Draft

Suwannee River Basin Management Action Plan (Lower Suwannee River, Middle Suwannee River, and Withlacoochee River Sub-basins)

Division of Environmental Assessment and Restoration
Water Quality Restoration Program
Florida Department of Environmental Protection

with participation from the
Suwannee River Basin Stakeholders

November 2017

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Acknowledgments

The Florida Department of Environmental Protection adopted the *Suwannee River Basin Management Action Plan* by Secretarial Order as part of its statewide watershed management approach to restore and protect Florida's water quality. The plan was developed in coordination with stakeholders, identified below, with participation from affected local, regional, and state governmental interests; elected officials and citizens; and private interests.

Florida Department of Environmental Protection
Noah Valenstein, Secretary

Table A-1. Suwannee River Basin stakeholders

Type of Entity	Name
Responsible Stakeholders	Agricultural producers Counties: Dixie Gilchrist Hamilton Lafayette Levy Madison Suwannee Taylor Municipalities: Bell Branford Chiefland Fanning Springs Greenville Lee Live Oak Madison Mayo Trenton
Responsible Agencies	Florida Department of Agriculture and Consumer Services Florida Department of Environmental Protection Florida Department of Health Florida Fish and Wildlife Conservation Commission
Other Interested Stakeholders	Citizens Suwannee River Partnership Florida Farm Bureau Federation Florida Onsite Wastewater Association Florida Springs Council Florida Springs Institute Lafayette County Soil and Water Conservation District Madison County Soil and Water Conservation District Sierra Club University of Florida Institute of Food and Agricultural Sciences

Appendix A contains links to important sources referenced in this document. For additional information on total maximum daily loads and nutrient management strategies for the Lower Suwannee River, Middle Suwannee River, and Withlacoochee River Sub-basins, contact:

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List of Acronyms and Abbreviations

AWT	Advanced Wastewater Treatment
ATU	Aerobic Treatment Unit
BMAP	Basin Management Action Plan
BMPs	Best Management Practices
CAFO	Concentrated Animal Feeding Operation
CARES	County Alliance for Responsible Environmental Stewardship
CASTNET	Clean Air Status and Trends Network
CMAQ	Community Multiscale Air Quality
CUFS	Chamber Upflow Filter and Skimmer
DEP	Florida Department of Environmental Protection
DMR	Discharge Monthly Report
DO	Dissolved Oxygen
ERP	Environmental Resource Permit
F.A.C.	Florida Administrative Code
F.A.R.	Florida Administrative Register
FDACS	Florida Department of Agriculture and Consumer Services
FDOH	Florida Department of Health
FF	Farm Fertilizer
FGS	Florida Geological Survey
FOWA	Florida Onsite Wastewater Association
FSAID ILG	Florida Statewide Agricultural Irrigation Demand Irrigated Lands Geodatabase
F.S.	Florida Statutes
FY	Fiscal Year
FYN	Florida Yards and Neighborhoods
GIS	Geographic Information System
gpd	Gallons Per Day
HDPE	High-Density Polyethylene
IA	Implementation Assurance
in/yr	Inch Per Year
lb-N/yr	Pounds of Nitrogen Per Year
LVS	Linear Vegetation Survey
LW	Livestock Waste
MFL	Minimum Flow and Level
mgd	Million Gallons Per Day
mg/L	Milligrams Per Liter
MIL	Mobile Irrigation Lab
N	Nitrogen
NA	Not Applicable
NADP	National Atmospheric Deposition Program
NELAC	National Environmental Accreditation Conference
NELAP	National Environmental Accreditation Program

NNC	Numeric Nutrient Criteria
NOI	Notice of Intent
NPDES	National Pollutant Discharge and Elimination System
NSF	National Sanitation Foundation
NSILT	Nitrogen Source Inventory Loading Tool
NTN	National Trends Network
OAWP	Office of Agricultural Water Policy (FDACS)
OFS	Outstanding Florida Spring
OSTDS	Onsite Sewage Treatment and Disposal System
PBTS	Performance-based Treatment System
PFA	Priority Focus Area
PNRS	Passive Nitrogen Sedimentation System
PSA	Public Service Announcement
QA/QC	Quality Assurance/Quality Control
RFA	Restoration Focus Area
RIB	Rapid Infiltration Basin
RIVER	Regulatory Initiative Valuing Environmental Resources (Program)
RPS	Rapid Periphyton Survey
SBIO	DEP Statewide Biological Database
SCC	Suwannee Country Club
SCI	Stream Condition Index
SOP	Standard Operating Procedure
SRWMD	Suwannee River Water Management District
STORET	Florida Storage and Retrieval System
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management
TDEP	Total Atmospheric Deposition Model
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UFA	Upper Floridan Aquifer
UF–IFAS	University of Florida Institute of Food and Agricultural Sciences
UTF	Urban Turfgrass Fertilizer
WBID	Waterbody Identification (Number)
WIN	Florida Watershed Information Network (Database)
WMD	Water Management District
WWTF	Wastewater Treatment Facility

Executive Summary

Suwannee River Basin

The Florida Springs and Aquifer Protection Act (Chapter 373, Part VIII, Florida Statutes [F.S.]), provides for the protection and restoration of Outstanding Florida Springs (OFS), which comprise 24 first magnitude springs, 6 additional named springs, and their associated spring runs. The Florida Department of Environmental Protection (DEP) has assessed water quality in each OFS and determined that 24 of the 30 OFS are impaired for the nitrate form of nitrogen. Seven springs in the Suwannee River Basin are impaired OFS: Fanning Springs, Manatee Spring, Falmouth Spring, Troy Spring, Lafayette Blue Spring, Madison Blue Spring, and Peacock Springs.

The Suwannee River Basin Management Action Plan (BMAP) area comprises three sub-basins (Lower Suwannee River, Middle Suwannee River, and Withlacoochee River) and encompasses 1,323,662 acres in eastern Dixie, eastern Madison, western Hamilton, northeast and eastern Lafayette, western Levy, western Gilchrist, small pockets of Taylor and Columbia Counties, and the majority of Suwannee County. Urban areas include Live Oak and Branford in Suwannee County, Mayo in Lafayette County, Bell and Trenton in Gilchrist County, Fanning Springs in Gilchrist and Levy Counties, Chiefland in Levy County, and Madison, Lee, and Greenville in Madison County (**Figure ES-1)**.

Suwannee River Priority Focus Areas (PFAs)

PFAs totaling 839,681 acres are delineated in each sub-basin springshed (see **Section 1.5**). The Lower Suwannee River Sub-basin comprises 431,722 acres, of which 199,928 acres are designated as a PFA. The Middle Suwannee River Sub-basin covers an area of 704,802 acres, of which 554,965 acres are designated as a PFA. The Withlacoochee River Sub-basin comprises 187,138 acres, of which 84,788 acres are designated as a PFA.

Nitrogen Source Identification, Required Reductions, and Options To Achieve Reductions

DEP set nitrate water quality restoration targets of 0.35 milligrams per liter (mg/L) for the Suwannee River and associated springs. The seven OFS addressed by this BMAP have the same water quality restoration target.

Farm fertilizer (FF) represents 60 % and livestock waste (LW) represents 22 % of the total nitrogen loading to groundwater, based on the results of the Nitrogen Source Inventory Loading Tool (NSILT) developed by DEP.

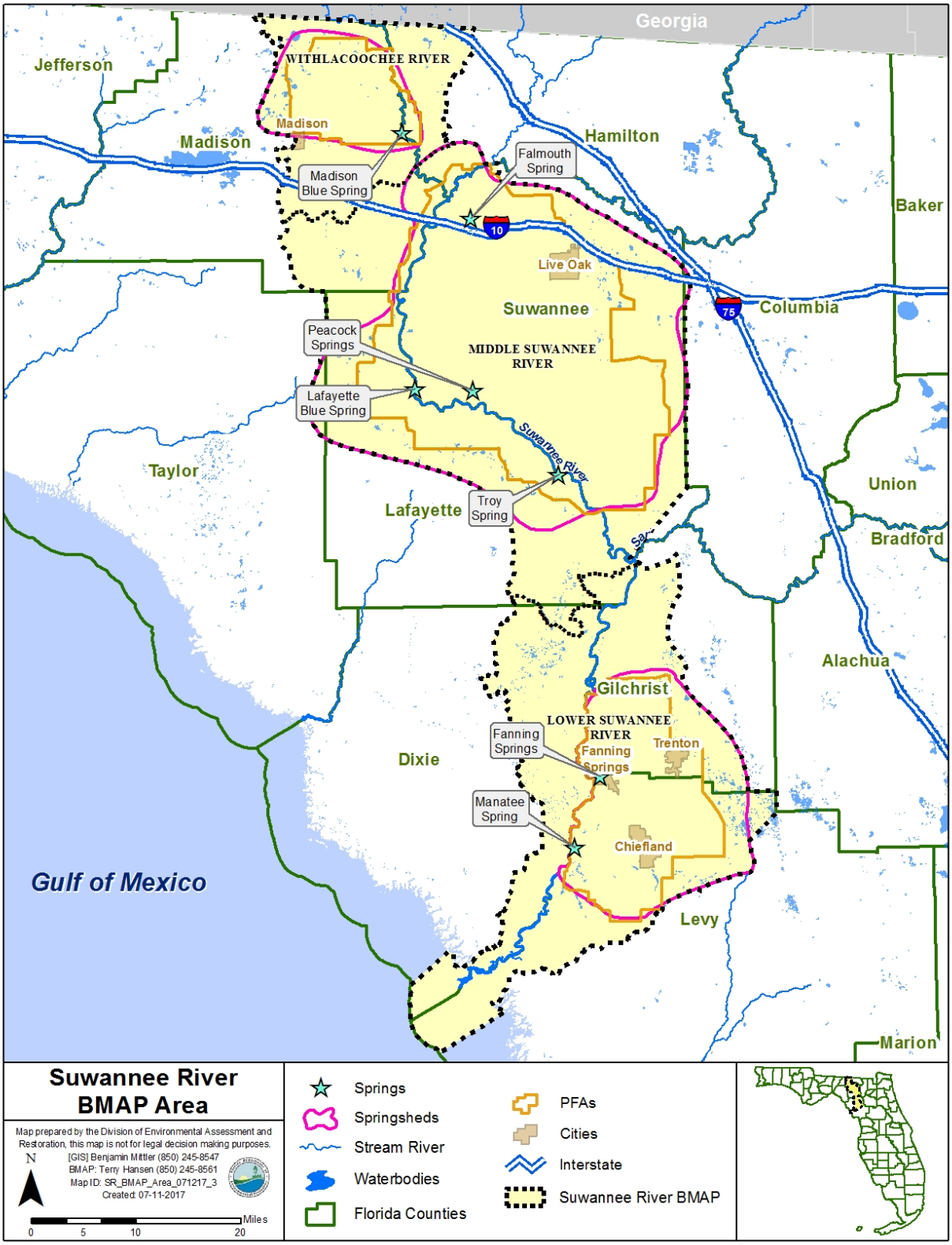

Figure ES-1. Suwannee River BMAP and PFA boundaries

The total load reduction required to meet the total maximum daily loads (TMDLs) is 4,075,935 pounds of nitrogen per year (lb-N/yr). To measure progress towards achieving the necessary load reduction, DEP has established the following milestones:

- 1,222,781 lb-N/yr (30 %) within 5 years.
- 2,037,968 lb-N/yr (50 %) within 10 years.
- 815,187 lb-N/yr (20 %) within 15 years.
- A total of 4,075,935 lb-N/yr within 20 years.

There are currently 65 projects to improve water quality (see **Appendix B**), of which 25 projects have estimated load reductions. Included are owner-implemented best management practices (BMPs) for farm fertilizer, dairies, and livestock; wastewater treatment facility (WWTF) upgrades; and onsite sewage treatment and disposal system (OSTDS, or septic systems; the terms are used interchangeably throughout this document) conversions to sewer.

The 65 projects are estimated to achieve a reduction of 2,076,174 lb-N/yr, leaving a balance of 1,999,761 lb-N/yr still to be achieved.

Restoration Approaches

- **OSTDS** – DEP evaluated the potential for nitrogen reductions based on OSTDS enhancement through nitrogen-reducing actions or replacement through connection to central sewer. For this BMAP, to achieve the TMDLs on all lots less than one acre in size in the PFAs, the BMAP specifies that Florida Department of Health (FDOH) permits to install new OSTDS or repair/modify existing OSTDS will require enhancement unless sewer will be available within five years. If sewer is readily available to lots of less than one acre in the PFAs, new or repair permits will not be issued. Connection to sewer service is required when such service is available (Subsection 381.00655, F.S.).

- **WWTFs** − The effluent standards listed in **Table ES-1** will apply to all WWTFs in the BMAP (inside and outside the PFAs).

- **Urban Turfgrass Fertilizer (UTF) –** UTF sources can receive up to 6 % credit for DEP's approved suite of public education and source control ordinances. Sources have the option to collect and provide monitoring data to quantify reduction credits for additional measures.

Table ES-1. WWTF effluent standards

gpd = Gallons per day

Permitted Capacity (gpd)	Nitrogen Concentration Limits for Rapid Infiltration Basins (RIBs) and Absorption Fields (mg/L)	Nitrogen Concentration Limits for All Other Land Disposal Methods (mg/L)
Greater than 100,000	3	3
20,000 to 100,000	3	6
Less than 20,000	6	6

- **FF** – All FF sources are required to implement BMPs or perform monitoring. A 15 % reduction to groundwater is estimated for owner-implemented BMPs. Additional credits could be achieved through better documentation of reductions achieved through BMP implementation or the implementation of additional agricultural projects and practices, such as precision irrigation, soil moisture probes, controlled-release fertilizer, and cover crops.

- **LW** – All LW sources are required to implement BMPs or perform monitoring. A 10 % reduction to groundwater is estimated for owner-implemented BMPs. Additional credits could be achieved through better documentation of reductions achieved through BMP implementation.

Challenges

- **NSILT Estimates Are a Current Snapshot Only** – The NSILT results are based on the best available data at a given time. DEP tentatively plans to update the Suwannee River NSILT by the first five-year milestone of the BMAP planning period to incorporate more current data and update methodologies (as appropriate).

- **Unquantified Project Benefits** – More information is needed to identify or refine the benefits/credits for certain kinds of management actions, so reductions from these activities can be estimated.

- **Legacy Sources** – Land uses or management practices not currently active in the basin may still be affecting the nitrate concentration of the springs. The movement of water from the land surface through the soil column to the Upper Floridan aquifer (UFA) and through the UFA to the spring system varies both spatially and temporally and is influenced by localized soil and aquifer conditions. As a result, there may be a delay between when the nitrogen input to the UFA occurred and ultimately when that load arrives at the Suwannee River springs. The impact of this delay is not fully known.

- **OSTDS Permitting** – Local FDOH offices and their permitting practices are important for the successful implementation of the OSTDS requirements.

Ensuring the availability of reliable maps of projected sewer capacity will be vital to the process, to avoid unnecessary costs caused by duplication of efforts.

- **Improvements at the Springs** – The reductions are estimated based on actual data at the spring vent. Given that this is a groundwater system, some reductions will take time to observe at the vent; hence the reason for achieving all the load reductions in the first 15 years. The estimated credits and necessary reductions will likely need to be adjusted over time based on the response measured at the springs.

- **Additional Options for Agricultural Sources** – More information on practical options for agricultural activities to reduce groundwater loading is needed. Most BMPs focus on reducing surface runoff. Few data exist on the benefits of fertilizer BMPs to groundwater loads; even fewer data exist on the benefits of livestock BMPs to groundwater. More options for reducing farm fertilizer and livestock loads to groundwater are necessary in this agricultural basin. In other basins, the Florida Department of Agriculture and Consumer Services (FDACS) is conducting research on additional practices and projects such as: rotational production; soil moisture sensor deployment and calibration; BMP effectiveness on controlled release fertilizer; and reuse of high nutrient value water. Findings of this research may be applicable in this basin if they are technically feasible, funding is available, and landowners are willing to implement them.

Successful BMAP implementation requires commitment, dedicated state funding, and follow-up. Stakeholders have expressed their intention to carry out the plan, monitor its effects, and continue to coordinate within and across jurisdictions to achieve nitrogen reduction goals. As the TMDLs must be achieved within 20 years, DEP, FDACS, and Suwannee River Water Management District (SRWMD) will implement management actions with the annual $50 million in state appropriations to reduce nitrogen in the Suwannee River Basin. The cost estimates for implementing advanced nitrogen reducing technologies and implementing voluntary land acquisition or conservation easements is well within state appropriations.

Section 1: Background

1.1 Legislation

Chapter 373, Part VIII, F.S., the Florida Springs and Aquifer Protection Act, provides for the protection and restoration of OFS, which comprise 24 first magnitude springs, 6 additional named springs, and their associated spring runs. DEP has assessed water quality in each OFS and determined that 24 of the 30 OFS are impaired for the nitrate form of nitrogen. Seven springs in the Suwannee River Basin are impaired OFS: Fanning Springs and Manatee Spring in the Lower Suwannee River Sub-basin; Falmouth Spring, Lafayette Blue Spring, Peacock Springs, and Troy Spring in the Middle Suwannee River Sub-basin; and Madison Blue Spring in the Withlacoochee River Sub-basin.

The statutes require DEP to initiate a water quality assessment by July 1, 2016, of any OFS or spring system for which a determination of impairment has not been made under the numeric nutrient criteria (NNC) for spring vents. The assessments of the Suwannee River and associated springs were completed in 2008 (the Group 1, Cycle 2 assessment). BMAP development to meet the new requirements of the Florida Springs and Aquifer Protection Act for the Suwannee River Basin was initiated in 2016.

1.2 Water Quality Standards and TMDLs

A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. The impaired springs addressed in this BMAP are Class III waterbodies with a designated use of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criterion applicable to the impairment addressed by these TMDLs is nutrients, which in excess have been demonstrated to adversely affect flora or fauna. Further, the excessive growth of algae is a significant problem. Algal mats can produce human health problems, foul beaches, inhibit navigation, and reduce the aesthetic value of the springs and bay.

DEP adopted nutrient TMDLs for certain waters in the Suwannee River Basin in 2008, including Fanning Springs, Manatee Spring, Falmouth Spring, and Troy Spring (**Table 1**). The TMDLs established a target of a monthly average of 0.35 mg/L of nitrate to be protective of the aquatic flora or fauna in the Lower and Middle Suwannee River and the associated springs. The period of record for the TMDLs was June 1, 2000, through June 30, 2007.

Lafayette Blue Spring, Peacock Springs, and Madison Blue Spring do not have existing TMDLs but are impaired for nitrate. A monthly average of 0.35 mg/L of nitrate (as nitrogen) is also an appropriate water quality target for these springs, and the same target is applied in this BMAP.

Table 1 lists the nitrate (as nitrogen) restoration targets for Fanning Springs, Manatee Spring, Falmouth Spring, Troy Spring, Lafayette Blue, Peacock Springs, Madison Blue Spring, Middle Suwannee River, and Lower Suwannee River. The TMDL targets are listed as monthly averages

instead of daily values because changes in aquatic vegetation biomass do not respond instantaneously to changes in nutrient concentrations. The percent reductions are the load reductions needed to attain the NNC through the implementation of this BMAP.

Total phosphorus (TP) concentrations rose in the Suwannee River Basin until they peaked in 1983 and have been generally declining since then. During the TMDL process, DEP could not link the impairments with either phosphorus load or concentration and, therefore, is targeting nitrate as nitrogen to achieve standards. Monitoring and evaluation for TP continues as the nitrate TMDLs are implemented.

Table 1. Restoration targets for the impaired river and springs in the Suwannee River Basin

Spring Name	Basin	Waterbody Identification (WBID) Number	Parameter	TMDL(mg/L)
Fanning Springs	Lower Suwannee	3422S	Nitrate, monthly average	0.35
Manatee Spring	Lower Suwannee	3422R	Nitrate, monthly average	0.35
Falmouth Spring	Middle Suwannee	3422Z	Nitrate, monthly average	0.35
Lafayette Blue Spring	Middle Suwannee	3528Z	Nitrate, monthly average	0.35
Peacock Springs	Middle Suwannee	3483	Nitrate, monthly average	0.35
Troy Spring	Middle Suwannee	3422T	Nitrate, monthly average	0.35
Madison Blue Spring	Withlacoochee River	3315Z	Nitrate, monthly average	0.35
Middle Suwannee River	Middle Suwannee	3422J,3422L,3422T,3422U,3422Z	Nitrate, monthly average	0.35
Lower Suwannee River	Lower Suwannee	3422,3422R,3422S	Nitrate, monthly average	0.35

1.3 BMAP Requirements

Section 403.067(7), F.S., provides DEP the statutory authority for the BMAP Program. A BMAP is a comprehensive set of strategies to achieve the required pollutant load reductions. In addition to specifying BMAP statutory authority, the Florida Springs and Aquifer Protection Act describes additional requirements for 30 springs, including provisions that a TMDL must be

achieved no more than 20 years after the adoption of the BMAP. This BMAP provides for a phased implementation schedule (5-, 10-, and 15-year targets) designed to achieve incremental reductions within the first 15 years, while simultaneously monitoring and conducting studies to better understand the water quality dynamics in the basin.

Among other provisions, Section 403.067(7), F.S., specifies that a BMAP must include numerous components. Examples include the following:

- Integrate appropriate management strategies through existing water quality protection programs to achieve TMDLs.
- Provide phased implementation of the management strategies to promote timely, cost-effective actions.
- Establish a schedule implementing the management strategies.
- Establish a basis for evaluating the plan's effectiveness.
- Identify feasible funding strategies for implementing the management strategies.
- Equitably allocate pollutant reductions to individual basins, as a whole to all basins, or to each identified point source or category of nonpoint sources, as appropriate.

The Florida Springs and Aquifer Protection Act further specifies that a BMAP for an OFS must include the following provisions:

- Identification and estimated pollutant load in the PFAs of each point source or category of nonpoint sources, including but not limited to, UTF, sports turfgrass fertilizer (STF), agricultural fertilizer, OSTDS, WWTFs, animal wastes, and stormwater facilities.
- A list of all specific projects and programs identified to implement a nutrient TMDL.
- The delineation of PFAs.
- An OSTDS remediation plan if DEP identifies OSTDS as contributors of at least 20 % of the nonpoint source nitrogen pollution in a PFA, or if DEP determines remediation is necessary to achieve a TMDL.
- A list of all specific projects identified in an OSTDS remediation plan.

- A priority rank, planning-level cost estimate, estimated completion date, and estimated nutrient load reduction for each listed project.
- The source and amount of financial assistance to be made available by DEP, a water management district (WMD), or other entity for each listed project.
- A description of BMPs adopted by rule.

1.4 BMAP Area

The BMAP area (**Figure 1**) comprises three sub-basins and encompasses 1,323,662 acres in eastern Dixie, eastern Madison, western Hamilton, northeast and eastern Lafayette, western Levy, western Gilchrist, small pockets of Taylor and Columbia Counties, and the majority of Suwannee County. Urban areas include Live Oak and Branford in Suwannee County, Mayo in Lafayette County, Bell and Trenton in Gilchrist County, Fanning Springs in Gilchrist and Levy Counties, Chiefland in Levy County, and Madison, Lee, and Greenville in Madison County.

The BMAP area contains seven OFS and numerous other springs. This area is largely based on the groundwater contributing areas (or springsheds) delineated by the SRWMD with input from the Florida Geological Survey (FGS). DEP considered the contributing areas to be a combination of the surface water drainage basin and the individual springsheds. A springshed is the area of land that contributes water to a spring or group of springs, mainly via groundwater flow. **Table 2** lists the acreage, number of springs, and land uses associated with the three sub-basins comprising the BMAP area.

1.5 PFAs

In compliance with the Florida Springs and Aquifer Protection Act, this BMAP delineates three PFAs in the Suwannee River BMAP area: Lower Suwannee River, Middle Suwannee River, and Withlacoochee River. A PFA is defined in the Florida Springs and Aquifer Protection Act as the area(s) of a basin where the Floridan aquifer is generally most vulnerable to pollutant inputs and where there is a known connectivity between groundwater pathways and an OFS. The PFAs provide a guide for focusing restoration strategies where science suggests these efforts will most benefit the springs. The documents that describe the delineation process for each PFA are on the DEP website and included in **Appendix C.**

1.5.1 Description

Nitrogen sources are more likely to travel to a groundwater system under certain conditions. For example, where soils are sandy and well drained, less nitrogen is converted to gas and released into the atmosphere or taken up by plants, compared with other soil types. Therefore, local soils play a role in how much nitrogen travels from the land surface to groundwater in a specific springshed. Also, geologic features such as a porous limestone layer (also called a "karst feature") allow surface water to more easily travel into deeper aquifers compared with areas where geologic features create a barrier to water movement downward. These types of features,

and others, were considered in the delineation of the Lower Suwannee River, Middle Suwannee River, and Withlacoochee River PFAs.

Briefly, the PFA boundaries delineated in **Figure 2**, **Figure 3**, and **Figure 4** were developed by overlaying geographic information system (GIS) coverages of groundwater recharge rates, aquifer vulnerability, soil types, conservation lands, and potential nitrogen source information. A description of each PFA follows each figure.

Upon BMAP adoption, DEP will ensure that the GIS files associated with the PFA boundary are available to the public on the DEP Map Direct webpage.

