas of high loadings of nutrients to surface water and ground water, and areas of aquifer vulnerability) needed to achieve the TMDLs in future BMAP phases.

With the implementation of the projects outlined in this BMAP, reductions in nitrate and TP loading to the Wekiva River, Rock Springs Run, and Little Wekiva Canal Basin are expected to improve water quality conditions. The following outcomes are expected from BMAP implementation:

- Improved water quality trends in the watershed tributaries.
- Decreased loading of the target pollutants (nitrate and TP).
- Increased coordination, such as through the OSTDS Initiative and annual meetings, among state and local governments and within divisions of local governments in problem solving for water quality restoration.
- Determination of effective projects through the stakeholder decision-making and priority-setting processes.
- Enhanced public awareness of pollutant sources, pollutant impacts on water quality, and corresponding corrective actions.
- Enhanced understanding of basin hydrology, water quality, and pollutant sources.
- Reduced cover and/or biomass of attached macroalgae in springs and downstream spring run streams.

Chapter 4, Management Actions, provides an overview of the specific projects completed or proposed by WBWG member organizations to reduce nutrient loadings to the Wekiva River Basin. **Chapter 5, Assessing Progress and Making Changes,** provides an overview of the monitoring plan and studies that have been completed, are ongoing, or are proposed to provide additional understanding of the basin and help prioritize actions.

Chapter 4: Management Actions

"Management actions" refers to the required suite of projects and other actions that the allocation entities will be conducting pursuant to this BMAP. These include both structural and nonstructural activities. Management actions had to meet several criteria, as follows, to be considered eligible for inclusion in the BMAP:

- All projects, programs, and activities had to address nutrient loads (TN, TP, or both) to receive credit, and had to be located in the Wekiva River, Rock Springs Run, or Little Wekiva Canal BMAP planning area. This includes all contributing flows such as the Little Wekiva River, Blackwater Creek, and the springshed portion of the planning area.
- More specifically, projects benefiting surface water had to be located in the surface water drainage area, and projects benefiting ground water had to be located in the springshed of the BMAP planning area. (Note: The surface water drainage basin and the springshed overlap in a portion of the planning area.)
- Completed projects since January 1, 2000, were eligible for inclusion.

Based on these eligibility requirements and the wide variety of sources to the surface water drainage system and springshed, the BMAP identifies numerous possible actions, as follows, associated with the general categories discussed in **Chapter 3**:

- Wastewater treatment plant upgrades and collection system projects (**Section 4.1**):
  - Elimination/reduction of surface water discharge.
  - WWTF and WRF treatment plant upgrades.
  - Collection system rehabilitation.
  - Improved treatment of septic tank effulent.
  - Water reuse projects.
- MS4 and other stormwater projects (**Section 4.2**):
  - BMP installation.
  - Stormwater system rehabilitation.

    - Street sweeping.
- Agricultural BMPs (**Section 4.3**).
- Other nutrient load reduction efforts (**Section 4.4**):
    - Stream bank protection and restoration.
    - Land conservation and preservation.
    - Public education.

At the conclusion of **Chapter 4, Section 4.5** summarizes the load reductions associated with the efforts of WBWG partners across all of these project categories.

4.1 Wastewater Treatment and Collection System Projects

4.1.1 WWTFs and WRFs

As noted in **Section 3.1.1.1**, in February 2006 the department adopted Section 62-600.550, F.A.C. (*i.e.*, the Wekiva rule), which established the general requirements for all wastewater discharges in each of the three protection zones in the WSA. The rule was effective in April 2006. The department notified WWTFs of the new requirements (in the same month) and of the deadline for compliance in April 2011. **Figure 4.1**, which shows the locations of the WWTFs and WRFs in the Wekiva Basin, includes a geographic information system (GIS) layer indicating the different protection zones that were created in accordance with the WPPA, based on the aquifer vulnerability results provided by the WAVA model (Chichon *et al.* 2005). These general requirements are implemented through the operating permits issued to each WWTF or WRF. This information was presented to the WBWG by Christianne Ferraro, department Central District, in June 2009.[2] The information Ms. Ferraro presented is as follows:

[2] The full presentation is available online. http://publicfiles.dep.state.fl.us/DEAR/BMAP/MiddleStJohns/Wekiva/Meetings/2009_%286%29June/Wekiva%20Rule%20-%20Wekiva%20BMAP%20June%202009%20meeting.pdf

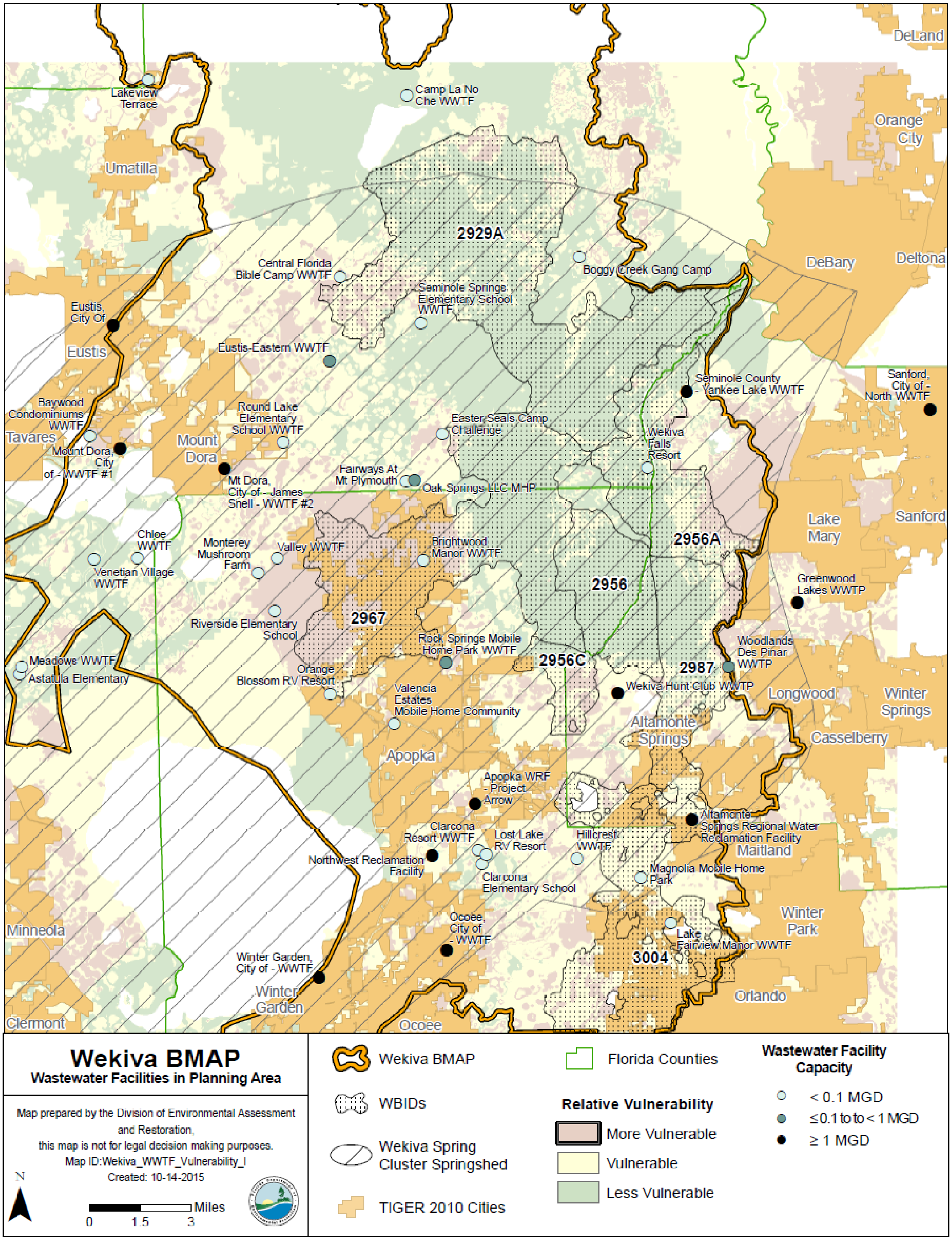

FIGURE 4.1. LOCATION OF DOMESTIC WWTFS AND WRFS IN THE WEKIVA BMAP PLANNING AREA

PRIMARY PROTECTION ZONE (MORE VULNERABLE)

- No new RIB systems or restricted access sprayfields.
- Wekiva domenstic wastewater effluent limits:
  - Existing RIBs — 3 mg/L TN.
  - Reuse irrigation systems – 10 mg/L TN (including RIBs as backup to reuse).
  - Package plants – 10 mg/L TN or connect to another system.
  - No residuals land application sites.
  - Five years to implement for existing facilities; new facilities must comply now.

SECONDARY PROTECTION ZONE (VULNERABLE)

- New RIB systems are allowed.
- Wekiva domestic wastewater effluent limits:
  - Existing and new RIBs – 6 mg/L TN.
  - Reuse irrigation systems – 10 mg/L TN (including RIBs as backup to reuse).
  - Package plants – 10 mg/L TN or connect.
  - No residuals land application sites.
  - Five years to implement (10 years for package plants); new facilities must comply now.

TERTIARY PROTECTION ZONE (LESS VULNERABLE)

- Meet existing regulations.

EXISTING SURFACE WATER DISCHARGES IN BASIN

- Backup to public access reuse only.
- Five years to implement for existing discharges.
- New discharges must meet the requirements of A Prototype Realistically Innovative Community of Today (APRICOT).

— TMDL development/adoption may make these options unavailable.

Based on currently available data and analysis, these effluent limitation requirements are appropriate to protect ground water quality and prevent contribution to water quality impairment in the Wekiva River Basin.

During the development of the BMAP, many WWTFs/WRFs underwent significant treatment process upgrades in anticipation of these requirements, and the department renewed all applicable operating permits to include new permit limits based on the requirements. WWTFs and WRFs are not always included in BMAP projects and management actions (the discharges being regulated by permits are already addressed by the WLA and permit limits). However, because of the considerable effort and investment made by public and private operators of these facilities across the entire basin, a summary of the larger facilities (with a permitted flow greater than one MGD) and their nitrate reductions is included in **Tables 4.1a** and **4.1b. Figure 4.1** shows the location of each facility.

An estimated reduction in nitrate from the larger facilities and reclaimed water distribution sites in the BMAP planning area is approximately 328,659 lbs/yr (**NOTE**: The combined total of **Table 4.1a** and **4.1b**). Assuming as MACTEC (2010) did that 63 percent of that amount would be loaded to ground water, this would equate to a potential load reduction of approximately 207,055 lbs/yr. This loading estimate was based on the average annual daily flow for 2012 for each facility, the 2006 (pre-Wekiva rule) nitrate permit limit, and the Wekiva rule TN permit limits in each facility's current permit. This approach provides an overall conservative estimate of load reductions.

The Wekiva rule limits TN (measured as all forms of nitrogen [nitrate, nitrite, ammonia-N, and organic nitrogen]). This overestimates the amount of nitrate in the effluent from each facility and hence underestimates the load reduction. In addition, no load reduction is attributed to several facilities with permitted flows greater than one MGD (they did not have nitrate permit limits in 2006, and so no reduction was calculated), or to any of the facilities with permitted flows less than one MGD. This conservative loading estimate across all of these facilities provides a buffer for future growth (*i.e.*, wastewater flows) to these plants in the basin.

TABLE 4.1A. PERMITTED DOMESTIC WASTEWATER TREATMENT FACILITIES THAT TREAT AND REUSE RECLAIMED WATER OR DISCHARGE EFFLUENT IN THE WEKIVA BMAP PLANNING AREA (FACILITIES IDENTIFIED IN THE TMDL DOCUMENT)
(FACILITIES WITH PERMITTED FLOWS GREATER THAN ONE MGD ARE SHOWN, AND ESTIMATED ANNUAL TN LOAD REDUCTIONS ARE PROVIDED)

N/A = Not available
- = Empty cell/no data
[1] Other WWTF and WRF facilities in the WSA (outside the BMAP planning area) and all facilities less than one MGD are not represented in this table.
[2] Facilities with FL permit numbers are regulated by NPDES permits for discharges to surface waters. Facilities with FLA permit numbers do not have a surface water discharge (*i.e.*, they discharge to reclaimed water systems, RIBs, *etc*.).
[3] 2006 nitrate, Wekiva TN (current), TN permit limits, and average annual daily flow for 2012 were used to calculate the potential difference (reduction) in load per year. Assumes nitrate and TN concentration limits are comparable for this application.
[4] SCES/Yankee Lake WRF voluntarily ceased surface water discharge in June 2011. The previous permit number was FL0042625.

Facility Name[1, 2]	Permit Number[3]	Permitted Capacity (MGD)	2006 Nitrate Limit (mg/L)	Wekiva TN Limit (mg/L)	Flow 2012 (MGD)	Nitrate Load (lbs/day) Based on 2006 Limit	TN Load (lbs/day) Based on Wekiva TN Limit	Potential Difference/ Load Reduction (TN lbs/yr)[3]
Altamonte Springs Regional WRF	FL0033251	12.5	No limit	10	5.66	N/A	473	N/A
Apopka WRF, Project Arrow	FLA010818	4.5	No limit	10	2.634	N/A	220	N/A
Seminole County, Northwest WRF (referred to as SCES/Yankee Lake WRF)[4]	FLA042625	2.5	12	3	1.993	200	50	54,673

ESTIMATED LOAD REDUCTION BASED ON AVAILABLE DATA (LBS/YR) (FOR FACILITIES IDENTIFIED IN THE TMDL) = 54,673
ESTIMATED LOAD REDUCTION TO GROUND WATER (63%) (LBS/YR) = 34,444

TABLE 4.1B. PERMITTED DOMESTIC WASTEWATER TREATMENT FACILITIES THAT TREAT AND REUSE RECLAIMED WATER OR DISCHARGE EFFLUENT IN THE WEKIVA BMAP PLANNING AREA (ADDITIONAL FACILITIES IN THE BMAP PLANNING AREA)

(FACILITIES WITH PERMITTED FLOWS GREATER THAN ONE MGD ARE SHOWN, AND ESTIMATED ANNUAL TN LOAD REDUCTIONS ARE PROVIDED)

N/A = Not available

- = Empty cell/no data

[1] Other WWTF and WRF facilities within the WSA (outside the BMAP planning area) and all facilities less than one MGD are not represented in this table.

[2] Facilities with FL permit numbers are regulated by NPDES permits for discharges to surface waters. Facilities with FLA permit numbers do not have a surface water discharge (*i.e.*, they discharge to reclaimed water systems, RIBs, *etc.*).

[3] 2006 nitrate, Wekiva TN (current), TN permit limits, and average annual daily flow for 2012 were used to calculate the potential difference (reduction) in load per year. Assumes nitrate and TN concentration limits are comparable for this application.

[4] Woodlands Des Pinar WRF (operated by Sanlando Utilities Corp.) went offline in September 2012; flows (0.5 MGD permitted) were transferred to Wekiva Hunt Club WRF.

Facility Name[1, 2]	Permit Number[3]	Permitted Capacity (MGD)	2006 Nitrate Limit (mg/L)	Wekiva TN Limit (mg/L)	Flow 2012 (MGD)	Nitrate Load (lbs/day) Based on 2006 Limit	TN Load (lbs/day) Based on Wekiva TN Limit	Potential Difference/ Load Reduction (TN lbs/yr)[3]
Conserv II Distribution Center	FLA010795	68.2	10	10	29.61	2,498	2,498	0
Eustis Bates Ave. Main WRF	FLA010507	2.4	12	10	1.111	111	93	6,775
Mount Dora WWTF #1	FLA010508	1.5	12	10	0.734	74	61	4,475
Mount Dora Snell WWTF #2	FLA268542	1.25	No limit	10	0.425	N/A	35	N/A
Orange County Northwest WRF	FLA010798	7.5	12	3	5.269	528	132	144,542
Ocoee WRF	FLA010815	3.0	12	10	1.594	160	133	9,717
Sanford North WRF	FL0020141	9.2	No limit	10	4.797	N/A	401	N/A
Sanlando Utilities Corp. Wekiva Hunt Club WWTP[4]	FL0036251	2.9	12	10	1.74	174	145	10,607
Seminole County Greenwood Lakes WRF	FLA011086	3.0	12	3	1.981	199	50	54,344
Winter Garden WRF	FL0020109	2.0	12	6	2.38	239	119	43,526

TOTAL ESTIMATED LOAD REDUCTION BASED ON AVAILABLE DATA (LBS/YR) (ADDITIONAL FACILITIES) = 273,986

TOTAL ESTIMATED LOAD REDUCTION TO GROUND WATER (63%) (LBS/YR) (ADDITIONAL FACILITIES) = 172,611

4.1.2 Collection System and Reclaimed Water Projects

In addition to the treatment plant upgrades and process improvements at the facilities, the operators of these systems have implemented additional management actions to reduce the nutrient pollutant loads to the Wekiva River system. These efforts have included the following:

- Rehabilitating collection systems to reduce infiltration and inflow (I/I) issues and sanitary sewer overflows (SSOs), and to reroute flows to improve the use of treatment capacity at individual facilities.
- Extending the service area of centralized sewer to connect residential and commercial areas on septic tanks as well as package plants.
- Expanding the storage and distribution systems for reclaimed water, thus transferring wastewater flow previously discharged to surface water and/or RIBs to reuse for irrigation. This is expected to result in a lower load to surface water and hence to the Wekiva River system. This effort also reduces the demand for new ground water drawn from the Floridan aquifer for irrigation use in the basin.

Table 4.2 summarizes the types of collection system projects, the subbasin location, and the jurisdiction responsible for implementing each project. The table presents 47 projects implemented by 10 WBWG member organizations. Some municipalities chose to address septic systems by extending sanitary sewer service to areas that previously only had septic systems. That comprises the extent to which septic systems were affected by projects included in this initial phase of the BMAP by the WBWG. Project cost estimates provided by WBWG member organizations indicate that these projects represent an investment of at least $67 million (based on project cost information for 33% of the projects).

TABLE 4.2. COLLECTION SYSTEM NUTRIENT LOAD REDUCTION PROJECTS IN THE WEKIVA BMAP PLANNING AREA
(47 PROJECTS BY 10 WBWG MEMBER ORGANIZATIONS REPRESENTING AN INVESTMENT OF MORE THAN $67 MILLION)

\- = Empty cell/no data

COLLECTION SYSTEM PROJECTS	LITTLE WEKIVA CANAL AND/OR LITTLE WEKIVA RIVER	WEKIVA RIVER	SPRINGSHED	TOTAL NUMBER OF PROJECTS
Improve Reuse System (*e.g.*, collection, transmission, storage) (**Table 4.4** and **Appendix B**)	Altamonte Springs (2) Apopka (1)	-	Apopka (5)	8
Expand Collection System (*i.e.*, septic systems to sewer; decommission WWTF) (**Table 4.3** and **Appendix** B)	Altamonte Springs (3) Orlando (7)	Wekiwa Springs State Park (1)	Apopka (6) Mount Dora (1)	18
Rehabilitate/Upgrade Sanitary Collection System (*e.g.*, pipe relining, manhole sealing, lift station replacement and relocation) (**Table 4.3** and **Appendix B**)	Altamonte Springs (1) Orlando (4)	Seminole County (4) Sanlando Utilities (1)	Apopka (4) Mount Dora (2) Ocoee (1) Orange (3) Winter Garden (1)	20
Inspect Sanitary Sewer System (**Appendix B)**	Orlando (1)	-	Mount Dora (1)	2
Carry Out Studies (**Chapter 5** and **Appendix B**)	Altamonte Springs(1)	-	-	1
TOTAL COLLECTION SYSTEM PROJECTS	**20 PROJECTS**	**6 PROJECTS**	**24 PROJECTS**	**49**

4.1.3 SEPTIC TANKS

Early in the BMAP development process, the relationship between the Wekiva BMAP and any FDOH rulemaking regarding septic tanks was clarified. The Wekiva BMAP process was focused on the TMDL water quality restoration targets adopted for the Wekiva Basin by the department in 2008.

Table 4.3 presents a summary list of collection system expansion and rehabilitation projects with estimated load reduction calculations (23 percent of the total list). Load reductions have not been calculated for the other projects at this time; therefore, the list underestimates the total load reductions associated with this type of project within the BMAP planning area. Significant load reductions have been noted by the city of Apopka for the expansion of the centralized sanitary sewer system to collect wastewater from the Chalet North Mobile Home Park, Yothers Road, and Zellwood Station (the latter is already completed) (**Appendix B** provides the **full list** of collection system projects).

Load reductions for other similar projects, such as the connection of the Wekiwa Springs State Park wastewater line to the Orange County sanitary sewer system, have not been estimated and thus are not included in the summary of quantified load reductions. The Wekiwa Springs State Park Project (completed in March 2013) added lift stations to collect most wastewater from Wekiwa Springs State Park for treatment at the Orange County Northwest WRF. The three-phase conversion included the administration building, main user area, Ranger Station, residences in the park, Youth Camp, campground dump station, two bathhouses, and nearly 40 campsites. The two spray fields at the park have been dismantled. Other WBWG members that have implemented projects that do not have associated load reductions include Mount Dora, Ocoee, Orlando, Sanlando Utilities Corporation, Seminole County, and Winter Garden.

The projects included in the BMAP provide an example of the effort and effectiveness of these types of activities. During BMAP implementation, projects related to the expansion of wastewater collection systems, where feasible, may be useful to provide additional reductions throughout the basin. FDOH has conducted the Florida Onsite Sewage Nitrogen Reduction Study, administered by FDOH's Bureau of Environmental Health, to identify cost-effective technologies to reduce the amount of nitrogen contributed to ground water by OSTDS. For more information about this study, see **Section 5.2.2**.

Data from multiple sources indicate that nutrient loadings from nonpoint sources, including OSTDS, are significant and must be considered in order to achieve the TMDL reductions necessary in the Wekiva River Basin (see **Section 3.1.2**, *Septic Systems*, in **Chapter 3**). Consequently, the Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP process must continue to address nutrient loadings associated with both existing and new OSTDS to achieve the TMDL.

The department recognizes that stakeholders, including government jurisdictions, the public, and utilities, have completed numerous OSTDS collection system projects, and continue to plan and pursue excellent steps to achieve additional nutrient reductions from wastewater and OSTDS sources. The adopted and planned measures and actions resulting from the OSTDS Initiative will provide the basis for implementing projects in this BMAP.

4.1.4 Reclaimed Water Collection, Transmission, and Storage

Table 4.4 contains a summary list of wastewater reuse projects by the cities of Altamonte Springs and Apopka with estimated TN and TP load reduction calculations (75 percent of the projects in the full list). These reductions via reuse projects are in addition to nutrient reductions achieved by the WWTFs and

WRFs shown in **Tables 4.1a** and **4.1b**. The Apopka and Altamonte Springs facilities did not have nitrate or TN limits prior to the Wekiva permit requirement; thus no load reductions were included for these facilities in **Table 4.1a**. As with the collection system expansion and rehabilitation projects, this table understates the total nutrient load reductions associated with WBWG projects. An additional project (*e.g.*, implemented by the City of Apopka) does not currently have calculated nutrient load reductions. **Appendix B** includes the **full list** of collection system–related projects.

Table 4.3. Estimated Nutrient Load Reductions Associated with Collection System Projects in the Wekiva BMAP Planning Area

(This table presents 23% of the expansion and rehabilitation projects [only those with estimated load reductions are shown]; therefore the total understates the total load reductions in the basin for these types of projects. Additional projects are included in Appendix B.)

- = Empty cell/no data

Entity	Subbasin	Project Name	Project Type	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	Status
Apopka	Springshed/ Rock Springs Run	Chalet North Mobile Home Park	Collection System Expansion	58,586	9,644	Completed
Apopka	Springshed/ Rock Springs Run	Yothers Rd. and Zellwood Station	Collection System Expansion	35,388	5,825	Completed
Apopka	Springshed/ Rock Springs Run	Individual Septic to Sewer Projects	Collection System Expansion/ Septic to Sewer System	3,381	557	Completed
Apopka	Springshed/ Rock Springs Run	Kelly Park at Rock Springs (Orange County Park)	Collection System Expansion/ Septic to Sewer System	1,296	213	Completed
Apopka	Springshed/Rock Springs Run	Lift Station 10 (near 441 and Sheeler) Wet wells	Collection System Rehabilitation	-	-	Completed
Apopka	Springshed/Rock Springs Run	Manholes (Alabama and 8th St.; Little St. and 9th St.; Park Ave; Charleston Park Subdivision)	Collection System Rehabilitation	-	-	Completed
Apopka	Springshed/Rock Springs Run	Victoria Plaza, Forest Ave., 3rd St., Park Ave.	Collection System Rehabilitation	-	-	Completed
Apopka	Springshed/Rock Springs Run	WWTP Expansion & nutrient removal	Collection System Rehabilitation	-	-	Design
Apopka	Springshed/Rock Springs Run	Kelly Park Rd. 8-inch Force Main	Sanitary Sewer Collection System	-	-	Completed
Apopka	Springshed/Rock Springs Run	US Highway 441 Force Main Extension	Sanitary Sewer Collection System	-	-	Completed

Entity	Subbasin	Project Name	Project Type	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	Status
Mount Dora	Springshed	Community Development Block	Collection System Expansion/ Septic to Sewer System	-	-	Completed
Mount Dora	Springshed	Lift Station #10 Piping Replacement	Collection System Rehabilitation	-	-	Completed
Mount Dora	Springshed	Pipe Lining 2007, 2008, 2009, and 2010	Collection System Rehabilitation	-	-	Completed
Ocoee	Springshed/Wekiva River	Lift Station #7 Rehab and Relocation	Collection System Rehabilitation	-	-	Completed
Altamonte Springs	Little Wekiva River	Adventist Health System Headquarters Development	Collection System Expansion/ Septic to Sewer System	72	13	Completed
Altamonte Springs	Little Wekiva River/ Lake Orienta	640 Jasmine Ave. – Septic System Removal	Collection System Expansion/ Septic to Sewer System	15	3	Completed
Altamonte Springs	Little Wekiva River	Spring St., Central St., Marker St., and Campello St. Septic System Removal	Collection System Expansion/ Septic to Sewer System	101	18	Completed
Altamonte Springs	Little Wekiva River	Central Parkway Force Main Replacement from Lift Station 54 to Montgomery Rd.	Sanitary Sewer Collection System Rehabilitation	5	4	Completed
Orlando	Little Wekiva River	Arthur Avenue Sewer Line	Collection System Expansion	-	-	Completed
Orlando	Little Wekiva River	Fairview Shores – North Service Area	Sanitary Sewer Collection System	-	-	Completed
Orlando	Little Wekiva River	Lynx Facility	Sanitary Sewer Collection System	-	-	Completed
Orlando	Little Wekiva River	Rio Grande Sanitary Sewer	Sanitary Sewer Collection System	-	-	Completed

Entity	Subbasin	Project Name	Project Type	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	Status
Orlando	Little Wekiva River	West Lake Fairview Sanitary Sewer	Sanitary Sewer Collection System	-	-	Completed
Orlando	Little Wekiva River	Lift station #37 Improvements	Sanitary Sewer Rehabilitation	-	-	Completed
Orlando	Little Wekiva River	Lift Station #85 Variable Frequency	Sanitary Sewer Rehabilitation	-	-	Completed
Orlando	Little Wekiva River	Lift Station #93 Improvements	Sanitary Sewer Rehabilitation	-	-	Completed
Orlando	Little Wekiva River	West Lake Silver Phase 1 and 2	Sanitary Sewer Collection System	-	-	Completed
Orlando	Little Wekiva River/Little Wekiva Canal	Manholes (Alabama and 8th St.; Little St. and 9th St.; Park Ave; Charleston Park Subdivision)	Sanitary Sewer Rehabilitation	-	-	Completed
Orlando	Little Wekiva River/Little Wekiva Canal	Regent Avenue Force Main 2613	Sanitary Sewer Collection System	-	-	Completed
Orange County	Springshed/ Study Area	Force Main/Gravity Replacement	Sanitary Sewer Collection System Rehabilitation	-	177	90% design
Orange County	Springshed/ Study Area	Pump Station Replacements/Repairs	Sanitary Sewer Collection System Rehabilitation	-	15,589	Ongoing
Orange County	Springshed/ Surface Watershed	Gravity Sewer Rehab	Sanitary Sewer Collection System Rehabilitation	606	157	Construction 75% complete
Sanlando Utilities Corp.	Wekiva River	Sweetwater I&I Investigation and Collection System Repairs	Sanitary Sewer Collection System Rehabilitation	-	-	Completed
Seminole County	Wekiva River	Apple Valley Lift Station	Sanitary Sewer Collection System Rehabilitation	-	-	Completed

Entity	**Subbasin**	**Project Name**	**Project Type**	**TN Load Reduction (lbs/yr)**	**TP Load Reduction (lbs/yr)**	**Status**
Seminole County	Wekiva River	Bridgewater Drive	Sanitary Sewer Collection System Rehabilitation	-	-	Completed
Seminole County	Wekiva River	Gravity Main Testing and Repairs	Sanitary Sewer Collection System Rehabilitation	-	-	Completed
Seminole County	Wekiva River	Lift Station Rehab	Sanitary Sewer Collection System Rehabilitation	-	-	Completed
Winter Garden	Springshed	State Road 50 Utility Relocation	Sanitary Sewer Collection System Rehabilitation	-	-	Ongoing
Wekiva State Park	Wekiva River	Remove Wekiva State Park from Septic	Sanitary Sewer Collection Expansion/Septic to Sewer System	-	-	Phases 1 and 3 completed

Total TN Load Reduction (lbs/yr) = 99,450
Total TP Load Reduction (lbs/yr) = 32,200

Table 4.4. Estimated Nutrient Load Reductions Associated with Wastewater Reuse Projects in the Wekiva BMAP Planning Area

(This table includes 75 percent of all collection system reuse projects [only those with estimated load reductions are shown]; therefore it understates the total load reductions in the basin for reuse projects. Additional projects are included in Appendix B)

\- = Empty cell/no data

Entity	Subbasin	Project Name	Project Type	Project Detail	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	Status
Altamonte Springs	Little Wekiva River	Storage and Retrieval of Reclaimed Water in Cranes Roost Regional Stormwater Facility	Reclaimed Water Collection, Transmission, and Storage	Storage and retrieval of reclaimed water in Cranes Roost permitted by department in 2002	3,827	14,806	Completed
Altamonte Springs (with Apopka, FDOT, SJRWMD, and department)	Little Wekiva River	Altamonte Springs-FDOT Integrated Reuse and Stormwater Treatment (A-FIRST)	Reclaimed Water and Stormwater Collection, Transmission, and Storage	Collection, treatment, and reuse of stormwater from Cranes Roost Basin (including Interstate 4 widening) and eliminating direct reclaimed and one direct stormwater discharge to the Little Wekiva River	31,872 (61,572 buildout load reduction estimate – not counted in totals below)	13,993 (27,693 buildout load reduction estimate – not counted in totals below)	Design
Apopka	Little Wekiva River	Sanlando Utilities Corp. Reuse to City of Apopka	Reclaimed Water Collection, Transmission and Storage	Reclaimed water currently being discharged into Little Wekiva (starting at 1 MGD)	13,698	4,566	Design
Apopka	Springshed/ Rock Springs Run	Orange County Reuse to City of Apopka	Reclaimed Water Collection, Transmission and Storage	Reclaimed water currently being discharged into RIBs (up to 3 MGD)	18,264	6,088	Design
Apopka	Springshed/ Rock Springs Run	Northwest Reclaimed/Stormwater Storage Pond	Reclaimed Water Collection, Transmission and Storage	Constructed 120 MG gallon lined reclaimed storage pond; pond also collects stormwater from 300-acre northwest recreation facility	-	-	Completed

ENTITY	**SUBBASIN**	**PROJECT NAME**	**PROJECT TYPE**	**PROJECT DETAIL**	**TN LOAD REDUCTION (LBS/YR)**	**TP LOAD REDUCTION (LBS/YR)**	**STATUS**
Apopka	Springshed/ Rock Springs Run	Northwest Reclaimed/Stormwater Storage Pond B	Reclaimed Water Collection, Transmission and Storage	Construction of 21 MG lined reclaimed storage pond; pond also collects stormwater from 300-acre northwest recreation facility	-	-	Completed
Apopka	Springshed/ Rock Springs Run	Northwest Reclaimed/Stormwater Storage Pond C	Reclaimed Water Collection, Transmission and Storage	Construction of 68 MG lined reclaimed storage pond; pond also collects stormwater from 300-acre northwest recreation facility	-	-	Completed
Apopka	Springshed/ Rock Springs Run	Altamonte Springs to Apopka	Reclaimed Water Collection, Transmission and Storage	Altamonte is in construction stage of sending 3.5 MGD of reuse water to city of Apopka	-	-	Completed

TOTAL TN LOAD REDUCTION (LBS/YR) = 67,661
TOTAL TP LOAD REDUCTION (LBS/YR) = 39,453

4.1.4.1 Altamonte Springs-FDOT Integrated Reuse and Stormwater Treatment (A-FIRST) Project

The City of Altamonte Springs is spearheading the planning and design phase for an innovative project that combines traditional alternative water supply with groundbreaking approaches to stormwater management for a highly urbanized area and a major FDOT highway project (the Interstate 4 widening). The project is named the Altamonte Springs-FDOT Integrated Reuse and Stormwater Treatment (A-FIRST) project. Partnerships have been developed —including FDOT, the department, the SJRWMD, and the City of Apopka—to bring the project to fruition.

