FINAL

BASIN MANAGEMENT ACTION PLAN

for the Implementation of Total Maximum Daily Loads adopted by the Florida Department of Environmental Protection in the Silver Springs Basin Management Area

for Silver Springs, Silver Springs Group, and Upper Silver River

prepared by the
Division of Environmental Assessment and Restoration
Water Quality Restoration Program
Florida Department of Environmental Protection
Tallahassee, FL 32399

in cooperation with the
Silver Springs Basin Management Action Plan Working Group

October 2015

ACKNOWLEDGMENTS

The *Silver Springs Basin Management Action Plan* was prepared as part of a statewide watershed management approach to restore and protect Florida's water quality. It was developed with participation from affected local, regional, and state governmental interests, identified below; elected officials and citizens; and private interests.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Jon Steverson, Secretary

LIST OF SILVER SPRINGS BMAP PARTICIPANTS

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TYPE OF ENTITY	NAME
Local Governments	City of Ocala Alachua County City of Belleview City of Hawthorne Marion County The Villages Town of McIntosh Lake County Town of Lady Lake Town of Fruitland Park Putnam County Sumter County
Regional and State Agencies	Florida Department of Agriculture and Consumer Services (including the Florida Forest Service and Office of Agricultural Water Policy) Florida Department of Environmental Protection, Central and Northeast District Offices Florida Department of Health in Marion County Florida Department of Transportation, Districts 2 and 5 Silver Springs State Park St. Johns River Water Management District Southwest Florida Water Management District
Other Interested Stakeholders	Silver Springs Alliance Adena Springs Oklawaha Valley Audubon Plum Creek Timber Company University of Florida–Institute of Food and Agricultural Sciences Extension Sierra Club Private agricultural interests University of Florida Florida Farm Bureau Federation Marion County Farm Bureau

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LIST OF ACRONYMS AND ABBREVIATIONS

AADF	Annual Average Daily Flow
ACAVA	Alachua County Aquifer Vulnerability Assessment
ACEPD	Alachua County Environmental Protection Department
AWT	Advanced Wastewater Treatment
BMAP	Basin Management Action Plan
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BWG	Basin Working Group
CASTNET	Clean Air Status and Trends Network
CDD	Community Development District
cfs	Cubic Feet Per Second
CR	County Road
CRA	Community Redevelopment Area
DEAR	Division of Environmental Assessment and Restoration
Department	Florida Department of Environmental Protection
DO	Dissolved Oxygen
DRA	Drainage Retention Area
EMC	Event Mean Concentration
EPA	United States Environmental Protection Agency
ERP	Environmental Resource Permit
F.A.C.	Florida Administrative Code
FAR	Florida Administrative Record
FDACS	Florida Department of Agriculture and Consumer Services
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FLUCCS	Florida's Land Use/Land Cover and Forms Classification System
FRPP	Farm and Ranch Lands Protection Program
F.S.	Florida Statutes
FWC	Florida Fish and Wildlife Conservation Commission
FWRA	Florida Watershed Restoration Act
FYN	Florida Yards and Neighborhoods
GIS	Geographic Information System
gpd	Gallons Per Day
HUC	Hydrologic Unit Code
I	Interstate
IWR	Impaired Surface Waters Rule
kg	Kilogram
kg-N/yr	Kilograms of Nitrogen Per Year

LA	Load Allocation
lbs/yr	Pounds Per Year
lbs-N	Pounds of Nitrogen
lbs-N/yr	Pounds of Nitrogen Per Year
LCWA	Lake County Water Authority
LID	Low-Impact Development
MCAVA	Marion County Aquifer Vulnerability Assessment
mg/L	Milligrams per Liter
MGD	Million Gallons Per Day
mg-N/L	Milligrams of Nitrogen Per Liter
mi^2	Square Miles
mL	Milliliter
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
MST	Microbial Source Tracking
N	Nitrogen
NADP	National Atmospheric Deposition Program
NE	Northeast
NNC	Numeric Nutrient Criteria
NO_3 as N	Nitrate
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSI	Nitrogen Source Inventory
NSILT	Nitrogen Source Inventory and Loading Tool
NW	Northwest
OAWP	Office of Agricultural Water Policy
OFW	Outstanding Florida Water
ORI	Outfall Reconnaissance Inventory
OSTDS	Onsite Sewage Treatment and Disposal System
PAR	Photosynthetically Active Radiation
PBS&J	Post Buckley Schuh and Jernigan
PLRG	Pollutant Load Reduction Goal
PSA	Public Service Announcement
RRLA	Rapid-Rate Land Application
RIB	Rapid Infiltration Basin
SAV	Submerged Aquatic Vegetation
SCI	Stream Condition Index
SE	Southeast
SJRWMD	St. Johns River Water Management District
SPIS	Springs Protection Initiative Science
SPOZ	Springs Protection Overlay Zone

SR	State Road
SRF	State Revolving Fund
SRWMD	Suwannee River Water Management District
STORET	Storage and Retrieval
SW	Southwest
SWCD	Soil and Water Conservation District
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management
TBD	To Be Determined
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorus
TSI	Trophic State Index
TSS	Total Suspended Solids
TVR	Transfer of Vested Rights
UF	University of Florida
UFA	Upper Floridan aquifer
UF–IFAS	University of Florida–Institute of Food and Agricultural Sciences
US	United States
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VFD	Variable Frequency Drive
WAFR	Wastewater Facility Regulation
WBID	Waterbody Identification
WLA	Wasteload Allocation
WMP	Watershed Management Plan
WRF	Water Reclamation Facility
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

This document describes the management priorities for the first phase of the Silver Springs Basin Management Action Plan. The Silver Springs BMAP was developed over a two-year period beginning in March 2013. It addresses nutrient impairment in Silver Springs, Silver Springs Group, and Upper Silver River, which were verified as impaired under the Florida Watershed Restoration Act (FWRA) (Chapter 403.067, Florida Statutes [F.S.]) and the Impaired Surface Waters Rule (IWR) (Rule 62-303, Florida Administrative Code [F.A.C.]).

The BMAP documents more than 140 management actions that have been or will be undertaken by local, regional, state, or private entities to reduce the amount of nitrogen released into the Upper Floridan aquifer (UFA), the source of flow in Silver Springs and primary source for the Upper Silver River. These actions address all the major source categories that contribute nitrogen loading to the UFA (agriculture, land application of wastewater, onsite sewage treatment and disposal systems [OSTDS], urban fertilizer, and drainage wells). Reducing the amount of nitrogen entering the UFA will help achieve the water quality standards and designated uses established by the Florida Department of Environmental Protection. Silver Springs, Silver Springs Group, and Upper Silver River are designated as Class III, suitable for recreational use and for the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. They are also designated as Outstanding Florida Waters (OFWs).

An important part of the BMAP process for Silver Springs is the participation and commitment of local stakeholders in the process. Local governments, water management districts, state agencies, agricultural interests, environmental interests, other private interests, and the department's District Offices provided valuable information and input.

The BMAP process enhanced communication and cooperation among basin stakeholders that will have benefits beyond the BMAP. That enhanced interaction and communication will allow the BMAP to support the initiation of three management efforts, whose outcomes will be improved coordination between stakeholders and the identification of solutions that will result in further reductions in nitrogen loading to the UFA. These efforts comprise the OSTDS 9-1-1 Strategy (wastewater management), stormwater education and outreach effort, and small farms equine outreach effort.

SILVER SPRINGS MANAGEMENT AREA

The Silver Springs BMAP area (**Figure ES-1**) is located mostly in central Marion County. The BMAP area approximates the extent of the 1,000-year modeled ground water capture area and is elongated north to south. It includes the surface drainage area for Upper Silver River, which receives its discharge from Silver Springs and Silver Springs Group. The northern portion of the BMAP area covers portions of Alachua and Putnam Counties, while the southern tip extends into Lake and Sumter Counties. Major cities and urban areas included in the BMAP area are Ocala, Belleview, The Villages, Fruitland Park, Hawthorne, and Lady Lake.

The area contributing recharge, or the ground water contributing area, to Silver Springs varies significantly from year to year in response to climatic conditions. Estimates of the location of the contributing area depend on amount of rainfall, seasonality, the density of measuring wells, and the location of and interaction with the Rainbow Springs contributing area. For these reasons, the BMAP area does not coincide with any particular year's potentiometric surface, although variations in potentiometric surface were considered in its development, as was the extent of the modeled 1,000-year ground water capture area. Instead, the BMAP area boundaries are referenced to roads wherever possible to provide a readily recognizable boundary tied to a permanent feature on the land surface.

The western boundary of the BMAP area is coincident with the eastern extent of the Rainbow Springs BMAP area at Interstate (I) 75 in Marion County, ensuring that all of Silver Springs' contributing area is covered by a BMAP. I-75 is also the boundary separating the St. Johns River Water Management District (SJRWMD) from the Southwest Florida Water Management District (SWFWMD).

TOTAL MAXIMUM DAILY LOAD

A TMDL was adopted for Silver Springs, Silver Springs Group, and Upper Silver River in 2012 that sets a target concentration of 0.35 milligrams per liter (mg/L) of nitrate (NO_3 as N) and requires a 79% reduction in nitrate concentration for each of the impaired waterbodies. The waterbodies to which this TMDL applies are identified by their unique waterbody identification (WBID) numbers as well as common name and consist of Silver Springs (WBID 2772A), Silver Springs Group (WBID 2772C), and Upper Silver River (WBID 2772E) (**Figure ES-2**).

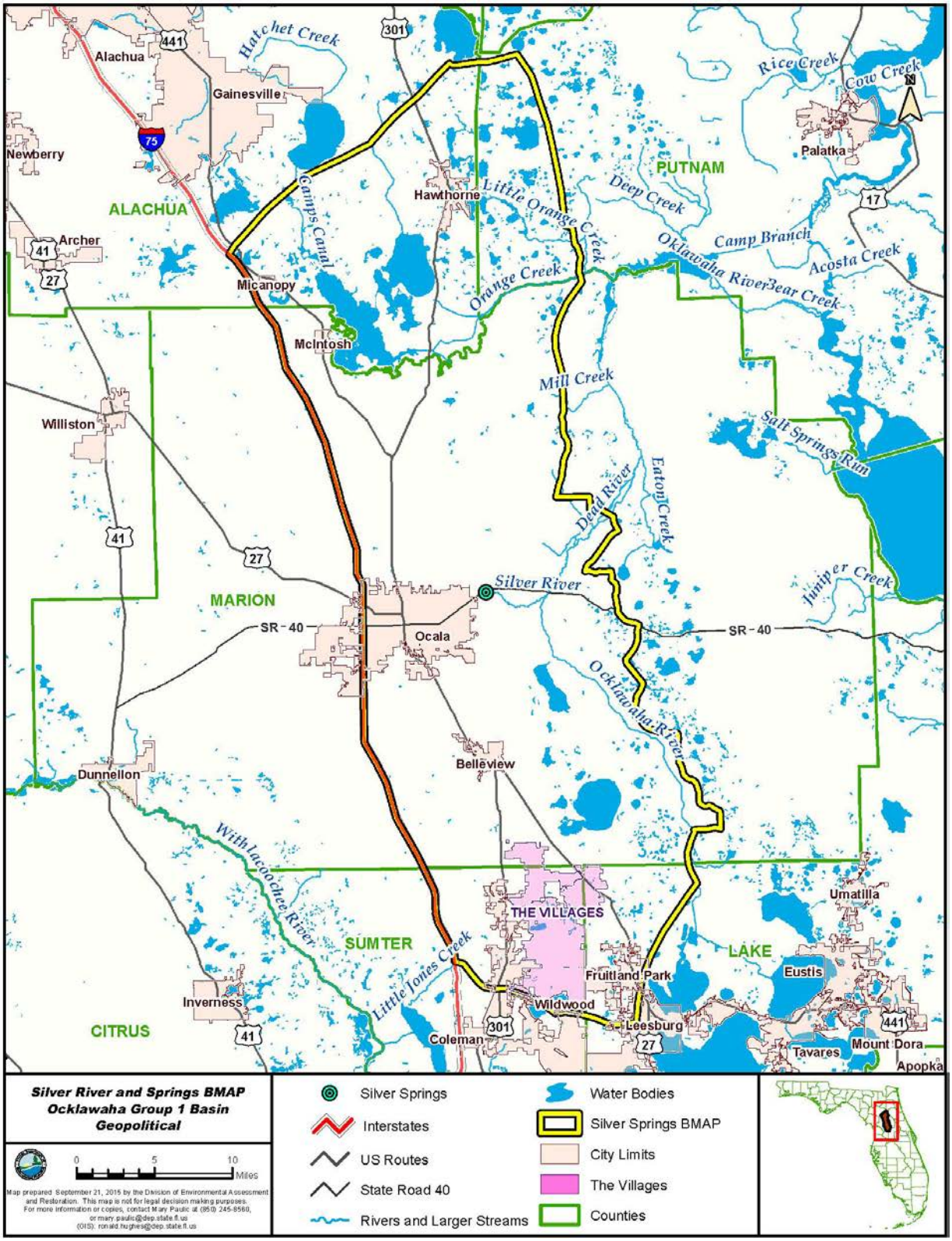

FIGURE ES-1: LOCATION OF BMAP AREA

FIGURE ES-2: LOCATION OF IMPAIRED WATERBODIES

These waterbodies were considered nutrient impaired because of an imbalance of flora and fauna evidenced by excessive algal growth and smothering of submerged aquatic vegetation. The excessive algal growth was correlated to elevated levels of nitrate contributed from ground water.

SILVER SPRINGS BMAP

This BMAP represents a commitment by stakeholders to restore water quality to Silver Springs and Upper Silver River. Stakeholders recognize that no one management action will restore water quality in Silver Springs and Upper Silver River, and agree that the entire BMAP area should be considered when identifying loading reduction management actions. This decision was based on the acknowledgment that all stakeholders have a shared responsibility in restoring Silver Springs and Upper Silver River proportional to their contribution. Management actions are identified for the first phase of the BMAP which constitute sufficient efforts that should result in improved water quality.

This BMAP provides for phased implementation under Subparagraph 403.067(7)(a)1, F.S., and this adaptive management process will continue until the TMDL is met. The phased BMAP approach allows for incrementally reducing loadings through the implementation of management actions, while simultaneously monitoring and conducting studies to better understand water quality dynamics (sources and response variables) in each impaired waterbody. In subsequent five-year management cycles, progress will be evaluated and adjustments made or new projects added, as needed, to meet the TMDL.

Phased implementation is particularly important in ground water systems because of "legacy" nitrogen already in ground water. A legacy source contributes to the continuing rise in nitrate concentrations in Silver Springs, but the source entered the aquifer as a result of past land use practices. The response of ground water–driven systems to changes in land use or practices is typically slower than surface water–driven systems and can be on the order of years or decades. This lag time in response to reductions in nitrate loading by changes in practices is one of the factors that should be considered when evaluating the success of management actions.

Detailed allocations with specified reductions in total nitrogen (TN) loading could not be assigned to each stakeholder for this first BMAP phase, because of the uncertainty associated with the fate and transformation of nitrogen in the UFA. The SJRWMD, as part of a three-year springs research initiative, is investigating the fate and transport of nitrogen as well as local ground water hydrogeology to improve the understanding of the relation between nitrogen loading to the land surface and nitrate concentration in the spring's discharge. The information gained from that initiative will be used to

develop a better understanding of ground water movement and impacts to its quality as well as the fate and transformation of nitrogen. The findings will be applied during the second BMAP phase.

Guiding principles were developed with stakeholder input to provide defined expectations for the management of TN loadings from wastewater, stormwater, and agricultural sources. The purpose of these principles is to encourage stakeholders to apply technologies and management strategies that reduce nitrogen loading and to consider areas of high recharge and potential high loading as priorities for retrofit opportunities. These guiding principles are intended as recommendations and as a guide for future project selection and focusing of efforts that support the implementation of the BMAP.

NITROGEN SOURCE INVENTORY LOADING TOOL

The department developed the Nitrogen Source Inventory Loading Tool (NSILT) to provide a BMAP-areawide evaluation of the potential sources of TN loading to the UFA, to provide stakeholders with information on the comparative importance of different sources, and to assist in the selection and targeting of projects to reduce nitrogen loading. The NSILT provides the best available assessment of where nitrogen is currently being applied in the BMAP area relative to aquifer recharge rates.

The NSILT is a Geographic Information System (GIS) and spreadsheet-based tool that provides estimates of the relative contribution of nitrogen from the following sources:

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

The results of the NSILT (**Figure ES-3**) indicate that an estimated 1,661,268 pounds of nitrogen (lbs-N) enter the UFA annually. This represents approximately 12.5% of the input at the land surface. The majority of the load, 67%, is from high-recharge areas. OSTDS and the aggregate contribution of agricultural commodities contribute the greatest potential loading to the UFA, each providing 38% of the annual estimated contribution of nitrogen to the UFA. Exclusively urban sources, urban fertilizer

(which reflects stormwater runoff), and drainage wells contribute an estimated 10% of the annual estimated contribution of nitrogen to the UFA.

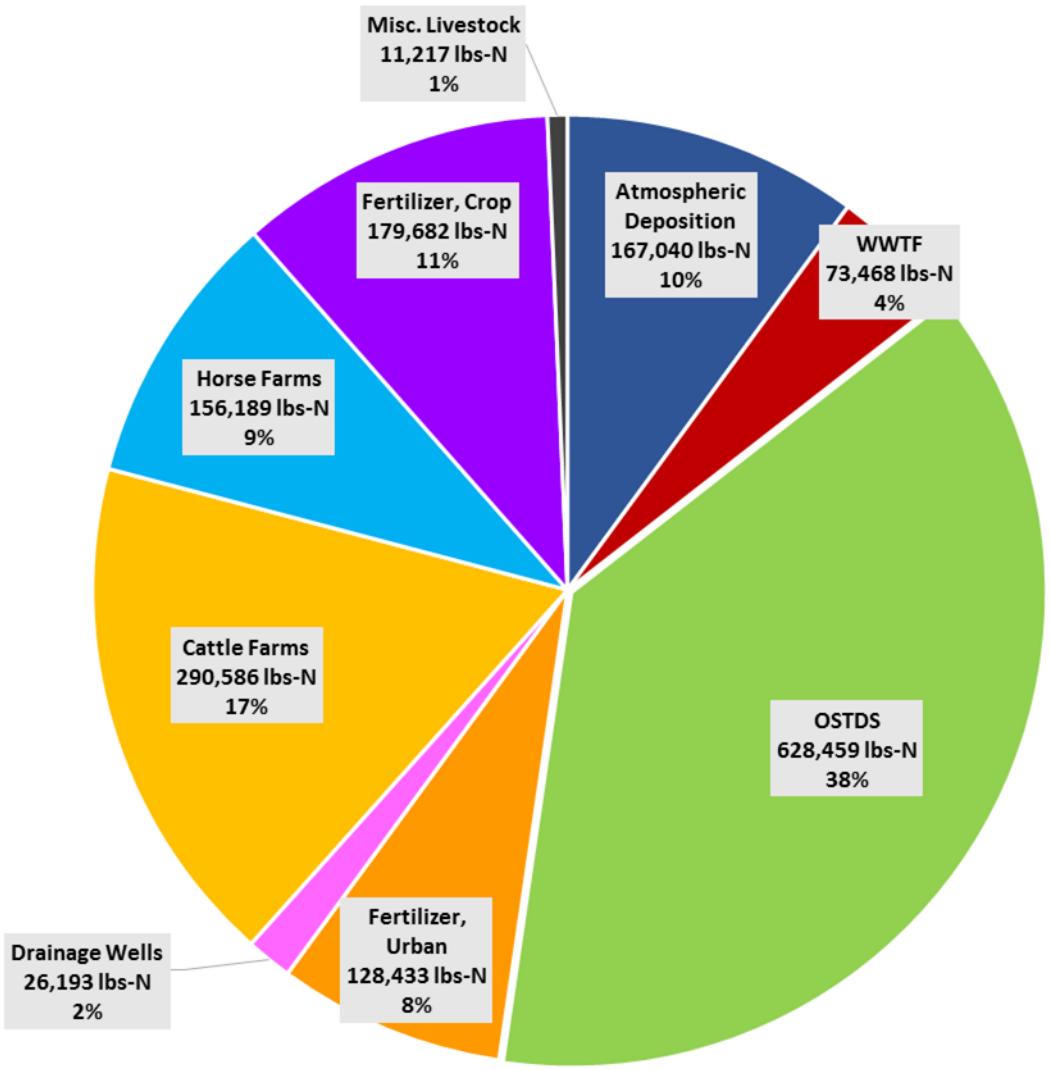

FIGURE ES-3: ANNUAL RELATIVE NITROGEN INPUTS TO THE UFA BY SOURCE CATEGORY FOR THE BMAP AREA

MANAGEMENT ACTIONS

Stakeholder management actions, including more than 140 specific projects identified in this BMAP, will reduce nitrogen loading to the UFA. These management actions are categorized as follows:

- Stormwater Structural Best Management Practices (BMPs).
- Drainage Well Abatement.
- Agricultural BMPs.

- Regulations, Ordinances, and Guidelines.
- Special Studies and Planning Efforts.
- Education and Outreach Efforts.
- Basic Stormwater Management Program Implementation.
- Conservation Land Acquisition.
- OSTDS Conversion.
- Wastewater System Upgrade and Improved Management and Infrastructure Management, Maintenance, and Repair.

Projects are identified that address each of the nitrogen source categories evaluated in the NSILT (summarized in **Table ES-1**). Project details are listed in **Chapter 4** and **Table C-1** and **Table C-2** in **Appendix C**. Projects identified for agricultural sources are in addition to the required commodity-specific BMPs. **Table ES-2** summarizes the nitrogen loading reduction achieved by these projects. Loading reductions were calculated based on the nitrogen load to the land surface and not the UFA.

Projects categorized as planned or conceptual are priorities for future funding as needed and implementation through the BMAP. Marion County, Ocala, The Villages, and Florida Department of Transportation (FDOT) contributed the greatest number of projects. These entities cover a large part of the BMAP area or are located close to Silver Springs and Upper Silver River.

The highest number of activities and percent reductions of nitrogen loading from a source have been achieved for wastewater treatment facilities (WWTFs) (wastewater) and urban stormwater management (urban fertilizer). Most of that reduction has come from actions taken by larger facilities. About half of the wastewater loading generated by these facilities is reclaimed for reuse (**Table ES-2**). Including reuse, wastewater projects achieve a 79.7% reduction in nitrogen loading. The following are examples of the type of activities undertaken by larger facilities to improve wastewater management:

- The city of Ocala is removing its oldest and poorest performing WWTF from operation (Project S091).
- Marion County Utilities has ceased the operation of a poorly performing facility close to the springs (Silver Spring Regional WWTF) and is improving effluent quality from other WWTFs (Projects S037 and S038).

— Since the NSILT was completed, five small WWTFs have been removed from service by connection to municipal utilities (Projects S109 and S036), and two larger WWTFs were removed from service.

The implementation of projects to improve stormwater management resulted in a 9.0% reduction in nitrogen loading from urban fertilizer. Stormwater managers agreed to include for credit only those structural BMP projects that were retrofits to better nitrogen removal technologies or located on soils that provided a net removal of nitrogen—largely poorly drained soils. The cessation of fertilizer use on state road rights-of-way by FDOT is one of the largest source reductions of urban fertilizer. Innovative technologies (the use of bioabsorptive media and wetlands) with higher nitrogen removal potential than traditional approaches will be used by Ocala and Marion County (Projects S088, S085, S086, S123, S124, S032, S030, and B028) to treat stormwater runoff and stormwater discharge to drainage wells.

TABLE ES-1: SUMMARY OF PROJECTS

- = Empty cell/no data

SOURCE CATEGORY	TOTAL NUMBER OF PROJECTS	PLANNED PROJECTS	CONCEPTUAL PROJECTS
Urban Fertilizer (Urban Stormwater)	58	6	2
Drainage Wells	3	3	-
Wastewater (WWTFs)	34	2	2
Septic Systems	6	1	1
Agriculture (not including BMPs)	7	3	-
Conservation Lands	14	1	1

TABLE ES-2: LOADING REDUCTIONS BY SOURCE CATEGORY

- = Empty cell/no data
lbs-N/yr = Pounds of nitrogen per year
[1] Includes credit for education and outreach efforts by stakeholders.
[2] Wastewater includes load removed by reuse.
[3] Currently 18.2% of acreage is covered by a Notice of Intent (NOI).

SOURCE CATEGORY	TN LOADING REDUCTION (LBS-N/YR)	TN LOADING AT LAND SURFACE (LBS-N/YR)	% REDUCTION
Urban Fertilizer[1]	92,415.5	1,028,106	9.0%
Drainage Wells	1,424	40,298	3.5%
Wastewater[2]	290,471	364,471	79.7%
Wastewater Reuse	-	217,424	-
OSTDS	24,300	1,588,491	1.5%
Agriculture[3]	213,116	7,596,510	2.8%

Agriculture of all types contributes approximately 38% of the nitrogen loading to the UFA. For this reason, the Florida Department of Agriculture and Consumer Services (FDACS) is targeting cost-share funding for springs protection with an emphasis on enrolling agricultural operations in high-recharge areas. Marion County supports a county-level Farm Outreach Coordinator through a staff position with the University of Florida Institute of Food and Agricultural Science (UF–IFAS) and Water Quality Education and Equine Farm BMPs outreach projects (Projects B010, B041, and B011).

Management activities that primarily protect Silver River, but also reduce loading to the UFA, are the State Road (SR) 40 Pollution Reduction Project and the restoration activities at Silver Springs State Park. The SR 40 project removes over 1,900 lbs-TN/yr from urban stormwater runoff (urban fertilizer source category). Extensive stormwater retrofits and upgrades to the wastewater collection system that were undertaken with the addition of Silver Springs Attraction into the state park provide important nitrogen reductions to Upper Silver River as well as protect Silver Springs and Silver Springs Group. The Florida Park Service is connecting areas of Silver Springs Park serviced by OSTDS to Marion County Utilities wastewater collection system, reducing nitrogen loading from the park to Silver River and Silver Springs as well as the UFA.

Several other projects are under way to address OSTDS. Belleview extended its wastewater collection system to the limits of its service area, facilitating the connection of additional properties to central sewer (Project S034). Ocala plans to extend sewer service to properties near Silver Springs that are within its service area (Project S035). Even with these projects, the net reduction in loading is only 1.5%. One of the priorities for this BMAP is to reduce the nitrogen loading from OSTDS.

This BMAP proposes three specific initiatives (listed as projects) to continue efforts to reduce nitrogen loading in the basin, find better methods for reducing and managing nitrogen loads, and, as noted above, address the largest sources identified by the NSILT. Local municipal stormwater and wastewater utility managers provided input and guidance to the department in the development of these initiatives. The initiatives are as follows:

- OSTDS and other wastewater issues are addressed through the wastewater management project OSTDS 9-1-1 Strategy, which will engage local government and private utilities as well as community and environmental interests to develop a strategy that addresses the large loading from OSTDS. This project is also

considering BMAP area–specific effluent standards for WWTFs in an effort to provide more consistency between facilities.

- Stormwater Public Education Coordination, Project B036, provides public education and outreach coordination and consistency among stakeholders related to stormwater impacts on springs.
- An outreach program will be implemented for the Small Farm Equine BMP Manual (Project B012) in collaboration with FDACS, Marion County, UF–IFAS, and other stakeholders.

ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION

Through the implementation of the wastewater, stormwater education, and small farm equine BMP initiatives, other projects and activities listed in this BMAP, and future NSILT source assessment, stakeholders expect the following outcomes:

- Decreased concentration of nitrate in Silver Springs, Silver Springs Group, and Upper Silver River.
- Decreased loading of nitrogen to the UFA.
- Improved coordination and communication between state and local governments and between all levels of government and the community.
- Improved project selection and targeted project implementation through the use of the guiding principles and the NSILT.
- Enhanced public awareness and understanding of the impacts of nitrogen loading on Silver Springs and Upper Silver River.

BMAP COST

Costs were provided for about 43.6% of the management actions identified in the BMAP, consisting of an estimated total cost of more than $216 million. These costs include a substantial investment made to improve wastewater treatment (about $54 million) and the purchase of conservation lands ($134 million) for water quality protection. The funding sources for projects range from local contributions to legislative appropriations. Stakeholders will continue to explore new sources of funding to ensure that the activities listed in this BMAP can be achieved at the necessary level of effort.

BMAP FOLLOW-UP

The department and stakeholders will continue to track projects and other implementation efforts, as well as monitor water quality in TMDL waterbodies, to ensure that the BMAP is carried out and to measure its effectiveness. As needed, the NSILT may be updated in the future to reflect new information about sources and to evaluate nitrogen management efforts. New information and refinements to source loadings that result from research conducted by the SJRWMD will be incorporated into the second phase of the BMAP to the extent possible.

Stakeholders will meet at least annually to discuss implementation issues, consider new information, and determine other management actions needed for waterbodies that are not projected to meet their TMDLs. Each stakeholder responsible for implementing management actions as part of the BMAP will complete an annual report for submittal to the department. The report will track the implementation status of any management actions listed in the BMAP and document additional projects undertaken to further water quality improvements in the basin. Additional projects are expected with the implementation of the wastewater initiative and stormwater education and outreach initiative.

As part of the BMAP, stakeholders designed a strategy for monitoring water quality based on specific indicators and the measurement of nitrate concentrations to determine if water quality is improving and the TMDL is being met. The monitoring strategy includes the following three distinct sampling networks:

- The **Surface Water Network** will be used to evaluate the water quality of Silver Springs and Upper Silver River and identify and follow changes. The network will measure both biological and chemical water quality indicators. Biological tests are for attached algae (Rapid Periphyton Index [RPI]), Stream Condition Index (SCI), and habitat assessment.
- The **Ground Water Network** will be used to evaluate changes in ground water quality in the Silver Springs BMAP area as well as the response of the aquifer to different land uses and management actions.
- The **Targeted Ground Water Network** will be used to evaluate the general conditions of the Floridan aquifer in the Silver Springs BMAP area using public water supply and surveillance well data.

Observations of water quality conditions will be reported to stakeholders and the general public at least annually as part of the BMAP reporting process. Water quality data will be used to support the adaptive management process, assess projects, and identify the need for new projects.

COMMITMENT TO THE BMAP

The management actions outlined in this BMAP as well as the proposed management initiatives provide sufficient direction for this BMAP to achieve reductions in nitrogen loading to Silver Springs and Upper Silver River. The guiding principles and BMAP initiatives help to define additional management actions that support water quality restoration in Silver Springs and Upper Silver River. Monitoring plans and the SJRWMD Silver Springs Initiative provide for additional information and advancement of knowledge about the system to allow for adaptive changes to the management actions outlined in this BMAP and the initiation of additional projects as supported by data.

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

The Silver Springs Basin Management Action Plan was developed over a two-year period beginning in March 2013. It addresses nutrient impairment in Silver Springs, Silver Springs Group, and Upper Silver River, which were verified as impaired under the Florida Watershed Restoration Act (FWRA) (Chapter 403.067, Florida Statutes [F.S.]) and the Impaired Surface Waters Rule (IWR) (Rule 62-303, Florida Administrative Code [F.A.C.]). These waters were considered nutrient impaired because of excessive algal growth correlated to elevated levels of nitrate contributed from ground water.

A Total Maximum Daily Load was adopted for these waterbodies in 2012 (**Table 1**). The TMDL set a target concentration of 0.35 milligrams per liter (mg/L) of nitrate (NO_3 as N) for the springs discharge and Upper Silver River to restore water quality.

The decline in water quality in Silver Springs and Silver River has occurred because land use practices have resulted in high nitrogen loads entering the Floridan aquifer. This loading comes from a variety of sources; however, part of it results from historical land use practices, complicating the restoration of these waterbodies.

The BMAP documents the management actions that have been or will be undertaken by local, regional, state, or private entities to reduce the amount of nitrogen released into the Upper Floridan aquifer (UFA), which is the source of flow in Silver Springs and primary source for Silver River. Reducing the amounts of nitrogen entering the UFA will help achieve the water quality standards and designated uses established by the Florida Department of Environmental Protection. Silver Springs and Silver River are designated as Class III, suitable for recreational use and for the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. They are also designated as Outstanding Florida Waters (OFWs).

An important result of the BMAP process for Silver Springs has been the level of local stakeholder participation and commitment. The BMAP process enhanced communication and cooperation among basin stakeholders that will have benefits beyond the BMAP. That enhanced interaction and communication allows the BMAP to support the initiation of a wastewater management initiative, a stormwater education and outreach effort, and a small farms equine outreach effort.

Stakeholder management actions, including more than 140 specific projects identified in this BMAP, will reduce nitrogen loading to the UFA. These management actions are categorized as follows:

- Stormwater Structural Best Management Practices (BMPs).
- Drainage Well Abatement.
- Agricultural BMPs.
- Regulations, Ordinances, and Guidelines.
- Special Studies and Planning Efforts.
- Education and Outreach Efforts.
- Basic Stormwater Management Program Implementation.
- Conservation Land Acquisition.
- On-Site Sewage Treatment and Disposal Systems (OSTDS) Conversion.
- Wastewater System Upgrade and Improved Management and Infrastructure Management, Maintenance, and Repair.

The department developed a Nitrogen Source Inventory and Loading Tool (NSILT) in support of the BMAP decision-making process. The NSILT was developed from an extensive review of literature on nitrogen sources and migration/transformation to the aquifer and eventually to Silver Springs. Various stakeholder groups provided valuable insight into activities contributing nitrogen, such as fertilization practices and cattle- and horse-grazing activities. The NSILT provides the best available assessment of where nitrogen is currently being applied in the BMAP area relative to aquifer recharge rates and contributing to elevated nitrate concentrations in Silver Springs and Silver River. The NSILT was developed to assist stakeholders and the department in identifying the relative importance of sources and helping to focus efforts on implementing specific projects that will have the greatest impact on reducing nitrogen loads.

This BMAP provides for phased implementation under Subparagraph 403.067(7)(a)1, F.S. The management actions and adaptive management approach described in the BMAP will address nitrogen reductions needed to meet the TMDL. This adaptive management process will continue until the TMDL is met.

A phased implementation is particularly important in ground water systems because of “legacy” nitrogen already in ground water. A legacy source contributes to the continuing rise in nitrate concentrations in Silver Springs, but the source entered the aquifer as a result of past land use practices.

The response of ground water–driven systems to changes in land use or practices is typically slower than surface water–driven systems and can be on the order of years or decades. This lag time in response to reductions in nitrate loading by changes in practices is one of the factors that should be considered when evaluating the success of management actions.

The adoption of a phased BMAP allows for the implementation of projects designed to achieve incremental reductions from current land uses and practices and to better manage nitrogen loads from future land use change, while simultaneously monitoring discharge at Silver Springs and the aquifer throughout the BMAP area to identify changes in nitrate concentrations. The intent is that stakeholders not be disproportionately burdened with attempting to address the impact of legacy nitrogen loads. In subsequent five-year management cycles, progress will be evaluated and adjustments made or new projects added, as needed, to meet the TMDL.

1.1 BACKGROUND

The Silver Springs BMAP was developed as part of the department's TMDL Program (authorized by the FWRA [Section 403.067, F.S.]). The department implements the act using a watershed management approach that includes a five-year rotating basin cycle. Each year of the cycle represents a different activity for the waters in a given basin group, as follows: Initial Basin Assessment, Strategic Monitoring, Data Analysis and TMDL Development, BMAP Development, and BMAP Implementation. At the end of each five-year, five-phase cycle, a new cycle begins for each group of basins in which additional waters may be identified for TMDL establishment and implementation.

TMDLs are water quality targets for waterbodies that the department has identified as impaired for specific pollutants. Adopted by rule, they establish the maximum amount of specific pollutants that can be present in a waterbody while still maintaining water quality standards in support of its designated uses.

TMDLs may be implemented through BMAPs, which contain management actions to reduce and prevent pollutant discharges through various cost-effective means. The FWRA contains provisions that guide the development of BMAPs and other TMDL implementation approaches.

Stakeholder involvement is critical to the success of the implementation of all parts of the TMDL Program. The BMAP development process is structured to achieve cooperation and consensus among a broad range of interested parties. Under statute stakeholders are invited to participate in the BMAP process, as their involvement is essential to develop, gain support for, and secure commitments to

implement the BMAP. The department must hold at least one noticed public meeting in the basin to discuss and receive comments during the planning process.

1.2 TOTAL MAXIMUM DAILY LOAD

The TMDL for Upper Silver River, Silver Springs Group, and Silver Springs was adopted in November 2012 (Chapter 62-304, F.A.C.) and is listed in **Table 1** and displayed in **Figure 2**. The waterbodies to which this TMDL applies are identified by their unique waterbody identification (WBID) numbers as well as common name. These waters were determined to be impaired because of an imbalance of flora and fauna evidenced by algal growth and the smothering of submerged aquatic vegetation (SAV). TMDLs are waterbody and parameter specific; a given waterbody can have multiple TMDLs for different parameters.

Elevated nitrate concentrations were determined to be the primary cause of the excess growth of algae; the concentration of total phosphorus (TP) was below the range of 0.065 to 0.09 milligrams per liter (mg/L) shown to contribute to biological impairment.[1] The concentration of nitrate needed to restore ecological balance was determined by examining the relation between the concentration and response of attached forms of algae (periphyton). At higher nitrate concentrations, periphyton produce more biomass for each incremental increase in nitrate compared with the periphyton response at lower nitrate concentrations. A change point analysis was done that identified the point along a gradient of increasing nitrate concentration when the algae respond with increased biomass. This change point concentration was used to set the TMDL targeted level of nitrate.

The percent reduction needed to achieve the TMDL target was based on a comparison of the target with the highest long-term (2000–11) monthly average nitrate concentration; the highest long-term monthly nitrate average was found for Silver Springs Group for January. Complete details of the process to set the TMDL target are found in the TMDL document for Silver Springs, Silver Springs Group, and Upper Silver River.[2]

[1] Hallas, J.F., and W. Magley. September 2008. *Nutrient and dissolved oxygen TMDL for the Suwannee River, Santa Fe River, Manatee Springs (3422R), Fanning Springs (3422S), Branford Spring (3422J), Ruth Spring (3422L), Troy Spring (3422T), Royal Spring (3422U), and Falmouth Spring (3422Z).* TMDL report. Tallahassee, FL: Florida Department of Environmental Protection, Division of Environmental Assessment and Restoration, Bureau of Watershed Restoration.
[2] Hicks, R.W., and K. Holland. November 2012. *Nutrient TMDL for Silver Springs, Silver Springs Group, and Upper Silver River (WBIDs 2772A, 2772C, and 2772E).* Tallahassee, FL: Florida Department of Environmental Protection, Division of Environmental Assessment and Restoration, Bureau of Watershed Restoration.

TABLE 1: WATERBODIES ADDRESSED BY THE SILVER SPRINGS TMDL

MOS = Margin of safety
NPDES = National Pollutant Discharge Elimination System
N/A = Not applicable

WBID	PARAMETER	TMDL (MG/L)	TMDL % REDUCTION	WASTELOAD ALLOCATION FOR WASTEWATER	WASTELOAD ALLOCATION (WLA) FOR NPDES STORMWATER % REDUCTION	LOAD ALLOCATION (LA) % REDUCTION	MOS
Silver Springs (WBID 2772A)	Nitrate as monthly average	0.35	79%	N/A	79%	79%	Implicit
Silver Springs Group (WBID 2772C)	Nitrate as monthly average	0.35	79%	N/A	79%	79%	Implicit
Upper Silver River (WBID 2772E)	Nitrate as monthly average	0.35	79%	N/A	79%	79%	Implicit

1.3 REGIONAL SETTING OF THE SILVER SPRINGS BASIN MANAGEMENT AREA

Silver Springs is the largest spring group, as measured by magnitude, in Florida, discharging over 700 cubic feet per second (cfs). Silver Springs and Silver River are contained within Silver Springs State Park. The springs group is the main source of flow for the five-mile spring run known as Silver River. The springs group and river have significant habitat and recreational value and have been a tourist destination since the late 19th century. The springs and river continue to have economic significance, contributing as much as $60 million annually to the area.[3]

The Silver Springs BMAP area (**Figure 1**) is located mostly in central Marion County. It approximates the extent of the 1,000-year modeled ground water capture area and is elongated north to south. The northern portion of the BMAP area covers portions of Alachua and Putnam Counties, while the southern tip extends into Lake and Sumter Counties. Silver Springs, Silver Springs Group, and Upper Silver River are designated as segments with WBID numbers 2772A, 2772C, and 2772E, respectively (**Figure 2**).