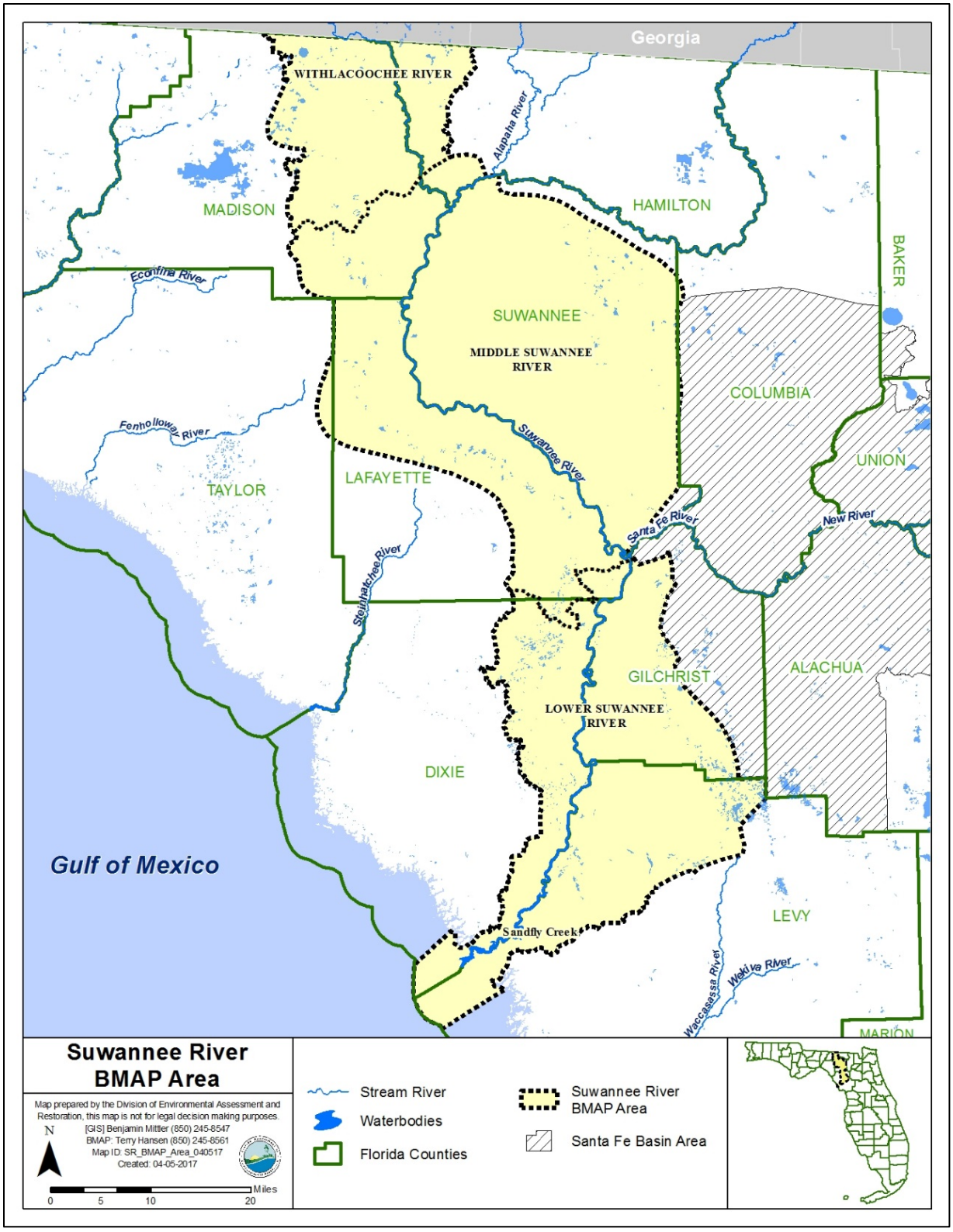

Figure 1. Suwannee River BMAP area

Table 2. Acreage, springs, and land uses for each sub-basin in the BMAP area

Characteristic	Lower Suwannee River Sub-basin	Middle Suwannee River Sub-basin	Withlacoochee River Sub-basin
Acreage	431,722 acres	704,802 acres	187,138 acres

Springs	Spring Name (County Where Located)	Spring Name (County Where Located)	Spring Name (County Where Located)
OFS	Fanning Springs (Levy) Manatee Spring (Levy)	Falmouth Spring (Suwannee) Lafayette Blue Spring (Lafayette) Peacock Springs (Suwannee) Troy Spring (Lafayette)	Madison Blue Spring (Madison)

Land Use	% of Total Land Uses	% of Total Land Uses	% of Total Land Uses
Forest	42	47	49
Agriculture	34	27	31
Urban	10	10	7
Wetlands	11	9	7
Rangeland	3	6	5
Water		1	1

The Lower Suwannee River Sub-basin comprises 431,722 acres, of which 199,928 acres are designated as a PFA. The PFA covers most of the combined springshed, including areas with high groundwater recharge/vulnerability conditions and soil conditions that tend to leach nitrogen. It includes potential areas of higher nitrogen loading from agriculture and urban land uses, as well as an area where groundwater travel to the springs could occur rapidly. It also includes interconnected areas of agricultural land use, areas of urban development, areas with OSTDS, domestic wastewater facilities, and concentrated animal feeding operations (CAFOs). All of these have the potential to contribute to nitrogen enrichment in the aquifer and springs.

The Lower Suwannee River PFA is located in Gilchrist and Levy Counties. It includes the Cities of Fanning Springs, Chiefland, and Trenton, in addition to Fanning Springs State Park, Manatee Springs State Park, Hart Springs Park, a corridor along the Suwannee River of SRWMD-managed state land and conservation easements, and state wildlife management areas. Conservation land boundaries, natural features, political boundaries, roads, and survey boundaries in the area were also considered in the development of a readily identifiable boundary.

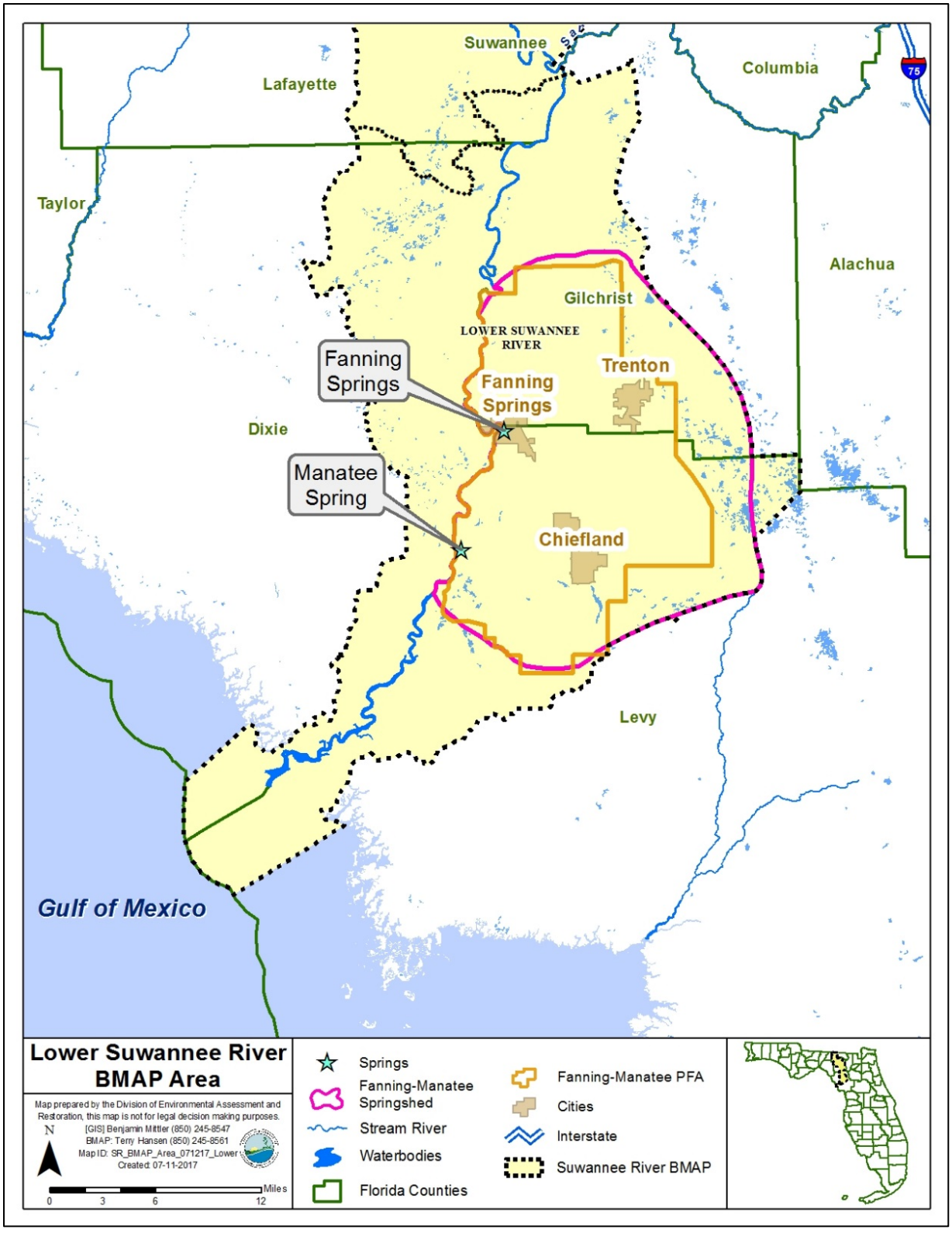

Figure 2. Lower Suwannee River PFA, sub-basin boundary, and springshed boundary

The Middle Suwannee River Sub-basin comprises an area of 704,802 acres, of which 554,965 acres are designated as a PFA. The PFA covers most of the combined springshed, including areas with high groundwater recharge/vulnerability conditions and soil conditions that tend to leach nitrogen. It includes potential areas of higher nitrogen loading from agriculture and urban land uses, as well as an area where groundwater travel to the springs could occur rapidly. It also includes interconnected areas of agricultural land use, areas of urban development, areas with OSTDS, domestic wastewater facilities, and CAFOs. All of these have the potential to contribute to nitrogen enrichment in the aquifer and springs.

The Middle Suwannee River PFA is mainly located in Suwannee County, with smaller portions in Lafayette, Madison, and Hamilton Counties. It includes the City of Live Oak, portions of the Towns of Branford and Mayo, and part of the community of Day, in addition to Troy Spring State Park, Peacock Springs State Park, Lafayette Blue Spring State Park, Suwannee River State Park, and a corridor along the Suwannee River of SRWMD-managed state land and conservation easements. Conservation land boundaries, natural features, political boundaries, roads, and survey boundaries in the area were all considered in the development of a readily identifiable PFA boundary.

The Withlacoochee River Sub-basin comprises an area of 187,138 acres, of which 84,788 acres are designated as a PFA. The PFA covers most of the combined springshed. The area contains several important springs along the Withlacoochee River, including Madison Blue, Rossiter, Pot, Tanner, and several other named springs that contribute flow to the system and share the same springshed. This area has high groundwater recharge/vulnerability conditions and soil conditions that tend to leach nitrogen. It includes potential areas of higher nitrogen loading from agriculture and urban land uses, as well as an area where groundwater travel to the springs could occur rapidly. It also includes interconnected areas of agricultural land use and larger areas of urban development, which have the potential to contribute to nitrogen enrichment in the aquifer and springs.

The Withlacoochee River PFA is mainly located in Madison County, with a smaller portion along the Withlacoochee River in Hamilton County. It includes Madison Blue Spring State Park and a part of the Withlacoochee State Forest that occurs as a corridor along the Withlacoochee River. Conservation land boundaries, natural features, political boundaries, roads, and major survey boundaries in the area were used in the development of a readily identifiable boundary.

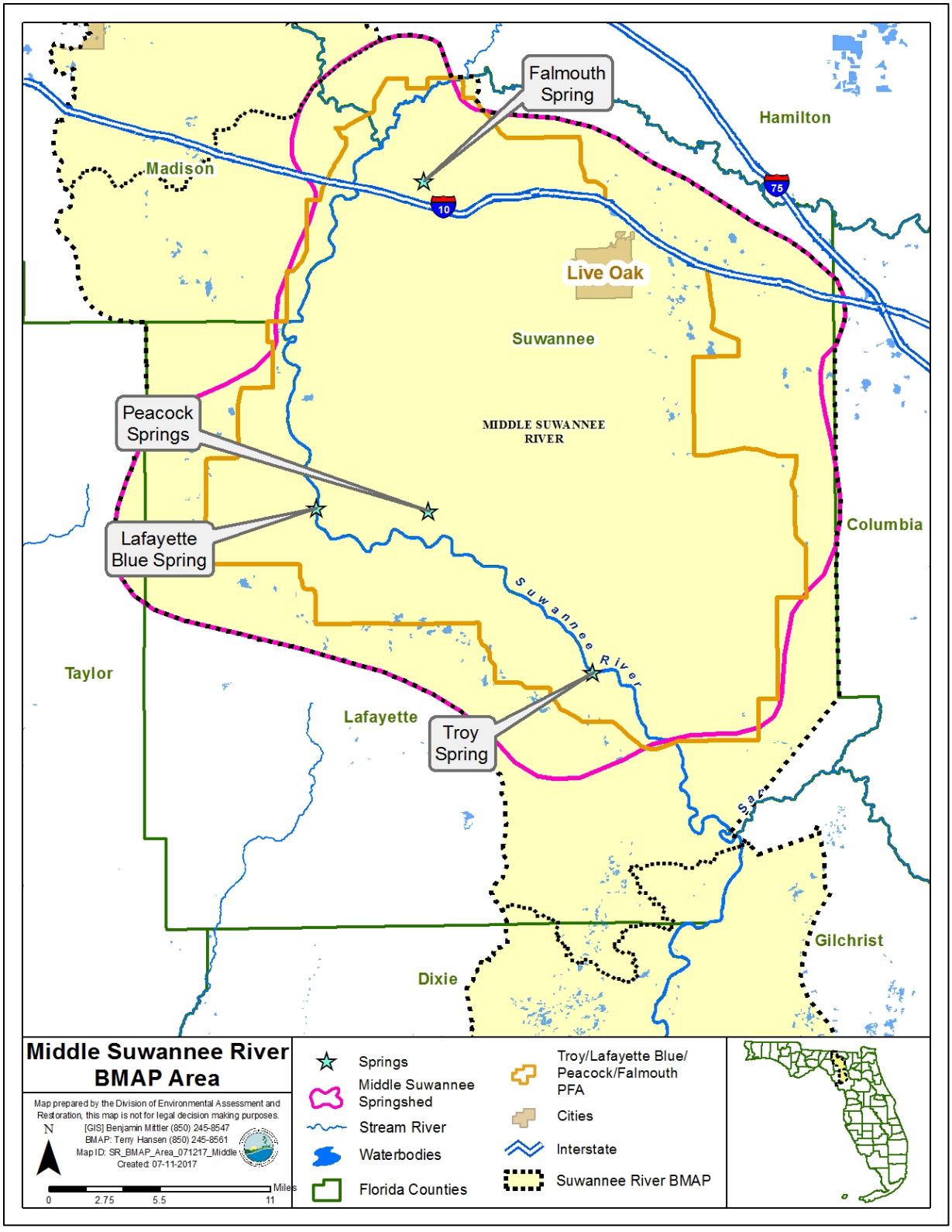

Figure 3. Middle Suwannee River PFA, sub-basin boundary, and springshed boundary

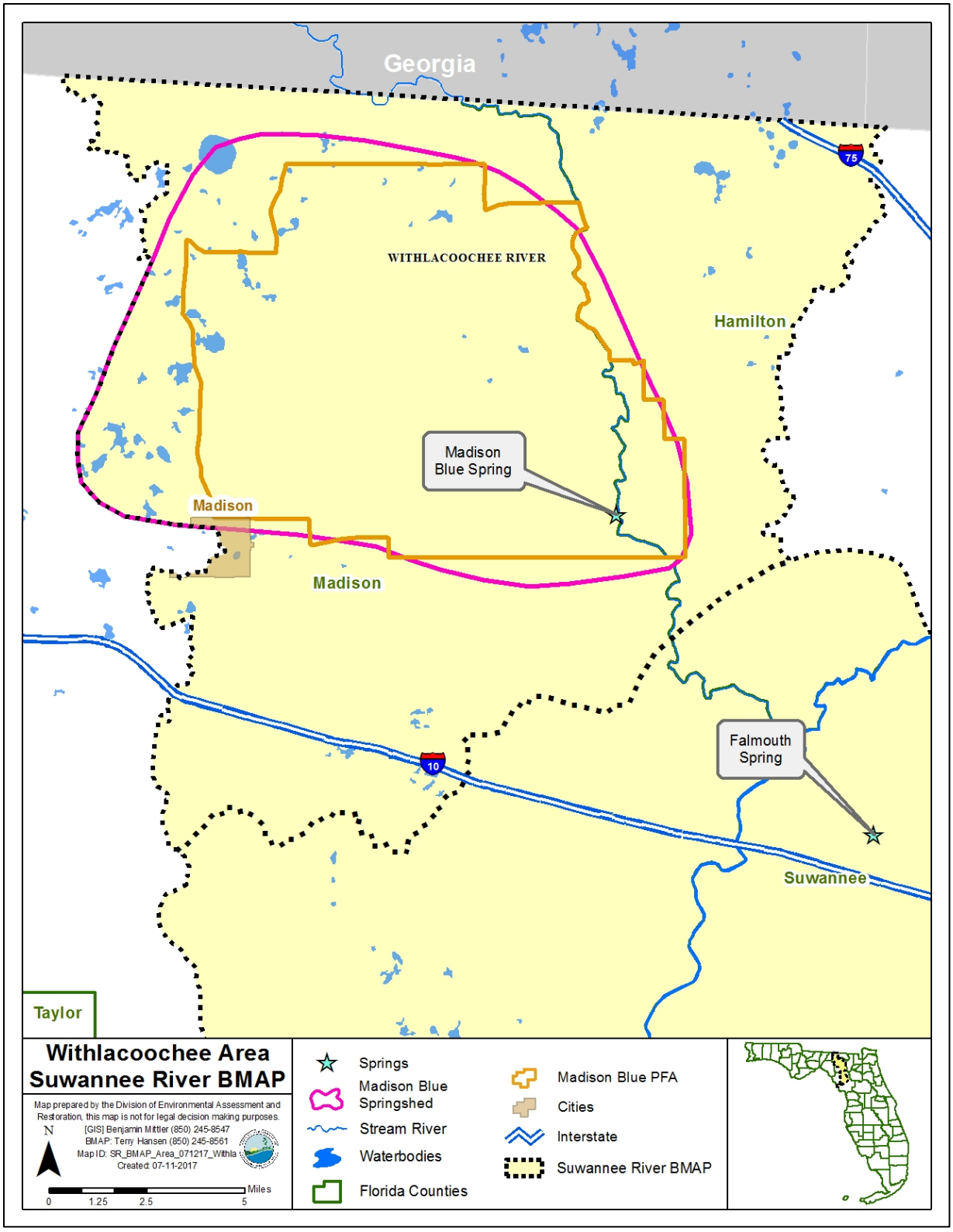

Figure 4. Withlacoochee River PFA, sub-basin boundary, and springshed boundary

1.5.2 Additional Requirements

In accordance with Section 373.811, F.S., the following activities are prohibited in each PFA in the Suwannee River BMAP:

- New domestic wastewater disposal facilities, including rapid infiltration basins (RIBs), with permitted capacities of 100,000 gpd or more, except for those facilities that meet an advanced wastewater treatment (AWT) standard of no more than 3 mg/L total nitrogen (TN) on an annual permitted basis.

- New OSTDS on lots of less than one acre inside one of the three PFAs, unless additional nitrogen treatment is provided, as specified in the OSTDS Remediation Plan (see **Appendix D** for the provisions under which new OSTDS are allowed in the Suwannee River Basin PFAs**)**.

- New facilities for the disposal of hazardous waste.

- The land application of Class A or Class B domestic wastewater biosolids not in accordance with a DEP-approved nutrient management plan establishing the rate at which all biosolids, soil amendments, and sources of nutrients at the land application site can be applied to the land for crop production, while minimizing the amount of pollutants and nutrients discharged to groundwater or waters of the state.

- New agricultural operations that do not implement BMPs, measures necessary to achieve pollution reduction levels established by DEP, or groundwater monitoring plans approved by a WMD or DEP.

Also, to meet the TMDLs in accordance with Section 373.807, F.S., this BMAP provides the following additional limitations for OSTDS:

- Issuance of repair or modification permits for OSTDS on lots of less than one acre inside the PFAs, unless enhancement features are added to meet or exceed National Sanitation Foundation (NSF) Standard 245 nitrogen treatment levels, or if a sewer hook-up will occur within five years (see **Appendix D** for more details).

Biosolids and Septage Application Practices

In the PFA, the aquifer contributing to the springs is highly vulnerable to contamination by nitrogen sources and soils have a high to moderate tendency to leach applied nitrogen. DEP previously documented elevated nitrate concentrations in groundwater beneath septage application zones in spring areas. To assure that nitrogen losses to groundwater are minimized from permitted application of biosolids and septage in the PFA, the following requirements apply to newly-permitted application sites and existing application sites upon permit renewal.

- All permitted biosolids application sites that are agricultural operations must be enrolled in the FDACS BMP program or be within an agricultural operation enrolled in the FDACS BMP program for the applicable crop type. Implementation of applicable BMPs will be verified by FDACS in accordance with Chapter 5M-1, Florida Administrative Code (F.A.C.). Permitted biosolids application sites that are new agricultural operations must also comply with Subsection 373.811(5), F.S. Biosolids application sites must be certified as viable agricultural operations by an acknowledged agricultural professional such as an agricultural consultant or agricultural extension agent. Effective nutrient management practices must be ongoing at the application zones in the permit. Plant uptake and harvesting are vital components of the nutrient management plan to remove nitrogen and prevent it from leaching to groundwater. If DEP determines that the site is not a viable agricultural site implementing a nutrient management plan, corrective action will be required.

- Effective nutrient management practices must be ongoing at the application zones in the permit. Plant uptake and harvesting are vital components of the nutrient management plan to remove nitrogen and prevent it from leaching to groundwater. If DEP determines that the site is not a viable agricultural site implementing a nutrient management plan, corrective action will be required.

- Groundwater monitoring for nitrate is required for all biosolids and septage land application sites in the PFA to assure compliance with nutrient management objectives in this BMAP.

- However, groundwater monitoring is not required if the site nutrient management plan limits biosolids application rates to TN with no adjustment for available nitrogen normally allowed by subsections 62-640.500(5) and (6), F.A.C. (e.g. for a recommended fertilizer rate of 160 pounds of nitrogen per acre, only 160 pounds of TN per acre shall be applied). For septage application, groundwater monitoring is not required if the site nutrient management plan limits application rates to 30,000 gallons per acre for sites accepting mixtures of septage and grease (food establishment sludge) or to 40,000 gallons per acre for sites accepting septage without grease. The permit renewal application will include a trend analysis for nitrate in groundwater monitoring wells during the previous permit cycle, and an evaluation of the potential for the facility to cause or contribute to exceedance of the TMDL.

1.6 Other Scientific and Historical Information

In preparing this BMAP, DEP collected and evaluated credible scientific information on the effect of nutrients, particularly forms of nitrogen, on springs and springs systems. Some of the information collected is specific to the Suwannee River Basin, while other references provided

information on related knowledge for restoring springs, such as nitrogen-reducing technologies, the treatment performance of OSTDS, and runoff following fertilizer applications.

In addition to seeking scientific references, DEP reviewed the August 2017 Draft Suwannee River Basin Surface Water Improvement and Management (SWIM) Plan, sponsored by SRWMD. **Appendix B** identifies projects and activities of direct relevance to the Suwannee River Basin BMAP for which SRWMD is the lead/responsible agency.

1.7 Stakeholder Involvement

Stakeholder involvement is critical to develop, gain support for, and secure commitments in a BMAP. The BMAP process engages stakeholders and promotes coordination and collaboration to address the pollutant load reductions necessary to achieve the TMDLs. DEP invites stakeholders to participate in the BMAP development process and encourages public participation and consensus to the greatest practicable extent. **Table A-1** lists the stakeholders who participated in the development of this BMAP.

During the development of the Suwannee River BMAP, DEP held a series of meetings involving stakeholders and the general public. The purpose of these meetings was to consult with stakeholders to gather information, evaluate the best available science, develop an OSTDS remediation plan (including a public education plan), define management strategies and milestones, and establish monitoring requirements. All meetings were open to the public and noticed in the *Florida Administrative Register* (F.A.R.). Additionally, a public meeting on the current draft BMAP was held on November 14, 2017, and was noticed in the F.A.R. and in local newspapers.

Upon BMAP adoption, DEP intends to facilitate annual meetings with stakeholders to review progress towards achieving the TMDLs.

1.8 Description of BMPs Adopted by Rule

Table 3 lists the adopted BMPs relevant to this BMAP.

Table 3. BMPs adopted by rule as of June 2017

Agency	F.A.C. Chapter	Chapter Title
FDACS Office of Agricultural Water Policy (OAWP)	5M-6	Florida Container Nursery BMP Guide
FDACS OAWP	5M-8	BMPs for Florida Vegetable and Agronomic Crops
FDACS OAWP	5M-9	BMPs for Florida Sod
FDACS OAWP	5M-11	BMPs for Florida Cow/Calf Operations
FDACS OAWP	5M-12	Conservation Plans for Specified Agricultural Operations
FDACS OAWP	5M-13	BMPs for Florida Specialty Fruit and Nut Crop Operations
FDACS OAWP	5M-14	BMPs for Florida Equine Operations
FDACS OAWP	5M-16	BMPs for Florida Citrus
FDACS OAWP	5M-17	BMPs for Florida Dairies
FDACS OAWP	5M-18	Florida Agriculture Wildlife BMPs
FDACS OAWP	5M-19	BMPs for Florida Poultry
FDACS Division of Agricultural Environmental Services	5E-1	Fertilizer
FDACS Division of Aquaculture	5L-3	Aquaculture BMPs
FDACS Florida Forest Service	5I-6	BMPs for Silviculture
FDACS Florida Forest Service	5I-8	Florida Forestry Wildlife BMPs for State Imperiled Species
DEP	62-330	Environmental Resource Permitting

Section 2: Implementation To Achieve the TMDLs

2.1 Allocation of Pollutant Loads

2.1.1 Nutrients in the Springs and Spring Systems

DEP collected and evaluated credible scientific information on the effect of nutrients, particularly forms of nitrogen, on the seven OFS, described below.

2.1.1.1 Nitrogen

DEP compiled an inventory of nitrogen sources in the three PFAs and estimated their loading to groundwater using the NSILT. The NSILT provides information on the major sources of nitrogen in the groundwater contributing area and spring contributing area in the PFAs. A GIS-based and spreadsheet-based tool, it provides spatial estimates of the relative contribution of nitrogen from various sources while considering the transport pathways and processes affecting the various forms of nitrogen as they move through the land surface through soil and geologic strata into the Floridan aquifer (groundwater).

The first major factors to consider in estimating the loading to groundwater in the NSILT are the geologic features in the springshed and the related "recharge rate." Water movement between the shallow groundwater (surficial aquifer) and the deeper aquifer (UFA) is slowed by a low permeability layer of clay, silt, and fine sand that forms an intermediate confining unit perforated by sinkholes. The rocky layers that partially contain the UFA are prone to dissolving, and, over geologic time, the layers develop numerous karst features (sinkholes, caves, and conduits). These features allow water from the land surface to move directly and relatively rapidly into the aquifer.