A-FIRST will provide significant pollutant reductions in the Wekiva Basin by (1) collecting, treating, and reusing stormwater generated in the Cranes Roost Basin (a landlocked basin with pumped discharge to the Little Wekiva River) and from impervious areas associated with the Interstate 4 widening project; and (2) by virtually eliminating one existing reclaimed water discharge point and significantly reducing the discharge volume from an existing direct stormwater pump station (and the corresponding nutrient loading) to the Little Wekiva River. In addition, A-FIRST will create an alternative water supply, generating 4.5 MGD of public access reclaimed water, by diverting excess reclaimed water from the Altamonte Springs Regional WRF (also known as Project APRICOT) to the City of Apopka for the augmentation of its reclaimed water system, known as the Apopka Regional Reuse of Water (ARROW) project.

Benefits from the A-FIRST project include the following:

- Significantly reduces surface water discharges to the Little Wekiva River, resulting in substantial reductions in pollutant loading from nonpoint (surface water/Cranes Roost) sources.
- Significantly reduces discharges from a point source (Altamonte Springs Regional WRF) to the Little Wekiva River.
- Reduces ground water augmentation (*i.e.*, pumping needs) in Apopka and Altamonte's springshed, which directly correlates with spring flows and MFLs.
- Addresses numeric nutrient criteria (NNC) and TMDLs as well as the state's regional WPPA goals for the area.

- Addresses stormwater treatment needs for Interstate 4 in Altamonte Springs.
- Increases indirect aquifer recharge through ARROW, thus contributing to a regional reduction in fresh ground water withdrawals and improvement in MFLs.
- Alleviates unmet water supply demands in west central Florida (the Apopka area).
- Creates a conveyance system to potentially move alternative water supplies from east central Florida to areas with deficits in west central Florida.

This project is included in the BMAP as an example of the benefits of cooperative, multiparty, large-scale projects. It is also included in **Appendix B**.

4.2 MS4 and Other Stormwater Projects

When a BMAP and/or an implementation plan for a TMDL is adopted under Subsection 403.067(7), F.S., for a waterbody into which the permittee's MS4 discharges the pollutant of concern, the MS4 operator must comply with the adopted provisions of the BMAP and/or implementation plan that specify activities to be undertaken by the permittee during the permit cycle. All NPDES permits, including MS4 permits, must be consistent with the requirements of adopted TMDLs.

Phase I MS4s were subject to a two-part permit application process requiring the development of a proposed Stormwater Management Program (SWMP) that would meet the standard of reducing (discharged) pollutants to the maximum extent practicable (MEP), and the incorporation of the SWMP into an individual permit issued to the MS4 operator. To comply with the MEP standard, the SWMP must be designed and implemented to reduce the discharge of pollutants to surface waters of the state. The implementation of BMPs consistent with the provisions of the SWMP required under an MS4 permit constitutes compliance with the standard of reducing pollutants to the MEP for discharges to unimpaired waters. However, MS4s must also continue to assess and adjust their list of approved projects (**Appendix D**) to achieve the greatest reduction of pollutants practicable to protect receiving waters in accordance with an adopted TMDL or BMAP.

Entities that fail to implement their list of approved projects to reduce pollutants to the MEP standard will be subject to enforcement action in accordance with Sections 403.067, 403.121, 403.141, and 403.161, F.S. In addition, both MS4 Phase I and Phase II permits include provisions for revising the effluent limitations, monitoring requirements, and SWMPs to meet applicable TMDL allocations that are consistent with the assumptions and requirements of the adopted BMAP.

4.2.1 NPDES MS4 Phase I Stormwater Permit Requirements

The SWMP activities for Phase I MS4s may include, but are not limited to, the following measures:

- Inspect, maintain, and map stormwater control structures, conveyances, and outfalls consistent with frequencies required by the permit.
- Reduce water quality impacts from stormwater discharges from new development and redevelopment activities by (1) ensuring that stormwater requirements in state, regional, and local regulations are met; (2) promoting low-impact development in the permittee's land development regulations and site plan approval requirements; and (3) implementing a construction site inspection program to ensure that erosion and sedimentation control practices have been implemented properly.
- Reduce pollutant loads from municipal facilities—*e.g.*, municipal equipment yards and shops that support road repair activities or waste fleet facilities—by implementing appropriate BMPs and conducting annual inspections.
- Implement a street-sweeping program, track the quantities of residuals, and report the pounds of nutrients removed based on guidance provided by the department.
- Consider the retrofit existing drainage infrastructure with water quality treatment components.
- Adopt the department's Model Ordinance for Florida-Friendly Fertilizer Use on Urban Landscapes if the local government is within the watershed of a nutrient-impaired waterbody.
- By January 1, 2014, train all permitted staff applying fertilizer through the Green Industry BMP Program.
- Operate municipal golf courses in a manner that is consistent with the department's 2007 manual, "*Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses.*"

- Routinely detect and eliminate nonstormwater discharges (illicit discharges) to the system.
- Routinely inspect industrial and commercial properties discharging stormwater to the MS4.

To avoid the need for reopening MS4 permits each time a TMDL or BMAP is adopted, language has been added to Phase I MS4 permits that automatically requires the implementation of any stormwater requirements in an adopted BMAP. This "TMDL clause" states:

> *In accordance with Section 403.067, F.S., NPDES permits must be consistent with the requirements of adopted TMDLs. Therefore, when a Basin Management Action Plan (BMAP) and/or an implementation plan for a TMDL for a water body into which the permitted MS4 discharges the pollutant of concern to the impaired water(s) is adopted pursuant to Subsection 403.067(7), F.S., the MS4 operator must comply with the adopted provisions of the BMAP and/or implementation plan that specify activities to be undertaken by the permittee during the permit cycle.*

4.2.2 NPDES MS4 Phase II Stormwater Permit Requirements

Under a generic permit (a permit by rule as opposed to an individual permit), operators of regulated Phase II MS4s must develop a SWMP that includes BMPs, with measurable goals, to effectively implement the following six minimum control measures:

1. **Public Education and Outreach –** Carry out educational outreach on the harmful impacts of polluted stormwater runoff.

2. **Public Participation/Involvement –** Comply with state and local public notice requirements and encourage other avenues for citizen involvement.

3. **Illicit Discharge Detection and Elimination –** Implement a plan to detect and eliminate any nonstormwater discharges to the MS4 and create a system map showing outfall locations. Subsection 62-624.200(2), F.A.C., defines an illicit discharge as "…any discharge to an MS4 that is not composed entirely of stormwater…," except discharges under an NPDES permit, or those listed in rule that do not cause a violation of water quality standards. Illicit discharges can include septic/sanitary sewer discharge, car wash

wastewater, laundry wastewater, the improper disposal of auto and household toxics, and spills from roadway accidents.

4. **Construction Site Runoff Control –** Implement and enforce an erosion and sediment control program for construction activities.

5. **Postconstruction Runoff Control –** Implement and enforce a program to address discharges of postconstruction stormwater runoff from new development and redevelopment areas. (**NOTE:** This minimum control is met through state stormwater permitting requirements under Part IV, Chapter 373, F.S., as a qualifying alternative program.)

6. **Pollution Prevention/Good Housekeeping –** Implement a program to reduce pollutant runoff from municipal operations and property, and train staff in pollution prevention.

4.2.2.1 TMDL Allocations and Phase II MS4s

If a TMDL is approved for any surface waterbody into which the Phase II MS4 discharges, and the TMDL includes requirements for the control of stormwater discharges, the operator must review its stormwater management program for consistency with the TMDL allocation. If the Phase II MS4 is not meeting its TMDL allocation, the operator must modify its stormwater management program to comply with the provisions of the TMDL implementation plan applicable to the operator in accordance with the schedule in the plan.

The department plans to modify the Phase II MS4 Generic Permit addressing TMDL allocations and implementation plans through rulemaking and public workshops in the near future.

4.2.3 Structural and Nonstructural Stormwater BMPs

Table 4.5 summarizes the structural and nonstructural stormwater system projects, the subbasin location, and the jurisdiction responsible for implementing the projects and management actions. The 133 projects presented in **Table 4.5** represent the efforts of 17 WBWG member organizations and an investment of more than $60 million (based on cost information for 36 percent of the projects).

Other types of projects (*e.g.,* agriculture, shoreline stabilization, and land preservation) are discussed in **Sections 4.3** (agriculture) and **4.4** (other nonpoint source projects and management actions). **Table 4.6** provides additional information on quantified load reductions for structural and nonstructural BMPs (*e.g.,* stormwater treatment/management, street sweeping) as well as the rehabilitation of stormwater systems to improve treatment capabilities. For structural BMPs, the load reduction estimate provided is for stormwater retrofits to provide treatment to previously untreated areas, or treatment above and beyond the amount required by the ERP Program administered by the SJRWMD across the Wekiva BMAP planning area. The additional treatment results from local requirements or from providing treatment for previously untreated areas (*e.g.*, urban area retrofits or roadways without treatment).

As with the previous tables presenting load reduction estimates, **Table 4.6** presents only the projects with load reduction estimates (70 percent of the full list) and therefore underestimates the amount of load reduction associated with stormwater treatment projects. The quantified load reduction estimates also cannot take into account the benefit of inspection programs implemented by the city of Orlando that go beyond normal MS4 requirements and ensure that operation and treatment capabilities are maintained at hundreds of privately owned stormwater management facilities in the city. **Appendix B** includes the **full list** of stormwater and other noncollection system projects.

Table 4.5. Stormwater and Other Noncollection System Nutrient Load Reduction Projects in the Wekiva BMAP Planning Area
(133 projects by 17 WBWG member organizations, representing an investment of more than $60 million)

- = Empty cell/no data
OOCEA = Orlando-Orange County Expressway Authority

Noncollection System Projects	Blackwater Creek	Little Wekiva Canal	Little Wekiva River	Rock Springs Run	Wekiva River	Springshed	Total Projects
Stormwater Treatment Associated with Paving Dirt Roads (**Table 4.7** and **Appendix B**)	Lake County (1)	Orange County (10)	Orange County (1)	Orange County (6)	Seminole County (2)	-	20
Stormwater System Inspections (**Appendix B**)	-	-	Orlando (2) Orange County (1)	-	-	-	3
Stormwater System Rehabilitation (**Table 4.6** and **Appendix B**)	-	-	Orlando (1)	-	-	Mount Dora (5)	6
Stormwater Treatment System (**Table 4.6** and **Appendix B**)	FDOT (1) Seminole County (1)	FDOT (2) Orlando (1) Orange County (8) Seminole County (2)	Altamonte Springs (11) FDOT (9) Orlando (8) Seminole (2)	Apopka (1) Orange County (1)	Seminole County (4)	Eustis (2) FDOT (15) Lake County (1) Mount Dora (3) Oakland (1) Ocoee (17) Turnpike (2) Winter Garden (2)	94
Street Sweeping (**Table 4.6** and **Appendix B**)	-	Orange County (1)	Altamonte Springs (1) Maitland (1) Orlando (1)	Apopka (1)	Seminole (1)	FDOT (1) Mount Dora (1) Ocoee (1) Winter Garden (1)	10
Total Stormwater BMP Projects	**3 projects**	**24 projects**	**38 projects**	**9 projects**	**7 projects**	**52 projects**	**133 projects**

TABLE 4.6. ESTIMATED NUTRIENT LOAD REDUCTIONS ASSOCIATED WITH STORMWATER PROJECTS IN THE WEKIVA BMAP PLANNING AREA

(THIS TABLE INCLUDES 70 PERCENT OF THE STORMWATER PROJECTS [ONLY THOSE WITH ESTIMATED LOAD REDUCTIONS]; THEREFORE IT UNDERSTATES THE TOTAL LOAD REDUCTIONS IN THE BASIN FOR THESE TYPES OF PROJECTS. ADDITIONAL PROJECTS ARE INCLUDED IN APPENDIX B.)

- = Empty cell/no data

SUBBASIN	ENTITY	PROJECT NAME	TN LOAD REDUCTION (LBS/YR)	TP LOAD REDUCTION (LBS/YR)	STATUS
Blackwater Creek	FDOT District 5	1 treatment project (FM: 238406 [State Road 44]): Swales with ditch blocks	15	2	Completed
Blackwater Creek	Seminole County	Bear Lake Road Reconstruction	91	32	Completed
Little Wekiva Canal	FDOT District 5	2 treatment projects (FM: 239289 [State Road 438 widening]): Treatment Basin 2 (Ponds 2A, 2B, and 2C) and Wet Detention Pond 4	88	9	Completed
Little Wekiva Canal	Orange County	11th and 12th St. Improvement	82	69	Completed
Little Wekiva Canal	Orange County	C-6 Canal – Solar Reuse	721	229	Planned – Funded
Little Wekiva Canal	Orange County	Clarcona Ocoee East and West Segments	56	47	West Segment Completed
Little Wekiva Canal	Orange County	Lake Weston Curb Inlet Baskets	70	18	Planned – Funded
Little Wekiva Canal	Orange County	North Lake Lawne Stormwater Treatment Project (C-7)	51	13	Planned – Funded
Little Wekiva Canal	Orange County	Riverside Pond	4,533	-	Completed
Little Wekiva Canal	Orange County	Street Sweeping	209	134	Ongoing
Little Wekiva Canal	Orange County	Bay Lake Stormwater Retrofit	14	1	Planned – Funded
Little Wekiva Canal	Orange County	Tree Planting at Elba Way/River	-	-	Completed
Little Wekiva Canal	Orlando	Center of Commerce	11,060	2,551	Envisioned
Little Wekiva Canal	Seminole County	Bunell Road Widening	36	9	Completed
Little Wekiva Canal	Seminole County	Eden Park Rd.	59	14	Completed
Little Wekiva River	Altamonte Springs	West Altamonte Operations and Administration Center	169	24	Completed
Little Wekiva River	Altamonte Springs	Altamonte Springs Shopping Center (Crossroads) Development	1	<1	Completed
Little Wekiva River	Altamonte Springs	Brantley Terrace Condo	5	-	Completed

Subbasin	**Entity**	**Project Name**	**TN Load Reduction (lbs/yr)**	**TP Load Reduction (lbs/yr)**	**Status**
Little Wekiva River	Altamonte Springs	Cracker Barrel Development	1	<1	Completed
Little Wekiva River	Altamonte Springs	Fairfield Marriott Suites Development	4	1	Completed
Little Wekiva River	Altamonte Springs	Florida Hospital Development	12	1	Completed
Little Wekiva River	Altamonte Springs	Gateway Clinic and Gateway Crossing Development	42	11	Completed
Little Wekiva River	Altamonte Springs	Maitland Ave. Walgreens Development	6	1	Completed
Little Wekiva River	Altamonte Springs	Panera Bread (State Road 434) Development	1	<1	Completed
Little Wekiva River	Altamonte Springs	River Run South Pond 23 Improvement Project	2	1	Completed
Little Wekiva River	Altamonte Springs	Spring Oaks, San Sebastian, and River Run Inlet Skimmer Baskets	5	1	Completed
Little Wekiva River	Altamonte Springs	Street Sweeping	6,862	4,440	Ongoing
Little Wekiva River	FDOT District 5	2 treatment projects (FM: 239496-2 [State Road 423 Shader Rd. to State Road 424]): Wet Detention Pond 100 and Wet Detention Pond 200	156	17	Completed
Little Wekiva River	FDOT District 5	7 treatment projects (FM: 240231-2 and 3 [State Road 434 Maitland Blvd. to Lotus Landing Blvd. and then to State Road 436]): Dry Detention Pond 1N-1, Dry Detention Pond 1N-2, Dry Detention Pond 2N, Wet Detention WTC Ponds 1 and 2, Exfiltration System (4N-1), Dry Detention Pond P, and Exfiltration System 5N	60	7	Completed
Little Wekiva River	Maitland	Street Sweeping	24	15	Ongoing
Little Wekiva River	Orlando	2 Inlet Baskets Around Lake Daniel	-	8	Completed
Little Wekiva River	Orlando	22 Inlet Baskets Around Lake Orlando	-	25	Completed
Little Wekiva River	Orlando	4 Inlet Baskets Around Lake Sarah	-	8	Completed
Little Wekiva River	Orlando	4 Inlet Baskets Around Lake Silver	-	14	Completed
Little Wekiva River	Orlando	4 Baffle Boxes on Ardsley	-	-	Completed
Little Wekiva River	Orlando	Lake Silver Treatment Structure (Westmoreland Dr. Continuous Deflective Separation [CDS] Unit)	-	19	Completed
Little Wekiva River	Orlando	Little Lake Fairview Restoration and Dubsdread Golf Course Renovation Project	265	-	Completed
Little Wekiva River	Orlando	Palomar Exfiltration	6	3	Completed

Subbasin	Entity	Project Name	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	Status
Little Wekiva River	Orlando	Sandbar Removal on Lake Sarah	-	-	Completed
Little Wekiva River	Orlando	Street Sweeping	1,204	772	Ongoing
Little Wekiva River	Seminole County	Markham Woods Rd. – 3-lane State Road 434 to Springs Landing Blvd.	46	8	Completed
Little Wekiva River	Seminole County	Markham Woods Rd. – 3-lane Springs Landing Blvd. to EE Williamson Rd.	32	4	Completed
Rock Springs Run	Apopka	Shopke-Lester Road Pond Expansion and Improvement	-	1	Completed
Rock Springs Run	Apopka	Street Sweeping	869	557	Ongoing
Rock Springs Run	Orange County	Rock Springs Road	50	40	Completed
Springshed	Eustis	Cardinal Pond – Retention for area along Bates Avenue between Glover and Wall Street	-	-	Completed
Springshed	Eustis	Downtown Master Stormwater Project	-	-	Completed
Springshed	FDOT District 5	4 treatment projects (FM: 410983-1 [Avalon Rd. to State Road 429]): Wet Detention Pond L-4, Pond L-7,Wet Detention Pond M-10/11, and Wet Detention Pond N-2/2A	391	42	100% Design
Springshed	FDOT District 5	2 treatment projects (FM: 239535-2 [State Road 50 add lanes from east lane of Turnpike to Avalon Rd.]); Wet Detention Pond A and Wet Detention Pond B	68	7	Completed
Springshed	FDOT District 5	7 treatment projects (FM: 238314-1 [State Road 500]): Dry Detention Pond 2, French Drains, Ponds 3B, 3C, and 3D, Wet Detention Pond 3E,Dry Retention Pond 4, Wet Detention Pond 5 A/B, and Dry Retention Pond 6	218	20	Completed
Springshed	FDOT District 5	Street Sweeping	1,098	-	Ongoing
Springshed	Lake County	Wolfbranch Drainage Retrofit	-	-	In Progress
Springshed	Mount Dora	Highway 441 and Highway 46 Installation of Storm Tech System	-	-	Completed
Springshed	Mount Dora	St. Johns Street Storm Tech Installation	-	-	Completed
Springshed	Mount Dora	1552 Hilltop Drive Pipe Relining	-	-	Completed
Springshed	Mount Dora	5th Ave. and McDonald Street	-	-	Completed

Subbasin	Entity	Project Name	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	Status
Springshed	Mount Dora	Donnelly St. and Lincoln Ave. Pipe Repair	-	-	Completed
Springshed	Mount Dora	Pine and Jackson Pipe Repair	-	-	Completed
Springshed	Mount Dora	5th Ave. and Rossiter Nutrient Separating Baffle Box (NSBB) Installation	64	26	Completed
Springshed	Mount Dora	Street Sweeping	1,304	2,033	Ongoing
Springshed	Oakland	SRF Infill Depressions	-	-	Ongoing
Springshed	Ocoee	ABC Fine Wine and Spirits Store #52	2	-	Completed
Springshed	Ocoee	Arden Park South	3	-	On hold
Springshed	Ocoee	Cambridge Village Subdivision	<1	-	Completed
Springshed	Ocoee	Forest Trails Subdivision	2	-	Completed
Springshed	Ocoee	Hackney Prairie Park	<1	-	In progress
Springshed	Ocoee	Ingram Estates Subdivision	2	-	In progress
Springshed	Ocoee	Oak Trail Reserve	6	-	In progress
Springshed	Ocoee	Ocoee Carwash	9	-	Completed
Springshed	Ocoee	Olympia, Planned Unit Development (PUD)	5	-	Completed
Springshed	Ocoee	Orchard Park Phase III Subdivision	1	-	Completed
Springshed	Ocoee	Peach Lake Manor Drainage Improvements	88	-	In progress
Springshed	Ocoee	Prairie Lake Reserve	1	-	Completed
Springshed	Ocoee	Remington Oaks Phase I and II Subdivision	1	-	Completed
Springshed	Ocoeee	Sabinal Court	-	-	Completed
Springshed	Ocoee	Street Sweeping	-	-	Ongoing
Springshed	Ocoee	Villa Roma	5	-	In progress
Springshed	Ocoee	Villages of West Oak Subdiviaion	0.16	-	Completed
Springfield	Ocoee	Wellington Place Subdivision	0.28	-	Completed
Springshed	Ocoee	West Colonial Property	5	-	In progress

Subbasin	Entity	Project Name	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	Status
Springshed	Ocoee	Willows on the Lake	6	-	Completed
Springshed	Winter Garden	Dillard St. Pond Expansion	272	-	Completed
Springshed	Winter Garden	Plant Street Segments 1	250	-	In progress
Springshed	Winter Garden	Street Sweeping	285	-	Ongoing
Wekiva River	Seminole County	Street Sweeping	596	268	Ongoing
Wekiva River	Seminole County	Triangle Dr. Treatment Pond	222	146	Planned – Not Funded
Wekiva River	Seminole County	Wekiva Springs Rd. at Wekiwa Springs State Park	167	50	Completed
Wekiva River	Seminole County	Wekiva Springs Rd. Hunt Club to Fox Valley	53	9	Completed
Wekiva River	Seminole County	West Wekiva Trail Treatment Pond	113	74	Planned – Not Funded
Wekiva River	Turnpike Authority	Widen Turnpike, Beulah to State Road 50	95% removal	-	Under Construction
Wekiva River	Turnpike Authority	Widen Turnpike, Gotha to Beulah	86% Removal	-	Completed

Total TN Load Reduction (lbs/yr) = 32,144.44
Total TP Load Reduction (lbs/yr) = 11,781

4.2.4 Stormwater Treatment Associated with Road-Paving Projects

A special category of stormwater treatment project that the WBWG included in the BMAP project list is road paving. Since 2000, the jurisdictions in the Wekiva BMAP planning area have paved a significant number of roadways. For jurisdictions that added stormwater treatment (*e.g.*, swales with ditch blocks) along with the road-paving efforts, the WBWG accepted projects and nutrient load reduction estimates. **Table 4.7** summarizes those projects. All projects of this type are listed in **Table 4.7**.

Table 4.7. Estimated Nutrient Load Reductions From Stormwater Treatment (Associated with Road-Paving Projects) in the Wekiva BMAP Planning Area
(This table includes load reduction estimates for 100% of these projects. All projects are complete.)

- = Empty cell/no data

Subbasin	County	Project Name	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)
Blackwater Creek	Lake County	Dirt Roadway Paving with Ditch Blocks	223	122
Little Wekiva Canal	Orange County	11th Ave.	3	2
Little Wekiva Canal	Orange County	13th Ave.	5	4
Little Wekiva Canal	Orange County	15th Ave.	5	2
Little Wekiva Canal	Orange County	17th Ave.	6	5
Little Wekiva Canal	Orange County	Alternative Surface Program – Group IIIA Projects (load split 50% LWC, 50% with RSR)	461	390
Little Wekiva Canal	Orange County	Alternative Surface Program – Group IIIB Projects (load split 50% LWC, 50% with RSR)	287	243
Little Wekiva Canal	Orange County	Boxwood Dr. (load split with Bull Run Rd. 50% LWC, 50% with RSR)	4	4
Little Wekiva Canal	Orange County	Lake Pleasant Rd. Improvement	1	1
Little Wekiva Canal	Orange County	Quenton Ave. and Range Dr.	3	2
Little Wekiva Canal	Orange County	Ridge Terrace and Roan Rd.	9	8
Little Wekiva River	Orange County	Highland St. (load split with Hereford and Holly St., 33% LWR, 67% RSR)	4	4
Rock Springs Run	Orange County	Alternative Surface Program – Group IIIA Projects (load split 50% LWC, 50% with RSR)	461	390
Rock Springs Run	Orange County	Alternative Surface Program – Group IIIB Projects (load split 50% LWC, 50% with RSR)	287	243
Rock Springs Run	Orange County	Bull Run Rd. (load split with Boxwood 50% LWC, 50% with RSR)	4	4
Rock Springs Run	Orange County	Hereford Rd. and Holly St. (load split with Highland 33% LWR, 67% RSR)	9	8
Rock Springs Run	Orange County	New Hampshire	6	5
Rock Springs Run	Orange County	Sadler Rd.	10	9
Wekiva River	Seminole County	Palm Springs Rd. Paving and Drainage	1	0
Wekiva River	Seminole County	Wekiva Springs Rd. – State Road 434 to Sabal Point	16	3

Total TN Load Reduction (lbs/yr) = 1,805
Total TP Load Reduction (lbs/yr) = 1,449

4.3 Agricultural BMPs

BMPs are individual or combined practices determined through research, field testing, and expert review to be the most effective and practicable means for improving water quality, taking into account economic and technological considerations.

FDACS BMPs fall into two categories: structural and management. Structural BMPs involve the installation of structures or changes to the land, usually are more costly, and often require cost-share to be economically feasible. These BMPs include water control structures, fencing, and tailwater recovery systems. Management BMPs, such as nutrient and irrigation management, comprise the majority of practices and often are not readily observable.