Silver Springs is actually a group of springs, with as many as 30 named springs. WBID 2772A is the head spring, also referred to as Mammoth Springs, and the largest of the group. Water

[3] Bonn, M.A. 2004. *Visitor profiles, economic impacts, and recreational aesthetic values associated with eight priority Florida springs located in the St. Johns River Water Management District.* Palatka, FL: St. Johns River Water Management District.

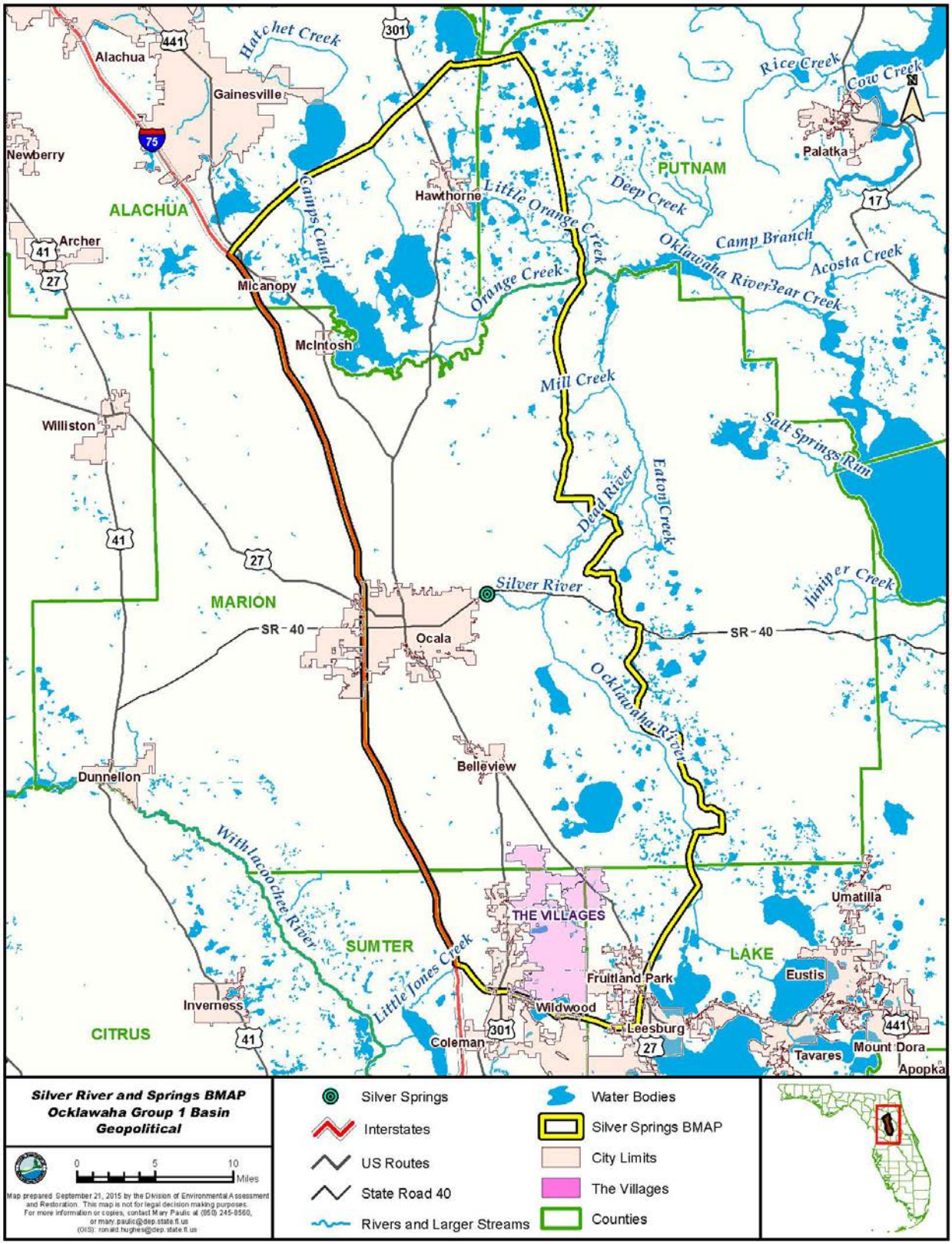

FIGURE 1: LOCATION OF SILVER SPRINGS BMAP AREA

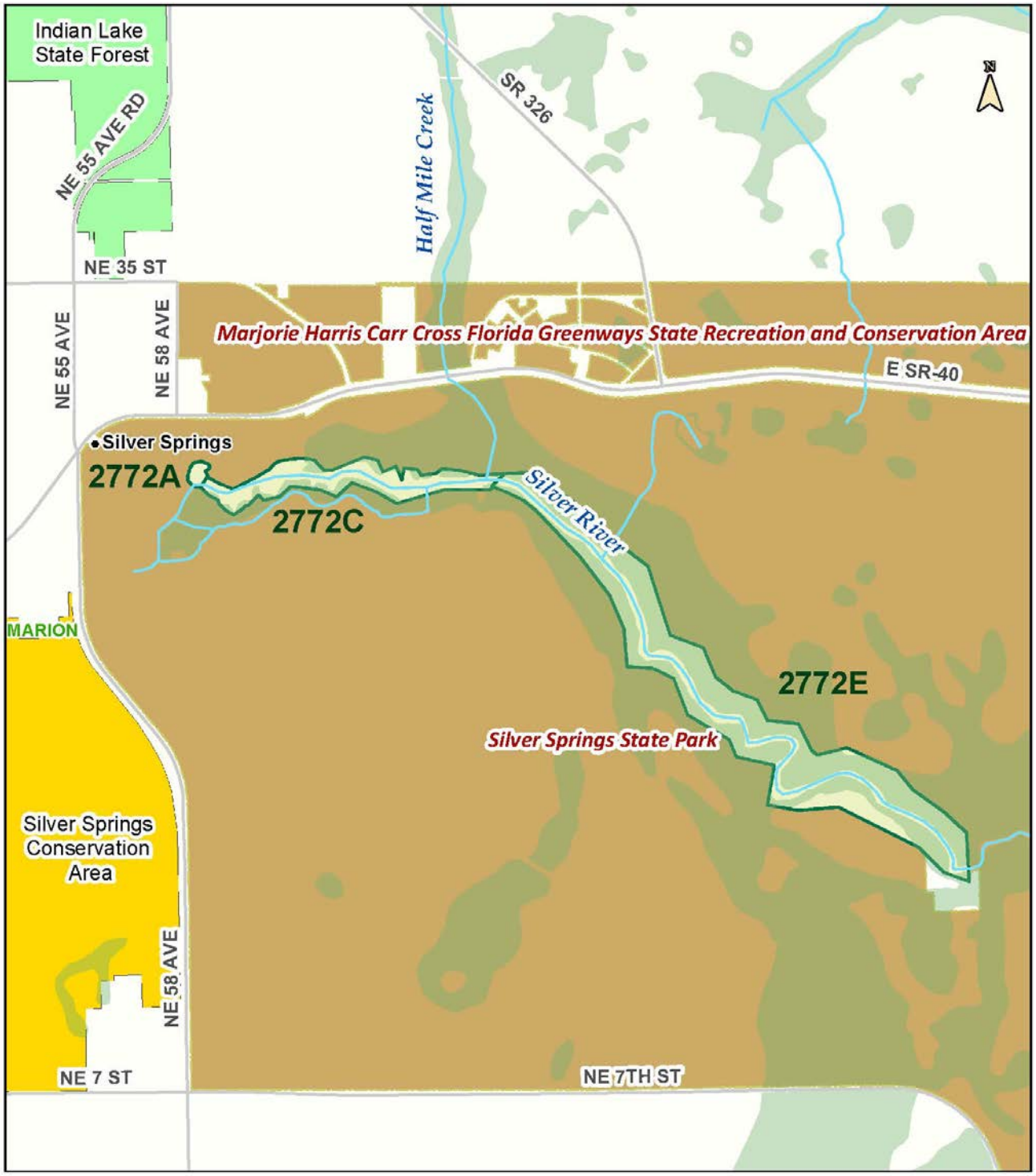

FIGURE 2: LOCATION OF IMPAIRED WATERBODIES

discharged from this spring appears to originate from two distinct locations: Mammoth East and Mammoth West. WBID 2772C consists of a short section of Silver River called Silver Springs Group, ending a short distance downstream from the confluence with Half Mile Creek, that contains

numerous other springs contributing flow to Silver River. WBID 2772E is a 1.7-mile section of Silver River below the Springs Group.

Half Mile Creek is the only significant surface tributary to the impaired segments of Silver River. Land use in the Half Mile Creek watershed is mainly forest with some low-density residential subdivisions and a few small tracts of agriculture. Prior to 2010 and the completion of the State Road 40 stormwater project, urban stormwater flows from the creek contributed sediment and nutrient loading to Silver River.

Flow in Silver River is primarily from spring discharges of ground water from the karstic UFA. Overlying the UFA area are a surficial aquifer and a confining unit that is present in some places. The UFA is recharged from rainfall collected across the karst terrain in the BMAP area. A description of the area's karst terrain is contained in **Section 1.4** and in the TMDL report.[4]

The area contributing recharge, or ground water contributing area as defined by potentiometric surface, to Silver Springs may vary significantly from year to year in response to climatic conditions. Estimates of the location of the contributing area depend on amount of rainfall, seasonality, the density of measuring wells, and the location of and interaction with the Rainbow Springs contributing area. The ground water divide between Silver Springs and Rainbow Springs is not well defined. For these reasons, the BMAP area does not coincide with any particular year's potentiometric surface, although variations in potentiometric surface were considered in its development, as was the extent of the modeled 1,000-year ground water capture area. Instead, the BMAP-area boundaries are referenced to roads wherever possible to provide a readily recognizable boundary tied to a permanent feature on the land surface.

The western boundary of the BMAP area is coincident with the eastern extent of the Rainbow Springs BMAP area at Interstate (I) 75 in Marion County, ensuring that all of the Silver Springs contributing area is covered by a BMAP. I-75 is also the boundary separating the St. Johns River Water Management District (SJRWMD) from the Southwest Florida Water Management District (SWFWMD).

The 989-square-mile (mi^2) BMAP area encompasses all or portions of several municipalities in Marion, Alachua, Sumter, and Lake Counties, including the city of Ocala, city of Belleview, city of Hawthorne, town of McIntosh, city of Fruitland Park, town of Lady Lake, city of Wildwood, and The Villages

[4] Hicks and Holland 2012, *op. cit.*

Community Development Districts (CDDs). Marion County and Alachua County together cover almost 80% of the BMAP area. **Table 2** lists the area by county in the BMAP management area.

Table 3 summarizes land use in the BMAP area. Based on 2009 land use mapping, forest-related land uses (both natural upland forest and tree plantation) are the largest land uses, followed by urban land uses (including residential, commercial, and industrial uses), agricultural land uses besides silviculture, and wetlands and surface waters (**Figure 3**). Conservation and recreation lands occupy about 17% of the total BMAP area and are displayed in **Figure 4** and **Figure 5**.

TABLE 2: BMAP AREA BY COUNTY

COUNTY	AREA (MI^2)	% OF TOTAL AREA
Marion	594	60.0%
Alachua	194	19.6%
Putnam	76	7.7%
Sumter	75	7.6%
Lake	50	5.1%
TOTAL	**989**	**100%**

TABLE 3: LAND USE

- = Empty cell/no data
* = Areas where water accumulates before infiltrating

LAND USE CATEGORY	ACREAGE	AREA (MI^2)	% AREA
Agriculture	144,933.9	226.5	22.9%
Commercial and Services	9,387.6	14.7	1.5%
Communication and Utilities	2,953.4	4.6	0.5%
Disturbed Land	1,357.2	2.1	0.2%
Forested Wetlands	60,603.3	94.7	9.6%
Freshwater Marshes	36,176.4	56.5	5.7%
Golf Courses	5,111.5	8.0	0.8%
High-Density Residential	11,695.6	18.3	1.8%
Industrial (includes mining)	6,099.0	9.5	1.0%
Institutional	4,227.2	6.6	0.7%
Low-Density Residential	65,311.0	102.0	10.3%
Medium-Density Residential	32,212.6	50.3	5.1%
Mixed Scrub-Shrub Wetland	14,713.1	23.0	2.3%
Rangeland	9,357.2	14.6	1.5%
Recreation Lands	2,876.4	4.5	0.5%
Streams and Lakes	29,496.4	46.1	4.7%
Transportation	4,434.9	6.9	0.7%
Tree Plantation	90,189.8	140.9	14.3%
Undeveloped Urban Land	8,716.1	13.6	1.4%
Upland Forest	92,221.0	144.1	14.6%
Drainage Retention Areas (DRAs)*	4,467.5	7.0	-

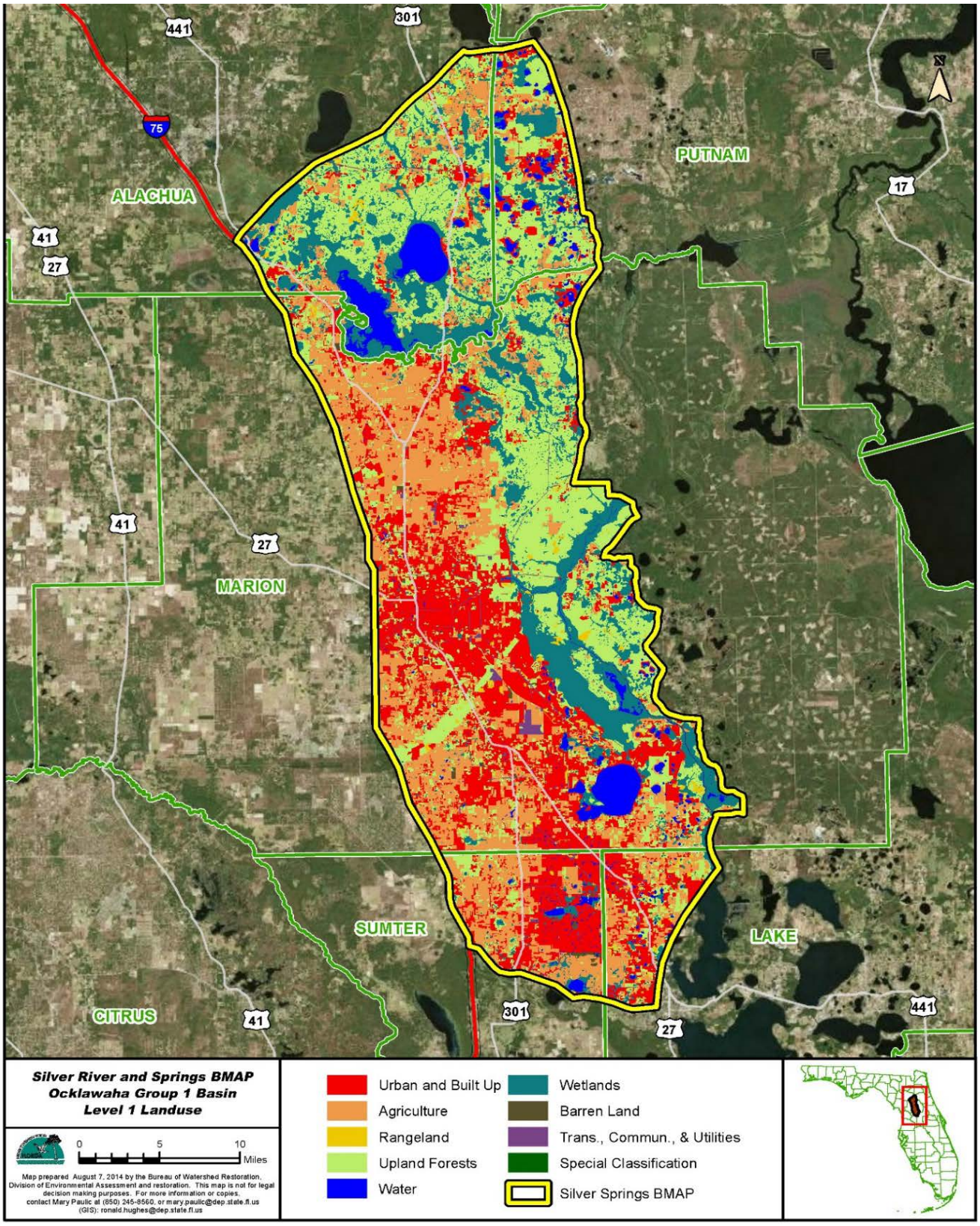

FIGURE 3: LAND USE IN THE SILVER SPRINGS BMAP AREA

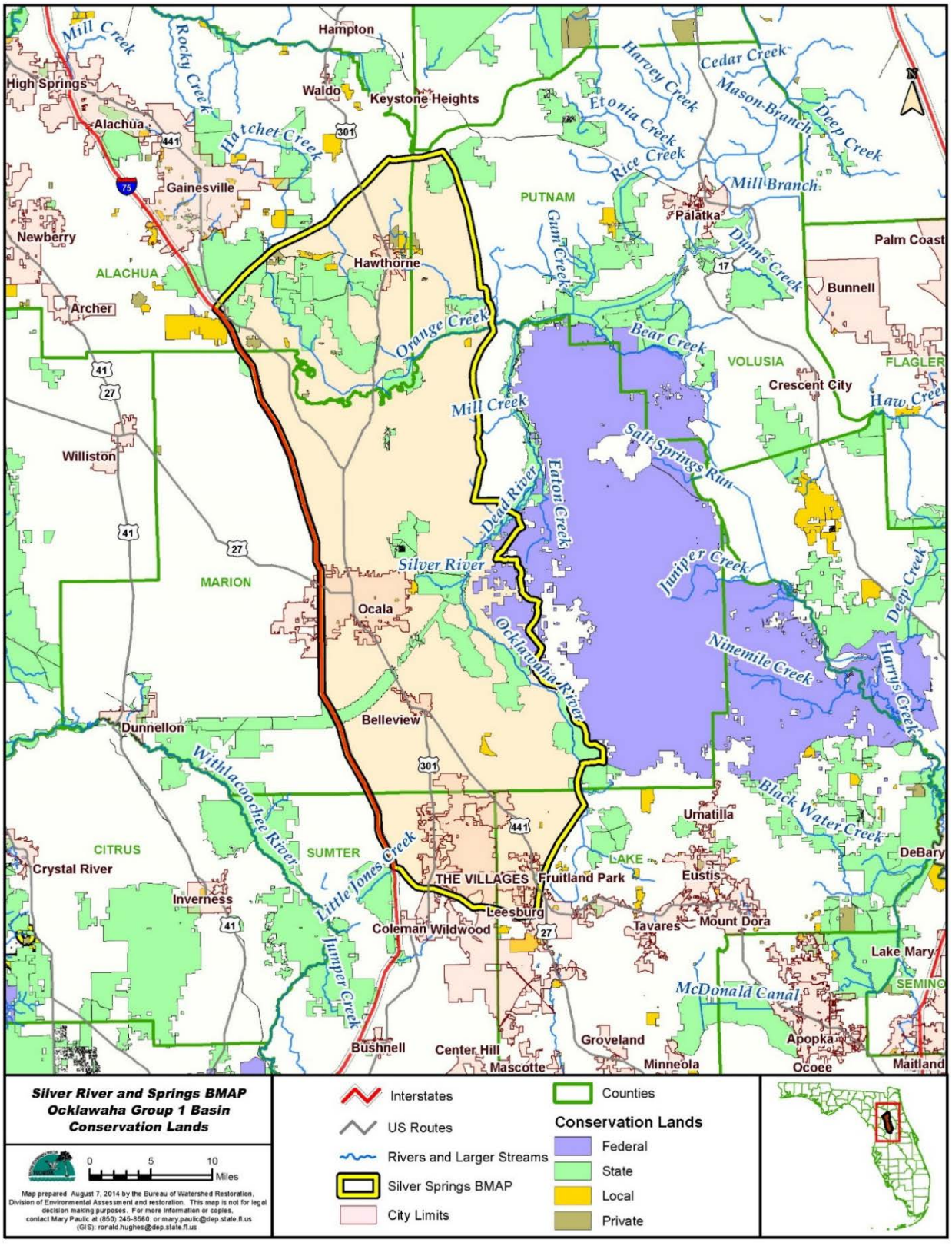

FIGURE 4: CONSERVATION LANDS IN THE BMAP AREA

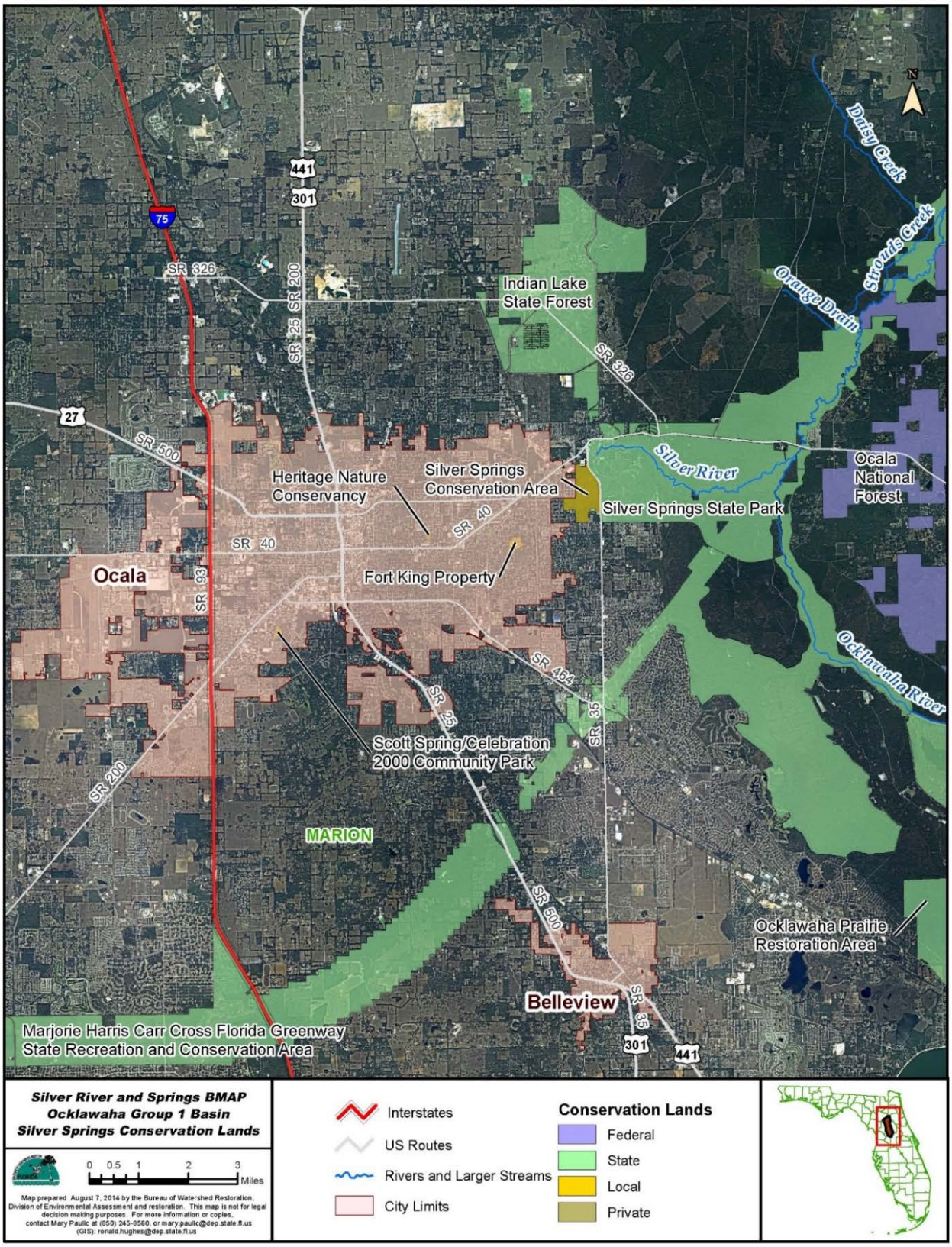

FIGURE 5: CONSERVATION LANDS LOCATED NEAR SILVER SPRINGS AND SILVER RIVER

1.4 HYDROGEOLOGY

Geology and hydrogeology influence the characteristics of Silver Springs and help explain many of the observed ground water quality issues. Moving westward from approximately the Silver Springs Group to the BMAP boundary, the Ocala Group, the geological formation that contains the limestone rocks of the UFA, is close to the land surface and typically under unconfined or water table aquifer conditions. Overburden is thicker to the east of the springs moving towards the Ocklawaha River; as a result, the Floridan aquifer lies deeper under the land surface. East of Silver Springs, the Ocala Group can be overlain by the Hawthorn Group, a phosphate-rich clay layer, which can act as an intermediate confining unit and may contain an intermediate aquifer. The UFA typically is confined where the Hawthorn Group is present. As a confining layer, the Hawthorn Group may retard the downward movement of water to the UFA.

The ground water contributing area for Silver Springs has been estimated by mapping the potentiometric surface through the direct measurement of water-level elevations from wells and through different modeling techniques.[5] **Figure 6** displays several of the resulting interpretations.

Several conclusions were drawn from modeling results and dye tracer tests.[6] The movement of ground water to Silver Springs is a mix of conduit flow and matrix flow; however, comparing modeled results with dye tracer results, it was concluded that most of the ground water movement in the two-year capture zone is probably by conduit flow. Conduit flow moves ground water more quickly toward the springs than matrix flow; thus distance from the springs is not a completely reliable indicator of the potential effect of a nitrate source on the springs' nitrate concentration.

Both Alachua and Marion Counties have prepared detailed aquifer vulnerability maps using local information (Marion County Aquifer Vulnerability Assessment and Alachua County Aquifer Vulnerability Assessment). In Alachua County the portion of the BMAP area including Orange Lake was classified as moderately vulnerable, while east of Orange Lake was classified as low vulnerability. In Marion County, the BMAP area west of Silver Springs Group and the western half of Lake Weir is a

[5]Phelps, G G. 2004. *Chemistry of ground water in the Silver Springs Basin, Florida, with an emphasis in nitrate.* United States Geological Survey Scientific Investigations Report 2004-5144.
Boniol, D. March 2013. *Silver Springs Group springshed delineation and dye trace studies.* Presentation given at March 14, 2013 Silver Springs BMAP meeting. St. Johns River Water Management District.
McGurk, B. E., J. B. Davis, J. A. Stokes, D. J. Toth, with URS Corporation and Karst Environmental Services. 2012. *Silver Springs nutrient pathway characterization project.* Special Publication SJ2012-SP3. Palatka, FL: St. Johns River Water Management District.
[6] Boniol March 2013, *op. cit.*, and McGurk 2012, *op. cit.*

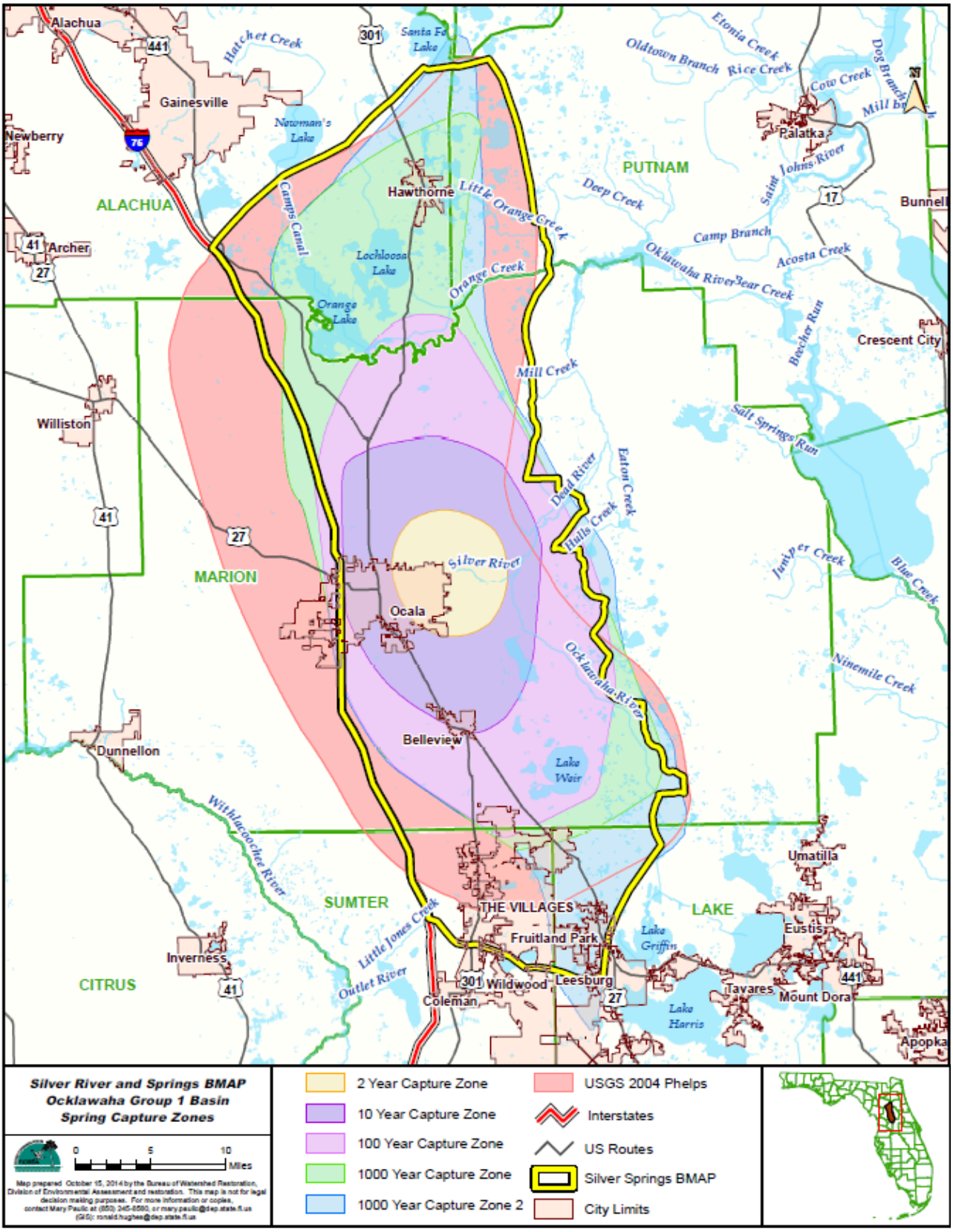

FIGURE 6: ESTIMATED SILVER SPRINGS MODELED CAPTURE ZONES

mix of the two highest vulnerability classes: most vulnerable and more vulnerable. East of the springs is classified as less vulnerable to the south and vulnerable to the north.

1.5 BMAP ASSUMPTIONS AND CONSIDERATIONS

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

- **Project Collection Period** – Project information collected from 2000 to 2015 was considered for inclusion in the BMAP.
- **Project Area Inclusion** – Stakeholders agreed that the entire area of the city of Ocala should be considered a part of the Silver Springs BMAP area. A portion of the city is located west of I-75 and inside the Rainbow Springs BMAP area, but is located where the ground water divide between Rainbow Springs and Silver Springs is not well defined. Climatic conditions at any given time dictate whether ground water is moving toward Silver Springs or Rainbow Springs. Upgrades to Ocala Utilities wastewater treatment facilities (WWTFs) will allow the transfer of wastewater between portions of Ocala east and west of I-75. This BMAP includes all projects implemented by Ocala.
- **Unquantified Project Impacts** – Nitrogen reductions for some of the projects and activities contained in this BMAP cannot currently be quantified, *e.g.*, maintenance of wastewater collection systems. However, because of their positive impact, it is assumed that these actions will help reduce pollutant loads, and estimated loading reductions may be determined at a later date and assigned to these activities.
- **Source Identification** – The NSILT represents the most current and best estimate of the total nitrogen (TN) inputs to the land surface, load to ground water, and sources to the UFA but there is uncertainty associated with this estimate. The estimated loading to ground water must also account for both an attenuation factor in the soil column and the rate of ground water recharge. These rates are averages and can vary substantially, adding a degree of uncertainty to the loading estimates.
- **Legacy Sources** – Land uses or management practices not currently active in the basin may still be affecting the nitrate concentration of Silver Springs. The movement of water from the land surface through the soil column to the UFA and

through the UFA to Silver Springs varies both spatially and temporally and is influenced by localized soil and aquifer conditions. The result is that there may be a lag in time between when nitrogen input to the UFA occurred and ultimately when that load arrives at Silver Springs. The impact of this delay is not fully understood.

— **Implementation Schedule** – BMAP implementation will be a long-term process. The adaptive management approach used for this BMAP requires regular follow-up to ensure that management strategies are carried out and that their incremental effects are assessed. This type of approach acknowledges that there is some uncertainty associated with the outcomes of proposed management strategies. As each five-year iteration is completed and more information is gathered, additional management strategies to achieve the TMDL will be developed or existing strategies refined to better address the sources of nitrogen loading.

— **Uncertainties Related to Ecological and Chemical Processes** – There are still many unknowns regarding the effect of nitrate concentrations on the plants and animals and overall ecology of Silver River as well as the fate and transformation of nitrate in the UFA. In response the SJRWMD has begun a three-year Springs Protection Initiative that will address these two issues as well as others. **Chapter 3** provides more details about the proposed monitoring and research effort. The results of this research will be considered in the second phase of the BMAP.

— **Changes in Spring Flows** – A decline in the volume of water discharged from Silver Springs has been observed over the past 20 years. Reasons suggested for this occurrence vary. In response, the SJRWMD is developing minimum flows and water levels necessary to protect Silver Springs and Silver River. The role of this BMAP is to promote the implementation of water quality restoration activities while the minimum flow level (MFL) will address water flows and levels.

1.6 BMAP DEVELOPMENT PROCESS

In January 2013, the department convened a public meeting to present an overview of the Silver Springs TMDL and BMAP process. The first in a series of public stakeholder BMAP development meetings began in March 2013. Representatives from local, regional, state, business, and community interests provided input during the development of the NSILT and BMAP. The BMAP process was structured to achieve cooperation and consensus among a broad range of interested parties. The process promoted the

engagement of local stakeholders in a coordinated and collaborative manner to address the reductions of loadings of nutrients needed to achieve the Silver Springs Basin TMDL.

As part of a commitment to enhanced communication between the department and stakeholders, the department participated in the Silver Springs Forum sponsored by the Silver Springs Alliance on May 11, 2013, and in the Springs Festival on April 26, 2014. The BMAP Program participated in public workshops sponsored by the department's Division of Recreation and Parks on August 7, 2013, and June 6, 2013. The department held these workshops to inform the public and receive comment on plans for the renovation of the Silver Springs attraction and its incorporation into the state park system with the subsequent creation of Silver Springs State Park.

All stakeholder meetings held in the basin were noticed in the *Florida Administrative Record* (FAR) and on the department's website. Public comment from interested citizens was solicited during regularly scheduled stakeholder meetings. A final public workshop on the BMAP, held on July 23, 2015, was advertised in the *Gainesville Sun* and *Ocala Star Banner* newspapers.

1.7 POLLUTANT REDUCTIONS

The TMDL covered by this BMAP requires a 79% reduction in nitrate concentration in Silver Springs, Silver Springs Group, and Upper Silver River. To aid in the identification of nitrogen sources, the department developed the NSILT to provide a BMAP-areawide evaluation of the potential sources of TN loading to the UFA, to provide stakeholders with information on the comparative importance of different sources, and to assist in the selection and targeting of projects to reduce nitrogen loading.

Guiding principles are presented to provide defined expectations for the management of TN loadings from wastewater, stormwater, and agricultural sources. They were developed with stakeholder input. The purpose of these principles is to encourage stakeholders to apply technologies and management strategies that reduce nitrogen loading and to consider areas of high recharge and potential high loading as priorities for retrofit opportunities. **Sections 4.2**, **4.4,** and **4.5** describe the principles in more detail. These guiding principles do not supercede local, water management district, or state regulations but are intended as a guide for future project selection and the focusing of efforts that support the implementation of the BMAP.

Detailed allocations with specified reductions in TN loading were not assigned to each stakeholder for this first BMAP phase, because of the uncertainty associated with the fate and transformation of nitrogen in the UFA. The SJRWMD, as part of a three-year springs research initiative, is investigating the fate

and transport of nitrogen as well as local ground water hydrogeology to improve the understanding of the relation between nitrogen loading to the land surface and the concentration of nitrate in the springs' discharge. The information gained from that initiative will be used to develop a better understanding of ground water movement and impacts to its quality as well as the fate and transformation of nitrogen. Findings from the research initiative will be applied during the second phase. **Section 3.3** provides detail about the initiative.

Chapter 2: NITROGEN SOURCES, GROUND WATER QUALITY, AND FUTURE GROWTH

Most identified nitrogen sources for Silver Springs are nonpoint in nature and dispersed throughout the BMAP area. Nitrogen applied over a broad area at or just below the land surface infiltrates through the soil, where it enters the aquifer, retention ponds, or topographic low points where it has been transported by stormwater runoff. Wastewater treatment applied through sprayfields or rapid infiltration basins (RIBs) also constitutes nonpoint source pollution. This is different from a point source of nitrogen where pollutant sources may be traced to a specific facility or outfall. In addition, nitrogen in organic form may undergo nitrification to nitrate during infiltration under aerobic soil conditions.

This chapter discusses the nitrogen source inventory developed to estimate the sources of nitrogen applied at the land surface. The NSILT evaluates existing nitrogen loading data from various sources, along with information from studies and input from stakeholders. It was developed to assist stakeholders in identifying and planning future nutrient reduction efforts for this BMAP. Finally, the chapter discusses the relationship of the BMAP to other impaired waterbodies as well as the management of pollutant sources from future growth and the role of land conservation in protecting spring water quality.

2.1 NSILT

The NSILT is a geographic information system (GIS) and spreadsheet-based tool that provides estimates of the relative contribution of nitrogen from various sources, as follows:

- Atmospheric deposition.
- Wastewater land applications.
- Onsite sewage treatment and disposal systems (OSTDS) (septic systems).
- Livestock waste (predominantly horse and cattle).
- Agricultural and nonagricultural (urban) fertilizers.
- Stormwater runoff to drainage wells.

The NSILT was provided as a tool for the development and implementation of the BMAP to identify areas where nitrogen source reduction efforts could be focused to achieve the most beneficial and cost-effective improvements in water quality.

This section of the BMAP contains a summary of the NSILT. A detailed discussion of the NSILT methods, results, and supporting references are documented in a separate report.[7] The general approach used for the NSILT in the BMAP area was to characterize ground water recharge, identify categories of land use that are potential nitrogen sources, estimate annual nitrogen inputs at the land surface, and finally calculate the estimated annual nitrogen load to the UFA. Nitrogen loadings expressed in this document are calculated as TN and expressed as pounds of nitrogen per year (lbs-N/yr). The nitrogen input at the land surface is not the equivalent of the amount of nitrogen (load) delivered to the UFA. Nitrogen input at the land surface is attenuated by varying biological and geochemical processes as well as variations in rate of recharge to the aquifer that affect the estimated nitrogen loading to the UFA.