Recharge rates from the surface to the UFA are affected by variations in the structure of the surficial aquifer layers, karst features, and average annual rainfall. SRWMD estimated the recharge rate ranges and grouped them into four recharge rate categories, which DEP then applied in the NSILT:

- Discharge.
- Low recharge (1 to 5 inches per year [in/yr]).
- Medium recharge (5 to 15 in/yr).
- High recharge (15 in/yr or greater).

The discharge category includes areas where groundwater from the UFA discharges through springs, seepage into lakes, streams, or wetlands.

A second major factor to consider in estimating the loading to groundwater in the NSILT is the attenuation of nitrogen as it moves from its source through the environment, before it reaches the

UFA. The movement of nitrogen from the land surface to groundwater is controlled by biological and chemical processes that occur as part of the nitrogen cycle, as well as hydrogeological processes. Many of these processes attenuate (impede or remove) the amount of nitrogen transported to groundwater. An understanding of how water moves through the subsurface and the processes that transform the different forms of nitrogen is essential for estimating nitrogen loading to groundwater from various sources.

In the NSILT, DEP applied different attenuation factors to different types of sources, so that various biological, chemical, and hydrogeological effects could be estimated. The attenuation that was applied means that the amount of nitrogen leaving a source (such as a livestock operation or a newly fertilized yard) reduces the amount of nitrogen predicted to reach the aquifer. In the Lower Suwannee River, Middle Suwannee River, and Withlacoochee River NSILT estimates, the attenuation rates ranged from 90 % (for atmospheric deposition) to 25 % (for wastewater disposal in a RIB). This means that, for these examples, only 10 % of nitrogen from atmospheric deposition is expected to reach the aquifer, while 75 % of nitrogen from a RIB is expected to reach groundwater, because the remainder is attenuated by various chemical and biological processes.

2.1.1.2 Other Nutrients

Phosphorus is naturally abundant in the geologic material underlying much of Florida and is often present in high concentrations in surface water and groundwater. Historical TP concentrations rose in the Suwannee River Basin, peaked in 1983, and have generally declined since then. During the TMDL development process, DEP could not link impairments with either phosphorus load or concentration. The monitoring and evaluation of TP and its influence on the springs continues as the nitrate TMDLs are implemented.

2.1.2 Estimated Nitrogen Loads

As discussed in **Section 1.4**, DEP considered the nitrogen loading contributing areas to be a combination of the surface water drainage basin and the individual springsheds (the areas of land that contribute water to a spring or group of springs, mainly via groundwater flow). Nitrogen loading to surface water will be reduced through the activities and strategies for the sources identified in this chapter for groundwater loading.

Groundwater loading data referenced here are from the three 2017 NSILT estimates, on which the forthcoming NSILT summary reports will be based. The NSILT for a given springshed or PFA is based on the best available data at a given time. DEP intends to update the three Suwannee River Basin NSILTs by the first five-year milestone of the BMAP planning period to incorporate more current data and to update methodologies (as appropriate).

Table 4 lists the estimated nitrogen loads to groundwater by source. Note that urban stormwater loads are included in UTF estimates, while agricultural stormwater loads are included in FF and LW estimates.

Table 4. Nitrogen load to groundwater by source

Nitrogen Source	Estimated Total Nitrogen Load to Groundwater (lb-N/yr)	% Contribution
OSTDS	301,234	3
UTF	293,157	3
Atmospheric Deposition	807,819	8
FF	5,794,80	60
STF	12,819	.01
Permitted Dairies	339,182	3.5
LW	2,087,394	21.5
WWTFs	89,745	.09
Total	**9,726,330**	**100**

2.1.3 Assumptions and Considerations

The NSILT estimates are based on the following assumptions and considerations:

- **NSILT Nitrogen Inputs** – The methods used to estimate nitrogen inputs for each pollutant source were based on a detailed synthesis of information, including direct water quality measurements, census data, surveys, WWTF permits, published scientific studies and reports, and information obtained in meetings with agricultural producers. For some pollutant source categories, nitrogen inputs were obtained using assumptions and extrapolations, and as a result, these inputs could be subject to further refinement if more detailed information becomes available.

- **OSTDS Load Contribution** – A per capita contribution to an OSTDS of 9.012 lb-N/yr was used to calculate loading from OSTDS. The average household contribution was estimated based on 2010 U.S. Census Bureau data on the average number of people per household for the counties in the area.

- **Nitrogen Attenuation Factors** –Biological and chemical processes that occur as part of the nitrogen cycle, as well as hydrogeological processes, control the movement of nitrogen from the land surface to groundwater. To estimate the amount of nitrogen loading to the aquifer, DEP applied two nitrogen attenuation factors. Biochemical attenuation accounts for biochemical processes that convert or transform the different forms of nitrogen, while hydrogeological attenuation accounts for spatial variations that affect the rate of water infiltrating through geological media to recharge the UFA.

- **Average Attenuation Factor** – Given the relatively large range of literature-reported values of nitrogen attenuation for each source category, DEP used an

average attenuation factor for each source based on land use practices and hydrogeological conditions in the contributing areas.

Other assumptions and considerations for BMAP implementation include the following:

- **Unquantified Project Benefits** – Nitrogen reductions for some of the projects and activities listed in this BMAP cannot currently be quantified. 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.

- **Atmospheric Deposition** – Air sources of nitrogen are local, national, and international. Atmospheric deposition is considered an uncontrollable source. Atmospheric sources are generally of low nitrogen concentration compared with other sources and are further diminished through additional biological and chemical processes before they reach groundwater. Atmospheric deposition sources and trends will need to be reevaluated in five years to see if the TMDLs can be met without allocating additional reductions to either air sources or to local springshed sources.

- **OSTDS Inventory and Loading Calculations** – The total number of OSTDS in the basin is estimated based on local information and FDOH data. Future BMAPs and the associated OSTDS loading calculations may be adjusted based on improved data on the number and location of existing septic systems, and may include additional OSTDS installed since BMAP adoption.

- **PFA** – The PFA provides a guide for focusing strategies where science suggests efforts will best benefit the springs. The PFA boundary and the associated OSTDS policy will be re-evaluated at the first five-year milestone. The PFA boundary and OSTDS policy may be adjusted (i.e., expanded) based on this evaluation. In the meantime, local governments and utilities are encouraged to implement policies and projects that limit new conventional OSTDS and provide more effective forms of wastewater treatment outside of the PFA.

- **Project Collection Period –** Projects completed in the springshed as of July 1, 2007, were considered for inclusion in this BMAP since monitoring data collected for June 1, 2000, through June 30, 2007 were used to develop the TMDLs.

- **Legacy Sources** – Land uses or management practices not currently active in the basin may still be affecting the nitrate concentration of the springs. The movement of water from the land surface through the soil column to the UFA and through the UFA to the spring system varies both spatially and temporally

and is influenced by local soil and aquifer conditions. As a result, there may be a delay between when nitrogen input to the UFA occurs and when that load ultimately arrives at an OFS. The impact of this delay is not fully understood.

- **Implementation Schedule** – BMAP implementation is a 20-year process. This plan defines nitrogen reduction milestones for 5-year (30 %), 10-year (50 %), and 15-year (20%) implementation, so that the TMDLs will be met no later than the 20-year goal (see **Section 2.1.6** for further details). Further, the total reductions and project credits may be adjusted under the adaptive management approach used for the BMAP. This approach requires regular follow-up to ensure that management strategies are carried out and that their incremental effects are assessed. This process acknowledges that there is some uncertainty associated with the outcomes of proposed management strategies and the estimated response of concentration at the springs. As each 5-year iteration is completed and more information is gathered, additional management strategies to achieve the TMDLs will be developed or existing strategies refined to better address the sources of nitrogen loading.

- **Changes in Spring Flows** – The role of this BMAP is specifically to promote the implementation of projects that reduce nitrogen load to groundwater, while the minimum flows and levels (MFLs) established for specific springs address water flows and levels. To maximize efforts between the two programs, spring protection projects should provide both water quality and quantity benefits.

2.1.4 Loading by Source

From the Suwannee River NSILT estimates, the pie charts in **Figure 5**, **Figure 6**, and **Figure 7** depict the estimated percentage of nitrogen loading to groundwater by source in the springshed for each sub-basin. FF and LW are responsible for more than 85 % of the nitrogen sources in each springshed. Stormwater loading to groundwater is incorporated into the other source categories.

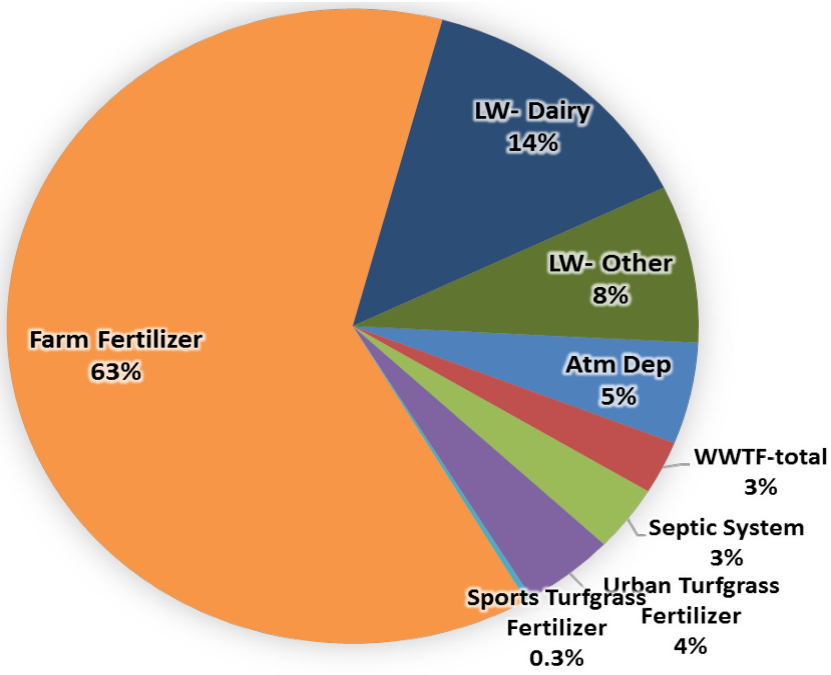

Figure 5. Loading to groundwater by source in the Lower Suwannee River Springshed

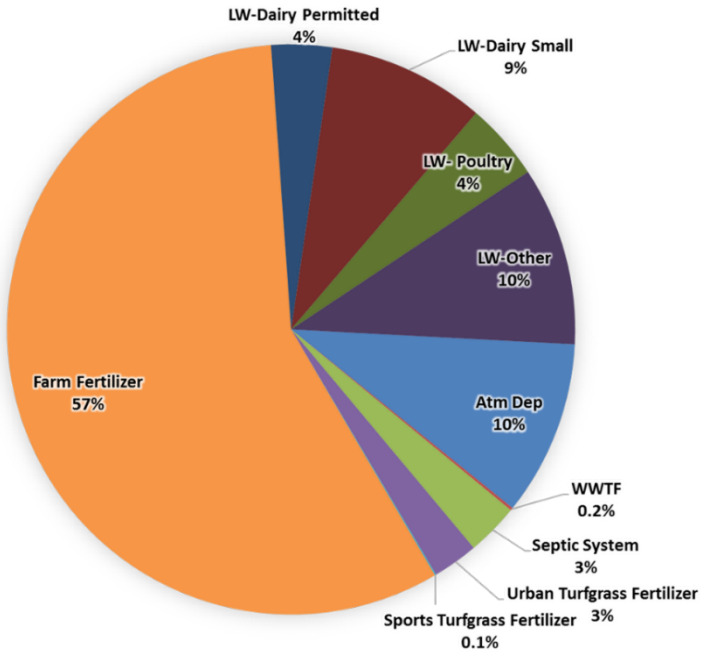

Figure 6. Loading to groundwater by source in the Middle Suwannee River Springshed

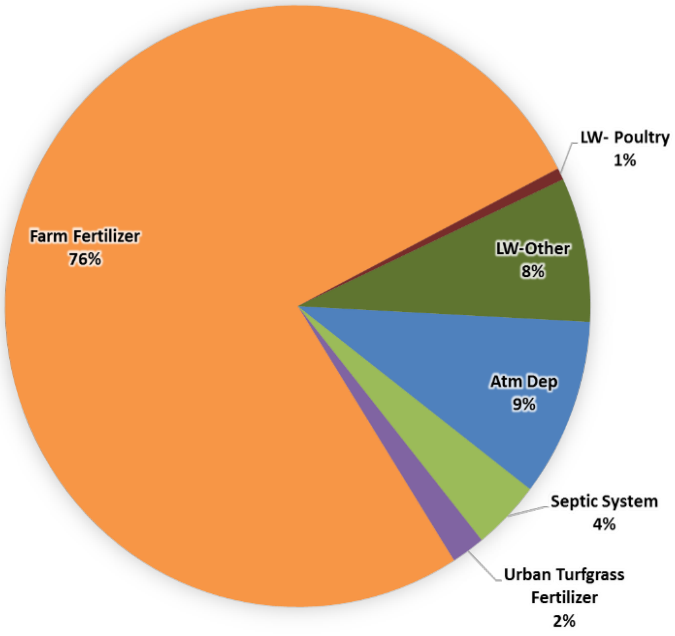

Figure 7. Loading to groundwater by source in the Withlacoochee River Springshed

2.1.5 Allocations and Reduction Obligations

The nitrogen source reductions are based on the source percentages (**Figure 5**, **Figure 6**, and **Figure 7**) and overall calculated load to groundwater. **Table 5a** lists the total nitrate (as nitrogen) loads at the spring vents compared with the TMDL loading based on a target nitrate concentration of 0.35 mg/L. The difference between the spring vent loading and the TMDL loading estimates is the required reduction to meet the TMDLs.

Loads were calculated in each of the three springsheds, including the load at the vent, the estimated TMDL load based on reaching the 0.35 mg/L concentration, and the reduction needed. Load reductions were also calculated for the areas outside the springshed but inside the BMAP area boundary, based on the average load per acre inside the springshed and the total acres outside the springshed but in the BMAP area (**Table 5b**). The total estimated load to groundwater that is required to be reduced in the basin is being allocated to the entire basin and is separated out to provide a guide for restoration activities.

Table 5a. Total reduction required to meet the TMDLs inside springsheds

Area	Total Load at Spring Vents	TMDL Load	Required Reduction to Meet TMDL
Lower	1,276,822	145,500	1,131,322
Middle	1,489,907	693,663	796,244
Withlacoochee	361,000	79,300	281,700
		Subtotal	**2,209,266**

Table 5b. Total reduction required to meet the TMDLs outside springsheds

Area	Total Load at Spring Vents	TMDL Load	Required Reduction to Meet TMDL
Lower			1,311,640
Middle			214,981
Withlacoochee			340,048
		Subtotal	**1,866,669**
		Total	**4,075,935**

The total load at the Madison Blue Spring vent in the Withlacoochee River Sub-basin was calculated using the 95th percentile of nitrate concentrations and flows at Madison Blue Spring from 2001 through 2016.

The total loads at the spring vents for the Middle Suwannee River Sub-basin were calculated using the 95th percentile of nitrate concentrations and periods of base flow for the Suwannee River from 2013 through 2016.

The total loads at the spring vents for the Lower Suwannee River Sub-basin were calculated using the 95th percentile of nitrate concentrations and flows at Fanning and Manatee Springs from 2003 through 2016.

2.1.6 Description of 5-, 10-, and 15-year Milestones/Reduction Schedule

The overall load reduction targets are 30 % of the total within 5 years, 80 % of the total within 10 years, and 100 % of the total within 15 years. The goals are aggressive for the first 10 years to ensure that the overall load reduction occurs within 20 years. **Table 6** lists the estimated nitrogen reduction schedule, by milestone.

Table 6. Nitrogen reduction schedule (lb-N/yr)

5-Year Milestone (30% of Total)	10-Year Milestone (50% of Total)	15-Year Milestone (20% of Total)	Total Nitrogen Reduction (100%)
1,222,781	2,037,968	815,187	4,075,935

Load reduction progress will be tracked yearly and adjustments made as needed. At the five-year milestone, progress will be assessed and load reductions adjusted as necessary. Entities have flexibility in the types and locations of projects as long as they achieve the overall required load reductions. The monitoring of existing groundwater and springs sampling locations is essential. **Section 2.2** describes detailed source reduction strategies.

2.2 Prioritization of Management Strategies

The management strategies and projects listed in **Appendix B** are ranked as high, medium, or low priority. The priority selected for each project was primarily based on the priority submitted by the lead entity conducting the project. In addition, DEP considered the following factors in assigning the ranking:

- **Agricultural Sources (FF, Permitted Dairies, and LW)** − Owner-implemented BMPs are the highest priority, with the expectation that all commercial operations in the BMAP area will implement BMPs or conduct water quality monitoring in compliance with Section 403.067, F.S. Under the Florida Aquifer and Springs Protection Act, new agricultural operations are required to implement BMPs. Further, the implementation of additional agricultural projects and practices is necessary to meet the TMDLs. The locations of additional projects and practices, and the magnitude of their load reduction, are also considerations for the project ranking.

- **Wastewater Sources** − Projects that assist facilities with meeting the BMAP concentration requirements receive priority. **Section 2.7.2** describes the WWTF requirements.

- **OSTDS Sources** − In general, projects that address OSTDS loads in the PFAs on lots of less than one acre receive the highest priority. Projects that address OSTDS loads in the PFAs but on larger lots are ranked as medium priority. Projects that address OSTDS loads outside the PFAs receive lower priority. However, other considerations can affect a project ranking, such as projects

that that require significant planning, engineering, and/or program development to carry out and to achieve future reduction milestones.

- **UTF and STF Sources** − Projects that are needed to meet an upcoming milestone, are ready to be implemented, and have larger reductions are ranked highest. Also, projects that that require significant planning, engineering, and/or program development are considered for a higher ranking, as the implementation process needs to continue in the near term to carry out these projects and to achieve future reduction milestones.

2.3 OSTDS Management Strategies

In accordance with the Florida Springs and Aquifer Protection Act, DEP assessed the OSTDS loading compared with other nitrogen sources in the PFAs, as well as the relative loading in the BMAP area. Based on the results of these assessments, DEP has determined that for the Suwannee River BMAP area, OSTDS are not contributors of at least 20 % of nonpoint source nitrogen pollution in the PFAs. Based on the results of the Suwannee River Basin NSILTs, septic systems contribute 3 % pollutant loading in the springshed area and 3 % of the nitrogen loading in the PFAs. However, DEP has determined that an OSTDS remediation plan is necessary to achieve the TMDLs, to support modifications to permitting OSTDS, and to limit the future growth of OSTDS loads. The revised OSTDS permitting policies are included in the OSTDS Remediation Plan in **Appendix D** and are adopted as part of this BMAP.

A combination of OSTDS enhancement (adding improvements that reduce nitrogen) and replacement (conversion to central sewer) will be necessary to achieve the overall required load reductions. There are over 19,000 OSTDS in the PFAs, based on FDOH estimates. **Figure 8**, **Figure 9**, and **Figure 10** show the OSTDS locations in each sub-basin. Integral to OSTDS enhancement is the necessity for a rule allowing the permitting of additional OSTDS drain field enhancement procedures. As of October 2017, FDOH is working to complete this process.

This BMAP lists 8 BMAP projects that reduce OSTDS loading by 55,281 lb-N/yr.