Nutrient management addresses fertilizer type, amount, placement, and application timing, and includes practices such as soil and tissue testing to determine crop nutrient needs, application methods, and setbacks from water resources. Irrigation management is the maintenance, scheduling, and overall efficiency rating of irrigation systems. In several areas of the state, FDACS-funded Mobile Irrigation Labs (MILs) identify and demonstrate irrigation efficiency techniques to producers. The implementation of these recommendations results in billions of gallons of water saved throughout the state and helps reduce nutrient runoff and leaching.

The section below identifies the key structural and management BMPs that likely would be applicable to agricultural operations in the basin. By definition, BMPs are technically and economically feasible. However, FDACS BMP manuals contain some practices that may only be affordable with financial assistance. The BMP checklists allow producers to indicate whether a practice is not economically feasible, on a case-by-case basis. As cost-share becomes available, FDACS will work with producers in the basin to implement applicable key BMPs that otherwise are not affordable.

FDACS Office of Agricultural Water Policy (OAWP) BMPs and staff contact information are available online. Printed BMP manuals can be obtained from local county agricultural extension centers, or by contacting OAWP field staff.

4.3.1 Agricultural Producers' Responsibilities under the FWRA

Paragraph 403.067(7)(b), F.S., requires that nonpoint pollutant sources (such as agriculture) included in a BMAP demonstrate compliance with pollutant reductions needed to meet a TMDL, either by implementing appropriate BMPs (adopted by FDACS or the department, as applicable), or conducting water quality monitoring prescribed by the department or the applicable water management district. If these pollutant sources do not either implement BMPs or conduct monitoring, they may be subject to enforcement actions by the department or the water management district as described in statute.

Under Paragraph 403.067(7)(c), F.S., the implementation of FDACS-adopted, department-verified BMPs in accordance with FDACS rule provides a presumption of compliance with state water quality standards. In addition, growers who implement BMPs may be eligible for cost-share from FDACS, the water management district, or others. Through the OAWP, the Florida Forest Service, and Division of Aquaculture, FDACS develops, adopts, and assists producers in implementing agricultural BMPs to improve water quality and water conservation.

4.3.2 FDACS OAWP Role in BMP Implementation and Follow-Up

4.3.2.1 BMP Implementation

Through field staff and contracted service providers, OAWP works with producers to submit Notices of Intent (NOIs) to implement the BMPs appropriate for their operations. Depending on the region of the state, these providers include the soil and water conservation districts, UF–IFAS, and resource conservation and development councils. They also provide technical assistance to producers and, as funding allows, help implement cost-share programs that leverage regional, state, and federal funds. The key management and structural BMPs that most likely would be applicable to agricultural operations in the basin are as follows:

- Determining Nutrient Needs:
  - **Soil and Tissue Testing**: Used to base fertilizer applications on plant needs and available nutrients in the soil; helps prevent the over application of fertilizer.
  - **Nutrient Budgeting**: Adjustment of fertilizer regime to account for other nutrient sources, such as biosolids, legumes, manure, and nutrient-laden irrigation water; helps prevent the over application of fertilizer.
- Managing Nutrient Application:
  - **Precision Application of Nutrients**: Use of specialized equipment for precise placement of nutrients on targeted areas at specified rates; reduces total amount used and prevents stray applications.

- **Equipment Calibration/Maintenance**: Ensures proper functioning of equipment; prevents the misapplication or over application of fertilizer materials.
- **Split Fertilizer Applications**: Multiple applications timed with optimal growth stages; allows plants to assimilate nutrients more efficiently; reduces nutrient loss in leaching and runoff.
- **Fertigation**: Application of fertilizer through irrigation water; allows for direct nutrient application to the crop root zone and more efficient assimilation by plants, reducing nutrient loss in leaching and runoff.
- **Controlled-Release Fertilizer**: Use of fertilizer formulations that have a controlled nutrient release curve; reduces nutrient loss to leaching and runoff.
- **Fertilizer Application Setbacks from Waterbodies (wetlands, watercourses, sinks, springs, *etc.*)**: Establishes a zone where no fertilizer will be applied; reduces nutrient loadings to waterbodies.

— Managing Irrigation:

- **Irrigation Scheduling**: Planning when to irrigate to reduce water and nutrient losses, based on available soil moisture content, evapotranspiration levels, recent rainfall, and time of day.
- **Monitoring Soil Moisture and Water Table**: Use of devices that measure the water table level and the amount of water in the soil; is a key component of proper irrigation scheduling.
- **Tailwater Recovery**: Use of downgradient catchment ponds to trap irrigation tailwater to be reused on cropland; reduces offsite transport of nutrients and conserves water.
- **Water Control Structures**: To slow and/or direct the flow of stormwater
- **Retention/Detention Ponds**: To capture and filter or otherwise treat stormwater onsite.
- **Filter Strips**: Vegetated strips of land designed to reduce nutrients and sediments in surface water runoff from fields, pastures, and livestock high-intensity areas before it reaches downstream waterbodies.
- **Vegetative Buffers**: Establishment of riparian and/or wetland buffers to attenuate and assimilate nutrient- or sediment-laden surface flows coming from cropped/grazed areas.

- **Ditch Maintenance and Retrofits**: Use of rip-rap, sediment traps, staging structures, and permanent vegetative bank cover to minimize the erosion and transport of nutrient-laden sediments.

— Livestock Management (applicable to cow/calf and equine operations):

- **Alternative Water Sources**: Use of upland livestock watering ponds and/or water troughs; minimizes manure deposition in waterbodies.
- **Rotational Grazing**: Movement of cattle to different grazing areas on a planned basis; prevents concentrated waste accumulations and denuding of pasture areas. May involve fencing.
- **High-Intensity Areas Location**: Siting of cowpens, supplemental feed areas, *etc.*, away from waterbodies to minimize nutrient loadings.

— Operations Management:

- **Fertilizer Storage**: Proper location/storage of bulk fertilizer products to prevent nutrient loadings.
- **Fertilizer Mix/Load**: Use of appropriate dedicated or temporary mix/load areas located away from waterbodies to prevent nutrient loading.
- **Employee Training**: Training provided to farm workers on how to implement BMPs.
- **Record Keeping**: Proper record keeping provides accountability in the implementation of BMPs and assists the producer in making nutrient and irrigation management decisions.

The OAWP will assist producers in the Wekiva BMAP planning area in enrolling in adopted BMP programs applicable to their operations. OAWP staff and contractors will identify existing growers, to the greatest extent possible, with the help of grower associations, information on county agricultural exemptions, field staff knowledge, and other means. Staff/contractors will assist producers in selecting the appropriate BMPs, with emphasis on nutrient management, irrigation management, sediment/erosion control, stormwater management, and record keeping.

4.3.2.2 Follow-Up and Reporting on BMP Enrollment and Implementation

The OAWP works with producers to submit NOIs to implement the BMPs applicable to their operations, provides technical assistance to growers, and distributes cost-share, as available, to eligible producers for selected practices. The OAWP follows up with growers through written surveys and site visits, to evaluate the level of BMP implementation and record keeping, identify areas for improvement, if any, and discuss cost-share opportunities, among other things.

When the department adopts a BMAP that includes agriculture, it is the agricultural producer's responsibility to implement BMPs adopted by FDACS to help achieve load reductions. If land use acreage corrections and BMP implementation do not fully account for the current agricultural load reduction allocation, it may be necessary to develop and implement cost-assisted field- and/or regional-level treatment options that remove nutrients from farms and other nonpoint sources. In that case, FDACS will work with the department and the SJRWMD to identify appropriate options for achieving further agricultural load reductions.

The FWRA requires that, where water quality problems are demonstrated despite the proper implementation of adopted agricultural BMPs, FDACS must reevaluate the practices, in consultation with the department, and modify them if necessary. Continuing water quality problems will be detected through the BMAP monitoring component and other departmental and SJRWMD activities. If a reevaluation of the BMPs is needed, FDACS will also include the SJRWMD and other partners in the process.

OAWP Implementation Assurance Program

The OAWP formally established its Implementation Assurance (IA) Program in 2005 in the Suwannee River Basin as part of the multi-agency/local stakeholder Suwannee River Partnership. In 2007, OAWP initiated the IA Program in the Lake Okeechobee Watershed and launched a standardized follow-up program for the remaining areas of the state in 2013, beginning with the Ridge Citrus and Indian River Citrus BMPs. Because of program-specific needs, the followup process for each of these three components was different. In early 2014, the OAWP began to streamline the IA Program to ensure consistency statewide and across commodities and BMP manuals. This effort resulted in a single IA site-visit form, which is currently used by OAWP staff.

The current IA Program consists of two key components—mail-out surveys and site visits. Mail-out surveys are developed by OAWP staff, in conjunction with commodity experts. This component of the IA Program was borne out of the recognition that OAWP staff resources are limited; therefore, visits to each of the enrolled producers across the state were not possible within a short/contemporary time frame. All enrolled producers are mailed these surveys and are asked to fill out the surveys and return them to OAWP staff.

Site visits, the second component, are conducted by OAWP field staff and technicians as workload allows. For the visits, field staff and technicians use a standard form (non-commodity or BMP-manual specific) that was developed in 2014. This site-visit form focuses on nutrient management, irrigation management, and water resource protection BMPs common to all of the adopted BMP manuals. The paper forms are submitted to OAWP staff and compiled into a spreadsheet, and the data are reported annually in reports such as this one. From 2007 to 2014, OAWP conducted over 1,200 site visits. However, it is difficult to compare data collected prior to the implementation of the single IA site-visit form developed in 2014 because of regional differences (*e.g.*, different forms and information asked) in the administration of the IA Program.

In late 2014, the OAWP commenced efforts to revise and restructure its current IA Program, and these efforts are ongoing. The OAWP expects to increase its site visits in the future. Through this program, FDACS will gain feedback on key BMPs, such as fertilization rates, to determine whether the current estimates for farm fertilizer and livestock waste in this BMAP are accurate or should be refined.

4.3.2.3 Department and SJRWMD Roles in BMP Implementation

The FWRA states that nonpoint source dischargers who fail either to implement the appropriate BMPs or conduct water quality monitoring prescribed by the department or a water management district may be subject to enforcement action by either of those agencies.

4.3.2.4 BMP Current Enrollment, Enrollment Goals, and Load Reduction Estimates

BMP Enrollment Goals. **Table 4.8** summarizes the agricultural acreage based on 2009 land use information from the SJRWMD, the FDACS-adjusted acreage, the BMP manual associated with the land use, the acreage enrolled as of June 30, 2015, and the number of NOIs/Certifications for each FDACS BMP Program. **Figure 4.2** shows the location of enrolled agricultural acreage across the entire Wekiva BMAP planning area.

Table 4.8. Agricultural Acreage, BMP Enrollment, and Future Enrollment Goals for the Wekiva BMAP Planning Area

\- = Empty cell/no data
N/A = Not applicable
TBD = To be determined
* FDACS staff-adjusted acreage for purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.
** Most of these horse farms likely are not commercial agriculture, and loading will be addressed through department-developed BMPs.
*** FDACS staff have observed no active commercial poultry operations in the BMAP area but will be confirming this. The land use appears to include mostly misidentified nursery operations, and any actual poultry operations appear to be small, backyard farms, according to the 2007 *Florida Agricultural Statistics Survey*.

2009 SJRWMD Land Use	2009 Acres	FDACS-Adjusted Acres for Enrollment*	Related FDACS BMP Programs	Acreage Enrolled	Related NOIs/ Certification
Pasture	28,201.6	28,201.6	Cow/Calf Future (hay)	2,419.7	5
Row/Field/Mixed Crops	5,181.4	5,181.4	Vegetable/Agronomic Crops	1,139.6	5
Fallow Cropland	77.5	N/A	No enrollment needed	N/A	N/A
Horse Farm	3,437.1	3,437.1**	Equine	139.0	1
Citrus	4,191.4	3,457.7	Citrus	978.4	45
Abandoned Citrus	129.9	N/A	No enrollment needed	N/A	N/A
Tree Crops	160.6	160.6	Specialty Fruit and Nut	159.9	8
Tree Nurseries	156.8	156.8	Nursery	3,199.1	228
Nurseries and Vineyards	97.9	-	Nursery	(Nursery, see above)	(Nursery, see above)
Ornamentals	5,072.4	5,072.4	Nursery	(Nursery, see above)	(Nursery, see above)
Floriculture Shade Ferns Hammock Ferns	15.3 346.6 87.6	449.6	Nursery	(Nursery, see above)	(Nursery, see above)
Sod Farms	577.3	577.3	Sod	565.0	2
Specialty Farms Dairies Poultry Feeding***	174.7 7.2 90.0	271.9	Conservation Plan Rule	0.0	N/A
Other Open Lands – Rural	109.6	N/A	No enrollment needed	N/A	N/A
Aquaculture	37.1	37.1	(FDACS Aquaculture Division)	-	-
Total	**48,152.1**	**47,101.5**	**-**	**8,600.8**	**294**

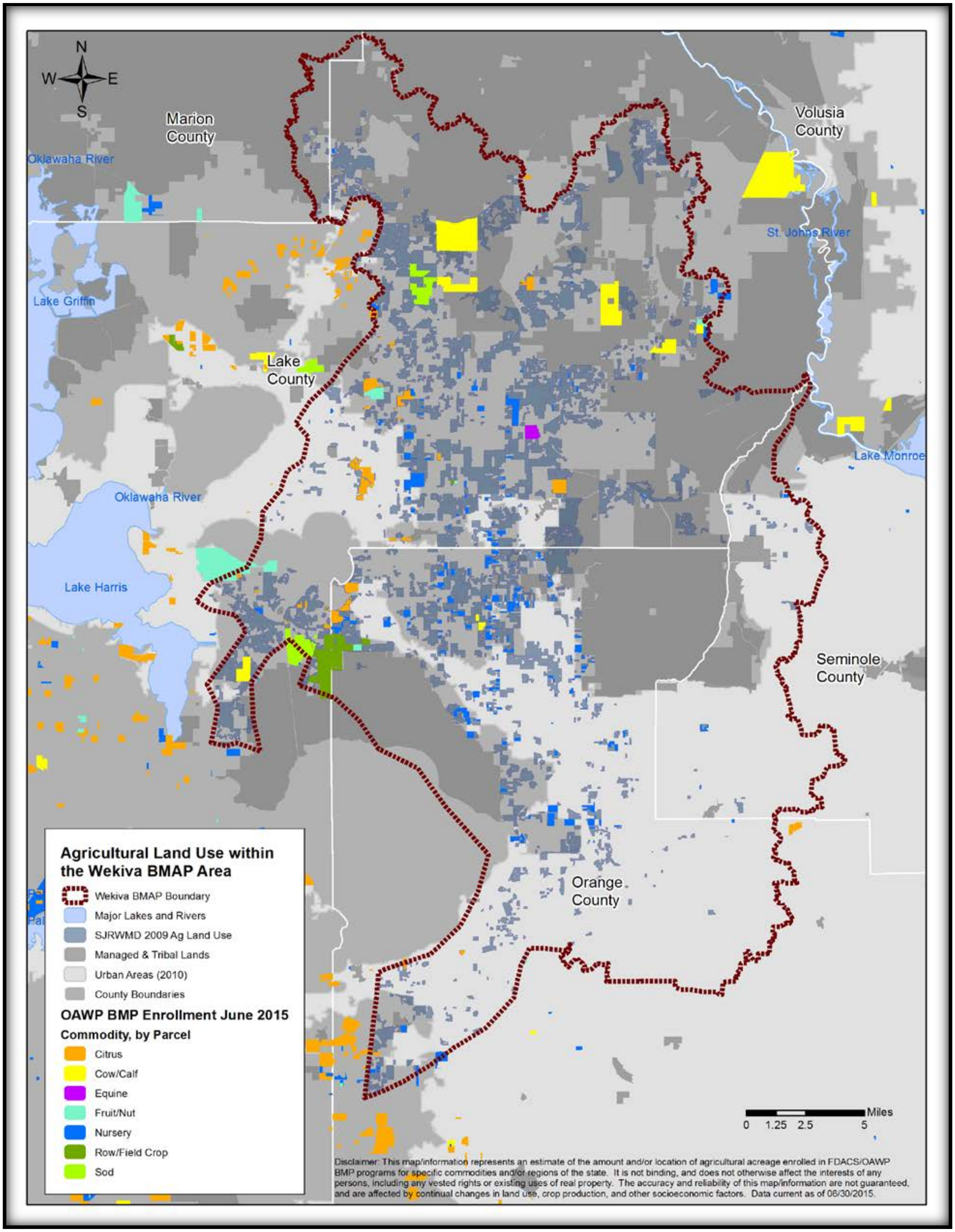

FIGURE 4.2. ENROLLED AGRICULTURAL ACREAGE FOR THE IMPLEMENTATION OF BMPS IN THE WEKIVA BMAP PLANNING AREA (ENROLLED ACRES AS OF JUNE 30, 2015)

The acreage used to calculate the starting point agricultural nutrient load is based on 2009 land use information from the SJRWMD. Based on aerial imagery and local staff observations, FDACS adjusted these figures to reflect more accurately the current agricultural land use acreage. The FDACS-adjusted acreage shows approximately 2% less total acreage than indicated in the 2009 acreage figures, due primarily to citrus freeze/disease issues.

As of June 30, 2015, approximately 294 producers in the Wekiva Basin had submitted NOIs covering about 8,601 acres to implement FDACS-adopted BMPs. This represents five cow/calf operations, five row/field crop operations, 45 citrus groves, eight specialty fruit/nut orchards, two sod farms, and 228 container nurseries. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time. The currently enrolled acres represent approximately 18% of the agricultural acres in the basin. FDACS BMP manuals relevant to this region have not been available for the entire period of record for the basin, and enrollment efforts for the most recent manuals (equine, statewide citrus) are still in the early stages.

The federal Clean Water Act defines aquaculture facilities as point sources. Under the authority delegated to the state of Florida by the EPA to implement the Clean Water Act, the department annually certifies and inspects aquaculture facilities for compliance with Chapter 597, F.S. In addition to the 239 producers who have submitted NOIs for the FDACS BMAP Program, there are currently 15 aquaculture facilities located in the Wekiva River Basin. These facilities possess the Aquaculture Certificate of Registration and are in compliance with department-promulgated, environmentally oriented BMPs. Aquaculture facilities that implement BMPs are presumed to be in compliance with state ground water and surface water standards.

Priority Enrollment Area – Phase 1 BMAP Goals. During the first phase of the BMAP, FDACS field staff and contractors will focus their efforts on the region depicted within the rectangle in **Figure 4.3**, which encompasses seven springs, including Rock Springs and Wekiwa Springs, and a significant portion of the areas identified as "more vulnerable" in the WAVA model, as documented in **Chapter 1** of the BMAP. **Table 4.9** presents the land use based on the 2009 SJRWMD land use/cover code, the acres in the priority area, and the currently enrolled acres within each land use category. The agricultural acres in the priority area include approximately 32 percent of the total agricultural acres in the Wekiva Basin and the FDACS goal is to achieve at least 80% enrollment in this area.. This focused approach will allow

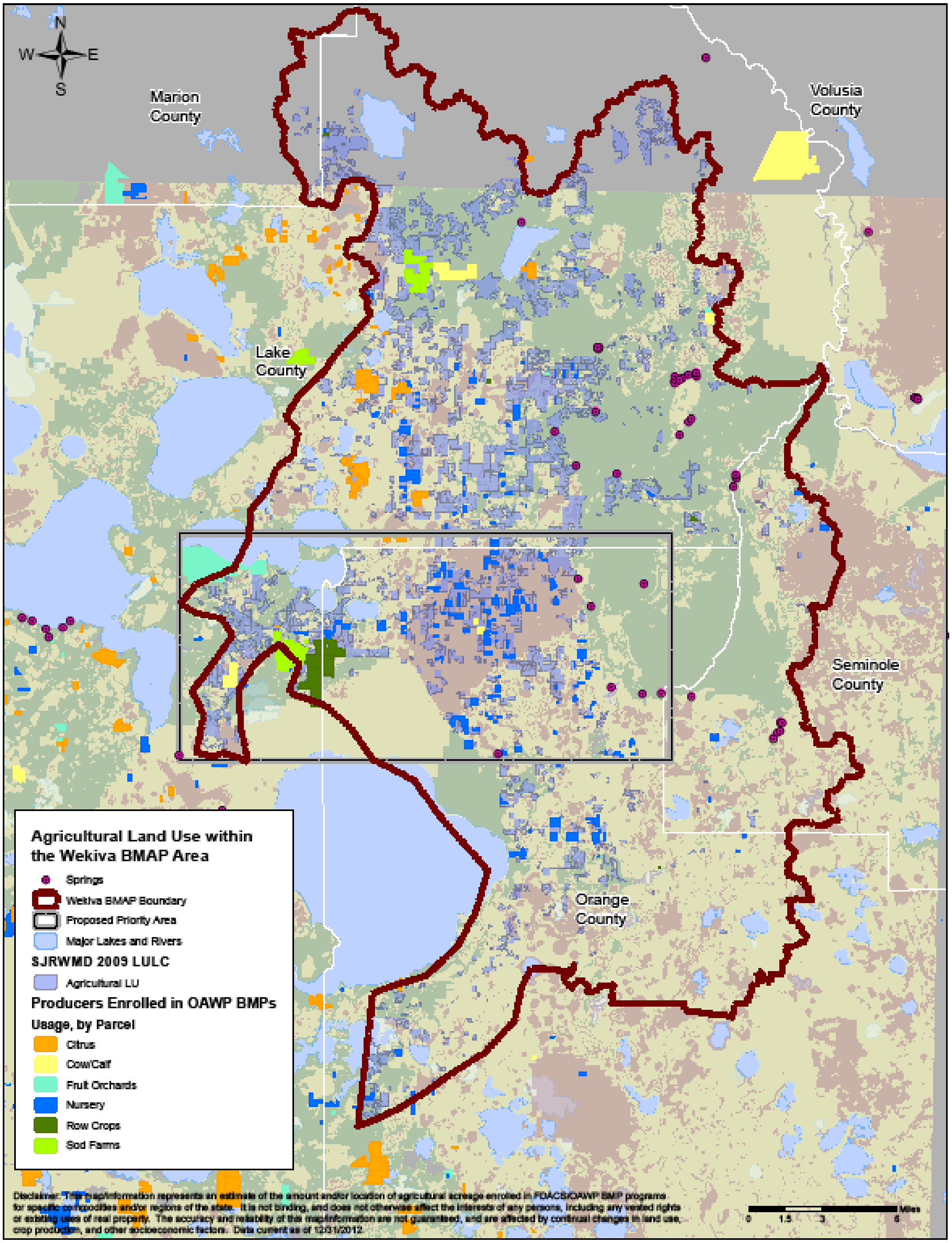

FIGURE 4.3. PRIORITY AREA FOR BMP IMPLEMENTATION PHASE 1 OF THE WEKIVA BMAP (FDACS' GOAL IS 80 PERCENT ENROLLMENT IN THE PRIORITY AREA; THIS AREA REPRESENTS 32 PERCENT OF THE WEKIVA BMAP PLANNING AREA)

TABLE 4.9. SJRWMD 2009 AGRICULTURAL LAND USE/LAND COVER CODE, BMP ENROLLMENT, AND ENROLLMENT GOAL IN THE AGRICULTURAL BMP WEKIVA PRIORITY AREA (ENROLLED ACRES IN THE PRIORITY AREA AS OF JUNE 30, 2015)

\- = Empty cell/no data
[1] Land use acres do not reflect sod farm acreage accurately, as it may be misidentified as pasture.

LAND USE/ LAND COVER CODE	DESCRIPTION	ACRES IN PRIORITY ENROLLMENT AREA	ENROLLED ACRES
2110	Improved Pasture	4,993.62	226.1
2120	Unimproved Pastures	855.89	Includes 2110 and 2130
2130	Woodland Pastures	1,703.32	Includes 2120 and 2130
2140	Row Crops	1,032.72	1,151.9
2150	Field Crops	1,437.31	Included in 2140
2200	Tree Crops	23.86	87.1
2210	Citrus Groves	1,582.29	337.3
2240	Abandoned Tree Crops	67.39	-
2320	Poultry Feeding Operations	16.45	-
2400	Nurseries and Vineyards	10.78	-
2410	Tree Nurseries	61.95	-
2420	Sod Farms[1]	155.06	325.00
2430	Ornamentals	2,808.58	1,427.9
2431	Shade Ferns	74.29	-
2500	Specialty Farms	58.92	-
2510	Horse Farms	726.42	-
-	**TOTAL ACRES**	**15,608.85**	**3,555.3**
-	**FIVE-YEAR ENROLLMENT GOAL (80%)**	**-**	**12,487.08**
-	**REMAINING ACRES TO ENROLL**	**-**	**8,931.78**

limited staff resources to be used to concentrate enrollment and implementation assurance efforts in a more sensitive area of the basin, a portion of which also overlaps with the Upper Ocklawaha River BMAP area. This priority area for FDACS outreach efforts does not preclude the obligation of all commercial growers in the entire BMAP area to either implement agricultural BMPs adopted by FDACS or coordinate with the department in monitoring water quality at their own expense to show compliance with state water quality standards.

Table 4.9 shows 2009 land use, current BMP enrollment, and the five-year enrollment goal for the identified priority area. Approximately 28 percent of the agricultural acres in the priority area are currently enrolled. **Figure 4.3** shows the area of enrolled agricultural acreage for the implementation of BMPs in the Wekiva BMAP planning area.

Acreage Not Appropriate for Enrollment in FDACS BMPs. It is important to understand that, even if all targeted agricultural operations are enrolled, not all of the acreage listed as agriculture will be included in enrollment figures. The NOIs will document the estimated total number of acres on which applicable BMPs are implemented, not the entire parcel acreage. This is because land use data can contain nonproduction acres (such as buildings, parking lots, and fallow acres). This acreage is counted on the NOIs submitted to FDACS but will not be considered for enrollment credit by the department.

In addition, FDACS BMPs are not targeted toward noncommercial agricultural activities, such as equine ranchettes, that would be addressed more appropriately by local government or department regulations or BMPs. Equine ranchettes, in particular, may have issues such as manure storage and disposal and denuded areas, but may not have the acreage to resolve these issues. A joint effort between local government, the department, and UF–IFAS may be needed to address these more urban operations.

The department, in collaboration with FDACS and UF–IFAS, developed and finalized the "Small Scale Horse Operations: Best Management Practices for Water Resource Protection in Florida" manual in 2013. This manual is intended for use by horse and pony owners who do not typically operate as a business and are characterized as "noncommercial."

There also may be significant amounts of acreage that do not need to be enrolled, such as lands that are not actively involved in commercial agriculture (operations conducted as a business). These areas are often low-density residential uses on large parcels of grassed land, or land that was but is no longer in commercial agricultural production. This information frequently is impossible difficult to discern in the photo interpretation process used to generate land use data. Local governmental or departmental BMPs, such as the equine manual listed above, may address these noncommercial sources.

4.3.2.5 Agricultural Load, Load Reduction Allocation, and BMP Load Reduction Estimates

Agriculture is included in the load reduction percentages for the nonpoint source allocations contained in the TMDLs for the basin. An estimated load for agriculture was derived in order to be able to calculate an average load reduction resulting from the implementation of agricultural BMPs. Due to inaccuracies in the 2009 land use data and to changes in land use since 2004, agricultural loadings may be less than originally estimated.

The estimated average load reduction for agriculture in the basin is based on a range of percentages used for the Lake Jesup Basin, which has similar soil types. These estimates represent the relative amount of phosphorus and nitrogen reductions expected from "typical" agricultural BMP implementation, which includes nutrient management, stormwater retention, limited wetland retention/restoration, and rotational livestock grazing practices, as applicable to the commodity and operation.[3] **Table 4.10** summarizes the estimated load reduction associated with the implementation of agricultural BMPs.

More precise information will be incorporated into the next iteration of the BMAP. If the department plans to develop an estimate of agricultural loadings in the future, the refinement of a basin- and commodity-specific agricultural loading/reduction model should be considered.

TABLE 4.10. LOAD REDUCTION ESTIMATES FOR THE IMPLEMENTATION OF AGRICULTURAL BMPS IN THE WEKIVA BMAP PRIORITY AREA
(CURRENTLY ENROLLED ACRES AND 80% ENROLLMENT WITHIN THE PRIORITY AREA DURING PHASE I)

[1] Additional acres outside the priority area may be enrolled, potentially resulting in higher reductions.
Note: The estimated load reductions are based on an estimated total baseline load calculated using land use loading rates associated with 2009 SJRWMD agricultural land uses and the total FDACS-adjusted agricultural acres adjusted for enrollment (**43,566.40** acres) as presented in **Table 4.13**. Not all agricultural land use acres will be considered production acres and eligible for enrollment.

ESTIMATED LOADS AND REDUCTIONS	TN (LBS/YR)	TP (LBS/YR)
Current estimated load reduction within the basin outside the BMP priority area (based on 2,415 enrolled acres)	1,457	854
Current estimated load reduction within the BMP priority area (based on 4,405 enrolled acres)	2,671	1,566
Five-year projected load reduction for additional enrolled acreage within the BMP priority area (based on 8,082 additional acres – 80% total enrollment)	4,887	2,865
TOTAL ESTIMATED LOAD REDUCTIONS FOR THE BMAP (PHASE 1)[1]	**9,015**	**5,285**

4.3.2.6 Beyond Agricultural BMPs

Under the FWRA, when the department adopts a BMAP that includes agriculture, it is the agricultural producer's responsibility to implement BMPs adopted by FDACS and verified as effective by the department in helping to achieve load reductions. If further agricultural load reductions are required to help meet the basin goals, it may be necessary to develop and implement cost-assisted field- and/or regional-level treatment options that remove nutrients from farm discharges. In that case, FDACS will work with the department and the SJRWMD to identify appropriate options for achieving additional agricultural load reductions.

