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

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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 Cities, Towns, and Communities: Bell Branford Chiefland Fanning Springs 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	Homeowners/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 the watershed management approach for the Lower Suwannee River, Middle Suwannee River, and Withlacoochee River Sub-basins, contact:

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List of Acronyms and Abbreviations

ac	Acre
AWT	Advanced Wastewater Treatment
ATU	Aerobic Treatment Unit
BAF	Biochemical Attenuation Factor
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
cfs	Cubic Feet per Second
CMAQ	Community Multiscale Air Quality
DEP	Florida Department of Environmental Protection
DMR	Discharge Monthly Report
DO	Dissolved Oxygen
EPA	Environmental Protection Agency (U.S.)
F.A.C.	Florida Administrative Code
F.A.R.	Florida Administrative Register
F.S.	Florida Statutes
FDACS	Florida Department of Agriculture and Consumer Services
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FF	Farm Fertilizer
FFB	Florida Farm Bureau
FGS	Florida Geological Survey
FLUCCS	Florida Land Use Cover and Forms Classification System
FLWMI	Florida Water Management Inventory
FOWA	Florida Onsite Wastewater Association
FPS	Florida Park Service
FSAID	Florida Statewide Agricultural Irrigation Demand
FY	Fiscal Year
FYN	Florida Yards and Neighborhoods
GIS	Geographic Information System
gpd	Gallons Per Day
HA	Habitat Assessment
HDPE	High-Density Polyethylene
IA	Implementation Assurance
ILG	Irrigated Lands Geodatabase
IV	Implementation Verification
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
NA	Not Applicable
NADP	National Atmospheric Deposition Program
NASS	National Agricultural Statistics Service
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	NSF International (formerly 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
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
SAV	Submerged Aquatic Vegetation
SBIO	DEP Statewide Biological Database
SCC	Suwannee Country Club
SCI	Stream Condition Index
SOP	Standard Operating Procedure
SRWMD	Suwannee River Water Management District
STF	Sports Turfgrass Fertilizer
STORET	Florida Storage and Retrieval System
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management
TBD	To Be Determined
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
USDA	U.S. Department of Agriculture
USGS	U.S. Geologic Survey
UTF	Urban Turfgrass Fertilizer
WAFR	Wastewater Facility Regulation (Database)
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 (**Figure ES-1)** 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. Population centers 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, and Lee and Madison County.

Suwannee River Priority Focus Areas (PFAs)

PFAs totaling 839,681 acres are delineated for the OFS in each sub-basin (see **Appendix C**). The Lower Suwannee River Sub-basin comprises 431,722 acres, of which 199,928 acres are designated as a PFA for Fanning and Manatee Springs. The Middle Suwannee River Sub-basin covers an area of 704,802 acres, of which 554,965 acres are designated as a combined PFA for Troy, Peacock, Lafayette Blue, and Falmouth Springs. The Withlacoochee River Sub-basin comprises 187,138 acres, of which 84,788 acres are designated as a PFA for Madison Blue Spring.

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.

In the springsheds and basins for the OFS, 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.