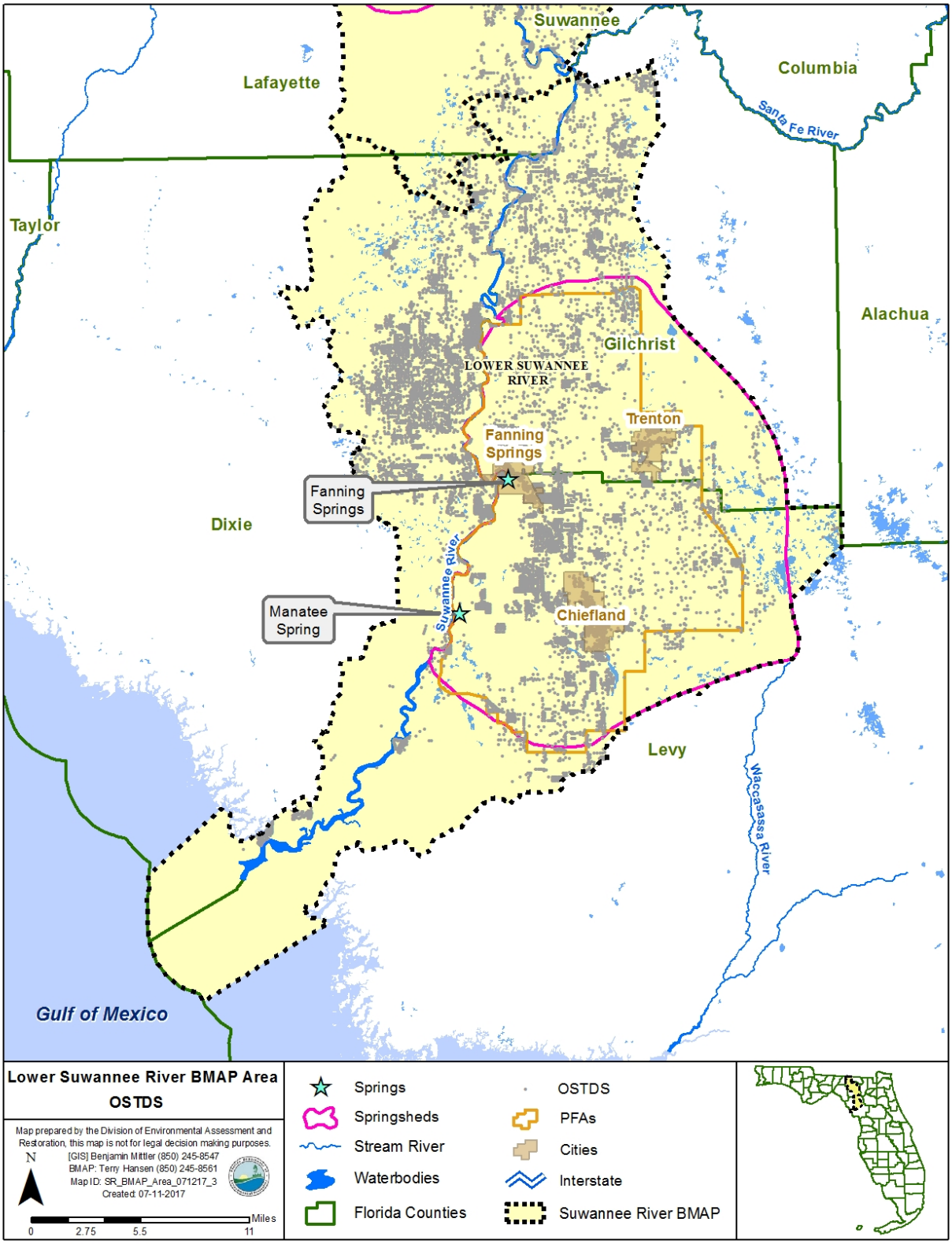

Figure 8. OSTDS locations in the Lower Suwannee River Sub-basin

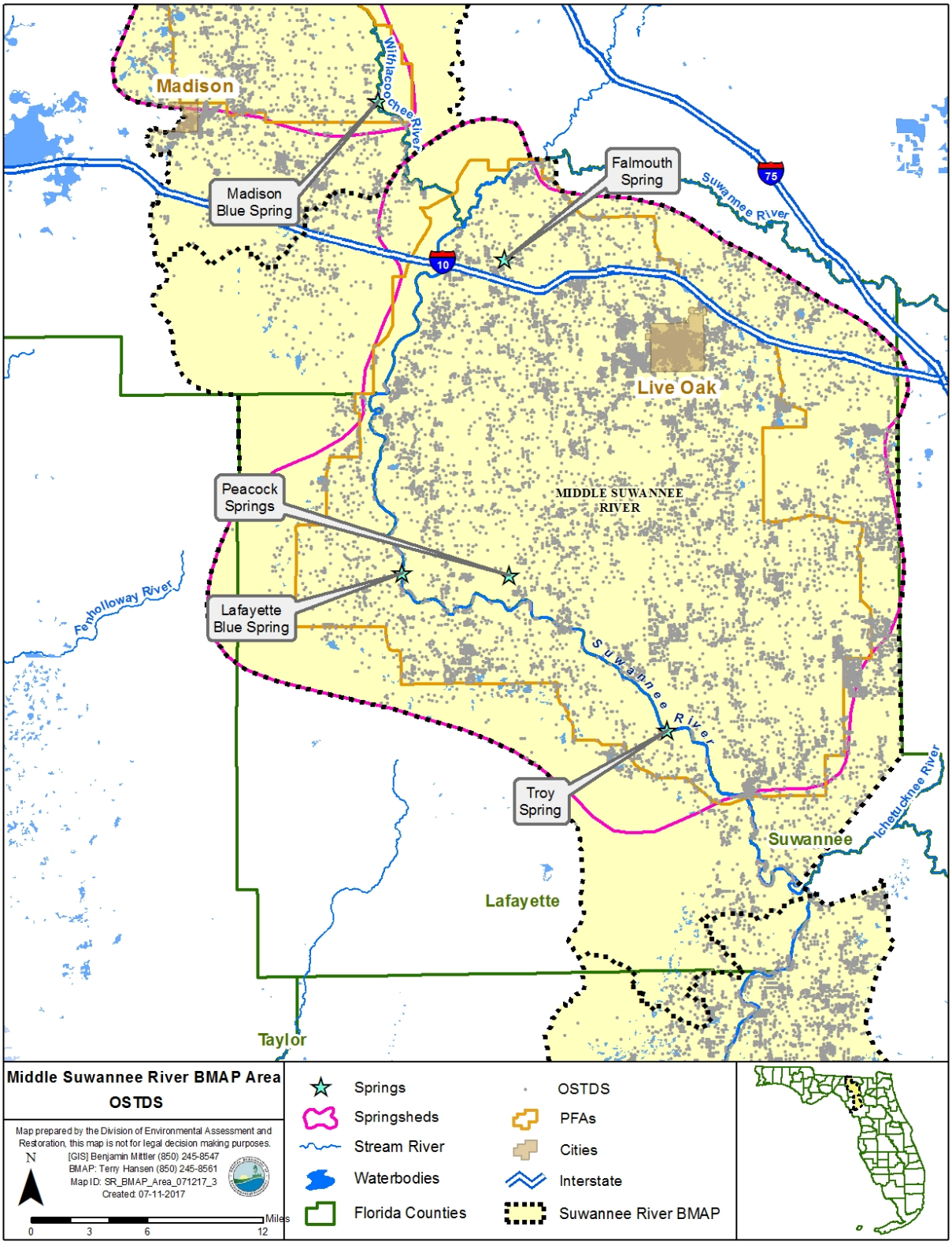

Figure 9. OSTDS locations in the Middle Suwannee River Sub-basin

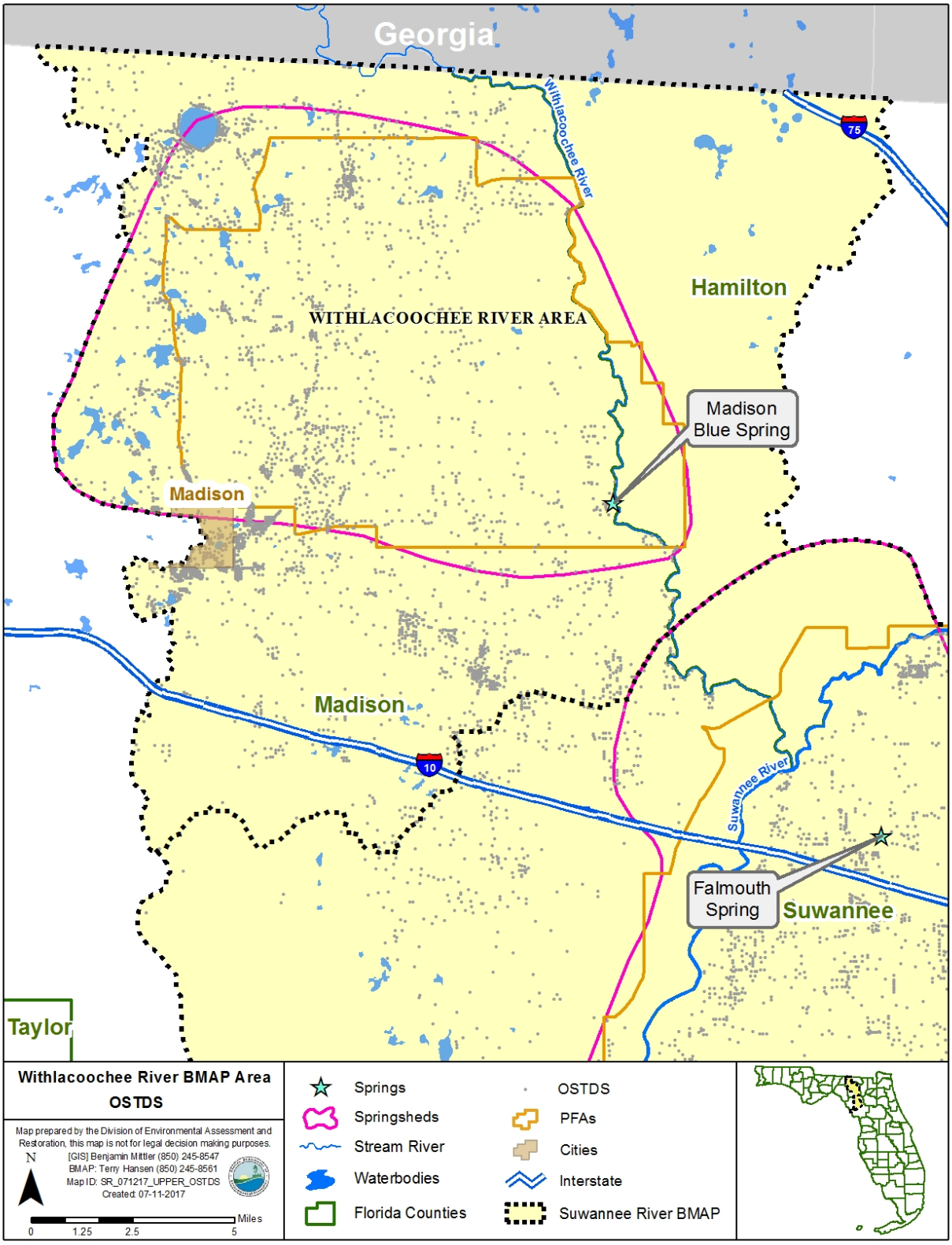

Figure 10. OSTDS locations in the Withlacoochee River Sub-basin

2.4 UTF Management Strategies

UTF consists of fertilizers applied to the turfgrass typically found in residential and urban areas (including residential lawns and public green spaces). It is applied by either the homeowner or a lawn service company on residential properties, while on nonresidential properties, it may be applied by contractors or maintenance staff.

2.4.1 Fertilizer Ordinance Adoption

As required by the Florida Legislature, as described in Subsection 373.807(3), F.S., local governments with jurisdictional boundaries that include an OFS or any part of a springshed or the delineated PFA of an OFS, are required to develop, enact, and implement a fertilizer ordinance by July 1, 2017. The statutes require any ordinance to be based, at a minimum, on the DEP model ordinance for Florida-friendly fertilizer use on urban landscapes. DEP has reached out to the local governments in the Suwannee River Basin to remind them of the ordinance adoption requirement.

2.4.2 Prioritized Management Strategies and Milestones

Based on the fertilizer ordinances in place at the time of BMAP adoption, the associated credits for UTF reductions to groundwater are 1,466 lb-N/yr (see **Table 7**). Additional environmental benefits could be credited if the counties and municipalities implement other public education efforts and source control ordinances, as described in **Section 2.11.3.**

Local stormwater projects that treat urban runoff, including nitrogen from urban fertilizer, are also in place (see **Appendix B**), for a total estimated reduction to groundwater of 69 lb-N/yr.

Table 7. Current project credits to reduce UTF loading to groundwater

Project Category	Project Credits Based on Management Actions in Appendix B (lb-N/yr)
Fertilizer Ordinances (all entities)	1,466
Stormwater Improvements	69
Total Project Credits	**1,535**

Since there is uncertainty about the data used in the NSILT estimates to calculate the UTF loading to groundwater, DEP will work toward collecting better data by documenting reductions with the stakeholders. Also, DEP will work with the stakeholders to develop additional measures to reduce fertilizer application.

Even after the implementation of this suite of management actions, additional measures will be needed to meet the TMDLs, either through additional UTF reductions that can be demonstrated through water quality data or other reliable sources, or reductions from other source categories.

2.5 STF Management Strategies

STF areas fall into two main categories that are evaluated separately: golf courses and sporting facilities such as baseball, football, soccer, and other fields. There is only one golf course in the entire BMAP area, and thus other types of sports fields are the main source of the load to groundwater in this source category.

2.5.1 Prioritized Management Strategies and Milestones

DEP will work with sports field managers and the golf course superintendent to ensure relevant BMP implementation and to estimate reductions associated with these efforts. To improve the golf course loading estimate over a literature-based approach, DEP will also confer with the golf course superintendent to identify the actual rate of fertilizer application to update the golf course load to groundwater. The golf course is expected to implement the BMPs described in DEP's *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses* for an estimated 10 % reduction in load to groundwater.

Sports field managers can assist by reducing fertilizer use, using products that reduce leaching, and more efficiently irrigating their sports turf. The estimated credit for better management of nongolf sports turfgrass is 6 % of the starting load to groundwater.

Based on these approaches, the initial calculation of reductions from STF sources is 1,051 lb-N/yr, as listed in **Table 8**. Additional efforts, yet to be identified, will be needed to meet the overall TMDL reduction goal, either through additional STF reduction efforts or reductions in other sources.

Table 8. Maximum load reductions from STF improvements based on existing credit policies

STF Source Control Measures	Credit Based on Estimated Load to Groundwater (%)	Possible Nitrogen Credits (lb-N/yr)
Golf Course BMP Implementation	10	705
Sports Fields BMPs	6	346
Total Possible Credits		**1,051**

2.6 Agricultural Sources Management Strategies

Based on data provided by FDACS, there are 359,896 acres in the basin: 198,638 acres are fertilized croplands, 155,135 acres are livestock lands, and 6,123 acres are classified as both fertilized croplands and livestock lands.

2.6.1 FF

Nitrogen in agricultural fertilizer is applied at varying rates, depending on the crop and individual farm practices. The NSILT estimated total nitrogen load to groundwater from FF is 5,794,980 lb-N/year, approximately 60 % of the total nitrogen load to groundwater in the BMAP area.

2.6.2 LW

Agricultural practices specific to LW management were obtained through meetings with agricultural producers and stakeholders. The NSILT estimated total nitrogen load to groundwater from LW is 2,087,394 lb-N/year, or 21.5 % of the total nitrogen load to groundwater.

2.6.3 Permitted Dairies

The loading from dairies with confined animal feed lot permits was estimated separately from other LW. The NSILT estimated total nitrogen load to groundwater from permitted dairies is 339,182 lb-N/yr, or 3.5 % of the total nitrogen load to groundwater in the BMAP area.

2.6.4 Prioritized Management Strategies and Milestones

Subsection 403.067, F.S., requires agricultural nonpoint sources in a BMAP area either to submit to FDACS a notice of intent (NOI) and implement the applicable FDACS-adopted BMPs, which provides a presumption of compliance with water quality standards, or conduct water quality monitoring prescribed by DEP or SRWMD that demonstrates compliance with water quality standards. Further, based on the Florida Springs and Aquifer Protection Act, Subsection 373.811(5), F.S., prohibits any new agricultural operations in BMAP areas that do not implement applicable FDACS BMPs upon the commencement of those operations, implement measures necessary to achieve pollution reduction levels established by DEP, or follow a water management district– or DEP-approved monitoring plan to demonstrate compliance with water quality standards. Failure to submit to FDACS an NOI and implement BMPs or conduct monitoring that demonstrates compliance may result in enforcement action by DEP.

During the first five-year period, FDACS will proactively seek the further enrollment of all producers in the BMAP area and will undertake projects involving precision irrigation, soil moisture probes, and cover crop planting. As of December 31, 2016, there were 748 NOIs to enroll in BMPs covering 187,312 acres in the Suwannee River Basin BMAP area. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time. **Appendix B** lists project information. **Appendix E** provides detailed information on BMPs and agricultural practices in the BMAP area.

With crop-specific BMP enrollment or monitoring for FF areas, an estimated 869,247 lb-N/yr reduction to groundwater can be achieved, based on an average reduction of 15 % in the nitrogen load to groundwater. While DEP has listed larger percentage reductions in nitrogen from agricultural BMPs in estimating benefits to surface waters, the best data available on benefits to groundwater from BMPs indicate a 15 % reduction in the load to groundwater where owner-

implemented BMPs are in place. In addition to groundwater reductions from owner-implemented BMPs on fertilized lands, an additional 724,060 lb-N/yr in reductions are estimated from specific stakeholder projects on fertilized lands. This number could increase as more data are collected on the impact of BMPs to groundwater.

For permitted dairies, the estimated load reductions from owner-implemented BMPs are 15 % in the nitrogen load to groundwater, or 50,877 lb-N/yr, assuming 100 % BMP implementation at these dairies. Additionally, stakeholder projects are estimated to achieve 106,000 lb-N/yr in reductions, for a total estimated permitted dairy reduction of 156,877 lb-N/yr.

For all livestock operations not included in the permitted dairies category, owner-implemented BMPs are expected to achieve a reduction of 208,739 lb-N/yr, using an estimated 10 % reduction in the load to groundwater from owner-implemented BMPs at livestock operations.

Summarizing the reductions discussed above, the total reduction from all agricultural sources is 1,958,924 lb-N/yr. As the overall reduction goal for the Suwannee Basin is 4,075,935 lb-N/yr, additional reductions will be needed from agricultural sources, which are the largest sources in the basin, comprising 85 % of the nitrogen load to groundwater.

Additionally, the SRWMD is implementing a series of projects encouraging producers to transition to less intensive cropping systems, change land use to fallow or native landscape, or change the type of cropping system. Currently, an estimated 375,000 lb-N/yr reduction is being achieved.

2.7 WWTF Management Strategies

The role of WWTFs is to receive and treat domestic wastewater. In the Suwannee River BMAP area, treated effluent containing nitrogen is discharged to sprayfields, RIBs, and percolation ponds, and is reused for irrigation water. The estimated nitrogen load from WWTFs is 89,745 lb-N/yr. The discharge location (such as proximity to the spring, highly permeable soils, etc.) and level of wastewater treatment are important factors to consider when addressing loadings to groundwater. Additionally, addressing the nitrogen loading from OSTDS could increase the volume of effluent treated and disposed of by WWTFs.

2.7.1 Summary of Facilities

There are 19 domestic WWTFs located in the Suwannee River Basin BMAP area, including 6 WWTFs discharging more than 100,000 gallons of treated effluent per day. **Figure 11** shows the locations of WWTFs in the Suwannee River Basin with discharges greater than 0.1 million gallons per day (mgd) and discharges less than 0.1 mgd.

Figure 11. Locations of WWTFs in the Suwannee River BMAP area

2.7.2 Wastewater Management Standards and Reuse Management

The Florida Springs and Aquifer Protection Act prohibits new domestic wastewater disposal facilities in the PFAs, including RIBs, with permitted capacities of 100,000 gpd or more, except for those facilities that meet an AWT standard of no more than 3 mg/L total nitrogen, expressed as N, on an annual permitted basis.

To provide regulatory consistency in the BMAP area and to further improve wastewater management to protect the Suwannee River Basin, DEP requires the nitrogen effluent limits listed below in any new or existing wastewater permit, unless the utility/entity can demonstrate reasonable assurance that the reuse or land application of effluent would not cause or contribute to a violation of the nitrate concentrations established by the Suwannee River Basin TMDLs. To demonstrate reasonable assurance, the utility/entity shall provide relevant water quality data, physical circumstances, or other site-specific credible information needed to show a nitrate concentration no greater than 0.35 mg/L at the spring vents. This demonstration may include factors such as dilution, site-specific geological conditions, research/studies, including dye tracer tests, and groundwater transport modeling. Should DEP concur with the reasonable assurance demonstration request, the TN effluent requirements established here may be modified for the applicant or waived.

The nitrogen effluent limits listed in **Table 9** will be applied as an annual average to all new and existing WWTFs with a permitted discharge. New effluent standards will take effect at the time of permit renewal or no later than five years after BMAP adoption, whichever is sooner.

Table 9. Wastewater effluent standards for the BMAP area

95% of the Permitted Capacity (gpd)	Nitrogen Concentration Limits for RIBs and Absorption Fields (mg/L)	Nitrogen Concentration Limits for All Other Land Disposal Methods (mg/L)
Greater than 100,000	3	3
20,000 to 100,000	3	6
Less than 20,000	6	6

Additionally, new or existing wastewater permits in the BMAP area must require at least quarterly sampling of the effluent discharge for TN and report these sampling results in the discharge monitoring reports (DMRs) submitted to DEP.

The expansion of reuse water is expected to improve water conservation and reduce reliance on the Floridan aquifer for water supply. The nitrogen load to groundwater from reuse water is expected to be reduced through these WWTF policies, as improvements in reuse quality will both reduce loads from this source and limit future increases in loading from reuse because of high treatment levels.

2.7.3 Prioritized Management Strategies and Milestones

WWTF owners/operators are responsible for meeting the effluent standards defined in this BMAP, with consideration for the volume of discharge, concentration, attenuation, and locations in the high, medium, or low recharge areas. Based on the current volumes of discharge and effluent concentrations, the estimated reductions to be achieved through the implementation of these revised wastewater standards are 17,533 lb-N/yr. **Appendix B** contains detailed information on projects that have either been completed, are underway, or are planned to reduce nitrogen loading from WWTFs.

2.8 Atmospheric Deposition Management Strategies

Atmospheric deposition is largely a diffuse, albeit continual, source of nitrogen. Nitrogen species and other chemical constituents are measured in wet and dry deposition at discrete locations around the U.S. In Florida, the Clean Air Status and Trends Network (CASTNET) has two stations that collect and analyze dry deposition. Wet deposition data currently are collected at nine stations around the state as part of the National Atmospheric Deposition Program (NADP) National Trends Network (NTN).

2.8.1 Summary of Loading

In 2014, Schwede and Lear published a hybrid model for estimating the total atmospheric deposition of nitrogen and sulfur for the entire U.S., referred to as "TDEP." Deposition data from several monitoring networks—including CASTNET, the NADP Ammonia Monitoring Network, the Southeastern Aerosol Research and Characterization Network, and modeled data from the Community Multiscale Air Quality (CMAQ) Modeling System—are combined in a multistep process with NTN wet deposition values to model total deposition. The TDEP model run used for the NSILT included data from 2011 to 2013.

2.8.2 Description of Approach

Air sources of nitrogen are local, national, and international. They are considered to be uncontrollable sources under this BMAP. Atmospheric sources are generally of low nitrogen concentration compared with other sources and are further diminished through additional biological and chemical processes before they reach groundwater. At the five-year milestone, changes in atmospheric deposition rates will be assessed, and the necessary load reductions may be adjusted to reach the milestones and the TMDLs.

2.9 Future Growth Management Strategies

Local land development regulations, comprehensive plans, ordinances, 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 regarding the implementation of FDACS-adopted BMPs (**Section 2.6**).

Irrigated acreage is projected to increase 11 % (36,680 acres) in the next 25 years. The associated increased load to groundwater will need to be addressed in addition to the current load reductions. Future development must connect to central sewer, if available; otherwise an enhanced OSTDS must be installed, as described in **Appendix D**. At the five-year update of this BMAP, the NSILTs will be used to reevaluate land use and determine if changes in source load estimates are required.

2.10 Protection of Surface Water and Groundwater 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 in the Suwannee River Basin. **Table 10** identifies fee acquisitions and conservation easements acquired by SRWMD since Fiscal Year (FY) 2007−08 through the Florida Forever Program. These acquisitions are for the entire SRWMD jurisdiction, including the Suwannee River Basin.

Table 10. SRWMD conservation land purchases through the Florida Forever Program

FY	Fee Acquisition Expenditures	Fee Acres Acquired	Conservation Easement Expenditures	Conservation Easement Acres Acquired
2007−08	$4,041,930	493	$6,379,514	3,294
2008−09	$10,965,200	2,171		
2009−10	$494,000	84	$1,789,725	786
2010−11	$5,426,437	1,201	$1,557,593	682
2011−12			$250,710	167
2012−13				
2013−14				
2014−15	$628,145	85	$707,850	35
2015−16	$6,720			
Total	**$21,562,432**	**4,034**	**$10,685,392**	**4,964**

2.11 Gap Analysis for Load Reductions

While the load reductions achieved through the existing and planned efforts described above and the projects listed in **Appendix B** are substantial, the total load reductions to groundwater do not meet the reduction target of 4,075,935 lb-N/yr. Based on the totals of all the listed management actions and policies, the total reductions to groundwater from projects listed in this BMAP are 1,722,649 lb-N/yr (see **Table 11).**

The current gap in necessary projects to achieve the TMDLs is 1,999,761 lb-N/yr. Additionally, up to an estimated 14,500 lb-N/yr are projected to reach groundwater yearly based on potential increases in irrigated acreage. To achieve the remaining reductions, additional project options are available to local entities but have not been planned. Other efforts could be pursued to further reduce the nitrogen load to groundwater in the Suwannee River Basin.

Table 11. Gap analysis for Suwannee River Basin projects to meet the TMDLs

Nitrogen Source	Credits to Load to Groundwater Based on Project Tables (lb-N/yr)	Description
OSTDS	55,281	Credits identified for stakeholder OSTDS projects (enhancement or sewer)
UTF	1,535	DEP approved credits (up to 6%) for public education activities as well as credits identified for stakeholder stormwater projects
Atmospheric Deposition		No reduction
FF	724,060	Credits identified for stakeholder farm fertilizer projects
FF	869,247	15% BMP credit on farm fertilizer load to groundwater, assuming 100% owner-implemented BMPs on all fertilized lands
STF	1,051	6% BMP credit for sports fields and 10% BMP credit for golf courses on STF load to groundwater, assuming 100% BMP implementation on golf courses and sports fields
Permitted Dairies	106,000	Credits identified for stakeholder dairy projects
Permitted Dairies	50,877	15% BMP credit on permitted dairy load to groundwater, assuming 100% owner-implemented BMPs at permitted dairies.
LW	208,739	10% BMP credit on load to groundwater, assuming 100% owner-implemented BMPs at all livestock facilities
WWTF	17,533	Achieved by BMAP WWTF policy if BMAP-wide (achieving 3 or 6 mg/L)
Other	41,850	Credit identified for the Madison Blue Spring Aquifer Recharge Project that DEP provided cost-share funding
Total Credits	**2,076,174**	
Required Reduction	**4,075,935**	
Load Remaining	**1,999,761**	
Yearly Increase	**14,500**	**Future irrigated acreage (estimated 2.5% per year for 25 years)**

2.11.1 Agricultural Reductions To Address the Gap

Further reductions can be achieved through implementing additional agricultural projects or practices, including land acquisition and conservation easements. These projects can be assured implementation because the state of Florida appropriates at least $50 million per year pursuant to Paragraph 375.041(3)(b)2., F.S. to implement springs restoration projects. Additional advanced nitrogen reducing agricultural projects and practices, and land acquisition and conservation easements, have already been funded pursuant to these state appropriations.

SRWMD is implementing projects to encourage low input agriculture, and also implementing water quality improvement technologies. Other reductions associated with the implementation of BMPs may be determined through data collection. Basin-specific studies will be conducted to demonstrate the effectiveness of BMPs on a site-specific basis. Based on existing crop types, the

estimated load reductions from implementing additional agricultural projects and practices in the basin and associated reductions are listed in **Table 12**. FDACS supplied the acreages where the practices would be applicable and estimated the costs of implementation.

Table 12. Estimated reductions for additional agricultural projects and practices

Action	Acreage	Reduction Credit if 100% in High-Recharge Area (lb-N/yr)	Reduction Credit if 100% in Medium-Recharge Area (lb-N/yr)	Cost
Precision Irrigation	88,940	174,993	97,219	$39,667,270
Precision Fertilization	51,296	313,932	174,406	$6,001,608
Soil Moisture Probes	95,845	448,555	249,197	$4,854,500
Controlled-Release Fertilizer	17,261	46,605	25,892	$310,704
Rotational Production	50,048	122,400	68,000	$62,560,565
Cover Crops	87,208	706,385	70,638	$3,924,375
Line Five Storage Waste Ponds	0	9,000	180	$200,000
Total	**390,598**	**1,821,870**	**685,532**	**$117,519,022**

Table 13 lists the reductions to groundwater that could be achieved through changes in practices. For example, a 75 % reduction of fertilizer loss to groundwater on 25 % of the fertilized lands would result in an estimated reduction of 1,086,559 lb-N/yr. Note that these estimates are averaged over the entire basin, and the recharge characteristics of a specific site and the fertilization practices for specific crops may change the estimated reduction for specific acres with a conservation easement or change in fertilization.

Table 13. Potential for additional load reductions to groundwater

% of Fertilized Acres with a Change in Practice	Number of Fertilized Acres with a Change in Practice	100% Reduction in Load to Groundwater (lb-N/yr reduced)	75% Reduction in Load to Groundwater (lb-N/yr reduced)	50% Reduction in Load to Groundwater (lb-N/yr reduced)	25% Reduction in Load to Groundwater (lb-N/yr reduced)	10% Reduction in Load to Groundwater (lb-N/yr reduced)
100	359,856	5,794,980	4,346,235	2,897,490	1,448,745	579,498
75	269,892	4,346,235	3,259,676	2,173,118	1,086,559	434,624
50	179,928	2,897,490	2,173,118	1,448,745	724,373	289,749
25	89,964	1,448,745	1,086,559	724,373	362,186	144,875
10	35,986	579,498	434,624	289,749	144,875	57,950

Additional reductions in agricultural loading may be achievable based on the results of ongoing research. Current research areas include increased reductions associated with BMP implementation, up to a 30 % reduction for fertilized crops, the installation of nitrate recovery wells and bioreactors, and increased reductions associated with widespread rotational production and cover crop planting.

2.11.2 Possible OSTDS Reductions To Address the Gap

Table 14 summarizes the nitrogen inputs, attenuation and recharge factors, and loads to groundwater for conventional OSTDS. The conventional OSTDS nitrogen input is based on a per capita contribution of 9.012 lb-N/yr. This value is multiplied by the estimated number of people using the system. Percent reductions are applied to the conventional OSTDS nitrogen groundwater loads to determine improvements to groundwater. Enhanced OSTDS reduce the conventional nitrogen inputs by 65 % and replaced/sewered OSTDS reduce the conventional nitrogen inputs by 95 % (assumes AWT). The results show an estimated nitrogen reduction (i.e., credit) of 5.3 in high recharge areas, 2.9 in medium recharge areas, and 0.6 in low recharge areas for each enhanced OSTDS and an estimated nitrogen reduction of 7.7 in high recharge areas, 4.3 in medium recharge areas, and 0.9 in low recharge areas for each replaced OSTDS.

Table 14. Estimated OSTDS improvements to groundwater

Recharge Category	Conventional OSTDS Load To Groundwater (lb-N/yr/OSTDS)	Reduction To Groundwater (lb-N/yr/OSTDS)	
		Enhanced OSTDS	Replaced OSTDS
Nitrogen Input	18	–	–
Attenuation (0.5)	9.0	–	–
Low Recharge (0.1)	0.9	**0.6**	**0.9**
Medium Recharge (0.5)	4.5	**2.9**	**4.3**
High Recharge (0.9)	8.1	**5.3**	**7.7**

Table 15 lists the estimated reductions associated with OSTDS enhancement and replacement. Using these "credits," reductions associated with OSTDS projects may be determined.

The estimates in the table indicate that loading can be substantially reduced to address OSTDS sources. However, OSTDS are a relatively small source compared with other sources in the basin. Estimated costs for retrofitting (onsite treatment improvements) or removing (sewering) OSTDS range from $10,000 to $20,000 per system. These costs can be refined as projects are completed and detailed cost data are available. The overall reduction goal is 4,075,935 lb-N/yr; thus, the targets cannot be achieved through OSTDS reductions alone.