2.1.1 Ground Water Recharge and Land Use

The NSILT characterized recharge based on the SJRWMD recharge map. The SJRWMD recharge rates were then aggregated into four recharge categories: discharge, low recharge (0 to 4 inches per year [in/yr]), medium recharge (>4 to 12 in/yr), and high recharge (12 in/yr or greater) (**Figure 7**).

Land use in the BMAP area was developed with 2009 data from the SJRWMD predominately, 2008 data from the SWFWMD for Sumter County, and 2010–11 data from the Suwannee River Water Management District (SRWMD) for a small portion of Alachua County. The various county property appraisers provided detailed information on specific agricultural practices and land use classifications for the period from November 2013 to January 2014.

2.1.2 Estimating Nitrogen Inputs to the Land Surface

Nitrogen load to the land surface was estimated for each of the source and land use categories listed above and was further categorized by recharge category. Eller and Katz (2015) provide a full discussion of the methods and source references used to develop the estimates.[8] It is estimated that up to 13.34 million lbs-N/yr are potentially applied to the land surface. **Figure 8** shows the total estimated loading applied to the land surface in the BMAP area by land use category.

[7] Eller, K., and B.G. Katz. June 2015. *Draft nitrogen source inventory and loading estimates for the Silver Springs BMAP contributing area.* Tallahassee, FL: Florida Department of Environmental Protection, Division of Environmental Assessment and Restoration, Water Quality Evaluation and Total Maximum Daily Loads Program, Ground Water Management Section.
[8] Eller and Katz, *ibid.*

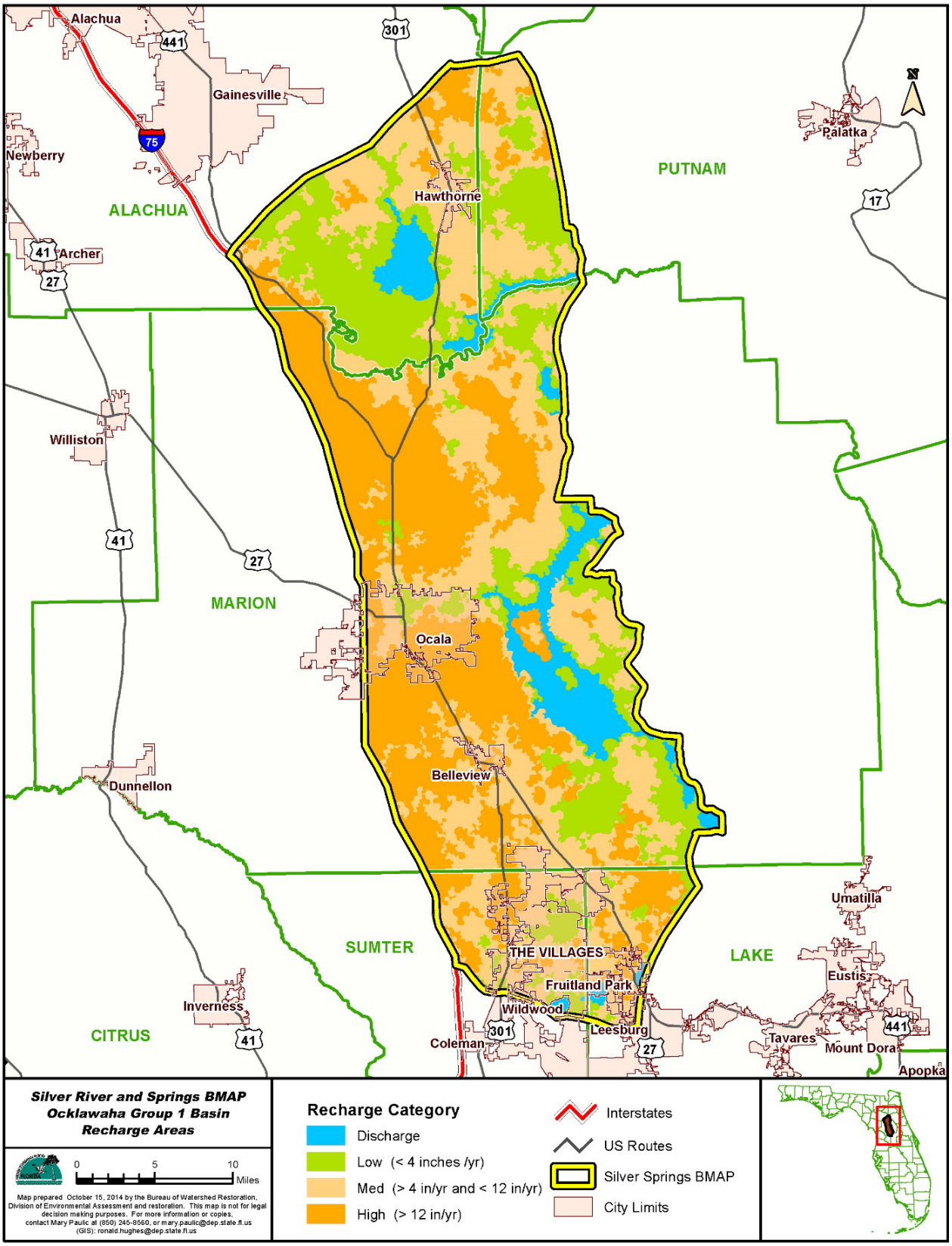

FIGURE 7. DISTRIBUTION OF RECHARGE RATES TO THE UFA

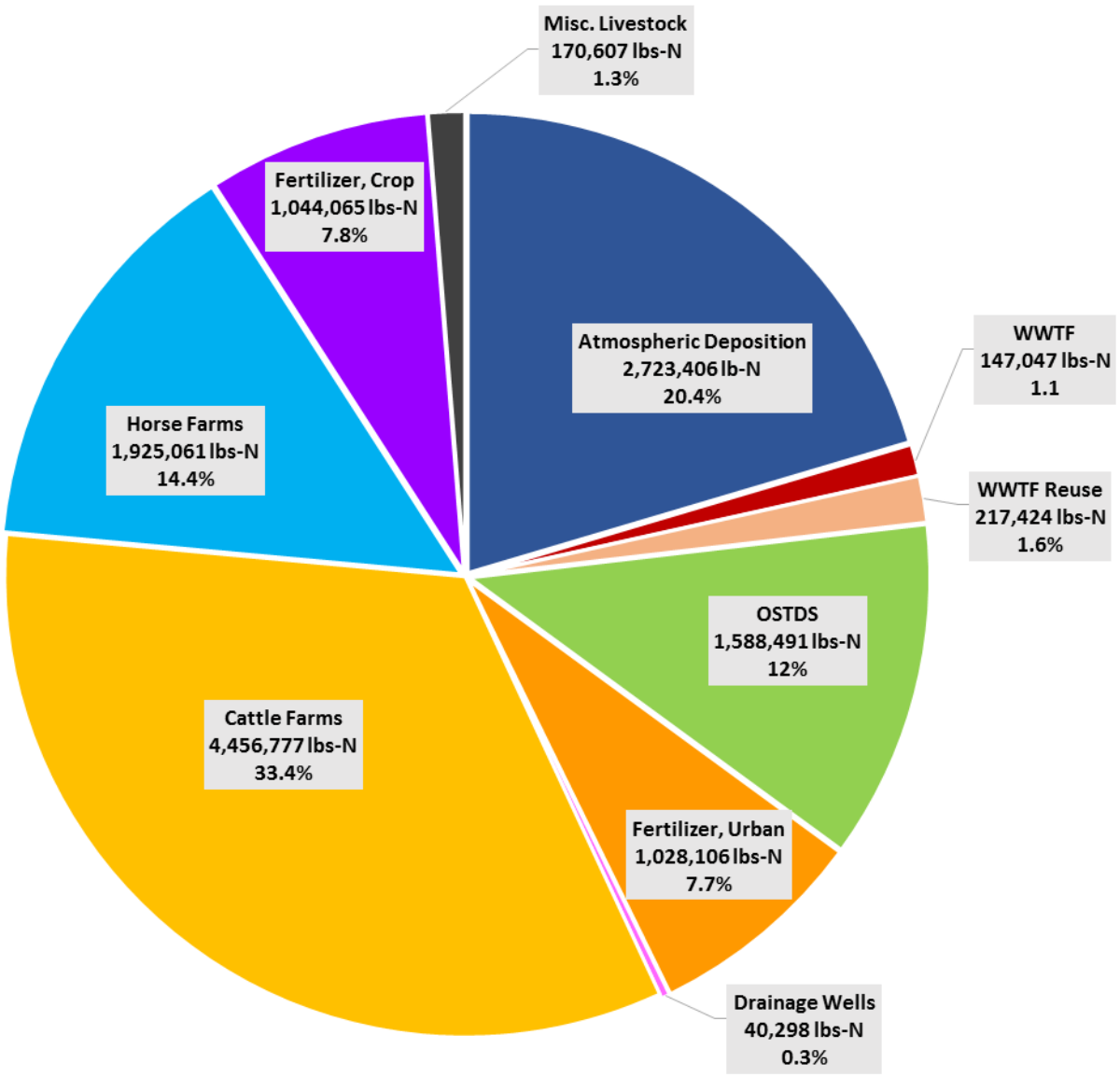

FIGURE 8: ANNUAL RELATIVE NITROGEN INPUTS TO THE LAND SURFACE FOR THE BMAP AREA

2.1.2.1 Atmospheric Deposition

Total atmospheric deposition rates (a total of wet and dry) were estimated for the BMAP area. Nitrogen species and other chemical constituents are measured in wet and dry deposition at discrete locations around the United States, including Florida. Recently, Schwede and Lear (2014) developed a hybrid approach for estimating the total atmospheric deposition of nitrogen and sulfur for the entire United States, referred to as TDEP.[9] The technique uses a GIS model approach to estimate deposition that includes data from monitoring stations, atmospheric measurements, and other models. Its usage resulted in an increase in the estimate of the contribution of atmospheric deposition loading of nitrogen

[9] Schwede, D.B., and G.G. Lear. 2014. A novel hybrid approach for estimating total deposition in the United States. *Atmospheric Environments* 92:207–220.

compared with estimates derived from discrete sampling locations. Dry deposition data from several monitoring networks—including the Clean Air Status and Trends Network, National Atmospheric Deposition Program Ammonia Monitoring Network, the Southeastern Aerosol Research and Characterization Network, and modeled data from the Community Multi-scale Air Quality Model—are combined in a multi-step process with National Trend Network wet deposition values to model total deposition. The TDEP model utilized for the NSILT includes data from 2011 to 2013.

2.1.2.2 Wastewater Land Applications

Nitrogen input to the land surface from each of the 97 WWTFs in the BMAP area was estimated by multiplying an average TN concentration by average yearly flow. In the BMAP area, treated effluent containing nitrogen is discharged to sprayfields, RIBs, or percolation ponds, or is reused for irrigation water. **Table B-1** in **Appendix B** summarizes the data, and **Section 4.2** provides more detail about the calculation for each facility.

2.1.2.3 OSTDS

Nitrogen input from OSTDS (septic systems) was estimated using a rate of 9.9 lbs-N/person/yr. The number of persons per OSTDS was developed from United States Census data in each county (2.26 to 2.53 persons). The number of OSTDS was estimated from a 2009 Florida Department of Health (FDOH) model, with the exception of Marion County, where the county provided data based on a GIS analysis of property appraiser and utility services area information.

2.1.2.4 Livestock Operations

Nitrogen input from livestock was subdivided into loading from horses, cattle, and other animals. Countywide numbers of livestock were determined from the 2012 United States Department of Agriculture (USDA) Census of Agriculture and apportioned by the area of the respective county within the BMAP area. Other livestock includes chickens, goats, hogs, sheep, and turkeys. Cow-calf operations comprise most of the cattle industry in the BMAP area. Based on a literature review, a calf produces approximately 20% of the nitrogen that its mother produces. The average residence time for calves in the basin is 183 days.[10] The contribution of nitrogen from manure from horses was calibrated based on manure handling practice information provided by UF–IFAS, specific to Marion County. Pasture fertilization is also included for inputs from livestock operations. Fertilization rates can vary widely from year to year based on market prices and stocking rates; however, estimates of the average

[10] Marion County Cattlemen's Association, personal communication, 2014.

annual fertilizer applications to pasture were developed based on information received through meetings with the Marion County Cattlemen's Association, UF–IFAS, and Florida Farm Bureau.

2.1.2.5 Agricultural and Nonagricultural Fertilizer

County property appraiser data were used to determine the types of crops grown in the BMAP area. The total amount of fertilizer and nitrogen content were estimated from Florida Department of Agriculture and Consumer Services (FDACS) countywide data and applied based on UF–IFAS recommended rates. The nitrogen load in the BMAP area from urban sources was determined based on the area of the total countywide urban land uses in the BMAP area. Urban land uses were primarily residential lawns and golf courses.

2.1.3 Stormwater Runoff to Drainage Wells

Drainage wells directly recharge the UFA. For the BMAP area, the input from an estimated 42 drainage wells owned by the city of Ocala was included in the NSILT; however, the city is inventorying the actual number of wells in use. The annual runoff volume for each well's drainage area and literature-based event mean concentrations (EMCs) for TN in stormwater runoff were used to estimate the nitrogen load from drainage wells.

2.1.4 Estimated Load to the UFA

Nitrogen inputs to the land surface in a given year are not equivalent to the estimated nitrogen loading to the UFA. The estimated loading to ground water must also account for both an attenuation factor within the subsurface and the annual rate of ground water recharge.

The NSILT results indicate that about 1,661,286 lbs-N/yr enters the UFA. This represents approximately 12.5% of the input at the land surface. The majority of the load, 67%, is from high-recharge areas. Medium-recharge areas provide 31% of the annual load. **Figure 9** shows the breakdown, by percent, of nitrogen reaching the UFA by land use category. OSTDS and the aggregate contribution of agricultural commodities contribute the greatest potential loading, each providing 38% of the annual estimated contribution of nitrogen to the UFA. Exclusively urban sources, urban fertilizer (which reflects stormwater runoff), and drainage wells contribute an estimated 10% of the annual estimated contribution of nitrogen to the UFA.

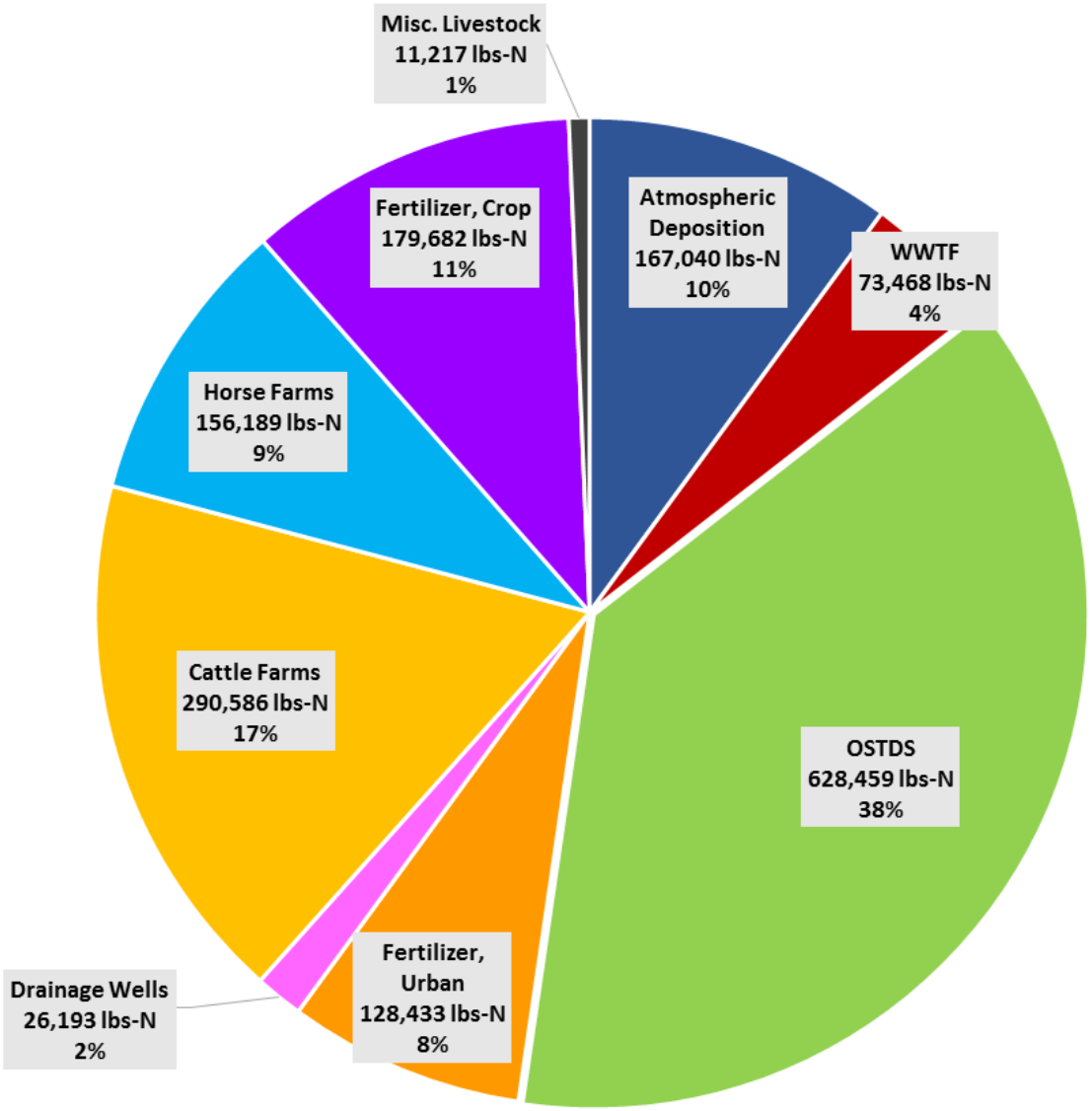

FIGURE 9: ANNUAL RELATIVE NITROGEN INPUTS TO THE UFA BY SOURCE CATEGORY FOR THE BMAP AREA

Nitrogen inputs to the UFA in the modeled 10-year capture zone were also estimated for each potential source (**Figure 10**). Overall the 10-year capture zone comprises about 20% of the BMAP area acreage, but contributes 37% of the nitrogen loading to the UFA. Urban land uses are a greater portion of this zone's acreage, as reflected by the greater contribution of urban fertilizer and drainage wells (19%) compared with 10% for the entire BMAP area. OSTDS contribute the greatest amount of nitrogen loading to the UFA (44%). The combined contribution of agricultural activities and fertilizer is still relatively large in the 10-year capture zone, at 23.3% of the total loading.

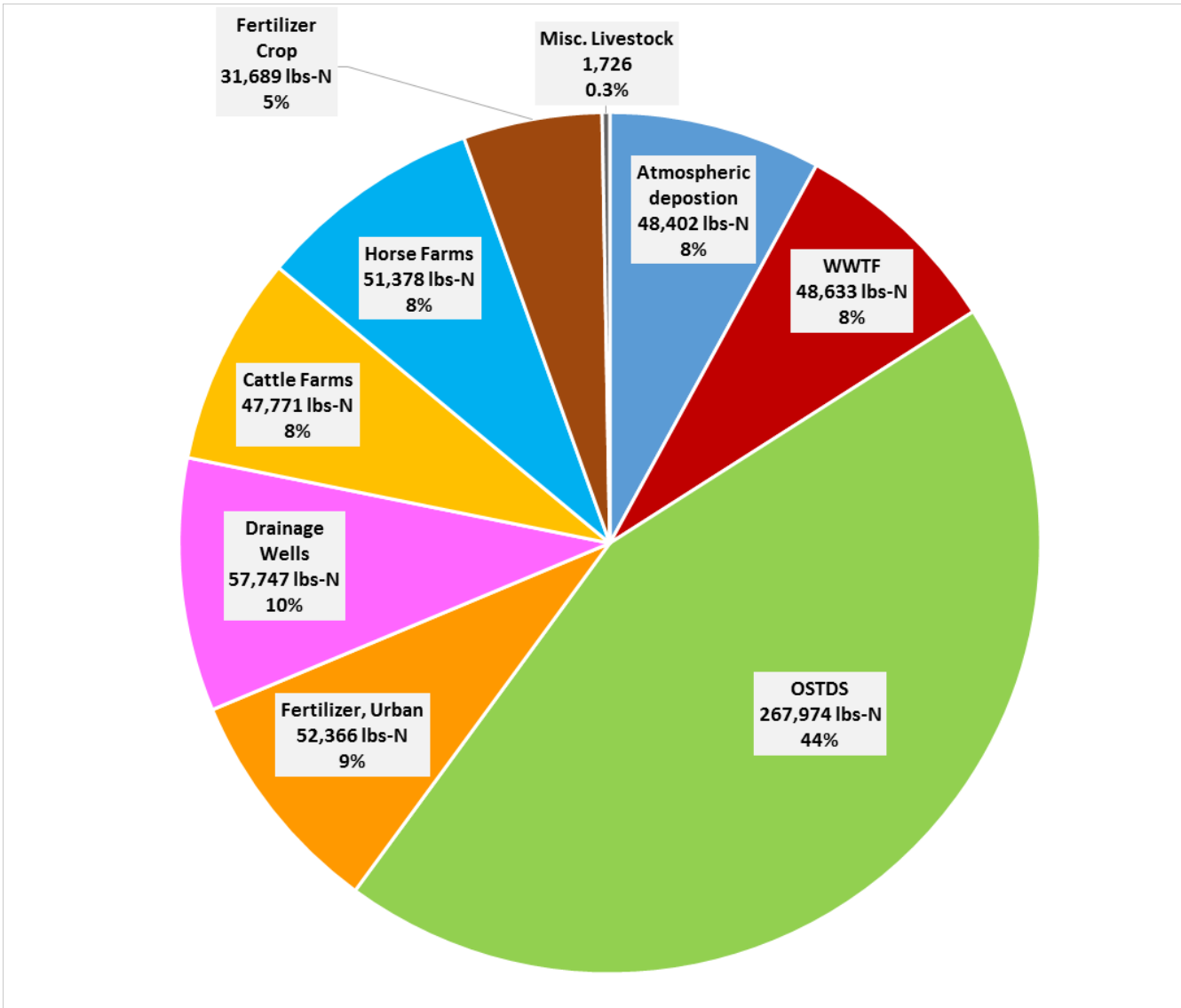

FIGURE 10: ANNUAL RELATIVE NITROGEN INPUTS TO THE UFA BY SOURCE CATEGORY FOR THE 10-YEAR CAPTURE ZONE

2.2 ESTIMATING CHANGES IN POTENTIAL LOADING TO THE UFA

The NSILT was developed to be a tool for the department's evaluation of the contribution of different source categories to nitrogen loading to the UFA under different land use scenarios. As changes in land use occur in the basin, the NSILT will be useful for estimating potential loading to the UFA. As new data become available that greatly affect the results of the NSILT, a reevaluation of the NSILT will be initiated. This reevaluation will provide the department and stakeholders with a new estimate of the distribution of loading by source categories and their comparative contribution to overall loading to the UFA. It will also help identify any changes in the contribution of categories of sources from the previous NSILT evaluation.

Changes in the distribution of sources are expected with time as different nitrogen loading reduction management actions are implemented, population growth results in shifts between types of land use (particularly between urban and agriculture land uses), and business practices change in specific land use categories. Along with surface and ground water monitoring data, the NSILT evaluation will help the department and stakeholders identify the direction to be taken during the second and future phases of the BMAP.

2.3 ADDITIONAL VERIFIED IMPAIRED WATERBODIES

The Silver Springs BMAP area contains surface waters that have been identified as impaired for nutrients or other pollutants and have TMDLs developed for them. Lake Weir, located in southern central Marion County and south of Silver Springs, has a draft TMDL for TN and TP.

The Orange Creek BMAP area overlaps a portion of the northern Silver Springs BMAP area and contains several nutrient-impaired lakes, including Orange and Lochloosa Lakes (**Figure 11**). Orange Lake has a TMDL for TP, while Lochloosa Lake has a draft TMDL for both TN and TP. Dye injected into a sinkhole along Orange Lake's southern shore was traced as far south as a well in Reddick, confirming a connection between the lake and the UFA in the Silver Springs BMAP area.[11]

The Upper Ocklawaha BMAP covers portions of Lake County, including Lake Griffin, which is also included in the Silver Springs BMAP area (**Figure 11**). Lake Griffin has a TMDL for TP. There is evidence of leakage from Lake Griffin to the UFA and potential, but unconfirmed, ground water movement toward Silver Springs.[12] The SJRWMD is developing models to evaluate the interaction of Lake Griffin and the UFA.

[11] McGurk *et al., op. cit.*
[12] Fulton, R. June 2013. *Restoration of Lake Griffin – influence on Silver Springs?* Presentation given at June 20, 2013 BMAP meeting. SJRWMD.

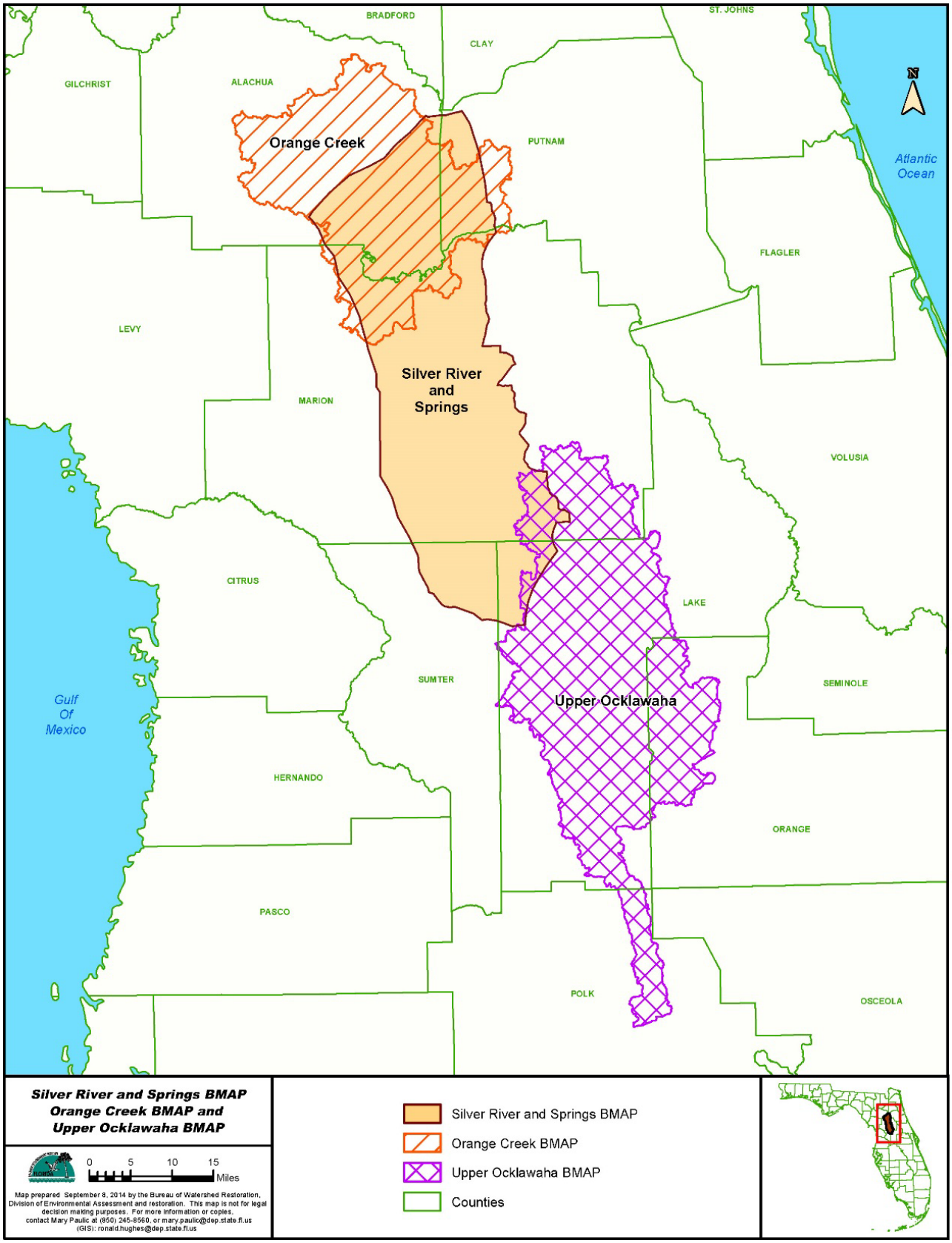

FIGURE 11. LOCATION OF OTHER OVERLAPPING SURFACE WATER BMAP AREAS

Actions taken to manage nutrient loadings in the Orange Creek Basin and the Upper Ocklawaha Basin can also provide positive benefits for Silver Springs. Though many of these basin's TMDLs are written to address TP, many of the BMPs used for TP removal also remove nitrogen. For stakeholders located in overlapping BMAP areas, activities given BMAP credit in one BMAP may also be given credit in the second BMAP as they address two different impaired waterbodies, provided that the management action undertaken will benefit both impaired waterbodies.

Silver Springs and Silver River are part of the Ocklawaha Basin, a Group 1 basin. These basins were last assessed in 2012 and will be reassessed in 2017. The 2017 assessment could result in the identification of other waters as impaired or additional parameters for waterbodies with existing TMDLs.

Furthermore, on November 30, 2012, the United States Environmental Protection Agency (EPA) approved the department's numeric nutrient criteria (NNC) for rivers, streams, lakes, and some estuaries. In January 2014, a federal judge granted the EPA's motion to discontinue federal rulemaking and allow the department to implement its NNC. Future evaluations for impairments in the basin will be based on the state's NNC, which set a concentration of 0.35 mg/L of nitrate as the criterion for springs, the same as the concentration target for the Silver Springs and Silver Springs Group TMDL.

2.4 MANAGING POLLUTANT LOADS FROM FUTURE GROWTH

Local land development regulations, comprehensive plans, local codes, incentives, BMPs, and Environmental Resource Permit (ERP) requirements provide mechanisms for protecting water resources and reducing the impact of new development and other land use changes as they occur. They are the primary mechanisms available to address additional nitrogen loadings from urban and agricultural growth. Future agricultural operations will be subject to the same requirements as existing operations with regard to the implementation of FDACS-adopted BMPs. **Chapter 3** provides further discussion of the FDACS enrollment program. The Silver Springs BMAP recognizes the local protections described in this section (**Table 4**) as an important component of the BMAP and encourages these local governments to further strengthen local watershed protection frameworks.

2.4.1 ALACHUA COUNTY

Alachua County's Water Quality Code, in effect since January 1, 2003, establishes standards for environmental protection through the regulation of water pollution. Erosion and sediment control are

part of the Water Quality Code, and the code requires land excavation or filling not to adversely impact surface or ground water quality.

Alachua County requires the review and approval of any development activities that occur within its jurisdiction in the unincorporated portion of the basin. Specific protection standards are in place to protect regulated natural resources, which include wetland and surface waters and associated buffers, 100-year floodplain, significant geological features, listed species habitat, and all areas identified as strategic ecosystems. Local policies and regulations for the protection of regulated natural resources in unincorporated Alachua County are provided in the Conservation and Open Space Element of the Alachua County Comprehensive Plan 2011–2030 and Chapter 406 of the Alachua County Unified Land Development Code.

County regulations require that all efforts should be made to avoid adverse impacts to wetlands and surface waters. The county evaluates development proposals based on the determination of avoidance of adverse impacts. Where the applicant demonstrates that all reasonable steps have been taken in the attempt to avoid adverse impacts, but impacts are unavoidable, activities are required to minimize the impacts and mitigate if necessary.

To allow significant impacts in wetlands, the application must meet the requirements of Section 406.44, Unified Land Development Code. Buffer width must be determined on a case-by-case basis, depending on what is demonstrated to be scientifically necessary to protect natural ecosystems from significant adverse impacts. This determination is made in consideration of the development type and potential for adverse impacts, natural community and hydrology, buffer characteristics and function, and the presence of listed plant and animal species. Absent scientific information which demonstrates that a larger or smaller buffer width is appropriate, buffer widths for the resources are set forth in Table 406.43.1, Alachua County Unified Land Development Code. Supporting Alachua County Comprehensive Plan Objectives and Policies are available online.

2.4.2 CITY OF HAWTHORNE

The city of Hawthorne has land development regulations to protect wetlands and surface waters within its boundaries. Hawthorne Zoning Regulations (Section 4.3.7) require a minimum 35-foot natural buffer from wetlands, perennial rivers, streams, creeks, lakes, and ponds. Any structures (except permitted docks, walkways, and piers) are prohibited in these buffer areas, although nonintensive, resource-based recreational activities are permitted in the riverine buffer areas. In addition, in the riverine and wetland

buffer areas, agriculture and silviculture uses conducted in accordance with BMPs may be allowed. Other protection standards and policies may apply. Supporting Hawthorne Comprehensive Plan Policies are available online.

2.4.3 MARION COUNTY

Marion County's Spring Protection Resolution was passed in 2005, and the resulting development standards were included in subsequent updates to the Land Development Code. Standards include effluent concentration limits for WWTFs, lot size restrictions for septic tanks in new developments, septic tank maintenance requirements, ground water recharge requirements, and stormwater management standards encouraging low-impact development (LID). The Marion County Fertilizer Ordinance was passed in 2008 and its provisions subsequently incorporated into the Land Development Code. The fertilizer ordinance includes provisions for fertilizer content standards, allowable application rates, fertilizer-free zones, and certification standards for commercial applicators.

In June 2013, Marion County designated an area north and west of Silver River State Park and SR 40, as well as part of the park, as a Community Redevelopment Area (CRA) (Marion County Ordinance No. 13-14), in accordance with the 1969 Community Redevelopment Act (Section 163.355, F.S.). The area covered by the CRA encompasses about 4,000 acres.

To protect natural resources, Marion County enacted a Transfer of Vested Rights Program and Transfer of Development Rights Program to minimize the dense development of certain properties without central water and sewer systems or other supporting infrastructure by allowing the transfer of development rights to another property (see **Table 4** for more detail).

2.4.4 LAKE COUNTY

Lake County Land Development Regulations contain provisions for the protection of wetlands and waterbodies, the removal of shoreline vegetation, stormwater management, and ground water aquifer recharge protection. An average buffer of 50 feet is required around wetlands, increasing to 100 feet for rivers and streams. Areas identified as managed natural areas by the county comprehensive plan require a development review of all proposed activity within 1,000 feet of the natural area to avoid potential impacts to natural systems. Activities within recharge areas may not reduce the volume of recharge, increase the volume of postdevelopment runoff, or reduce the quality of ground water below existing county or state standards.

2.5 PROTECTION OF SURFACE WATER AND GROUND WATER RESOURCES THROUGH LAND CONSERVATION

Maintaining land at lower intensity uses through land purchases or easements for conservation and recreational use is one strategy for reducing water quality impacts to Silver Springs, the UFA, and Upper Silver River. **Table 5** lists the acquisitions made in the BMAP area since 2000. Overall 48,990 acres have been purchased or proposed by different entities. Land purchases for conservation have occurred primarily in two locations in the BMAP area: around Silver Springs State Park and around Lochloosa Lake (**Figure 4** and **Figure 5**). Most of the projects listed in **Table 5** were purchased through local government land conservation programs or in partnership with other state and federal programs.