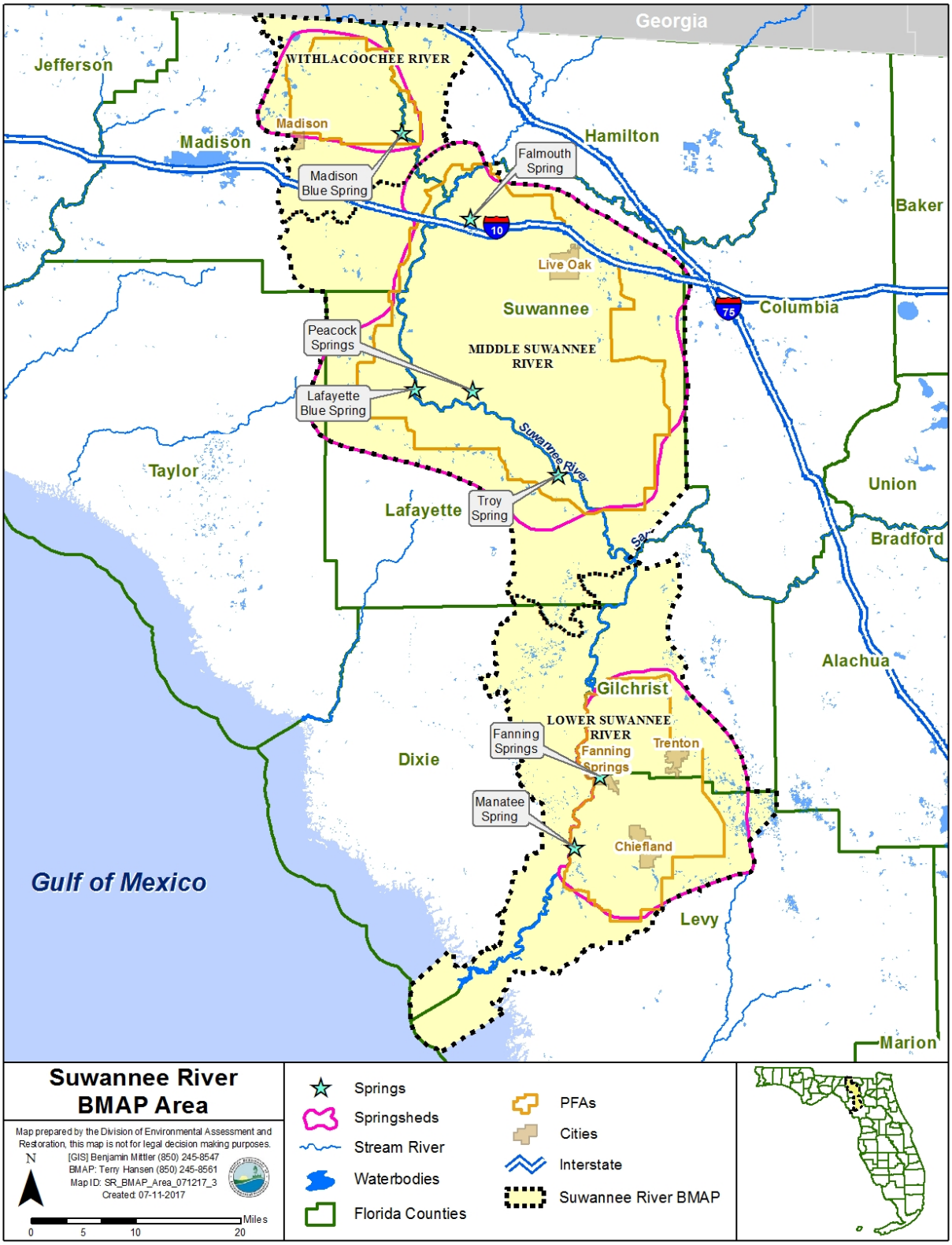

Figure ES-1. Suwannee River BMAP and PFA boundaries

The total load reduction required to meet the total maximum daily loads (TMDLs) at the spring vents 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:

- Initial reduction of 1,222,781 lb-N/yr (30 %) within 5 years.
- An additional 2,037,968 lb-N/yr (50 %) within 10 years.
- The remaining 815,187 lb-N/yr (20 %) within 15 years.
- For a total of 4,075,935 lb-N/yr within 20 years.

The policies and submitted projects included within this BMAP are estimated to achieve a reduction of 2,541,035 to 4,859,027 lb-N/yr to groundwater. While reductions to groundwater will benefit the springs, it is uncertain to know with precision how those reductions will impact the necessary reductions at the springs. DEP will continue to monitor the springs to evaluate those reductions as projects are implemented against the required load reductions above. The BMAP is designed to achieve 80 % of the load reductions needed for the spring vents within 10 years of adoption and 100 % within 15 years. Projects and strategies are designed to achieve nitrogen reductions in the Suwannee Basin but are expected to provide benefits to all springs vents within the springshed/contributing area. DEP will evaluate progress towards these milestones and will report to the Governor and Florida Legislature. DEP will adjust management strategies to ensure the target concentrations are achieved.

For the list of projects to improve water quality, see **Appendix B**. Possible load reductions include projects resulting from policies for owner-implemented best management practices (BMPs) for FF, dairy waste, and other LW; wastewater treatment facility (WWTF) upgrades; policies to reduce urban turfgrass fertilizer (UTF) application; and voluntary onsite sewage treatment and disposal system (OSTDS) enhancements or conversions to sewer.

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, water management districts (WMDs), Florida Department of Health (FDOH), and Florida Department of Agriculture and Consumer Services (FDACS) will implement management strategies using the annual Legacy Florida appropriation from the legislature of at least $50 million to reduce nitrogen in impaired OFS. DEP, working with the coordinating agencies, will continue to invest existing funds and explore other opportunities and potential funding sources for springs restoration efforts.

Restoration Approaches

Load reduction to the aquifer is needed to achieve the load reductions requirements at the spring vent. To ensure that load reductions are achieved at the spring vent, the following restorations actions are being established. These actions are designed to reduce the amount of nutrients to the

aquifer, which will reduce the load at the vent and ultimately achieve the necessary reductions. Monitoring of the vent during implementation will be implemented to monitor progress.

- **New OSTDS** – Upon BMAP adoption, the OSTDS remediation plan prohibits new systems on lots of less than 1 acre within the PFAs, unless the system includes enhanced treatment of nitrogen as defined by the OSTDS remediation plan, or unless the OSTDS permit applicant demonstrates that sewer connections will be available within 5 years. The OSTDS remediation plan is incorporated as **Appendix D**.

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

Table ES-1. WWTF effluent standards

gpd = Gallons per day

95% of the 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, Including Reuse (mg/L)
Greater than 100,000	3	3
20,000 to 100,000	3	6
Less than 20,000	6	6

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

- **Sports Turfgrass Fertilizer (STF) –** STF sources include golf courses and other sporting facilities. Golf courses can receive up to 10 % credit for implementing the Golf Course BMP Manual. Other sports fields can receive up to 6 % credit for managing their fertilizer applications to minimize transport to groundwater.

- **FF** – All FF sources are required to implement BMPs or perform monitoring to demonstrate compliance with the TMDL. 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.

- **Dairies –** Permitted dairies with an approved nutrient management plan receive a 15% reduction to groundwater for owner-implemented BMPs. Additional credits could be achieved through better documentation of reductions achieved through BMP implementation.

Section 1: Background

1.1 Legislation

Chapter 373, Part VIII, Florida Statutes (F.S.), the Florida Springs and Aquifer Protection Act, 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 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. Development of the basin management action plan (BMAP) 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 Total Maximum Daily Loads (TMDLs)

A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality criteria. The Suwannee River and 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. These waters are impaired by nitrate nitrogen, which in excess has been demonstrated to adversely affect flora or fauna through the excessive growth of algae. Excessive algal growth results in ecological imbalances in the springs and river and can produce human health problems, foul beaches, inhibit navigation, and reduce the aesthetic value of the resources.

DEP adopted nutrient TMDLs for certain waters in the Suwannee River Basin in 2008, including the Suwannee River, Fanning Springs, Manatee Spring, Falmouth Spring, and Troy Spring (**Table 1**). The TMDLs established a monthly average nitrate target of 0.35 milligrams per liter (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 water quality data evaluated for the TMDLs was June 1, 2000 through June 30, 2007.