Table 15. Estimated reduction credits for additional OSTDS enhancement or sewer *

***Estimated reductions listed in the table are for either enhancement or sewer per parcel classification. Reductions cannot be combined for the same parcel classification but can be combined between the different classifications. For example, the sewer credit associated with parcels less than one acre in size can be combined with the sewer credit associated with parcels one acre or greater in size.

Recharge Area	BMAP Policy: OSTDS Parcels Less Than One Acre in PFAs	Credit for Sewer (lb-N/yr)	Credit for Enhancement (lb-N/yr)	OSTDS Parcels One Acre and Greater in PFAs	Credit for Sewer (lb-N/yr)	Credit for Enhancement (lb-N/yr)
High	6,290	48,433	33,337	13,523	104,127	71,672
Medium	0	0	0	0	0	0
Total	**6,290**	**48,433**	**33,337**	**13,523**	**104,127**	**71,672**

2.11.3 Possible UTF Reductions To Address the Gap

The anticipated reduction from UTF sources is currently limited to 6 % of the estimated load to groundwater. This reduction can be achieved through a 6 % total credit if each local government has an applicable fertilizer ordinance, landscape ordinance, irrigation ordinance, and pet waste ordinance; carries out public education activities; and implements the Florida Yards and Neighborhood (FYN) Program (**Table 16**).

Table 16. Maximum load reductions from UTF improvements based on existing public education credit policies

UTF Source Control Measures	Credit, Based on Estimated Load to Groundwater (%)	Possible Nitrogen Credits (lb-N/yr)
Fertilizer Ordinance	0.50	1,466
Pet Waste Ordinance	0.50	1,466
Landscape Ordinance	0.50	1,466
Irrigation Ordinance	0.50	1,466
FYN Program	3.00	8,795
Public Education Program	1.00	2,932
Total Possible Credits	**6.00**	**17,589**

If all the local governments were to implement the full suite of public education measures, a 17,589 lb-N/yr reduction could be achieved. Currently, it is assumed that all local governments have or will adopt the required fertilizer ordinance for a reduction credit of 1,466 lb-N/yr. Thus, an additional 16,123 lb-N/yr reduction could be achieved through public education and source control efforts.

2.12 Commitment to Implementation

Successful BMAP implementation requires commitment, dedicated state funding, and follow-up. Stakeholders have expressed their intention to carry out the plan, monitor its effects, and continue to coordinate within and across jurisdictions to achieve nutrient reduction goals. As the TMDLs must be achieved within 20 years, DEP, FDACS, and SRMWD will implement management actions with the annual $50 million state appropriations to reduce nitrogen in the

Suwannee River Basin. The cost estimates for implementing advanced nitrogen reducing technologies and implementing voluntary land acquisition or conservation easements is well within state appropriations.

Section 3: Monitoring and Reporting

3.1 Methods for Evaluating Progress

DEP will work with stakeholders to track project implementation and organize the monitoring data collected each year. The project and monitoring information will be presented in an annual update. Stakeholders have agreed to meet annually after the adoption of the BMAP to follow up on plan implementation, share new information, and continue to coordinate on TMDL restoration-related issues. The following activities may occur at annual meetings:

Implementation data and reporting:

- Collect project implementation information from stakeholders, including FDACS agricultural BMP enrollment and FDOH-issued permits, and compare with the BMAP schedule.
- Discuss the data collection process, including any concerns and possible improvements to the process.
- Review the monitoring plan implementation, as detailed in **Section 3.3**.

Sharing new information:

- Report on results from water quality monitoring and trend information.
- Provide updates on new management strategies in the basin that will help reduce nutrient loading.
- Identify and review new scientific developments on addressing nutrient loads and incorporate any new information into annual progress reports.

Coordinating TMDL restoration–related issues:

- Provide updates from DEP on the basin assessment cycle and activities related to any impairments, TMDLs, and BMAP.
- Obtain reports from other basins where tools or other information may be applicable to the Suwannee River Basin TMDLs.

3.2 Adaptive Management Measures

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

- Procedures to determine whether additional cooperative strategies are needed.

- Criteria/processes for determining whether and when plan components need revision because of changes in costs, environmental impacts, social effects, watershed conditions, or other factors.

- Descriptions of stakeholders' roles after BMAP completion.

- Description of the proposed corrective actions (and any supporting documentation) that will be undertaken if water quality does not improve after the management actions are implemented or if management actions are not completed on schedule, and a process for notifying DEP that these corrective actions are being implemented.

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

3.3 Water Quality Monitoring

3.3.1 Objectives

Focused objectives are critical for a monitoring strategy to provide the information needed to evaluate implementation success. Since the BMAP is an iterative process, the monitoring efforts are related to primary and secondary objectives. The primary objectives focus on water quality improvements, while the secondary objectives focus on water quality parameters that can be used to provide information for future refinements of the BMAP. The monitoring strategy may be updated after the first year of data is collected and analyzed.

Primary objectives:

- Determine the levels of existing water quality parameters.

- Document nutrient trends in the Suwannee River Basin and associated springs.

- Focus BMP efforts by using sampling data results combined with appropriate GIS information, including land use data.

Secondary objectives:

- Identify areas where groundwater data might help in understanding the hydrodynamics of the system.

- Determine and implement more effective nutrient reduction strategies.

- Determine the effectiveness of nitrogen isotope and tracer sampling for identifying organic and inorganic sources.

3.3.2 Parameters, Frequency, and Network

To achieve the objectives listed above, the monitoring strategy focuses on two types of indicators to track improvements in water quality: core and supplemental (**Table 17** and **Table 18,** respectively). The core indicators are directly related to the parameters causing impairment in the river or associated springs. Supplemental indicators are monitored primarily to support the interpretation of core water quality parameters. The monitoring network is established for a variety of purposes. For this BMAP, TN is considered to be the key core parameter measured, to track progress in decreasing nitrogen concentrations in groundwater and the water surfacing at the spring vent. The other parameters are considered supplementary parameters for the BMAP, as they build information about groundwater and the spring but are not direct measurements of impairment.

At a minimum, the core parameters will be tracked to determine the progress that has been made towards meeting the TMDLs and/or achieving the NNC. Resource responses to BMAP implementation may also be tracked. A significant amount of time may be needed for changes in water chemistry to be observed. However, resource responses represent improvements in the overall ecological health of the Suwannee River Basin (see **Table 19**).

Table 17. Core water quality indicators and field parameters

Core Parameters	Anticipated Trend
Chloride	Indicator of human wastewater
Sulfate	Decrease in concentration
Potassium	Decrease in concentration
Ammonia as Nitrogen	Decrease in concentration
Total Kjeldahl Nitrogen	Decrease in concentration
Nitrate/Nitrite as Nitrogen	Decrease in concentration
Boron	Indicator of human wastewater
Oxygen isotopes	Change in organic/inorganic ratios
Nitrogen isotopes	Change in organic/inorganic ratios

Table 18. Supplemental water quality indicators and field parameters

Supplemental Parameters	Anticipated Trend
Specific Conductance	Monitored to support interpretation of core indicators
Dissolved Oxygen (DO)	Monitored to support interpretation of core indicators
pH	Monitored to support interpretation of core indicators
Temperature	Monitored to support interpretation of core indicators
Total Suspended Solids (TSS)	Monitored to support interpretation of core indicators

Table 19. Anticipated resource responses from BMAP implementation

Resource Responses
Increase in Stream Condition Index (SCI) score
Increase in Linear Vegetation Survey (LVS) score
Increase in Rapid Periphyton Survey (RPS) score
Increase in key fish populations

Initially, data from the ongoing sampling effort being conducted by DEP and SRWMD will be used to determine progress towards the primary objectives. **Figure 12** shows the locations of the river and spring stations currently being sampled that will be used for the BMAP monitoring in the Suwannee River Basin.

The secondary (research) objectives will be developed based on the results of the actions occurring in the adjoining Santa Fe Basin Restoration Focus Area (RFA). The number and location of the monitoring wells to be sampled or installed will be determined after the initial effort in the Santa Fe Basin RFA provides information on the state of the system and where additional monitoring might be most effective.

3.3.3 Data Management and Assessment

As of June 30, 2017, water quality data in Florida are entered by the entity collecting the data into the Florida Watershed Information Network (WIN) Database, which is replacing the Florida Storage and Retrieval System (STORET). DEP pulls water quality data directly from WIN for impaired waters evaluations and TMDL development. Data providers are required to upload their data regularly, so the information can be used as part of the water quality assessment process and for annual reporting. Data providers should upload their data to WIN upon the completion of the appropriate quality assurance/quality control (QA/QC) checks. All data collected in the last quarter of the calendar year should be uploaded no later than April 1 of the following year.

Biological data are stored in the DEP Statewide Biological (SBIO) Database. Biological data collected by data providers should also be uploaded regularly, after the appropriate QA/QC checks. All biological data collected in the last quarter of the calendar year should be uploaded no later than April 1 of the following year.

The water quality and biological data will be analyzed during BMAP implementation to determine trends in water quality and the health of the biological community. A wide variety of statistical methods are available for the water quality trend analyses. The selection of an appropriate data analysis method depends on the frequency, spatial distribution, and period of record available from existing data. Specific statistical analyses were not identified during BMAP development. However, commonly accepted methods of data analysis will be proposed to stakeholders and incorporated into future BMAP revisions.

Figure 12. Groundwater and surface water stations sampled in the Suwannee River Basin

3.3.4 QA/QC

Stakeholders participating in the monitoring plan must collect water quality data in a manner consistent with Chapter 62-160, F.A.C., and the DEP standard operating procedures (SOPs) for QA/QC required by rule. The most current version of these procedures is available on the DEP website. For BMAP-related data analyses, entities should use National Environmental Laboratory Accreditation Conference (NELAC) National Environmental Laboratory Accreditation Program (NELAP)–certified laboratories or other labs that meet the certification and other requirements outlined in the SOPs.

Appendices

Appendix A. Important Links

The links below were correct at the time of document preparation. Over time, the locations may change and the links may no longer be accurate.

- DEP Website: www.dep.state.fl.us
- DEP Map Direct Webpage: https://ca.dep.state.fl.us/mapdirect/
- Email Address for Terry Hansen, Basin Coordinator: terry.hansen@dep.state.fl.us
- TMDLs: http://www.dep.state.fl.us/water/tmdl/
- Section 403.067, F. S.: http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0400-0499/0403/Sections/0403.067.html
- Priority Focus Area Reports: http://publicfiles.dep.state.fl.us/DEAR/BMAP/Suwannee/PFA/
- Springs Prohibitions: http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0373/Sections/0373.811.html
- DEP Model Ordinances: http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/dep-fert-modelord.pdf
- DEP Standard Operating Procedures for Water Quality Samples: http://www.dep.state.fl.us/water/sas/sop/sops.htm
- NELAC NELAP: https://fldeploc.dep.state.fl.us/aams/index.asp
- FDACS BMPs: http://www.freshfromflorida.com/Water/Best-Management-Practices-BMPs/Enroll-in-BMPs/BMPs-at-a-Glance
- FDACS BMP and Field Staff Contacts: http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy
- Florida Administrative Code (Florida Rules): https://www.flrules.org/
- Laws of Florida: http://laws.flrules.org/
- Florida Statutes: http://www.leg.state.fl.us/statutes/
- SRWMD SWIM Plans: http://www.srwmd.state.fl.us/index.aspx?NID=447
- SRWMD 2017 Consolidated Annual Report: http://www.srwmd.state.fl.us/DocumentCenter/View/11712
- UF–IFAS Research: http://research.ifas.ufl.edu/

Appendix B. Projects To Reduce Nitrogen Sources

Table B-1. Stakeholder projects to reduce nitrogen sources

Notes:
While the 20-year planning period for this BMAP is 2017−36, projects completed since July 1, 2007, count toward the overall nitrogen reduction goals. June 30, 2007, was the end date of the period of record used when setting the TMDLs.
Estimated nitrogen reductions are subject to refinement based on DEP verification and/or on adjustment to calculations based on loading to groundwater rather than surface water.
TBD = To be determined; NA = Not applicable

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
Alliance Dairy	High	AD-01	Rotational Grazing and Anaerobic Digester Pilot Project	Information not provided.	BMPs	Lower Suwannee River Basin	Underway	Information not provided	Information not provided	LW	Information not provided	Information not provided	Information not provided	Information not provided
Town of Branford	High	BRAN-01	Advanced Wastewater Treatment Facility (WWTF)	Upgrade WWTF from secondary to advanced water treatment.	WWTF Upgrade	Middle Suwannee River Basin	Planned	2017	2018	WWTF	TBD	$1,500,000	DEP/ SRWMD	TBD
Town of Branford	High	BRAN-02	Branford Wastewater Effluent Pond Failure Repairs	Replace effluent pond at WWTP with tanks.	WWTF Upgrade	Middle Suwannee River Basin	Underway	2014	2017	WWTF	TBD	$264,500	Town/ SRWMD	SRWMD: $231,500 Town: $33,000
Town of Bronson	High	BRON-01	Septic to Sewer Conversion, Phases 2 and 3	Expansion of the town's wastewater collection system and decommission 30 to 50 septic systems.	Wastewater Service Area Expansion	Lower Suwannee River Basin	Planned	TBD	TBD	OSTDS	1,500	$1,650,000	Town/ DEP/ SRWMD	TBD
City of Chiefland	High	CH-01	Biosolids Treatment Unit Replacement	Reconstruct the City's aged biosolids treatment unit (digester). The project includes two new tanks and other equipment to better treat the biosolids.	WWTF Upgrade	Lower Suwannee River Basin	Underway	2016	2018	WWTF	TBD	$418,400	City/DEP	DEP: $376,560 City: $41,840
City of Fanning Springs	High	FS-01	Fanning Springs Water Quality Improvement Project, Phase I	Expansion of wastewater collection and transmission system to convert septic to sewer in Areas 1-4 (65 septic systems).	Wastewater Service Area Expansion	Lower Suwannee River Basin	Completed	2014	2015	OSTDS	1,300	$1,276,360	City/ DEP/ SRWMD	City: $662,000 DEP: $492,960 SRWMD: $121,440
City of Fanning Springs	High	FS-02	Fanning Springs Water Quality Improvement Project, Phase II	Expansion of wastewater collection and transmission system to convert septic to sewer in Area 10 (60 septic systems).	Wastewater Service Area Expansion	Lower Suwannee River Basin	Underway	2015	2018	OSTDS	4,300	$2,120,000	DEP/ SRWMD / City	DEP: $2,000,000 SRWMD: $120,000

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
City of Fanning Springs	High	FS-03	Fanning Springs Water Quality Improvement Project, Phase III	Expansion of wastewater collection and transmission system to convert 198 septic systems to sewer in Areas 5-9.	Wastewater Service Area Expansion	Lower Suwannee River Basin	Underway	2016	2018	OSTDS	4,554	$3,395,100	City/ DEP/ SRWMD	DEP: $3,355,100 City: $40,000
City of Fanning Springs	High	FS-04	Advanced Wastewater Treatment (AWT) System Expansion, Phase 6	Construction of a new AWT facility that will have capacity for wastewater flows from Lancaster Prison and a portion of Alliance Dairy to benefit Hart and Otter Springs.	WWTF Upgrade	Lower Suwannee River Basin	Planned	TBD	TBD	WWTF	TBD	$7,000,000	City/ DEP/ SRWMD	TBD
City of Fanning Springs	High	FS-05	Lancaster Prison/ Alliance Dairy/ City of Fanning Springs Wastewater Treatment Improvements and Aquifer Recharge	Convey wastewater from Lancaster Prison and Alliance Dairy (both facilities are secondary treatment) to City's advanced WWTF for treatment and recharge wetlands.	Wastewater Service Area Expansion	Lower Suwannee River Basin	Planned	TBD	TBD	WWTF	TBD	$10,000,000	City/ DEP/ SRWMD	TBD
City of Live Oak	High	LO-01	Hillman Regional Stormwater Management Facility	Information not provided.	Stormwater System Upgrade	Middle Suwannee River Basin	Underway	Information not provided	Information not provided	UTF	TBD	$1,564,500	Information not provided	Information not provided
City of Live Oak	High	LO-02	Stormwater, Drainage, and Aquifer Recharge Well Rehabilitation	Installation of 60 wells for 4,800 pounds of aquifer recharge volume.	Groundwater Management	Middle Suwannee River Basin	Underway	Information not provided	Information not provided	Other	TBD	$7,200,000	City/ SRWMD	Information not provided
City of Live Oak	High	LO-03	Suwannee Country Club (SCC) Reuse Connection	Connect the SCC golf course to the City of Live Oak reuse line and install a pump station.	BMPs	Middle Suwannee River Basin	Completed	2014	2017	STF	Information not provided	$129,344	SRWMD	SRWMD: $129,344
City of Live Oak	High	LO-04	Live Oak 49/90 Lift Station Improvements	Install a mixer in the lift station to eliminate sewage spills and improve water quality.	WWTF Upgrade	Middle Suwannee River Basin	Completed	2016	2017	WWTF	Information not provided	$30,802	City/ SRWMD	SRWMD: $24,840 City: $5,962
City of Live Oak	Medium	LO-05	South Walker Avenue Stormwater Management Facility Expansion	Information not provided.	Stormwater System Upgrade	Middle Suwannee River Basin	Planned	TBD	TBD	UTF	TBD	$158,500	TBD	TBD

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
City of Live Oak	Medium	LO-06	9th and Scriven Regional Stormwater Management Facility	Information not provided.	Stormwater System Upgrade	Middle Suwannee River Basin	Planned	TBD	TBD	UTF	TBD	$600,000	TBD	TBD
City of Live Oak	Medium	LO-07	Northeast Regional Stormwater Management Facility	Information not provided.	Stormwater System Upgrade	Middle Suwannee River Basin	Planned	TBD	TBD	UTF	TBD	$1,400,000	TBD	TBD
City of Live Oak	Medium	LO-08	Duval and Lisle Stormwater Management Facility Expansion	Information not provided.	Stormwater System Upgrade	Middle Suwannee River Basin	Planned	TBD	TBD	UTF	TBD	$64,500	TBD	TBD
City of Live Oak	Medium	LO-09	Stormwater, Drainage, and Aquifer Recharge Well Pretreatment Retrofit	Identification of a minimum of five existing, high priority stormwater drainage/aquifer drainage wells not within FDOT right of-way to retrofit wells with a pretreatment method that may include: detention/retention, biological nutrient removal, skimmers, or biological activated material for advanced water treatment.	Stormwater System Upgrade	Middle Suwannee River Basin	Planned	TBD	TBD	Other	TBD	$866,800	City/ DEP/ SRWMD	TBD
City of Live Oak	Medium	LO-10	Denitrification Carousel Tank No. 1 Rehabilitation and Retrofit	Rehabilitation of an aged biological nutrient removal tank, including solids removal, rehab/replacement of surface aerator, installation of two additional aerators and mixer, sealing of two anoxic basins and two oxidation tanks, and control system upgrades.	WWTF Upgrade	Middle Suwannee River Basin	Planned	TBD	TBD	WWTF	TBD	$1,178,000	City/ DEP/ SRWMD	TBD
City of Live Oak	Medium	LO-11	Duval Street and 105th Road Wastewater System Extensions	Extend the City's wastewater collection system to serve approximately 30 homes and three businesses.	Wastewater Service Area Expansion	Middle Suwannee River Basin	Planned	TBD	TBD	OSTDS	959	$1,476,000	City/ DEP/ SRWMD	TBD

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
City of Live Oak	Medium	LO-12	2nd Street and Evelyn Avenue Wastewater System Extensions, Phase 1	Extend the City's wastewater collection system to serve approximately 30 homes.	Wastewater Service Area Expansion	Middle Suwannee River Basin	Planned	TBD	TBD	OSTDS	1,050	$1,089,300	City/ DEP/ SRWMD	TBD
City of Madison	High	MAD-01	Lake Frances Sediment Control	This project will improve the quality of stormwater discharged to Lake Frances, which receives most stormwater in the city, a 61-acre watershed.	Stormwater System Upgrade	Withlacoochee River Basin	Underway	Information not provided	Information not provided	UTF	Information not provided	$77,525	SRWMD	SRWMD: $77,525
City of Trenton	High	T-01	Wastewater Treatment Facility (WWTF) Improvements	Improvements to City's WWTF to provide advanced wastewater treatment.	WWTF Upgrade	Lower Suwannee River Basin	Planned	TBD	TBD	WWTF	TBD	$6,200,000	City/ DEP/ SRWMD/ USDA	TBD
City of Trenton	High	T-02	Trenton Lift Station #7 Rehabilitation	Rehabilitate existing lift station.	WWTF Upgrade	Lower Suwannee River Basin	Underway	2014	2017	WWTF	Information not provided	$207,800	City/ SRWMD	SRWMD: $150,000 City: $57,800
Dixie County	High	DC-01	Lower Suwannee River Springs Restoration and Aquifer Recharge	Restore ~500 acres of sand ponds and rehydrate ~1,250 acres of wetlands by re-establishing natural flow through natural recharge features and an aquifer recharge well. The project will conserve ~3.26 mgd in water supporting water supply and spring flow of Fanning Springs and the Lower Suwannee River.	Hydrologic Restoration	Lower Suwannee River Basin	Underway	2016	2018	Other	TBD	$2,406,359	County/ DEP/ SRWMD	DEP: $2,200,000 SRWMD: $106,359 County: $100,000
Dixie County	High	DC-02	Cow Pond Drainage Basin Aquifer Recharge Project	Re-establish natural drainage patterns and use natural recharge features and aquifer recharge wells to restore approx. 300 acres of sand ponds and rehydrate approx. 1,750 acres of wetlands while conserving 1.69 MGD of water and support spring flow.	Hydrologic Restoration	Lower Suwannee River Basin	Underway	2016	2018	Other	TBD	$1,600,000	County/ DEP/ SRWMD	DEP: $1,500,000 SRWMD: $50,000 County: $50,000

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
Florida Dept. of Agriculture and Consumer Services (FDACS)	High	FDACS-01	Best Management Practices (BMPs) Implementation and Verification - Farm Fertilizer	Implementation of existing BMPs on applicable acreage. Up to 15% reduction in load to groundwater.	BMPs	Basinwide	Underway	Information not provided	Information not provided	FF	869,247	$14,000,000	FDACS	TBD
FDACS	High	FDACS-02	BMPs Implementation and Verification - Livestock Waste	Implementation of existing BMPs at applicable facilities.	BMPs	Basinwide	Underway	Information not provided	Information not provided	LW	208,739	Information not provided	FDACS	TBD
Florida Dept. Environ. Protection Florida Park Service (FPS)	High	FPS-01	Fanning Springs State Park Restoration	Replant submerged aquatic vegetation (SAV) in spring run of Fanning and Little Fanning Springs.	SAV Planting	Lower Suwannee River Basin	Planned	TBD	TBD	Other	TBD	TBD	DEP	TBD
FPS	High	FPS-02	Manatee Spring State Park Restoration	Replant SAV in spring run.	SAV Planting	Lower Suwannee River Basin	Planned	TBD	TBD	Other	TBD	TBD	DEP	TBD
FPS	High	FPS-03	Troy Spring State Park Restoration	Shoreline stabilization at spring run.	Shoreline Stabilization	Middle Suwannee River Basin	Planned	TBD	TBD	Other	TBD	TBD	DEP	TBD
Florida Dept. of Transpor-tation (FDOT)	High	FDOT-01	Fertilizer Elimination	Eliminate fertilizer in rights-of way.	Fertilizer Cessation	Basinwide	Completed	Information not provided	Information not provided	UTF	Information not provided	Information not provided	Information not provided	Information not provided
FDOT	Medium	FDOT-02	Stormwater Pond Retrofit	Stormwater pond retrofit with denitrification capacity.	Wet Detention Pond	Basinwide	Planned	TBD	TBD	UTF	TBD	$200,000	TBD	TBD
FDOT	High	FDOT-03	FDOT Water Quality Pilot Project	Comparison of the nutrient removal effectiveness of two different types of biosorptive activated media in a roadside swale just east of Fanning Springs.	Studies	Lower Suwannee River Basin	Underway	2015	2018	Other	NA	$180,101	SRWMD	SRWMD: $180,101
Florida Farm Bureau (FFB)	High	FFB-01	Agricultural Producer Workshops	Workshops with agricultural producers in the basin.	BMPs	Basinwide	Underway	Information not provided	Information not provided	FF	Information not provided	Information not provided	Information not provided	Information not provided

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
FFB	High	FFB-02	County Alliance for Responsible Environmental Stewardship (CARES)	Stewardship program active within the basin.	BMPs	Basinwide	Underway	Information not provided	Information not provided	FF	Information not provided	Information not provided	Information not provided	Information not provided
Gilcrhist County	High	GC-01	Hart and Otter Springs Water Quality Improvement Project	A three-phase project to decommission septic systems at Otter and Hart Springs and to decommission the wastewater package plant at Hart Springs to connect to Fanning Springs WWTP.	Wastewater Service Area Expansion	Lower Suwannee River Basin	Underway	2016	2019	OSTDS	1,724	$5,979,740	DEP	DEP: $1,829,890 (Phase I)
Lafayette County	High	LC-01	County Road 300 Stormwater Improvement Project	Design and construction of a stormwater collection and conveyance system that will increase stormwater storage.	Stormwater System Upgrade	Middle Suwannee River Basin	Underway	2016	Information not provided	UTF	TBD	$142,550	SRWMD / County	SRWMD: $142,550
Madison County	High	MC-01	Madison Blue Spring Aquifer Recharge	Rehabilitate or replace up to six existing drainage wells to improve aquifer recharge rates. Recharge benefits are estimated up to 3.4 mgd.	Groundwater Management	Withlacoochee River Basin	Underway	2017	Information not provided	Other	41,850	$2,500,000	DEP / Nestle Waters / Madison Co. / SRWMD / City of Madison	DEP: $2,150,000 Nestle Waters: $225,000 Madison Co.: $75,000 SRWMD: $50,000
Suwannee County	High	SC-01	WWTF at I-75/CR 136 Interchange	Construction of new WWTF at an interchange in proximity to the Suwannee River. 32 commercial septic systems will be converted to the WWTF.	Wastewater Service Area Expansion	Middle Suwannee River Basin	Underway	2017	Information not provided	OSTDS	39,894	$3,300,000	DEP / County / SRWMD	DEP: $500,000 County: $150,000 SRWMD: $2,650,000
Suwannee River Water Manage-ment District (SRWMD)	High	SRWMD-01	Suwannee River Surface Water Improvement Management (SWIM) Plan	Implementation and periodic review and update of the Suwannee River SWIM Plan.	Studies	Basinwide	Underway	2015	2017	Other	NA	$238,563	SRWMD	SRWMD: $238,563
SRWMD	High	SRWMD-02	Subsurface Irrigation	Replacement of corner (of field) end-guns with subsurface irrigation.	BMPs	Basinwide	Underway	Information not provided	Information not provided	FF	6,000	$240,000	SRWMD	SRWMD: $240,000