TABLE 4: PLANNING AND LAND DEVELOPMENT REGULATIONS ADDRESSING FUTURE GROWTH

- = Empty cell/no data

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	START DATE	STATUS
Planning	B001	Marion County Transfer of Development Rights	Marion County Growth Services	Transfer of Development Rights (TDR) Program is designed to protect natural resources, especially those listed in Policy 1.1.2 of Conservation Element of Marion County Comprehensive Plan and locally important and prime farmlands in Marion County. These resources include, but are not limited to, preservation of high-water recharge and underground drainage basins, springs, karst areas, sinkholes, sinks, sinkhole ponds, and other karst features. Land from which development rights are transferred is subject to conservation easement. Article 3 of Land Development Code defines TDR Program and eligible sending and receiving areas.	2000	Ongoing
Planning	B002	Marion County Transfer of Vested Rights	Marion County Growth Services	Transfer of Vested Rights (TVR) Program is designed to minimize dense development of vested properties without central water and sewer systems, and/or other supporting infrastructure, and thus protect natural resources, encourage and enhance development of larger parcels, reduce county's inventory of vested properties, and permit county to better plan for future growth. Land from which vested rights are transferred is subject to conservation easement. Article 3 of Land Development Code defines TVR Program and eligible sending and receiving areas.	2000	Ongoing
Planning	B003	Marion County Hamlet Design Option	Marion County Growth Services	Comprehensive Plan Future Land Use Element Policy 2.1.13 establishes Hamlet Development Option, designed to provide for clustered low-density development patterns in rural designated lands, while requiring permanent open spaces reserved from development and some increased additional urban services (*e.g.*, central water, central sewer, designed/constructed stormwater systems) that comply with Marion County's design and development standards, including Springs Protection. Article 3 of Land Development Code generally defines Hamlet design provisions.	2000	Ongoing

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	START DATE	STATUS
Planning	B004	Marion County Rural Community Land Use Designation	Marion County Growth Services	Comprehensive Plan Future Land Use Element Policy 2.1.18 establishes Rural Community future land use designation to provide for clustered urban density development patterns in rural designated lands, while requiring permanent open spaces reserved from development and complete urban services (*e.g.*, central water, central sewer, and designed/constructed stormwater systems) that comply with Marion County's design and development standards, including Springs Protection. Article 3 of Land Development Code generally defines Rural Community design provisions.	2000	Ongoing
Planning	B005	Marion County Community Redevelopment Area Program	Marion County Growth Services	Comprehensive Plan Future Land Use Element Objective 2.2 establishes specific limited density and specialized design standards for wetland and floodplain areas slated for development. Articles 5 and 6 of Land Development Code set forth specific design and development criteria related to applicable areas.	2000	Ongoing
Planning	B006	Marion County Springs Protection Zones	Marion County Growth Services	Comprehensive Plan Future Land Use Element Objective 7.2 establishes Springs Protection Overlay Zones (SPOZ) and identifies extent of Primary and Secondary Zones along with other design and development standards. Articles 5 and 6 of Land Development Code set forth specific design and development criteria for applicable SPOZ.	2000	Ongoing
Regulation or Ordinance	-	Springs Protection Resolution 05-R-106	Marion County Office of the County Engineer	Resolution establishes springs protection zones with development standards for reduction of nitrogen. Development standards were later incorporated into Marion County Land Development Code.	2005	Ongoing
Regulation or Ordinance	B007	Marion County Irrigation Ordinance	Marion County Office of the County Engineer	Ordinance sets enforceable irrigation schedule and rates of irrigation for Marion County. It also identifies efficient irrigation systems that are exempt from schedule.	2008	Ongoing
Regulation or Ordinance	B008	Marion County Fertilizer Ordinance	Marion County Office of the County Engineer	County's Florida-Friendly Fertilizer Use on Urban Landscapes ordinance regulates proper use of fertilizers by any applicator; requires proper training of commercial and institutional fertilizer applicators; establishes training and licensing requirements; and specifies allowable fertilizer application rates and methods, fertilizer-free zones, low-maintenance zones, and exemptions. It requires use of BMPs that provide specific management guidelines to minimize negative secondary and cumulative environmental effects associated with misuse of fertilizers. 2008 ordinance is now included in latest Land Development Code.	2008	Ongoing

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	START DATE	STATUS
Regulation or Ordinance	S002	Stormwater Management-Policy Adoption	Village Center CDD	Adopted policy prohibits illicit discharges for Village Center CDD No. 1.	2007	Ongoing
Regulation or Ordinance	S001	Fertilizer and Landscape Irrigation Codes	Alachua County Environ-mental Protection Department (ACEPD)	County's Adopt and Enforce Fertilizer Management and Landscape Irrigation ordinances reduce volume of runoff from overirrigation and reduce nutrient loading from use of fertilizers. They implement Alachua County Comprehensive Plan Conservation and Open Space Element – Surface Water Systems Objective 4.6.	2009	Ongoing
Regulation or Ordinance	S003	Golf Course Resource Management Plan	Lake County Public Works	Golf course resource management plans are applicable to unincorporated portion of Lake County. They apply to new and existing golf courses. This regulatory approach will protect ground and surface waters.	2001	Ongoing
Regulation or Ordinance	S004	Lake County Shoreline Protection Guide	Lake County Public Works	Guide for lakefront landowners on water resource issues includes shoreline protection, stormwater BMPs, erosion, and aquatic plants. As part of outreach program targeted at county residents, it informs property owners of better land management practices to improve water quality protection.	2000	Ongoing

TABLE 5: COMPLETED CONSERVATION LAND PURCHASES

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

PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	COST OF PURCHASE
S005	**Acquisition of Indian Lake State Forest**	Department Division of State Lands	Acquisition of 4,400 acres of sandhills and pastureland previously known as the Avatar property. Forest is within two- and 10-year modeled capture areas for Silver Springs and contains Indian Lake, a karst feature directly connected to UFA, and numerous sinkholes. Restoration of native sandhills is under way. Forest was acquired with Florida Communities Trust contributing $76 million, with additional $2 million provided by Marion County.	Florida Communities Trust, Marion County	2007	Managed by Florida Forest Service	2007	$78,000,000
S006	**Silver Springs Conservation Area**	Department Division of State Lands	Acquisition of 346 acres of undeveloped land directly across SR 35 from Silver Springs State Park. Land was acquired under Florida's First Magnitude Springs project by Division of State Lands. By preserving land around springs, project will help to protect springs, karst windows, and Floridan aquifer from effects of commercial, residential, and agricultural runoff; clear cutting and mining; and unsupervised recreation.	Marion County	2005	Managed by Marion County	2005	$7,847,000
S007	**Little Orange Creek Land Acquisition**	Alachua County EPD	Little Orange Creek addition is 699 acres. No increase in surface runoff of pollutants due to land use change, continued aquifer recharge and ecosystem/habitat preservation; implement Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1.	None	2012	Complete	2012	$795,437.55
S008	**Phifer Flatwoods Land Acquisition #1 – Lochloosa Creek**	ACEPD	Phifer Flatwoods #1 is 600 acres. No increase in surface runoff of pollutants due to land use change; aquifer recharge and ecosystem/habitat preservation will continue; implements Alachua County Comp Plan Conservation and Open Space Element – Alachua County Forever Policy 6.2.1.	Alachua Conservation Trust; Florida Conservation Trust	2006	Complete	2006	$2,882,239

PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	COST OF PURCHASE
S009	**Phifer Flatwoods Land Acquisition #2 – Lochloosa Creek**	ACEPD	Phifer Flatwoods #2 is 380 acres. No increase in surface runoff of pollutants due to land use change; aquifer recharge and ecosystem/habitat preservation will continue; implements Alachua County Comp Plan Conservation and Open Space Element – Alachua County Forever Policy 6.2.1.	None	2009	Complete	2009	$1,170,864
S010	**Longleaf Flatwoods Preserve Land Acquisition**	ACEPD	Purchase of 1,388.5 acres of longleaf flatwoods. No increase in surface runoff of pollutants due to land use change; aquifer recharge and ecosystem/habitat preservation will continue; implements Alachua County Comprehensive Plan Conservation and Open Space Element – Alachua County Forever Policy 6.2.1.	SJRWMD	2003	Complete	2003	$2,259,654
S011	**Rayonier Tract Acquisition (River Styx)**	ACEPD	Rayonier Tract purchase of 1,450 acres. No increase in surface runoff of pollutants due to land use change; aquifer recharge and ecosystem/habitat preservation will continue; implements Alachua County Comp Plan Conservation and Open Space Element – Alachua County Forever Policy 6.2.1.	SJRWMD	2008	Complete	2008	$4,855,506
S012	**Freddy Wood Land Tract Acquisition**	ACEPD	Freddy Wood Tract covers 600 acres. No increase in surface runoff of pollutants due to land use change; aquifer recharge and ecosystem/habitat preservation will continue; implements Alachua County Comp Plan Conservation and Open Space Element – Alachua County Forever Policy 6.2.1.	Natural Resources Conservation Service (NRCS)	2008	Complete	2008	$1,136,000
S013	**Lochloosa Wildlife Conservation Area**	SJRWMD	Acquisition of 28,337 acres of land around Lochloosa Lake and around north side of Orange Lake for Lochloosa Wildlife Conservation Area. **Benefits:** No increase in the surface runoff of pollutants due to land use changes.	Alachua County	2003	Complete; managed by SJRWMD	2003	$16,058,211 Cost-share

PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	COST OF PURCHASE
S110	**Cypress Point Creamery Land Acquisition**	ACEPD	Acquisition of 600 acres. No increase in surface runoff of pollutants due to land use change; aquifer recharge and ecosystem/habitat preservation will continue; implements Alachua County Comprehensive Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1.	USDA Farm and Ranch Lands Protection Program (FRPP)	2014	Complete	2014	$461,000
S111	**Higginbotham Ranch Acquisition**	ACEPD	Acquisition of 600 acres. No increase in the surface runoff of pollutants due to land use change; aquifer recharge and ecosystem/habitat preservation will continue; implements Alachua County Comp Plan Conservation and Open Space Element - Alachua County Forever Policy 6.2.1.	USDA FRPP	2014	Complete	2014	$756,000
S113	**Silver Springs Sandhill Acquisition**	Marion County Parks	County applied to have project added to Florida Forever list. Project preserves 470 acres of high-recharge sandhills located within one mile of Silver Springs. Property is located just south of Indian Lake State Forest.	None-	2015	Planned	2020	$4,432,979
S114	**Silver Springs Forest**	Marion County Parks	Project involves acquisition of 4,900 acres of managed forest land, owned by Rayonier, east of Indian Lake State Forest and west of CR 315. Land will be restored and opened for recreational use. Project is identified in Heather Island Florida Forever Project and as United States Forest Service Legacy Project: Silver Springs Watershed Forest Legacy project.	United States Forest Service and Florida Forest Service	2015	In Progress	2016	-
S117	**Heather Island Conservation Easement**	Marion County Parks	Project would establish conservation easement on 5,223 acres of privately owned forest land east of CR 315 along Ocklawaha River. Tract is identified as part of Heather Island Florida Forever project and is identified as Phase 2 of Silver Springs Watershed Forest Legacy project.	None	2015	Conceptual	2020	

Chapter 3: POLLUTANT SOURCES AND RESEARCH STRATEGIES

The BMAP requires the implementation of specific projects and activities by the Silver Springs BMAP stakeholders and agricultural producers in the basin. This chapter describes the regulatory framework that applies to the entire Silver Springs BMAP area and that is used to enforce the implementation of management actions (discussed in **Chapter 4**). The understanding of how nitrogen loading applied to the land surface travels to and impacts the UFA and Silver Springs is not well understood. This chapter includes an overview of the research efforts to better understand the fate and transport of nitrogen.

3.1 SUMMARY OF SOURCES IN THE BMAP AREA

3.1.1 ENVIRONMENTAL RESOURCE PERMITTING

Activities that exceed SJRWMD permitting thresholds for stormwater must be authorized by an ERP from the district (Chapters 40C-4 through 40C-400, F.A.C.) that incorporates both stormwater treatment and the mitigation of any wetland impacts. To obtain an ERP where existing ambient water quality does not meet state water quality standards, an applicant must demonstrate that the proposed activity will result in a net improvement in the parameters that do not meet standards. The SJRWMD applies this criterion to waters listed by the department as impaired.

3.1.2 NPDES STORMWATER PROGRAM

The NPDES stormwater program regulates discharges to surface waters for several entities in the basin. The basic requirements of this program serve as a foundation for the stormwater management efforts of the basin's communities. Phase I addresses large and medium municipal separate storm sewer systems (MS4s) located in incorporated places and counties with populations of 100,000 or more, as well as specific industrial activities. Phase II addresses additional sources, including small MS4s. All of the MS4s in the Silver Springs BMAP area are Phase II permits.

Under a generic permit, the operators of regulated Phase II MS4s must develop a Stormwater Management Program that includes BMPs, with measurable goals, to effectively implement the following six minimum control measures: public education and outreach, public participation/ involvement, illicit discharge detection and elimination, construction site runoff control, postconstruction runoff control, and pollution prevention/good housekeeping.

Table 6 lists local governments and other entities in the BMAP area that are currently designated as Phase II MS4s. The regulated Phase II MS4 permit areas for Alachua County and FDOT District 2 (Gainesville urbanized area) do not overlap any portion of the BMAP contributing area, including the Lochloosa Lake and Orange Lake Basins.

Additionally, the generic permit (Paragraph 62-621.300[7][a], F.A.C.) states, "If a TMDL is approved for any waterbody into which the Phase II MS4 discharges, and the TMDL includes requirements for 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 Implementation Plan."

TABLE 6: ENTITIES IN THE SILVER SPRINGS BMAP AREA DESIGNATED AS REGULATED PHASE II MS4S

PERMITTEE	MS4 PERMIT NUMBER
Alachua County	FLR04E005
Lake County	FLR04E106
Marion County	FLR04E021
FDOT, District 2	FLR04E018
FDOT, District 5	FLR04E024
City of Ocala	FLR04E046
City of Leesburg	FLR04E110
City of Fruitland Park	FLR04E114
City of Lady Lake	FLR04E105
The Villages CDD Districts 1-10	FLR04E116

3.1.3 URBAN NONPOINT SOURCES

Subsubparagraph 403.067(7)(b)2.f, F.S., prescribes the pollutant reduction actions required for nonagricultural pollutant sources that are not subject to NPDES permitting. These nonpoint sources must also implement the pollutant reduction requirements detailed in a BMAP. The cities of Belleview, Hawthorne, and McIntosh are the entities that may be responsible for reducing nonpoint sources in the BMAP area.

Failure by a nonpoint source to reduce loadings, as required in a BMAP, can result in enforcement action by the department under Subsubparagraph 403.067(7)(b)2.h, F.S. The department can designate

an entity as a regulated Phase II MS4 if its discharges are determined to be a significant contributor of pollutants to surface waters of the state in accordance with Rule 62-624.800, F.A.C. The designation of an entity as a Phase II MS4 can occur when a TMDL has been adopted for a waterbody or segment into which the entity discharges the pollutant(s) of concern. If an entity is designated as a regulated Phase II MS4, it is subject to the conditions of the Phase II MS4 Generic Permit.

3.2 AGRICULTURAL BMP IMPLEMENTATION

Agricultural nonpoint sources in a BMAP area are required by state law (Subsection 403.067[7], F.S.) either to implement FDACS-adopted BMPs or to conduct water quality monitoring prescribed by the department or SJRWMD, to demonstrate compliance with water quality standards. Failure either to implement BMPs or conduct monitoring may bring enforcement action by the department or SJRWMD. The implementation of FDACS-adopted, department-verified BMPs in accordance with FDACS rule provides a presumption of compliance with state water quality standards.

Table 7 summarizes agricultural land use categories, other than silviculture (see **Section 3.2.6**), in the Silver Springs BMAP area, based on 2009 SJRWMD land use data. **Figure 12** displays the locations of agricultural lands in the basin. Primary agricultural activities in the BMAP area are horse farms and cattle operations. An estimated 48,081 acres of land identified as silviculture in 2009 are in transition to other, more intensive agricultural uses. As within-agriculture land use categories shift, FDACS works with producers to enroll the new land use acreage in the appropriate BMPs.

TABLE 7: AGRICULTURAL LAND USES IN THE SILVER SPRINGS BMAP AREA

- = Empty cell/no data
* Included as rangeland in **Table 3**.

LAND USE CODE	CODE DESCRIPTION	TOTAL ACRES	% OF TOTAL ACRES
2100	Cropland and Pastureland	14,157.5	9.2%
2110	Improved Pasture	59,076.6	38.3%
2120	Unimproved Pasture	3,582.2	2.3%
2130	Woodland Pasture	8,880.1	5.8%
3100*	Herbaceous Upland Nonforested	4,464	2.9%
3200*	Shrub and Brushland	2,127.3	1.4%
3300*	Mixed Upland Nonforested	2,761.1	1.8%
2140	Row Crop	1,137.6	0.7%
2150	Field Crops	20,125.6	13.0%
2160	Mixed Crops	737.3	0.5%
2200	Tree Crops	888.2	0.6%
2210	Citrus	2,025.8	1.3%
2240	Abandoned Trees	65.1	-
2300	Animal Feeding Operations	83.1	0.1%
2310	Cattle Feeding Operation	81.4	0.1%
2320	Poultry Feeding Operation	74.8	-
2400	Nurseries	454.7	0.3%
2410	Tree Nurseries	366.6	0.2%
2430	Ornamentals	629.7	0.4%
2500	Specialty Farms	830.6	0.5%
2510	Horse Farm	28,674.3	18.6%
2520	Dairies	1,004.6	0.7%
2540	Aquaculture	11.1	-
2600	Other Open Lands – Rural	1,661.0	1.1%
2610	Fallow Cropland	54.7	-
-	**TOTAL**	**154,283.4**	**100%**

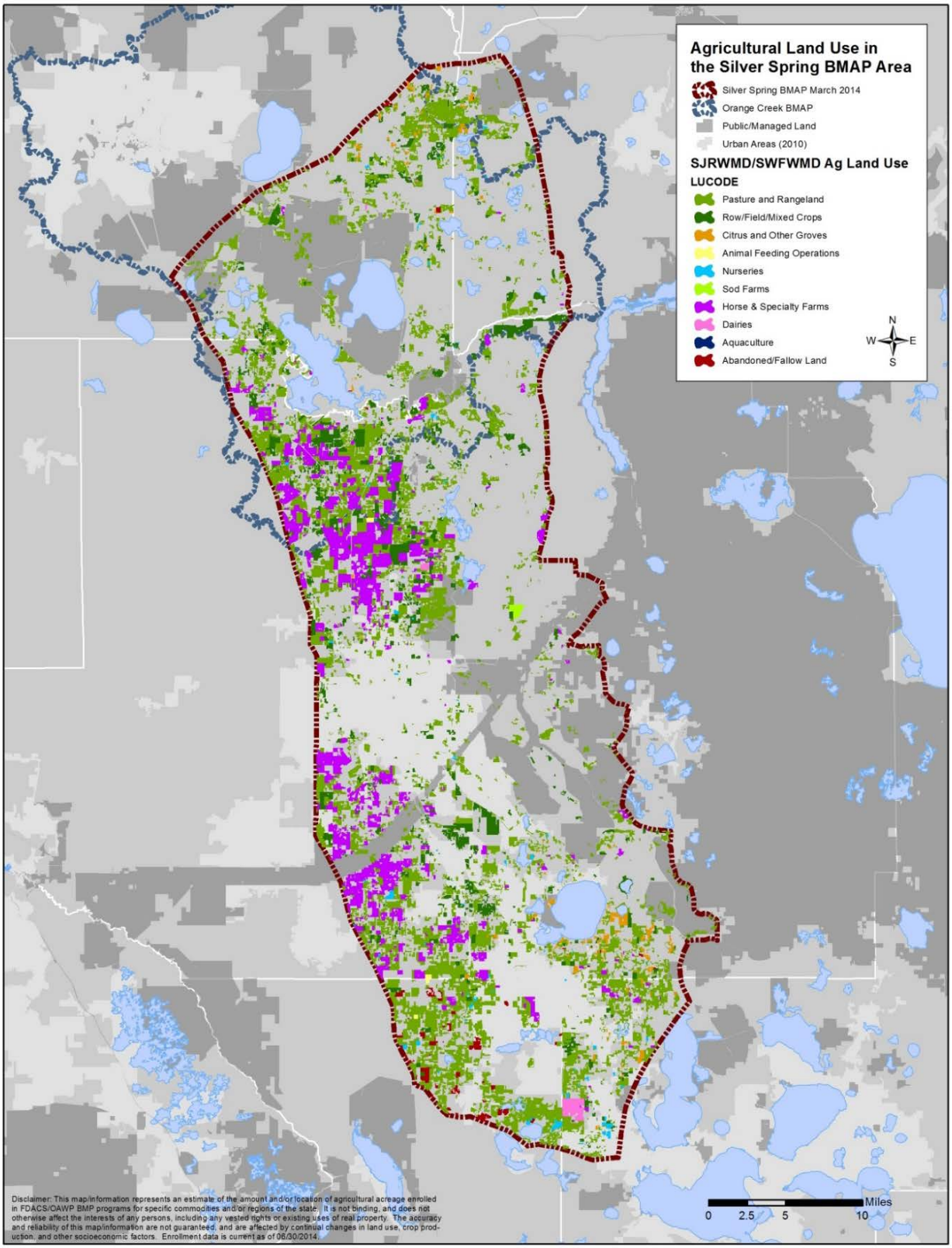

FIGURE 12: FDACS' OFFICE OF AGRICULTURAL WATER POLICY (OAWP) 2009 AGRICULTURAL LANDS IN THE SILVER SPRINGS BMAP AREA

3.2.1 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 has authority for establishing agricultural BMPs through the Florida Forest Service (silviculture BMP program), Division of Aquaculture (Aquaculture Certification Program), and Office of Agricultural Water Policy (OAWP) (all other agricultural BMP programs).

The OAWP BMPs fall into two categories: structural and management. Structural BMPs involve the installation of structures or changes to the land and are usually more costly. They include water control structures, fencing, and tailwater recovery systems, among other things. Management BMPs, such as nutrient and irrigation management, comprise the majority of the practices. 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, correct fertilizer formulations, and setbacks from water resources. Irrigation management is the maintenance, scheduling, and overall efficiency rating of irrigation systems. In most areas of the state, FDACS-funded Mobile Irrigation Labs are available to evaluate irrigation system efficiency and provide recommendations to producers to improve efficiency. The implementation of these recommendations results in billions of gallons of water saved throughout the state, and helps reduce nutrient runoff and leaching.

Table 8 identifies key management and structural BMPs that would be applicable to agricultural operations in the basin. By definition, BMPs are developed to be technically and economically feasible. However, FDACS' BMP manuals do contain some BMPs that may be affordable only with financial assistance through cost-share programs. The BMP checklists allow producers to indicate whether implementing a BMP requires financial assistance, on a case-by-case basis. Through cost-share programs, FDACS works with producers to implement applicable key BMPs that otherwise are not affordable.

For assistance with enrolling in FDACS' BMP program or with obtaining cost-share funds, interested producers should contact OAWP staff. Information on the BMP manuals and field-staff contact information is available online. BMP manuals can also be obtained in the local extension office, at county agricultural extension centers, at USDA-NRCS Service offices, or by contacting OAWP field staff.

TABLE 8. KEY MANAGEMENT AND STRUCTURAL BMPS ADOPTED BY FDACS' OAWP

DETERMINING NUTRIENT NEEDS

Soil and Tissue Testing: Used to base fertilizer applications on plant needs and available nutrients in the soil; helps prevent the overapplication 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 overapplication 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 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 down-gradient catchment ponds to trap irrigation tailwater to be reused on cropland; reduces offsite transport of nutrients and conserves water.

TREATMENT AND EROSION CONTROL

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 erosion and transport of nutrient-laden sediments.

LIVESTOCK MANAGEMENT (APPLICABLE TO COW/CALF AND EQUINE OPERATIONS)

Manure Management: Appropriate storage and disposal of animal waste.

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.

3.2.2 BMP ENROLLMENT

Table 9 summarizes the land use data figures for agriculture in the BMAP area, the acreage associated with commodity types addressed by OAWP BMP manuals, and the acres enrolled in OAWP BMP programs. Based on aerial imagery and local staff observations, FDACS adjusted the 2009 land use figures to reflect more accurately the current agricultural land use acreage. During the first phase of the BMAP, the OAWP will review aerial imagery and use other means to determine changes in agricultural land use in the basin. Current enrollment in OAWP BMPs as of June 30, 2015, is about 27,912 acres (see **Table 9** and **Figure 13**), or 18.4% of the FDACS-adjusted agricultural acreage.

FDACS' field staff are focusing on enrolling commercial equine and cow/calf operations in this region and will continue to do so. The availability of cost-share funds is expected to have a significant impact in increasing equine BMP implementation in both the Silver and Rainbow Springs BMAP areas. For the 2015-16 fiscal year, FDACS plans to contract with the Marion Soil and Water Conservation District (SWCD) to distribute up to $250,000 in cost-share funds to agricultural producers in the region. Staff will also work to enroll other agricultural operations within the BMAP area.

FDACS reports annually to the department on its progress in contacting and enrolling producers, including number of operations and acres enrolled. In conducting outreach to producers, FDACS works with the SWCDs, resource conservation and development councils, county extension staff, and others to convey the statutory requirement for agriculture to implement BMPs, as well as their benefits to the environment and the producers.

Not all of the acreage listed as agriculture in **Table 9** is included in enrollment figures, because the NOIs document only the estimated total number of acres on which applicable BMPs are implemented, not the entire land use acreage mapped as agriculture in land use maps. Land use data can contain nonproduction acres (such as buildings, parking lots, and fallow acres) that will not be counted on the NOIs submitted to OAWP. There also may be acreage that is not appropriate for enrollment in OAWP BMPs, such as lands not in commercial production (defined as operations conducted as a business).

3.2.3 AGRICULTURAL BMP LOAD REDUCTION ESTIMATES

Due to mapping inaccuracies in the 2009 land use data and to changes in land use since 2009, current agricultural loadings may be somewhat different than the 2009 data indicate. No specific total percent nitrogen load reduction efficiency is estimated for each category of agriculture BMPs used in the basin. Instead an estimated average load reduction percentage was derived for all types of BMPs in Florida.

TABLE 9: AGRICULTURAL ACREAGE AND BMP ENROLLMENT AS OF JUNE 30, 2015, FOR THE SILVER SPRINGS BMAP AREA

- = Empty cell/no data
N/A = Not applicable
[1] 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. Acreage for potential BMP enrollment. Includes abandoned tree crop and fallow or open land.
[2] Tree nursery acreage may be covered under the Specialty Fruit and Nut BMP Program or under the Statewide Nursery BMP Program.
[3]Acreage enrolled is for FDACS BMP program and not specific 2009 land use.

2009 Land Use	Total Acres	FDACS-Adjusted Acres[1]	Related FDACS BMP Program	Acreage Enrolled	Number of Notice of Intent (NOI)
Pasture and Rangeland	95,054.8	95,054.8	Cow/Calf	22,944.1	22
Row/Field/Mixed Crops	22,000.5	22,000.5	Vegetable/Agronomic	2,905.9	5
Citrus	2,025.8	2,025.8	Citrus	521.0	16
Abandoned Tree Crops (citrus)	65.1	0.0	N/A	N/A	N/A
Tree Crops/Other Groves	031.7	931.7	Specialty Fruit and Nut[2,3]	417.93	15
Nurseries and Vineyards	454.7	454.7	Specialty Fruit and Nut[2,3]	417.93	15
Tree Nurseries	366.6	366.6	Statewide Nursery[3]	450.4	8
Ornamental	629.7	629.7	Statewide Nursery[3]	450.4	8
Sod Farm	284.9	284.9	Sod	0.0	0
Cattle Feeding Operations	81.4	81.4	Conservation Plan Rule[3]	0.0	0
Poultry Feeding Operations	74.8	74.8	Conservation Plan Rule[3]	0.0	0
Feeding Operations	83.1	83.1	Conservation Plan Rule[3]	0.0	0
Specialty Farms	830.6	830.6	Conservation Plan Rule[3]	0.0	0
Horse Farms	28,674.3	28,674.3	Equine	527.9	14
Dairies	1,004.6	1,004.6	Future Dairy Manual	0.0	0
Other Open Lands-Rural	1,661.0	0.0	N/A	N/A	N/A
Fallow Cropland	54.7	0.0	N/A	N/A	N/A
Aquaculture	11.1	-	FDACS Aquaculture Division	0.0	0
Totals	154,289.4	151,776.9	-	27,911.5	81

An agricultural BMP average efficiency of 30% is applied to all types of agriculture within the entire Silver Springs BMAP area. This percentage represents the relative amount of nitrogen reduction expected for "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. Agricultural BMP implementation in the Silver Springs BMAP area is anticipated to reduce agricultural loadings of nitrogen for row crops, sod, citrus, nurseries, fruit/nut, cow/calf, and equine operations.

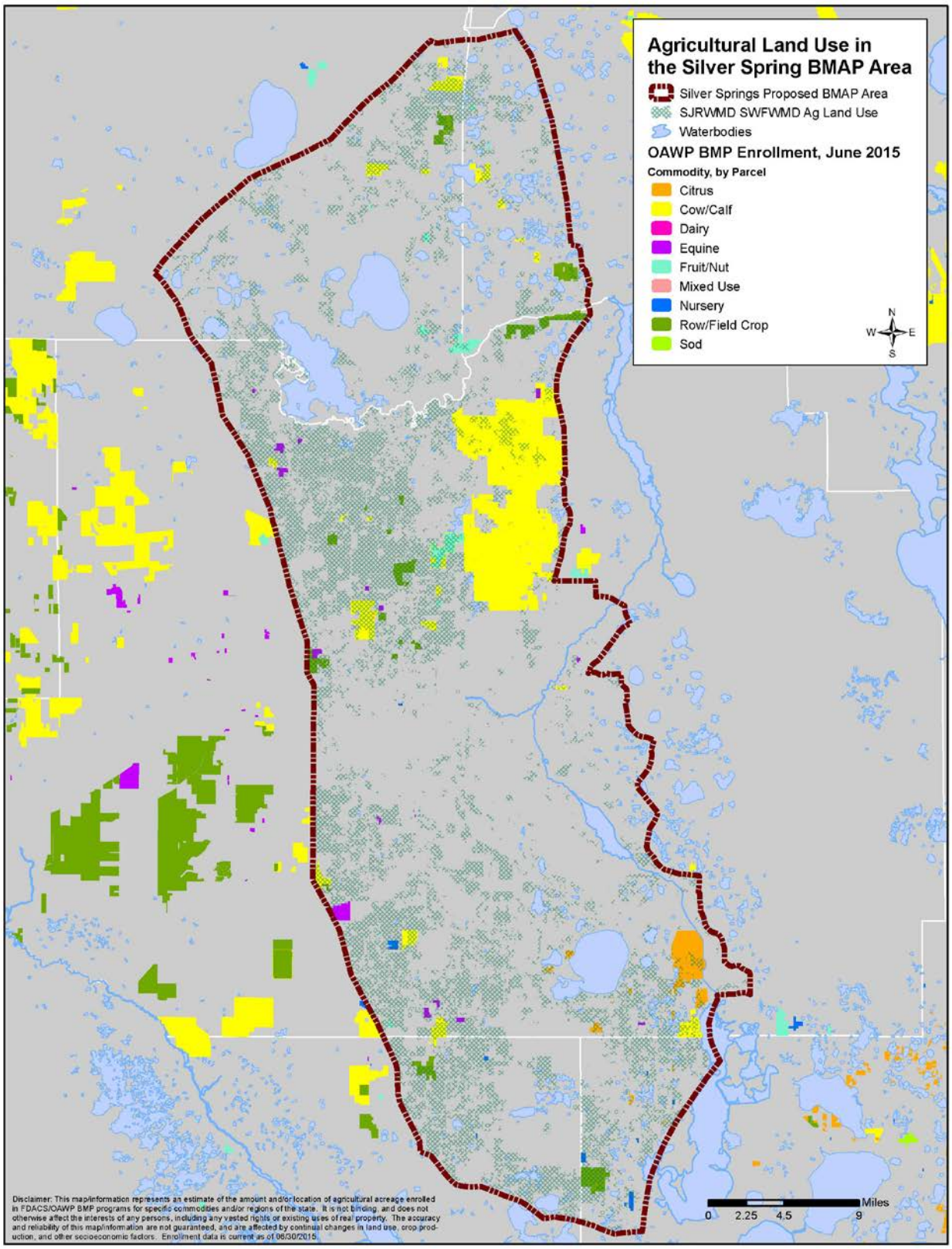

FIGURE 13: FDACS' OAWP BMP ENROLLMENT IN THE SILVER SPRINGS BMAP AREA AS OF JUNE 2015

The region is expected to continue shifting from agricultural to residential land uses, which may further reduce the agricultural load. 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 may be considered.

3.2.4 FDACS' OAWP Role in BMP Implementation and Follow-Up

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 department and SJRWMD activities. If a reevaluation of the BMPs is needed, FDACS will also include the SJRWMD and other partners in the process.

3.2.5 OAWP Implementation Assurance (IA) Program

The OAWP formally established its IA Program in 2005 in the Suwannee River Basin as part of the multiagency/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 follow-up 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 their workload allows. For the visits, field staff and technicians use a standard form (noncommodity 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 2007–14, 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 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 site visits during BMAP implementation.

3.2.6 Florida Forest Service Role in BMP Implementation and Monitoring

FDACS' Florida Forest Service Silviculture BMP Program is responsible for the development, implementation, and monitoring of silviculture BMPs across the state. Silviculture BMPs are applicable to all bonafide ongoing forestry operations. However, they are not intended for use on tree removal or land clearing operations that are associated with a planned land use change for a nonforestry objective. The current *2008 Silviculture BMP Manual* contains 150 individual BMPs in 14 categories. Silviculture BMPs are both structural (forest roads, stream crossings, *etc.*) and management based (pesticide and fertilizer application, special management zones, *etc.*). The silviculture BMP NOI Program began on February 11, 2004. As of August 2014, there were 98,339.2 acres signed up under the silviculture BMP NOI in the Silver Springs BMAP area.

Since 1981, the Florida Forest Service has monitored silviculture operations for compliance with BMPs by conducting biennial surveys. Surveys are conducted on both public and private silviculture operations with on-the-ground evaluations of randomly selected sites where recent silviculture operations have taken place. The *2013 Silviculture BMP Implementation Survey Report* included sites from three counties in the Silver Springs BMAP area (Marion, Alachua, and Putnam). Data for these counties were collected from 17 different silviculture operations with a combined total of 339 applicable silviculture BMPs. The overall silviculture BMP compliance rate for these three counties in 2013 was 99.7%.

An important aspect of silviculture BMPs is that they have been proven effective. A multiyear study conducted by the Florida Forest Service with assistance from the department looked at the effectiveness of silviculture BMPs in protecting aquatic ecosystems during silviculture operations. These BMPs included clear-cut harvesting, intensive mechanical site preparation, machine planting, postplanting herbicide treatments, and forest fertilization treatment. Silviculture BMP effectiveness was evaluated using water chemistry analysis, habitat assessment, and the SCI (a bioassessment methodology developed for Florida stream ecosystems). The study concluded that silviculture BMPs were effective at protecting aquatic habitat in nearby streams with no evidence of impacts or impairments to the designated beneficial use of the streams.[12]

In cooperation with the University of Florida, the Florida Forest Service is also assisting with two more research projects to evaluate the effectiveness of silviculture BMPs for forest fertilization. One study, completed in November 2013, examined the effectiveness of forest fertilization BMPs for protecting ground water from nutrient leaching. Study results showed that the ground water concentrations of ammonium, total Kjeldahl nitrogen (TKN), and TP observed for wells monitored in the fertilization treatment area did not increase compared with prefertilization baseline levels or distant control wells.[13] An ongoing study that looks at the effectiveness of forest fertilization BMPs for protecting nearby surface waters was initiated in 2012 and is expected to be completed in 2017.

[12] Vowell, J.L. 2001. Using stream bioassessment to monitor best management practice effectiveness. *Forest Ecology and Management* 143: 237–244.
Vowell, J.L., and R.B. Frydenborg. 2004. A biological assessment of best management practice effectiveness during intensive silviculture and forest chemical application. *Water, Air, and Soil Pollution, Focus 4*: 297–307.
[13] Minogue, P.J. *et al.* September 13, 2013. *Effectiveness of silviculture best management practices for forest fertilization in pine straw production to protect water quality in Florida: Four year monitoring results and interpretation.* Gainesville, FL: University of Florida–Institute of Food and Agricultural Sciences, North Florida Research and Education Center.

More information on silviculture BMPs and the Silviculture BMP Program is available on the Florida Forest Service website.

3.3 SJRWMD SPRINGS PROTECTION INITIATIVE

The Springs Protection Initiative is a multiyear SJRWMD effort, begun in 2012, to focus district resources to develop and coordinate the protection and restoration of major springs. The district has started a detailed investigation to increase the scientific understanding of spring systems, with one of the primary issues being the reduction of nitrogen loads to springs. In addition, cost-share funds have been made available to local stakeholders throughout the district to assist with projects that yield reductions in nitrogen loads. Wastewater treatment plant (WWTP) upgrades and reuse projects, included in the project tables, have received cost-share funding in the Silver Springs BMAP area. More information about the Springs Protection Initiative is available online.

The science portion of the Springs Protection Initiative is a collaborative effort with the University of Florida. Research began in 2014, is expected to conclude in three years, and is focused in the Silver Springs BMAP area. Research efforts are divided into two "supergroups," as follows:

- The goal of the Springshed Supergroup is to improve the understanding of how nitrogen loading at the land surface is transformed and transported through the soil and the aquifer. There are many unknowns surrounding the transport and conversion of nitrate through soils and the UFA and how that transport is affected by conduits in the UFA. The Springshed Supergroup focuses its research efforts on identifying the sources and loading rate of nitrogen and phosphorus in the springshed, the transformation and loss of those nutrients in soil, and their fate and transport in the aquifer.
- The Springs Ecosystem Supergroup focuses research efforts on processes in the headspring and Silver River. There are many unanswered questions about how the aquatic ecosystem responds to the increase in nitrate concentration. The Springs Ecosystem Supergroup is investigating hydrodynamics and hydraulics in the river, trophic interactions, and benthic sources and sinks of nutrients. There is speculation that the ability of algae to dominate the Silver Springs ecosystem may also be attributable to an imbalanced trophic structure and is not solely an outcome of

elevated nitrate concentrations. Part of the solution would then be to restore the appropriate predator-prey relations.

The results from the two supergroups will be integrated for an improved understanding of the relative influences and manageabilities of factors that affect springs, and will support decisions for cost-effective, long-term management solutions based on the expected environmental responses from activities.

The findings of this research are expected to inform and direct the future BMAP process by aiding in the selection of additional management actions and increasing the understanding of the processes that transport and transform nitrate in the aquifer. The research results will be not available until 2017, and thus the outcomes of studies will most likely be integrated into the BMAP during its second phase.

In addition to the research and project funding components of the initiative, the SJRWMD increased water quality monitoring in Silver River and the BMAP area. This includes additional monitoring wells in a 60-site monitoring network of existing and new wells. Well sites will be chosen to be representative of the varied land use in the BMAP area, and will include multiple wells for sampling in both the surficial aquifer and UFA. **Chapter 5** includes additional details about the proposed monitoring networks.

3.4 OTHER RESEARCH EFFORTS

Table 10 lists other research and modeling efforts that have been completed or proposed. Marion County prepares watershed management plans (WMPs) for surface water drainage basins in the county, several of which are located in the BMAP area. These management plans are used to address the water quality issues created by stormwater and identify solutions to those issues. The county completed a Floridan aquifer vulnerability assessment in 2007 that is more detailed and locally specific than the state aquifer vulnerability maps. Maps generated from that exercise are used to guide development actions and reduce impacts to ground water. Alachua County has completed a similar aquifer vulnerability mapping for the county. The department worked with Florida State University in 2007 to complete an investigation of the contribution of ground water to Lochloosa Lake. Marion County Parks Department proposes an investigation of management techniques that promote healthy turf on playing fields while reducing or eliminating ground water pollution.

TABLE 10: RESEARCH AND MODELING EFFORTS

- = Empty cell/no data
N/A = Not applicable
* = Completion date needs to be determined during first phase of BMAP. End of first BMAP phase entered as a default.

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE
Studies	B034	Marion County Watershed Management Program	Marion County Office of the County Engineer	WMPs will be completed countywide and used to identify and address Marion County water quality issues. WMPs will include creation and maintenance of comprehensive geodatabase for Marion County storm sewer system data, watershed boundaries, and hydrologic features countywide.	SWFWMD	2003	Ongoing	Ongoing
Studies	B035	Marion County Aquifer Vulnerability Assessment	Marion County Office of the County Engineer	Project to identify vulnerable areas of aquifer provides scientifically defensible water resource management and protection tool that will facilitate planning of human activities to help minimize adverse impacts on ground water quality. Aquifer vulnerability maps are displayed in classes of relative vulnerability (*i.e.*, one area is more vulnerable than another). Maps benefit local government, planners, and developers in guiding growth into more appropriate areas (*e.g.*, away from ground water recharge areas) and improve site selection for expanding existing or establishing new wellfields.	None	2007	Complete	2007
Studies	S066	Ground Water - Surface Water Interaction Study Lake Lochloosa Area, Alachua and Marion Counties	Department	Study of Lake Lochloosa and Orange Lake watersheds examined ground water pathways through which nutrients enter these lakes. Field investigations were carried out to determine levels of TP and TN in different aquifers associated with land use categories. Radon studies were performed to estimate ground water seepage into Lake Lochloosa.	United States Geological Survey (USGS)	2007	Complete	2007

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE
Studies	S067	SJRWMD Springs Protection Initiative Science (SPIS)	SJRWMD	SJRWMD Springs Protection Initiative. District recognizes this effort as strategic priority for agency. Initiative will include three major components of projects, regulation, and science. Science component (SPIS) acknowledges that effective management of springs requires understanding of relative influences and manageabilities of numerous natural and anthropogenic forces that affect their ecological health, and that additional interdisciplinary research is needed to achieve this goal (Department 2007). Workgroups have been established and include Springshed Supergroup (Surface Water, Ground Water, and Nitrogen biogeochemistry) and Springs Ecosystem Supergroup (Hydrology and Hydrodynamics, Biology, and Physicochemistry). Also, district has contracted with University of Florida Water Institute for support for this integrated work. Work of these groups will focus on Silver Springs system and its springshed. Interdisciplinary workgroups will build on existing work and develop and merge data and models that will focus on goal of providing sound scientific foundation for development of cost-effective approaches for management of activities to address issues in Silver Springs. Findings and results of this three-year effort are expected to support future BMAP activities.	University of Florida	2013	Ongoing	2017
Data Collection	S068	Water Resource Information and Data Collection	SJRWMD	SJRWMD has core monitoring in/on Silver Springs, Silver River, and contributing area to Silver Springs. Core monitoring consists of discharge monitoring, surface and ground water levels, surface and ground water quality, and biological monitoring. As part of SJRWMD Springs Protection Initiative, district has added discharge monitoring site, increased number and sampling frequency of surface and ground water quality sites, increased biological monitoring, and added continuous water quality monitoring at five sites in Silver River.	Department	2000	Ongoing	Ongoing

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE
Studies	S099	Marion/ Aquifer-Friendly Fertilization Program for Sports Facilities	Marion County Parks	Goal of project is to develop method of maintaining 67.77 acres (Wrigley Fields, Brick City Adventure Park, Shocker Park, Rotary Sportsplex, Ralph Russell Memorial Park, and Belleview Sportsplex) of sports fields in manner that reduces, if not eliminates, pollutant loading while keeping fields healthy and safe. Program includes creation and use of specific fertilizer formulas on playing fields at various sports complexes that county Parks Department manages.	None	2020*	Conceptual; dependent on funding	2020*

Chapter 4:NITROGEN LOADING SOURCE MANAGEMENT STRATEGIES

This chapter describes projects that address the reduction of nitrogen loads in the Silver Springs BMAP area. Individual project summaries are presented by source category. Project data were collected from 2000 through 2014. This period corresponds with an increase in awareness by local governments and community interests of the impacts of elevated nitrate concentrations in Silver Springs. Many of these projects are ongoing activities of existing programs, *e.g.*, street sweeping, but their continuation is important for managing pollutant loads to the UFA.