Lafayette Blue Spring, Peacock Springs, and Madison Blue Spring were not included in the 2008 TMDL document, but are also 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. A yearly average was not appropriate

because algal growth responds to seasonal changes. The percent reductions are the load reductions needed to attain the numeric nutrient criteria (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 OFS in the Suwannee River Basin

Waterbody or 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 (Part VIII of Chapter 373, F.S.) describes additional requirements for the 30 OFS.

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 hundreds of other springs. This area includes the surface water basin as well as the groundwater contributing areas for the springs (or springsheds). Springsheds for the OFS were delineated or reviewed by Suwannee River Water Management District (SRWMD) with input from the Florida Geological Survey (FGS). A springshed is the area of land that contributes water to a spring or group of springs, mainly via groundwater flow. **Tables 2, 3,** and **4** list the acreage, number of designated OFS, and land uses associated with the three sub-basins comprising the BMAP area.

1.5 Priority Focus Areas (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 (Manatee and Fanning Springs), Middle Suwannee River (Troy, Lafayette Blue, Peacock, and Falmouth Springs), and Withlacoochee River (Madison Blue Spring). A PFA is defined 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. The link to the PFA document is provided in **Appendix C.**

1.5.1 Description

Nitrogen sources are more likely to influence groundwater quality 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, the underlying geologic material influences the vulnerability of the underlying aquifers and the rate of lateral movement within the Floridan aquifer toward the springs and river. These conditions, and others, were considered in the delineation of the Lower Suwannee River, Middle Suwannee River, and Withlacoochee River PFAs (see **Appendix C**).

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.

Following 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.

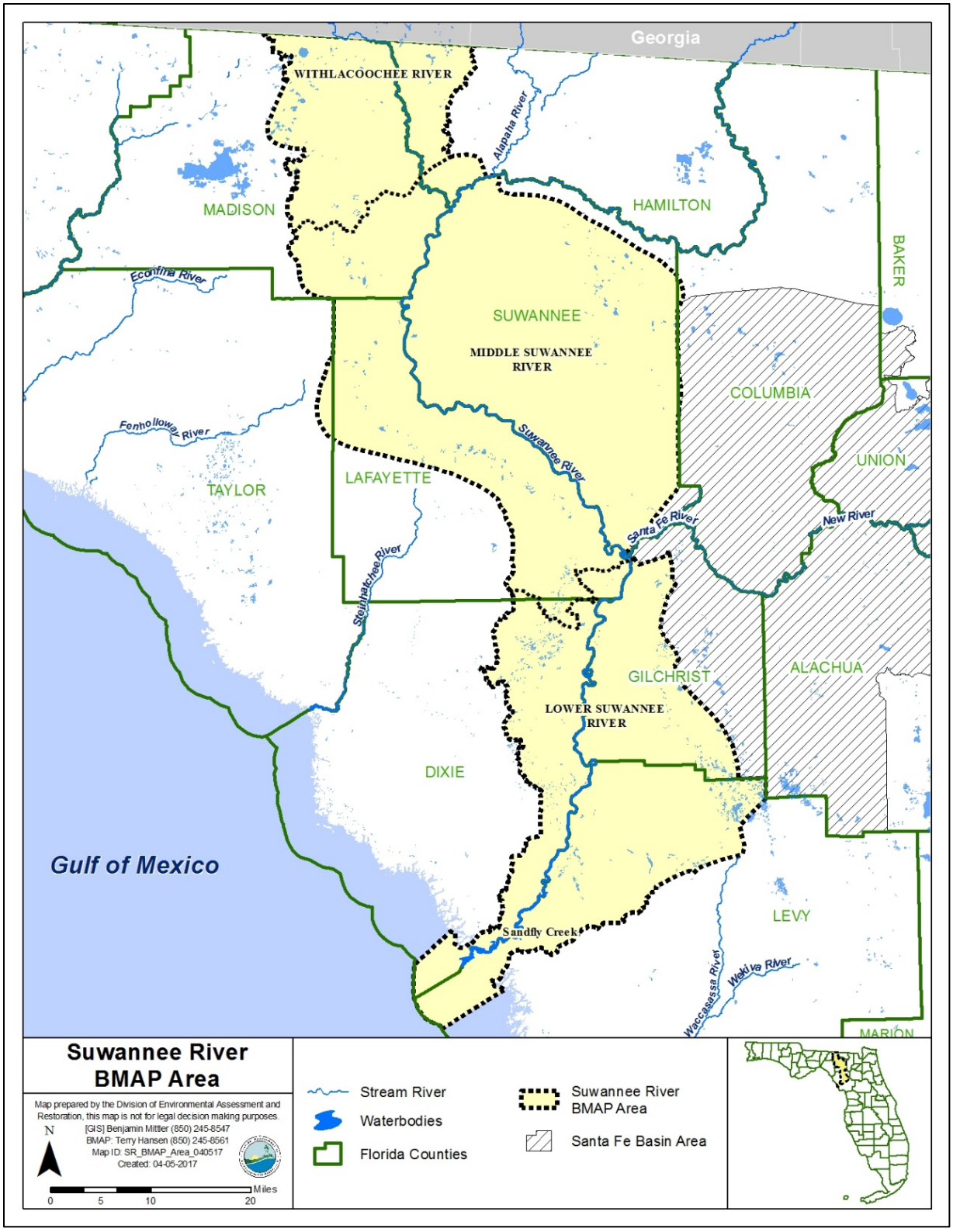

Figure 1. Suwannee River BMAP area

Table 2. Acreage 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

Table 3. OFS for each sub-basin in the BMAP area

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)

Table 4. Land uses for each sub-basin in the BMAP area

Land Use	% of Total Land Uses in the Lower Suwannee River Sub-basin	% of Total Land Uses in the Middle Suwannee River Sub-basin	% of Total Land Uses in the Withlacoochee River Sub-basin
Forest	42	47	49
Agriculture	34	27	31
Urban	10	10	7
Wetlands	11	9	7
Rangeland	3	6	5
Water	0	1	1

The Lower Suwannee River Sub-basin comprises 431,722 acres, of which 199,928 acres are designated as the PFA for Fanning and Manatee Springs. The PFA covers most of the combined springshed for these and several smaller springs, 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 onsite sewage treatment and disposal systems (OSTDS or septic systems, the terms are used interchangeably through this document), 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 includes parts of 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.