[3] Based on modeling work conducted by Bottcher (2008).

4.4 Other Nutrient Load Reduction Activities

WBWG member organizations have also included projects and management actions that address other nonpoint sources in the Wekiva Basin. The following two sections detail projects and management actions and estimated load reductions for the following:

- Bank and shoreline stabilization, erosion protection, and grade control.
- Land preservation and conservation.
- Exotic vegetation removal.
- Wetland rehabilitation/restoration.

Table 4.11 summarizes the efforts under way by nine WBWG member organizations for 35 projects representing an investment of $115 million (based on cost estimates for 37 percent of the projects); more than 95% of the projects have been completed.

Table 4.11. Summary of Additional Projects and Management Actions in the Wekiva BMAP Planning Area

Noncollection System Projects	Blackwater Creek	Little Wekiva River	Rock Springs Run	Wekiva River	Springshed	Total Projects
Bank Stabilization, Erosion Protection, Grade Control, Shoreline Stabilization (**Table 4.13** and **Appendix B**)	-	Altamonte Springs (2) Orange County (7) Seminole County (5)	-	Seminole County (1)	-	15
Exotic Vegetation Removal (**Appendix B**)	-	Seminole County (5)	-	-	-	5
Land Preservation and Conservation (**Table 4.14** and **Appendix B**)	Lake County (1)	-	Orange County (3)	Altamonte Springs (1) department (1) Seminole (2) Combined effort (department, SJRWMD, OOCEA, Lake County, Orange County) (1)	Lake County (3) Winter Garden (1)	13
Wetland Rehabilitation/ Restoration (**Appendix B**)	-	-	-	Altamonte Springs (1)	Mount Dora (1)	2
Total Other Nonpoint Source Projects	**1 project**	**19 projects**	**3 projects**	**7 projects**	**5 projects**	**35 Projects**

4.4.1 Stabilization, Restoration, and Exotic Vegetation Removal

While not a land-based source considered as a part of TMDL development, several types of projects and management actions by WBWG member organizations are implemented directly within the river system. Extensive work has been done on shoreline and bank stabilization, erosion protection, stream restoration, and the removal of exotic vegetation. These projects and management actions are included in the BMAP as significant efforts to improve the overall health of the river system and its restoration capacity. **Table 4.12** presents these types of projects for which a nutrient load reduction estimate could be provided. **Appendix B** lists additional projects.

In addition, there were several projects where associated nutrient load reductions could not be quantified, including the following:

- Riverside Acres pipe arch erosion protection by Orange County.
- Wetlands restoration on Lake John (Mount Dora) and at the Wekiva GeoPark (Altamonte Springs).
- Exotic vegetation removal on Lake Mobile, Mirror Lake, Spring Lake, and the Little Wekiva River at Spring Landing.

4.4.2 Conservation and Parklands

The Wekiva BMAP planning area has the benefit of extensive protected lands owned and/or operated by the state (*e.g.*, Wekiva River Aquatic Preserve, Wekiwa Springs State Park, Rock Springs Run State Reserve, Lake Norris Conservation Area) and local jurisdictions and authorities (*e.g.*, Kelly Park, Bear Track Preserve, Lake Tracy Preserve). These conservation lands protect the water quality of tens of thousands of acres in the Wekiva BMAP planning area.

In addition, the BMAP includes as land preservation projects more than 5,100 acres of additional land purchases by state agencies and localities since 2000. Some acquisitions protected natural lands from development, while others converted agricultural lands to conservation for habitat protection, water quality protection, and passive recreation. At this time, nutrient load reduction estimates are only available for the Orange County projects (103 lbs/yr TN and 20 lbs/yr TP) and the city of Winter Garden project (1,989 lbs/yr TN). These projects focused on converting agricultural lands to conservation uses, reducing the nutrient load attributable to surface runoff from the area previously used for agricultural production.

Table 4.13 lists the land preservation projects included in the BMAP, the owner/operator, the acreage, and the management focus for the land (**Appendix B** contains details).

TABLE 4.12. ESTIMATED NUTRIENT LOAD REDUCTIONS ASSOCIATED WITH SHORELINE STABILIZATION AND EROSION CONTROL PROJECTS IN THE WEKIVA BMAP PLANNING AREA
(THIS TABLE PRESENTS 89 PERCENT OF THE PROJECTS [ONLY THOSE WITH ESTIMATED LOAD REDUCTIONS]; THEREFORE IT UNDERSTATES THE TOTAL LOAD REDUCTIONS IN THE BASIN FOR THESE TYPES OF PROJECTS. ADDITIONAL PROJECTS ARE INCLUDED IN APPENDIX B.)

- = Empty cell/no data

SUBBASIN	ENTITY	PROJECT NAME	TN LOAD REDUCTION (LBS/YR)	TP LOAD REDUCTION (LBS/YR)
Little Wekiva River	Altamonte Springs	Little Wekiva River Erosion Management Project (1, 2, and 3)	163	17
Little Wekiva River	Altamonte Springs	Riverbend Apartments Shoreline Stabilization	71	8
Little Wekiva River	Orange County	Elba Way	155	35
Little Wekiva River	Orange County	Gutsy Lane	35	8
Little Wekiva River	Orange County	Little Wekiva Slope Stabilization West/East Banks	214	49
Little Wekiva River	Orange County	Natural Resources Conservation Service (NRCS) Riverside Acres	47	11
Little Wekiva River	Orange County	NRCS Riverside Park Ave.	25	6
Little Wekiva River	Orange County	Riverside Park Rd.	165	38
Little Wekiva River	Orange County	Sherry Dr.	65	15
Little Wekiva River	Seminole County	Grade Control Structures 6 and 7	174	18
Little Wekiva River	Seminole County	Horse Lovers Lane Erosion Control Project	113	12
Little Wekiva River	Seminole County	Little Wekiva Grade Control – Montgomery Rd. to State Road 434	298	31
Little Wekiva River	Seminole County	North Western Erosion Control Project	32	3
Little Wekiva River	Seminole County	Weathersfield Erosion Control Project	28	3
Wekiva River	Seminole County	Sweetwater Cove Dredging and Drainage Improvements and Sweetwater Tributary Erosion Project	2,609	68
Wekiva River	Seminole County	Wekiva Park Dr. Erosion Control Project	36	4

Total TN Load Reduction (lbs/yr) = 4,230
Total TP Load Reduction (lbs/yr) = 326

Table 4.13. Land Preservation Projects in the Wekiva BMAP Planning Area

(Load reductions not available for all projects; total available estimated load reductions of TN = 2,092 lbs/yr, TP = 20 lbs/yr. All projects listed have been purchased.)

- = Empty cell/no data

Entity	Name	Location	Type of Land	Acres
Altamonte Springs	Stimmell Tract Land Preservation (Audubon Society)	Little Wekiva River	Land purchase for conservation	268
Department, SJRWMD, OOCEA, Lake and Orange Counties	Neighborhood Lakes	Lake Lerla, Wekiva River, Rock Springs Run	Previous land use = agriculture; management focus = water resource, passive recreation	1,584
Department	Pine Plantation	Wekiva River	Previous land use = agriculture; management focus = ground water recharge resource, natural community restoration and preservation	345
Lake County	Mount Plymouth Lakes	Springshed	Lake bottom	184
Lake County	Northeast Lake County Scrub Preserve	Surface watershed	Mature sand pine scrub community with wetlands in southeast; adjacent to Seminole State Forest	60
Lake County	Lake May Reserve	Springshed	136 acres of remnant citrus, xeric oak hammock, and 20-acre Lake May	136
Lake County	South Pine Lakes Reserve	Springshed	Two adjoining properties consisting of scrub, scrubby flatwoods, herbaceous marsh; bear habitat, possible sandhill crane nesting	128
Orange County	Sandhill Preserve	Wekiva River	Previous land use = agriculture; management focus = water resource, sandhill	83
Orange County	Lake Lucie Conservation Area	Wekiva River	Previous land use = agriculture; management focus = scrub habitat and water resource, passive recreation	166
Orange County	Pine Plantation	Wekiva River	Previous land use = agriculture; management focus = passive recreation, preservation	40
Seminole County	Yankee Lake Scrub Jay Preservation Area	Wekiva River	Previous land use = natural land; Management focus = preservation, passive recreation	300
Seminole County	Black Bear Wilderness Area	Wekiva River	Previous land use = natural land; Management focus = preservation, passive recreation	1,650
Winter Garden	Tucker Ranch	Springshed	Previous land use = agricultural; management focus = primitive campground/park	208

Total Acres = 5,152

One project to note is the Neighborhood Lakes Management Plan. This 1,584-acre property in Lake and Orange Counties was a joint acquisition by Lake County, Orange County, the department, the SJRWMD, and the OOCEA. Approximately 201 acres will be managed by the Lake County Parks and Trails Division, and the Florida Park Service will manage the remaining acres as part of the Rock Springs Run State Reserve. This project serves many functions: Wekiva River Basin recharge area protection, part of the Wekiva–Ocala wildlife corridor, and habitat for rare species (*e.g.*, Florida black bear, swallow-tailed kite). The OOCEA will use about 19 percent of the land (298 acres) to build a portion of the 27-mile Wekiva Parkway.

4.4.3 Public Education and Local Ordinances and Land Development Codes

This section summarizes the efforts of WBWG members to reduce nutrient loads to the Wekiva River system through a mix of efforts, including public education, local ordinances (regulating fertilizer use and irrigation), and land development codes. **Table 4.14** summarizes the ongoing programs, ordinances, and public education efforts. Some specific efforts are also called out in this section to highlight the types of efforts under way across the basin.

One item to note that applies statewide, but is especially relevant in the Wekiva Basin, is the model ordinance for FFF use. In 2009, the Legislature passed the *Model Ordinance for Florida-Friendly Fertilizer Use on Urban Landscapes* (Section 403.9337, F.S.). All county and municipal governments within the watershed of a waterbody segment that is listed as impaired by nutrients under Section 403.067, F.S., must (at a minimum) adopt an ordinance consistent with the FFF. Additionally, Section 482.1562, F.S. (the Green Industry BMP certification program), specifies that all county and municipal staff who apply fertilizer have to be certified by January 1, 2014. These requirements are further emphasized in the NPDES MS4 Phase I permits held by nine of the WBWG members.

Public education is supported by all WBWG members across the basin in efforts to connect residents and visitors to the springs and river with firsthand experience in the extensive public parks (*e.g.*, Wekiwa Springs State Park, Rock Springs Run State Reserve, Kelly Park). In combination, direct experience and public education help people understand and appreciate the water resources in the area and encourage support for the protection of the entire Wekiva River system.

Table 4.14. Public Education, Local Ordinances, and Land Development Codes Implemented in the Wekiva BMAP Planning Area

(All municipalities discharging to impaired waters must adopt an ordinance consistent with the model FFF ordinance. Also, all municipal staff applying fertilizer must be certified. Load reductions have not been calculated for these programs.)

- = Empty cell/no data
N/A = Not applicable
PSAs = Public service announcements
FYN = Florida Yards and Neighborhoods
FOWR = Friends of the Wekiva River

WBWG Member Organizations	FYN Program	Landscaping Ordinance	Irrigation Ordinance	Pet Waste Management	PSAs, Websites, Pamphlets, *etc.*
Altamonte Springs	Yes	`-	Yes	Yes	Yes
Apopka	-	Yes	Yes	-	Yes
Astatula	-	-	Yes	-	-
Eustis	-	Yes	Yes	-	Yes
Maitland	-	Yes	Yes	Yes	Yes
Mount Dora	-	-	Yes	Yes	Yes
Oakland	-	Yes	Yes	-	Yes
Ocoee	-	Yes	Yes	-	Yes
Orlando	Yes	Yes	Yes	Yes	Yes
Tavares	-	Yes	Yes	-	Yes
Winter Garden	Yes	Yes	Yes	-	-
FDOT District 5	N/A	N/A	N/A	N/A	Yes
FOWR	-	-	-	-	Yes
Lake County	Yes	Yes	Yes	-	Yes
Orange County	Yes	Yes	Yes	Yes	Yes
Seminole County	Yes	Yes	Yes	Yes	Yes
SJRWMD	N/A	N/A	Districtwide watering restrictions	N/A	Yes

Fertilizer use is a very important topic for public education in the Wekiva Basin and is addressed in several ways. In addition to ordinances, many WBWG members have implemented public education programs (some through the FYN Program) to explain the link between landscaping activities and the waterbodies nearby. The Wekiva River "promise" (modeled after one in place in the Ichetucknee River Basin) also makes this connection by asking residents to promise to improve water quality in the Wekiva Basin by changing their own actions, such as limiting fertilizer, going native when landscaping, and reducing water consumption.

In support of knowledgeable fertilizer application, in June 2009 Dr. Erich Marzolf of the SJRWMD made a presentation to the WBWG to emphasize the value of using reclaimed water for irrigation. He characterized the use of reclaimed water as beneficial to both the environment (less pollution) and the homeowner (less fertilizer). Dr. Marzolf provided the following information in support of the public education programs implemented by the wastewater utilities on the WBWG and stressed the need to "not just move nutrients but to remove nutrients":

- Nutrient pollution in central Florida is a pervasive problem. In some areas, too much nitrogen and phosphorus from fertilizer is used, and the excess runs off into waterbodies. Using reclaimed water is a way to distribute nutrients that need to be disposed of into places that need nutrients. However, caution must be exercised when applying nutrients (through fertilizer or reclaimed water) in the recharge area for the Wekiva River.

- For areas using reclaimed water for irrigation, it is important to understand the amount of nitrogen and phosphorus that is needed for the landscape and how much is being delivered in the reclaimed water. The result may be that reclaimed water customers will probably not need to add more phosphorus and might not need to add nitrogen either, resulting in lower fertilizer costs and possibly fewer maintenance requirements and costs (*e.g.*, mowing, turf replacement).

This is one example of the many ways in which the SJRWMD provides public education on key technical issues for the general public, environmental managers, and decision makers.

The FOWR is a WBWG member but is not a local jurisdiction. It has as one of its core objectives carrying out educational activities that promote and protect the aesthetic and recreational values and the integrity of the Wekiva River system, and that work towards the restoration and continuation of the river and its tributaries. In addition to FOWR's long history of advocacy efforts for the Wekiva and its tributaries, the organization has supported public education and outreach efforts such as the following:

- Hosts canoe trips, hikes, water resources events, and other regular educational programs and field trips.

- Maintains a website.

- Holds meetings to inform members and the public on issues affecting the basin.

- Organizes the annual FOWR banquet.

- Organizes Riverfest, an event attracting several thousand participants to Wekiwa Springs State Park for education, art, music, canoe races, pontoon rides, and fun.

- Coordinates the Wekiva Audubon Society Christmas bird count.
- Hosts booths at environmental and community events.
- Assisted in producing and marketing the documentary ***Wekiva: Legacy or Loss?*** and maintains an ongoing commitment to the teachers of central Florida through the website's River Classroom with projects and resources to accompany the video.
- Sponsored and hosted the Wekiva Basin BioBlitz, which brought more than 170 scientists and naturalists to the basin to document its biodiversity for a given period.

One additional example is Lake County's efforts to implement the North Lake County Community Environmental Stewardship Program. This project, funded by a grant from the EPA, involves many types of local partners (*e.g.,* a city, a newspaper, a college, several schools, a lake management society, and private citizens). The partnership works to provide teacher workshops and educational outreach to kindergarten through 12th-grade students. Its goal is to provide exposure to environmental careers, increase the number of volunteers for water quality sampling sites, and create a community project showcase site that uses native shoreline vegetation. **Appendix B** provides details on the project.

4.5 Summary of Nutrient Loads and Estimated Nutrient Reductions

The surface water basins in the Wekiva BMAP planning area together cover nearly 300,000 acres (see **Figure 3.2**). Nutrient loads in surface runoff for nitrate and TP associated with each land use were calculated, based on 2009 land use data, SJRWMD aquifer recharge information, and the EMCs for individual land uses in the subbasins. The methodology used to estimate the nutrient load from surface water runoff as well as the load from the springs discharge was discussed in **Section 3.3**. The estimated loads for nitrate and TP surface runoff, and from spring discharge, are summarized in **Table 4.15**.

TABLE 4.15. ESTIMATED NITRATE AND TP LOADS FROM RUNOFF AND SPRING DISCHARGE IN THE WEKIVA BMAP PLANNING AREA

\- = Empty cell/no data
[1] Calculated based on Gao (2008) using the WMM and updated by R. Hicks in 2013 using SJRWMD 2009 land uses and excluding high-recharge areas.
[2] Calculated in Gao (2008) using spring discharge and concentration.

SUBBASIN	NITRATE LOAD (LBS/YR)	TP LOAD (LBS/YR)
Baseline Runoff Total	291,243	154,087
Spring Discharge[2]	511,433	78,952
Combined Baseline Runoff and Spring Discharge Load	802,676	233,039

In reviewing the estimated nitrate and TP loads from runoff and spring discharge in the Wekiva BMAP planning area (in **Table 4.15),** consider the complexity of the system and note the following:

- The loading estimates from the watershed loading model tool were developed by excluding subbasin areas that would most likely not have appreciable runoff. The remaining areas were assumed to contribute runoff. Therefore, these estimates are helpful for comparison purposes, but the tool has limitations.
- Runoff estimates also include nutrient loads from natural sources such as wetlands.
- A considerable fraction of the phosphorus load from springs is from natural sources.
- The TMDL for the Little Wekiva Canal is expressed as TN. There is no TMDL for TP for this subbasin.
- The TMDLs for the Wekiva River and Rock Springs Run (and associated contributing areas in Blackwater Creek and the Little Wekiva River) are expressed as concentrations of nitrate and TP.

It is important to present the values in **Table 4.15** in the form of loads because load reductions are most easily calculated for many projects and activities that are being implemented to achieve the TMDLs. However, the concentration-based TMDLs for the Wekiva River and Rock Springs Run do not easily translate to loads, since the methods for calculating loads to the river involve numerous assumptions. The process of nitrogen transformation (from sources on the land to a nitrate load to surface water or ground water) is a very complex process in general, and is especially so in the Wekiva BMAP planning area due to the relationship between surface water and ground water. The basic assumption made during BMAP development was that reducing the nutrient loads in the BMAP planning area should result in a reduction in nutrient concentrations measured from the springs and the surface water and ground water of the Wekiva River system.

Chapter 4 has presented a wide variety of nutrient source control and load reduction efforts by all WBWG partners. The activities documented in the BMAP represent the efforts of the WBWG partners to address water quality impairments within the Wekiva River system and its tributaries, including Wekiwa and Rock Springs and the other springs in the Wekiwa Spring Cluster springshed, since 2000. These efforts represent many approaches to water quality protection and restoration, ranging from the removal of point source domestic wastewater discharges from surface waters in the basin, to increased stormwater treatment and management, to activities within the stream system (*e.g.*, erosion control, stream bank stabilization) and within the community (*e.g.,* public education to reduce fertilizer use and promote water conservation, and landscaping and fertilizer ordinances).

Taken together the BMAP projects represent a considerable local, regional, and state investment in a multifaceted approach to water quality protection and restoration within the Wekiva River system. Cost estimates for more than 50 percent of the projects represent an investment of more than $262 million for wastewater collection system expansion and rehabilitation, stormwater management, and other nonpoint source controls. Of the more than 200 projects contained in the BMAP, 76% are completed, with the balance as ongoing efforts (*e.g.,* education, street sweeping), in design, or under construction during the five-year implementation of the BMAP.

Table 4.16 presents the estimated nutrient (TN and TP) load reductions from BMAP and WWTF or WRF projects in the Wekiva BMAP planning area. The table summarizes the individual nutrient load reduction tables presented throughout **Chapter 4** for each project category. The individual tables are referenced in **Table 4.16**. When reviewing this table, it is important to note the following:

- WBWG member organizations expressed the estimated nutrient load reductions associated with projects and management actions as TN and TP.
- The estimates provided in this table are a conservative estimate. Many projects do not have estimated nutrient load reductions at this time (*e.g.,* public education, local ordinances, some stormwater treatment projects, some collection system expansion projects); however, they were implemented with the expectation that they would reduce

nutrient loads. The "additional" projects (*i.e.*, without a load reduction estimate) represent an extra nutrient load reduction towards achieving the TMDL.

At this time, it is not possible to directly compare TMDL reduction requirements with the load reductions (from projects and management actions) to determine the percent reduction of nitrate anticipated during the first five-year phase of BMAP implementation. TN reductions cannot be directly compared with nitrate goals. However, the load reduction estimates provided in **Table 4.16** appear to indicate that the domestic WWTFs and BMAP projects will account for a significant amount of the nitrogen and phosphorus load reductions needed to meet the TMDLs.

There are technical limitations to the ability to verify load reductions and response in the Wekiva River system at this time. The response in the Wekiva system will be monitored and tracked with a water quality monitoring network of surface water, spring, and ambient ground water stations, as well as biological assessments and flow measurements. This monitoring will help measure the actual effects of these projects and others on nutrient concentrations in the Wekiva River system and nitrogen and BOD loads to the Little Wekiva Canal. Additional efforts are planned by WBWG monitoring partners to further investigate details of the interactions impacting spring water quality. Other investigations and studies will also help measure and predict the effects of projects and activities. **Chapter 5** details the monitoring plan, including future studies and research, developed by the WBWG.

TABLE 4.16. ESTIMATED NUTRIENT LOAD REDUCTIONS FROM BMAP AND WWTF/WRF PROJECTS IN THE WEKIVA BMAP PLANNING AREA

- = Empty cell/no data

PROJECT	**TN LOAD REDUCTIONS (LBS/YR)**	**TP LOAD REDUCTIONS (LBS/YR)**
Domestic WWTF and WRF Upgrades (**Tables 4.1a** and **4.1b**)	207,055	-
Wastewater Facility Collection System Projects **(Table 4.3)**	99,450	32,200
Wastewater Reuse **(Table 4.4)**	67,661	39,453
Stormwater Projects (including street sweeping) **(Table 4.6)**	32,176	11,784
Stormwater Treatment Associated with Road-Paving Projects **(Table 4.7)**	1,805	1,449
Agricultural BMPs (**Table 4.10**)	9,015	5,285
Shoreline Stabilization/Erosion Control (**Table 4.12**)	4,230	326
Land Preservation (**Table 4.13**)	2,092	20
TOTAL	**423,484**	**90,517**

CHAPTER 5: ASSESSING PROGRESS AND MAKING CHANGES

Successful BMAP implementation requires commitment and follow-up. The FWRA requires that an assessment be conducted every five years to determine whether there is reasonable progress in implementing the BMAP and achieving pollutant load reductions. **Chapter 5** presents the tools that the department will use throughout the first five-year BMAP implementation phase to assess progress in project implementation and water quality protection and restoration. This chapter contains information on a water quality monitoring component, additional studies, and an approach for tracking progress that will be sufficient to make this evaluation.

5.1 WATER QUALITY MONITORING

The Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP monitoring plan is designed to enhance the understanding of basin loads, identify areas with high nutrient concentrations, and track water quality trends across the surface water basin and springshed. To implement this plan, many of the WBWG members have coordinated monitoring locations and are sharing data. **Table 5.1** lists the monitoring plan partners for the BMAP.

TABLE 5.1. WEKIVA RIVER, ROCK SPRINGS RUN, AND LITTLE WEKIVA CANAL BMAP MONITORING PARTNERS AND TYPES OF MONITORING STATIONS

- = Empty cell/no data
X = Monitoring carried out

ENTITY	SURFACE WATER CORE STATIONS	SURFACE WATER SUPPLEMENTAL STATIONS	SPRINGS STATIONS	AMBIENT GROUND WATER STATIONS	BIOLOGICAL STATIONS	FLOW STATIONS
City of Altamonte Springs	X	X	-	-	-	-
City of Apopka	X	X	-	X	-	-
City of Maitland	X	-	-	-	-	-
City of Mount Dora	-	-	-	X	-	-
City of Orlando	X	X	-	-	-	-
City of Winter Garden	-	-	-	X	-	-
Lake County	X	X	-	X	-	-
Orange County	X	X	X	X	X	X
Seminole County	X	X	-	-	X	-
SJRWMD	X	-	X	X	X	X

The information gathered through monitoring will be used to measure progress toward achieving the TMDLs and provide a better understanding of the watershed loading. Sampling stations, parameters, frequency, and other elements of this strategy may be modified as appropriate to match changing environmental conditions and funding resources. However, any modifications made must not affect the ability of the monitoring network to fulfill the objectives listed below.

5.1.1 Objectives

Focused objectives are critical for a monitoring plan to provide the information needed to evaluate implementation success. Primary objectives are necessary to evaluate the success of the BMAP. Secondary objectives contribute to this evaluation, can help interpret data collected, and provide information for potential future refinements of the TMDL and/or BMAP. The primary and secondary objectives of the monitoring plan for the Wekiva River, Rock Springs Run, and Little Wekiva Canal Basin are as follows:

— **Primary Objective—Long-Term Trend Analysis:** Track inputs and concentration trends in nutrients (*e.g.*, nitrate, TN, and TP) through ground water, surface water, and spring sampling, as well as biological assessments and flow measurements.

— **Secondary Objective—Source Assessment:** Identify areas in the springshed and surface water basin with high loadings of nutrients to surface water and ground water to better focus management efforts.

5.1.2 Water Quality Monitoring Stations for Surface and Ground Water

A system of core stations has been developed by coordinating the monitoring programs of the WBWG monitoring partners listed in **Table 5.1**. All stations are expected to be sampled for all parameters. **Table 5.2** provides definitions for core and supplemental stations.

Table 5.2. Core and Supplemental Station Definitions

Core (Required) Stations
— All ambient **GROUND WATER** stations in the springshed of the BMAP planning area
— Selected **SURFACE WATER OR SPRING** monitoring stations in the surface watershed of the BMAP planning area monitored preferably monthly (but at least quarterly)
Supplemental Stations
— All other regularly sampled ambient **SURFACE WATER OR SPRING** monitoring stations in the surface watershed of the BMAP planning area

All other regularly sampled ambient surface water or spring monitoring stations in the surface water basin of the BMAP planning area will be considered when assessing water quality trends.

The network comprises stations that are part of existing monitoring networks for the WBWG member organizations. To support this BMAP effort, some stations have been reactivated, parameters have been expanded, and/or monitoring frequency has been increased to meet the data collection needs. The specific monitoring stations were selected as part of the network used to collect water quality data across the entire surface water basin, as well as the priority springs (discussed in **Chapter 3**) and ground water stations in the springshed, in order to assess long-term trends in nutrient inputs and concentrations. The long-term trends will be considered in light of the activities in the BMAP planning area, such as the implementation of BMAP projects and management actions (discussed in **Chapter 4**), changes in land use, and spring and surface water flows.

The water quality monitoring network is supplemented with an extensive biological monitoring network (discussed in **Section 5.1.4**) and a flow measurement network (discussed in **Section 5.1.5**) for surface water flows and discharges from the priority springs. During BMAP implementation, it may be necessary to adjust the location and distribution of specific stations.

Appendix C contains lists of the proposed monitoring station network across the basin. These lists are provided as a representation of the level of sampling and extent of spatial coverage sought by the Wekiva Basin BMAP monitoring plan. Any adjustments to the plan would be reviewed by the monitoring partners and the WBWG as appropriate. **Appendix C** lists all stations in a series of tables, as follows:

- Surface water monitoring stations (core and supplemental stations are indicated in separate tables).
- Spring monitoring stations (all stations are core stations).
- Ambient ground water monitoring stations (all stations are core stations).
- Biological monitoring stations (all stations are supplemental stations).
- Flow monitoring stations (all stations are supplemental stations).

The tables in **Appendix C** provide the following information for each type of monitoring station:

- Sampling entity.
- Station number, name, and location description.
- Latitude and longitude.
- Sample frequency.
- Sample parameters.

5.1.3 Water Quality Indicators and Resource Responses

To achieve the objectives above, the monitoring plan focuses on the following two types of indicators to track water quality trends:

- **Core indicators** (**Table 5.3a**) are directly related to the parameters causing impairment in the Wekiva River and Rock Springs Run.
- **Supplemental indicators** (**Table 5.3b**) are monitored primarily to support the interpretation of core water quality parameters.

It is anticipated that all core stations will be monitored for both core and supplemental parameters. At a minimum, the core parameters will be tracked for surface water monitoring stations to determine progress towards meeting the TMDLs. Some monitoring partners sample for additional parameters (*e.g.*, department quarterly spring monitoring includes boron and sucralose, which are helpful for identifying wastewater contributions).