Projects anticipated to be implemented over the five-year period covered by the BMAP include fully funded projects, planned projects, and conceptual projects. Projects designated with an S are applicable to only Silver Springs, while projects designated with a B apply to both Silver and Rainbow Springs. Planned projects typically lack either sufficient funds or have not yet entered the design phase. They may not be identified in an agency's current adopted budget but may be identified in near-term budget planning documents (*e.g.*, capital improvement plan). Projects categorized as conceptual do not currently have committed funding but will be considered as funds become available. Planned and conceptual projects are priorities for securing adequate funding during the first phase of the BMAP.

The BMAP projects and activities represent a considerable local, regional, and state investment in a multifaceted approach to water quality protection and restoration. Responsible entities submitted these management strategies to the department with the understanding that the strategies would be included in the BMAP, thus requiring each entity to implement the proposed strategies in a timely manner and perform any required operations or maintenance. However, projects and activities are 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 strategies must result in equivalent or greater nutrient reductions than expected or an equivalent benefit from the original strategies.

4.1 MANAGEMENT EFFORTS FOCUSED ON SILVER RIVER

Projects are listed in **Table 11** and described in **Sections 4.2.1** and **4.2.2**. Management activities that primarily protect Silver River, but also reduce loading to the UFA, are the SR 40 Pollution Reduction Project and the restoration activities at Silver Springs State Park.

4.1.1 SILVER SPRINGS/SILVER RIVER POLLUTION REDUCTION PROJECT

This joint project was led by the city of Ocala and Marion County to address stormwater runoff from surface water basins draining to the SR 40 stormwater conveyance system and discharged with minimal water quality treatment into Half-Mile Creek, the only tributary of the impaired Upper Silver River. The department, SJRWMD, and FDOT District 5 provided additional project funding.

The city of Ocala portion of the project involved the construction of a new retention pond to add storage capacity in four drainage basins totaling 738 acres. The added capacity reduced the frequency of pumping stormwater into the portion of the storm sewer system that terminated at Half Mile Creek.

The section of the storm sewer system also drained an additional 505 acres outside the city limits. Marion County addressed this portion of the drainage area through the construction of a pump station near Half Mile Creek and a new retention pond across from Silver Springs. FDOT District 5 provides for maintenance of the system, which includes operation and maintenance costs for the pump systems.

4.1.2 SILVER SPRINGS STATE PARK IMPROVEMENTS

Silver Springs State Park was created on October 1, 2013, with the inclusion of 266 acres of the former Silver Springs Attraction–Nature's Theme Park into Silver River State Park. With the inclusion of this acreage into the park, all three impaired waterbodies—Upper Silver River, Silver Springs Group, and Silver Springs— are in a state conservation area. The entire length of the Silver River is now contained within the park's boundary.

The park provides environmental benefits to both Silver River and Springs and local protection of the UFA. Refurbishment and restoration activities under way in the park will add to that benefit. State parks are typically managed to the extent possible to minimize stormwater and wastewater impacts to natural resources. The Silver Springs State Park Acquisition and Restoration Council Draft Unit Management Plan Amendment outlines a 10-year plan of restoration and improvements in the park.[14] These efforts include projects to correct hydrology, reduce water consumption, reduce stormwater runoff, restore native vegetation, and improve the treatment and collection of wastewater.

[14] Florida Department of Environmental Protection. May 16, 2014. *Silver Springs State Park Acquisition and Restoration Council draft unit management plan amendment.* Tallahassee, FL: Division of Recreation and Parks.

TABLE 11: MANAGEMENT EFFORTS FOCUSED ON SILVER RIVER

N/A = Not applicable
NA = Not available
*= Completion date needs to be determined during first phase of BMAP. End of first BMAP phase entered as a default.

PROJECT TYPE	PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	PROJECT COST/ OPERATION COST
Wastewater Collection System Maintenance	S093 - Silver Springs State Park Management Plan Amendment Sewer Upgrades	Department's Division of Recreation and Parks	Management plan for Silver Springs State Park was formally amended in May 2014 to account for inclusion of former Silver Springs attraction into Silver River State Park. In addition to change in park name, management goals were developed to provide maintenance of sewer system for former attraction. Existing system was in poor repair, potentially leaking nitrogen to headspring and river.	None	2014	In progress	2015	$1,976,335 combined cost with wastewater upgrades S089/NA
OSTDS Connection	S090 - Silver Springs State Park Management Plan Amendment State Park Sewer Connection	Department's Division of Recreation and Parks	Management plan for Silver Springs State Park was formally amended in May 2014 to account for inclusion of former Silver Springs attraction into Silver River State Park. In addition to change in park name, management goals were developed to connect park services in former Silver River State Park to central sewer, thus eliminating nitrate inputs to aquifer and Silver River.	Department's Division of Environmental Assessment and Restoration (DEAR)	2014	In progress	2015	$977,490/ NA
Urban Structural BMP	S014 - City of Ocala Silver Spring/River Pollution Reduction Project	City of Ocala	Addresses surface water discharge. Project provided water quality treatment for four drainage basins in city of Ocala. These basins historically discharged untreated stormwater runoff to Half Mile Creek via SR 40/Silver Springs Blvd. storm sewer system.	City of Ocala, FDOT	2009	Complete	2010	$1,339,057/ NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project Cost/ Operation Cost
Urban Structural BMP	S031 - Marion County Silver Springs/River Pollution Reduction Project	Marion County Office of the County Engineer	Addresses surface water discharge. Construction of pump station to intercept runoff from 42.6 acres of SR 40 right-of-way and adjacent commercial land uses prior to discharge to Half Mile Creek, tributary of Silver River. Runoff is pumped to retention pond located on state lands across from Silver Springs attraction. Marion County was lead agency for engineering design and for construction. Project partners each contributed funds towards construction.	Department, SJRWMD, FDOT	2009	Complete	2010	$1,766,828/ NA
Stormwater Operation and Maintenance	S053 - SR40 Stormwater Pump Station Construction, Operation and Maintenance	FDOT District 5	Operation and maintenance of pump station and collection system constructed as part of Marion County portion of Silver/Springs River Pollution Reduction Project. Activities include servicing and repair of pump station and clean out of accumulated sediment. Construction cost represents FDOT's contribution to Marion County project. Treated acres are portion of drainage area that is FDOT right-of-way.	None	2010	Maintenance ongoing	Construction complete 2010	$595,927/ NA

PROJECT TYPE	PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	PROJECT COST/ OPERATION COST
Urban Structural BMP	S089 - Silver Springs State Park Management Plan Amendment - Runoff	Department's Division of Recreation and Parks	Management plan for Silver Springs State Park was formally amended in May 2014 to account for inclusion of former Silver Springs attraction into Silver River State Park. In addition to change in park name, management goals were developed to improve water quality, specifically nitrate, from surface discharges. Animals and animal enclosures on Ross Allen Island were removed; that action will reduce nitrate inputs to Silver River and allow existing water retention berm to be breached to reconnect wetlands to river. Evaluation of park's stormwater management system and amount of impervious area, particularly in parking lots, will also be undertaken. Impervious areas in parking lots and buildings will be removed and restored to natural communities. Sheet flow will be restored and stormwater system improved and maintained.	None	2014	In progress	2020*	$1,976,335 combined cost with wastewater upgrades S093/ NA

Several hydrologic modifications were made to the attraction prior to its inclusion in the state park. A large ditch, the Fort King Waterway, was dug parallel to the Silver River from the head spring to approximately half a mile downstream. The waterway formerly collected overflow water pumped from animal enclosures. The animals have been removed from the park and water pumping has ceased, removing a direct nutrient discharge to Silver River. The Fort King Waterway also receives untreated stormwater runoff via a secondary ditch that drains the attraction parking areas as well as floodplain areas.

The paved parking areas are under evaluation for partial removal to reduce the amount of impervious area contributing stormwater to Silver River and improve stormwater management. The park management plan calls for ditches to be blocked or filled where possible. One water retention area was constructed adjacent to the Fort King Waterway to capture and treat stormwater runoff, with work completed in August 2014. Paved areas and construction of the Fort King Waterway and other ditches have also impacted wetlands, either by altering their community structure or hydrology, or by eliminating them altogether.

Large volumes of water were previously pumped around the attraction property to irrigate lawns and landscaping as well as hydrate some areas. A portion of this water came from Silver River. Irrigation supplied by the pumping of surface and ground water is being reduced or phased out to the greatest extent possible. A number of small wells located in the park to supply water for park operation will be evaluated for capping and abandonment.

The attraction is connected to central sewer, but parts of the wastewater collection system were old and needed rehabilitation or replacement. About 75% of the rehabilitation of existing wastewater collection system was completed as of August 2014. Approximately 3,050 linear feet of sewer were replaced with new sewer line, and four lift stations were refurbished or replaced. Rehabilitation work will be completed in 2015.

Silver River State Park was never on central sewer, but with the connection of almost all of its facilities to Marion County Utilities' wastewater collection system, the park is included as part of this BMAP. The sewering project includes the installation of a force main on Sharps Ferry Road as well as a lift station. The lift station is being installed to accommodate potential future connections of areas outside the park that are currently on OSTDS.

The redevelopment of Ross Allen Island is planned. Animals and their enclosures have been removed from the island, eliminating a nitrogen source. Buildings will be removed and boardwalk design simplified, as well as natural hydrology restored and native vegetation reestablished on the island. Buildings not needed for park operation are slated for removal, adding pervious area.

4.2 WASTEWATER MANAGEMENT

WWTFs and OSTDS are the two sources of nitrogen loading from wastewater included in the NSILT. Stakeholders having responsibilities for managing or regulating wastewater collection and disposal agreed to a set of guiding principles (**Table 12**) as a mechanism to aide future actions and the selection of projects to address wastewater sources. The guiding principles are proposed for the use of utility stakeholders, both public and private, who operate wastewater treatment and collection systems and the state agencies with regulatory authority over, or water quality interests related to, WWTFs and OSTDS.

TABLE 12: GUIDING PRINCIPLES FOR WASTEWATER TN LOADING REDUCTION

- Utility stakeholders are encouraged to implement technology that maximizes nitrogen removal from effluent when upgrading, replacing, or constructing new facilities in areas of high recharge, as indicated by the NSILT or other similar analysis.
- Operators of package plants in Marion County will comply with applicable county codes to decommission these facilities when they cannot be replaced or practically upgraded to meet applicable effluent standards and where better centralized facilities are available, particularly in areas of high recharge and with high nitrogen effluent concentrations. Package plants outside Marion County, but located in the BMAP area, are encouraged to do the same.
- FDOH and utility stakeholders are encouraged to participate with the department in developing strategies for providing alternative effluent treatment to areas currently with dense concentrations of septic tanks and package plants. The following factors may be considered:
  - Identification of dense concentrations of OSTDS and package plants.
  - Identification of priority areas for centralized sewer expansion.
  - Development of financial assistance programs for implementing priority projects.

4.2.1 NITROGEN LOADING FROM WWTFS

In the Silver Springs BMAP area, treated effluent containing nitrogen from WWTFs is discharged to sprayfields, RIBs, or percolation ponds, or is used for irrigation water (reuse). For the entire BMAP area, wastewater contributes about 2.7% of the nitrogen loading to the land surface but contributes 4% of the potential loading of nitrogen reaching ground water (UFA). The discrepancy in percent

contribution is attributable to the attenuation factors applied to different source categories. In the 10-year capture zone, the contribution of WWTFs to ground water loading is 6%. Though those percent contributions are smaller than the contributions from OSTDS or agriculture sources, the discharge location (proximity to the spring, highly permeable soils, *etc.*) and level of wastewater treatment can be important factors to consider when addressing loadings to the UFA. Additionally, addressing the nitrogen loading from OSTDS could include increasing the volume of effluent treated and disposed of by WWTFs.

There are 95 domestic WWTFs located within the Silver Springs BMAP boundary, one industrial WWTF, and one residuals site—all of which were included in the NSILT evaluation of the wastewater effluent loading of nitrogen to the UFA. Seventeen of these facilities discharge more than 100,000 gallons of treated effluent per day (**Table 13**). The information in **Table 13** includes the portion of nitrogen loading generated by a facility and then distributed as reuse water. Most of the larger WWTFs in the Silver Springs BMAP area supply reuse water for different purposes.

Table B-1 summarizes the loading from all wastewater facilities used for the NSILT and identifies those plants in the 10-year capture zone. Another 19 permitted industrial wastewater discharges and one permitted residuals application site in the BMAP area were not included in the NSILT because wastewater effluent limits are not applicable for these facilities. The data in **Table 13** and **Appendix B** were developed from data compiled for each facility for one complete year starting approximately in June 2012 through May 2013. Since May 2013, several facilities have been removed from service or are proposed for removal as part of the BMAP and are identified in those tables.

Fifty-seven of the permitted facilities listed in **Table B-1** use RIBs as the primary method for effluent disposal. Loading impacts to the UFA can be cumulative from multiple small facilities located close to each other. An additional nine facilities provide wastewater for reuse such as irrigation but have RIBs as backup treatment. Most of the WWTFs using rapid infiltration as their primary disposal method are smaller plants with a permitted capacity less than 0.1 million gallons per day (MGD).

Required monitoring varies between facilities, and not all report the same type of data, resulting in inconsistencies in the data collected for WWTFs. For larger facilities, the annual effluent input to the land surface was estimated using the average TN concentration and the reported (not permitted capacity) discharge (volume), but this information was not always available for smaller facilities. Smaller

WWTFs (by volume, <0.1 MGD) are not always required to monitor and report effluent concentrations, and therefore not all these facilities had available data.

For those smaller WWTFs with effluent data, some reported NO_3-N concentrations rather than TN. For these facilities, the TN concentration was estimated at 8.97 mg/L based on a 2009 cooperative study with the Water Reuse Foundation of 40 domestic wastewater facilities across the state. Also, some facilities in some years reported NO_3-N rather than TN for their effluent concentrations. For these, the department estimated TN concentrations by extrapolating from the NO_3-N data (assuming the NO_3-N concentration was 38.5% of the TN). Additionally, smaller facilities may not have reported the actual discharge volume, and the nitrogen input was estimated assuming that the plant was discharging effluent at 50% of its permitted design capacity.

There are 33 projects identified that address wastewater management (see **Table C-1** in **Appendix C** for details). They fall into the following different management categories: reuse, wastewater collection system maintenance, wastewater service area expansion, and system upgrades that improve effluent treatment to improve its quality. There are different categories of reuse permitted in the BMAP area. **Table 14** summarizes the number of projects implemented by each management category and the estimated reduction in nitrogen loading from those projects. Reuse water used for irrigation increases the attenuation of nitrogen from wastewater by passage through the soil column and plant uptake. Overall, improved wastewater management and reuse will remove an estimated 290,471 lbs-N/yr, or about 79.7%, of the potential nitrogen loading to the land surface from WWTFs.

The larger municipal WWTFs are operated by Marion County Utilities, city of Ocala, city of Belleview, The Villages (Village Center, Little Sumter Utilities, North Sumter Utilities, and Central Sumter Utilities), city of Wildwood, city of Hawthorne, city of Fruitland Park, and town of Lady Lake. The remaining WWTFs are smaller plants that typically serve mobile home parks, residential properties, commercial properties, and schools where central sewer is not available.

The volume of wastewater discharged by a WWTF is not a complete indicator of the impact of nitrogen loading and concentration contributed by that plant on the UFA. Smaller facilities can contribute large amounts of nitrogen loading compared with the volume of wastewater produced or can have high estimated concentrations of nitrogen in their effluent. Noncompliance with permit conditions is a periodic problem for a number of the smaller facilities. In areas where small facilities are aggregated, the impact to the UFA is magnified. At least eight facilities have effluent TN concentrations that are 20

mg-N/L or higher (**Table B-1**). Because of the small volume of wastewater treated at these facilities, few cost-effective options are available to improve treatment besides connection to larger utilities.

TABLE 13: SUMMARY DATA FOR DOMESTIC WWTFS WITH LARGE NITROGEN INPUTS

- = Empty cell/no data
* TN data estimated based on available NO_3 data.
+ Effluent data are not available; average TN value from department study used.
[1] Removed from service post-loading evaluation.
[2] Not a separate loading. Reuse water contributed from Central Sumter Utility (up to 1.60 MGD), North Sumter Utilities (up to 2.80 MGD annual average daily flow [AADF]), and city of Wildwood (up to 2.0 MGD AADF).
[3]Nitrogen loading noted, but not included in total wastewater loading.

WWTF NAME	FACILITY ID	COUNTY	RECHARGE AREA	ANNUAL AVERAGE TN (MG-N/L)	ANNUAL FLOW (MGD)	NITROGEN LOADING (KG-N/YR)	NITROGEN LOADING DISTRIBUTED TO REUSE (KG-N/YR)	NET NITROGEN INPUT (KG-N/YR)
City of Ocala #1	FLA010677	Marion	Low	20.90	0.776	22,409	22,409	No loading
City of Ocala #2	FLA010680	Marion	High	6.83*	2.305	21,753	-	21,753
North Sumter Utilities	FLA281581	Sumter	Medium	14.95*	0.881	18,196	13,504	4,692
Little Sumter Utility Company	FLA017133	Sumter	Medium	5.73	1.725	13,652	13,433	219
North Sumter Utility Master Reuse Distribution System[2]	FLA516708	Sumter	All	6.33*	0.211	Reuse system	-	No loading
The Villages WWTF	FLA010555	Lake	Medium	7.26	0.995	9,980	7,829	2,151
Silver Springs Shores	FLA296651	Marion	High	6.49*	0.823	7,384	-	7,384
Ocala East Villas	FLA01075	Marion	Medium	111.69*	0.04	6,173	-	6,173
City of Wildwood	FLA013497	Sumter	Medium	7.73*	0.550	5,822	5,742	80
Marion Correctional Institute	FLA010789	Marion	High	6.05*	0.514	4,298	-	4,298
Central Sumter Utility	FLA499951	Sumter	Medium	16.00	0.127	2,807	1,202	1,605
Spruce Creek South[1]	FLA010769	Sumter	Medium	8.97+	0.225	2,789	-	2,789
Town of Lady Lake	FLA399761	Lake	High	5.81	0.217	1,741	1,398	334
City of Fruitland Park	FLA374245	Lake	High	11.07*	0.094	1,438	-	1,438
Silver Springs Regional[1]	FLA010786	Marion	Medium	7.34*	0.133	1,350	-	1,350
Pennbrooke WWTP	FLA010570	Lake	Low	7.77	0.108	1,159	846	313
City of Belleview	FLA010678	Marion	High	2.35	0.356	1,154	1,088	66
City of Ocala #3[3]	FLA190268	Marion	High	4.43	2.15	13,117	-	13,117

TABLE 14: WASTEWATER MANAGEMENT ACTIONS SUMMARY

- = Empty cell/no data
[1]Includes projects located at Silver Springs State Park
[2]Includes OSTDS 9-1-1 Strategy

MANAGEMENT STRATEGY	TOTAL NUMBER OF PROJECTS	NUMBER OF PLANNED PROJECTS	NUMBER OF CONCEPTUAL PROJECTS	TN LOADING REDUCTION AT LAND SURFACE (LBS-N/YR)
Reuse	6	-	-	173,893
Wastewater Collection System Maintenance	11[1]	-	-	-
Wastewater Service Area Expansion	4	-	-	17,396
Wastewater System Upgrade	13	2	2	99,182
TOTAL WASTEWATER	**34**	**2**	**2**	**290,471**
CONNECTION TO SEWER	**6[1]**	**1[2]**	**1**	**24,300**

Table C-1 lists projects that reduce nitrogen loading, and major projects are described below. Projects are almost exclusively contributed by the larger public facilities. The Villages, Ocala, Marion County, Wildwood, Lady Lake, and Belleview have active reuse programs for the disposal of their treated wastewater. Including the municipally owned and Villages-owned service areas, there are at least two other private wastewater management utilities operating in the BMAP area.

The largest current permitted discharge is the Ocala Water Reclamation Facility (WRF) 2, followed by utilities that provide service to The Villages. Overall, Ocala operates three WWTFs with a combined permitted capacity of 12.96 MGD and a current combined discharge of 5 MGD. Upgrades in treatment level at Ocala's WRF 2 are in progress, and when complete the plant will discharge at advanced wastewater treatment (AWT) standards. Ocala's WRF 3 is located west of I-75, but improvements have been made at that facility to increase the treatment level and allow the exchange of wastewater between that plant and other service areas in Ocala. With these improvements, wastewater collected west of I-75 could potentially be disposed of closer to Silver Springs. WRF 3 contributes 13,117 kg-N/yr of loading to the UFA but was not included in the calculation of WWTF nitrogen loading because of its location west of I-75.

WRF 1 is Ocala's oldest WWTF and also the WWTF discharging the highest potential TN loading, though that loading is redistributed as reuse. With the completion of improvements at WRFs 2 and 3, the city expects to remove WRF 1 from service. Improving the treatment of wastewater from the current WRF 1 service area is a priority for the BMAP.

Belleview operates one WWTF with a permitted capacity of 0.76 MGD, and most of its loading is used for reuse. The city, with a grant from the department, is extending its collection system about three miles southward along United States (US) Highway 441 to the limits of its service area. This will allow future connections to municipal sewer of commercial properties currently either on OSTDS or small treatment facilities.

The Villages comprises 13 CDDs, parts of which are located in Marion County, Sumter County, and Lake County. The total permitted capacity of 9.04 MGD is divided among four active WWTFs: The Villages (1.64 MGD AADF), North Sumter Utilities (2.8 MGD AADF), Little Sumter Utilities (3.0 MGD AADF), and Central Sumter Utilities (1.6 MGD AADF). The primary disposal of effluent is through the irrigation of golf courses (reuse), with RIBs as backup disposal. The North Sumter Utilities Company Master Reuse Distribution System is permitted to receive effluent from Central Sumter Utility, North Sumter Utilities, and city of Wildwood, and to distribute it for reuse. The city of Wildwood supplies some of the reuse water used by The Villages golf courses as well as to the Rolling Hills golf course.

Marion County Utilities currently operates three WWTFs in the BMAP area, and all have either been renovated or built since 2005. Plant upgrades are under way for the Salt Springs and Silver Springs Shores facilities, and when completed those facilities will meet AWT standards. Wastewater from the Silver Springs Regional plant has been diverted to the Silver Springs Shores facility. The Silver Springs Regional plant ceased operation as a WWTF in 2014 (it was included in the NSILT). The Spruce Creek WWTF, which originally provided wastewater treatment for the Spruce Creek South Subdivision, has been closed, and the effluent is now sent to the Little Sumter Utilities WWTF.

Fruitland Park and Lady Lake are comparatively small municipal WWTFs but are ranked 14th and 13th, respectively, in total potential loading to the UFA. Lady Lake can send reclaimed water to the Village Center WWTF for reuse, and that accounts for about 80% of the loading from that plant. Fruitland Park will refurbish its WWTF over the next five years. During that time, wastewater from Fruitland Park will be treated at Lady Lake's WWTF and receive higher treatment for a reduction in loading.

Marion County has adopted as part of its local land development code requirements (Article 6, Technical Standards and Requirements, Division 16, Wastewater Facilities) for WWTFs and wastewater effluent quality that are currently applicable in unincorporated Marion County. The code identifies two protection zones: a Primary Protection Zone that approximates the 10-year ground water capture zone

and a Secondary Protection Zone that includes all the remaining area of Marion County. Thirty-four of the facilities evaluated by the NSILT are within the county's Primary Protection Zone.

Pursuant to the code, new or expanded WWTFs since August 1, 2009, are subjected to minimum TN effluent quality standards, depending on discharge volume and type of treatment and which protection zone they are located in. **Table 15** summarizes the standards set forth in the code for each zone. Existing facilities are not required to modify operations to meet the code and continue to be permitted in the same manner.

By January 1, 2019, the Marion County code requires existing WWTFs currently using RRLA or RIBs to either connect to a central sewer system that does not utilize RRLA, or meet a standard of 10 mg/L TN and convert to a slow-rate land application system or a public access reuse system. The code provides for waivers for RIB disposal systems unable to meet the code requirements.

TABLE 15: MARION COUNTY WASTEWATER EFFLUENT STANDARDS FOR PRIMARY AND SECONDARY PROTECTION ZONES

Primary Protection Zone

DESIGNED AVERAGE DAILY FLOW (MGD)	RAPID-RATE LAND APPLICATION (RRLA) EFFLUENT DISPOSAL SYSTEM	SLOW-RATE LAND APPLICATION EFFLUENT DISPOSAL SYSTEM	PUBLIC ACCESS REUSE EFFLUENT DISPOSAL SYSTEM
Greater than 0.5 MGD	3 mg/L	3 mg/L	10 mg/L
Less than 0.5 and greater than or equal to 0.01 MGD	3 mg/L	6 mg/L	10 mg/L
Less than 0.01 MGD	10 mg/L	10 mg/L	10 mg/L

Secondary Protection Zone

DESIGNED AVERAGE DAILY FLOW (MGD)	RRLA EFFLUENT DISPOSAL SYSTEM	SLOW-RATE LAND APPLICATION EFFLUENT DISPOSAL SYSTEM	PUBLIC ACCESS REUSE EFFLUENT DISPOSAL SYSTEM
Greater than or equal to 0.5 MGD	3 mg/L	3 mg/L	10 mg/L
Less than 0.5 but greater than or equal to 0.1 MGD	3 mg/L	6 mg/L	10 mg/L
Less than 0.1 but greater than or equal to 0.01 MGD	6 mg/L	6 mg/L	10 mg/L
Less than 0.01 MGD	10 mg/L	10 mg/L	10 mg/L

In unincorporated Marion County, the code requires facility operators to test effluent for nitrate and TN concentrations monthly for facilities discharging greater than 0.1 MGD and quarterly sampling for facilities discharging less than 0.1 MGD.

Alachua County's Unified Land Development Code (Article 12, Sections 406.70, 406.114, and 407.115) requires all new WWTFs in high aquifer recharge areas of the county to provide AWT, including nutrient removal. The county defines high aquifer recharge areas as those areas depicted on the Alachua County Floridan Aquifer High Recharge Area map (adopted with the 2011–2013 Comprehensive Plan) as areas where the Floridan aquifer is classified as vulnerable or highly vulnerable or there are stream to sink basins. The portion of the BMAP area within Alachua County that surrounds Orange Lake meets the definition of vulnerable (supporting documentation for the Alachua County Unified Land Development Code is available online).

4.2.2 Wastewater Standards for the Silver Springs BMAP Area

In an effort to provide regulatory consistency across the BMAP area, as well as continue the improvement of wastewater management to protect Silver Springs and River, the department will require the following in any new or existing permit unless the facility can make a demonstration that reasonably assures the reuse or land application of effluent (as specified in **Appendix D**) would not cause or contribute to a violation of the 0.35 mg/L nitrate concentration established by the Silver Springs TMDL. Should the department concur with the reasonable assurance demonstration request, the TN effluent requirements established here may be modified or waived. Effluent standards are as follows:

1. Require the reporting of effluent discharge and concentration for TN.

2. Require at least quarterly sampling of effluent discharge for TN.

3. Within the Marion County Primary Protection Zone, apply the effluent standards set forth in **Table 15** as an annual average to all new and existing WWTFs that have a permitted nutrient discharge.

4. Outside the Marion County Primary Protection Zone, apply an effluent standard no greater than 6 mg/L TN as an annual average or discharge to a public reuse system with an effluent standard of 10 mg/L TN as an annual average to all new and existing WWTFs that have a permitted nutrient discharge and permitted capacity of 10,000 gallons per day (gpd) or greater.

5. Outside the Marion County Primary Protection Zone, WWTFs with a permitted nutrient discharge and a permitted capacity less than 10,000 gpd apply an effluent standard no greater than 10 mg/L TN as an annual average.

6. New effluent standards would take effect at the time of permit renewal or no later than five years after BMAP adoption, whichever is sooner.

All WWTFs in Marion County and located within the BMAP area using RRLA as a primary wastewater disposal method are required by county code to increase treatment (*i.e.*, nitrogen removal), connect to a central sewer system, or convert to a slow-rate land application system or public access reuse system. All WWTFs outside Marion County are encouraged to investigate the practicality of increasing treatment, connecting to central sewer systems, or converting to a slow-rate land application system or public access reuse system.

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

4.2.3 Nitrogen Loading from OSTDS

OSTDS contribute 38% of the overall loading of nitrogen that potentially enters the UFA across the entire BMAP area and 44% of the loading of nitrogen in the 10-year capture zone (**Figure 6** displays the 10-year capture zone). This makes OSTDS one of the largest contributors to nitrogen loading to the UFA for the entire BMAP area and the largest contributor of nitrogen loading in the 10-year capture zone. **Table 16** summarizes the number of OSTDS by county and recharge area, and **Figure 14** displays their location.

The vast majority of OSTDS are located in Marion County, with approximately 24,177 systems located in the 10-year capture zone; of that number, 8,419 OSTDS are located in the two-year capture zone. For the entire BMAP area, approximately 18,835 OSTDS are located in an existing utility service area or municipal boundary.

Table 17 summarizes OSTDS distribution by 2009 land use in the BMAP area, and **Table 18** summarizes the number of OSTDS by urban land use and recharge category. More than 9,200 OSTDS are associated with nonurban land uses. Almost 48% of the total number of OSTDS are located on land uses identified as medium-density residential dwelling units. Medium-density residential is defined as

two to five dwelling units per acre by the definition utilized in Florida's Land Use/Land Cover and Forms Classification System (FLUCCS). There are over 17,000 OSTDS serving medium-density residential property located in a high-recharge area and over 12,000 OSTDS serving medium-density residential property located in medium-recharge areas.

Figure 15 displays where OSTDS are located on urban land uses relative to the Marion County Primary Spring Protection Zone. As shown in **Figure 15**, higher densities of medium-density residential land use using OSTDS for wastewater treatment and within the Primary Protection Zone are concentrated north of Ocala between SR 492 and SR 326 and south of Ocala near SR 35 and SR 464. Most of these OSTDS are outside existing utility service areas. The majority of OSTDS categorized as medium-density residential land use are located in medium- to high-recharge areas (**Figure 14**).

TABLE 16: DISTRIBUTION OF OSTDS BY COUNTY AND RECHARGE RATE

COUNTY	SEPTIC SYSTEMS IN HIGH-RECHARGE AREAS	SEPTIC SYSTEMS IN MEDIUM-RECHARGE AREAS	SEPTIC SYSTEMS IN LOW-RECHARGE AREAS	TOTAL NUMBER BY COUNTY
Alachua	818	1,299	587	2,704
Lake	3,341	3,818	532	7,691
Marion	28,088	17,926	3,732	49,746
Sumter	748	1,803	184	2,735
Putnam	372	1,551	1,715	3,638
TOTAL BMAP	**33,367**	**26,397**	**6,750**	**66,514**

Projects listed in **Table 19**, as well as the connection of Silver Springs State Park to central sewer (Project S090 in **Table 13**), are beginning to address the loading from OSTDS. Collectively, these projects will reduce the nitrogen loading from OSTDS by 24,300 lbs-N/yr, or 1.5% of the loading calculated at the land surface without attenuation. Ocala is working to connect the remaining OSTDS within the city's boundary to central sewer, as well as connecting properties with private wells to public water supply (Projects S035 and S115). Ocala charges customers for the availability of sewer even if they are not currently connected and then uses those funds to help cover part of that property's connection cost.

Belleview's expansion of its wastewater collection system south along US 441 to the limits of its service area provides an opportunity for the future connection of businesses currently using OSTDS or package plants (Project S034). The city expects the expanded collection system to be completed in 2015. The Belleview City Commission approved an ordinance in 2015 that waives connection and system

development (impact) fees for businesses that take advantage of the expanded collection system and convert from OSTDS to central sewer.

Local codes and permitting authority vary within the BMAP area. Current statutory language (Section 381.00655, F.S.) requires the owner of a properly functioning OSTDS to connect to sewer within 365 days of notification that central sewer is available for connection.

TABLE 17: DISTRIBUTION OF OSTDS BY 2009 LAND USE CATEGORY AS DEFINED BY FLORIDA LAND USE CODES

2009 LAND USE CATEGORY	NUMBER OF OSTDS	% OF TOTAL NUMBER
Commercial	1,208	1.8%
Industrial	121	0.2%
Institutional	208	0.3%
Low-density residential – less than two dwelling units per acre	22,366	33.6%
Medium-density residential – two to five dwelling units per acre	31,836	47.9%
High-density residential – six or more dwelling units per acre	1,190	1.8%
Other urban	324	0.5%
Nonurban land use	9,261	13.9%

TABLE 18: DISTRIBUTION OF OSTDS BY 2009 URBAN LAND USE CATEGORY AND RECHARGE RATE

2009 LAND USE CATEGORY	HIGH-RECHARGE NUMBER OF OSTDS	MEDIUM-RECHARGE NUMBER OF OSTDS	LOW-RECHARGE NUMBER OF OSTDS
Commercial	558	553	91
Industrial	82	34	5
Institutional	123	67	18
Recreational	21	21	12
Low-density residential – less than two dwelling units per acre	10,441	8,846	2,833
Medium-density residential – two to five dwelling units per acre	17,472	12,013	2,255
High-density residential – six or more dwelling units per acre	207	957	25

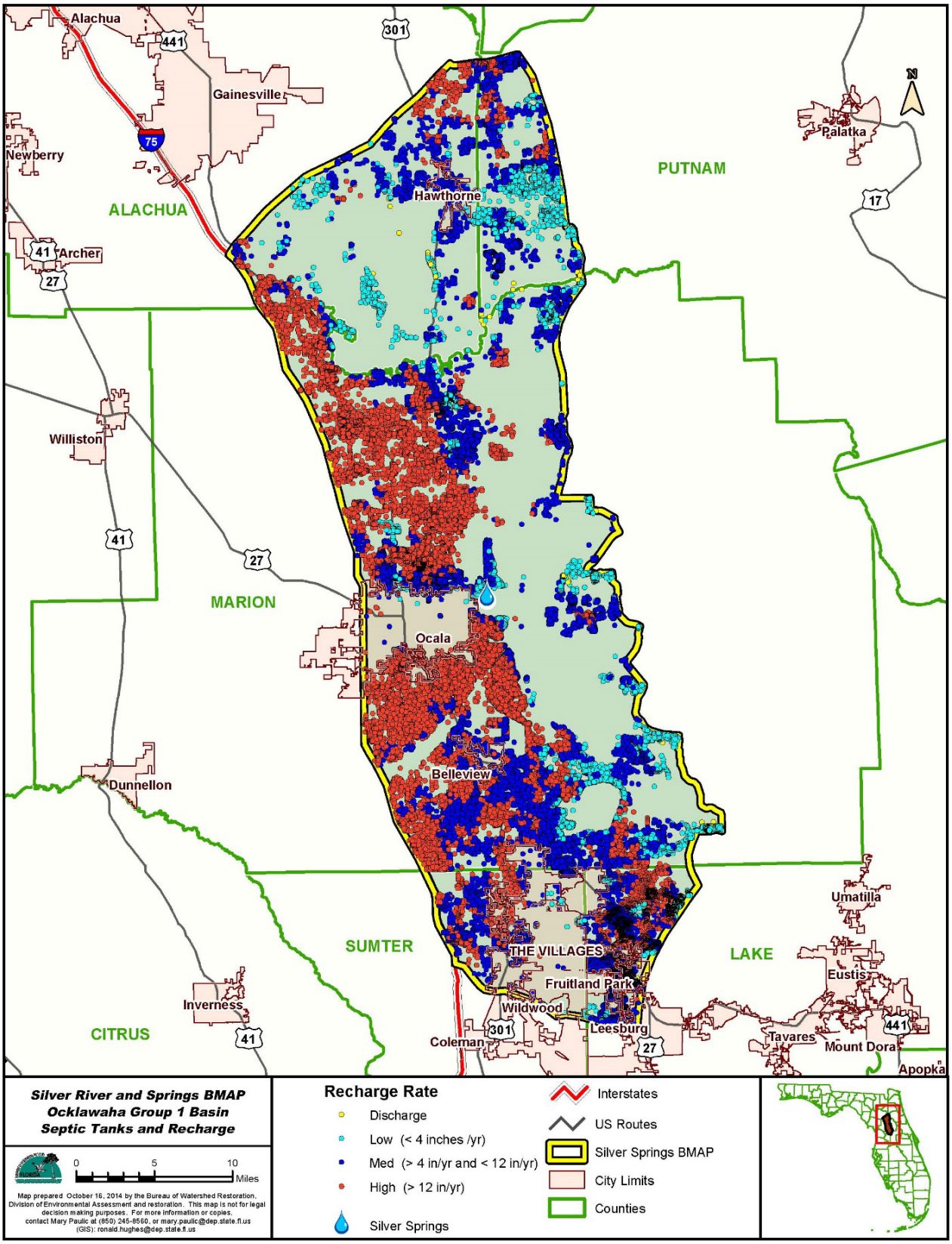

FIGURE 14: LOCATION OF OSTDS

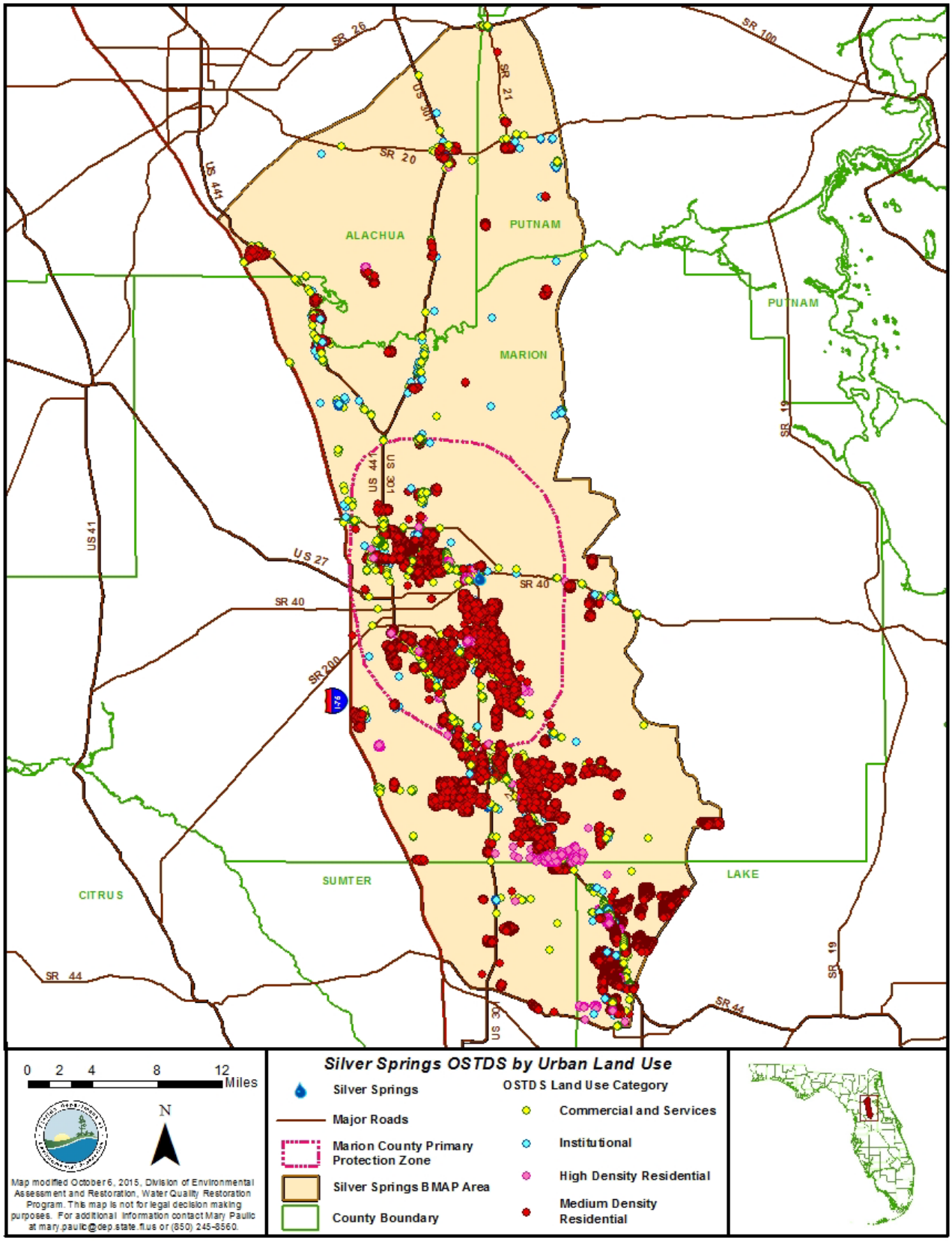

FIGURE 15: LOCATION OF URBAN OSTDS BY LAND USE CATEGORY

TABLE 19: PROJECTS THAT ADDRESS NITROGEN LOADING FROM OSTDS

* = Completion date needs to be determined during first phase of BMAP. End of first BMAP phase entered as a default.