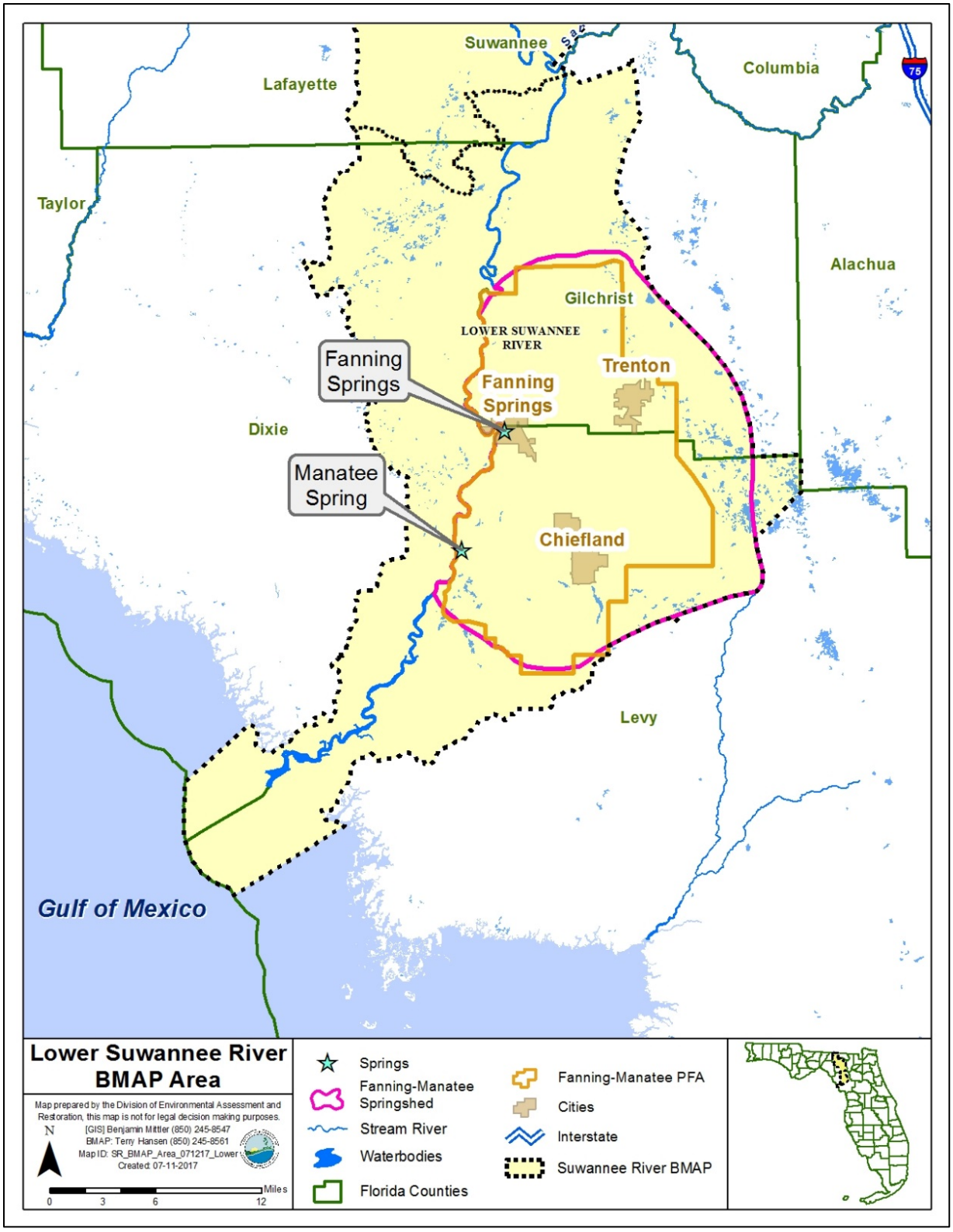

Figure 2. Lower Suwannee River PFA and sub-basin boundary

The Middle Suwannee River Sub-basin comprises an area of 704,802 acres, of which 554,965 acres are designated as the combined PFA for Troy, Lafayette Blue, Peacock, and Falmouth Springs. The PFA covers most of the combined springshed for these and numerous other springs along the Suwannee River, 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 the PFA for Madison Blue Spring. 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.