Table 5.3a. Core and Supplemental Parameters for Surface Water Monitoring in the Wekiva BMAP Planning Area

- = Empty cell/no data
PCU = Platinum cobalt units; SU = Standard units; µg/L = Micrograms per liter; umho/cm = Micromohs per centimeter

Parameter Type	Name
Core	Nitrate as N (mg/L) Total Kjeldahl nitrogen (TKN) (mg/L) TN as N (mg/L) Orthophosphate as Phosphorus (P) (dissolved) (mg/L) TP (as P) (mg/L)
Supplemental	Total suspended solids (TSS) (mg/L) BOD (mg/L) Color (PCU) Chlorophyll-*a* (corrected) (µg/L) DO (mg/L) – field Temperature (° Celcius [C]) – field Specific conductance (umho/cm) – field pH (SU) – field

Table 5.3b. Core and Supplemental Indicators for Ground Water Monitoring in the Wekiva BMAP Planning Area

- = Empty cell/no data
NTU = Nephelometric turbidity units

Indicator Type	Name
Core	Nitrate as N (mg/L) Total Kjeldahl Nitrogen (TKN) (mg/L) TN as N (mg/L) TP (as P) (mg/L)
Supplemental	Total dissolved solids (TDS) (mg/L) Chloride as Cl (mg/L) Temperature (°C) - field Turbidity (NTU) - field DO (mg/L) – field Specific conductance (umho/cm) – field pH (SU) – field

5.1.4 Biological and Vegetation Monitoring

Bioassessments are desirable tools for detecting the severity of impairments affecting the flora and/or fauna of a waterbody. Just as water chemistry results provide detailed information regarding the health of a waterbody at a specific time, bioassessment results reflect the health of the biological communities within the waterbody over a longer period. Seminole and Orange Counties and the City of Orlando employ various department-designed bioassessment tools to detect changes in these biological communities, as described below.

Continuing bioassessments are a useful tool to evaluate the Wekiva River system during BMAP implementation. Most of the evidence used to list the Wekiva River and Rock Springs Run for nutrient impairment was benthic algae information, either benthic algae cell density or growth rate or community structure. The WBWG monitoring partners conduct several types of assessments. The types of assessments and the monitoring locations are discussed below.

In addition, the WBWG monitoring partners routinely conduct other biological assessments. Long- and short-term trends are developed using these assessments, which include tracking aquatic vegetation and algal types, growth rate, diversity of species (flora and fauna), native and non-native species, clarity, and overall health. Lake assessments are performed by certified professionals on staff in compliance with state and federal standards and methodologies; the results are provided in a narrative report distributed to the regulatory agencies in the Middle St. Johns River Basin. Two specific types of assessments are conducted, as follows:

- The **Lake Vegetation Index (LVI)**, a multimetric index, evaluates how closely a lake's plant community resembles one that has very little human disturbance.
- The **Stream Condition Index (SCI)**, another multimetric tool, assesses the macroinvertebrate communities and compares the results with "minimally disturbed" reference sites.

With the new numeric criteria rule being implemented, many sampling organizations will be involved with a type of biological assessment called the Rapid Periphyton Survey (RPS). This type of biological monitoring is appropriate in the streams and rivers of the basin (not the lakes). Data collected by the BMAP monitoring partners conducting RPSs in the Wekiva BMAP planning area may be considered during the review and analysis of monitoring data.

In addition to the LVI, SCI, and RPS assessments identified above, the SJRWMD has 16 stations on Rock Springs Run and 25 stations on the Wekiva River, where it conducts annual (late spring/early summer, from April–June) submerged aquatic vegetation (SAV) and algal surveys. The surveys quantitatively describe the distribution and spatial coverage of SAV and filamentous macroalgae (macroscopic or plantlike thallus visible to the naked eye), primarily Chlorophyta (green algae), Cyanobacteria (blue-green algae), Bacillariophyceae (diatoms), and/or Xanthophyceae (yellow-green algae). SAVs are vascular plants that grow submersed on the stream bottom with no aerial or emergent portions and that include the green alga *Chara* sp. Concurrent with the SAV/algal surveys, field water quality data (water temperature, pH, conductivity, and DO) are also assessed.

Most biological monitoring is done on lakes and very little on streams, except for Seminole County's SCI/Bioreconnaissance work on the Little Wekiva River. Additional biological monitoring on the Wekiva main stem and Rock Springs Run would be a valuable addition to the monitoring plan.

5.1.5 Other Monitoring Data

Water quality and biological data collected as part of the surface water, ground water, and springs monitoring network will be supplemented with two other types of data, as follows:

- Flow measurement data taken at surface water and springs concurrent with the water quality monitoring.
- Monitoring and other reported data submitted by WWTF (or WRF) or MS4 permittees as part of permit requirements.

5.1.5.1 Flow Measurement

In addition to collecting water quality data, two monitoring partners also collect flow data at surface water stations. The review of these data along with water quality data may provide loading information on the subbasins considered in the Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP. Flow data may be used as part of the periodic water quality trend analysis to assess loadings in the system and the relative contribution of the discharges from the springs to the Wekiva River system. It may also be helpful during the reevaluation of the basin for future TMDL assessments.

5.1.5.2 Permitted Facilities

As mentioned in Chapter 3, the Wekiva BMAP planning area has two types of permitted facilities: (1) WWTFs and WRFs, and (2) MS4 stormwater programs (both Phase I and II). The department permits issued to these facilities and MS4 operators contain monitoring and other reporting requirements. As part of BMAP implementation, the department's Watershed Planning and Coordination Section staff will coordinate with the department's wastewater facilities and MS4 permitting staff to determine if any compliance issues exist that should be noted during the annual meeting of the WBWG and considered during water quality trend analysis of the monitoring network.

5.1.6 Data Management

The Florida Storage and Retrieval (STORET) database serves as the primary repository of ambient water quality data for the state. The department pulls water quality data used for impaired waters evaluations and TMDL development directly from the Florida STORET database. Ambient water quality data collected as part of the BMAP will be uploaded into STORET for long-term storage and availability. The SJRWMD, the department, and some local stakeholders currently upload water quality data into Florida STORET. All BMAP data providers have agreed to upload ambient water quality data to STORET at least once every six months, on completion of the appropriate quality assurance/quality control (QA/QC) checks.

Other data, such as the results of biological assessments and information on storm events, may also be collected, and the STORET database is not equipped to store these types of data. Stakeholders agree to provide these data to other BMAP partners on request and when appropriate for inclusion in BMAP data analyses and adaptive management evaluations.

5.1.7 QA/QC

Stakeholders participating in the monitoring plan must collect water quality data in a manner consistent with the department's standard operating procedures (SOPs) for QA/QC (Rule 62-160, F.A.C., Quality Assurance). The most current version of these procedures can be downloaded online. For BMAP-related data analyses, entities should use National Environmental Laboratory Accreditation Council (NELAC) National Environmental Laboratory Accreditation Program (NELAP)–certified laboratories or other labs that meet the certification and other requirements outlined in the SOPs. SJRWMD staff and contractors collect, process, and preserve samples according to the SJRWMD's *Standard Operating Procedures for the Collection of Surface Water Quality Samples and Field Data–Feb. 13, 2004*. Where SJRWMD and department SOPs do not correspond to one another, SJRWMD staff and contractors defer to the department's SOPs.

5.2 ADDITIONAL RESEARCH EFFORTS

5.2.1 PLANNED RESEARCH TO ADDRESS NUTRIENT SOURCES

Both the SJRWMD and the department plan to apply resources to further the understanding of nutrient sources in the Wekiva Basin, the priority areas for restoration actions, and the fate and transport of nutrients in ground water and springs.

Research and monitoring efforts have provided useful information on water quality and flow trends in Florida's spring systems, including the Wekiva system. The data have also been used to verify impairment under state law (Rule 62-303, F.A.C.). Good science is fundamental to the development of successful TMDLs and subsequent BMAP strategies. Even though the results of several studies and models are available, including some that estimate potential sources for the elevated nitrate concentrations observed in the Wekiva River system, there is still a need for additional evaluation to understand the interrelationships and dynamic factors affecting spring water quality. Additional research and coordination are needed to understand the chemical, geochemical, and physical processes that affect spring discharge water quality.

The SJRWMD, through its Springs Protection Initiative, has developed a work plan to study the complex science of springs through a multidisciplinary approach to improving management abilities. Specifically, the objectives of the work plan are listed as follows:

1. Improve the scientific foundation for management of nitrate loadings to spring ecosystems.
2. Evaluate whether nitrate reduction alone will be sufficient to restore the ecological balance in spring ecosystems.
3. Assess the relative influences and manageability of the various drivers influencing spring ecosystems.
4. Provide reliable basis for development and implementation of the most cost-effective solutions for SJRWMD springs.

The goal is to complete this work plan in three years, with the actual scope depending on available resources and funding. Additional support and participation by the department and stakeholders of the Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP, as well as information gathered on other springs in Florida, will be instrumental to the success of the program. The planned approach will specifically focus on the Silver Springs system~~s~~, due to nutrient and discharge conditions and the existing data and information on the~~se~~ system~~s~~. The information gained in this research will be transferrable to other areas, and future spring TMDLs and BMAPs are expected to benefit from it. More information about the Springs Protection Initiative is available online.

The SJRWMD recognizes that a better scientific understanding is needed in order to identify the most cost-effective solutions for spring protection and improvement. It is interested in assisting in this goal and, in addition to the data collection activities described above, the SJRWMD will focus on providing a scientific foundation of understanding and identify actions that can be implemented, that will be cost-effective, and that can reasonably reach the established goal. The department will provide support for this effort with available resources and contracts.

As described in **Section 3.3**, the NSILT is being prepared by the department to quantify the relative contributions of nitrogen sources to the ground surface and the springshed. This information will assist with the prioritization of projects and management actions and understanding the magnitude of the various nitrogen sources in the springshed.

5.2.2 Florida Onsite Sewage Nitrogen Reduction Study

The 2008 Legislature instructed FDOH to conduct the necessary research and/or demonstrations to better define passive onsite sewage disposal technologies that effectively reduce nitrogen discharging to ground water. Furthermore, the legislation directed FDOH to evaluate passive systems that may utilize reactive media, that have no more than one pump, and that are operated and maintained similarly to conventional onsite systems.

Consequently, FDOH has initiated the Florida Onsite Sewage Nitrogen Reduction Study, which is administered by FDOH's Bureau of Environmental Health. The purpose of the study is to identify cost-effective technologies to reduce the amount of nitrogen contributed to ground water by onsite sewage treatment and disposal systems. The study consists of four components, as follows:

1. An initial evaluation of the most cost-effective technologies at a research facility.
2. Further evaluation of promising technologies installed in association with seven residential properties in strategic locations statewide.
3. Monitoring of nitrogen fate and transport in soil and shallow ground water at several onsite systems.
4. Development of modeling tools to estimate nitrogen contributions from onsite systems.

The anticipated completion date for the study is 2015, with the final report to be submitted to the Legislature by December 31, 2015. Plausible outcomes from the study include the following:

1. Designs for "passive" systems that have been performance evaluated, are effective at removing nitrogen, and are user friendly for property owners.

2. Cost estimates for these systems and a comparison of costs with existing approved systems.

3. Development of a nitrogen fate and transport model that will help in estimating nitrogen contributions from existing and proposed systems with geographic specificity.

4. Opportunities for nitrogen reduction from onsite sewage systems in sensitive watersheds where municipal sewers are not feasible.

In the meantime, the 2012 Legislature (House Bill 1263) prohibited a governmental entity (including a municipality or county) from mandating the use of performance-based treatment systems before the study is completed, with the exception of passive engineer-designed systems. The prohibition does not apply to a governmental entity that adopted a local law or ordinance on or before January 31, 2012. In addition, site-specific variances for violations of Rule 64E-6, F.A.C., can require performance-based treatment systems.

5.2.3 WBWG Studies

There is a long history of study and research in the Wekiva River Basin that has sought to better characterize the surface and ground water interactions in the basin, identify the sources of pollutants that adversely affect the resource, and identify nutrient load reduction strategies and treatment options. WBWG members have conducted studies to determine the best management actions to implement. The 11 projects listed below are included in the management action plan list provided in **Appendix B**; of these, six studies have been completed and five are under way:

- Altamonte Springs.
  - **Lake Orienta, Lake Florida, and Lake Adelaide (complete).** A study to determine the TN and TP loads to Lakes Orienta, Florida, and Adelaide and to identify the best pollutant load reduction options.
  - **Citywide (under development)** – A study to develop a citywide pollutant loading/ hydrologic and hydraulic (H&H) model.
  - **Citywide I&I study (under development)** – A study to evaluate the city's sewer system to identify areas prone to I&I and develop a schedule for repair of the system.

- Lake County.
  - **Royal Trails (complete)** – A drainage and water quality improvement study conducted to perform a flood analysis, develop a pollutant loading model, and develop a conceptual project priority list.
- Orange County.
  - **Lake Gandy (complete)** – A study to evaluate hydrologic conditions and nutrient loadings to Lake Gandy.
  - **Lake Lawne (under development)** – A study to evaluate hydrologic conditions and nutrient loadings to Lake Lawne.
- Orlando.
  - **Lake Lawne, Center of Commerce, Lake Orlando (complete) –** A study using the suggested drainage improvements from an earlier report by CDM sought to identify nutrient reduction projects in Lake Lawne, the Center of Commerce, and Lake Orlando drainage areas to reduce loadings to the Little Wekiva River.
- Seminole County.
  - **Bear Lake Chain-of-Lakes Hydrology/Nutrient Budget and Water Quality Management Plan – Little Wekiva Canal (complete).** A detailed nutrient and hydrologic study, identifying and quantifying all nutrient sources, including internal loading, ground water, surface water, precipitation, *etc.* The management plan includes potential structural and nonstructural improvements that can be made to protect and enhance water quality.
  - **Spring Lake/Spring Lake Watershed Hydrology/Nutrient Budget and Water Quality Management Plan – Little Wekiva River (under development).** A detailed nutrient and hydrologic study, identifying and quantifying all nutrient sources, including internal loading, ground water, surface water, precipitation, *etc*. The management plan includes potential structural and nonstructural improvements that can be made to protect and enhance water quality.
  - **Wekiva Basin Stormwater Pond Enhancement Feasibility Study for Nitrogen Transport – Wekiva River (under development).** A preliminary analysis of nitrogen transport into and out of retention pond/ground water, and a follow-up analysis of

improvement made to ground water discharge after the addition of Bold and Gold amendment to the pond bottom.

- **Seminole County Water Quality Master Plan – Wekiva River; Little Wekiva River; Wekiva Canal (under development).** A countywide assessment of all water quality data, monitoring programs, regional ponds, capital improvement plan (CIP) projects, *etc*., to improve the efficiency and effectiveness of existing programs and identify additional structural/nonstructural improvement projects.

WBWG members are using these studies to help identify other projects that could be included in the BMAP management action lists.

As part of the BMAP efforts, two members of the WBWG proposed ongoing studies as part of the management actions. The progress of these efforts, and any resulting action items, should be considered during the first year of BMAP implementation.

5.2.4 Wekiva-Area Septic System Studies

The department has been working with the Coalition for Property Rights and Orange County on a study to assess and quantify the leaching of nitrogen from active conventional septic systems in the Wekiva River area to better understand potential for and conditions under which septic systems might contribute to nitrogen in area springs. The study will identify representative septic systems in the area and monitor soil pore water beneath their drainfields to provide data on nitrogen leaching toward ground water. At some locations, ground water samples may also be collected. Septic systems included in the study will provide good representation of the more common drainfield designs and ages as well as the range in soil conditions.

The primary focus of this assessment will be on gathering data on the transport and attenuation of nitrogen from conventional drainfields within the underlying soil profile under a variety of settings that represent the range of conditions under which most septic systems exist in the area of interest. The study also will assess the influence of pumping out septic tanks on water quality in effluent. Initial septic tank effluent sampling will be followed by a pumpout at a subset of the sites. Subsequent sampling from these sites and control sites, which will not be pumped out, will allow the department to evaluate the change in effluent water quality.

Department scientists are also conducting a tracer study to evaluate the rate of ground water movement from areas within the boundaries of the Wekiva BMAP planning area to area springs. A tracer gas is being injected into wells drilled into the Floridan aquifer at two locations in the spring contributing area. Periodic monitoring will look for the tracer's arrival at Wekiwa and Rock Springs.

5.2.5 Additional Research and Investigation Needs

During BMAP implementation, the department and the WBWG will need to consider whether additional research or analysis is possible to address some of the considerations identified in **Section 1.4** of this document (primarily factors governing the complex fate and transport of nutrients in the basin). Specifically, it would be useful to discuss the following types of research to determine whether additional research is appropriate:

- **Agricultural Land Uses –** During FDACS' efforts to enroll agricultural producers in the BMP programs, new information will be gathered about the agricultural acreage currently in production for each commodity. Revised estimates of the agricultural acreage available for enrollment in a BMP may need to be developed and load reduction estimates adjusted accordingly.

- **Updated Land Uses and Load Reduction Estimates –** Additional load reduction estimates can be developed for some projects (*e.g.*, Neighborhood Lakes Conservation Lands; the conversion of septic tanks at Wekiwa Springs State Park to centralized sewer).

- **Nitrate and TP Loadings in Recharge Areas –** Additional research may be useful on nitrate and TP loadings in the recharge areas for Wekiwa, Rock, Seminole (at Sorrento), Sanlando, and Starbuck Springs due to the significant contribution of the discharges from these springs to the Wekiva River system. This may include investigating how geologic sources of phosphorus contribute to the springs with respect to the total load and anthropogenic fraction of the load.

- **Septic Tank Loadings –** Additional research will be useful to assess nitrate and TP loadings from residential neighborhoods (e.g., septic tanks, fertilizer use) in the recharge areas of select springs. A better estimate of the number of septic tanks in the basin and additional information on the relative contributions from septic tanks will help in assessing the magnitude of the loading. For example, the relative contributions could be evaluated by comparing neighborhoods on septic systems with others on centralized sewer. To evaluate the possible impact of septic tanks on the concentration of nitrates in ground water, new ground water wells might have to be added in the vicinity of Wekiwa Springs and Miami Springs.

5.3 TRACKING IMPLEMENTATION

During BMAP development, there was considerable controversy on the relative contribution of various sources of nutrients to ground water / springs and on how best to identify and track types of sources. Additional information gathered from these research efforts can help clarify sources and relative contributions. From that information, it may be possible to develop better control strategies to focus future load reduction efforts. The efforts described throughout **Sections 5.1** and **5.2** will address these research needs.

Data collection should be closely related to those data needed to support the identification of cost-effective solutions. The department will work with stakeholders to collect and organize monitoring data and track project implementation.

The water quality data will be analyzed each year during BMAP implementation. Water quality trends in the surface water basin and the springshed will be evaluated using appropriate data analysis methods, depending on the frequency, spatial distribution, and period of record available from sample locations (*e.g.*, some stations are long-term monitoring stations and others have recently been reactivated, requiring consideration of how to address the data gaps). Specific statistical analyses were not identified during BMAP development; however, commonly accepted methods of data analysis will be used.

Trend analysis comparable to the analysis previously conducted by the SJRWMD for water quality and biological monitoring will likely be used as a template for evaluating the data during BMAP implementation. This includes, but is not limited to, long-term trend analysis and consideration of weather events, spatial trends, and land use trends in the system. Examples of the water quality trend analysis conducted by the SJRWMD were presented to the WBWG in September 2010 and February 2012.

The department and the WBWG will use the results of the water quality trend analysis to assess the Wekiva River system's response to the implementation of the projects and management actions outlined in the BMAP. As needed, the department and the WBWG will consider additional actions needed in certain subbasins, or across the entire basin, to achieve the TMDLs during Phase 2 of BMAP implementation.

This information will be presented in an annual report. The technical stakeholders will meet annually after the adoption of the BMAP to follow up on plan implementation, share new information, and continue to coordinate on TMDL-related issues. The following types of activities may occur at annual meetings:

- Reporting on project implementation and monitoring.
  - Collect project implementation information from the stakeholders and MS4 permit reporting and compare it with the BMAP schedule.
  - Discuss the data collection process, including any concerns and possible improvements to the process.
  - Review the monitoring plan implementation, as detailed in **Section 5.1** and **Appendix C**.
- Sharing new information.
  - Report on results from water quality monitoring and trend information.
  - Provide updates on new projects and programs in the basin that will help reduce nutrient loading.
  - Identify and review new scientific developments in addressing nutrient loading and incorporate any new information into annual progress reports.
  - Discuss new sampling technologies that will improve source identification.
  - Provide updates to the stakeholders on any surface water or ground water loading models, or estimates for nutrient source investigations relevant to the Wekiva Basin and projects contained in the BMAP.
  - Obtain updates from the department on the basin cycle and activities related to any impairments, TMDLs, and BMAP.
  - Obtain reports from other basins where tools or other information may be applicable to the Wekiva River and Rock Springs Run TMDLs.
- Coordinating TMDL- and BMAP-related actions.
  - WBWG members will work to understand and apply the information gathered from project implementation, monitoring activities, and studies to establish priorities and implement effective projects and management actions to reduce nutrient loadings to the Wekiva River system.

Covering all of these topics is not required for the annual meetings, but the list provides examples of the types of information that should be considered for the agenda to assist in BMAP implementation and improve coordination among the agencies and stakeholders.

5.4 Adaptive Management Measures

Adaptive management involves setting up a mechanism for making adjustments in the BMAP when circumstances change or feedback indicates the need for a more effective strategy. Adaptive management measures include the following:

- Procedures to determine whether additional cooperative strategies are needed.
- Criteria/processes for determining whether and when plan components need revision due to changes in costs, environmental impacts, social effects, watershed conditions, or other factors.
- Descriptions of the stakeholders' role after BMAP completion.

Key components of adaptive management to share information and expertise are tracking plan implementation, monitoring water quality and pollutant loads, and holding periodic meetings.

BMAP execution will be a long-term process. Some key projects with significant source reductions will extend beyond the first five years of the BMAP cycle. The department and the stakeholders will track implementation efforts and monitor water quality to measure effectiveness and ensure BMAP compliance. The stakeholders will meet annually to discuss implementation issues, consider new information, and—if the Wekiva River and Rock Springs Run are not projected to meet the TMDLs—determine additional corrective actions. Information on the status of project implementation and the status of monitoring and other activities will be collected annually from the participating entities. The stakeholders will review these reports to assess progress towards meeting the BMAP's goals.

Chapter 6 presents the department's position on assessing the implementation and effectiveness of management strategies, determining the sufficiency of effort for all BMAP partners, and its authority for enforcing the commitments outlined in the BMAP.

CHAPTER 6: Management Strategies, Sufficiency of Effort, and Enforcement

The Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP integrates state and local government water quality initiatives to facilitate achieving the TMDLs. A cornerstone of this BMAP effort is the WPPA (Chapter 369, Part III, F.S.). The WPPA has integrated efforts to reduce nutrient loadings from existing WWTFs, coordinate water use and land use planning, coordinate land acquisition to meet transportation and conservation needs, minimize water quality impacts from new development, identify improved technologies applicable to OSTDS, and achieve future water supply needs consistent with MFLs. Consequently, the implementation of the WPPA in the WSA provides a foundation for BMAP stakeholders to continue implementing projects and management actions sufficient to achieve the TMDLs.

For ground water–based systems (*i.e.*, predominated by springsheds) where the origin, transport, and fate of pollutants are significantly less certain than for surface water systems, the development of source-specific detailed allocations that are scientifically supportable is problematic and can distract from the primary task of developing projects that result in pollutant reductions.

Without source-specific detailed allocations, methods can still be developed to accurately measure incremental progress, sufficiency of effort, and future project needs. The WPPA established a precedent in this regard by utilizing priority zones, based on the relative vulnerability of ground water resources, to define required reductions for wastewater facilities in the Wekiva Basin. Similar approaches may be considered during the first five-year iteration to prioritize areas and sources where future reductions will be most cost-effective. Tools other than aquifer vulnerability may be developed, such as targeting sources within springsheds, or land activities associated with higher nutrient loading potential. The department encourages the WBWG and all stakeholders to continue discussions to identify and enlist the most equitable and accurate science-based tools for prioritizing reductions and measuring incremental progress.

Enforcement is not the primary tenet of the department's TMDL implementation and BMAP processes. However, for point sources, both WWTFs and MS4s, the BMAP and required TMDL reductions are enforceable through NPDES permits. For nonpoint sources, the BMAP requirements and TMDL reductions are enforceable under Subsection 403.067(7), F.S. Furthermore, an agricultural nonpoint source discharger included in a BMAP must demonstrate compliance with required reductions by either implementing the appropriate BMPs or conducting water quality monitoring prescribed by the department or a water management district.

APPENDICES

Appendix A: Basin Stakeholder Involvement in BMAP Development for Wekiva River and Rock Springs Run

The department convened a total of 15 publicly advertised meetings as part of the Wekiva River, Rock Springs Run, and Little Wekiva Canal BMAP development process. The first event was a kickoff meeting on March 6, 2009. Representatives from all jurisdictions within and near the Wekiva BMAP planning area and relevant state agencies, nonprofit organizations, and interested members of the public were invited.

On April 4, 2009, the department convened the WBWG and began the formal BMAP development process. WBWG and technical meetings were held periodically from 2009 through 2012. The meetings were structured to organize and review the technical information that is the basis of the BMAP. The WBWG also identified projects and management actions to improve water quality in the basin and a monitoring plan to assess water quality changes across the basin. Twelve WBWG meetings were held throughout the BMAP development process on the following dates:

- April 4, 2009.
- June 7, 2009.
- August 19, 2009.
- November 10, 2009.
- March 18, 2010.
- September 29, 2010.
- December 16, 2011.
- February 17, 2012.
- April 20, 2012.
- July 27, 2012.
- March 1, 2013.
- September 2, 2015.

An additional technical meeting held on September 15, 2009, was open to anyone interested in participating in the technical discussions. A public meeting to discuss the draft BMAP was held on April 30, 2013.

Public Participation in Meetings

All WBWG technical meetings and policy briefings were open to the public and noticed in the *Florida Administrative Register (FAR) (*previously known as the *Florida Administrative Weekly* [FAW]).

Public Meetings

Public meetings on the proposed Verified List and the Wekiva River, Rock Springs Run, and Little Wekiva Canal TMDLs were held before each list was adopted. A public meeting on the draft BMAP was held on April 30, 2013.

Plan Recommendation Approval and Adoption

The final BMAP will be adopted by department Secretarial Order (approximately October 2015).

APPENDIX B: PROJECTS AND MANAGEMENT ACTIONS TO ACHIEVE THE TMDLS

The tables below set forth the projects and activities, and the time frames for implementation of those projects and activities required in this BMAP. Additional reductions are expected to be necessary in future BMAP phases to meet the loads specified in the TMDLs.

Where available, the tables provide information on the assigned nutrient reductions, shown in lbs/yr, for projects benefiting the watershed. The BMAP projects and activities represent a considerable local, regional, and state investment in a multifaceted approach to water quality protection and restoration within the Wekiva River system. For more than 50 percent of the projects, cost estimates project an investment of more than $262 million for wastewater collection system expansion and rehabilitation, stormwater management, and other nonpoint source controls. Of the more than 200 projects and activities included in the BMAP, 76 percent are already completed. The other projects and activities will occur during the five-year implementation of the BMAP.

Responsible entities submitted these projects and activities to the department with the understanding that each entity would implement the proposed projects/activities in a timely way and achieve the assigned load reduction estimates. However, this list of projects and activities is meant to be flexible enough to allow for changes that may occur over time. Any change in listed projects and activities, or the deadline to complete these actions, must first be approved by the department. Substituted projects and activities must result in equivalent or greater nutrient reductions than expected from the original projects and activities.

The list of projects and management actions included in this appendix has several main components. Summary information for most project categories is also provided in the main report, as referenced below.

- Stormwater treatment system and other nonwastewater projects:
  - Bank/shoreline stabilization and erosion protection (**Table 4.12**).
  - Exotic vegetation removal/revegetation with native species.
  - Land preservation (conservation and parkland) (**Table 4.13**).
  - Public education (beyond general public outreach) (**Table 4.14**).
  - Stormwater treatment system inspections.
  - Stormwater treatment systems (**Table 4.6**).
  - Stormwater treatment system rehabilitation (**Table 4.6**).

  - Stormwater treatment systems associated with road paving (**Table 4.7**).
  - Street sweeping (**Table 4.6**).
  - Stormwater studies (**Chapter 5**).

- Sanitary sewer collection system projects:
  - Sanitary sewer collection system expansion (to remove septic systems or small. wastewater treatment plants from service) (**Table 4.3**).
  - Reclaimed water collection, transmission, storage (*i.e.*, reuse) (**Table 4.4**).
  - Sanitary sewer collection system rehabilitation (**Table 4.3**).
  - Sanitary sewer collection system inspection.
  - Sanitary sewer collection system studies (**Chapter 5**).