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE
OSTDS Connection	S035	Citywide Septic Tanks and Well Elimination Program	City of Ocala	Project includes connection of remaining septic systems in city of Ocala service area at no cost to homeowners. Elimination of septic tanks in project will reduce nitrogen loading to Silver Springs by approximately 20,321 lbs-N/yr.	None	2015	In progress	2017
OSTDS Connection	S096	Septic System Connection Removal in County Parks	Marion County Parks	Project focuses on removal of OSTDS (septic systems) and connection to centralized wastewater facilities. A few parks in BMAP area are close to existing or planned wastewater facilities (Brick City Adventure Park, Rotary Sportsplex, and Baseline Road Trailhead). Goal of project is to remove as many septic systems in this area as possible.	None	2020	Conceptual	2020*
Wastewater Service Area Expansion	S034	US 441 Sewer Main Expansion	City of Belleview	Project consists of construction of new sewer line south of city along US 441. Sewer line will allow commercial and residential areas to hook up to centralized system. Project is estimated to provide 79 central sewer connections to rapidly developing corridor, with potential for up to 60 more connections.	None	2014	In progress	2015
OSTDS Connection	S112	OSTDS 9-1-1 Strategy	Department/ FDOH/Marion County	Develop strategy for addressing OSTDS and other wastewater management issues. Goal is to enhance communication and coordination among utilities and agencies.	Local utilities, SJRWMD, SWFWMD, and other interested parties	2015	Planned	2018

PROJECT TYPE	PROJECT NUMBER	PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE
OSTDS Connection	S115	Miscellaneous Water and Sewer	City of Ocala	Miscellaneous extension of existing water, sewer, and reuse facilities to provide service.	None	2015	In progress	2020

Under Marion County Land Development Code (Section 6.14.3, Onsite Waste Treatment and Disposal Systems), activities that require a Repair or Modification permit from FDOH in Marion County for new, modified, or repaired OSTDS are required to meet a minimum 24-inch separation between the bottom of the drainfield and the estimated wettest season water table. This applies to all development, including those OSTDS installed before 1983. In Belleview, if an existing OSTDS fails and central sewer is available, FDOH in Marion County will not issue a repair permit. New development in unincorporated Marion County is required to connect to central sewer if the treatment plant has available capacity and if a connection line is available within 400 feet, but existing development is not addressed (Marion County Land Development Code, Section 6.14.2).

The department provided support to Marion County Utilities for an analysis in 2009 of OSTDS within five miles of Silver Springs and the prioritization of those areas for connection to central sewer.[15] The five-mile radius around Silver Springs extends beyond the two-year capture zone but is within the 10-year capture zone and Primary Protection Zone. The PBS&J report identified four areas adjacent to existing county wastewater collection infrastructure as priority areas and estimated the cost of connecting those areas at $11,000 per OSTDS connected based on costs in 2009.

Technologies that are currently in use for nitrogen reduction are similar to secondary and advanced secondary WWTFs. They include an aeration treatment step and generally an element of recirculation to increase nitrogen reduction. Several studies have indicated that such technologies can reduce nitrogen concentration in the effluent of OSTDS by 50% to 70%. Currently, the development of nitrogen reduction strategies for OSTDS is under way by FDOH but will most likely not be completed before the adoption of this BMAP (additional information is available on the FDOH website). The preliminary results of field testing done at active home sites shows a 90% to 95% reduction of TN. FDOH is also characterizing nitrogen removal from effluent in the soil underneath OSTDS and in the shallow ground water, as well as developing a nitrogen fate and transport model that can be applied to conditions specific to Florida.

With financial support from the department, limited testing of three different alternative treatment methods was performed at the University of Central Florida (UCF) Stormwater Academy. Design methods included the use of a sand filter, an experimental bioabsorptive media filter (trademarked as Bold and Gold), and a subsurface upflow wetland. The bioabsorptive media filter obtained a 70%

[15] Post Buckley Schuh and Jernigan [PBS&J] 2009.

reduction in TN.[16] Additionally, the department is evaluating the effectiveness of drainfield amendments on the denitrification process. Any new OSTDS product or technology requires approval by FDOH prior to installation.

FDOH updated the Florida Water Management Inventory starting in 2014 with the stated goal of documenting and mapping the wastewater treatment method and source of drinking water for 6 million improved land parcels in the state. The inventory was last completed in 2009. Marion County and Alachua County are pilot counties for this inventory.

4.3 WASTEWATER MANAGEMENT STRATEGY

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. OSTDS are one component of wastewater disposal but are also one of the more difficult sources of nitrogen loading to the UFA to address. Solutions are complex and frequently controversial. Connection to central sewer systems is sometimes considered as one option for addressing this source. However, several factors, such as the cost-effectiveness of the sewering project and available WWTF capacity, need to be considered. Conversely, OSTDS do provide needed wastewater treatment in areas where central sewer is not economically feasible or practical.

There are other wastewater management concerns in the Silver Springs BMAP area besides OSTDS. Some of the small WWTFs evaluated under the NSILT contribute large loadings of nitrogen relative to the size of their discharge, and so there is a need to develop better solutions for poorly performing WWTFs. Local government regulations applicable to wastewater management, including effluent quality standards, vary between jurisdictions.

Given the complexity and scope of the issues related to OSTDS and other wastewater management issues, stakeholders agreed that the best course of action was to use the BMAP process to more fully develop an integrated wastewater management strategy applicable to the entire BMAP area. Project S112, OSTDS 9-1-1 Strategy, will be initiated within three months after the adoption of the BMAP and completed no later than 30 months after initiation. The primary purpose of this project is to identify effective, financially feasible strategies that address the current and future nitrogen loading from OSTDS as well as other wastewater sources. The project goal is enhanced coordination and communication among utilities, the public, and responsible agencies in the Silver Springs BMAP area that results in the

[16] Chang *et al.* 2011.

better management of nitrogen from wastewater sources. The timing of the implementation of project components may change, depending on legislative mandates and allowances or other unforeseen extenuating circumstances interfering with that schedule.

The basic elements that the strategy will address include (but are not limited to) BMAP area–specific wastewater effluent standards, the prioritization of geographic areas of concern, upgrades to existing treatment systems, connection to central sewer, alternative solutions to central sewer, and education and outreach. An effective public education and outreach component will strengthen the overall wastewater management strategy.

The department, with assistance from Marion County and FDOH, will facilitate the organization of an Advisory Committee with representation from vested interests such as private and public utilities, local governments, CDDs, homeowners, environmental interests, businesses, and other interested parties. Because a portion of Silver Springs' ground water contributing area is in the Rainbow Springs BMAP area and Marion County is affected by the requirements for both springs' BMAPs, utilities located in the Rainbow Springs BMAP area will be invited to participate in the project, providing consistency between BMAP areas.

The Advisory Committee will, as part of the BMAP implementation of Project S112 (OSTDS 9-1-1 Strategy), build on existing utility management plans and studies[15] to develop agreed-upon priorities for the connection of OSTDS to central sewer and develop solutions for areas where central sewer is not feasible. The three main objectives of the Advisory Committee are to (1) collect and evaluate existing plans, priorities, and studies to build a framework with priority projects for funding and identify missing parts or conflicts within that framework, (2) develop a wastewater management plan that includes the identification projects that will reduce nitrogen loadings from wastewater including OSTDS, and (3) develop a public education plan that at a minimum provides area residents with reliable and understandable information about the impacts of nitrogen loading on Silver Springs and proper and effective wastewater management.

The project is intended to supplement and support local efforts to improve wastewater management and not delay their implementation. Local stakeholders are encouraged to submit projects that address needed wastewater improvements for financial support or initiation at any time during Project S112. Completed studies and existing ordinances provide direction for the scope of the project. Public education and outreach is identified by stakeholders as a priority component of this project, and efforts

will begin upon its initiation. The expected project outcome is a management plan that will be used to identify actions and projects local utilities can implement before the start of the second phase of the BMAP.

The three objectives that this project will address as part of its overall management strategy are outlined below with expected deliverables and general time frames:

Objective 1: Data Collection

- Finalize project definition and scoping.
- Update the OSTDS geographic distribution map and database for the BMAP area.
- Update WWTF location, level of treatment information, and facility-related information.
- Compile and update existing or planned wastewater utility jurisdictions and their wastewater collection infrastructure data.
- Compile and summarize existing ordinances, statutes, and studies related to OSTDS and wastewater management in the BMAP area.

Deliverable: These tasks will be completed one year after project initiation and will generate a refined project scope as well as drafts of an OSTDS geographic map and database, a sewer collection system database, and the compilation of existing ordinances and results of studies for the BMAP area that can be shared between participating stakeholders and used for decision making.

Objective 2: Analysis and Prioritization

- Identify and prioritize locations where wastewater loadings from WWTFs and OSTDS are a concern for water quality in the UFA or surface waters and should be addressed.
- Identify and prioritize potential actions that remediate the effects of wastewater on the quality of ground water or surface water.
- Identify and prioritize locations where the connection of OSTDS to central sewer is the preferred and appropriate management strategy.
- Identify potential funding sources for proposed actions.

Deliverable: All work is complete no later than 30 months from initiation with identified wastewater improvement projects implemented throughout the project time frame. The products of this element are a Management Plan for Wastewater and agreement among cooperating entities to identify projects/actions that meet the implementation requirement of the management plan and will be initiated before the second phase of the BMAP.

Objective 3: Public Education and Outreach

- Compile information about existing education and outreach efforts in the BMAP area—in particular, what has been successful and what are the strengths and weaknesses of these efforts.
- Coordinate BMAP area outreach efforts with state level OSTDS education and outreach initiatives.
- Design an outreach effort that explains to landowners proper wastewater management including, but not limited to, how an OSTDS works; the proper maintenance of an OSTDS; the impacts of fats, oil, and grease (FOG) on collection systems; potential impacts to ground water and surface water quality; and where and why OSTDS should be upgraded to a better treatment system or removed. Information collected from existing education and outreach efforts as well as information obtained from Objectives 1 and 2 will be helpful for designing the outreach effort.

Deliverable: The compilation of existing program information and drafting of education outreach effort will be completed within one year after project initiation. The entire public education and outreach program will be finalized by the end of the 30-month project. Implementation of education and outreach efforts will be ongoing through the duration of the project.

4.4 URBAN FERTILIZER AND DRAINAGE WELLS

There is limited surface water drainage within the BMAP area, and nitrogen washed off the land surface in stormwater runoff enters ground water via percolation through drainage retention areas, sinkholes, stormwater ponds, or natural areas where runoff collects. Nitrogen from fertilizer can also infiltrate into ground water directly where it is applied. Drainage wells are points where nitrogen in stormwater runoff can enter the aquifer directly and are treated as a separate category in the NSILT. The drainage well

category is unique to Ocala in the BMAP area. The wells are used to manage stormwater volume to prevent flooding in closed basins.

Stormwater managers agreed to a set of guiding principles, summarized in **Table 20,** as a mechanism to direct future actions and select projects to address stormwater sources. These principles include recommendations for source control. They are intended to supplement and support the implementation of the Silver Springs BMAP.

The nitrogen loading contribution from urban fertilizer was calculated from urban land uses, including residential, commercial, parks and recreational areas, and golf courses. Marion County urban land uses contributed the greatest portion of that loading, followed by The Villages, Ocala, and Lake County.

The NSILT identifies urban fertilizer as contributing about 8% of the nitrogen loading to the UFA and drainage wells contributing 0.3% of the nitrogen loading for the entire BMAP area. The portion of loading contributed in the 10-year ground water contributing zone is 9% for urban fertilizer, comparable to the entire BMAP area, but for drainage wells is much greater at 10%, making drainage wells a larger contributor of nitrogen loading closer to Silver Springs.

There are five categories of management actions identified that reduce the impacts of urban fertilizer and 52 projects to implement those actions (**Table C-2** in **Appendix C)**. Management categories include installing structural BMPs to reduce the loading from urban stormwater, operating and maintaining structural BMPs (such as cleaning), treating stormwater before discharge into drainage wells, sweeping streets, and public education and outreach.

Total reductions for education and outreach were calculated by applying an approach that allows up to a 6% credit based on the total urban fertilizer loading, provided that specific program elements are present. **Table 21** outlines this approach. Urban fertilizer loading was apportioned to entities based on the percent area of urban land within their jurisdiction contributing to the overall loading, as calculated by the NSILT.

TABLE 20: GUIDING PRINCIPLES FOR URBAN FERTILIZER AND DRAINAGE WELLS

Stormwater and Drainage Wells

- Stakeholders are encouraged to implement, where feasible, emerging stormwater treatment technologies or innovative uses of more established technologies that offer improved nitrogen treatment efficiency over typical stormwater treatment practices, in new facilities or as retrofits of existing facilities in areas of high nitrogen loading. The department may be able to provide guidance in stormwater management technology and financial support through grants.
- To focus efforts in areas of high nitrogen loading, stakeholders are encouraged to use the NSILT or develop their own methods to determine areas of high load.
- To focus efforts in areas of high nitrogen loading , stakeholders are encouraged to develop decision-making processes to prioritize potential stormwater retrofit projects. These prioritization processes can be included in the BMAP as projects. The following factors are provided as guidance:
  - The feasibility of improving the treatment of nitrogen over what is currently provided by existing facilities or the absence of facilities.
  - The potential reduction in nitrogen versus cost ($/lbs/yr or a similar method).
  - The location of the project in a high-recharge area as identified in the NSILT or another similar analysis.

Source Control

- Stakeholders are encouraged to participate in public outreach and education programs that make information available to residents in urban areas regarding methods they can use to reduce nitrogen sources and protect Silver Springs. Efforts that are not communitywide should be directed towards areas of high loading.
- Stakeholders are encouraged to consider implementing ordinances and regulations to address the overapplication of nitrogen from fertilizer in urban areas, including golf courses.
  - Operators of golf courses should be encouraged to implement the practices in the department's BMP manual for golf courses.
  - Operators of golf courses and other entities, such as homeowner associations, using reuse water should be encouraged to learn how to properly adjust the fertilizer application rate to account for nitrogen supplied through reuse water.

TABLE 21: APPROACH APPLIED FOR PUBLIC EDUCATION CREDITS

ACTIVITY	% CREDIT
Florida Yards and Neighborhoods (FYN) Program	3%
Local Codes and Ordinances	2% total for all four
— Landscaping	0.5%
— Irrigation	0.5%
— Fertilizer	0.5%
— Pet Waste Management	0.5%
Public Service Announcement (PSA)	0.25%
Informational Pamphlets	0.25%
Website	0.25%
Inspection Program and Call-in Number for Illicit Discharges	0.25%

Table 22 summarizes projects to address the reduction in nitrogen loading from urban fertilizer. Overall, the management actions undertaken in the BMAP area will reduce nitrogen loading to the land surface by 92,415.5 lbs-N/yr or about 9%. Stormwater managers agreed to include only those dry retention structural BMPs that were retrofits to better nitrogen removal technologies or located on soils that provided a net removal of nitrogen—largely poorly drained soils. The largest measurable single reduction in nitrogen loading from a single project was achieved by FDOT (31,781 lbs-N/yr) through the cessation of fertilizer use on the medians and rights-of-way of state-maintained roadways throughout the BMAP area.

The city of Ocala and Marion County's Office of the County Engineer are designing projects that take advantage of innovative technology for reducing nitrogen loading. Ocala plans to pretreat stormwater runoff through a bioabsorptive media at three sites before discharge into drainage wells. The completion of these projects depends on the availability of funding. This is the first time the city is trying this strategy for improving the quality of water discharged to the UFA. The descriptions of Projects S085, S086, and S087 in **Table C-2** provide more detail.

Marion County has completed stormwater management projects that utilize bioabsorptive media to reduce nitrogen loading and has other projects planned for the first BMAP phase. Project S088 proposes the use of a patented bioaborptive media, Bold and Gold, to enhance nitrogen removal under priority drainage retention areas (stormwater ponds).

Education and outreach activities comprise 22 projects. Their contribution to loading reduction was estimated based on applying appropriate education credit for each entity to the land surface loading from urban fertilizer in the BMAP area, based on the crediting approach outlined in **Table 21**. Those local entities with MS4 permits have education and outreach as one of the requirements of their permit. Overall, the credits obtained by all education and outreach activities are greater than any other management category.

There is support among stormwater managers for a more coordinated education and outreach approach for spring-related materials. The formation of a public education coordination team facilitated by Marion County and consisting of representatives from local government, state agencies, water management districts, and local interest groups is proposed to meet this interest (Project BO36 in **Table C-2**). The purpose of the group would be to ensure that citizens are provided with consistent and accurate information about the impacts of stormwater runoff on spring water quality, as well as advice on protecting and restoring Silver Springs. The project would maximize outreach efforts among coordination team members and enhance communication between team members.

TABLE 22: SUMMARY OF MANAGEMENT ACTIONS THAT ADDRESS URBAN FERTILIZER

- = Empty cell/no data
[1] Sum of individual entity reductions based on credits summarized in **Table 21**.

SOURCE CATEGORY	NUMBER OF PROJECTS	NUMBER OF PLANNED PROJECTS	NUMBER OF CONCEPTUAL PROJECTS	TN LOADING REDUCTION (LBS-N/YR)
Urban Fertilizer Total	58	5	2	92,415.5
— **Urban Structural BMPs**	29	5	2	7,750
• *Structural BMPs*	22	5	2	7,501.5
• *Operation and Maintenance*	7	-	-	248.5
— **Nonstructural BMPs**	29	1	-	-
• *Street Sweeping*	5	-	-	6,316
• *Education and Outreach*[1]	22	1	-	46,320
• *Fertilizer Cessation*	2	-	-	31,781
Drainage Wells	3	3	-	1,424

Total Nitrogen Loading at Land Surface 1,028,106 lbs-N/yr

4.5 AGRICULTURAL MANAGEMENT STRATEGIES

Overall, agricultural production contributes 38% of the estimated nitrogen loading to the UFA, comparable to the contribution from OSTDS. Cattle farms provide 17% of the loading of nitrogen to the

UFA. In addition to the implementation of BMPs for appropriate agricultural commodities, additional activities are proposed that address the loading from agriculture.

Agricultural sources combined contribute an estimated 7,596,510 lbs-N/yr at the land surface. **Table 23** lists the loading estimates for individual agricultural source categories. Currently, 18.4% of the FDACS-identified agricultural acreage is covered by a NOI from FDACS (**Table 9**). An efficiency of 30% is assumed for each BMP and when applied to the acreage signed up under each BMP program yields an estimated total loading reduction of 213,116 lbs-N/yr or 2.8% at the land surface.

The largest contribution of agricultural loading to the land surface comes from cattle farms (**Table 23**). Cattle operations in the BMAP area are mainly cow-calf operations for the production of beef cattle. Calves were assumed to have an average residence time in the BMAP area of 183 days, based on input from stakeholders. The loading from fertilizer used on pasture for hay production is included as part of the nitrogen loading from horse farms and cattle farms. **Table 23** also lists the estimated loading reductions at the land surface for the implementation of appropriate BMPs.

TABLE 23: SUMMARY OF AGRICULTURE BMP LOADING REDUCTIONS

[1]Calculated as percent acreage covered by NOI (**Table 9**) times source loading to land surface times 30% efficiency.

AGRICULTURAL SOURCE	LOADING TO LAND SURFACE (LBS-N/YR)	BMP PROGRAM	ESTIMATED LOADING REDUCTION AT LAND SURFACE (LBS-N/YR)[1]
Horse Farms	1,925,061	Equine	2,009
Cattle Farms	4,456,777	Cow/Calf	202,119
Miscellaneous Livestock	170,607	Conservation Plan Rule	No acreage covered
Fertilizer, Crops	1,044,065	Vegetable/Agronomic Crop, Citrus, Specialty Fruit/Nut, and Nursery	8,988

Agricultural loadings of nitrogen and phosphorus are associated primarily with fertilization, irrigation, and manure disposal practices. Nutrients from fertilization and animal manure can find their way into water resources through irrigation or stormwater runoff, and can be carried in sediments that are transported through runoff. As set out in Paragraph 403.067(7)(c), F.S., agricultural producers in a BMAP area must either implement FDACS-adopted BMPs or monitor their water quality, to demonstrate compliance with state water quality standards. Producers in the Silver Springs BMAP area have so far chosen to implement BMPs. While FDACS has BMP manuals for nine different commodity groups (including forestry), with two more slated for adoption in 2015, each manual addresses the principles of nutrient management, irrigation management, sedimentation and erosion control, and water

resources protection. FDACS developed a set of guiding principles for agricultural producers based on recommended BMP practices. **Table 24** lists the guiding principles related to the implementation of BMPs in each of these key categories.

Table 25 lists other agriculture-related management strategies under way or proposed for the Silver Springs BMAP area. The Marion County Clean Farms Initiative and the UF–IFAS/Marion County Water Quality Education and Equine Farm BMP Program are outreach efforts directed towards large commercial horse farms for the implementation of manure management and nutrient reduction BMPs. The Clean Farms Initiative was completed in 2008; one result of the project was the creation of an outreach coordinator position supported by county extension. That position continues to be supported by Marion County for farm outreach and education.

TABLE 24: GUIDING PRINCIPLES FOR AGRICULTURAL LOAD REDUCTIONS IN THE SILVER SPRINGS BMAP AREA

- Nutrient Management –
  - Producers should strive to achieve the most appropriate combination of nutrient sources, amount, placement, and application timing, based on crop needs, soils, and weather conditions, to increase the availability of nutrients to the crop and decrease the potential for runoff or leaching of nutrients to the environment.
  - On animal operations, such as cow/calf and equine, producers also should ensure the proper management of manure, either through application/spreading onsite at agronomic rates or appropriate disposal offsite.
- **Irrigation Management** – Producers should, to the extent feasible, do the following:
  - Maximize irrigation system efficiency, based on system design specifications, through proper maintenance and use.
  - Manage the frequency, timing, and amount of irrigation applications to target water delivery to the plant root zone.
  - Incorporate the use of simple but effective irrigation management tools, such as soil moisture sensors, rain gauges, and onsite or online weather station data, *etc.*
  - If one is available, consult with a Mobile Irrigation Lab regarding potential ways to increase irrigation system efficiency and improve irrigation management.
- **Sedimentation and Erosion Control** – Producers should maintain vegetation in areas prone to erosion, in order to hold soil and decrease the velocity of irrigation and stormwater runoff.
- **Water Resources Protection** – Producers should employ buffers, swales, and/or setbacks to reduce the potential for pollutant discharges to water resources.

The department recently published the *Small Equine BMP Manual*. A new effort in the Silver and Rainbow Springs BMAP areas will be an outreach program featuring the new manual and directed towards small, typically noncommercial (hobby) horse farms. The new manual provides a set of manure management and nutrient reduction BMPs that are appropriate for hobby farms. Hobby farms are numerous in the basin and may have issues with manure storage and disposal, denuded areas, *etc.*, but do not have the acreage to resolve these issues. It is typically not appropriate or possible for hobby farms to enroll under FDACS' Equine BMP Program. A joint outreach and education effort facilitated by the department in collaboration with FDACS, local governments, and UF–IFAS is under development to address these smaller operations.

The outreach strategy for equine hobby farms is expected to be completed during the first phase of the BMAP, and implementation will be ongoing. Initial steps will focus on identifying ways to reach the target audience, identifying and engaging agencies with existing outreach programs, and developing outreach materials to supplement the new department manual. A method of assessing program effectiveness for the BMPs implemented on hobby farms and the amount of acreage involved also will be considered, possibly using existing programs.

In addition to signing up producers for a BMP NOI, FDACS has focused its priorities and increased its activity in the BMAP area as follows:

- **BMP Enrollment** – The OAWP will focus its enrollment efforts initially on the following priority areas in the basin: agriculture concentrated in high-recharge areas, particularly the parts of the BMAP area that overlap with the Orange Creek Basin and south of Ocala. Staff and contractors will identify active commercial agricultural operations through grower associations, information on county agricultural tax classifications, field staff knowledge, and other means. The OAWP will attempt to ensure that all producers are aware of their statutory obligation to implement BMPs, through letters, emails, workshops, brochures, and/or other means. Staff/contractors will assist producers in selecting the appropriate BMPs, with emphasis on nutrient management, irrigation management, sediment/erosion control, water resources protection, and record keeping.
- With funding targeted toward springs protection, FDACS will provide $250,000 in BMP cost-share for the Silver Springs BMAP area.

- To help focus cost-share expenditures and BMP implementation follow-up, FDACS will review its rule-adopted cow/calf and equine BMPs to identify the practices likely to have the greatest nutrient load reduction benefits.
- FDACS hired an additional BMP technician in May 2015 to increase the focus on BMP enrollment in spring-related basins, including Silver Springs.

TABLE 25: OTHER AGRICULTURAL MANAGEMENT STRATEGIES

* Planned, but no current implementation timeline. Start date needed by first annual report date.

PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE
B009 - Silviculture BMP Implementation and Compliance	Florida Forest Service	Covers silviculture lands in Rainbow and Silver Springs BMAP areas. BMPs for silviculture are applicable to public and private industrial and nonindustrial forestlands. Silviculture BMPs were first developed in mid-1970s in response to federal Clean Water Act. First silviculture BMP manual was published in 1979 and most recently revised in 2008. Silviculture BMPs are minimum standards for protecting and maintaining water quality during ongoing silviculture activities, including forest fertilization. Ongoing projects include biennial BMP surveys, targeted training, and technical assistance for landowners and forestry professionals.	FDACS, Florida Forest Service	2004	Ongoing	Ongoing
B010 - Clean Farms Initiative	Marion County Office of the County Engineer	Clean Farms Initiative was designed to assist Marion County farm owners and managers with implementation of BMPs, and to recognize them for their cooperative efforts. Initiative was begun by passage of Resolution 04-R-384, by Marion County Board of County Commissioners, recognizing importance of agriculture to county's history and economy, while also recognizing need to protect water resources. As part of initiative, more than 7,500 surveys and brochures were mailed in October 2006 to owners of agricultural land, ranging from large operations of several hundred acres to small tracts of land with fewer than a dozen animals. The survey measures current manure management and fertilization practices. Results of the survey, and input from focus groups held in February and March 2007, were used to create Farm Outreach Coordinator position to educate horse farm owners and managers on water quality, targeting practices such as manure management and fertilization.	None	2003	Complete	2008

PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE
B011 - Water Quality Education and Equine Farm BMPs	UF–IFAS Extension, Marion County	Equine Best Management Practices and Manure Management Education and Outreach Program sponsored by UF–IFAS Extension and Marion County. Between 2010 and 2013, program developed 44 types of educational materials and made 3,507 client consultations, of which 464 were in field. Three hundred and one producers participated in group education events, including manure management summit and tour. Program website received 446 views during this period. Program is ongoing.	SWFWMD	2010	Ongoing	Ongoing
B012 - Implementation of Outreach Program for Small Scale Horse Operations BMP Manual	Department	*Small Scale Horse Operations BMP Manual* is intended to educate owners of noncommercial horse farms on BMPs to reduce nutrient loads. Outreach program will be developed for effective implementation of BMPs on noncommercial horse farms in Silver and Rainbow Springs BMAP areas. Implementation program will consist of identification of key agencies with existing public education activities where BMP manual can be incorporated, development or modification of existing recognition programs to provide measurable goals for both participants and also types of BMPs implemented, and identification of existing cost-share programs that may assist noncommercial operations in BMP implementation.	FDACS, Marion County	2015	Planned	2020
B041 - FDACS Cost-Share Programs	FDACS	FDACS will provide at least $250,000 in BMP cost-share for Silver Springs/Rainbow Springs BMAP areas.	Marion SWCD	2014	Ongoing	Ongoing
B042 - FDACS Refinement of Appropriate BMPs	FDACS	To help focus cost-share expenditures and BMP implementation follow-up, FDACS will review its rule-adopted cow/calf and equine BMPs to identify practices likely to have greatest nutrient load reduction benefits.	None	2020*	Planned	2020*
B043 – Technical Agriculture Committee	UF–IFAS Extension Marion County	Formation of technical agriculture committee consisting of representatives from local interest groups, local governments, water management districts, and state agencies. Purpose will be to ensure that consistent and accurate information is provided for pollutant loading from agricultural uses and evaluate effectiveness of BMPs.	Local agriculture interests, local and state agencies, SJRWMD	2016	Planned	2020

Chapter 5: ASSESSING PROGRESS AND MAKING CHANGES

This chapter summarizes the goals of this BMAP and outlines the steps stakeholders will take to track progress in implementing projects and observing the results of those projects in BMAP waterbodies. It also summarizes information about grants or loans available for the implementation of projects.

5.1 SUFFICIENCY OF EFFORT

This BMAP represents a "sufficient effort" or commitment by stakeholders to restore water quality to Silver Springs and Upper Silver River. Stakeholders recognized that no one management action will restore water quality in Silver Springs and Upper Silver River. They agreed that the entire BMAP area should be considered when identifying loading reduction management actions. This decision was based on the acknowledgment that all stakeholders have a shared responsibility in restoring Silver Springs and Silver River and should have at least a minimal level of involvement in the restoration process.

Sufficiency of effort was evaluated in several ways. The first is ensuring that all potential source categories of TN loading identified in the NSILT are addressed with projects and, second, ensuring the participation of stakeholders located in the BMAP area in the BMAP process. **Table 26** summarizes the number of projects, the TN sources that they address, and project status. Conservation lands were not explicitly evaluated with the NSILT, but were included as projects because stakeholders agreed that they are an important tool for protecting water quality and managing current and future loadings. There are projects completed or under way, as well as planned or conceptual projects, for each of the source categories. **Table 27** summarizes the pounds of nitrogen loading removed by the management actions proposed for each source category. The percent reduction in loading is calculated from the nitrogen loading applied at the land surface and not at the top of the UFA. The greatest reductions in nitrogen loading are achieved with the WWTFs and urban fertilizer sources; however, all source categories have contributed nitrogen loading reductions.

Table 28 lists the number of projects assigned to each entity. The level of participation varies based on the proximity of an entity to Silver Springs or jurisdictional area. The greatest number of projects were contributed by Marion County, Alachua County, Ocala, The Villages, and FDOT District 5. These entities cover a large part of the BMAP area or are located close to Silver Springs and Upper Silver River.

TABLE 26: SUMMARY OF PROJECTS

- = Empty cell/no data
[1] Research and data collection provide the tools for identifying nitrogen loading reduction projects.

SOURCE CATEGORY	TOTAL NUMBER OF PROJECTS	PLANNED PROJECTS	CONCEPTUAL PROJECTS
Urban Fertilizer	58	6	2
Drainage Wells	3	3	-
Wastewater	34	2	2
OSTDS	6	1	1
Agriculture (not including BMPs)	7	3	-
Conservation Lands	14	1	1
Research and Data Collection[1]	6	-	-

TABLE 27: LOADING REDUCTIONS BY SOURCE CATEGORY

[1] Includes credit for education and outreach efforts by stakeholders.
[2] As of June 30, 2015, 18.4% of acreage is covered by a NOI.

SOURCE CATEGORY	TN LOADING REDUCTION (LBS-N/YR)	TN LOADING AT LAND SURFACE (LBS-N/YR)	% REDUCTION AT LAND SURFACE
Urban Fertilizer[1]	92,415.5	1,028,106	9%
Drainage Wells	1,424	40,298	3.5%
Wastewater	290,471	364,471	79.7%
OSTDS	24,300	1,588,491	1.5%
Agriculture[2]	213,116	7,596,510	2.8%

TABLE 28: NUMBER OF PROJECTS BY ENTITY

Note: Table summarizes all project types.

ENTITY NAME	NUMBER OF PROJECTS
Marion County	37
Alachua County	15
Lake County	6
Ocala	13
Belleview	2
The Villages	28
McIntosh	1
Lady Lake	7
Fruitland Park	4
SJRWMD	3
FDOT District 5	10
FDOT District 2	3
Department's Division of Recreation and Parks	3
FDACS' UF–IFAS	6
Putnam County	1
Department's Division of State Lands	4
Department's DEAR	3

The third evaluation of sufficiency considered the number of projects that will result in large loading reductions, address sources close to the springs, or pursue innovative technologies that produce larger reductions for the specific project type than typically expected. These types of projects are representative of a long-term commitment to improving the water quality of Silver Springs and Silver River, and they support the guiding principles outlined in the BMAP. The following projects meet these criteria:

- The city of Ocala is removing its oldest and poorest performing WWTF from operation (Project S091). Marion County Utilities has ceased the operation of a poorly performing facility close to the springs (Silver Spring Regional WWTF) and is improving effluent quality from other WWTFs (Projects S037 and S038). Since the NSILT was completed, five small WWTFs have been removed from service by connection to municipal utilities (Projects S109 and S036), and two larger WWTFs have been removed from service.
- Stormwater and wastewater management improvements at Silver River State Park (Projects S093, S090, and S089) and the SR 40 Pollution Reduction Project (Projects S031, S014, and S053) provide a high level of protection to the impaired waters because of their close proximity to the springs and Upper Silver River. **Section 4.1** outlines the project details. When completed, the projects will eliminate a large part of the direct untreated stormwater discharges into Upper Silver River and minimize impacts to the Silver Springs and Silver Springs Group from wastewater.
- For the management of stormwater and drainage wells, Ocala and Marion County will use innovative technologies (the use of bioabsorptive media and wetlands) that have higher nitrogen removal potential than traditional approaches (Projects S088, S085, S086, S032, S030, S123, S124, and B028).
- Belleview and Ocala have undertaken projects to convert business and residential properties from OSTDS to central sewer systems (Projects S034 and S035).
- FDACS is targeting cost-share funding for springs protection with emphasis on enrolling agricultural operations in high-recharge areas, and Marion County supports Water Quality Education and Equine Farm BMPs outreach (Projects B010, B041, and B011). FDACS will review its rule-adopted cow/calf and equine BMPs to identify

the practices likely to have the greatest nutrient load reduction benefits (Project S113).

The final measure of sufficiency considered was whether the BMAP contained next steps or a path forward, so that management actions that reduce nitrogen loading would continue and strengthen as the BMAP process continues into later phases. An initiative (listed as a project) was created to address each of the major anthropogenic sources, as follows:

- OSTDS and other wastewater issues are addressed through the wastewater management project OSTDS 9-1-1 Strategy (Project S112). This project includes education and outreach related to proper wastewater management.
- Public Education Coordination (Project B036) addresses public education and outreach related to stormwater impacts.
- An outreach program was implemented for the *Small Farm Equine BMP Manual* (Project B012) in collaboration with FDACS, Marion County, and other stakeholders.

Guiding principles developed for the source categories of wastewater—OSTDS, urban fertilizer, and agriculture—cover all the anthropogenic sources. These principles support the three BMAP initiatives described above and also provide guidance for the BMAP process. Though these principles are not requirements, they do provide stakeholders with information on the recommended outcomes of management actions.

The management actions outlined in this BMAP, as well as the proposed management initiatives, provide sufficient direction for this BMAP to reduce nitrogen loading to Silver Springs and Upper Silver River. The guiding principles and BMAP initiatives help to define additional management needs that support the restoration of water quality in Silver Springs and Upper Silver River. Projects categorized as planned or conceptual are priorities for funding and implementation during the first BMAP phase. Monitoring plans outlined in **Section 5.2** and the SJRWMD Silver Springs Initiative provide for additional information and advancement of knowledge about the system to allow for adaptive changes to the management actions outlined in this BMAP and the initiation of additional actions as supported by data.

5.2 MONITORING WATER QUALITY

The purpose of the monitoring network is to support the evaluation of progress made toward achieving the TMDL target nitrate concentration of 0.35 mg/L. The sampling locations, frequency, and sampled analytes identified in this chapter represent the minimum requirements needed to achieve this purpose. Currently, an extensive sampling program is in place as part of the Silver Springs Initiative. Elements of that network support the BMAP and will be used as part of the BMAP monitoring network. The results from the initiative will be used for the future refinement of BMAP monitoring needs.

The monitoring strategy includes the following three distinct sampling networks:

- A **Surface Water Network** to evaluate the water quality of Silver Springs and Upper Silver River and identify and follow changes.
- A **Ground Water Network** to evaluate changes in ground water quality in the Silver Springs BMAP area, as well as the response of the aquifer to different land uses.
- A **Targeted Ground Water Network** to evaluate the general conditions of the Floridan aquifer in the Silver Springs BMAP area using public water supply and surveillance well data.

5.2.1 MONITORING OBJECTIVES AND ANTICIPATED BENEFITS

Surface Water Monitoring Network Goals and Objectives:

1. Identify and track changes in nitrate concentration in Silver Springs (at the spring discharge), Silver Springs Group, and Silver River to determine if TMDL targets are being achieved.
2. Identify and track the biological response of Silver Springs, Silver Springs Group, and Silver River to changes in nitrate concentration.

Ground Water Monitoring Network Goals and Objectives:

1. Identify and track changes in nitrate concentration in the UFA at specific well locations to estimate progress made towards achieving the TMDL target concentration at Silver Springs.
2. Determine the response of UFA nitrate concentrations to different land uses.

3. Provide a comparison of nitrate concentrations between the surficial and Floridan aquifers.

Targeted Ground Water Monitoring Network Goals and Objectives:

1. Evaluate the condition of the UFA to determine if patterns in nitrate concentration are occurring.
2. Identify areas with persistent elevated levels of nitrate for further investigation of the sources and causes of elevated nitrates.

5.2.2 Monitoring Locations and Indicators

Surface Water and Ground Water Monitoring Network locations were selected to represent the minimum density of data collection sites needed to track changes in water quality and allow the annual evaluation of progress toward achieving the TMDL.

Figure 16 displays well monitoring locations included in the Ground Water Monitoring Network, **Figure 17** displays the minimally required sampling locations for the Surface Water Monitoring Network, and **Figure 18** displays the location of active water quality monitoring stations. There are additional sampling locations in the Ocklawaha River upstream and downstream of Silver River. Surface water data are collected to represent conditions in each of the impaired waterbodies and to track changes in nitrate level over time. **Table 29** describes the station locations. Water quality and ground water data are collected by the SJRWMD and the department's Oklawaha River Aquatic Preserve. Surface water stations are sampled every other month or six times per year by the SJRWMD, and the Oklawaha River Aquatic Preserve samples quarterly.

Table 30 lists the indicators monitored by each network. The SJRWMD has installed continuous recording data loggers at Mammoth Spring, as well as four other locations in Silver River and Half Mile Creek, that provide nitrate and other water quality data to supplement the monthly data collection. Discharge information is collected downstream of Mammoth Spring, at USGS site number 02239501 and in the Ocklawaha River just downstream of the confluence of Silver River (USGS site number 02240000) (**Figure 19**).