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
SRWMD	High	SRWMD-03	Advanced Nutrient Management Through Center Pivots	Fertigation system installation and center pivot retrofits.	BMPs	Basinwide	Underway	2014	Information not provided	FF	272,760	$1,190,700	DEP/ SRWMD	DEP: $915,000 SRWMD: $33,150 Producers: $242,500
SRWMD	High	SRWMD-04	Improved Nutrient Application Practices in Dairy Operations - Phase 2	Retrofit irrigation systems from overhead impact sprinklers to drop nozzles which will allow uniform application of wastewater over crops.	BMPs	Middle Suwannee River Basin	Underway	2015	2017	Dairy	34,000	$2,670,000	DEP/ SRWMD	DEP: $2,120,000 SRWMD: $20,000 Producers: $530,000
SRWMD	High	SRWMD-05	Dairy Wastewater System Improvement	Cost-share projects with dairies to invest in advanced treatment technologies (bioreactors), additional wastewater storage, and advanced manure solid separation.	BMPs	Middle Suwannee River Basin	Underway	2016	Information not provided	Dairy	10,000	$1,800,000	DEP/ SRWMD	DEP: $1,500,000 SRWMD: $300,000
SRWMD	High	SRWMD-06	Dairy Wastewater Conservation and Nutrient Optimization Project	Improve the management of dairy wastewater by increasing storage pond sizes to achieve greater nutrient uptake and irrigation efficiencies.	BMPs	Middle Suwannee River Basin	Underway	2014	Information not provided	Dairy	62,000	$1,885,590	DEP/ FDACS/ SRWMD/ Producers	DEP: $920,000 FDACS: $250,000 SRWMD: $298,004 Producers: $417,586
SRWMD	High	SRWMD-07	Sustainable Suwannee Springs Agriculture Pilot Program - Low Input Agriculture	Agriculture operators are invited to submit proposals to transition to less intensive cropping systems, change the type of cropping system, or change the land use to fallow or native landscape for a certain amount of time or a permanent conservation easement.	BMPs	Basinwide	Underway	2016	2019	FF	375,000	$5,000,000	DEP	DEP: $5,000,000
SRWMD	High	SRWMD-08	Sustainable Suwannee Springs Agriculture Pilot Program - Advanced Water Quality Improvement Technologies	Agriculture operators, landowners, local governments, private companies, other entities may submit proposals for advanced technologies that can cost-effectively reduce nitrogen in groundwater that contributes to spring flow.	BMPs	Basinwide	Underway	2016	2018	FF	66,000	$1,000,000	DEP	DEP: $1,000,000

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
SRWMD	High	SRWMD-09	Regional Initiative Valuing Environmental Resources (RIVER) Program	Benefits of the annual cost-share projects include: improving wastewater facilities serving hundreds of residents and commercial entities, preventing potential discharge of wastewater into receiving waters during various flood events, and significantly reducing nutrient leaching through the removal of a substantial number of septic systems.	WWTF Upgrade	Basinwide	Underway	2012	Information not provided	WWTF	TBD	$1,500,000	SRWMD	SRWMD: $1,500,000
SRWMD	High	SRWMD-10	Precision Agricultural Practices	Provide cost-share funds to agricultural producers within the BMAP area to implement precision nutrient and irrigation management technology.	BMPs	Basinwide	Underway	2017	Information not provided	FF	TBD	$2,500,000	SRWMD	SRWMD: $2,500,000
SRWMD	High	SRWMD-11	Middle Suwannee River Springs Restoration and Aquifer Recharge Project	Installation of hydraulic structures in southeast Lafayette and northeast Dixie counties with the objective of restoring natural water drainage patterns. The project will recharge the aquifer with ~ 10 mgd of water over ~ 1,500 acres of ponds and 4,000 acres of wetlands.	Hydrologic Restoration	Middle Suwannee River Basin	Underway	2015	Information not provided	Other	TBD	$1,900,000	SRWMD/ Dixie County / DEP	DEP: $1,548,000 SRWMD: $277,000 Dixie County: $75,000
SRWMD	High	SRWMD-12	Middle Suwannee River Springs Restoration and Aquifer Recharge Project, Phase II (Mallory Swamp)	Phase II is over 6,000 acres and will rehydrate natural systems along and adjacent to the southeastern margin of Mallory Swamp; thereby increasing available surface water for wetland hydration and groundwater recharge, which will enhance springs restoration.	Hydrologic Restoration	Middle Suwannee River Basin	Planned	TBD	TBD	Other	TBD	TBD	SRWMD	TBD

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
SRWMD	High	SRWMD-13	Otter Springs Restoration	Replace or fix deteriorating retaining walls, stabilize the springs banks to control further erosion, and construct access points to the spring and spring run. It is anticipated this project will benefit the spring by removing nutrients, sediments, and debris from the spring vents and spring runs, and restoring the flow of the original head spring to historic levels.	Shoreline Stabilization	Lower Suwannee River Basin	Underway	2016	Information not provided	Other	Information not provided	$140,000	SRWMD	SRWMD: $140,000
SRWMD	High	SRWMD-14	Hart Springs Restoration	Improve water quality and spring flows.	Hydrologic Restoration	Lower Suwannee River Basin	Completed	Information not provided	2015	Other	Information not provided	$76,500	SRWMD	SRWMD: $76,500
SRWMD	High	SRWMD-15	Pot Spring Restoration Project	The main goal of this project is to stabilize the shoreline along the spring run to prevent sediment from entering the Withlacoochee River.	Shoreline Stabilization	Middle Suwannee River Basin	Underway	2016	2017	UTF	69	$183,600	DEP	DEP: $183,600
SRWMD	High	SRWMD-16	Little River Spring Restoration Project	The main goal of this project was to stabilize the shoreline along the spring run to prevent sediment from entering the Suwannee River.	Shoreline Stabilization	Middle Suwannee River Basin	Completed	2015	2016	Other	Information not provided	$104,587	SRWMD/ Suwannee County	SRWMD: $90,000 County: $14,587
SRWMD	High	SRWMD-17	Charles Spring Restoration Project	Improve water quality through the replacement of a failing seawall along the bank of the spring which will reduce sediment loads washing into the spring.	Shoreline Stabilization	Middle Suwannee River Basin	Completed	2013	2016	Other	Information not provided	$112,378	County/ SRWMD	SRWMD: $105,000 County: $7,378
SRWMD	High	SRWMD-18	Gornto Springs Restoration Project	Construction of ~300 foot retaining wall, removal of sediment within spring run, and removal of man-made earthen dam and culvert.	Shoreline Stabilization	Middle Suwannee River Basin	Completed	2014	2017	Other	Information not provided	$167,165	County/ SRWMD	SRWMD: $145,985 County: $21,180

Lead Entity	Priority Ranking	Project Number	Project Name	Project Description	Project Type	Location	Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
SRWMD	High	SRWMD-19	Ravine and Convict Springs Nutrient Capture and Treatment Program	Install interceptor wells to capture high nitrate groundwater. A denitrifying system will be installed at each spring basin that will reduce nutrient loads and return the groundwater at the two locations.	BMPs	Middle Suwannee River Basin	Underway	2016	2020	FF	4,300	$630,000	DEP/ SRWMD	DEP: $600,000 SRWMD: $30,000
Golf Courses	High	GC-01	Golf Course Reduction Credits	6% BMP credit on golf course load to groundwater, assuming 100% BMP implementation by golf course owners.	BMPs	Lower Suwannee and Middle Suwannee River Basins	Planned	TBD	TBD	STF	705	TBD	TBD	TBD
Sports Fields	High	SF-01	Sports Field Reduction Credits	10% BMP credit on sports field load to groundwater, assuming 100% BMP implementation by sports field owners.	BMPs	Lower Suwannee and Middle Suwannee River Basins	Planned	TBD	TBD	STF	346	TBD	TBD	TBD
Waste-water Utilities	High	WU-01	Wastewater Treatment Facility Reduction Credits	Achieved by WWTF policy if implemented BMAP-wide, achieving 3 or 6 mg/L.	WWTF Upgrade	Lower Suwannee and Middle Suwannee River Basins	Planned	TBD	TBD	WWTF	17,533	TBD	TBD	TBD
Local Govern-ments	High	LG-01	Public Education	Adopted fertilizer ordinance.	Public Education	Basinwide	Planned	TBD	TBD	UTF	1,466	TBD	TBD	TBD
Permitted Dairies	High	PD-01	Dairy Reduction Credits	15% BMP credit on dairy load to groundwater assuming 100% owner implemented BMPs on all dairy lands.	BMPs	Middle Suwannee River Basin	Planned	TBD	TBD	Dairy	50,877	TBD	TBD	TBD

Appendix C. PFA Reports

The three PFA reports can be accessed here:
http://publicfiles.dep.state.fl.us/DEAR/BMAP/Suwannee/PFA/

Appendix D. OSTDS Remediation Plan

The Florida Aquifer and Springs Protection Act specifies that if during the development of a BMAP for an OFS, DEP identifies OSTDS as contributors of at least 20 % of nonpoint source nitrogen pollution in a PFA or if DEP determines remediation is necessary to achieve the TMDL, the BMAP shall include an OSTDS remediation plan. Based on the Suwannee River NSILT estimates and GIS coverages, OSTDS contribute approximately 3 % of the pollutant loading in the PFAs.

The OSTDS remediation plan must carry out the following:

- Evaluate credible scientific information on the effect of nutrients, particularly forms of nitrogen, on springs and spring systems.
- Include options for repair, upgrade, replacement, drain field modification, the addition of effective nitrogen-reducing features, connection to a central sewer system, or other action.
- Identify cost-effective and financially feasible projects necessary to reduce the nutrient impacts from OSTDS.
- Include a priority ranking for each project for funding contingent on appropriations in the General Appropriations Act.
- Include a public education plan to provide area residents with reliable, understandable information about OSTDS and springs.

The Florida Springs and Aquifer Protection Act defines an OSTDS as a system that contains a standard subsurface, filled, or mound drain field system; an aerobic treatment unit; a graywater system tank; a laundry wastewater system tank; a septic tank; a grease interceptor; a pump tank; a solids or effluent pump; a waterless, incinerating, or organic waste–composting toilet; or a sanitary pit privy that is installed or proposed to be installed beyond the building sewer on land of the owner or on other land on which the owner has the legal right to install such a system. The term includes any item placed within, or intended to be used as a part of or in conjunction with, the system. The term does not include package sewage treatment facilities and other treatment works regulated under Chapter 403, F.S.

D.1 Collection and Evaluation of Credible Scientific Information

As discussed in **Section 2,** DEP developed the NSILT, a planning tool that provides estimation of nitrogen loading sources to groundwater based on the best available scientific data at the time the tool is used for a particular geographic area. The NSILT estimates prepared for the Suwannee River Basin were obtained through separate evaluations of the Withlacoochee River, Middle Suwannee River, and Lower Suwannee River Sub-basins. The results were peer reviewed by

SRWMD, FDOH, and FDACS. DEP intends to update the Suwannee River NSILT by the first five-year milestone of the BMAP planning period.

DEP developed calculation methods to estimate nitrogen reductions associated with septic system enhancement and replacement projects, WWTF projects, golf course BMPs, other STF BMPs, and UTF BMPs. The calculations are based on extensive scientific research documented in the bibliography in **Appendix E.**

D.2 Remediation Options

The NSILT estimates that OSTDS contribute approximately 3 % of the pollutant loading to groundwater in the PFAs. **Table D-1** lists the number of existing OSTDS in the PFAs and the estimated nitrogen reductions associated with enhancement or replacement (i.e., sewer).

Table D-1. Estimated reduction credits for additional OSTDS enhancement or sewer*

***Estimated reductions are for either enhancement or sewer per parcel classification. Reductions cannot be combined for the same parcel classification, but can be combined between the different classifications. For example, the sewer credit associated with parcels less than one acre in size can be combined with the sewer credit associated with parcels one acre or greater in size.

Recharge Area	BMAP Policy: OSTDS Parcels Less Than One Acre in PFAs	Credit for Sewer (lb-N/yr)	Credit for Enhancement (lb-N/yr)	OSTDS Parcels One Acre and Greater in PFAs	Credit for Sewer (lb-N/yr)	Credit for Enhancement (lb-N/yr)
High	6,290	48,433	33,337	13,523	104,127	71,672
Medium	0	0	0	0	0	0
Total	**6,290**	**48,433**	**33,337**	**13,523**	**104,127**	**71,672**

Priority areas for remediation will be chosen from the area inside the PFAs. **Figure D-1**, **Figure D-2**, and **Figure D-3** show the areas where OSTDS in the PFAs will likely be remediated.

Remediation options are classified as replacement or enhancement. Replacement is the conversion of an OSTDS to a central sewer system. Enhancement is the installation of a nitrogen reducing system, including the in-ground nitrogen-reducing biofilters (media layer systems) specified in a proposed Rule 64E-6.009(7), F.A.C., (as of August 2017); the in-tank nitrogen-reducing biofilters identified in FDOH's Florida Onsite System Nitrogen Removal Strategy Studies; and other FDOH-approved treatment systems (e.g., aerobic treatment units [ATU] and performance-based treatment systems [PBTS]) capable of meeting or exceeding the NSF Standard 245 nitrogen removal rate before disposing wastewater in the drain field. The next section describes the FDOH interpretation of new, modified, and repaired OSTDS per Chapter 381, F.S., and Chapter 64E-6, F.A.C. **Section D.3** discusses the requirements for the repair, modification, and installation of OSTDS.

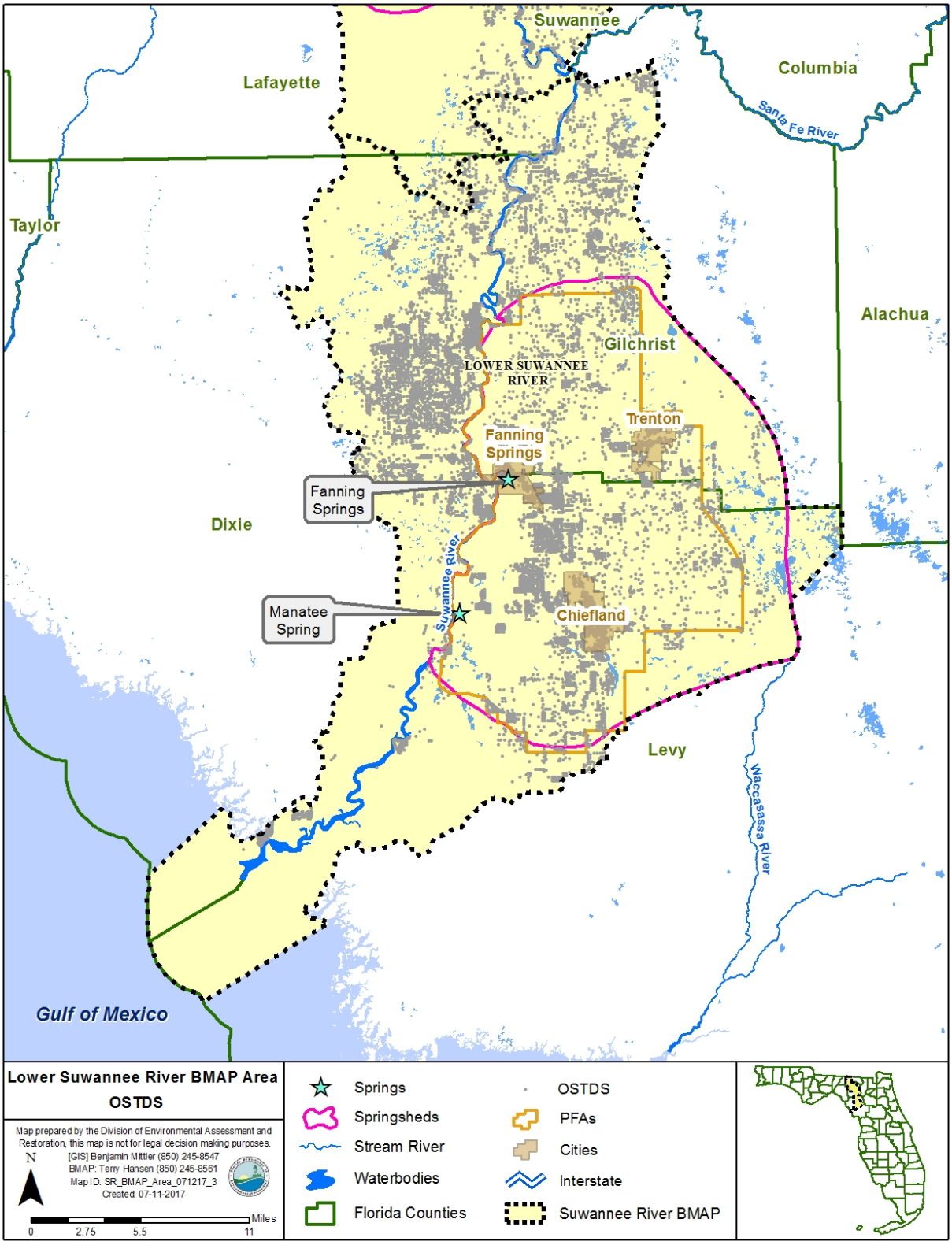

Figure D-1. OSTDS locations in the Lower Suwannee River Sub-basin PFA

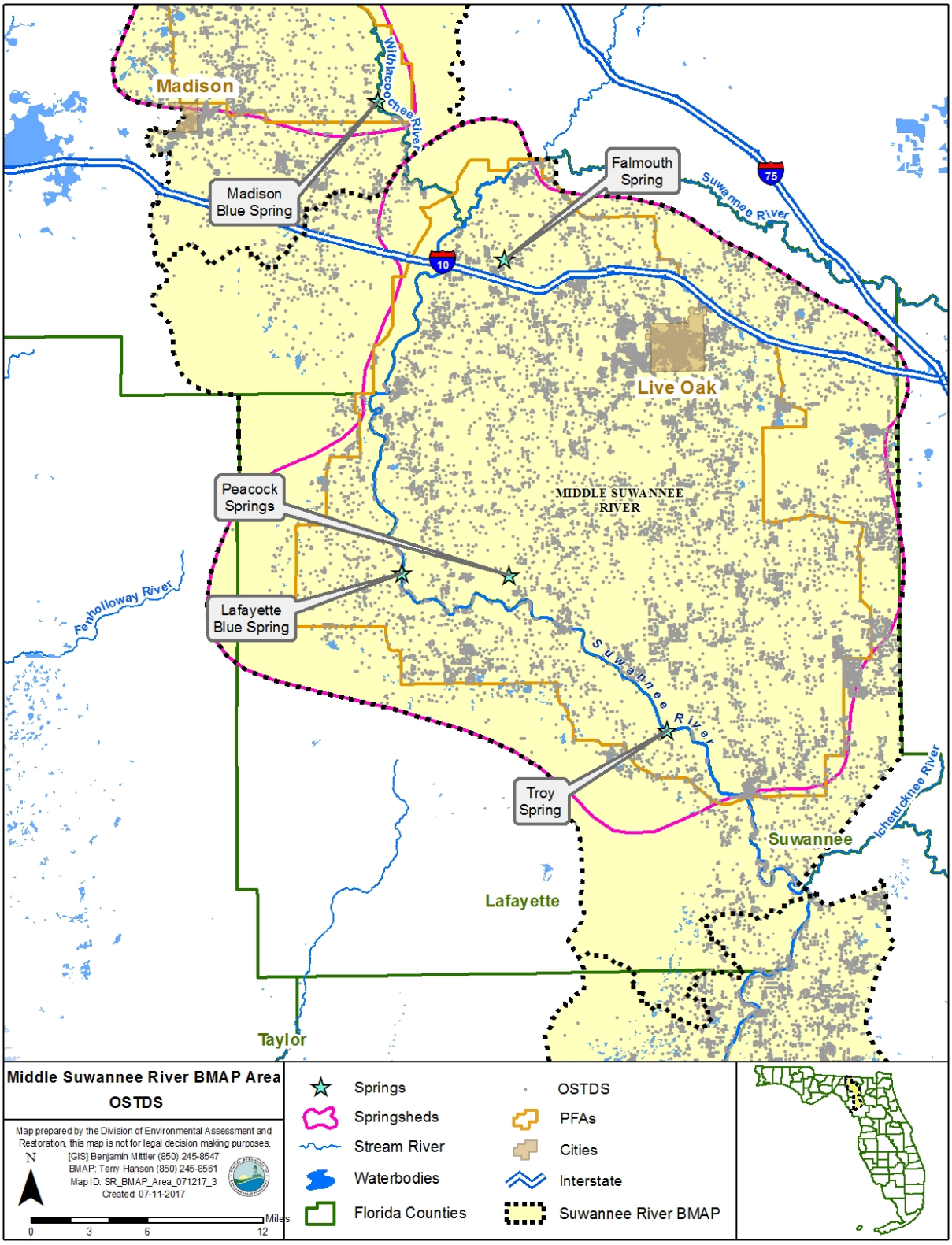

Figure D-2. OSTDS locations in the Middle Suwannee River Sub-basin PFA

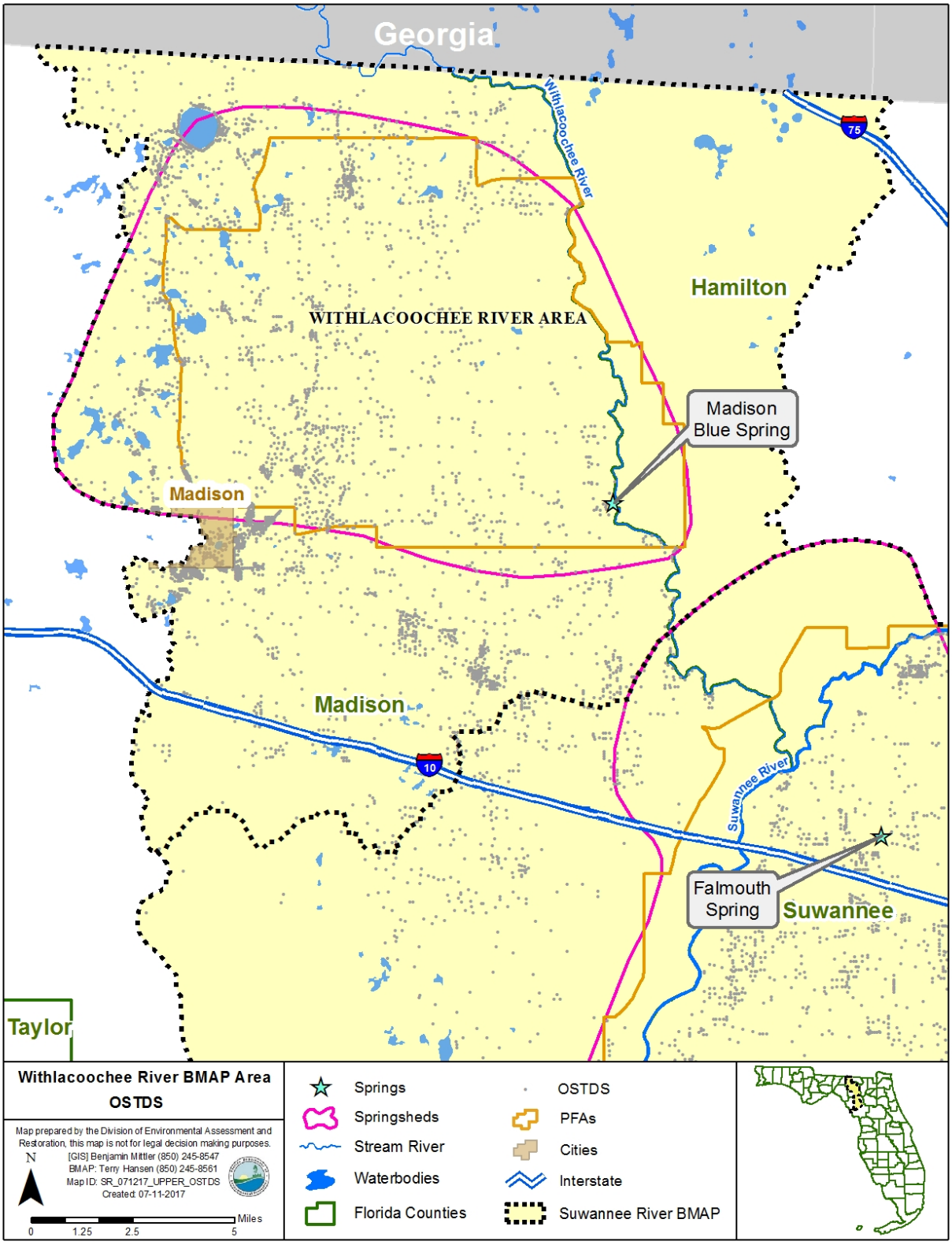

Figure D-3. OSTDS locations in the Withlacoochee River Sub-basin PFA

D.2.1 FDOH Interpretation of New Septic Systems

For purposes of this remediation plan, a new septic system is any OSTDS installed, repaired, altered, modified, abandoned, or replaced after the effective date of this BMAP and in such a way that requires a construction permit from FDOH pursuant to Chapter 64E-6, F.A.C.

D.3 Permitting Policies for OSTDS

Section 373.811(2), F.S., states that new OSTDS are prohibited in an OFS PFA on lots of less than one acre, if the addition of the specific systems conflicts with an OSTDS remediation plan incorporated into a BMAP in accordance with Subsection 373.807(3), F.S. Reducing the nitrogen contribution from OSTDS to groundwater requires a basin wide approach that provides a strategy to complement the requirements of Subsection 373.811(2), F.S. The BMAP additional policies apply to lots less than one acre in size, inside one of the PFAs. The DEP Map Direct webpage includes a springs PFA boundary layer that may be used to reference the area affected by the OSTDS policies.