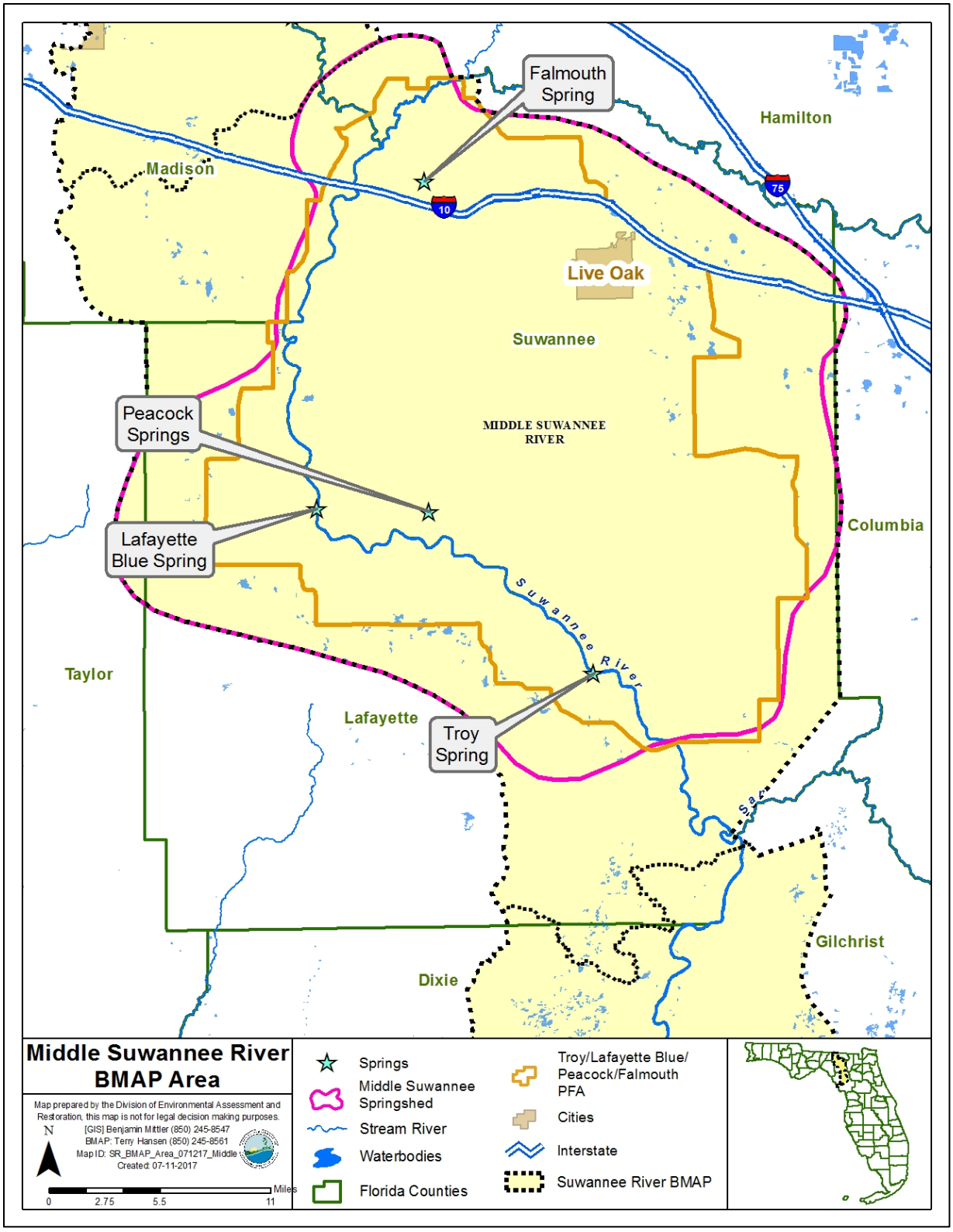

Figure 3. Middle Suwannee River PFA and sub-basin boundary

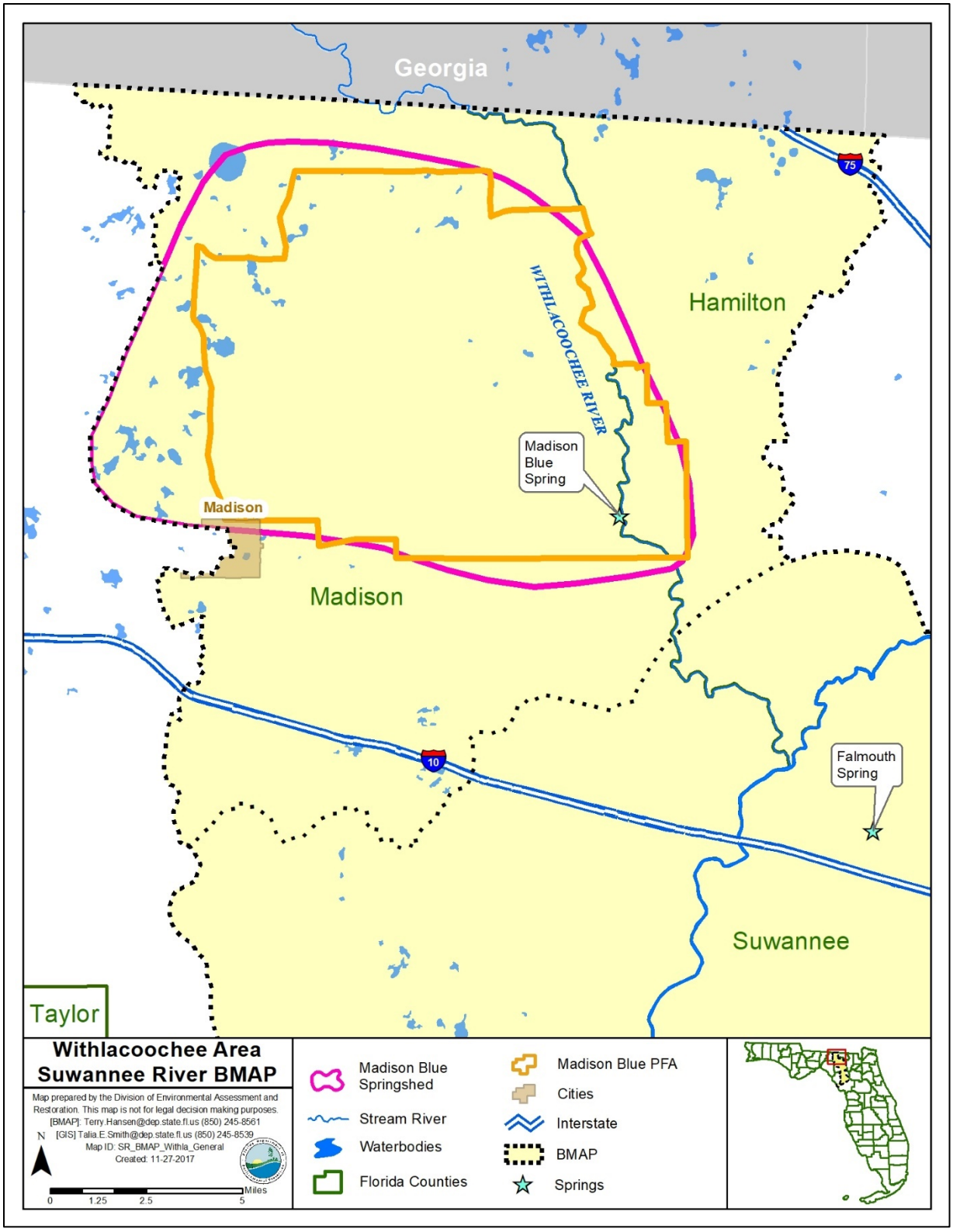

Figure 4. Withlacoochee River PFA and sub-basin boundary

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 the PFAs unless additional nitrogen treatment is provided, as specified in the OSTDS remediation plan (see **Appendix D** for details).

- 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 water management district or DEP.

1.5.2.1 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 Florida Department of Agriculture and Consumer Services (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.

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 of 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.

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 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 5 lists the adopted BMPs and BMP manuals relevant to this BMAP.

Table 5. BMPs and BMP manuals 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

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 Nutrients in the Springs and Spring Systems

DEP developed the Nitrogen Source Inventory Loading Tool (NSILT) to provide information on the major sources of nitrogen in the groundwater contributing area for the OFS in the three sub-basins. In addition, this tool is used to estimate nitrogen loads to groundwater from these sources in the spring contributing area. The NSILT is a GIS- and spreadsheet-based tool that provides spatial estimates of the relative contribution of nitrogen from major nitrogen sources and accounts for the transport pathways and processes affecting the various forms of nitrogen as they move from the land surface through the soil and geologic strata.

The first 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 Upper Floridan aquifer (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.

A second major factor to consider in estimating the loading to groundwater is the geologic features in the springshed and the related "recharge rate." Water movement between the shallow groundwater (surficial aquifer, where present) and the deeper aquifer (UFA) is slowed by a low permeability layer of clay, silt, and fine sand that retards the vertical movement of infiltrating water from the surface. The UFA occurs in limestone that can be prone to dissolving, and, over geologic time, the development of numerous karst features (sinkholes, caves, and conduits). These features allow water from the land surface to move directly and relatively rapidly into the aquifer and in some areas for groundwater in the aquifer to move rapidly to the springs.

Potential recharge rates from the surface to the UFA are affected by variations in the geologic materials and the presence of karst features. DEP estimated the recharge rate ranges and grouped them into three rate categories, which were applied in the NSILT:

- Low recharge (0 to 3 inches per year [in/yr]).
- Medium recharge (3.01 to 10 in/yr).
- High recharge (greater than 10 in/yr).

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.

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