Biological sampling is included in this monitoring plan as part of the Surface Water Network, as algal mats were indicated as the reason for listing these waterbodies as impaired. Biological data will be collected to calculate an SCI, Rapid Periphyton Survey (RPS) of benthic attached algae, and habitat

assessment for the Silver River at least every two years. The department is responsible for collecting and interpreting the SCI, RPS, and Habitat Assessment and Linear Vegetation Survey data. The department uses these biological indicators in interpreting the IWR (Chapter 62-303, F.A.C.). Additionally, the SJRWMD collects annual SAV data at the locations shown in **Figure 19** that will be used to supplement the evaluation of biological condition.

The Targeted Monitoring Network utilizes data collected from existing public water supply wells and surveillance wells. Depending on the number of people served, public water supply wells are permitted either by the department as Potable Water Supply or by FDOH as Limited Use Systems. Nitrate data are collected annually for the department-permitted facilities and at least every five years for the FDOH-permitted facilities. Surveillance well data represent data collected by FDOH when there is suspected ground water contamination in an area or well owner complaints. Together these data sources represented over 1,300 wells for the period from 2001 to 2013. These data sources will be evaluated every five years as part of the fifth-year assessment of progress made in implementing the TMDLs. These datasets are valuable for identifying locations in the BMAP area with persistent elevated levels of nitrate that should be investigated.

Station locations will be reviewed annually and modified as needed. The results of water quality data collection and any adjustments to monitoring locations will be reported annually to stakeholders.

TABLE 29: DESCRIPTION OF SURFACE WATER MONITORING LOCATIONS

- = Empty cell/no data
* Data logger site; otherwise a grab sample is collected.

MAP ID	SJRWMD STATION	DEPARTMENT STATION	DESCRIPTION AND PURPOSE
1 –Main Spring	SSG -Mammoth Spring SSG -Mammoth –East SSG -Mammoth-West SILHEAD*	SR1	WBID 2772A; track nitrate levels in springs discharge
2 - Silver River upstream of Half Mile Creek	SILBIRD*	SR2	WBID 2772C; track nitrate levels
3 – Half Mile Creek	Half Mile Creek HMCSR40* HMCSR326	-	Source of turbidity and water quality impacts to Silver River
4 - Silver River downstream of Half Mile Creek	-	SR3	WBID 2772E; measure effect of Half Mile Creek
5 - Silver River at downstream end of WBID	-	SR4	WBID 2772E
6 - Silver River downstream of impaired WBIDs	SILVERRIVERS5*	SR5	Downstream of impaired WBIDs to measure impact on unimpaired Silver River
7 - Silver River upstream of confluence with Ocklawaha River	SSR SILCONN*	SR6 SR7	Downstream of impaired WBIDs; monitors water quality of Silver River delivered to Ocklawaha River

TABLE 30: MINIMUM MONITORING INDICATORS

- = Empty cell/no data

INDICATOR	GROUND WATER NETWORK	SURFACE WATER NETWORK	BIOLOGICAL NETWORK
Dissolved Oxygen (DO)	√	√	√
Specific Conductance	√	√	√
pH	√	√	√
TN – Includes TKN, Nitrate, Ammonia	√	√	√
Total Organic Carbon (TOC)	√	√	-
TP	√	√	√
Total Suspended Solids (TSS)	√	√	-
Chloride, Sulfate, Fluoride	√	√	-
Alkalinity	√	√	-
Color	-	-	-
Biochemical Oxygen Demand (BOD)	-	-	-
Turbidity	-	-	-
Photosynthetically Active Radiation (PAR)	-	√	-
Chlorophyll *a*	-	√	-
Algal Surveys and SAV Monitoring	-	-	√
SCI	-	-	√
RPS	-	-	√

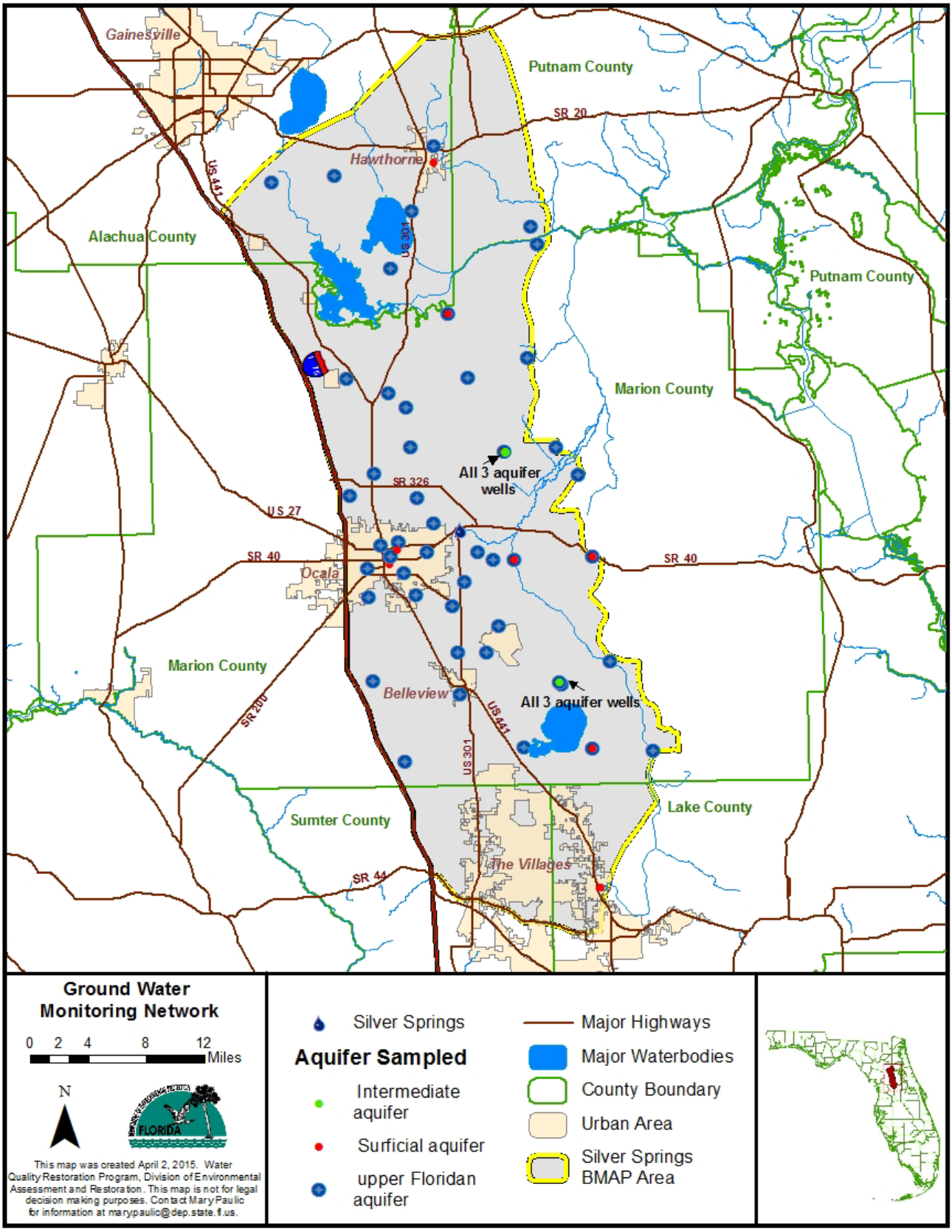

FIGURE 16: LOCATION OF GROUND WATER MONITORING WELLS

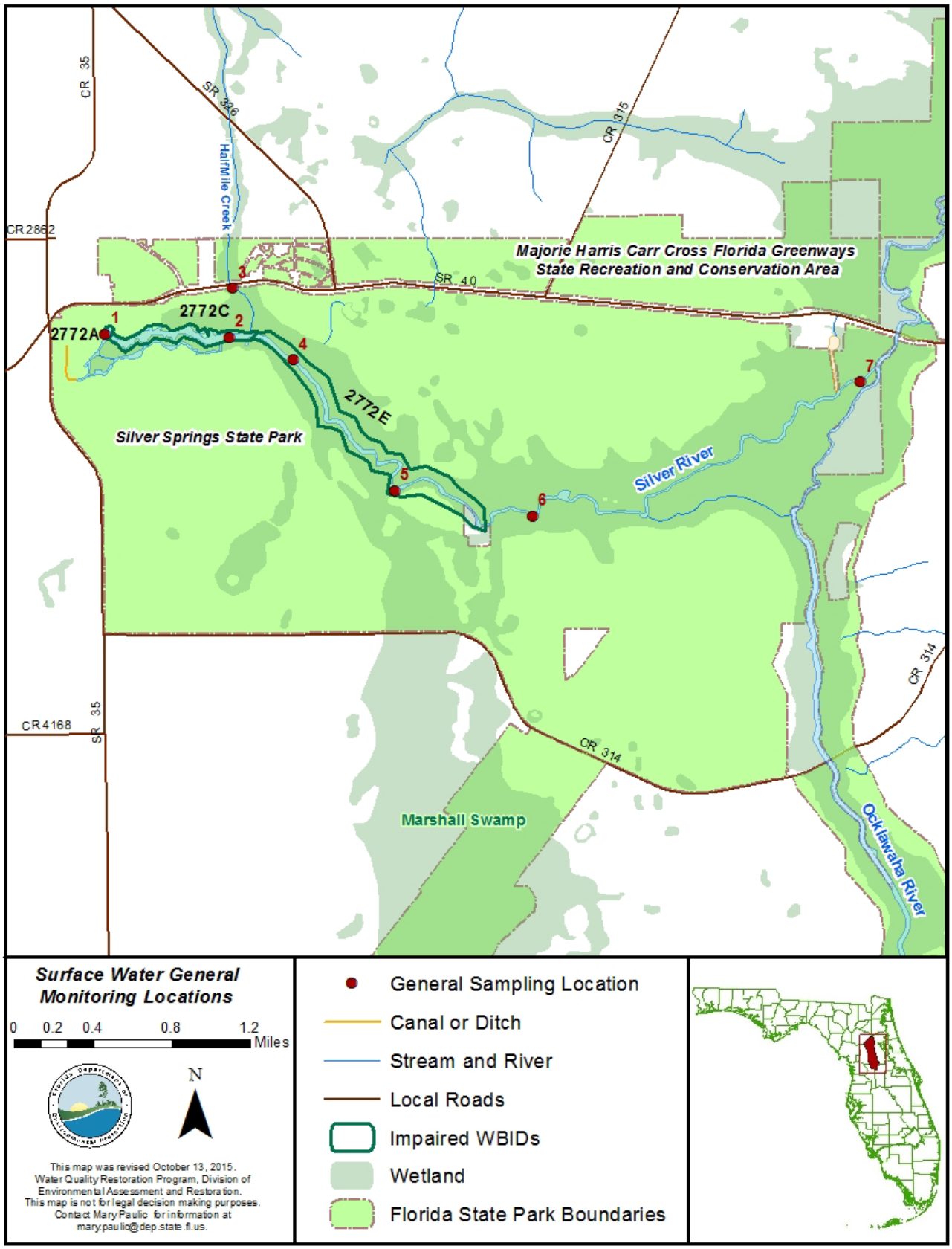

FIGURE 17: GENERAL SURFACE WATER MONITORING LOCATIONS

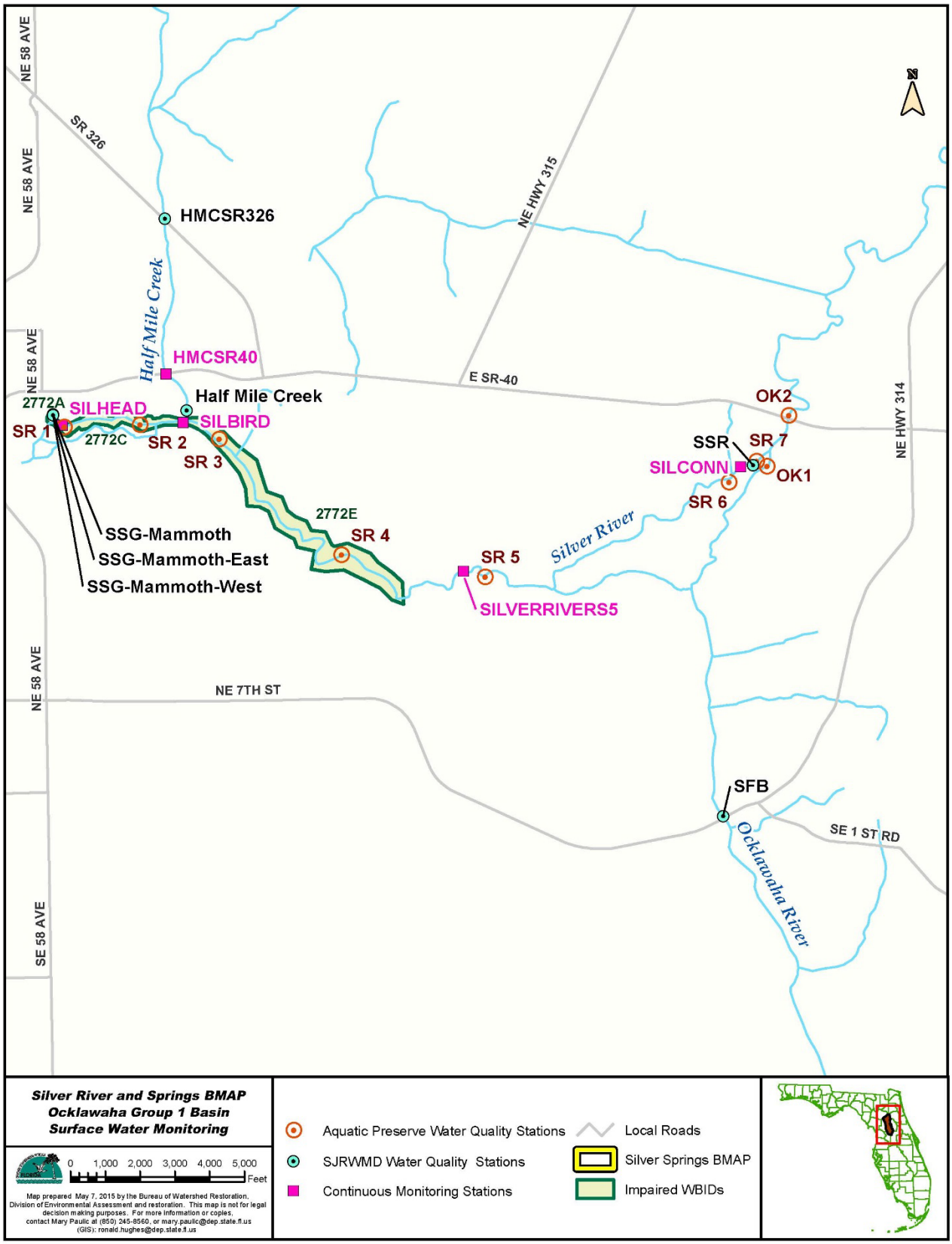

FIGURE 18: ACTIVE WATER QUALITY MONITORING IN IMPAIRED WATERBODIES

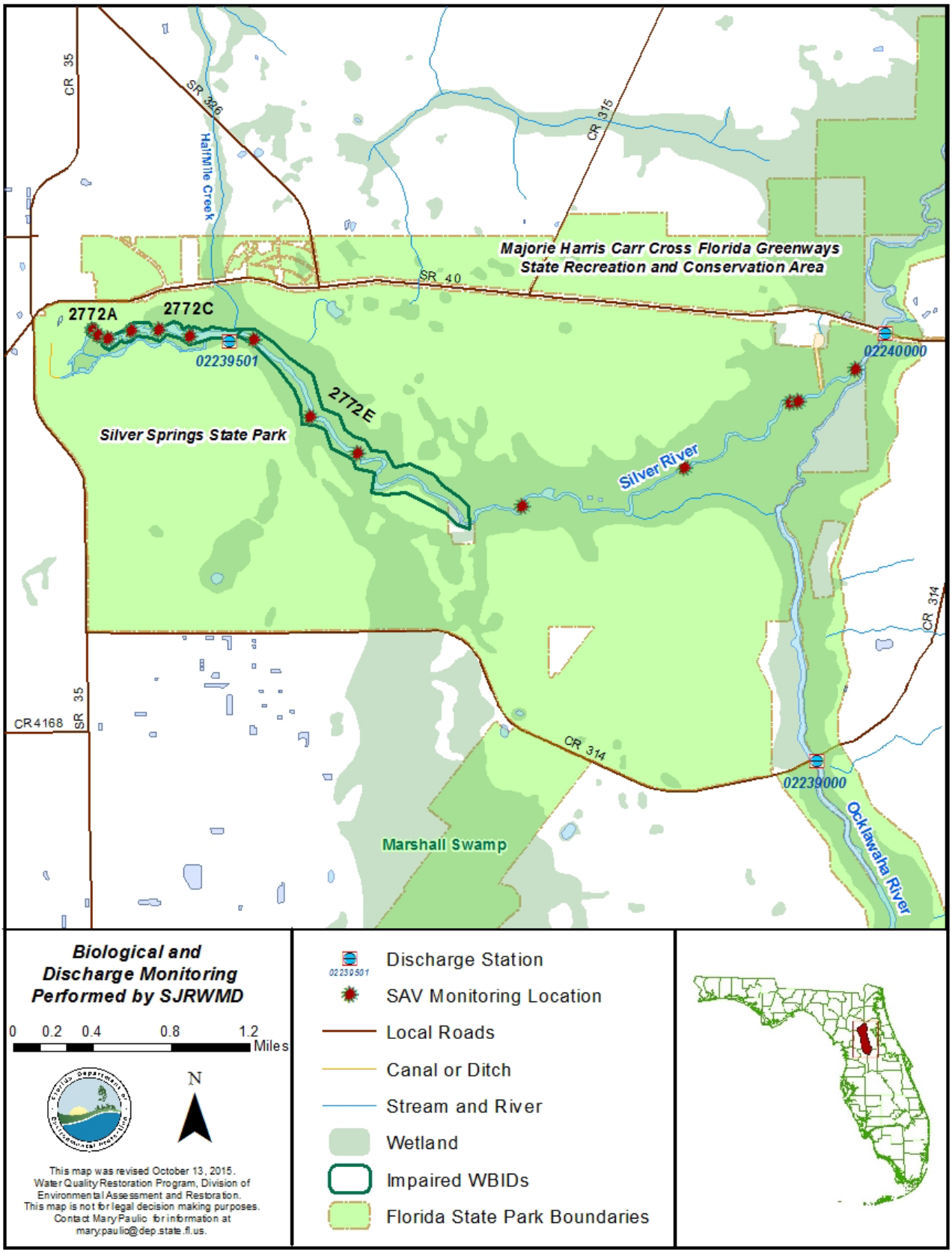

FIGURE 19: LOCATION OF SJRWMD BIOLOGICAL SAMPLING

5.2.3 Quality Assurance/Quality Control (QA/QC) Mechanisms

The collection of both ambient and performance-based water quality data will be conducted in a manner consistent with the department's standard operating procedures (SOPs) for QA/QC. The most current version of these procedures can be downloaded from the department's SOP website. All stakeholders contributing data in support of the BMAP agree to follow these 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*, as well as the department's SOPs. Through cooperation on TMDL-related data collection, the SJRWMD and the department have consistently used similar SOPs for field sampling and lab analyses. This consistency will continue into the future to ensure that data can be used not only for tracking BMAP progress but also for future TMDL evaluations and other purposes.

5.2.4 Data Management Mechanisms for Data Storage and Retrieval

Data collected through the above activities will need to be tracked, compiled, and analyzed to be useful in support of the BMAP. The Florida Storage and Retrieval (STORET) database will serve as the primary resource for storing data and providing access for all stakeholders. Stakeholders have agreed to upload data to STORET in a timely manner, after the appropriate QA/QC checks have been completed.

STORET uploads are only appropriate for data that is representative of ambient conditions. Performance-based data collected as part of a localized source identification project, BMP investigation, or similar activity are not representative of ambient water quality conditions. These data will not be uploaded into the STORET database.

5.3 Funding Strategies for BMAP Implementation

The management strategies and associated projects presented in this BMAP require adequate funding for their implementation. The BMAP requires that stakeholders secure their own funding for a project; however, numerous federal, state, and local programs provide grants or loans for water quality improvement. This section provides an overview of state, water management district, and local funding sources. **Appendix E** contains more complete descriptions and information on where to find additional funding for state and federal resources.

Local governments provide funding through assessments based on property value or through fees or assessments collected for specific services. Stormwater assessment fees are generated by Marion County, Lake County, and Ocala to support their stormwater management programs. Many of the

stormwater improvement projects adopted with the BMAP by these entities are funded through these locally generated fees. The Lake County Water Authority (LCWA) provides stormwater improvement grants to communities in Lake County (additional LCWA grant information is available online). The Stormwater Treatment Grant Program, in operation since 1996, is intended to fund projects that result in the removal of pollutants discharged into Lake County lakes and wetlands. Project costs for land acquisition, stormwater studies, and engineering design associated with construction may be eligible for funding.

The department makes available grants and loans for wastewater, drinking water, and stormwater management through different provisions of the federal Clean Water Act and also state funding sources. Florida's Section 319 Grant Program administers funds received from the EPA to implement projects or programs that reduce nonpoint sources of pollution. The department also administers Florida's Water Quality Restoration Grants Program, specifically to support restoration activities for impaired waterbodies. The department considers improvement projects directed toward impaired waterbodies to be funding priorities. Funding from any of these programs can be and is being used for water quality improvement projects in the BMAP area. Typically, for grants, some match with local funding is required.

Periodically, the Legislature may solicit applications directly for Community Budget Issue Request projects, including water projects, in anticipation of upcoming legislative sessions. This process is an opportunity to secure the legislative sponsorship of project funding through the state budget. Other programs at both the state and local level offer the possibility of water infrastructure funding. Florida Department of Economic Opportunity Small Cities Community Development Block Grant Program funds are available annually for water and sewer projects that benefit low- and moderate-income persons. Monies also may be available for water and sewer projects that serve a specific "job-creating entity," as long as most of the jobs created are for people with low or moderate incomes.

The water management districts offer financial assistance, through cost-share programs, for water conservation, alternative water supply development, water quality/nutrient loading, and water resource development.. To be eligible for the SJRWMD cost-share program funding, the project should support one of the district's initiatives, which for this BMAP would primarily be the Springs Protection Initiative. Other potential district priorities that could cover funding for the Silver Springs BMAP area include Water Conservation, Minimum Flows and Levels Development and Prevention and Recovery

Strategies, and North Central Florida Water Initiative. Additional details about SJRWMD cooperative funding are available online.

The SJRWMD Districtwide Agricultural Cost-Share Program assists farmers, growers, and ranchers in funding projects that reduce nutrient loading and conserve water. To be eligible, applicant projects must be within the district boundaries and enrolled in applicable BMPs for the commodities produced. This program helps applicants implement BMPs that may be more costly, but provide significant benefits for water resources. Additional details about the Districtwide Agricultural Cost-Share Program are available online.

Several of the communities in this BMAP area are eligible for cost-share funding from the SWFWMD. Through the Cooperative Funding Initiative, the district may provide up to 50% cost-share for projects that address sustainable water resources, enhance conservation efforts, restore natural systems, and provide flood protection. Additional information about the SWFWMD's cost-share program is available online.

FDACS is committed to providing cost-share funding for eligible agricultural producers who are enrolled in the FDACS BMP programs and properly implementing all appropriate practices. The funding planned for 2015–16 totals $250,000 and will be distributed via the Marion SWCD. Funds will provide partial cost reimbursement for nutrient and manure management practices. Producers in the Silver Springs and other BMAP areas will be given priority during the project selection process.

5.4 TRACKING PROGRESS AND FOLLOW-UP

BMAP implementation will be a long-term process. Significant unknowns remain regarding the nutrient sources for Silver Springs and the steps needed to remediate them, as well as the fate and transport of nitrogen in the UFA.

The department will track projects and other implementation efforts and monitor water quality in TMDL waterbodies to ensure that the BMAP is carried out and to measure its effectiveness. Key components of adaptive management are tracking implementation, monitoring water quality and pollutant loads, and holding periodic basin working group (BWG) meetings to share information and expertise. The FWRA requires that the plan be revised, as appropriate, in collaboration with basin stakeholders.

Adaptive management measures include the following:

- Developing procedures to determine whether additional restoration actions are needed.
- Determining whether and when plan components need to be revised.
- Describing the BWG's role after BMAP completion.

5.5 Anticipated Outcomes of BMAP Implementation

Through the implementation of the stormwater education, wastewater, and small farm equine BMP initiatives, other projects and activities listed in this BMAP, and future NSILT source assessment, stakeholders expect the following outcomes:

- Decreased concentration of nitrate in Silver Springs, Silver Springs Group, and Upper Silver River.
- Decreased loading of nitrogen to the UFA.
- Improved coordination and communication between state and local governments and between all levels of government and the community.
- Improved project selection and targeted project implementation through the use of the guiding principles and the NSILT.
- Enhanced public awareness and understanding of the impacts of nitrogen loading on Silver Springs and Upper Silver River.

5.6 Commitment to Plan Implementation

While the BMAP is linked by statute to permitting and other enforcement processes that affect individual entities, successful implementation requires that local stakeholders willingly and consistently work together to achieve adopted TMDLs. This collaboration fosters the sharing of ideas, information, and resources. On a practical level, BMAP implementation also depends on adequate resources and necessary authorizations. The management strategies contained in the BMAP are either under way or are planned. Current and future actions are contingent on necessary funding and approvals for their initiation and/or continuation.

Stakeholders have made commitments to address the following actions:

- Follow the guiding principles and continue to use an equitable and cost-effective, coordinated, comprehensive watershed management approach that applies the best

available science to achieve TMDL-related pollutant load reductions and water quality improvements within a stakeholder's authority.

— Seek necessary approvals and funding to implement consensus management strategies identified in the BMAP and implement those actions as required approvals and funding are secured.

— Track the implementation of management strategies for which a stakeholder is responsible to ensure that the BMAP is carried out.

— Inform the department and other stakeholders of any permanent obstacles to carrying out management strategies for which they are responsible, including technical, funding, and legal obstacles.

— Conduct water quality monitoring (if applicable) according to the monitoring strategy approved by the BWG.

— Continue to communicate and coordinate actions and funding across agencies and community groups with regard to BMAP implementation.

APPENDICES

APPENDIX A: REFERENCES

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APPENDIX B: WWTFS IN THE BMAP AREA

Table B-1 is a compilation of data from WWTFs used to estimate the loading of wastewater to the UFA. Facilities listed were in operation from June 2012 through May 2013. Additional WWTFs may have been permitted since then, and several facilities as noted in the table have been removed from service. Several facilities use reclaimed water for reuse to supply irrigation water to urban landscapes, golf courses, and agricultural operations. These facilities are also noted in the table.

TABLE B-1: SUMMARY TABLE OF CALCULATED TN LOADINGS FOR WWTFS

- = Empty cell/no data
* TN data estimated based on available NO_3 data.
+ Effluent data not available; average TN value from department study used.
§ Discharge data not available; 50% of the design capacity was used.
[a] Facility closed after the evaluation was completed.
[b] Facility connected to central sewer system.
[c] North Sumter Utility Reuse receives reclaimed water from Central Sumter Utilities (up to 1.6 MGD AADF), North Sumter Utilities (up to 2.80 MGD AADF), and city of Wildwood WWTF (up to 2.0MGD AADF)
[d] Net loading after removing reuse loading.
[e] Ocala WRF #3 not included in NSILT.
mg-N/L = Milligrams of nitrogen per liter; kg-N/yr = Kilograms of nitrogen per year; MHP = Mobile home park; MHC = Mobile home community; RV = Recreational vehicle

WWTF NAME	FACILITY ID	COUNTY	RECHARGE AREA	ANNUAL AVERAGE TN (MG-N/L)	ANNUAL AVERAGE NO_3 (MG-N/L)	PERMITTED CAPACITY (MGD)	ANNUAL FLOW (MGD)	NITROGEN INPUT (KG-N/YR)[D]	PRIMARY PROTECTION ZONE
1. Ocala, City of - WRF 2 Site	FLA010680	Marion	High	6.93*	2.63	6.5	2.305	21,753	Yes
2. Ocala, City of - WRF 1	FLA010677	Marion	Low	20.90	-	2.46	0.776	Reuse	Yes
3. Silver Springs Shores	FLA296651	Marion	High	6.49*	2.50	1.5	0.823	7,384	Yes
4. Silver Springs Regional[a]	FLA010786	Marion	Medium	7.34*	2.83	0.45	0.133	1,350	Yes
5. Belleview, City of	FLA010678	Marion	High	2.35	-	0.76	0.356	66d	-
6. Marion Correctional Institute	FLA010789	Marion	High	6.05*	2.33	0.9	0.514	4,298	Yes
7. Rolling Greens MHP	FLA010757	Marion	Medium	7.37	-	0.25	0.077	784	Yes
8. Associated Grocers of Florida	FLA010735	Marion	High	28.70*	11.05	0.023	0.006	238	Yes
9. Stonecrest WWTF	FLA010741	Marion	Medium	2.92	-	1.0	0.192	384d	-
10. Landfair	FLA010722	Marion	High	11.62	-	0.099	0.015	241	Yes
11. Spanish Oaks WWTF	FLA010744	Marion	Medium	0.24*	0.094	0.095	0.021	7	Yes

WWTF Name	Facility ID	County	Recharge Area	Annual Average TN (mg-N/L)	Annual Average NO_3 (mg-N/L)	Permitted Capacity (MGD)	Annual Flow (MGD)	Nitrogen Input (kg-N/yr)[p]	Primary Protection Zone
12.Central Process - Lime Stabilization (residuals)	FLA010776	Marion	High	8.97+	-	0.09	0.045§	558	Yes
13. Tradewinds WWTF	FLA010699	Marion	Medium	0.28	0.19	0.065	0.065	25	Yes
14. Springs RV Resort WWTF	FLA010700	Marion	Medium	8.97+	-	0.075	0.012	149	Yes
15. Grand Lake RV Resort WWTF	FLA010770	Marion	High	8.97+	-	0.035	0.013	161	-
16. Oak Bend Community	FLA010693	Marion	High	4.16*	1.6	0.06	0.028	161	-
17. Ocala East Villas WWTF	FLA010725	Marion	Medium	111.69*	43	0.06	0.04	6,173	Yes
18. Amadeus Hotel and Conference Center WWTF	FLA010754	Marion	Medium	8.97+	-	0.056	0.019	235	-
19. Paddock Park South WWTF	FLA010705	Marion	High	8.97+	-	0.05	0.017	211	-
20. Petro PSC Truck Stop	FLA016154	Marion	High	4.99*	1.92	0.05	0.016	110	-
21. Smith Lake Shores WWTF	FLA010701	Marion	Medium	8.97+	-	0.05	0.028	347	-
22. Lake View Woods WWTF	FLA010709	Marion	Medium	7.53*	2.9	0.05	-	125	-
23. North Marion High School	FLA010663	Marion	High	8.97+	-	0.04	0.01	124	Yes
24. Victory MHP LLC	FLA010692	Marion	High	8.97+	-	0.03	0.01	124	Yes
25. Shady Rd Villas WWTF	FLA010704	Marion	High	1.48*	0.57	0.03	0.008	16	-
26. Sleepy Hollow WWTF	FLA010788	Marion	High	8.97+	-	0.03	0.009	112	Yes
27. Hilltop Estates	FLA010703	Marion	Medium	0.3*	0.117	0.03	0.02	8	-
28. Spanish Palm Estates WWTF	FLA010740	Marion	Medium	0.73*	0.28	0.02	0.005	5	Yes
29. Plantation Landing WWTF	FLA017026	Marion	Medium	18.65*	7.18	0.03	0.023	593	Yes
30. Wilderness RV Park Estates	FLA107077	Marion	Medium	12.84	7.995	0.05	0.013	231	Yes
31. Cedar Hills WWTF	FLA010771	Marion	High	2.05*	0.79	0.027	0.034	96	Yes
32. North Marion Middle School	FLA010664	Marion	High	8.97+	-	0.025	0.034	421	-
33. Phoenix Houses of Florida	FLA010698	Marion	High	8.97+	-	0.025	0.005	62	-
34. Lake Waldena Resort WWTF	FLA010688	Marion	Medium	8.91*	3.43	0.0249	0.011	135	-
35. Lake Weir Middle School	FLA010662	Marion	Medium	15.92*	6.128	0.024	0.028	616	-

WWTF Name	Facility ID	County	Recharge Area	Annual Average TN (mg-N/L)	Annual Average NO_3 (mg-N/L)	Permitted Capacity (MGD)	Annual Flow (MGD)	Nitrogen Input (kg-N/yr)[p]	Primary Protection Zone
36. Motor Inns/ Ocala WWTF	FLA010721	Marion	Medium	31.17*	12	0.024	0.012	517	Yes
37. Vacation Host Inn	FLA010731	Marion	High	12.99*	5	0.02	0.006	108	Yes
38. State Fire College	FLA010790	Marion	High	103.90*	40	0.02	0.013	233	-
39. On Golden Pond Mobile Home Park WWTF	FLA010685	Marion	Medium	4.83*	1.86	0.02	0.007	47	-
40. Camp Sonlight	FLA010689	Marion	Medium	4.42*	1.7	0.02	0.0008	5	-
41. Pilot Travel Center #424[b]	FLA277134	Marion	Medium	0.25*	0.095	0.02	0.006	2	-
42. Sharpes Ferry MHC WWTF	FLA010729	Marion	Medium	8.97+	-	0.019	0.008	99	Yes
43. Ocala Jai Alai - WWTF	FLA010737	Marion	High	8.97+	-	0.01	0.006	74	-
44. Wandering Oaks RV Resort	FLA010756	Marion	High	8.97+	-	0.018	0.001	12	Yes
45. Belleview Santos Elementary	FLA010661	Marion	Medium	11.17*	4.3	0.018	0.002	31	Yes
46. Fessenden Elementary School	FLA010666	Marion	High	6.75*	2.6	0.015	0.002	19	-
47. Sparr Elementary School	FLA010667	Marion	High	8.97+	-	0.015	0.001	12	Yes
48. Cliftwood MHP WWTF	FLA010745	Marion	High	10.65*	4.1	0.015	0.007	103	Yes
49. Sportsman Cove WWTF	FLA010690	Marion	Medium	8.97+	-	0.015	0.005	62	-
50. Days Inn - Ocala West WWTF	FLA010763	Marion	Medium	8.97+	-	0.015	0.005	62	-
51. Fort McCoy School K-8	FLA010665	Marion	Discharge	37.79*	14.55	0.015	0.0046	0	-
52. Nautilus Trailer Park	FLA010708	Marion	High	2.42*	-	0.012	0.008	27	Yes
53. Ocala Springs Shopping Center	FLA010773	Marion	Medium	8.97+	0.93	0.011	0.005	62	Yes
54. Pilot SSA #92 WWTFb	FLA016765	Marion	Medium	28.57*	-	0.0105	0.005	197	-
55. Baseline Square WWTF	FLA010766	Marion	High	8.97+	-	0.009	0.002	25	Yes
56. Shady Hills Elementary School	FLA010669	Marion	High	8.97+	11	0.01	0.002	25	Yes
57. Harbor View Elementary	FLA010670	Marion	High	8.97+	-	0.01	0.004	50	-
58. Reddick Collier Elementary	FLA010672	Marion	High	8.97+	-	0.01	0.004	50	-
59. Our Lucaya	FLA010784	Marion	High	8.97+	-	0.01	0.005	62	Yes

WWTF Name	Facility ID	County	Recharge Area	Annual Average TN (mg-N/L)	Annual Average NO_3 (mg-N/L)	Permitted Capacity (MGD)	Annual Flow (MGD)	Nitrogen Input (kg-N/yr)[p]	Primary Protection Zone
60. Stanton Weirsdale Elementary	FLA010668	Marion	Medium	8.97+	-	0.01	0.003	37	-
61. Whispering Oaks WWTF	FLA010706	Marion	Medium	8.97+	-	0.01	0.003	37	-
62. G & S Packing Company, Inc. (Industrial)	FLA010730	Marion	Medium	8.97+	-	0.008	0.005§	62	-
63. Big Lake Village WWTF	FLA010750	Marion	Medium	8.97+	-	0.01	0.002	25	-
64. Robins Nest RV Park	FLA010696	Marion	Medium	2.6	2.1	0.0083	0.001	4	-
65. Marie's Mobile Home Park	FLA010764	Marion	Medium	8.97+	-	0.005	0.0025§	31	Yes
66. Golden Holiday WWTF	FLA010765	Marion	High	8.97+	-	0.003	0.0014	17	Yes
67. Villages WWTF	FLA010555	Lake	Medium	7.26	-	1.64	0.995	2,151d	-
68. Fruitland Park, City of	FLA374245	Lake	High	11.07*	4.26	0.098	0.094	1,438	-
69. Recreation Plantation RV Park	FLA010593	Lake	High	2.98*	1.15	0.085	0.0326	134	-
70. Lady Lake Mobile Home Park	FLA010575	Lake	Medium	8.97+	-	0.027	0.0135§	167	-
71. Lady Lake, Town of	FLA399761	Lake	High	5.81	-	0.63	0.217	334d	-
72. Leisure Meadows Mobile Home Park WWTF	FLA010592	Lake	Medium	1.27*	0.49	0.024	0.0103	18	-
73. Water Oak Country Club Estates	FLA010529	Lake	High	11.43*	4.40	0.2	0.057	900	-
74. Pennbrooke WWTP	Fla010570	Lake	Low	7.77	-	0.18	0.108	313d	-
75. Lake North Apartments	FLA010549	Lake	High	8.97+	-	0.015	0.0075§	900	-
76. Sunshine Mobile Home Park	FLA010611	Lake	Medium	2.08*	0.80	0.0125	0.00392	11	-
77. ACA Academy	FLA010595	Lake	High	17.49*	6.73	0.014	0.00425	103	-
78. Blue Parrot	FLA010623	Lake	Low	1.86*	0.716	0.082	0.013	33	-
79. Valencia Terrace	FLA010599	Lake	Medium	1.56*	0.6	0.08	0.025	54	-
80. Harbor Hills	FLA010608	Lake	Low	5.80	4.1	0.04	0.006	48	-
81. Fruitland Park Elementary	FLA010497	Lake	High	8.97+	-	0.012	0.006	74	-
82. Mirror Lake Manor Apartments WWTF	FLA010571	Lake	High	8.97+	-	0.009	0.007	87	-

WWTF Name	Facility ID	County	Recharge Area	Annual Average TN (mg-N/L)	Annual Average NO_3 (mg-N/L)	Permitted Capacity (MGD)	Annual Flow (MGD)	Nitrogen Input (kg-N/yr)[p]	Primary Protection Zone
83. Fruitland Acres WWTF	FLA010643	Lake	High	4.13*	1.59	0.008	0.005	29	-
84. City of Hawthorne	FLA011291	Alachua	Medium	3.28	-	0.34	0.211	534	-
85. Camp McConnell YMCA	FLA011293	Alachua	Medium	11.53*	4.44	0.0075	0.0015	24	-
86. North Sumter Utility Company Master Reuse System[c]	FLA516708	Sumter	All	6.33*	2.44	6.4	0.211	Reuse system	-
87. Little Sumter Utility Co. WWTF	FLA017133	Sumter	Medium	5.73	-	3.0	1.725	219d	-
88. Wildwood City of WWTF[c]	FLA013497	Sumter	Medium	7.73*	2.98	3.55	0.545	80d	-
89. Central Sumter Utility Company WWTF[c]	FLA499951	Sumter	Medium	16.00	-	1.6	0.127	1,605d	-
90. North Sumter Utilities WWTF[c]	FLA281581	Sumter	Medium	14.95*	5.76	2.80	0.881	4,692d	-
91. Orange Blossom Utilities	FLA358134	Sumter	Low	19.29*	7.43	0.099	0.004	108	-
92. Spruce Creek South[a]	FLA010769	Sumter	Medium	8.97+	-	0.45	0.225§	2,789	-
93. Rails End MHP RV and MHP WWTF	FLA013519	Sumter	Low	3.08*	1.18	0.012	0.002	8	-
94. Lake Deaton RV Park WWTF	FLA013517	Sumter	Low	3.87*	1.49	0.01	0.003	16	-
95. Ochwilla Elementary School WWTF	FLA011701	Putnam	High	9.92*	3.82	0.0097	0.004	55	-
96. Sandhill Forest Two WWTF	FLA011739	Putnam	Medium	5.92*	2.28	0.0075	0.003	25	-
97. Melrose Community School WWTF	FLA011697	Putnam	High	42.86*	16.5	0.006	0.007	415	-
Ocala WRF #3[e]	FLA190268	Marion	High	4.43	-	4.0	2.15	13,117	-

APPENDIX C: MANAGEMENT STRATEGIES FOR WASTEWATER AND URBAN FERTILIZER

TABLE C-1: MANAGEMENT STRATEGIES TO REDUCE NITROGEN LOADING IN WASTEWATER

NA = Not available
* Completion date not finalized. End date for Phase 1 of BMAP used as placeholder.