TABLE B.1. BANK AND SHORELINE STABILIZATION/EROSION PROTECTION (SUMMARIZED IN TABLE 4.12)

- = Empty cell/no data
N/A = Not applicable

ENTITY	PROJECT NUMBER	SUBBASIN	PROJECT NAME	PROJECT DETAIL	PROJECT COST	ESTIMATED TN LOAD REDUCTION (LBS/YR)	ESTIMATED TP LOAD REDUCTION (LBS/YR)	NITRATE REDUCTION CALCULATION METHOD	STATUS
Altamonte Springs	AS-1	Little Wekiva River	Little Wekiva River Erosion Management Project (1, 2, and 3)	Install structural controls to provide riverbank stabilization	$350,000	163	17	Sediment retention	Completed
Altamonte Springs	AS-2	Little Wekiva River	Riverbend Apartments Shoreline Stabilization	Install structural controls to provide riverbank stabilization	$250,000	71	7.5	Sediment retention	Completed
Apopka	A-1	Springshed/Rock Springs Run	Lester Rd Improvement	City paved and improved the stormwater collection system	$3,0288,140	-	-	-	Completed
Orange County	OC-1	Little Wekiva River	Elba Way	Erosion protection of Little Wekiva River; install gabions, grade control structures, river reshaping	$1,000,000	154.5	35.3	-	Constructed
Orange County	OC-2	Little Wekiva River	Gusty Lane	Remove existing triple aluminum pipes along Little Wekiva River at Gusty Lane Dr. and replace with control structure using rip-rap and gabion materials; install pipe and inlet for existing ditch adjacent to canal	$132,000	35.4	8.1	-	Constructed
Orange County	OC-3	Little Wekiva River	NRCS Riverside Acres	Erosion protection of Little Wekiva riverbank; install rip-rap; project length = 287 feet	$650,000	46.9	10.7	-	Constructed
Orange County	OC-4	Little Wekiva River	NRCS Riverside Park Ave.	Erosion protection of Little Wekiva riverbank; install rip-rap; project length = 150 feet	$350,000	24.5	5.6	-	Constructed
Orange County	OC-5	Little Wekiva River	Riverside Acres Arch Pipe	Replace existing 1,750 feet of pipe-arch pipe in Riverside Acres subdivision with open channel section and restore to reflect original river configuration	$5,000,000	-	-	-	Constructed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orange County	OC-6	Little Wekiva River	Riverside Park Rd.	Structural stabilization of channel bed and banks in main stem of river and into Lake Lovely Outfall Canal, including grade control structure; project includes gabions, Reno mattress, and riprap channel bottom and side bank protection	$600,000	164.9	37.7	-	Constructed
Orange County	OC-7	Little Wekiva River	Sherry Dr.	Erosion protection of Little Wekiva River bank; install gabion block and Reno mattress; project length = 400 feet	$600,000	65.4	15	-	Constructed
Orange County	OC-8	Little Wekiva River	Little Wekiva Slope Stabilization West/ East Banks	Eliminate erosion of banks by using steel sheet pile	$700,000	213.5	48.8	-	Completed
Seminole County	SC-1	Wekiva River	Sweetwater Cove Dredging and Drainage Improvements and Sweetwater Tributary Erosion Project	Increase water quality treatment resonance time through water quality treatment pond expansion, construct online sedimentation basin; carry out erosion control measures along Sweetwater Creek; area served = 2,181 acres	$2,700,000	2,609	68	EMC modeling-based approach	Active
Seminole County	SC-2	Little Wekiva River	Grade Control Structures 6 and 7	Reduce sediment loads through bank stabilization and river grade control structures in Little Wekiva River; area served = >5,000 acres	$300,000	174.3	18.4	Erosion retention	Completed
Seminole County	SC-3	Little Wekiva River	Horse Lovers Lane Erosion Control Project	Reduce sediment loads through bank stabilization along Spring Lake outfall, tributary to Little Wekiva River; use gabions and grade control structures plus replace culverts; area served = >1,000 acres	$700,000	112.9	11.9	Erosion retention	Completed
Seminole County	SC-4	Little Wekiva River	North Western Erosion Control Project	Reduce sediment loads through bank stabilization along Little Wekiva River; area served >5,000 acres	$950,000	32.0	3.4	Erosion retention	Completed
Seminole County	SC-5	Little Wekiva River	Weathersfield Erosion Control Project	Reduce sediment loads through bank stabilization along Little Wekiva River; measures include gabion lining, Reno mattresses, gabion baskets to serve as grade control structures; area served = > 5,000 acres	$750,000	27.9	2.9	Erosion retention	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-6	Little Wekiva River	Little Wekiva Grade Control – Montgomery Rd. to State Road 434	Reduce sediment loads through bank stabilization and construction of 2 river grade control structures in Little Wekiva River; area served = >5,000 acres	$850,000	298.3	31.4	Erosion retention	Completed
Seminole County	SC-7	Wekiva River	Wekiva Park Drive Erosion Control Project	Reduce sediment loads through grade control structures; area served = 400 acres	$350,000	36.6	3.8	Erosion retention	Completed

Table B.2. Exotics Removal/Revegetation with Native Species

- = Empty cell/no data

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-8	Little Wekiva River	Lake Mobile	Accomplished using in-house staff, residents, and volunteers	$25,000	-	-	-	Completed
Seminole County	SC-9	Little Wekiva River	LWR @ Springs Landing Bridge	Accomplished using in-house staff, residents, and volunteers	$10,000	-	-	-	Completed
Seminole County	SC-10	Little Wekiva River	Mirror Lake	Accomplished using in-house staff, residents, and volunteers	$75,000	-	-	-	Completed
Seminole County	SC-11	Little Wekiva River	Spring Lake	Accomplished using in-house staff, residents, and volunteers	$75,000	-	-	-	Completed

Table B.3. Land Preservation (summarized in Table 4.13)

- = Empty cell/no data
N/A = Not applicable

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-3	Little Wekiva River	Stimmell Tract Land Preservation (Audubon Society)	Conservation project – purchase 268 acres of land for preservation	$398,444	0	-	Department table	Completed
Lake County	LC-1	Blackwater Creek	Northeast Lake County Scrub Preserve	60 acres of mature sand pine scrub community with wetlands in southeast; adjacent to Seminole State Forest; protection of land; no change in land use, therefore no load reduction	$950,000	N/A	-	Unknown	Completed
Lake County	LC-1	Springshed	Lake May Reserve	136 acres of remnant citrus, xeric oak hammock and 20-acre Lake May	$6,200,000	-	-	-	Completed
Lake County	LC-3	Springshed	Mt. Plymouth Lakes	Property consists of 184 acres of lake bottom and associated uplands in plat of Mt. Plymouth	-	-	-	-	Completed
Lake County	LC-4	Springshed	Neighborhood Lakes	Part of multiagency acquisition (department, SJRWMD, OOCEA, and Lake and Orange Counties) totaling 1,584 acres; Lake County partnered with SJRWMD to purchase 210 acres	$5,000,000	-	-	-	Completed
Lake County	LC-5	Springshed	South Pine Lakes Reserve	Reserve consists of 2 adjoining properties totaling 128 acres, consisting of scrub, scrubby flatwoods, herbaceous marsh; bear habitat, possible sandhill crane nesting	$985,250	Unknown	-	Unknown	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orange County	OC-9	Rock Springs Run	Lake Lucie Conservation Area	Previous land use = agriculture; management focus = scrub habitat and water resource, passive recreational; acreage = 166.22	$4,397,800	56.7	11.2	-	Completed
Orange County	OC-10	Rock Springs Run	Neighborhood Lakes	department, SJRWMD, OOCEA, and Lake and Orange Counties partnered to buy land and put into conservation; previous land use = agriculture; management focus = water resource, passive; acreage = 1,584 (498 acres in Orange County)	$74,000,000	-	-	-	Completed (managed by department)
Orange County	OC-11	Rock Springs Run	Pine Plantation	Previous land use = agriculture; management focus = passive recreation, preservation; acreage = 40	$1,000,000	1.4	0.1	-	Completed
Orange County	OC-12	Rock Springs Run	Sandhill Preserve	Previous land use = agriculture; management focus = water resource, sandhill; acreage = 83.03	$3,320,000	44.6	8.2	-	Completed
Wekiva State Park	WSP-1	Rock Springs Run	Pine Plantation	Previous land use = agriculture; Management focus = ground water recharge, natural community restoration and preservation; acreage 344.73	-	-	-	-	Completed
Winter Garden	WG-1	Springshed	Tucker Ranch	City purchased approximately 208 acres of agricultural land and will convert it to primitive campground/park	$2,100,000	1,989	-	Comparison of ground water loading rates based on UF document CIR 1448	In progress

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-12	Wekiva River	Black Bear Wilderness Area	Previous land use = natural land; management focus = preservation, passive recreation; acreage = 1,650	-	-	-	-	Completed
Seminole County	SC-13	Wekiva River	Yankee Lake Scrub Jay Preservation Area	Previous land use = natural land; management focus = preservation, passive recreation; acreage = 300	-	-	-	-	Completed

Table B.4. Public Education (projects beyond those summarized in Table 4.14 and associated section)

\- = Empty cell/no data

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Lake County	LC-6	Blackwater Creek	North Lake County Community Environmental Stewardship Program	Project goals are to provide teacher workshops and educational outreach to Grades K-12, provide exposure to various environmental careers to middle/high school students, increase number of volunteer water quality sample sites, and create community project showcase site utilizing native shoreline vegetation; project partners include city of Umatilla, Umatilla Chamber of Commerce, Lake-Sumter Community College, Florida Lake Management Society, North Lake Outpost Newspaper, Altoona Charter School, Umatilla Elementary School, Umatilla High School, and private citizens	$30,868	-	-	-	In progress

Table B.5. Stormwater System Inspections

- = Empty cell/no data

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orange County	OC-13	Little Wekiva River	Stormwater Pond Inspection	Inspect private/public stormwater ponds for compliance with performance and permit conditions	-	-	-	-	Ongoing
Orlando	ORL-1	Little Wekiva River	Compliance Inspections of Private Stormwater Systems	Inspect annually all 233 commercial, single- and multifamily systems in basin for functionality; systems include, but are not limited to, retention and detention ponds, underdrains, exfiltration, and underground vaults; by maintaining ponds at design criteria, city is ensuring that optimal level of pollutant removal efficiency is being achieved	-	-	-	-	Ongoing
Orlando	ORL-2	Little Wekiva River	Stormwater System Inspections	Conduct proactive inspections and perform routine maintenance on 13 ponds and 31 ditches in basin to ensure systems are being maintained at optimal pollutant removal efficiency (and flood prevention)	-	-	-	-	Ongoing

Table B.6. Stormwater Treatment Systems (summarized in Table 4.6)

\- = Empty cell/no data
N/A = Not applicable

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-4	Little Wekiva River	Altamonte Springs Shopping Center (Crossroads) Development	Construct 20,602-square-foot retail/restaurant building with attendant parking and site utilities, plus stormwater facilities, on 2.06-acre site, providing higher level of stormwater treatment as result of city ordinance	-	0.8	0.1	EMC BMP	Completed
Altamonte Springs	AS-5	Little Wekiva River	Brantley Terrace Condo	Phase 3 of Lake Lotus Club, multifamily condominium development	-	4.7	0.0	EMC BMP	Completed
Altamonte Springs	AS-6	Little Wekiva River	Cracker Barrel Development	Redevelop commercial site and expand existing exfiltration system, raising level of treatment to current city standards	-	0.8	0.1	EMC BMP	Completed
Altamonte Springs	AS-7	Little Wekiva River	Fairfield Marriot Suites Development	Construct 92-room Fairfield Suites Hotel to replace commercial development constructed prior to stormwater development rules, raising level of water quality treatment on-site to meet city standards	-	4	0.5	EMC BMP	Completed
Altamonte Springs	AS-8	Little Wekiva River	Florida Hospital Development	Proposed development is for construction of 6,000± square-foot worship center, associated paved parking, and upgrades to existing stormwater management system to replace existing parking lot	-	12	0.8	EMC BMP	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-9	Little Wekiva River	Gateway Clinic and Gateway Crossing Development	Stormwater management system with online dry retention/detention area, providing higher level of stormwater treatment as result of city ordinance	-	41.5	11.1	EMC BMP	Completed
Altamonte Springs	AS-10	Little Wekiva River	Maitland Ave. Walgreens Development	Redevelop 1.46-acre commercial site and expand existing exfiltration system, raising level of treatment to current city standards	-	5.6	0.8	EMC BMP	Completed
Altamonte Springs	AS-11	Little Wekiva River	Panera Bread (State Road 434) Development	Demolish and remove existing impervious area for construction of new 4,479-square-foot restaurant; replace existing commercial building and residential areas; raise level of treatment to meet city standards	-	0.9	0.2	EMC BMP	Completed
Altamonte Springs	AS-12	Little Wekiva River	River Run South Pond 23 Improvement Project	Enlarge existing retention pond	$100,000	2.2	0.5	EMC BMP	Completed
Altamonte Springs	AS-13	Little Wekiva River	Spring Oaks, San Sebastian, and River Run Inlet Skimmer Baskets	Install 39 inlet skimmer baskets	$23,890	4.8	1.1	EMC BMP	Completed
Altamonte Springs	AS-14	Little Wekiva River	West Altamonte Operations and Administration Center	Identified area does not contribute to Wekiva River; however, closed basin was not removed from consideration in TMDL due to potential influence to the springshed	$975,000	168.7	24	EMC BMP	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Apopka	A-2	Rock Springs Run	Shopke-Lester Road Pond Expansion and Improvement	Improve existing drainage system and dry retention pond to increase inflow mass and reduce outflow mass; pollutant removal efficiency increased from 75% to 93%	-	-	0.77	-	Completed
Eustis	E-1	Springshed	Cardinal Pond	Retention for area along Bates Ave. between Glover and Wall Sts.	$300,000	Not required	-	-	Completed
Eustis	E-2	Springshed	Downtown Master Stormwater Project	Wet detention for downtown area; 32.4-acre drainage basin; project will provide pollutant reduction of 64.5% TN and 40% TP; small eastern portion of new lines falls within springshed	$4,000,000	Not required	-	-	Completed
FDOT District 5	FDOT-1	Blackwater Creek	FM: 238406 (1 treatment project)	State Road 44: Swales and ditch blocks providing treatment for runoff generated from existing and proposed pavement	-	14.88	2.0	Pre-/post-EMC	Completed
FDOT District 5	FDOT-2	Little Wekiva Canal	FM: 239289 (2 treatment projects)	State Road 438: Treatment Basin 2 (Pond 2A, 2B, and 2C) and Wet Detention Pond 4 providing treatment for runoff generated from existing and proposed pavement	-	88.13	9.4	Pre-/post-EMC	Completed
FDOT District 5	FDOT-3	Little Wekiva River	FM: 239496-2 (2 treatment projects)	State Road 423: Add lanes from Shader Rd. to State Road 424 (Edgewater Dr.). Wet Detention Pond 100 and Pond 200 providing treatment for John Young Parkway	-	155.61	16.7	Pre-/post-EMC	Design 100%/ pending funding

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
FDOT District 5	FDOT-4	Little Wekiva River	FM: 240231-2 and 3 (7 treatment projects)	Add lanes to State Road 434: from State Road 414, Lotus Landing Blvd., then to State Road 436: Dry Detention Pond 1N-1, 1N-2 2N, P, Wet Detention WTC Ponds 1 and 2; Exfiltration System 4N-1 and 5N providing treatment for runoff generated from existing and proposed pavement	-	59.93	7.3	Pre-/post-EMC	Completed
FDOT District 5	FDOT-5	Springshed	FM: 238314-1 (7 treatment projects)	State Road 500: Dry Retention Pond 2, 4, 6; Wet Detention Pond 3E, 5 A/B; Ponds 3B, 3C, 3D; French drain providing treatment for runoff generated from existing and proposed pavement	-	217.68	20.47	Pre-/post-EMC	Completed
FDOT District 5	FDOT-6	Springshed	FM: 239535-2 (2 treatment projects)	State Road 50: Add lanes from east ramps of Turnpike to Avalon Rd.; Wet Detention Ponds A and B providing treatment for runoff from existing and proposed pavement	-	67.71	7.25	Pre-/post-EMC	Design 100%/ pending funding
FDOT District 5	FDOT-7	Springshed	FM: 410983-1 (4 treatment projects)	State Road 50: from Avalon Road to State Road 429/Western Beltway; Wet Detention Pond L-4, L-7, M-10/11, and N-2/2A providing treatment for existing and new pavement	-	390.86	41.84	Pre-/post-EMC	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Lake County	LC-7	Springshed	Wolfbranch Drainage Retrofit	Project includes removing concrete flumes in right of way and piping area to 2 new dry retention ponds; what cannot be treated in ponds will be captured in continuous deflective separation (CDS) unit within right of way, and compensating treatment for this area will be treated in Pond B	$2,000,000	-	-	-	In progress
Mt. Dora	MD-1	Springshed	5th and McDonald Parking Lot	Install 3 36-inch diameter exfiltration pipes under new parking lot	-	-	-	-	Completed
Mt. Dora	MD-2	Springshed	Highway 441 and Highway 46 StormTech Installation	Install StormTech System: 100-linear-foot inline arrangement with "Isolator Rows" at each end for maintenance	-	-	-	-	Completed
Mt. Dora	MD-3	Springshed	St. Johns St. StormTech Installation	Install StormTech System: 2 50-linear-foot rows with "Isolator Row" for maintenance; regraded and paved road to improve drainage	$18,000	-	-	-	Completed
Oakland	OAK-1	Springshed	SFR Infill Depressions	Install depressional retention on all new infill single-family residences in old part of town to increase recharge and decrease surface flow	-	-	-	-	Ongoing

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Ocoee	O-1	Springshed	ABC Fine Wine and Spirits Store # 52	2.96-acre project; proposed surface water management system will retain and recover 3 inches of runoff from increase in impervious area; sewered area	-	1.95	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-2	Springshed	Arden Park South	98.52-acre project; construct 157 single-family residential subdivision with 4 dry retention ponds; surface water management system to store and recover pre- vs. post-development runoff volume from 25-year, 96-hour event; sewered area	-	2.85	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	In progress
Ocoee	O-3	Springshed	Cambridge Village Subdivision	Cambridge Village is 8.97-acre single-family residential subdivision located southeast of intersection of White Rd. and Clarke Rd. in city of Ocoee; surface water management system includes 30 lots, associated road, and 1 dry retention system	-	0.46	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Ocoee	O-4	Springshed	Forest Trails Subdivision	3 dry retention ponds to serve 51.8-acre single-family residential development	-	1.5	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-5	Springshed	Hackney Prairie Park	4.26-acre project served by stormwater treatment retention system; sewered area	-	0.24	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-6	Springshed	Ingram Estates Subdivision	11.47-acre residential site, single lots, with stormwater system; 2 dry retention systems; recharge volume to be recovered within 72 hours; sewered area	-	1.95	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Ocoee	O-7	Springshed	Oak Trail Reserve	Construct and operate surface water management system serving 61 single-family lots on 34.57-acre residential development located within Wekiva River Protection Basin; sewered area	-	5.86	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Ongoing
Ocoee	O-8	Springshed	Ocoee Carwash	1.79-acre car wash facility, Lake Lotta watershed; sewered area	-	8.59	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-9	Springshed	Olympia, PUD	21.2-acre commercial and public development, including Walgreens store and 1 public library; 1 wet detention system and 1 dry retention system constructed	-	5.16	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Ocoee	O-10	Springshed	Orchard Park Phase III Subdivision	Orchard Park Phase III 30.7-acre subdivision is located west of Lake Addah, on south side of Clarcona-Ocoee Rd., in west Orange County; site is located in Wekiva River Hydrologic Basin, south of State Road 436, within Most Effective Recharge Area, but does not contain any portions of Riparian Habitat Protection Zone (RHPZ); project consists of construction of 65-lot single-family residential subdivision and dry retention pond; applicant does not propose any development	-	0.89	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-11	Springshed	Peach Lake Manor Drainage Improvements	Construct and operate dry retention system (retrofit) of BMPs to serve approximately 60-acre residential subdivision with no conventional stormwater treatment; sewered area	-	87.88	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	In progress

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Ocoee	O-12	Springshed	Prairie Lake Reserve	Construct surface water management system to serve 42-acre residential subdivision (townhomes); 3 retention ponds permitted	-	1.20	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-13	Springshed	Remington Oaks Phase I and II Subdivision	140-lot single-family 49.5-acre subdivision with 2 dry retention ponds	-	1.43	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed

Entity	**Project Number**	**Subbasin**	**Project Name**	**Project Detail**	**Project Cost**	**Estimated TN Load Reduction (lbs/yr)**	**Estimated TP Load Reduction (lbs/yr)**	**Nitrate Reduction Calculation Method**	**Status**
Ocoee	O-14	Springshed	Sabinal Ct. and Geneva St. Drainage Improvements – Prima Vista Subdivision	City of Ocoee is applying for Government Modification in accordance with Paragraph 40C-42.024(2)(c), F.A.C.; city is requesting permission to perform construction activities within existing channel system that connects to Lake Lotta within Wekiva Recharge Protection Basin, but does not lie within Lake Apopka Basin; construction activities include removing and replacing concrete stormwater junction box, removing segment of 30-inch reinforced concrete pipe (RCP), installing 18-inch RCP, installing 42-inch RCP to replace 30-inch RCP, installing 2nd-generation baffle box, pipe end treatments, repairing and regrading channel side slopes, and installing stabilization matting; proposed improvements will alleviate flooding, improve safety, and improve water quality in subdivision that has no permitted stormwater management treatment system (see construction drawings)	$200,000	Unknown at this time	-	Monitoring program	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Ocoee	O-15	Springshed	Villa Roma	8.92-acre project; construct 52-townhome subdivision to be served by wet detention system; project will provide 100-year compensating storage; sewered area	-	5.16	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-16	Springshed	Villages of West Oak Subdivision	Construct 2 dry retention ponds to serve 33-lot, single-family, 5.5-acre subdivision	-	0.16	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-17	Springshed	Wellington Place Subdivision	Construct surface water management system to serve 14-acre residential subdivision	-	0.28	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Ocoee	O-18	Springshed	West Colonial Property	Construct 6.95-acre commercial development; sewered area	-	4.98	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Ocoee	O-18	Springshed	Willows on the Lake	Construct surface water management system to serve 86-unit, single-family, 15.18-acre subdivision and 9.99-acre Publix shopping center	-	6.29	-	Pre-/post-pollutant load analysis spreadsheet modified for TN; results of TN multiplied by 30% to obtain nitrate reduction value	Completed
Orange County	OC-14	Little Wekiva Canal	Tree Planting at Elba Way/Riverside Park	Project will reduce temperature of water and improve SCI	$55,000	-	-	-	Completed
Orange County	OC-15	Little Wekiva Canal	11th and 12th St. Improvement	New stormwater treatment to serve 11th and 12th Sts.; 8.8 acres	-	82	69.4	-	Completed
Orange County	OC-16	Little Wekiva Canal	Clarcona Ocoee East and West Segments	4-lane road improvement; existing 2 lanes do not have stormwater treatment; project length = 2.5 miles	-	55.9	47.3	-	West Segment Completed
Orange County	OC-17	Little Wekiva Canal	Riverside Pond	Expand size of 0.8-acre existing treatment pond to 1.6 acres and add aeration to address DO impairment	$766,918	4,533	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orange County	OC-18	Little Wekiva Canal	Bay Lake Stormwater Improvement Project	Provide treatment for 2 drainage basins totaling 91.7 acres (Modular Wetlands with Bold and Gold™ media)	$260,000	13.79	1	Bay Lake Study	Completed
Orange County	OC-19	Little Wekiva Canal	C-6 Canal – Solar Reuse	Online wet detention with solar-powered irrigation system for reuse on adjacent sports fields	$2,500,000	721	229	EMC (loading/ yr) (x) BMP efficiency	On hold – no funding
Orange County	OC-20	Little Wekiva Canal	Lake Weston Curb Inlet Baskets	Install 160 curb/grate inlet baskets on storm drains and apply storm drain markers	$160,000	70.4	18	In-house study	Planned
Orange County	OC-21	Little Wekiva Canal	North Lake Lawne Stormwater Treatment Project (C-7)	Install 115 curb/grate inlet baskets on storm drains and apply storm drain markers	$196,899	46	12.6	EMC (loading/ yr) (x) BMP efficiency	Planned and funded
Orange County	OC-22	Rock Springs Run	Rock Spring Road	4-lane road improvement; existing 2 lanes do not have stormwater treatment; project length = 2 miles	-	46.6	39.4	-	Completed
Orlando	ORL-3	Little Wekiva River	2 Inlet Baskets Around Lake Daniel	Install 2 inlet baskets in Lake Daniel Basin	$1,500	-	8	-	Completed
Orlando	ORL-4	Little Wekiva River	22 Inlet Baskets Around Lake Orlando	Install 22 inlet baskets in Lake Orlando Basin	$7,770	-	25	-	Completed
Orlando	ORL-5	Little Wekiva River	4 Baffle Boxes on Ardsley	Capture gross pollutants and reduce levels of nitrogen entering basin by removing leaves and clippings before they enter Lake Silver	$7,800	-	-	-	Completed
Orlando	ORL-6	Little Wekiva River	4 Inlet Baskets Around Lake Sarah	Install 3 inlet baskets in Lake Sarah Basin	$2,250	-	8	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orlando	ORL-7	Little Wekiva River	4 Inlet Baskets Around Lake Silver	Install 4 inlet baskets in Lake Silver Basin	$3,000	-	14	-	Completed
Orlando	ORL-8	Little Wekiva River	Lake Silver Treatment Structure (Westmoreland Dr. CDS Unit)	Install CDS unit to capture gross pollutants before they enter Lake Silver	$565,702	–	19	-	Completed
Orlando	ORL-9	Little Wekiva River	Little Lake Fairview Restoration and Dubsdread Golf Course Renovation Project	Expand 5 wet detention ponds and create 10 additional wet detention ponds within golf course; construct 15 ponds in series of 3 interconnected systems; all systems eventually discharge to adjacent wetland, except during high flows, when runoff discharges to drainwell or ditch routed to Little Lake Fairview; restores hydroperiod of wetland and improves wetland functions; also raises drainwell elevation to allow for more treatment before discharge	$9,000,000	265	-	*Evaluation of Current Stormwater Design Criteria within State of Florida* (Harper and Baker 2007)	Completed
Orlando	ORL-10	Little Wekiva River	Palomar Exfiltration	Install 20-foot pipe to capture debris in separate chamber before stormwater percolates into ground	$30,000	6	3	-	Completed
Seminole County	SC-14	Blackwater Creek	Bear Lake Rd. Reconstruction	Provide water quality treatment to existing roadway and subdivision through increased wet retention and utilization of existing dry retention pond; area served = 32 acres	$2,200,000	91.4	32.3	EMC modeling-based approach	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-15	Little Wekiva Canal	Bunell Rd. Widening	Provide treatment to untreated roadway through construction of new wet retention basin and exfiltration trench; designed to hold treatment volume plus 50%; area served = 7.5 acres	$3,200,000	35.9	9.1	EMC modeling-based approach	Completed
Seminole County	SC-16	Little Wekiva Canal	Eden Park Rd.	Provide treatment to untreated roadway through exfiltration, installation of CDS units, and new wet retention basin; area served = 10.6 acres	$3,500,000	58.6	14.1	EMC modeling-based approach	Completed
Seminole County	SC-17	Little Wekiva River	Markham Woods Rd. – 3 lane State Road 434 to Springs Landing Blvd.	Provide water quality treatment for additional traffic lane through construction of new exfiltration trench; area served = 12.4 acres	$1,400,000	32.4	4.4	Online 0.25-inch retention	Completed
Seminole County	SC-18	Little Wekiva River	Markham Woods Rd. – 3 Lane Springs Landing Blvd. to EE Williamson Rd.	Provide water quality treatment to existing roadway through exfiltration trench; area served = 9.2 acres	$2,300,000	45.9	7.7	Online 0.75-inch retention	Completed
Seminole County	SC-19	Wekiva River	Triangle Drive Treatment Pond	Construct wet detention pond and provide ecological restoration on drainage parcel near Triangle Drive prior to draining into Lake Brantley; area served = 372 acres	$800,000	221.5	146.4	Harper wet pond methodology online	Planned – not funded

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-20	Wekiva River	Wekiva Springs Rd. at Wekiva Springs State Park	Construct 2 interconnected sedimentation ponds to provide additional water quality treatment for 2 square miles of residential development; area served = 2 square miles	$220,000	166.7	50.42	Harper wet pond methodology online	Completed
Seminole County	SC-21	Wekiva River	Wekiva Springs Rd. Hunt Club to Fox Valley	Provide water quality treatment to existing roadway through swales; area served = 7 acres	$1,800,000	53.3	9.3	Online 0.75-inch retention	Completed
Seminole County	SC-22	Wekiva River	West Wekiva Tr. Treatment Pond	Construct wet detention pond and provide ecological restoration on drainage parcel north of West Wekiva Tr. prior to discharge into Wekiva River; area served = 220 acres	$900,000	112.5	73.8	Harper wet pond methodology online	Planned – not funded
Turnpike Authority	TP-1	Springshed	Widen Turnpike, Beulah to State Road 50	Roadway; 3 inches treated in dry retention; recovered in 72 hours	-	95% removal	-	Harper	Under construction
Turnpike Authority	TP-2	Springshed	Widen Turnpike, Gotha to Beulah	Roadway; 1.25 inches treated in dry retention, recovered in 72 hours	-	86% removal	-	Harper	Under construction
Winter Garden	WG-2	Springshed	Dillard Street Pond Expansion	Project is part of permitting process for New City Hall in Winter Garden; modify storm sewer system adjacent to pond to treat previously untreated runoff	-	272.03	-	Assumed at 50% removal	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Winter Garden	WG-3	Springshed	Plant St. Segment 1	Project involves widening Plant St., including blowing out intersection of West Crown Point Rd. in Winter Garden; no stormwater treatment for this section of road prior to widening	-	250.05	-	Assumed at 50% removal	Ongoing

Table B.7. Stormwater System Rehabilitation (summarized in Table 4.6)