Table 6 lists the estimated nitrogen loads to groundwater by source. Note that urban stormwater loads are included in urban turfgrass fertilizer (UTF) estimates, while agricultural stormwater loads are included in farm fertilizer (FF) and livestock waste (LW) estimates. Nitrogen loading to surface water will be reduced through the activities and strategies for the sources identified in this chapter for groundwater loading.

Table 6. Estimated nitrogen load to groundwater by source in the three springsheds

Nitrogen Source	Total Nitrogen Load to Groundwater (pounds of nitrogen per year [lb-N/yr])	% Contribution
OSTDS	301,234	3
UTF	293,157	3
Atmospheric Deposition	807,819	8
FF	5,794,980	60
STF	12,819	<1
Permitted Dairies	339,182	3.5
LW	2,087,394	21.5
WWTFs	89,745	<1
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 weighted average number of people per household for the counties in the area and additional information on the time spent away from home by the school-age population and labor force.

- **Nitrogen Attenuation Factors –**To estimate the amount of nitrogen loading to the aquifer, DEP applied two 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. 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. Given the relatively large range of literature-reported values of biochemical nitrogen attenuation for each source category, DEP used an average biochemical attenuation factor for each source based on land use practices and hydrogeological (i.e., recharge) 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** – Atmospheric sources of nitrogen are local, national, and international. 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 re-evaluated periodically.

- **OSTDS Inventory and Loading Calculations** – The total number of OSTDS in the basin is estimated based on local information and Florida Department of Health (FDOH) data. Future BMAPs and the associated OSTDS loading calculations may be adjusted based on improved data on the number, location, and type (conventional and enhanced nitrogen reducing) 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 boundaries may be adjusted in the future if additional relevant information becomes available.

- **Project Collection Period –** The BMAP project collection period is limited to projects after a certain date, based on the data used to calculate the reductions needed. Reductions from older projects are already accounted for in the baseline loading. Projects completed in the springshed after January 2007, were considered for inclusion in this BMAP.

- **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 known.

- **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 more information is gathered and progress towards each 5-year milestone is reviewed, 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 the 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

Based on the 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 (mainly from dairies and beef cattle cow-calf operations) are responsible for more than 85 % of the nitrogen sources in each springshed. Stormwater loading to groundwater is incorporated into the various source categories.