D.3.1 Construction Permits for OSTDS

On lots of less than one acre in the PFA, any installation, repair, alteration, modification, abandonment, or replacement of an OSTDS that requires a construction permit from FDOH pursuant to Chapter 64E-6, F.A.C., must meet additional requirements. For FDOH to issue a construction permit pursuant to Chapter 64E-6, F.A.C., any such OSTDS must include at least one of the following nitrogen-reducing enhancement features: in-ground nitrogen-reducing biofilters (media layer systems) characterized in Rule 64E-6.009(7), F.A.C.; in-tank nitrogen-reducing biofilters identified in FDOH's Florida Onsite System Nitrogen Removal Strategy Studies; and other FDOH-approved treatment systems (e.g., ATU and PBTS) capable of meeting or exceeding the NSF Standard 245 nitrogen removal rate before disposing the wastewater in the drain field. For FDOH-approved treatment systems that meet NSF 245, but do not meet or exceed the minimum treatment level expected from the in-ground nitrogen-reducing biofilters, the drain fields, at minimum, shall be installed with a 24-inch separation between the bottom of the drain field and the seasonal high water table.

D.3.2 Nitrogen Treatment Requirements for All OSTDS on Lots Less Than One Acre in the PFA In the PFA and on lots of less than one acre, all property owners must, no later than 20 years after BMAP adoption, abandon the OSTDS, install a new OSTDS, or retrofit an existing OSTDS to include nitrogen-reducing enhancement features as specified in in **Section D.3.1.** DEP will seek funding from the Florida Legislature to help offset the costs to individual property owners of connecting to central sewer or upgrading OSTDS to meet the requirements of this BMAP.

D.4 Public Education Plan

The following list of steps provide a possible framework for an OSTDS public education plan:

- **Step 1** – Understand the data and issues associated with OSTDS.
- **Step 2** – Identify existing and short-term activities to address the issues.
- **Step 3** – Undertake a pilot project outreach and social marketing campaign.
- **Step 4** – Identify future actions for basin wide implementation.

An OSTDS public education plan should target the following audiences with appropriate messaging and the preparation and delivery of materials/resources.

Target Audiences

- Schools (bottom-up curriculum; kids to adults).
- Utilities.
- Builders/realtors/developers/business community.

- Residents.
- Septic system contractors.
- Septic system owners.
- Homeowner associations.
- Civic groups.
- Local environmental groups.
- Policymakers (local, regional, and state).
- Public officials.

Messaging

- Convey cost of doing nothing.
- Preserving our waterways.
- Conventional septic systems provide minimal nitrogen treatment; septic system enhancement is needed.
- Septic system enhancement options.
- Promote springshed identity.
- People need to understand water (where it comes from and where it goes).
- Relate septic system pollution to other successful pollution abatement.
- Leave no trace (outdoor ethics).
- Establish connection between springs and septic systems.
- Your watershed/springshed. Your future. Your choice.
- We are all part of the problem and all part of the solution (show negative and positive contributions by people).
- Keep the message simple.

Materials/Resources

- FDOH public service announcements (PSAs) on septic systems.

- Florida Onsite Wastewater Association (FOWA) PSAs on septic systems.
- City of Tallahassee's Think About Personal Pollution Program.
- Southwest Florida Water Management District (SWFWMD) springs education webpage.
- Social media.
- Fact sheets and answers to frequently asked questions.
- Utility bill inserts.
- Websites (local jurisdictions).
- Local FDOH offices.
- Brochures and flyers.
- Billboards.
- Workshops.
- Tool kits.
- Television and radio commercials.

Appendix E. FDACS BMPs

E.1 Implementation of Agricultural BMPs

Agricultural nonpoint sources in a BMAP area are required by state law (Subsection 403.067[7], F.S.) either to implement FDACS-adopted BMPs, which provides a presumption of compliance with water quality standards, or to conduct water quality monitoring prescribed by DEP or SRWMD. Failure either to implement BMPs or conduct monitoring may result in enforcement action by DEP.

Growers who implement BMPs may be eligible for cost-share funding from FDACS, SRWMD, or others to defray partially the costs of implementation. Through the OAWP, the Florida Forest Service, and the Division of Aquaculture, FDACS develops, adopts, and assists producers in implementing agricultural BMPs to improve water quality and water conservation.

FDACS identified potential land that could be enrolled in the BMP Program in the Suwannee River Basin by creating a composite agricultural land use coverage. The acreage for irrigated areas was derived from the Florida Statewide Agricultural Irrigation Demand Irrigated Lands Geodatabase (FSAID ILG) 3, which provides crop and associated irrigation system information. The acreage for nonirrigated lands was derived from SRWMD 2013−14 land use data for agricultural areas not included in the FSAID ILG 3. Acreages for livestock lands were estimated using SRWMD land use data.

Table E-1 summarizes the composite land use data for agriculture in the Suwannee River Basin BMAP area. The total agricultural lands in the BMAP area comprise 359,896 acres. **Table E-2** provides detail on acreages for each of the crop types assumed to be fertilized, by springshed. Crop fertilizer lands total 198,638 acres, with hayfields making up 24 % of this acreage. Hayfields are the largest crop coverage in the basin as well as in each springshed. However, outside the springsheds, peanuts are the most common crop.

Table E-3 lists land uses for the livestock lands, by springshed. There are 155,135 livestock acres in the basin, with improved pastures being the dominant land use, accounting for 63 % of these lands. Improved pasture is also the dominant land use in each of the springsheds and outside the springsheds. It is important to note that 6,123 acres are classified as both fertilized croplands and livestock lands, resulting in some acreage being identified in both **Table E-2** and **Table E-3.**

Figure E-1 summarizes agricultural lands by nutrient source in the BMAP area. **Figure E-2**, **Figure E-3**, and **Figure E-4** provide closer views of the distribution of agricultural lands by nutrient source in the three springsheds.

Table E-1. Composite agricultural land use by nutrient source in the Suwannee River Basin BMAP area

Agricultural Nitrogen Loading Category	Acres Outside Springsheds	Springshed Acres Lower Suwannee River	Springshed Acres Withlacoochee River	Springshed Acres Middle Suwannee River	Acres in BMAP Area
Crop Fertilizer Lands Only	43,906	42,372	17,580	94,780	198,638
Livestock Lands Only	40,320	29,285	11,091	74,438	155,135
Crop Fertilizer and Livestock Lands	1,211	1,507	145	3,260	6,123
Total BMAP Agricultural Acres	**85,438**	**73,164**	**28,816**	**172,477**	**359,896**

Table E-2. Fertilized croplands in the Suwannee River Basin BMAP area

Crop Type	Acres Outside Springsheds	Springshed Acres Lower Suwannee River	Springshed Acres Withlacoochee River	Springshed Acres Middle Suwannee River	Total Acres
Blueberries	26		11	99	136
Cabbage	39				39
Carrots	168		131	273	573
Carrots_Corn	132		201	641	974
Carrots_Rye	262			142	404
ContainerNursery	468	862	28	598	1,957
Corn	144	1,766	195	1,159	3,265
Corn_Oats	80		101	77	258
Corn_Rye	275	273		708	1,255
Corn_SmallGrains			22		22
Corn_SnapBeans	70				70
Cotton	33		27	832	893
Cropland and Pastureland	6,921	7,743	2,940	12,071	29,675
Field Crops	64	24	20	65	174
FieldCorn	4,484	2,446	666	3,306	10,902
FieldCrops				1,138	1,138
FieldNursery	18	172		114	303
GreenBeans	166		76		243
Hay	1,080	2,734	813	9,843	14,470
Hay Fields	8,252	12,857	3,642	24,899	49,650
Hay_ImprovedPastures		75		40	115
Hay_Oats				244	244
HayAFO	103			532	636
ImprovedPastures				181	181
Melons	158			559	718

Crop Type	Acres Outside Springsheds	Springshed Acres Lower Suwannee River	Springshed Acres Withlacoochee River	Springshed Acres Middle Suwannee River	Total Acres
Millet_Rye				153	153
Nurseries and Vineyards	65	15		53	133
Oats				165	165
Ornamentals	129	77	162	378	746
Other Groves (Pecan, Avocado, Coconut, Mango, etc.)	91	240	100	942	1,373
Pasture	4,005	2,130	361	7,959	14,456
Pasture_Rye		30		191	222
Pasture_Rye_Watermelons		39			39
Peaches		59			59
Peanuts	9,314	4,406	3,431	13,940	31,091
Peanuts_Oats		150			150
Peanuts_Pasture		220		190	410
Peanuts_Rye	598	524	384	170	1,675
Peas			31		31
Pecans	34		71	432	537
Potatoes				48	48
Row Crops	5,449	4,179	3,627	10,958	24,214
Rye	268	285	223	252	1,028
SmallVeg				32	32
SnapBeans_Rye	107				107
Sod	131		103	80	313
Sod Farms				9	9
Sorghum	184				184
Soybeans	137		54	369	560
Soybeans_Carrots				102	102
Soybeans_DryBeans				21	21
Soybeans_Rye	26				26
SweetCorn			37	295	332
SweetCornCoverCrop				134	134
SweetPotatoes	9		145	580	733
Tree Nurseries	165	555	20	246	986
Vegetables	1,394	1,523	100	2,457	5,474
Vegetables_Rye	69				69
Vegetables_SpringOnion				148	148
Watermelon		494		213	707
Total	**45,118**	**43,879**	**17,725**	**98,040**	**204,761**

Table E-3. Livestock lands in the Suwannee River Basin BMAP area

Land Use Description	Acres Outside Springsheds	Springshed Acres Lower Suwannee River	Springshed Acres Withlacoochee River	Springshed Acres Middle Suwannee River	Total Acres
Cattle Feeding Operations	26	161	10	155	352
Dairies	162	543		460	1,165
Horse Farms	720	1,147	25	893	2,785
Improved Pastures	22,894	22,771	7,851	47,772	101,288
Poultry Feeding Operations	186		15	1,227	1,428
Range Land, Herbaceous (Dry Prairie)	12,930	3,694	2,316	20,277	39,217
Specialty Farms	20	4		60	85
Unimproved Pastures	1,710	898	414	2,421	5,443
Woodland Pastures	2,884	1,576	605	4,432	9,497
Total	**41,532**	**30,792**	**11,236**	**77,698**	**161,258**

Agricultural land use data are critical for determining agricultural nonpoint source loads and developing strategies to reduce those loads in a BMAP area, but there are inherent limitations in the available data. The time of year when land use data are collected (through aerial photography) affects the accuracy of photo interpretation. Flights are often scheduled during the winter months because of weather conditions and reduced leaf canopies, and while these are favorable conditions for capturing aerial imagery, they make photo interpretation for determining agricultural land use more difficult (e.g., more agricultural lands are fallow in the winter months) and can result in inappropriate analysis of the photo imagery.

There is also significant variation in the frequency with which various sources of data are collected and compiled, and older data are less likely to capture the frequent changes that often typify agricultural land use. In addition, agricultural activity is not always apparent, for example, acreage classified as improved pasture may be used for a cow-calf operation, consist of forage grass that is periodically harvested for hay, or simply be a fallow vegetable field awaiting planting.

Finally, the classification method itself may be an issue, for example, property appraiser data assigns an agricultural land use designation to an entire parcel, although agricultural production may only be conducted on a portion of the parcel. Because of error in the collection and characterization of land use data and changes in land use over time, agricultural land use acreage estimates are subject to adjustment.

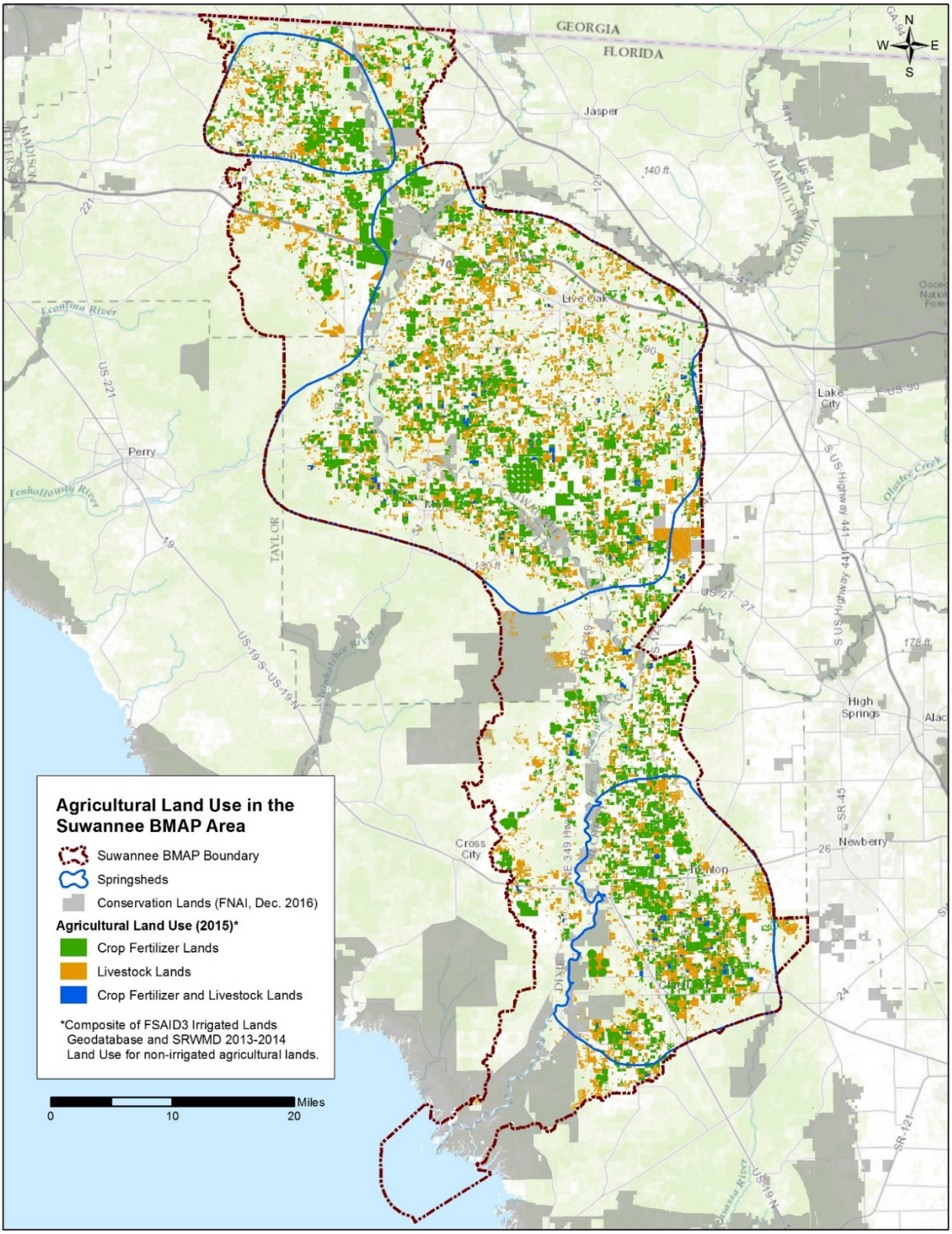

Figure E-1. Composite of agricultural lands in the Suwannee River Basin BMAP area

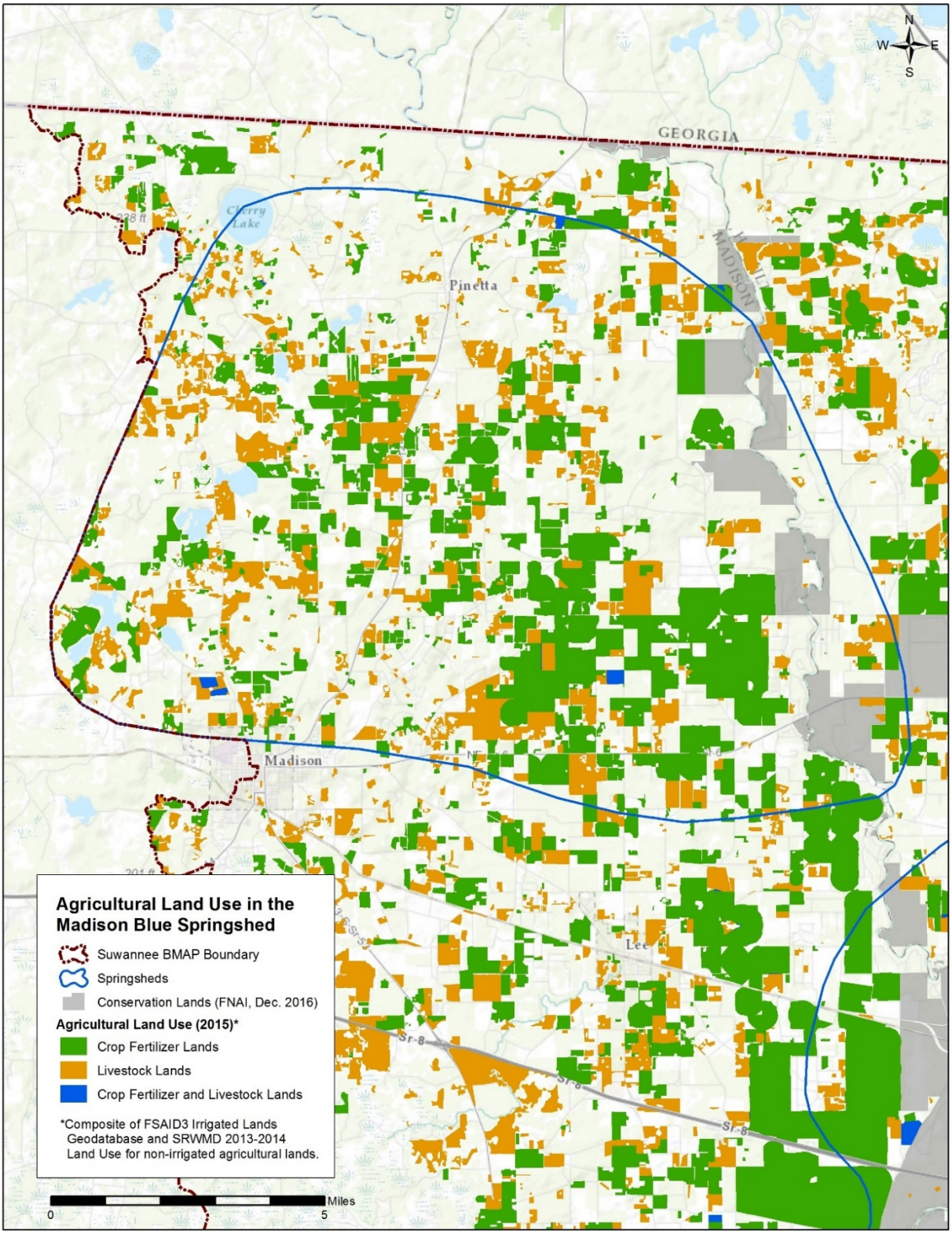

Figure E-2. Composite of agricultural lands in the Withlacoochee River Springshed

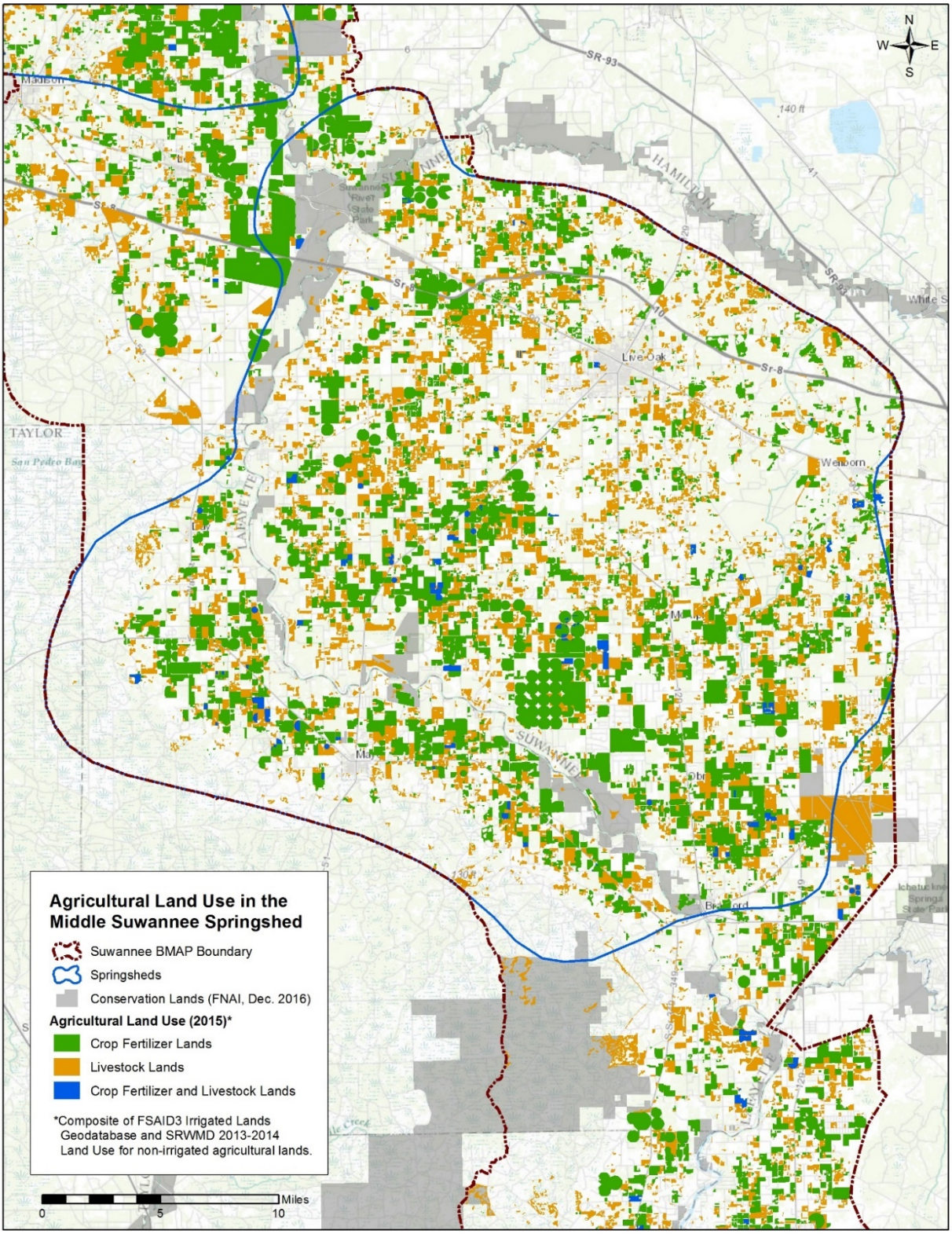

Figure E-3. Composite of agricultural lands in the Middle Suwannee River Springshed

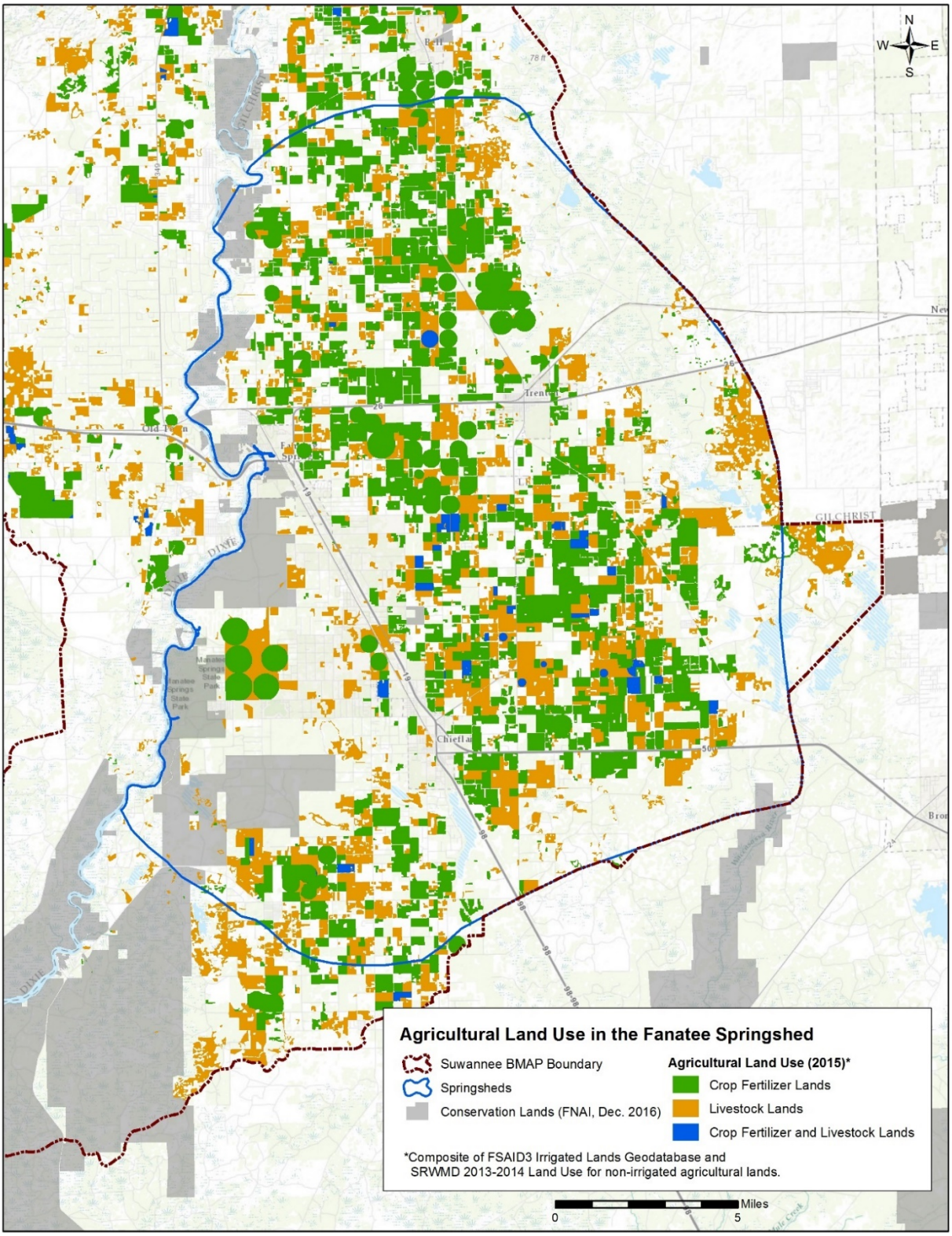

Figure E-4. Composite of agricultural lands in the Lower Suwannee River Springshed

E.2 Agricultural BMPs

BMPs are individual or combined practices determined through research, field testing, and expert review to be effective and practicable means for improving water quality, considering 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 OAWP (all other agricultural BMP programs). As of February 2017, OAWP has adopted manuals for cow-calf, statewide citrus, vegetable and agronomic crops, nurseries, equine operations, specialty fruit and nut, sod, dairy, and poultry operations. Development is underway for a small farms manual, and adoption is expected in 2017. The sod and cow/calf manuals are currently under review and revision.