- = Empty cell/no data

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Mt. Dora	MD-4	Springshed	5th Ave. & Rossiter NSBB Installation	Install Suntree NSBB at 5th Ave. and Rossiter discharge into Lake Franklin, which is isolated spring-fed lake	-	64	26	FSA Load Reduction Tool	Completed
Mt. Dora	MD-5	Springshed	1552 Hilltop Dr. Pipe Relining	Reline existing corrugated metal pipe (CMP) with high-density polyethylene (HDPE) to eliminate sinkhole formation and erosion into Lake Nettie	$13,000	-	-	-	Completed
Mt. Dora	MD-6	Springshed	5th Ave. and McDonald St. Retention Pond Restoration	Remove accumulated sediment and debris from retention pond; install new inlet pipe to prevent erosion; replace erosion protection around inlet pipes	$3,000	-	-	-	Completed
Mt. Dora	MD-7	Springshed	Donnelly St. and Lincoln Ave. Pipe Repair	Headwall broke away from pipe; water undermining Donnelly St.; install drop structure and extend pipeline 140 linear feet	$35,000	-	-	-	Completed
Mt. Dora	MD-8	Springshed	Pine and Jackson Pipe Repair	Replace crushed section of 36x54 CMP to allow proper drainage of northeast area of city	$3,000	-	-	-	Completed
Orlando	ORL-11	Little Wekiva River	Sandbar Removal on Lake Sarah	Remove 300 cubic yards of sediment from Lake Sarah	$20,000	-	-	-	Completed

Table B.8. Stormwater Treatment (associated with dirt road paving) (summarized in Table 4.7)

- = Empty cell/no data

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Lake County	LC-8	Blackwater Creek	Dirt Roadway Paving	Nutrient load reductions for 25 miles of road segments that were paved and improved with ditch blocks	-	223.31	122.14	AMEC report, September 10, 2012	Completed
Orange County	OC-23	Little Wekiva Canal	11th Ave.	Pave .3-acre dirt road treatment with open swales and ditch blocks	-	2.8	2.4	-	Completed
Orange County	OC-24	Little Wekiva Canal	13th Ave.	Pave .5-acre dirt road treatment with open swales and ditch blocks	-	4.7	3.9	-	Completed
Orange County	OC-25	Little Wekiva Canal	15th Ave.	Pave .3-acre dirt road treatment with open swales and ditch blocks	-	2.8	2.4	-	Completed
Orange County	OC-26	Little Wekiva Canal	17th Ave.	Pave .6-acre dirt road treatment with open swales and ditch blocks	-	5.6	4.7	-	Completed
Orange County	OC-27	Little Wekiva Canal	Lake Pleasant Rd. Improvement	Pave .12-acre dirt road – treatment with open swales and ditch blocks	-	1.1	0.9	-	Completed
Orange County	OC-28	Little Wekiva Canal	Quenton Ave. and Range Dr.	Pave 0.3-acre dirt road – treatment with open swale and ditch blocks	-	2.8	2.4	-	Completed
Orange County	OC-29	Little Wekiva Canal	Ridge Terrace and Roan Rd.	Pave 1-acre dirt road – treatment with open swale and ditch blocks	-	9.3	9.3	-	Completed
Orange County	OC-30	Rock Springs Run	New Hampshire	Pave 0.6-acre dirt road – treatment with open swale and ditch blocks	-	5.6	5.6	-	Completed
Orange County	OC-31	Rock Springs Run	Sadler Rd.	Pave 1.1-acre dirt road – treatment with open swales and ditch blocks	-	10.2	8.7	-	Completed
Orange County	OC-32	Rock Springs Run and Little Wekiva Canal	Alternative Surface Program – Group IIIA Projects	Pave 98.93-acre dirt road – treatment with open swales and ditch blocks	-	921	779.9	-	Completed

Entity	**Project Number**	**Subbasin**	**Project Name**	**Project Detail**	**Project Cost**	**Estimated TN Load Reduction (lbs/yr)**	**Estimated TP Load Reduction (lbs/yr)**	**Nitrate Reduction Calculation Method**	**Status**
Orange County	OC-33	Rock Springs Run and Little Wekiva Canal	Alternative Surface Program – Group IIIB Projects	Pave 61.53-acre dirt roads – treatment with open swales and ditch blocks	-	573	485	-	Completed
Orange County	OC-34	Rock Springs Run and Little Wekiva Canal	Boxwood Dr. and Bull Run Rd.	Pave 0.9-acre dirt road – treatment with open swales and ditch blocks	-	8.4	7.1	-	Completed
Orange County	OC-35	Rock Springs Run and Little Wekiva River	Hereford Rd., Highland St., and Holly St.	Pave 1.5-acre dirt road – treatment with open swales and ditch blocks	-	14	11.8	-	Completed
Seminole County	SC-23	Wekiva River	Palm Springs Rd. Paving and Drainage	Pave dirt road and install 2nd-generation baffle box to provide water quality treatment; area served = 0.4 acres	$255,000	1.3	0.2	2nd-generation baffle box	Completed
Seminole County	SC-24	Wekiva River	Wekiva Springs Rd. – State Road 434 to Sabal Point	Provide water quality treatment for new impervious portions of roadway improvements through construction of on-line exfiltration trench; area served = 3.4 acres	$6,900,000	15.5	2.5	Online retention 0.25 inch	Completed

Table B.9. Street Sweeping (Table 4.6)

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Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-15	Little Wekiva River	Street Sweeping	Street sweeping occurs daily; total miles swept = 5,000 miles per year	$45,000	6,862	4440	-	Ongoing
Apopka	A-3	Rock Springs Run	Street Sweeping	Street sweeping occurs monthly; total miles swept = 3,000 miles per year	-	869	557	-	Ongoing
FDOT District 5	FDOT-8	Springshed	Street Sweeping	Street sweeping occurs monthly; total miles swept = 2,247 miles per year	-	1,098	-	Pre-/post-EMC	Ongoing
Maitland	M-1	Little Wekiva River	Street Sweeping	Streets are swept twice a month; roadway length swept = 23.86 miles per 2 weeks; total miles swept = 572.64 miles per year	-	24	15	-	Ongoing
Mt. Dora	MD-9	Springshed	Street Sweeping	Streets are swept 15 times per year; length of streets swept = 69 miles; total miles swept = 1,035 miles per year	-	1,304	2033	-	Ongoing
Ocoee	O-19	Springshed	Street Sweeping	Streets are swept daily; length = 82 miles; road length swept = 3,500 miles per year; 500 tons of debris removed in 2011	-	-	-	-	Ongoing
Orange County	OC-36	Little Wekiva Canal	Street Sweeping	Streets are swept every 6 weeks; 481,128 pounds of material removed per year	-	209	134	-	Ongoing
Orlando	ORL-12	Little Wekiva River	Street Sweeping	Streets are swept every 2 weeks; road length = 67 miles; total miles swept = 1,742 miles per year	-	25	33	-	Ongoing

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-25	Wekiva River	Street Sweeping	Arterial/collector county streets maintained: 272,525 lane feet swept 7 times yearly = 361.3 lane miles per year; subdivisions/local county streets maintained: 1,357,948 lane feet swept 2 times a year = 514.4 lane miles per year; total miles swept = 875.7 per year	-	596	268	-	Ongoing
Winter Garden	WG-4	Springshed	Street Sweeping	Streets are swept weekly; total miles swept = 6,380 miles per year	-	285	-	-	Ongoing

Table B.10. Studies (summarized in Chapter 5)

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Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-16	Little Wekiva River	Citywide Pollutant Loading Model/ H&H Study	City is contracting with consultants to complete citywide pollutant model and H&H study	$200,000	-	-	-	Start-up
Altamonte Springs	AS-17	Little Wekiva River	Lake Orienta, Adelaide, and Florida Hydrologic/Nutrient Budgets and Management Plans	City contracted with consultants to determine phosphorus and nitrogen loadings to Lakes Orienta, Florida, and Adelaide; best pollutant load reduction options recommended based on study results	$105,000	-	-	-	Completed
FDOT District 5	FDOT-9	Basin wide	Fertilizer Cessation	Reduction of bulk fertilizer use on state roadways in basin	-	1,234	-	UCF Fertilizer Study	Ongoing
Lake County	LC-9	Blackwater Creek	Royal Trails Drainage and Water Quality Improvements	Flood analysis, pollutant loading model, and conceptual project priorities are completed; this year field verification will be carried out to prioritize projects for design	$394,101	-	-	-	Completed
Orange County	OC-37	Little Wekiva River	Lake Gandy Hydrologic and Nutrient Study	Study to evaluate hydrologic conditions and nutrient loadings to Lake Gandy	-	-	-	-	Completed
Orange County	OC-38	Little Wekiva River	Lake Lawne Hydrologic and Nutrient Study	Study to evaluate hydrologic conditions and nutrient loadings to Lake Lawne	-	-	-	-	Completed
Orlando	ORL-13	Little Wekiva River	Little Wekiva River – Preliminary Engineering Evaluation Lake Lawne, Center of Commerce, and Lake Orlando Sites	Recommend nutrient reduction projects in Little Wekiva River watershed, using suggested drainage improvements from CDM report	$49,900	-	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-26	Little Wekiva Canal	Bear Lake Chain-of-Lakes Hydrology/Nutrient Budget and Water Quality Management Plan	Detailed nutrient and hydrologic study, identifying and quantifying all nutrient sources, including internal loading, ground water, surface water, precipitation, *etc*.; management plan includes potential structural and nonstructural improvements that can be made to protect and enhance water quality	-	-	-	-	Completed
Seminole County	SC-27	Little Wekiva River	Spring Lake/Spring Lake Watershed Hydrology/Nutrient Budget and Water Quality Management Plan	Detailed nutrient and hydrologic study, identifying and quantifying all nutrient sources, including internal loading, ground water, surface water, precipitation, *etc*.; management plan includes potential structural and nonstructural improvements that can be made to protect and enhance water quality	-	-	-	-	Under develop-ment
Seminole County	SC-28	Wekiva River	Wekiva Basin Stormwater Pond Enhancement Feasibility Study for Nitrogen Transport	Preliminary analysis of nitrogen transport into and out of retention pond/ground water, and follow-up analysis of improvements made to ground water discharge after addition of Bold and Gold™ amendment to pond bottom	-	-	-	-	Under develop-ment
Seminole County	SC-29	Little Wekiva Canal, Little Wekiva River, Wekiva River	Seminole County Water Quality Master Plan	Countywide assessment of all water quality data, monitoring programs, regional ponds, capital improvement plan (CIP) projects, *etc*., to improve efficiency and effectiveness of existing programs and identify additional structural/nonstructural improvement projects	-	-	-	-	Under develop-ment

Table B.11. Wetland Rehabilitation Projects

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Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Load Reduction (lbs/yr)	Estimated TP Load Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-18	Wekiva River	Wekiva GeoPark Restoration Project	Conservation project – Restore 20 acres of wetlands in Wekiva Basin GeoPark; includes removal of logging roads	$387,500	-	-	-	Completed
Mt. Dora	MD-10	Springshed	Lake John Rehabilitation	Lake John is part of greater Lake Gertrude Basin project; wetland was excavated to remove excess sediment and exotic vegetation; stepwise drainage reestablished among 3 ponds, and new vegetation planted	$1,200,000	-	-	-	Completed

Wekiva Basin BMAP Projects and Management Actions: Significant Collection System Repairs/Replacements, Sewering To Connect Households and Businesses to Central Sewer (Instead of Septic)

Table B.12. Sanitary Sewer Collection System Expansion (Table 4.3)

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Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-19	Little Wekiva River	Adventist Health System Headquarters Development	Remove 5 septic systems within 200 meters of receiving waterbody by connecting them to city sanitary system	-	72.36	12.51	TMDL report – septic calculation	Complete
Altamonte Springs	AS-20	Little Wekiva River	Spring St., Central St., Marker St., and Campello St. Septic System Removal	Remove 7 septic systems within 200 meters of receiving waterbody by connecting them to city sanitary system	-	101.31	17.51	TMDL report – septic calculation	Complete
Altamonte Springs	AS-21	Little Wekiva River/ Lake Orienta	640 Jasmine Ave. – Septic System Removal	Remove 1 septic system within 200 meters of receiving waterbody by connecting it to city sanitary system	-	14.5	2.5	TMDL report – septic calculation	Complete
Apopka	A-4	Springshed/ Rock Springs Run	Chalet North Mobile Home Park	City worked in cooperation with Orange County Environmental Protection Division (OCEPD) and park to decommission package WWTF and effluent percolation pond and connect to city's collection system	-	58,586	9,644	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Apopka	A-5	Springshed/ Rock Springs Run	Individual Septic to Sewer Projects	Dr. Philip Trinh Dental Office (place existing septic on city's wastewater collection system); Honey Transport Inc. (abandon existing septic and place business on city collection system); United Pentecostal Church (work with church to abandon existing septic system during its expansion and connect to city collection system); Robinsons Restaurant (work with restaurant to transfer wastewater effluent treatment from septic system to city's collection system)	-	3,381	557	-	Completed
Apopka	A-6	Springshed/ Rock Springs Run	Kelly Park at Rock Springs (Orange County Park)	Expand Rock Springs Rd. and Kelly Park Rd. collection system, allowing city to connect Orange County's Kelly Park recreation area to city's collection system and abandon septic	-	1,296	213	-	Completed
Apopka	A-7	Springshed/ Rock Springs Run	Kelly Park Rd. 8-inch Force Main	Install 1,250 feet of 8-inch force main along east end of Kelly Park Rd.; allows Orange County's Kelly Park to connect to city collection system and abandon septic; also allows for future septic connections near Wekiwa and Rock Springs area	-	-	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Apopka	A-8	Springshed/ Rock Springs Run	Highway 441 Force Main Extension	Extend city wastewater collection system by installing 12,236 feet of 12-inch force main to Jones Ave., making connections to Zellwin Farms and Zellwood Elementary School), and providing availability for future connections in area	-	-	-	-	Completed
Apopka	A-9	Springshed/ Rock Springs Run	Yothers Rd. and Zellwood Station	City installed 5,375 feet of 10-inch force main and lift station that allowed Zellwood Mobile Home Park to decommission its package WWTF and effluent percolation pond, reducing effluent load to basin	-	35,388	5,825	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
department (Wekiwa State Park)	WSP-2	Wekiva River	Remove Wekiva State Park from Septic	Phase 1 – 3 lift stations, convert administration building, main user area, Ranger Station, and residents in southern portion of park (*e.g.*, rangers, assistant manager, law enforcement) from septic to wastewater collection to Orange County's WWTF Phase 2 – 4 lift stations, Youth Camp, 2 additional residences, and dump station for campground; dismantle 2 spray fields Phase 3 – 2 bath houses and 38 campsites Phase 4 – Family campground sites – pending funding	$1,616,775 (Phases 1 – 4)	-	-	-	Phases 1 and 3 – completed
Mt. Dora	MD-11	Springshed	Community Development Block Grant	Extend 8-inch sewer main and install 4 laterals to connect 4 duplexes to city sewer on 11th Ave.; abandon existing septic systems	$63,000	-	-	-	Completed
Orlando	ORL-14	Little Wekiva River	Arthur Ave. Sewer Line	Install approximately 1,200 feet of gravity lines in area with septic tanks to reduce nutrient seepage into ground water table	$53.977	-	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orlando	ORL-15	Little Wekiva River	Fairview Shores – North Service Area	Improve sanitary sewer, drainage, and roadway; install new sanitary force main, lift station (#65), and gravity pipes in area with septic tanks to reduce nutrient seepage into ground water table; install 2 Stormceptors to capture gross pollutants before they reach lake	$4,522,401	-	-	-	Completed
Orlando	ORL-16	Little Wekiva River	Lynx Facility	Install sanitary sewer in area with septic tanks to reduce nutrient seepage into ground water table	-	-	-	-	Completed
Orlando	ORL-17	Little Wekiva River	Rio Grande Sanitary Sewer	Install gravity lines in area with septic tanks to reduce nutrient seepage into ground water table	$1,622,124	-	-	-	Completed
Orlando	ORL-18	Little Wekiva River	West Lake Fairview Sanitary Sewer	Install sanitary sewer in area with septic tanks to reduce nutrient seepage into ground water table	$6,000,000	-	-	-	Envisioned

Table B.13. Reclaimed Water Collection, Transmission, and Storage (Table 4.4)

- = Empty cell/no data

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-22	Little Wekiva River	Storage and Retrieval of Reclaimed Water in Cranes Roost, Regional Stormwater Facility	Department-permitted storage and retrieval of reclaimed water in Cranes Roost in 2002	$152,284	3,827 lbs/yr (38,271.24 since 2002)	1,481 (14,806 since 2002)	Sum of 2002 through 2011 annual reclaimed water flow to Cranes Roost (x) annual average nitrate concentration	Completed
Altamonte Springs (with Apopka)	AS-23	Little Wekiva River	Altamonte Springs-FDOT Integrated Reuse and Stormwater Treatment (A-FIRST)	Collection, treatment, and reuse of stormwater from Cranes Roost Basin (including Interstate 4 widening) and eliminating 2 direct wastewater discharge points to Little Wekiva River	$12,500,000 (FDOT [$4.500,000], SJRWMD [$3,500,000], Altamonte Springs [$3,000,000], and department [$1,500,000])	31,872 61,572 at final buildout)	13,993 (27,693 at final buildout)	Estimated flow and water quality calculation	Design
Apopka	A-10	Little Wekiva River	Sanlando Utilities Corp. Reuse to City	City is receiving Sanlando Utilities Corp. reclaimed water that was being discharged into Little Wekiva, starting at 1 MGD; this will also reduce ground water withdrawal from city	$3,800,000	13,698	4,566	-	Completed 2013
Apopka	A-11	Springshed /Rock Springs Run	Northwest Reclaimed/ Stormwater Storage Pond	Constructed 120-million-gallon (MG) lined reclaimed storage pond; pond also collects stormwater from 300-acre northwest recreation facility that is filtered and distributed for irrigation; this will also reduce ground water withdrawal	$750,000	-	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Apopka	A-12	Springshed /Rock Springs Run	Northwest Reclaimed/ Stormwater Storage Pond B	Construction of 21-MG lined reclaimed storage pond; pond also collects stormwater from 300-acre northwest recreation facility that is filtered and distributed for irrigation; this will also reduce ground water withdrawal	$1,587,000	-	-	-	Constructio n
Apopka	A-13	Springshed /Rock Springs Run	Northwest Reclaimed/ Stormwater Storage Pond C	Construction of 68-MG lined reclaimed storage pond; pond also collects stormwater from 300-acre northwest recreation facility that is filtered and distributed for irrigation; this will also reduce ground water withdrawal	$1,380,000	-	-	-	Bidding
Apopka	A-14	Springshed /Rock Springs Run	Altamonte Springs to Apopka	Altamonte is in construction stage of sending 3.5 MGD of reuse water to city of Apopka with potential to discharge to Little Wekiva River	-	-	-	-	Constructio n – Online October 2015
Apopka	A-15	Springshed / Rock Springs Run	Orange County Reuse to City	City of Apopka has completed installation of 20” reuse water main (RWM) along Marden Rd. This 20-inch RWM will provide point for Orange County Utilities’ (OCU) Northwest Reclaimed Water Treatment Facility (NWRWTF) interconnect. OCU will be completed with construction of its NWRWTF improvements by November 2016. Therefore, OCU/city of Apopka interconnection anticipated to be operating by November 2016.	$490,000	18,254	6,088	-	Completed

Table B.14. Sanitary Sewer Collection System Rehabilitation (Table 4.3)

\- = Empty cell/no data
N/A = Not applicable

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TN Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-24	Little Wekiva River	Central Parkway Force Main Replacement from Lift Station (LS) 54 to Montgomery Rd.	Replace 1,230 linear feet of failing 8-inch force main	$245,133	4.56	4.4	15,000 gallon/event (x) 4 events since 2000 (x) 73.0 mg/L (annual average influent nitrate concentration)	Completed
Apopka	A-16	Springshed/ Rock Springs Run	Lift Station 10 (near 441 and Sheeler) Wet Wells	Rehabilitate lift station wet well due to hydrogen sulfide dissolving concrete walls	$41,945	-	-	-	Completed
Apopka	A-17	Springshed/ Rock Springs Run	Manholes (Alabama and 8th St.; Little St. and 9th St.; Park Ave; Charleston Park Subdivision)	Reline manholes with supercoat spray to prevent leaking between bricks	$28,420	-	-	-	Completed
Apopka	A-18	Springshed/ Rock Springs Run	Victoria Plaza, Forest Ave., 3rd St., Park Ave.	Reline to correct leaking joints	$200,591	-	-	-	Completed
Apopka	A-19	Springshed/ Rock Springs Run	WWTP Expansion & nutrient removal	The City is in the design stage of upgrading the existing treatment plant and expanding capacity to 8 MGD	$38-$55 million	243,528	-	-	Design
Mt. Dora	MD-12	Springshed	Lift Station #10 Piping Replacement (Pine Ave.)	Replace 602 feet of 8-inch pipe and 2 manholes	-	-	-	-	Completed

Entity	**Project Number**	**Subbasin**	**Project Name**	**Project Detail**	**Project Cost**	**Estimated TN Reduction (lbs/yr)**	**Estimated TN Reduction (lbs/yr)**	**Nitrate Reduction Calculation Method**	**Status**
Mt. Dora	MD-13	Springshed	Pipe Lining 2007, 2008, 2009, and 2010	2007 – Line 7,094 feet of 8-inch sewer main on Clayton and Liberty Sts. 2008 – Line 8,040 feet of 8- and 10-inch sewer main (Grandview, Alexander, Tremain, Baker, Lake Dora Rd, Pine Ave., and Donnelly St.). 2009 – Line 3,746 feet of 8-inch pipe on Old Eustis Rd. and Donnelly St. 2010 – Line 1,500 feet of 21-inch pipe along Lake John	$705,907	-	-	-	Completed
Ocoee	O-20	Springshed/ Wekiva River	Lift Station #7 Rehab and Relocation	Existing lift station at end of life cycle and experiencing operational issues; relocate replacement station north 900 feet, provide new generator set, provide bypass pumping, and increase pump horsepower	$1,901,067	N/A	-	N/A	Completed and in operation

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TN Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orange County	OC-39	Springshed/ Study Area	Force Main/ Gravity Replacement	Install 1,200 feet of 4-inch force main; new force main expected to prevent wastewater leakage; All American Blvd. from Clarcona Ocoee to Kennedy; force main from Avalon Rd. to Hiawassee Rd. 7,600 linear feet 36-inch force main; 760 linear feet 30-inch force main; and 1,200 linear feet 12-inch force main Many parcels near 35-21-28-0000-00-150; install 4,500 feet of 12-inch force main. New force main expected to prevent wastewater leakage. Clarcona Ocoee Rd. from Ingram to Clarke; install 11,000 feet of force main from Indian Hill Rd. to PS #3411. New force main will prevent wastewater leakage. North Pine Hills Rd. at Indian Hill Rd. and Clarcona Ocoee Rd.; relocate 710 linear feet 4-inch force main 1,280 linear feet 16-inch force main; and 710 linear feet 8-inch gravity main Many parcels near 30-21-29-0521-00-010	$10,494,000	-	176.7	Notes	90% design

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TN Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orange County	OC-40	Springshed/ Study Area	Pump Station Removal/Relocation (R/R)	Replace pump station #3006, Huggins and North Hastings R/R of wastewater pump stations, as follows: #3038 26-22-28-0000-00-003 #3411 06-22-29-5844-00-110 #3099 20-23-29-5360-00-170 #3133 21-23-29-5361-00-211 #3225 12-23-30-1280-00-001 #3251 33-21-29-1341-00-002 #3302 32-21-29-7134-03-301 #F3169 19-22-29-6954-08-051 #3230 23-22-28-0000-00-053 #F3195 Near 13-22-28-5175-04-040 #3014 12-22-28-0885-00-000 #3028 01-22-28-0000-00-005 #3202 01-22-28-4743-00-040	$13,263,500	-	15,589.2	Notes	Ongoing

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TN Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orange County (Utilities)	OC-41	Springshed/ Surface Watershed	Force Main/Gravity Sewer Rehab	Combine cured in-place pipe (CIPP) and point repairs to restore approximately 10,000 linear feet of 8-inch gravity sanitary sewer, including lining or coating 40 manholes. Near 20-22-29-4552-08-001; in addition to upsized storm pipes that go to Lake Robin, project includes replacing force main, gravity line, and manhole; replacement of force main will reduce leakage of sewage Near 24-22-28-7573-15-250; remove and relocate Pump Station #3045, plus remove existing force main and install 800 feet of gravity sewer., 29-21-29-4940-00-230	$1,780,000	605.55	157	N/A	Construction 75% completed
Orlando	ORL-19	Little Wekiva River	Lift Station #37 Improvements	Lift station is one of oldest in city; wet well is made of brick and starting to fail; replace lift station with precast concrete with liner and bigger capacity; install new pumping station and associated components, along with standby generator; also replace gravity pipes in area	$1,400,000	-	-	-	Completed
Orlando	ORL-20	Little Wekiva River	Lift Station #85 Variable Frequency Drives	Install variable frequency drives that will extend life of pump motors, preventing potential overflows; will also be more energy efficient at future cost savings to city	$2,830	-	-	-	Completed
Orlando	ORL-21	Little Wekiva River	Lift Station #93 Improvements	Relocate and completely rebuild lift station with new, upgraded equipment, including generator not present at previous location	$767,632	-	-	-	Completed
Orlando	ORL-22	Little Wekiva River	West Lake Silver Phase 1 and 2	Install lift station in new commercial area	-	-	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TN Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Orlando	ORL-23	Little Wekiva River, Little Wekiva Canal	Mercy Dr. Sewer Rehab	Replace force main on Mercy Dr. from south of Princeton to LS #45; connect or replace new sanitary pipe to existing pipes	$878,400	-	-	-	Completed
Orlando	ORL-24	Little Wekiva River, Little Wekiva Canal	Regent Ave. Force Main 2613	Construct force main along Silver Star Rd. connecting Lift Station #37 to existing 24-inch force main and 24-inch gravity sewer on Mercy Dr.	$2,000,000	-	-	-	Completed
Sanlando Utilities Corp.	SUC-1	Wekiva River	Sweetwater I&I Investigation & Collection System Repairs	Camera-inspect sanitary collection system in Sweetbrier subdivision and correct noted deficiencies	$900,000	-	-	-	Completed
Seminole County	SC-30	Wekiva River	Apple Valley LS	Relocate and build brand new lift station	$351,975	-	-	-	Completed
Seminole County	SC-31	Wekiva River	Bridgewater Dr.	Manhole sealing	$16,179	-	-	-	Completed
Seminole County	SC-32	Wekiva River	Gravity Main Testing and Repairs	Lateral repair – 1512 Cherry Rdg., 2067 Northumbria, 169 Killarney Ct., Shadowmoss Dr. Gravity main repair – 844 Preserve Terr., International Dr. and County Road 46A, Lake Rena Dr. Smoke test and seal laterals – Alaqua Lakes, Heathrow Woods # 1 & 2 LS, Lake Forest 1 & 2, Lake Forest 1 & 2 Additional work – Lake Forest 3 & 4, Aster Farms	$401,878	-	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TN Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Seminole County	SC-33	Wekiva River	Lift Station Rehab	Seal wet well and rehabilitate lines (Wilson School LS, Breckenridge LS, Stockbridge LS, Lake Forest #5 LS, Buckingham LS, Retreat at Wekiva LS, Aster Farms LS, Bel-Aire #3 LS, Bel-Aire #1 LS, Heathrow Master LS)	$324,353	-	-	-	Completed
Winter Garden	WG-5	Springshed	State Road 50 Utility Relocation	Replace city utilities due to widening of State Road 50; project includes replacement of 5,210 linear feet of 24-inch clay pipe and 2,650 linear feet of 18-inch clay pipe	-	-	-	-	Ongoing

Table B.15. Sanitary Sewer Inspections

\- = Empty cell/no data

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Mt. Dora	MD-14	Springshed	Lift Station #1, 2, 3, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 22, 25, 27, 28, 30, 31, & 34 Piping	#1 - Clean and camera-inspect 8- and 10-inch pipe totaling 11,981 feet (Alexander St., Donnelly St., Baker St., Lake Dora Rd., Tremain St.) #2 - Clean and camera-inspect 8-inch pipe totaling 5,275 feet (Grandview, Clayton, Liberty, Simpson, Rhodes, Rossiter, Stowe, Plymouth, First Ave.) #3 - Clean and camera-inspect 8-inch pipe totaling 2,223 feet (Sand Lake Ct., High Pt.) # 7 - Clean and camera-inspect 8-inch pipe totaling 1,975 feet and upsized 360 feet of force main (Chetanham Ct., Coventry Ct., Cantebury Ct., Dorsett Ct., Liberty Ave.) #9 - Clean and camera-inspect 12,281 feet of 8-inch pipe (2nd Ave., 3rd Ave., 4th Ave., 5th Ave., Simpson, Rhodes, Rossiter, Lake Franklin Dr., Summit Ave, Grovel and Pinecrest, Stanley Bell Dr.) #10 - Clean 22,558 feet of 8-inch pipe; camera-inspect 2,500 feet of 8-inch pipe (Unser, Orange, Simpson, Rhodes, Wardell, Limit Ave., Jefferson Dr., Jackson Ave., Grant Ave., Florida Ave., Pine Ave., Highland Ave., Fearon Ave.) # 11 - Smoke test 10,228 feet of 8-, 10-, and 12-inch pipe (Stacey Dr., Sunrise Blvd., Karen Dr., Stacey Cir., Brookside Cir., Brookside Dr., Elizabeth Ln., Eric Ln., Oak Cir, Briarcliff Ln., Cottonwood Ln.) #12 - Smoke test 3,214 feet of 8-inch pipe (St. Andrews Way, Heathland Ct.) #13 - Smoke test 10,811 feet of 8-inch pipe (Laurel Ridge Dr., St. James Way, Pine Hollow Dr., Arcadian Ct., Covey Cir., Friars Ct.) #14 - Smoke test 1,524 feet of 8-inch pipe on Greenbriar Tr. #15 - Smoke test 11,674 feet of 8-inch pipe (Hunter Green, Country Club Blvd., Oakcrest Cir., Laurel Dr., Shadowood Cir., Falconbridge Pl., Spring Creek Ct.)	$21,000	-	-	-	Completed

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Mt. Dora	MD-14 (continued)	Springshed	Lift Station #1, 2, 3, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 22, 25, 27, 28, 30, 31, & 34 Piping	#16 - Smoke test 5,399 feet of 8-inch pipe (Park Forest Blvd., Chase Ct., Stafford Springs Blvd., Citrus Cir., Edgewater Dr., Wyngate Ct., Country Club Blvd.) #17 - Smoke test 3,885 feet of 8-inch pipe (Loch Leven Ln., Juliette Blvd., Augustus Ln., Caesars Ct.) #20 - Clean and camera-inspect 8-inch pipe totaling 5,688 feet (Waterman Ave., Oakhill Ln., Mapleton Ln., Rockport Ln., Elmwood Ln., York Ln., Warfield Way, Salem Ave., Waterford Ave., Essex Ave., Beacon Ln.) #22 - Clean and camera-inspect 3,666 ft of 8- and 21-inch pipe on Limit Ave. #23 - Clean and camera-inspect 745 feet of 8-inch pipe on Magnolia Landing #25 - Clean and camera-inspect 6,741 feet of 8-inch pipe (Village Ln., Stratford Ln., Foxboro Ct., Amherst Ln., Clagary Ln., Mary Ln., Ken Ct., David Ct., Durham Ct.) #27 - Clean and camera-inspect 2,628 feet of 8-inch pipe on Spring Harbor Cir. #28 - Clean and camera-inspect 1,163 feet of 8-inch pipe #30 - Clean and camera-inspect 2,509 feet of 8-inch pipe (Oleander, Camellia, Azalea, Laurel Dr.) #31 - Clean and camera-inspect 512 feet of 8-inch pipe on Arbor Way #34 - Clean, camera-inspect, and smoke test 10,168 feet of 8-inch pipe (Castelli Blvd., Capri Ln., Palermo Ct., Isola Bella Blvd., Stefano Ct ., Murano Ct.)	$21,000	-	-	-	Completed
Orlando	ORL-25	Little Wekiva River	Sanitary System Inspections	Conduct proactive inspections and perform routine maintenance on lift stations and sanitary lines; identify problem areas, and increase maintenance frequency or perform repairs to prevent overflows from occurring; also assist with Sunshine State One-Call of Florida ("Call Before You Dig"/Line Locater)	-	-	-	-	Ongoing

Table B.16. Sanitary Sewer System Study (Chapter 5)

N/A = Not applicable

Entity	Project Number	Subbasin	Project Name	Project Detail	Project Cost	Estimated TN Reduction (lbs/yr)	Estimated TP Reduction (lbs/yr)	Nitrate Reduction Calculation Method	Status
Altamonte Springs	AS-25	Little Wekiva River	Citywide I&I Study	Contract with consultant to evaluate city's sewer system to identify areas prone to I&I and develop schedule for repair	$80,000	N/A	N/A	N/A	Study in process

Appendix C: Monitoring Stations

The tables in this appendix list the following Wekiva River and Rock Springs Run monitoring stations:

- Core surface water.
- Supplemental surface water.
- Springs.
- Ambient ground water.
- Biological monitoring.
- Flow measurement.