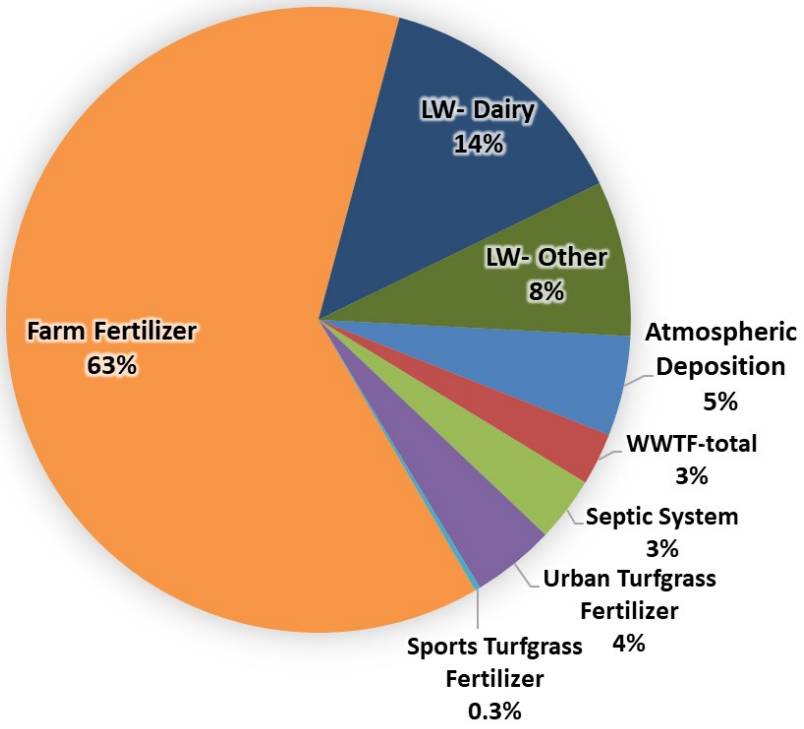

Figure 5. Loading to groundwater by source in the Lower Suwannee River Springshed

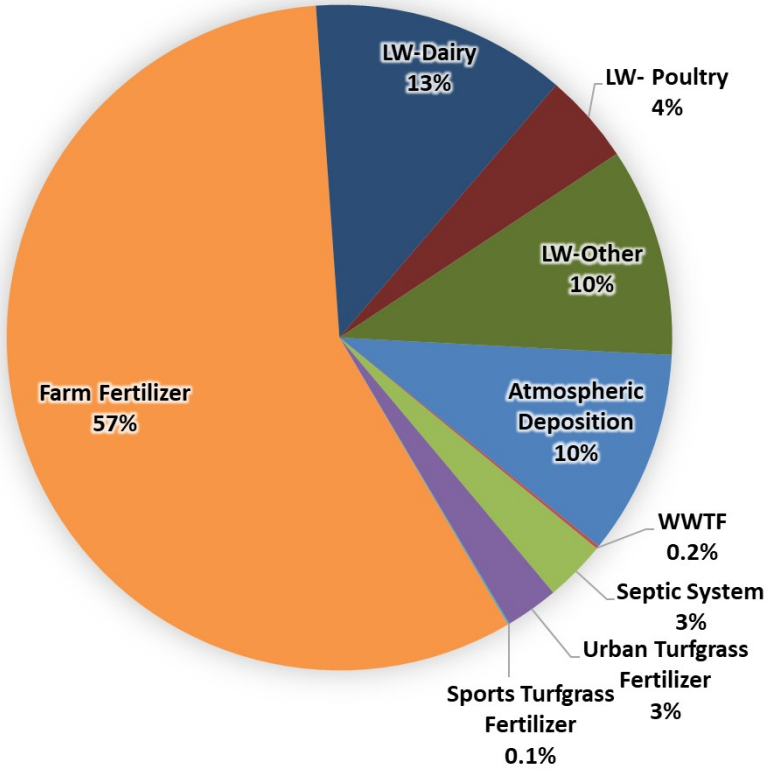

Figure 6. Loading to groundwater by source in the Middle Suwannee River Springshed

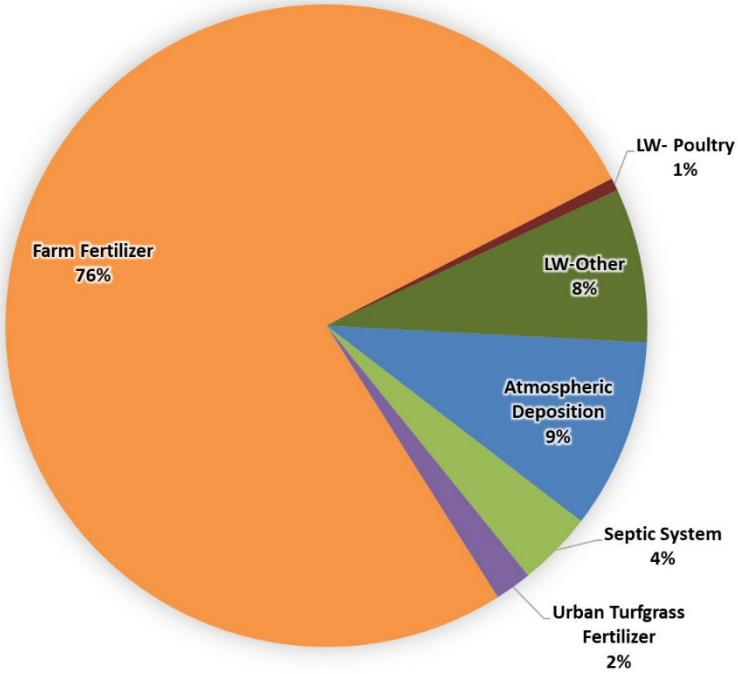

Figure 7. Loading to groundwater by source in the Withlacoochee River Springshed

2.1.5 Loading Allocation

The nitrogen source reductions are based on the measured nitrate concentrations and flows at the vent, along with the TMDL target nitrate concentration. **Table 7** lists the measured 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. The total load that is required to be reduced in the basin is being allocated to the entire basin and actions defined by the BMAP to reduce loading to the aquifer are needed to implement this allocated load.