Status Definitions:
Planned Project – Project designed, funding obtained or will be obtained, but has not started.
Conceptual Project – Funding has not been secured for project.
In Progress – Construction is under way.

PROJECT TYPE	PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	PROJECT OR CONSTRUCTION COST/ OPERATION COST
Reuse Project	S042 - Reuse Projects	City of Ocala	Reuse projects to three golf courses and various parks and recreation sites. Courses may be served by any of sewer facilities due to infrastructure configuration.	None	2014	In progress	2015	Unknown
Reuse Project	S043 – Village Center Service Area (VCSA) WWTP	Village Center CDD	Public access reuse system provides reclaimed water for irrigation of golf courses and roadways.	None	1991	Complete	2012	NA
Reuse Project	S044 – Little Sumter Service Area (LSSA) WWTP	Village Center CDD	Public access reuse system provides reclaimed water for irrigation of golf courses and roadways.	None	1997	Complete	2012	NA
Reuse Project	S045 – North Sumter Utilities (NSU) WWTP	North Sumter County Utility Dependent District	Public access reuse system provides reclaimed water for irrigation of golf courses.	None	2003	Complete	2012	NA
Reuse Project	S046 – Central Sumter Utility (CSU) WWTP	Central Sumter Utility Company, LLC	Public access reuse system provides reclaimed water for irrigation of golf courses.	None	2012	Complete	2013	NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Reuse Project	S098 - Silver Springs Shores Reuse to Spruce Creek Golf and Country Club	Marion County Utilities	Project will provide for delivery of reclaimed quality effluent and consists of reclaimed pumps, control valves, metering stations, and approximately 21,600 feet of 16" pipeline from Silver Springs Shores WWTP to Spruce Creek Golf and Country Club (SCGCC) and Lake Diamond golf courses located in southeast Marion County. Silver Springs Shores WWTP is currently permitted to treat 1.5 MGD and has potential of generating close to 1.0 MGD of reuse quality water based on current flows. Removes 54,794 lbs-TN/yr.	Legislature, SJRWMD	2014	In progress	2015	$3,192,000
Wastewater Collection System Maintenance	S054 - Collection System Maintenance Program	City of Belleview	Rehabilitation of 200 brick manholes to date and pipe replacement as needed.	None	2000	Complete	2010	NA
Wastewater Collection System Maintenance	S055 - Collection System Maintenance Program	City of Ocala	Maintenance program has used TV inspection on entire collection system. Slip lining of 175,000 feet of clay pipe is complete, and 40,000 feet per year are scheduled through 2020. Lift stations are upgraded at rate of about three per year. System and plants are Supervisory Control and Data Acquisition (SCADA) controlled, and flows can be rerouted.	None	2000	Ongoing	2020	NA/NA
Wastewater Collection System Maintenance	S056 - Collection System Maintenance Program	Marion County Utilities	Collection system maintenance program includes lift station maintenance and addition of SCADA. Capital Improvement Plan calls for lift station renovation every 10 years and identifies pipe replacement needs. Pipe replacement is done as funding allows.	None	2000	Ongoing	Ongoing	NA/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Wastewater Collection System Maintenance	S057 - Sanitary Sewer Repairs	Village Center CDD and North Sumter County Utility Dependent District	Inspection of main pipelines and manholes and timely repair of sewer and service line breaks.	None	2000	Ongoing	Ongoing	NA/NA
Wastewater Collection System Maintenance	S058 - Sanitary Sewer Cleaning	Village Center CDD and North Sumter County Utility Dependent District	Cleaning of 10% of collection system per year.	None	2013	Ongoing	Ongoing	NA/NA
Wastewater Collection System Maintenance	S059 - Lift Station Rehab	Village Center CDD	VCSA Lift Station No. 12 rehabilitation.	None	2012	Complete	2013	$75,000/NA
Wastewater Collection System Maintenance	S060 - Lift Station Rehab	Village Center CDD	VCSA Lift Station Nos. 4, 8, 13, and 14 rehabilitation.	None	2013	In progress	2014	$150,000/NA
Wastewater Collection System Maintenance	S061 - Lift Station Rehab	Village Center CDD	VCSA List Station Nos. 16 and 33 – Replace risers and recoat wetwell; LSSA List Station No. 16 – Replace risers and recoat wetwell.	None	2015	Planned	2016	$118,000/NA
Wastewater Collection System Maintenance	S062 - Sanitary Sewer Replacement	Village Center CDD	VCSA sanitary sewer replacement	None	2014	In progress	2015	$250,000/NA
Wastewater Service Area Expansion	S116 - Sanitary Sewer Smoke Testing, TVing and Lining	City of Ocala	Smoke testing and inspection of existing sanitary sewer system	None	2015	In progress	2020	$3,000,000/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Wastewater Service Area Expansion	S109 - Package Plant Abatement	Marion County Utilities	Baseline Square, truck stops at County Road (CR) 326 and I-75 package plants connected to central system. Removes 412 lbs TN/yr.	None	2014	In progress	2015	NA/NA
Wastewater Service Area Expansion	S036 - Package Plant Abatement	City of Ocala	Hook up of White Oak MHP and 301 Plaza to central sewer. Removes 546 lbs-TN/yr.	None	2015	In progress	2015	NA/NA
Wastewater Service Area Expansion	S037 - Divert Wastewater Flows from Silver Springs Regional WWTF to Silver Springs Shores WWTF	Marion County Utilities	Install force main to reroute all sewage from Silver Springs Regional wastewater plant via force main approximately three miles long that is connected to Silver Springs Shores wastewater plant. Route of new force main will allow other decentralized wastewater plants in vicinity of Silver Springs to connect in future. Removes 16,438 lbs-TN/yr.	Department, SJRWMD	2014	In progress	2015	$1,023,113.91/ NA
Wastewater System Upgrade	S038 - Silver Springs Shores WWTF Upgrade	Marion County Utilities	Upgrades to existing WWTP located in Silver Springs Shores, upgrading it to reclaimed quality effluent standards. Utility customers are paying for treatment facility upgrades. Removes 10,331 lbs-TN/yr.	None	2012	In progress	2015	$5,031,738/NA
Wastewater System Upgrade	S039 - VCSA WWTP	Village Center CDD	WWTP includes anoxic basin for denitrification of NO_3, which reduces NO_3 discharge in WWTP effluent.	None	1991	Complete	2012	NA/NA
Wastewater System Upgrade	S040 - LSSA WWTP	Village Center CDD	WWTP includes anoxic basin for denitrification of NO_3, which reduces NO_3 discharge in WWTP effluent.	None	1997	Complete	2012	NA/NA
Wastewater System Upgrade	S041 - NSU WWTP	North Sumter County Utility Dependent District	WWTP includes anoxic basin for denitrification of NO_3, which reduces NO_3 discharge in WWTP effluent.	None	2003	Complete	2012	NA/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Wastewater System Upgrade	S091 - City of Ocala Nitrogen Reduction Project	City of Ocala	Upgrade of WRF #2 to AWT treatment standard for TN and decommissioning of WRF #1. WRF #1 was constructed in 1949, is a trickling filter facility, and is not designed for removal of nitrate. WRF #2 and #3 have sufficient capacity to handle flows from WRF #1, and all of plants will be interconnected to allow for routing of flows as needed. WRF #1 will remain operational as relay and to process stormwater for reuse.	Department (potentially)	2017	Planned	2019	$16,000,000 estimate/NA
Wastewater System Upgrade	S092 - City of Ocala WRF 2 Nutrient Reduction Plan	City of Ocala	Upgrade existing wastewater plant to allow for advanced treatment and expand availability of reclaimed water for irrigation use. Project consists of construction of two 3.25 MGD carousels equipped with three 100-horsepower mechanical surface aerators with variable-frequency drives (VFDs) and lower impeller and anaerobic and anoxic zone submersible mixers. This will allow city of Ocala to reduce effluent TN to 3 mg/L or less. Estimated 500,000 gallons of day of public access reclaimed water are expected to be made available from project, reducing draws on aquifer and increasing flows to springs. Removes 27,593 lbs-TN/yr.	Legislature, SJRWMD	2014	In progress	2016	$12,144,000/NA

PROJECT TYPE	PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	PROJECT OR CONSTRUCTION COST/ OPERATION COST
Wastewater System Upgrade	S097 - Gore's Landing Package Plant Upgrade	Marion County Parks	Department has one package plant wastewater facility located at Gore's Landing, which is floodprone area along Ocklawaha River. Current system is antiquated, may not meet current sewage disposal standards, and should be upgraded. Goal of project is to bring existing sewage treatment system into compliance with current standards and regulations, while being mindful of potential expansion of park. Exact dollar figures for project are currently unknown.	None	2020*	Conceptual	2020*	NA/NA
Wastewater System Upgrade	S105 - VCSA WWTP SCADA	Village Center CDD	SCADA installation and operation at VCSA plant and collection system lift stations.	None	1991	Ongoing	Ongoing	NA/NA
Wastewater System Upgrade	S106 – LSSA WWTP SCADA	Village Center CDD	SCADA installation and operation at VCSA plant and collection system lift stations.	None	1997	Ongoing	Ongoing	NA/NA
Wastewater System Upgrade	S107 – NSU WWTP SCADA	North Sumter County Utility Dependent District	SCADA installation and operation at NSU plant and collection system lift stations.	None	2003	Ongoing	Ongoing	NA/NA
Wastewater System Upgrade	S108 – CSU WWTP SCADA	Central Sumter Utility Company, LLC	SCADA installation and operation at CSU plant and collection system lift stations.	None	2012	Ongoing	Ongoing	NA/NA
Wastewater System Upgrade	S118 – Fruitland Park WWTF Decommissioning	City of Fruitland Park	Remove existing WWTF from service. Construct lift station to allow transfer of wastewater to Lady Lake for treatment. Improved treatment at Lady Lake facility.	None	2016	Planned	2020	$1,500,000/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Wastewater System Upgrade	S119 – Construction of New Fruitland Park WWTF	City of Fruitland Park	New WWTF constructed with improved treatment and SCADA system. Expected 9 to 10 years for project completion.	None	2016	Conceptual	2020*	NA/NA

TABLE C-2: MANAGEMENT STRATEGIES TO REDUCE NITROGEN LOADING FROM URBAN FERTILIZER

- = Empty cell/no data
NA = Not available
* Completion date not finalized. End date for Phase 1 of BMAP used as placeholder.

Status Definitions:
Planned Project – Project designed, funding obtained or will be obtained, but has not started.
Conceptual Project – Funding has not been secured for project.
In Progress – Construction is under way.

PROJECT TYPE	PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	PROJECT OR CONSTRUCTION COST/ OPERATION COST
Urban Structural BMP	B022 - SR40 Design Project-Pond 3	FDOT District 5	238719-1, SR 40 from CR 328 to SW 80th Ave (CR 225A) - Pond 3/dry retention – Closed basin in poorly drained soils	None	2014	Ongoing	2016	NA/NA
Urban Structural BMP	B023 - SR40 Design Project-Pond 4	FDOT District 5	238719-1, SR 40 from CR 328 to SW 80th Ave (CR 225A) - Pond 4/dry retention – Closed basin in poorly drained soils	None	2014	Ongoing	2016	NA/NA
Urban Structural BMP	B024 - SR40 Design Project-Pond 5	FDOT District 5	238719-1, SR 40 from CR 328 to SW 80th Ave (CR 225A) - Pond 5/dry retention – Closed basin in poorly drained soils	None	2014	Ongoing	2016	NA/NA
Urban Structural BMP	B025 - SR40 Design Project-Pond 6	FDOT District 5	238719-1, SR 40 from CR 328 to SW 80th Ave (CR 225A) - Pond 6/dry retention – Closed basin in poorly drained soils	None	2014	Ongoing	2016	NA/NA
Urban Structural BMP	B028 - SW 85th St/SW 40th Ave. Stormwater Retrofit	Marion County Office of the County Engineer	Construction of DRA lined with Bold and Gold soil amendment to enhance nitrogen removal. Postconstruction event monitoring has shown 70% reduction in TN through soil amendment layer.	SWFWMD	2012	Complete	2012	$330,000/NA
Urban Structural BMP	B029 - West Highway 316 at 119th Ave. Stormwater Retrofit	Marion County Office of the County Engineer	Proposed project to construct wet retention area to reduce nitrate in stormwater runoff from transportation and residential land uses that is currently infiltrating to aquifer without treatment. Project is currently identified in adopted 2014 Stormwater Implementation Plan.	None	2016	Planned	2016	$52,654/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Urban Structural BMP	B030 - West Highway 316 at Highway 329 Stormwater Retrofit	Marion County Office of the County Engineer	Proposed project to construct wet retention area to reduce nitrate in stormwater runoff from transportation and residential land uses that is currently infiltrating to aquifer without treatment. Project is currently identified in adopted 2014 Stormwater Implementation Plan.	None	2016	Planned	2016	$552,125/ NA
Stormwater Operation and Maintenance	B032 - Sinkhole Repair Program in County DRAs	Marion County Office of the County Engineer	Part of ongoing stormwater system maintenance activities. Performed as needed by county crews or contractors depending on size and scope of repair.	None	2003	Ongoing	Ongoing	NA/$50,000
Education and Outreach	B036 - Public Education Coordination	Marion County Office of the County Engineer	Formation of public education coordination team consisting of representatives from local government, state agencies, water management districts, and local interest groups. Purpose of groups is to ensure that consistent and accurate information on pollution prevention is provided to citizens and to maximize efforts among coordination team members.	None	2015	Planned	2020	NA/NA
Education and Outreach	B037 - Marion County Clean Water Program - NPDES MS4 Permit	Marion County Office of the County Engineer	Public outreach and education programs including informational pamphlet distribution, PSAs, and public outreach events. Other efforts include illicit discharge inspection and education, mapping and modeling efforts, construction site pollution prevention program, and municipal operations pollution prevention program.	None	2003	Ongoing	Ongoing	NA/$3,500,000
Education and Outreach	B038 - FDOT Public Education	FDOT District 5	FDOT conducts inspections and provides annual illicit discharge, spill prevention, and erosion and sediment control training to staff and contractors.	None	Ongoing	Ongoing	Ongoing	NA/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Education and Outreach	B039 - Springs Awareness for Educators	Rainbow River Conserva-tion	Workshop for Marion County teachers and educators to provide resources on springs, water issues, and wildlife that can be used in classroom to enhance teaching common core standards.	SWFWMD, Florida Springs Institute, Marion County School District	2014	Ongoing	Ongoing	NA/NA
Urban Structural BMP	S027 - SR35 Design Project-Pond 9	FDOT District 5	238677-1, SR 35 from SR 464 (Maricamp Rd.) to SR 40 – Basin 9 (Pond 9)/dry retention	None	2010	Complete	2012	NA/NA
Urban Structural BMP	S030 - 31st Street Stormwater Retrofit	Marion County Office of the County Engineer	Construction of stormwater wetland to treat runoff from US 441 and adjacent commercial land uses prior to discharge to active sinkhole. Project was jointly funded by Marion County, department, and SJRWMD. Postconstruction monitoring was performed and found 72% reduction in nitrate concentrations in wetland.	Department (Section 319 grant), SJRWMD	2009	Complete	2009	$600,000/NA
Urban Structural BMP	S032 - Hunter's Trace Retention Area Retrofit	Marion County Office of the County Engineer	Project was field-scale research installation of Bold and Gold soil amendment. Goal of project was to assess pollutant removal potential of 12 inches of Bold and Gold. Construction and postconstruction monitoring was conducted through UCF. Final report to department found approximately 50% removal of nitrogen through soil amendment layer.	Department, UCF, SJRWMD, SWFWMD	2009	Complete	2009	$500,000/NA
Urban Structural BMP	S033 - Country Gardens Stormwater Retrofit	Marion County Office of the County Engineer	Proposed project to construct retention area to treat stormwater runoff from residential land uses that currently discharge to relict sinkhole/quarry.	None	2016	Planned	2016	$188,500/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Stormwater Operation and Maintenance	S047 - Fertilizer Cessation	FDOT District 5	FDOT operations and maintenance fertilizer cessation.	None	2012	Ongoing	Ongoing	NA/NA
Stormwater Operation and Maintenance	S048 - Staff Training	Village Center CDD	Train staff and certain subcontractors to aid in identification of illicit discharges as well as to reduce/eliminate illicit discharges and improper disposal of waste internally.	None	2010	Ongoing	Ongoing	NA/NA
Stormwater Operation and Maintenance	S049 - Pond Maintenance	Village Center CDD	Pond maintenance to ensure optimal pollutant removal and verify that performance is at design criteria by monthly checks and treating nuisance species such as algae, grasses, hydrilla, spike rush, duckweed, cattails, *etc.*, as necessary.	None	2000	Ongoing	Ongoing	NA/NA
Stormwater Operation and Maintenance	S050 - Stormwater System Inspections	Village Center CDD	Routine stormwater system inspections, cleaning, and maintenance performed as needed.	None	2000	Ongoing	Ongoing	NA/NA
Stormwater Operation and Maintenance	S051 - Skyline Drive Drainage Improvement	Town of Lady Lake	Improved stormwater conveyance system in area from Skyline Drive north to Ray Street, west to Summit Street, and east to High Street.	None	April 2014	Complete	12/14/2014	$1,300,000/NA
Stormwater Operation and Maintenance	S052 - Lady Lake Stormwater System Maintenance	Town of Lady Lake	Townwide curb and gutter cleaning and catch basin vacuuming. Removes pollutants and debris before they enter storm sewer system. Benchmark frequency for this routine maintenance is quarterly or as needed.	None	2000	Ongoing	Ongoing	NA/NA
Education and Outreach	S069 - Water Quality Protection BMP Training	ACEPD	Alachua County training and education for contractors, government, and citizens in sedimentation and erosion control to improve stormwater quality.	City of Gainesville, FDOT District 2	2007	Ongoing	Ongoing	NA/$2,000

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Education and Outreach	S070 - Pet Waste Outreach	ACEPD	Implement Alachua County social marketing campaign to motivate citizens to scoop, bag, and trash dog wastes at home and in community. Reduces bacteria and nutrient sources in all watersheds. Implements Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6.	City of Gainesville, FDOT District 2	2009	Ongoing	Ongoing	$40,655/NA
Education and Outreach	S071 - Landscape Debris Social Marketing	ACEPD	Implement Alachua County social marketing campaign designed to get citizens to keep landscaping debris out of roads and stormwater collection systems. Reduces bacteria and nutrient sources in all watersheds. Implements Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6.	City of Gainesville, FDOT District 2	2009	Complete	2010	NA
Education and Outreach	S072 - Water Conservation and LID	ACEPD	Alachua County targeted public outreach to encourage water conservation and rain harvesting. Includes rain barrel sales and LID promotion. By harvesting rainwater and keeping stormwater on site, stormwater and pollutants it transports are decreased.	City of Gainesville, FDOT District 2	2009	Ongoing	Ongoing	NA
Education and Outreach	S073 - Quantifying Nutrient Improvement in Street Sweeping	ACEPD	Gainesville urban area and Alachua County will monitor and assess street sweepings to quantify nutrient reductions and subsequent potential water quality improvements. Provides data to quantify nutrients in street sweepings and assess potential for water quality improvement. Implements Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6 and policies.	City of Gainesville, FDOT District 2	2013	In progress	2016	$38,940/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Education and Outreach	S074 - Landscaping Behavior Change Social Marketing	ACEPD	Gainesville urban area and Alachua County will implement social marketing campaign designed to get citizens to make landscaping behavior changes that reduce nutrients in stormwater. Reduces nutrient sources in all watersheds. Implements Alachua County Comp Plan Conservation and Open Space Element - Surface Water Systems Objective 4.6. Encourages behavioral changes to reduce nutrient inputs to stormwater; implements Alachua County Comp Plan Conservation and Open Space Element - Education and Outreach Objective 2.2; Surface Water Systems Objective 4.6; Alachua County Unified Land Development Code (ULDC), Chapter 407 Article 4 Landscaping - 406.43 Water Resources Buffers; ULDC Article 9 Stormwater Management.	City of Gainesville, FDOT District 2	2013	In progress	2017	NA/$25,000
Education and Outreach	S076 - Stormwater Management-Amenity Bill Inserts	Village Center CDD	Amenity bill inserts will address what residents can do to reduce impacts to stormwater.	None	2010	Ongoing	Ongoing	NA/$2,600,000
Education and Outreach	S077 - Stormwater Management-Telephone Book Aid	Village Center CDD	The Villages public service telephone book aid explains purpose of stormwater program and how to participate in stormwater activities.	The Villages Media Group	2010	Ongoing	Ongoing	NA/NA
Education and Outreach	S078 - Stormwater Management-Public Service Newspaper Column	Village Center CDD	Created public service newspaper column placed in The Villages newspaper to create awareness of effects of illicit discharges and illegal disposal.	The Villages Media Group	2010	Ongoing	Ongoing	NA/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Education and Outreach	S079 - Stormwater Management-CDD School/ Hometown Social	Village Center CDD	Monthly public educational meeting with residents.	UF–IFAS	2010	Ongoing	Ongoing	NA/$6,000
Education and Outreach	S080 - Illicit Discharge Awareness Notifications	Village Center CDD	Provides illicit discharge awareness notifications and educational material to area businesses to make them aware of hazards associated with illicit discharges and improper disposal of waste.	None	2010	Ongoing	Ongoing	NA/$250
Education and Outreach	S081 - Stormwater Pollution on Website	Village Center CDD	Section of district website for residents dedicated to providing education and links on stormwater pollution.	None	2010	Ongoing	Ongoing	NA/NA
Education and Outreach	S082 Lady Lake NPDES Permit Education and Outreach	Town of Lady Lake	Town of Lady Lake utilizes consultant for education and outreach. Activities include PSAs in cooperation with city of Leesburg and SJRWMD, distribution of pamphlets, educational website, illicit discharge inspection and education program, utility bill inserts, and informational displays for proper irrigation techniques and landscape management.	None	2000	Ongoing	Ongoing	NA/$7,500
Education and Outreach	S083 - Lake County NPDES Permit Education and Outreach	Lake County Public Works	Activities include distribution of pamphlets and both recurring and nonrecurring public outreach events. Other efforts include construction site pollution prevention, illicit discharge inspection and education, resource support of county extension training in Florida Friendly Landscaping/Florida Yards and Gardens, and an Adopt-a-Lake program, formerly known as Watershed Action Volunteers (WAV) Program.	None	2001	Ongoing	Ongoing	NA/$12,000

PROJECT TYPE	PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	PROJECT OR CONSTRUCTION COST/ OPERATION COST
Education and Outreach	S084 - Landscaper BMP Training	Lake County Public Works	Landscaper education about BMPs for landscapers and those who hire landscapers. Seminar was held in cooperation with Lake County Ag Center to educate landscapers about BMPs, and BMP brochures were mailed out countywide to landscape companies.	None	2010	Complete	2010	$1,276/NA
Urban Structural BMP	S094 - Sports Field Maintenance Equipment Wash-Down Area	Marion County Parks	Department has developed *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses Manual,* which highlights series of BMPs that can be implemented to offset impacts of golf courses on environment. Active sports complexes can have same impacts. One commonly used BMP is construction of "closed system equipment wash-down area." Similar facilities would allow park staff to wash down mowers and other equipment that have been used while maintaining sportsfields. Four sites (Brick City Adventure Park, Rotary Sportsplex, Shocker Park, and Ralph Russell Memorial Park) are all within 10 miles of Silver Springs and therefore should receive higher priority for scheduling construction of wash-down facilities.	None	2020*	Conceptual	2020*	NA/NA

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Urban Structural BMP	S095 - Parks Retention Pond Retrofits	Marion County Parks	Project is inventory of stormwater facilities in Marion County Parks to identify and prioritize them for potential retrofits to enhance nitrogen removal. Retrofits would involve removal of layer of soil from bottom of basins and then construction of engineered soil matrix. Project goal is to retrofit specific stormwater basins to reduce ground water pollution. Inventory will be conducted using GIS asset management tools.	None	2020*	Conceptual	2020*	NA/NA
Urban Structural BMP- Drainage Well	S085 - SkimBoss Filtration System - Tuscawilla Pond	City of Ocala	Addresses drainage well discharge. Retrofit installation of SkimBoss Filtration System with Bold and Gold Media - Tuscawilla Pond.	Department (potentially)	2020*	Planned	2020*	$263,140/$5,000
Urban Structural BMP – Drainage Well	S086 - SkimBoss Filtration System - Chazal Park Pond	City of Ocala	Addresses drainage well discharge. Retrofit installation of SkimBoss Filtration System with Bold and Gold Media -Chazal Park Pond.	Department (potentially)	2020*	Planned	2020*	$263,140/$5,000
Urban Structural BMP	S087 - Silver Springs Protection/ Stormwater Nutrient Reduction Project	City of Ocala	Addresses surface water discharge. Silver Springs Protection/ Stormwater Nutrient Reduction Project.	Department (TMDL grant), SJRWMD, FDOT District 5	2015	Planned	2020*	$3,000,000/ $10,000

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Urban Structural BMP	S088 - Bold and Gold Stormwater Retrofits in Silver Springs BMAP Area	Marion County Office of the County Engineer	Project proposes $1,400,000 through fiscal year 2019 for retrofit of county-owned DRAs in Silver Springs BMAP area. Number and location of DRAs retrofitted will depend on several factors, including potential load reductions, land availability, and location in priority focus areas identified in BMAP. Project is currently in preliminary scoping stages and is identified in adopted 2014 Stormwater Implementation Plan.	None	2015	Planned	2019	$1,400,000/NA
Urban Structural BMP	S015 - SR 20 Widening	FDOT District 2	Addresses surface water in eastern urban area of Gainesville and Alachua County. Widening of SR 20 from two-lane to four-lane road with stormwater runoff treatment. Three wet detention ponds were installed to treat stormwater runoff along with more than 100 ditch blocks to capture runoff.	None	2006	Complete	2006	$10,763,799/NA Construction cost is for entire project – only partly in Silver Springs BMAP
Urban Structural BMP	S017 - SR500 (US 441) Design Project-Basin C	FDOT District 5	238395-4, SR 500 (US 441) From Martin Luther King to Lake Ella Rd. - Basin C/wet detention-open basin discharge to Lake Griffin.	None	2011	Complete	2014	NA/NA
Urban Structural BMP	S019 - SR500 (US441) Design Project-Basin E	FDOT District 5	238395-4, SR 500 (US 441) From Martin Luther King to Lake Ella Rd. - Basin E/dry retention-open basin discharge to Lake Griffin.	None	2011	Complete	2014	NA/NA
Street Sweeping	B033 - Street Sweeping of Marion County Roads	Marion County Office of the County Engineer	Sweeping of Marion County–maintained roads. Sweeping of roads with curbs and gutters is completed nine times per year. Removes debris, sediment, and potential pollutants from streets. Prevents entry into storm sewer system.	None	2003	Ongoing	Ongoing	NA/$46,000

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Street Sweeping	S063 - Street Sweeping	Village Center CDD	All shopping centers and all three downtown areas anywhere from three times per week to quarterly, depending on location.	None	2000	Ongoing	Ongoing	NA/NA
Street Sweeping	S064 - State Road Street Sweeping	FDOT District 2	Street sweeping of state roads in urbanized areas that have curbs and gutters. Includes US 441, SR 26, SR 20, SR 24, SR 128, SR 222, and SR 121. Areas are swept by city of Gainesville and contract personnel for FDOT. Minimum benchmark sweeping frequency is quarterly. Performance benchmark for debris and sediment collected is 125 tons per year. Removes debris, sediment, and potential pollutants from streets; prevents them from entering storm sewer system.	City of Gainesville	2003	Ongoing	Ongoing	NA/NA
Street Sweeping	S065 - Lady Lake - Street Sweeping	Town of Lady Lake	Townwide street sweeping to remove dirt and debris. Benchmark frequency is quarterly or as needed. Removal of debris and potential pollutants prevents their entry into lakes. Performance benchmark is 250 cubic yards of material removed annually	None	2000	Ongoing-	Ongoing	NA/$25,000
Street Sweeping	S120 – Street Sweeping and Storm Drain Inlet Cleaning	City of Fruitland Park	Sweep streets four times per year and clean out 12 storm drain inlets	SJRWMD, City of Leesburg	2012	Ongoing	Ongoing	NA/NA

PROJECT TYPE	PROJECT NUMBER/ PROJECT TITLE	LEAD ENTITY	PROJECT DESCRIPTION	PROJECT PARTNERS	START DATE	STATUS	COMPLETION DATE	PROJECT OR CONSTRUCTION COST/ OPERATION COST
Education and Outreach	S121 – Fruitland Park NPDES Permit Education and Outreach	City of Fruitland Park	Landscaping, irrigation, fertilizer, and pet waste ordinances. City of Fruitland Park utilizes consultant for education and outreach. Activities include PSAs in cooperation with city of Leesburg and SJRWMD, distribution of pamphlets, educational website, illicit discharge inspection and education program, utility bill inserts, and informational displays for proper irrigation techniques and landscape management.	SJRWMD, City of Leesburg	2012	Ongoing	Ongoing	NA/NA
Education and Outreach	S122 – Education and Outreach	Putnam County	Provide educational materials including information about importance of protecting Silver Springs and small farm equine BMPs at Ft. Gates Ferry kiosks and at agricultural center and county fair.	None	2012	Ongoing	Ongoing	NA/NA
Urban Structural BMP	S123 – Silver Springs Shores Unit 55 Stormwater Retrofit	Marion County Office of the County Engineer	Project will retrofit two drainage retention areas in Silver Springs Shores Unit 55 with nitrogen-reducing Bold and Gold media. Both DRAs are adjacent to Baseline Golf Course. In addition to surface runoff from Silver Springs Shores Unit 55, runoff is also discharged into DRAs from golf course through pipes and as overland flow. It is estimated that this retrofit will prevent 106 pounds of TN from reaching aquifer annually.	None	2016	Planned	2016	$370,000/NA
Urban Structural BMP	S124 – Retrofit Installation of SkimBoss Filtration Systems with Bold and Gold.	City of Ocala	Installation of SkimBoss Filtration Systems using Bold and Gold Media to treat water leaving ponds and flowing into recharge well in NE 14th St – NE 12th Ct DRA.	Department (TMDL grant), Legislative appropriation	2020*	Planned	2020*	$485,650/$15,000

Project Type	Project Number/ Project Title	Lead Entity	Project Description	Project Partners	Start Date	Status	Completion Date	Project or Construction Cost/ Operation Cost
Stormwater Operation and Maintenance	S125 – Fertilizer Cessation	FDOT District 2	FDOT Operations and Maintenance fertilizer cessation	None	2012	Ongoing	Ongoing	NA/NA
Education and Outreach	S126 – Town of McIntosh Education and Outreach	Town of McIntosh	Town provides information at city hall about Florida Friendly Landscaping, OSTDS maintenance, and agriculture BMPs.	None	2014	Ongoing	Ongoing	NA/NA

APPENDIX D: REASONABLE ASSURANCE DEMONSTRATION

Those WWTFs that are permitted by the department on or before the date of BMAP adoption, and that have not already achieved permit limitations equal to or more stringent than those required in **Section 4.2.2**, shall be given an opportunity to make a demonstration that reasonably assures the reuse or land application project would not cause or contribute to a violation of the 0.35 mg/L nitrate concentration established by the Silver Springs and Upper Silver River TMDL. The permittee shall submit this request to the appropriate departmental District Office - Wastewater Program staff prior to or at the time of permit application. The demonstration shall be based on relevant water quality data, physical circumstances, or other site-specific credible information, as necessary to make a demonstration of no contribution of nitrate at a concentration of 0.35 mg/L at the spring vent. This demonstration may include factors such as the following:

- Dilution.
- Site-specific geological conditions.
- Research/studies, including dye tracer tests.
- Ground water transport modeling.

The demonstration will be jointly reviewed by appropriate staff from the following department programs: Northeast District Office or Central District Office – Wastewater Program, Florida Geological Survey (FGS), and DEAR. If the department's review results in concern that the reuse or land application site effluent is reaching karst conduits, additional information to that noted in paragraphs (a) or (b) above may be necessary for a final determination of the necessary TN effluent limit. The final decision of demonstration of reasonable assurance will be made by the appropriate District Director in conjunction with input from staff in the department's FGS and DEAR.

If the TN final effluent limit as described in **Section 4.2.2** is modified or waived subsequent to the demonstration of reasonable assurance, the permit shall include effluent monitoring requirements for TN and ground water monitoring requirements from the Floridan aquifer for nitrate as nitrogen. At each permit renewal, the demonstration of reasonable assurance shall be reviewed by the department programs previously identified in the joint review to reasonably assure that the reuse or land application would not cause or contribute to a violation of the 0.35 mg/L nitrate concentration at the spring vent

established by the Silver Springs and Upper Silver River TMDL. This review shall include the original data obtained during the initial demonstration, as well as any new data obtained since permit issuance.

APPENDIX E: FUNDING SOURCES

A BMAP must identify feasible funding strategies for implementing the management actions presented. This appendix provides a list of potential state, federal, and water management district funding sources.

The **Clean Water State Revolving Fund (SRF) loan program** provides low-interest loans to local governments to plan, design, and build or upgrade wastewater, stormwater, and nonpoint source pollution prevention projects. Certain agricultural BMPs may also qualify for funding. Discounted assistance for small communities is available. Interest rates on loans are below market rates and vary based on the economic resources of the community. The Clean Water SRF is Florida's largest financial assistance program for water infrastructure. More information is available online at the department's Clean Water SRF website.

The **Drinking Water SRF loan program** provides low-interest loans to local governments and certain private utilities to plan, design, and build or upgrade drinking water systems. Discounted assistance for small communities may be available. Interest rates on loans are typically 40% below market rates. More information is available online at the department's Drinking Water SRF Program website.

The **Small Community Wastewater Facilities Grants Program** provides grants to fund the construction of wastewater facilities in municipalities with 10,000 or fewer people and per capita income levels below Florida's average per capita income. A local match is required. The program is linked to the Clean Water SRF loan program outlined above, and is highly competitive. More information is available online at the department's Water Pollution Control SRF Program website.

Florida's **Section 319 grant program** administers funds received from the EPA to implement projects or programs that reduce nonpoint sources of pollution. Projects or programs must benefit Florida's priority watersheds (impaired waters), and local sponsors must provide at least a 40% match or in-kind contribution. Eligible activities include the demonstration and evaluation of urban and agricultural stormwater BMPs, stormwater retrofits, and public education. More information is available online at the department's Section 319 Program website.

Funding for projects related to the implementation of **Total Maximum Daily Load** determinations may be available through periodic legislative appropriations to the department. When funds are available, the program prioritizes stormwater retrofit projects to benefit impaired waters, somewhat along the lines of the Section 319 grant program listed above. More information is available online at the department's TMDL Water Quality Restoration Grants website.

The Florida Legislature may solicit applications directly for **Community Budget Issue Request** projects, including water projects, in anticipation of upcoming legislative sessions. This process is an opportunity to secure legislative sponsorship of project funding through the state budget. The Legislature may coordinate applications with the department. In other years, the Legislature will not solicit projects but may include them in the budget in any event. You are advised to contact your local legislative delegation to determine whether there are opportunities available to fund your project. Information on contacting Senators and Representatives is available online at the Florida Legislature website.

A number of other programs at both the state and federal levels offer the possibility of water infrastructure funding. These include the following:

Florida Department of Economic Opportunity **Small Cities Community Development Block Grant Program** funds are available annually for water and sewer projects that benefit low- and moderate-income persons. Monies also may be available for water and sewer projects that serve a specific "job-creating entity," as long as most of the jobs created are for people with low or moderate incomes. For more information, visit the Florida Small Cities Community Development Block Grant Program website.

The **Florida Rural Water Association Loan Program** provides low-interest bond or bank financing for community utility projects in coordination with the department's SRF programs discussed above. Other financial assistance may also be available. For more information, visit the Florida Rural Water Association website and look for the links to "Funding" and "Long-Term Financing."

Enterprise Florida – Enterprise Florida's program is a resource for a variety of public and private projects and activities, including those in rural communities, to facilitate the creation, capital investment, and strengthening and diversification of local economies by promoting tourism, trade, and economic development. The various Enterprise Florida programs and financial incentives are intended, among other things, to provide additional financial assistance to enable communities to better access other infrastructure funding programs. For more information, visit the Enterprise Florida website; contact information is available from the "Contact Us" link at the top of the page.

Florida's **five regional water management districts** also offer financial assistance for a variety of water-related projects, for water supply development, water resource development, and surface water restoration. Assistance may be provided from *ad valorem* tax revenues or from periodic legislative

appropriations for Alternative Water Supply Development and Surface Water Improvement and Management (SWIM) Program projects. The amount of funding available, matching requirements, and types of assistance may vary from year to year. For information on funding opportunities, contact the water management district with jurisdiction in your area; see the department's Water Management Districts website for a map and links to each of the districts.

The United States Department of Commerce **Economic Development Administration (EDA) Public Works and Development Facilities Program** provides funding to help distressed communities in economic decline revitalize, expand, and upgrade their physical infrastructure to attract new industry, encourage business expansion, diversify local economies, and generate or retain long-term, private sector jobs and investment. The program focuses on redeveloping existing infrastructure. For more information, visit the EDA Investment Priorities website.

The USDA **Rural Development Rural Utilities Service Guaranteed and Direct Loans and Grants Program** provides a combination of loans and grants for water, wastewater, and solid waste projects to rural communities and small incorporated municipalities. Some nonprofit entities also may be eligible. For more information, visit the Water and Waste Disposal Loan and Grant Program website.

Congress's **State and Tribal Assistance Grant Program** provides the opportunity to secure congressional sponsorship of project funding, including water project funding, through the annual federal budget process. The program's stated purpose is to strengthen state, local governments, and tribal abilities to address environmental and public health threats while furthering environmental compliance. You may want to consider contacting your Representatives or Senators for assistance in pursuing funding; see the Library of Congress Government Resources website.

Grants.gov is the official federal website for information on more than 1,000 federal grant programs. The site includes an automatic email notification system for keeping apprised of federal grant opportunities.

The **Catalog of Federal Domestic Assistance** provides a database of all federal programs available to state and local governments; public, quasi-public, and private profit and nonprofit organizations and institutions; specialized groups; and individuals. There are a variety of sources of niche funding that may be appropriate to your situation. There are also private funding sources (endowments, private trusts, *etc.*) that may, on occasion, fund water-related projects; a variety of sources to investigate these opportunities are available on the web.

The **Florida Resource Directory** provides a searchable directory of information about and links to many state and federal programs with resources available to help local communities. Funding for water-related projects is just one of many types of assistance identified here.

If you are interested in disaster relief, your first contacts should be Florida's **Division of Emergency Management** or your county emergency management agency (see the Florida County Emergency Management website); and the **Federal Emergency Management Agency** at 1–800–621–FEMA (3362), where the process for securing disaster-related infrastructure assistance begins.