The following information is provided:

- Indication of core parameters monitored.
- Sampling entity.
- Station number and name.
- Subbasin.
- Latitude and longitude.

Table C.1. Core Surface Water Monitoring Stations

Notes: Sort is by "sampling entity" and "station name."
N/A = Not applicable
Latitude and longitude are shown in decimal form.

Sampling Entity	Station Number or Name	Station Description	Subbasin	Latitude	Longitude
City of Altamonte Springs	N/A	Little Wekiva River 119 Variety Tree Cir.	Little Wekiva River	28.65469	-81.40609
City of Altamonte Springs	N/A	Little Wekiva River Merrill Park	Little Wekiva River	28.67697	-81.41461
City of Altamonte Springs	N/A	Little Wekiva River Montgomery Rd. Bridge	Little Wekiva River	28.67909	-81.40242
City of Altamonte Springs	N/A	Little Wekiva River Sanlando Office Park	Little Wekiva River	28.68422	-81.39703
City of Altamonte Springs	N/A	Little Wekiva River Seminole Trail	Little Wekiva River	28.66584	-81.41093
City of Apopka	A25	Lake Marshall (west of State Road 429 and Lake Marshall Rd.)	Springshed	28.67803	-81.53292
City of Apopka	A51	Dream Lake (downtown Apopka area – Park Ave. and Myrtle St.)	Rock Springs Run	28.68424	-81.51154
City of Apopka	BW51	Lake Pleasant (Lake Pleasant Rd. and Apopka Blvd. south of 441)	Little Wekiva Canal	28.65686	-81.48099
City of Maitland	N/A	Lake Destiny (center)	Little Wekiva River	28.63985	-81.39120
City of Maitland	N/A	Lake Harvest (center)	Little Wekiva River	28.62358	-81.39600
City of Maitland	N/A	Lake Hungerford (center)	Little Wekiva River	28.62082	-81.38967
City of Maitland	N/A	Lake Loch Lomond (center)	Little Wekiva River	28.63680	-81.39270
City of Maitland	N/A	Lake Lucien (center)	Little Wekiva River	28.62707	-81.39035
City of Maitland	N/A	Lake Shadow (center)	Little Wekiva River	28.62330	-81.40303
City of Orlando	N/A	Lake Lawne – North (center of northern lobe)	Little Wekiva Canal	28.56690	81.43800
City of Orlando	N/A	Lake Orlando (West) (aka Lake Wekiva)	Little Wekiva Canal	28.59660	81.43330
City of Orlando/OCEPD	City Number = N/A; Orange County Number = NPDES*[Date]*-1/LWO	Little Wekiva River	Little Wekiva River	28.61300	81.42160

Sampling Entity	Station Number or Name	Station Description	Subbasin	Latitude	Longitude
Lake County (Water Resource Management Lab [WRM LAB])	BWC44	BWC44	Blackwater Creek	28.87464	-81.48942
Lake County (Adopt-a-Lake)	DALHOUSIBR	Lake Dalhousie	Blackwater Creek	28.90255	-81.61795
Lake County (Adopt-a-Lake)	SENECASESH	Lake Seneca (off Lake Seneca Rd.)	Blackwater Creek	28.86753	-81.58619
OCEPD	BWB	Big Wekiva B (Wekiva Marina dock on the main river)	Upper Wekiva River	28.71366	-81.44538
OCEPD	BWKP	Big Wekiva KP (Kelly Park by the bathing beach)	Rock Springs Run	28.75612	-81.49861
OCEPD	LWA	Little Wekiva A (Silver Star Rd. north side of bridge)	Little Wekiva River	28.57816	-81.43447
OCEPD	LWB	Little Wekiva B (North OBT north side of bridge just past All American Blvd.)	Little Wekiva River	28.60938	-81.42723
OCEPD	LWD	Little Wekiva D (Oranole Rd., north side of bridge)	Little Wekiva River	28.64000	-81.42420
Seminole County	LAN	Little Wekiva River – LAN (at Springs Landing Blvd.)	Little Wekiva River	28.70194	-81.39194
Seminole County	SPG	Spring Lake – SPR	Little Wekiva River	28.65242	-81.40050
Seminole County	WEK46	Wekiva River WEK 46 at State Road 46)	Wekiva River	28.81550	-81.41949
Seminole County	WA	Little Wekiva River – WA (off Weathersfield Ave.)	Little Wekiva River	28.65917	-81.40722
SJRWMD	02235000	Wekiva River near Sanford at State Road 46	Wekiva River	28.81523	-81.41948
SJRWMD	BWCCPB	Blackwater Creek at Carter Prop. Bridge	Blackwater Creek	28.85749	-81.43689
SJRWMD	LW-MP	Little Wekiva River off Bull Run Rd.	Little Wekiva River	28.73086	-81.39733
SJRWMD	RSR-SR	Rock Springs Run, campsite within Rock Springs Run State Reserve	Rock Springs Run	28.74055	-81.46680
SJRWMD	BWC44	Blackwater Creek at State Road 44	Blackwater Creek	28.87464	-81.48942

Table C.2. Supplemental Surface Water Monitoring Stations

Notes: Sort is by "sampling entity" and "station name."
- = Empty cell/no data
N/A = Not applicable
Latitude and longitude are shown in decimal form.

Sampling Entity	Station Number or Name	Station Description	Subbasin	Latitude	Longitude
City of Altamonte Springs	ADE_Main	Lake Adelaide (main waterbody)	Little Wekiva River	28.66662	-81.36500
City of Altamonte Springs	ADE_Weir	Lake Adelaide (weir at Palm Spring)	Little Wekiva River	28.66952	-81.37389
City of Altamonte Springs	CR_EastBW	Cranes Roost (east boardwalk)	Little Wekiva River	28.66862	-81.38183
City of Altamonte Springs	FLA_Ctr	Lake Florida (center)	Little Wekiva River	28.67369	-81.36395
City of Altamonte Springs	LOT_Ctr	Lake Lotus (center)	Little Wekiva Canal	28.64805	-81.42176
City of Altamonte Springs	LWR_Northwestern Bridge	Little Wekiva River (at Northwestern Bridge)	Little Wekiva River	28.65409	-81.41055
City of Altamonte Springs	ORI_NMidLobe	Lake Orienta (north middle lobe)	Little Wekiva River	28.65920	-81.36954
City of Altamonte Springs	ORI_NorthLobe	Lake Orienta (north lobe)	Little Wekiva River	28.66177	-81.36849
City of Altamonte Springs	ORI_SMidLobe	Lake Orienta (south middle lobe)	Little Wekiva River	28.65789	-81.37317
City of Altamonte Springs	ORI_SouthLobe	Lake Orienta (south lobe)	Little Wekiva River	28.65397	-81.37756
City of Altamonte Springs	PEA_Ctr	Lake Pearl (center)	Little Wekiva River	28.66306	-81.42485
City of Orlando	N/A	Bay Lake (center)	Little Wekiva Canal	28.59120	81.42180
City of Orlando	N/A	Kasey Lake (center)	Little Wekiva Canal	28.59910	81.44320
City of Orlando	N/A	Kelly Lake (eastern portion of lake)	Little Wekiva Canal	28.59900	81.44800
City of Orlando	N/A	Kristy Lake (southwest portion of lake)	Little Wekiva Canal	28.59750	81.44710
City of Orlando	N/A	Lake Daniel (center)	Little Wekiva Canal	28.58210	81.40120
City of Orlando	N/A	Lake Fairhope (center)	Little Wekiva Canal	28.58420	81.39370
City of Orlando	N/A	Lake Fairview – North (center)	Little Wekiva Canal	28.59700	81.40510

Sampling Entity	Station Number or Name	Station Description	Subbasin	Latitude	Longitude
City of Orlando	N/A	Lake Fairview - South (center)	Little Wekiva Canal	28.59150	81.40560
City of Orlando	N/A	Lake Lawne – South (center of southernmost lobe)	Little Wekiva Canal	28.56010	81.43830
City of Orlando	N/A	Lake Orlando East (aka Lake Wekiva) (center of eastern lobe)	Little Wekiva Canal	28.59940	81.42660
City of Orlando	N/A	Lake Sarah (center)	Little Wekiva Canal	28.58460	81.40200
City of Orlando	N/A	Little Lake Fairview (center)	Little Wekiva Canal	28.59140	81.38860
Lake County (WRM LAB)	DORR	Lake Dorr (off State Road 19 north of Altoona)	Blackwater Creek	29.01576	-81.63494
Lake County (Adopt-a-Lake)	WOLFSINK	Wolfbranch Sink (south of State Road 46, east end of Robie St., Mt. Dora)	Blackwater Creek	28.79414	-81.61245
Lake County (WRM LAB)	-	Sulphur Run	Blackwater Creek	28.87667	-81.44333
OCEPD	BW19	Crooked Lake	Little Wekiva Canal	28.59846	-81.47885
OCEPD	BW41	Lake McCoy (center)	Rock Springs Run	28.68833	-81.49658
OCEPD	BW52	Lake Prevatt (center)	Rock Springs Run	28.70843	-81.48936
OCEPD	BW81	Sand Lake (Big Wekiva Basin) (center)	Rock Springs Run	28.72155	-81.47216
OCEPD	BWKL	Big Wekiva KL (Katie's Landing) (off bulkhead)	Upper Wekiva River	28.82918	-81.41300
OCEPD	LW7	Lake Gandy (center)	Little Wekiva Canal	28.62786	-81.43244
OCEPD	XCONTRVRSD1	Little Wekiva at Riverside	Little Wekiva River	28.63272	-81.41638
Seminole County	BER	Bear Lake	Blackwater Creek	28.65687	-81.44661
Seminole County	BRA	Lake Brantley	Upper Wekiva River	28.69270	-81.42300
Seminole County	CUB	Cub Lake	Little Wekiva Canal	28.64603	-81.44078
Seminole County	LBR	Little Bear Lake	Little Wekiva Canal	28.64659	-81.44411

Sampling Entity	**Station Number or Name**	**Station Description**	**Subbasin**	**Latitude**	**Longitude**
Seminole County	LWEK	Little Wekiva River at State Road 434	Little Wekiva River	28.68722	-81.39694
Seminole County	MIR	Mirror Lake	Little Wekiva River	28.66826	-81.43994
Seminole County	MOB	Lake Mobile	Little Wekiva River	28.67214	-81.35355
Seminole County	MRI	Lake Marion	Springshed	28.67881	-81.36633
Seminole County	MRK	Lake Markham	Lower Wekiva River	28.80298	-81.39828
Seminole County	YNK	Yankee Lake	Lower Wekiva River	28.80020	-81.39494

TABLE C.3. SPRINGS MONITORING STATIONS

Notes:
All stations are "core."
Sort is by "sampling entity" and "station name."
Latitude and longitude are shown in decimal form.

SAMPLING ENTITY	STATION NUMBER OR NAME	STATION NAME	SUBBASIN	LATITUDE	LONGITUDE
OCEPD	XWEKIVASW1	Wekiwa Springs (SW – WS)	Springshed	28.71191	-81.46045
OCEPD	BWD (formerly BW82)	Wekiwa Springs (near boil)	Springshed	28.71287	-81.45935
SJRWMD	Rock Spg	Rock Spring (at Apopka)	Springshed	28.75644	-81.50174
SJRWMD	Wekiwa Spg	Wekiwa Spring (at Altamonte)	Springshed	28.71189	-81.46042
SJRWMD	Miami Spg	Miami Spring (at Longwood)	Springshed	28.71017	-81.44303
SJRWMD	Palm Spg	Palm Spring (at Longwood)	Springshed	28.69112	-81.39284
SJRWMD	Sanlando Spg	Sanlando Spring (at Longwood)	Springshed	28.68870	-81.39530
SJRWMD	Starbuck Spg	Starbuck Spring (at Longwood)	Springshed	28.69684	-81.39106

TABLE C.4. AMBIENT GROUND WATER MONITORING STATIONS

Notes:
All stations are "core."
Sort is by "sampling entity" and "station name."
Latitude and longitude are shown in decimal form.

SAMPLING ENTITY	STATION NUMBER	STATION NAME	STATION LOCATION DESCRIPTION	LATITUDE	LONGITUDE	DEPTH OF MONITORING ZONE
City of Apopka	MWB-3	WAFR#5443/65630, GMS#3048A13435	Sprayfield – South Field Cleveland St. – Background Well	28.651428	-81.49859	44
City of Apopka	MWB-6	WAFR#5438/5453/65633, GMS#3048A13440	Sprayfield – East Field Cleveland St. – Background Well	28.654698	-81.49984	43
City of Mt. Dora	MW-4	MW-4	City of Mt. Dora WWTF Sprayfield – Background Well	28.607417	-81.54806	77.66
City of Mt. Dora	MW-13	MW-13	City of Mt. Dora WWTF Christian Home Irrigation – Background Well	28.607417	-81.54806	149.35
City of Winter Garden	MWC-1	MWC-1	Background well associated with RIBs – also referred to as MW-B	28.607417	-81.54806	22
Lake County WRM Lab	EUS-AB2	EUS-AB2	Eustis Spray Field – Background Well	28.842493	-81.57229	160
Lake County WRM Lab	FS39	FS39	Mt. Plymouth Rd. fire station	28.807449	-81.53620	Unknown possibly available from SJRWMD
Lake County WRM Lab	Irrigation well	Irrigation well	Irrigation well at intersection of State Road 44 and County Road 437	28.84648	-81.55724	Depth is 135 feet; casing to 84 feet
OCEPD	XWEKIVAMW1	MW-1	1750 Gulf Winds Ct.	28.709476	-81.50432	10
OCEPD	XWEKIVAMW3	MW-3	2241 Park Village Pl.	28.708823	-81.47158	15
OCEPD	XWEKIVAMW6	MW-6	1516 Sunset View Cir.	28.679283	-81.47840	10
OCEPD	XWEKIVAMW7	MW-7	1525 Sunsetview Cir.	28.679028	-81.47823	10
OCEPD	XWEKIVAMW10	MW-10	2421 Cimmaron Ash Way	28.678655	-81.46516	15
OCEPD	XWEKIVAMW15	MW-15	996 Piemont Oaks Dr.	28.665336	-81.47100	15
OCEPD	XWEKIVAMW17	MW-17	60 N. Cervidac Dr.	28.678423	-81.50014	10
OCEPD	XWEKIVAMW20	MW-20	2112 Wekiva Oaks Dr.	28.662893	-81.47187	10
Orange County Utilities	5252	MWB-12	Northwest Water Reclamation Facility – Apopka, FL – Background	28.62252	-81.52725	30

Sampling Entity	Station Number	Station Name	Station Location Description	Latitude	Longitude	Depth of Monitoring Zone
Orange County Utilities	57407	MWB-11	Northwest Water Reclamation Facility – Apopka, FL – Background	28.63931	-81.53269	53
Orange County Utilities	6-06	6-06 / 5147	WCII RIB Site 6 – Background Well	28.49825	-81.61243	40.21
SJRWMD	L-0814	Seminole SF New	Seminole State Forest – New at Cassia	28.88986	-81.46083	38
SJRWMD	L-0815	Seminole SF New	Seminole State Forest – New at Cassia	28.88986	-81.46083	72
SJRWMD	L-0816	Seminole SF New	Seminole Forest – New at Cassia	28.88986	-81.46083	220
SJRWMD	L-0929	Lk Norris Wells	Lake Norris Wells at Paisley (surficial aquifer)	28.92272	-81.56993	25
SJRWMD	L-0930	Lk Norris Wells	Lake Norris Wells at Paisley (intermediate confining aquifer)	28.92272	-81.56993	95.5
SJRWMD	L-0935	Lk Norris Wells	Lake Norris Wells at Paisley (upper Floridan aquifer)	28.92272	-81.56993	238
SJRWMD	OR0106	Plymouth Twr	Plymouth Tower Deep	28.70836	-81.58089	395
SJRWMD	OR0107	Plymouth Twr	Plymouth Tower Surficial	28.70836	-81.58089	40
SJRWMD	OR0547	Wekiva Spg SP	Wekiva Springs State Park	28.71117	-81.58089	645
SJRWMD	OR0548	Wekiva Spg SP	Wekiva Springs State Park	28.71117	-81.58089	155
SJRWMD	OR0546	Wekiva Spg SP	Wekiva Springs State Park	28.71117	-81.58089	60
SJRWMD	OR0650	Rock Spg Wells	Rock Springs Wells at Sorrento	28.77608	-81.43899	15
SJRWMD	OR0651	Rock Spg Wells	Rock Springs Wells at Sorrento	28.77608	-81.43899	72
SJRWMD	OR0652	Rock Spg Wells	Rock Springs Wells at Sorrento	28.77608	-81.43899	506
SJRWMD	OR0662	Rock Spg Wells	Rock Springs Wells at Sorrento	28.77608	-81.43899	180
SJRWMD	OR0661	Crate Mill	Crate Mill at Apopka (surficial aquifer)	28.66685	-81.50845	44
SJRWMD	OR0796	Crate Mill	Crate Mill at Apopka	28.66639	-81.50861	270
SJRWMD	OR0893	Prevatt Lk	Prevatt Lake (upper Floridan aquifer)	28.70757	-81.48812	140

Sampling Entity	Station Number	Station Name	Station Location Description	Latitude	Longitude	Depth of Monitoring Zone
SJRWMD	OR0894	Prevatt Lk	Prevatt Lake	28.70759	-81.48812	20
SJRWMD	OR1108	Lk Gem ES Wells	Lake Gem ES Wells	28.60509	-81.48859	39
SJRWMD	OR1110	Lk Gem ES Wells	Lake Gem ES Wells	28.60509	-81.48859	180
SJRWMD	OR1109	Lk Gem ES Wells	Lake Gem ES Wells	28.60509	-81.48859	90
SJRWMD	OR1121	Johns LK E Wells	Johns Lake E Wells (surficial aquifer)	28.52914	-81.61033	30
SJRWMD	OR1123	Johns LK E Wells	Johns Lake E Wells	28.52914	-81.61033	170
SJRWMD	S-0716	Sylvan Lake	Sylvan Lake (surficial aquifer)	28.4805879	-81.2302.459	20
SJRWMD	S-0717	Sylvan Lake	Sylvan Lake (intermediate aquifer)	28.4805884	-81.2302408	64
SJRWMD	S-0718	Sylvan Lake	Sylvan Lake (upper Floridan aquifer)	28.4805849	-81/2302.51	202
SJRWMD	S-1310	Yankee Lk	Yankee Lake STP at Sanford	28.82398	-81.39738	35
SJRWMD	S-1230	Yankee Lk	Yankee Lake STP at Sanford	28.82398	-81.39738	403
SJRWMD	S-1015	Charlotte St	Charlotte St. at Altamonte Springs	28.68239	-81.35551	50

Table C.5. Water Quality and Flow Monitoring Stations

Notes:
- = Empty cell/no data
Latitude and longitude are shown in decimal form.

Sampling Entity	Station Number or Name	Station Name	Subbasin	Latitude	Longitude
OCEPD	BWB	Big Wekiva B (Wekiva Marina)	Upper Wekiva River	28.71366	-81.44538
OCEPD	BWKP	Big Wekiva KP (Kelly Park)	Rock Springs Run	28.75612	-81.49861
OCEPD	BWD	Wekiva Springs (formerly BW82)	-	28.71287	-81.45935
OCEPD	LWA	Little Wekiva A (Silver Star Rd.)	Little Wekiva River	28.57816	-81.43447
OCEPD	LWB	Little Wekiva B (North OBT)	Little Wekiva River	28.60938	-81.42723
OCEPD	LWD	Little Wekiva D (Oranole Rd.)	Little Wekiva River	28.64000	-81.42420
SJRWMD	02235000	02235000/ Wekiva River at State Road 46	Wekiva River	28.81523	-81.41948
SJRWMD	BWC44	Blackwater Creek at State Road 44/44A	Blackwater Creek	28.87464	-81.48942
SJRWMD	Miami Spg	Miami Spring	-	28.71017	-81.44303
SJRWMD	Palm Spg	Palm Spring	-	28.69112	-81.39284
SJRWMD	Rock Spg	Rock Spring	-	28.75644	-81.50174
SJRWMD	Sanlando Spg	Sanlando Spring	-	28.68870	-81.39530
SJRWMD	Starbuck Spg	Starbuck Spring	-	28.69684	-81.39106
SJRWMD	Wekiwa Spg	Wekiwa Spring	-	28.71189	-81.46042

TABLE C.6. FLOW-ONLY MONITORING STATIONS

Note:
Latitude and longitude are shown in decimal form.

SAMPLING ENTITY	STATION NUMBER	STATION DESCRIPTION	SUBBASIN	LATITUDE	LONGITUDE
OCEPD	XCONTRVRSD1	Little Wekiva at Riverside	Little Wekiva River	28.63272	-81.41638
SJRWMD	30143084	Blackwater Creek DeBary	Blackwater Creek	28.85750	-81.43691
SJRWMD	09512135	Wekiva River Railroad Bridge	Lower Wekiva River	28.79264	-81.41336
SJRWMD/USGS	08561939	Little Wekiva River (at Altamonte Springs)	Little Wekiva River	28.68708	-81.39714

Table C.7. Biological Monitoring Stations

Notes:
No stations are "core."
All stations are supplemental.
Sort is by "sampling entity" and "station name."
Latitude and longitude are shown in decimal form.
- = Empty cell/no data
N/A = Not applicable

Sampling Entity	Station Number	Station Name	Station Location Description	Station Type	Sample Type
City of Orlando/ OCEPD	City Number = N/A; Orange County Number = NPDES*[Date]*-1/LWO	Little Wekiva River	100 meters of stream – West of All American Blvd; south of Edgewater Dr (located ~ 750 feet due west of intersection of All American Blvd./Edgewater Dr.)	Macroinvertebrate Assessment	Grab + biological
OCEPD	BWKP	Big Wekiva KP (Kelly Park)	Down by bathing beach boardwalk	Water Quality, Flow	SCI
OCEPD	LW7	Gandy	Lake Center	Water Quality	Aquatic vegetation assessment
OCEPD	LWD	Little Wekiva D (Oranole Rd)	Sample north side of bridge	Water Quality, Flow	SCI
Seminole County	BER	Bear	Bear Lake	Vegetation Assessment	LVI
Seminole County	BER	Bear	Bear Lake	Macroinvertebrate Assessment	Lake Condition Index (LCI)
Seminole County	BER	Bear	Bear Lake	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	BRA	Brantley	Lake Brantley	Vegetation Assessment	LVI
Seminole County	BRA	Brantley	Lake Brantley	Macroinvertebrate Assessment	LCI
Seminole County	BRA	Brantley	Lake Brantley	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	CUB	Cub	Cub Lake	Vegetation Assessment	LVI
Seminole County	CUB	Cub	Cub Lake	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	LBR	Little Bear	Little Bear	Vegetation Assessment	LVI
Seminole County	LBR	Little Bear	Little Bear	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	LWEK	Little Wekiva River – SR434	Little Wekiva River at West State Road 434	Macroinvertebrate Assessment	BioRecon

Sampling Entity	Station Number	Station Name	Station Location Description	Station Type	Sample Type
Seminole County	MRK	Markham	Lake Markham	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	MIR	Mirror	Mirror Lake	Macroinvertebrate Assessment	LCI
Seminole County	MIR	Mirror	Mirror Lake	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	MOB	Mobile	Lake Mobile	Vegetation Assessment	LVI
Seminole County	MOB	Mobile	Lake Mobile	Macroinvertebrate Assessment	LCI
Seminole County	SPG	Spring	Spring Lake	Vegetation Assessment	LVI
Seminole County	SPG	Spring	Spring Lake	Macroinvertebrate Assessment	LCI
Seminole County	SPR	Spring	Spring Lake	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	SPRW	Springwood	Springwood	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	SPRWW	Springwood Waterway	Springwood Waterway	Whole Lake Assessment	Aquatic vegetation assessment
Seminole County	SYL	Sylvan	Lake Sylvan	Vegetation Assessment	LVI
Seminole County	SYL	Sylvan	Lake Sylvan	Macroinvertebrate Assessment	LCI
Seminole County	SYL	Sylvan	Lake Sylvan	Whole Lake Assessment	Aquatic vegetation assessment
SJRWMD	RSR1	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR2	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR3	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR4	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR5	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR6	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR7	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment

SAMPLING ENTITY	STATION NUMBER	STATION NAME	STATION LOCATION DESCRIPTION	STATION TYPE	SAMPLE TYPE
SJRWMD	RSR8	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR9	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR10	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR11	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR12	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR13	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR14	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR15	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	RSR16	-	Rock Springs Run	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR1	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR2	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR3	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR4	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR5	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR6	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR7	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR8	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR9	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR10	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR11	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment

Sampling Entity	Station Number	Station Name	Station Location Description	Station Type	Sample Type
SJRWMD	WEKR12	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR13	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR14	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR15	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR16	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR17	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR18	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR19	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR20	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR21	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR22	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR23	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR24	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment
SJRWMD	WEKR25	-	Wekiva River	SAV/Algal Survey	Aquatic vegetation assessment

Appendix D: Bibliography of Key References and Websites

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Websites:

Table D.1. Local and Regional Stormwater and Water Quality Protection Websites and Embedded Links

SJRWMD
Seminole County Water Atlas

Table D.2. State Stormwater and Water Quality Protection Websites

General Portal for Florida
Department
Watershed Management
TMDL Program
BMPs, Public Information, and Environmental Education Resources
NPDES Stormwater Program
Nonpoint Source Funding Assistance
Adopted BMAPs
Wekiva BMAP Development Documents
Surface Water Quality Standards
Identification of Impaired Surface Waters Rule
STORET Program
Criteria for Surface Water Quality Classifications
FDACS Office of Agricultural Water Policy
FDACS Adopted Agricultural BMPs

Table D.3. National Stormwater and Water Quality Protection Websites

Center for Watershed Protection
EPA Office of Water
EPA Region 4 (Southeast United States)
Clean Water Act History
USGS: Florida Waters