The OAWP BMPs fall into two categories: structural and management. Structural BMPs, such as water control structures and fencing, involve the installation of structures or changes to the land and are usually costlier than management BMPs. Management BMPs, such as nutrient and irrigation management, comprise the majority of the practices and often are not readily observable. Nutrient management addresses fertilizer type, amount, placement, and application timing, and it includes practices such as soil and tissue testing, application methods, correct fertilizer formulations, and setbacks from water resources. Irrigation management consists of maintenance, scheduling, and other measures that improve the overall efficiency rating of irrigation systems. FDACS-funded mobile irrigation labs (MILs) 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 E-4 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.

Information on the BMP manuals and field staff contact information can be obtained here: http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy. Printed BMP manuals can be obtained by contacting OAWP field staff.

Table E-4. Key management and structural BMPs adopted by FDACS OAWP

BMP Category	BMP	Description
Nutrient Management (Right Source)	Use of Correct Formulations	Use of fertilizer formulations appropriate for environmental conditions. Includes enhanced efficiency fertilizers, as warranted.
Nutrient Management (Right Rate)	Soil and Tissue Testing Nutrient Budgeting	Used to base fertilizer applications on plant needs and available nutrients in soil; helps prevent overapplication of fertilizer. Consideration of all nutrient sources, such as commercial fertilizers, biosolids, legumes, manure, and nutrient-laden irrigation water to ensure that fertilization meets crop nutrient requirements.
Nutrient Management (Right Placement)	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.
Nutrient Management (Right Timing)	Split Fertilizer Applications	Multiple applications timed with optimal growth stages; allows plants to assimilate nutrients more efficiently; reduces nutrient loss in leaching and runoff.
Nutrient Management (Special Fertilization Practices)	Special Fertilization Practices	Commodity-specific fertilization practices to address nuances on case-by-case basis.
Nutrient Management (Fertilizer Storage and Handling)	Fertilizer Storage and Handling	Proper location/storage of bulk fertilizer products to prevent nutrient loadings. Use of appropriate dedicated or temporary mix/load areas located away from waterbodies to prevent nutrient loading.
Irrigation and Water Table Management	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.
Irrigation and Water Table Management	Irrigation System Maintenance	Use of MILs to identify efficiency issues, maintenance, and incorporation of potential upgrades to irrigation system.
Irrigation and Water Table Management	Wellhead Protection	Establishing safe practices around irrigation and drinking water wells.
Water Resource Protection	Buffers and Setbacks	Fertilizer application setbacks from waterbodies (e.g., wetlands, watercourses, sinks, springs, etc.) and use of appropriate buffers around water resource features.
Water Resource Protection	Ditch Maintenance and Water Control Structures	Use of rip rap, sediment traps, staging structures, and permanent vegetative bank cover to minimize erosion and transport of nutrient-laden sediments.
Water Resource Protection	Erosion Control	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.
Livestock Management	Manure Management	Appropriate storage and disposal of animal waste.
Livestock Management	Water Requirements and Sources	Use of upland livestock watering ponds and/or water troughs; minimizes manure deposition in waterbodies.
Livestock Management	Forage, Pasture and Grazing Management	Movement of cattle to different grazing areas on planned basis; prevents concentrated waste accumulations and denuding of pasture areas. May involve fencing. Also involves siting of cow pens, supplemental feed areas, etc., away from waterbodies to minimize nutrient loadings.
Livestock Management	Use Exclusion	Used when stream banks have significant rill or gully erosion because of cattle trampling.

E.3 BMP Enrollment

Figure E-5 shows the acres enrolled in the FDACS BMP Program in the Suwannee River Basin as of December 31, 2016. **Figure E-6**, **Figure E-7**, and **Figure E-8** are maps focused on BMP enrollment in the three watersheds. **Table E-5** lists the acres enrolled in the FDACS BMP Program by manual and the number of NOIs associated with those acres. Given that the enrolled acres on which BMPs are implemented can contain nonproduction acres (such as buildings, parking lots, and fallow acres), the enrollment for only the land classified as agriculture based on the composite land use is included in **Table E-5**. **Table E-6** lists the acreage of production agriculture enrolled in each of the BMP programs by springshed. **Table E-7** lists the associated number of NOIs in each springshed.

As of December 31, 2016, there are 748 NOIs that cover 187,312 acres in the Suwannee River Basin BMAP area. The Lower Suwannee River and Middle Suwannee River Sub-basin springsheds each have close to 66,000 agricultural acres enrolled with 319 and 228 NOIs, respectively, while the Withlacoochee River Sub-basin Watershed has over 41,000 agricultural acres and 37 NOIs. Outside the springsheds, 41,000 agricultural acres are enrolled under 164 NOIs. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time.

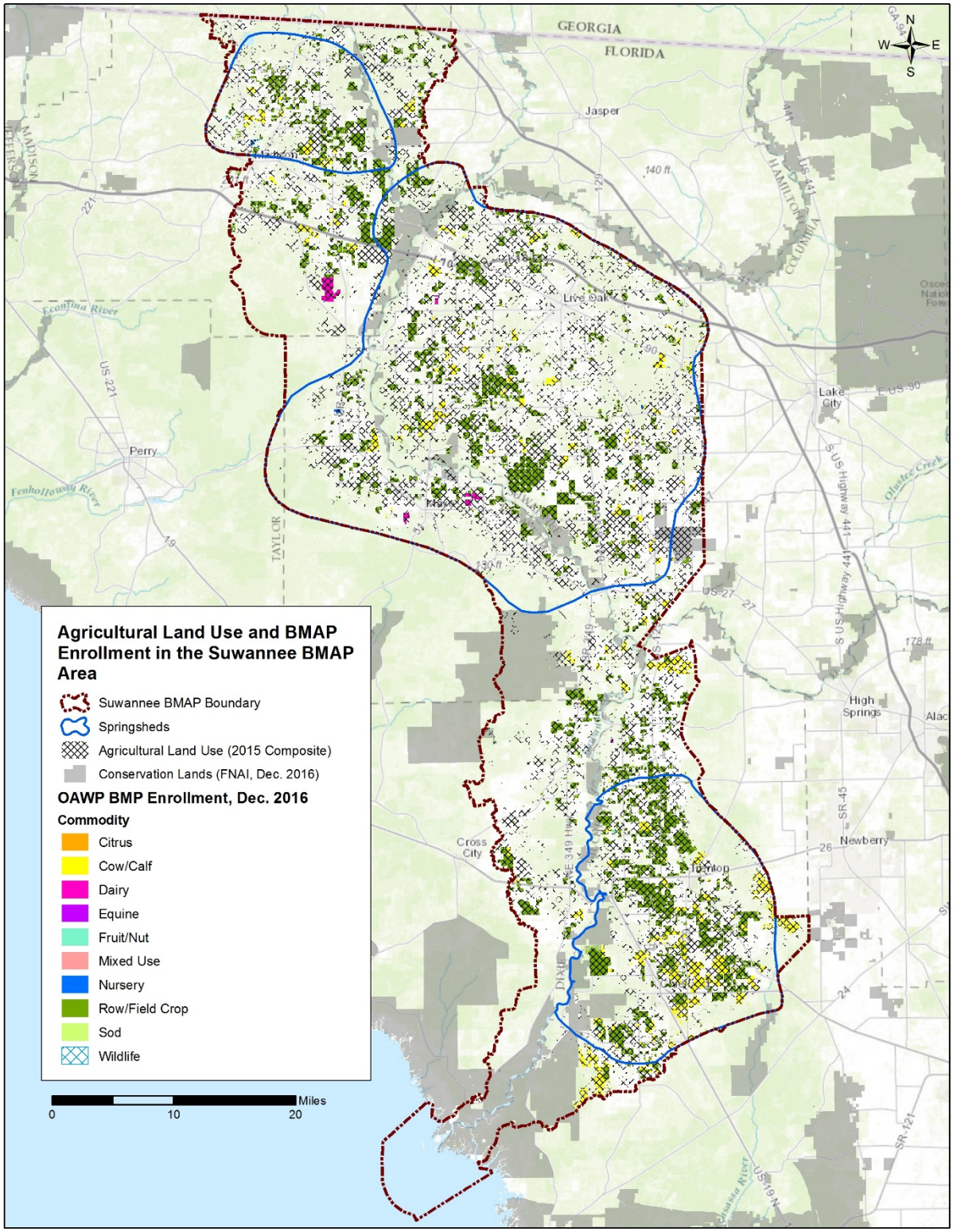

Figure E-5. BMP enrollment in the Suwannee River Basin as of December 31, 2016

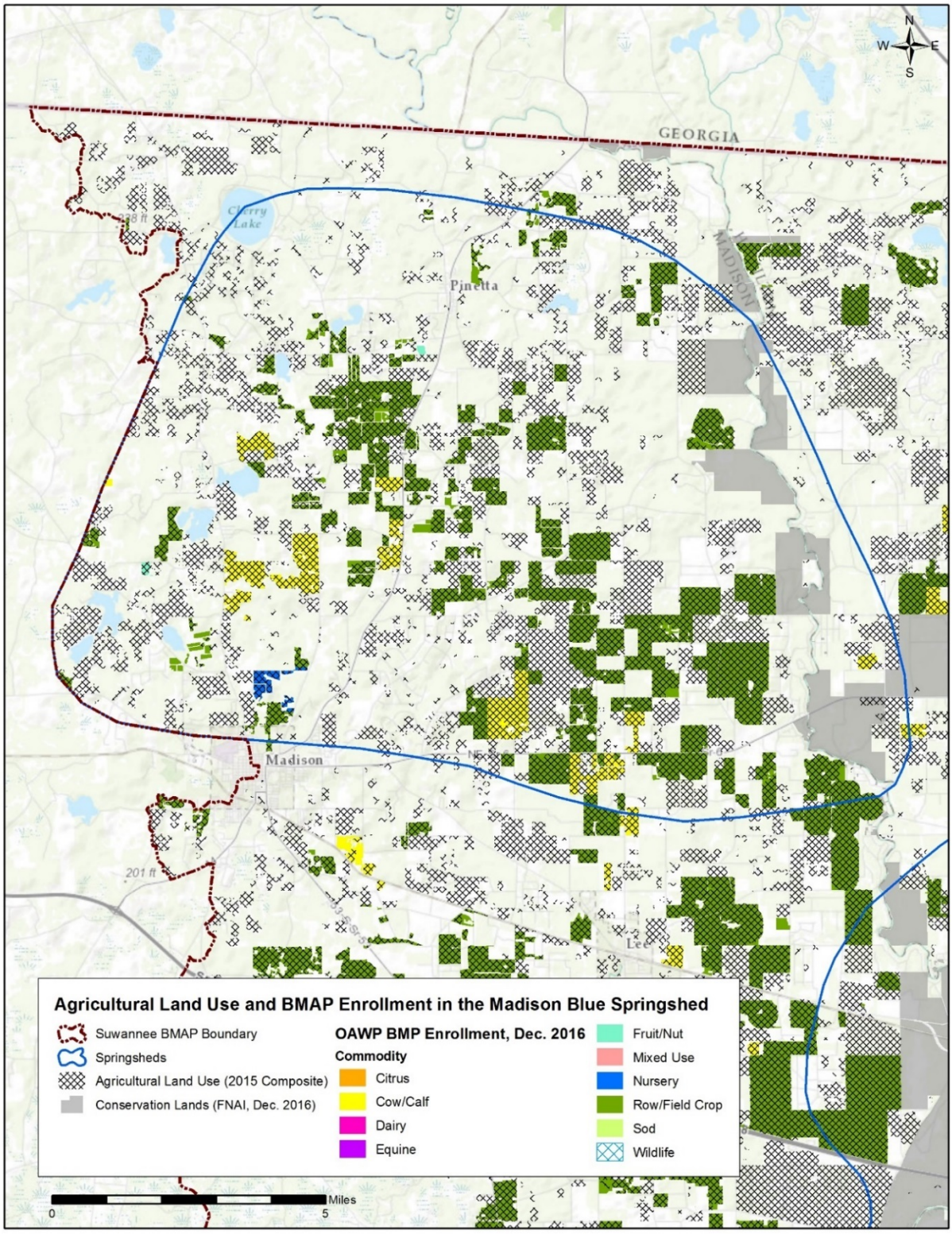

Figure E-6. BMP enrollment in the Withlacoochee River Springshed as of December 31, 2016

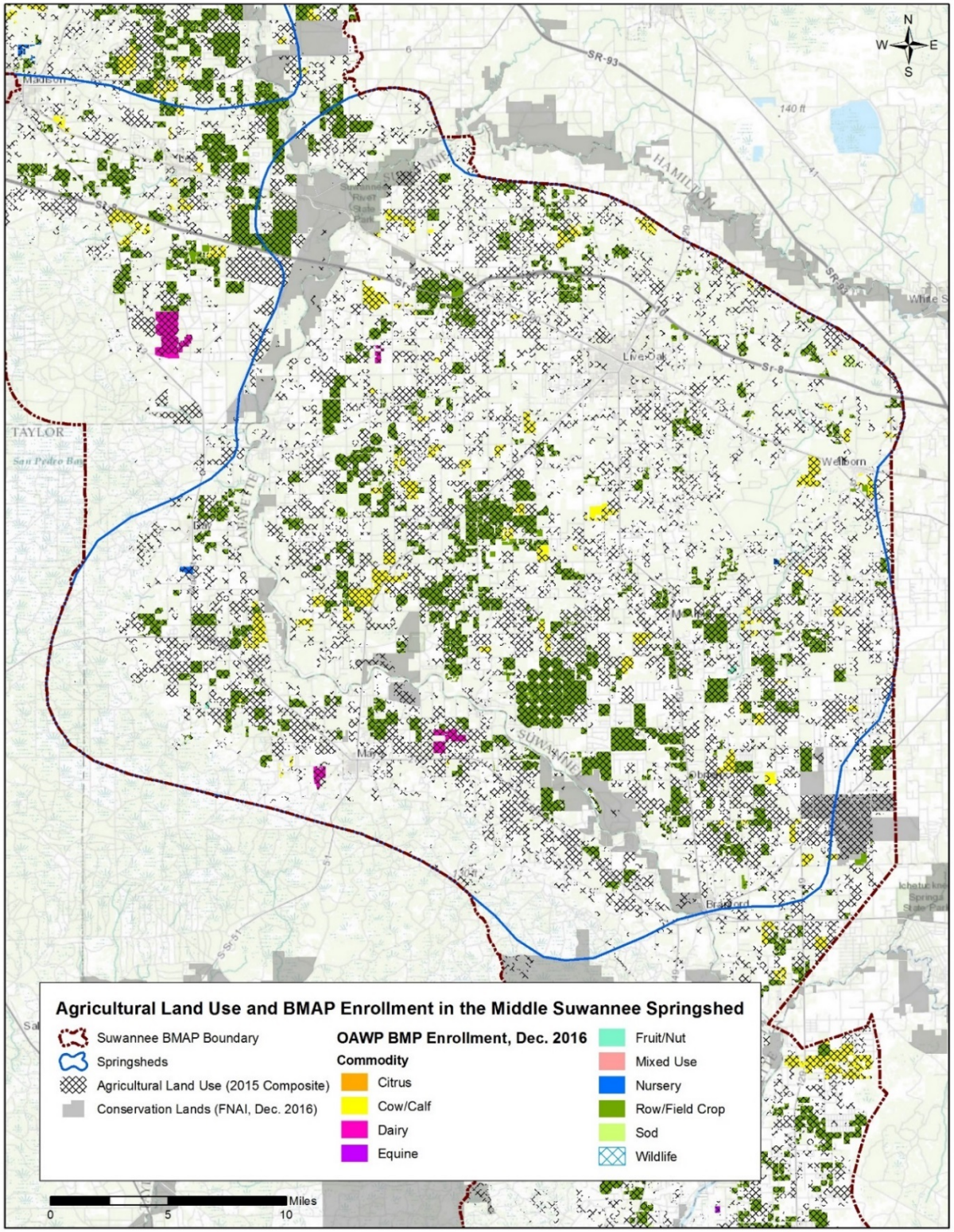

Figure E-7. BMP enrollment in the Middle Suwannee River Springshed as of December 31, 2016

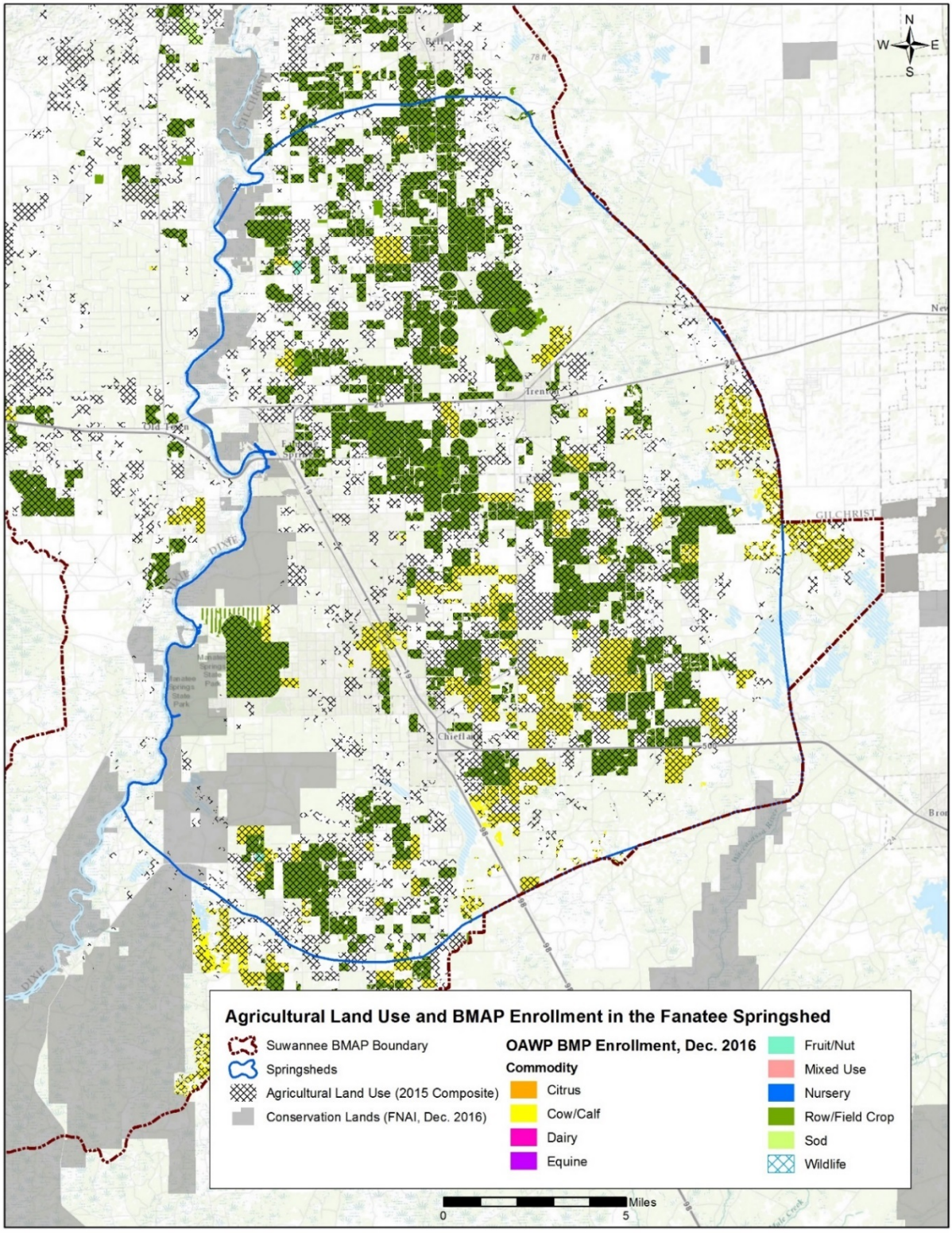

Figure E-8. BMP enrollment in the Middle Suwannee River Springshed as of December 31, 2016

Table E-5. Agricultural acreage and BMP enrollment in the Suwannee River Basin BMAP area as of December 31, 2016

FDACS BMP Program	NOI Enrolled Acres	Number of NOIs	Agricultural Land Use Acres with NOIs
Dairy Operations	3,113	4	1,990
Florida Container Nursery	469	4	268
Specialty Fruit and Nut	259	6	203
Statewide Cow/Calf	70,500	198	46,848
Statewide Equine	58	2	49
Statewide Sod	694	2	335
Vegetables and Agronomic Crops	184,286	532	137,620
Total	**259,380**	**748**	**187,312**

Table E-6. Agricultural acreage and BMP enrollment in the Suwannee River Basin by springshed as of December 31, 2016

FDACS BMP Program	Acres Outside Springsheds	Springshed Acres Lower Suwannee River	Springshed Acres Withlacoochee River	Springshed Acres Middle Suwannee River	Total Acres
Dairy Operations	1,237			753	1,990
Florida Container Nursery	3		137	127	268
Specialty Fruit and Nut		84	36	82	203
Statewide Cow/Calf	10,357	22,845	2,012	11,634	46,848
Statewide Equine	49				49
Statewide Sod	196			138	335
Vegetables and Agronomic Crops	29,254	43,061	12,276	53,029	137,620
Total	**41,096**	**65,990**	**14,461**	**65,764**	**187,312**

Table E-7. Number of NOIs and BMP enrollment in the Suwannee River Basin by springshed as of December 31, 2016

FDACS BMP Program	NOIs Outside Springsheds	Springshed NOIs Lower Suwannee River	Springshed NOIs Withlacoochee River	Springshed NOIs Middle Suwannee River	NOIs Total
Dairy Operations	1			3	4
Florida Container Nursery	1	-	1	2	4
Specialty Fruit and Nut		2	2	2	6
Statewide Cow/Calf	29	99	10	60	198
Statewide Equine	2				2
Statewide Sod	1			1	2
Vegetables and Agronomic Crops	130	218	24	160	532
Total	**164**	**319**	**37**	**228**	**748**

E.4 FDACS OAWP Role in BMP Implementation and Follow-Up

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

When DEP 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- or regional-level treatment options that remove nutrients from farms and other nonpoint sources. In that case, FDACS will work with DEP and SRWMD to identify appropriate options for achieving further agricultural load reductions.

Section 403.067, F.S. requires that, where water quality problems are demonstrated despite the proper implementation of adopted agricultural BMPs, FDACS must reevaluate the practices, in consultation with DEP, and modify them if necessary. Continuing water quality problems will be detected through the BMAP monitoring component and other DEP and SRWMD activities. If a reevaluation of the BMPs is needed, FDACS will also include SRWMD and other partners in the process.

E.5 OAWP Implementation Assurance Program

OAWP formally established its Implementation Assurance (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, 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 is based on interactions with producers during a site visit by OAWP staff. Site visits are conducted by OAWP field staff and technicians as workload allows. For the visits, field staff and technicians use a standard form (not BMP specific) developed in 2014. This form focuses on nutrient management, irrigation management, and water resource protection BMPs common to all of the BMPs that have been adopted by rule. The paper forms are submitted to OAWP staff and compiled into a spreadsheet, and the data are reported annually. From 2007 to2015, OAWP conducted 1,936 site visits. However, it is difficult to compare data collected prior to the implementation of the recently developed single IA site visit form because

of regional differences (e.g., different forms and information requested) in the administration of the IA Program.

Additional emphasis was given to verifying the implementation of BMPs by enrolled producers with the enactment of Chapter 2016-1, Laws of Florida. That legislation directed OAWP to formalize the Implementation Verification Program into rules. In December 2016, the OAWP published a notice of rule development. In February 2017, draft rule language was distributed and presented at a public workshop. This draft language provides the structure for a statewide uniform implementation verification system including assessments of the status of implementation, compliance assistance to aid producers in achieving full implementation, and referral to DEP for producers who are not implementing BMPs.

E.6 Beyond BMPs

Beyond enrolling producers in the FDACS BMP Program and verifying implementation, FDACS will work with DEP to improve the data used to estimate agricultural land uses in the springshed. FDACS will also work with producers to implement a suite of agricultural projects and research agricultural technologies on properties where they are deemed technically feasible and if funding is made available. The acreages provided by FDACS are preliminary estimates of the maximum acreages and will be evaluated and refined over time. As presented here, these projects are based on planning-level information. Actual implementation would require funding as well as more detailed designs based on specific information, such as actual applicable acreages and willing landowners. **Table E-8** summarizes these efforts.

Table E-8. Beyond BMP implementation

Category	Name	Description
Practices	Soil Moisture Probes	Deployment, training, technical support, and use of soil moisture probes to manage irrigation systems.
Practices	Precision Fertilization	Deployment of equipment, procedures, and training to improve formulations, delivery methods, and timing to match fertilization more precisely to crop needs.
Practices	Precision Irrigation	Deployment of equipment, procedures, and training to improve location, volume, and timing of irrigation to match crop needs more precisely.
Practices	Controlled-Release Fertilizer	Application of new and developing fertilizer products that become available to crops via dissolution over longer periods in growing season.
Practices	Cover Crops	Planting of cover crops between production cycles to increase soil organic content, improve nutrient retention, and reduce erosion.
Projects	Lined Dairy Waste Storage Ponds	Installation of high-density polyethylene (HDPE) liners and ancillary equipment (such as solids separation systems) for liquid waste storage ponds.
Projects	Bioreactors/Denitrification Walls and Onsite Capture and Reuse of High-Nutrient Water	Installation and operation of surface (bioreactor) and subsurface (denitrification walls) systems to remove nitrate by contact with carbon source. Installation and operation of network of capture wells and reuse of water onsite in irrigation system.
Research	Rotational Production	Conversion of conventional production operations to planned rotational production incorporating grass and cover crops. May include cattle.
Research	Soil Moisture Sensor Deployment and Calibration	Research into potential use of soil moisture sensors to assist in nutrient management.
Research	Effectiveness of Controlled-Release Fertilizer	Focused research on use of controlled-release fertilizer for other crop types.
Research	Regional Capture and Reuse of High-Nutrient Water	Study of potential regional capture/reuse systems, including sources of high nutrient value water, potential beneficial reuse sites, legal and regulatory obstacles, and costs.