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 8**).

Table 7. Total reduction required to meet the TMDLs inside springsheds

Area	Load at Spring Vents (lb-N/yr)	TMDL Load (lb-N/yr)	Required Reduction to Meet TMDL (lb-N/yr)
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 8. Total reduction required to meet the TMDLs outside springsheds

Area	Required Reduction to Meet TMDL (lb-N/yr)
Lower	1,311,640
Middle	214,981
Withlacoochee	340,048
Subtotal	**1,866,669**
Totals (Tables 7 and 8)	**4,075,935**

The total load at the Madison Blue Spring vent in the Withlacoochee River Sub-basin was estimated 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 (including the OFS) were estimated 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 OFS spring vents for the Lower Suwannee River Sub-basin were estimated 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. DEP will evaluate progress towards these milestones and will report to the Governor and Florida Legislature. DEP will adjust management strategies that reduce loading to the aquifer to ensure the target concentrations are achieved.

Table 9 lists the estimated nitrogen reduction schedule, by milestone. Progress will be tracked yearly and adjustments made as needed. At the 5-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 2.3** describes detailed source reduction strategies.

Table 9. 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**

2.2 Prioritization of Management Strategies

The management strategies listed in **Appendix B** are ranked with a priority of high, medium, or low. In 2016, the Florida Legislature amended the Watershed Restoration Act (Section 403.067, F.S.), creating additional requirements for all new or revised BMAPs. BMAPs must now include planning-level details for each listed project, along with their priority ranking.

Project status was selected as the most appropriate indicator of a project's priority ranking based primarily on need for funding. Projects with a "completed" status were assigned a low priority. Projects classified as "underway" were assigned a medium priority because some resources have been allocated to these projects, but additional assistance may be needed for the project to be completed. High priority was assigned to projects listed with the project status "planned" as well as certain "completed" projects that are ongoing each year (any project with one of these project types: "street sweeping," "catch basin inserts/inlet filter cleanout," "public education efforts," "fertilizer cessation," "fertilizer reduction," or "aquatic vegetation harvesting"), and select projects that are elevated because substantial, subsequent project(s) are reliant on their completion.

2.3 Load Reduction Strategy

A precise total load reduction to groundwater needed to meet the TMDL is unknown and dependent on a number of complex factors. Ultimately there must be a reduction at the spring vent of at least 4,075,935 lb-N/yr. Based on the totals of all the credits from BMAP actions and policies, the range of total reductions to groundwater is between 2,541,035 and 4,859,027 lb-N/yr (see **Table 10**). However, due to the proximity of these reductions to the springs and the

uncertainties of fate and transport in the karst geology, additional actions may be necessary to ensure that the loading at the vent is achieved within the timeline of the BMAP.

To achieve reductions outside the scope of the policies listed, 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 10. Summary of potential credits for the Suwannee River BMAP to meet the TMDL

Note: No reductions are estimated for atmospheric deposition sources.

Nitrogen Source	Credits to Load to Groundwater Based on Project Tables (lb-N/yr)	Description
OSTDS	52,822	Credits identified for stakeholder OSTDS projects (enhancement or sewer).
UTF	17,658	DEP approved credits (6%) for public education activities as well as credits identified for stakeholder stormwater projects.
FF Projects	534,760	Credits identified for stakeholder farm fertilizer projects.
FF	869,247	15% BMP credit on farm fertilizer load to groundwater, assuming 100% owner-implemented and verified BMPs on all fertilized lands.
Permitted Dairies Projects	167,000	Credits identified for stakeholder dairy projects.
Permitted Dairies	50,877	15% BMP credit on permitted dairy load to groundwater, assuming 100% owner-implemented and verified BMPs at permitted dairies.
LW	208,739	10% BMP credit on load to groundwater, assuming 100% owner-implemented BMPs and verified at all livestock facilities.
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.
WWTF	17,533	Achieved by BMAP WWTF policy (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 from BMAP Policies and Submitted Projects	**1,961,537**	
Advanced Agricultural Practices and Procedures	579,498- 2,897,490	Includes 10%-50% reduction from 100% of fertilized acres with a change in practice.
Total Credits	**2,541,035 - 4,859,027**	**Load reduction to meet the TMDL at the spring vents is 4,075,935 lb-N/yr.**

2.4 OSTDS Management Strategies

Overall, there are currently more than 6,000 OSTDS in the PFAs on lots less than one acre, based on FDOH estimates. This BMAP lists six specific projects (**Appendix B**) that reduce nitrogen loading from existing OSTDS on variably sized parcels by a total of 52,822 lb-N/yr. **Figure 8**, **Figure 9**, and **Figure 10** show the locations of all OSTDS in each sub-basin.

In addition to the six listed projects, DEP assessed the overall OSTDS loading compared with other nitrogen sources in the PFAs, as well as the relative loading in the wider BMAP area. Based on these assessments, DEP has determined that for the Suwannee River BMAP area, OSTDS contribute less than 20 % of nonpoint source nitrogen pollution to the OFS. Per the Suwannee River Basin NSILTs, septic systems contribute 3 % pollutant loading in the springshed areas and 3 % of the nitrogen loading in the PFAs. Irrespective of the percent contribution, nitrogen loading from OSTDS contribute to the significant degradation of the groundwater, and DEP has determined that an OSTDS remediation plan is necessary to achieve the TMDLs and to limit the increase in nitrogen loads from future growth. Accordingly, the OSTDS remediation plan prohibits the installation of new conventional systems on lots less than 1 acre within the PFA. The OSTDS remediation plan is incorporated as **Appendix D**.

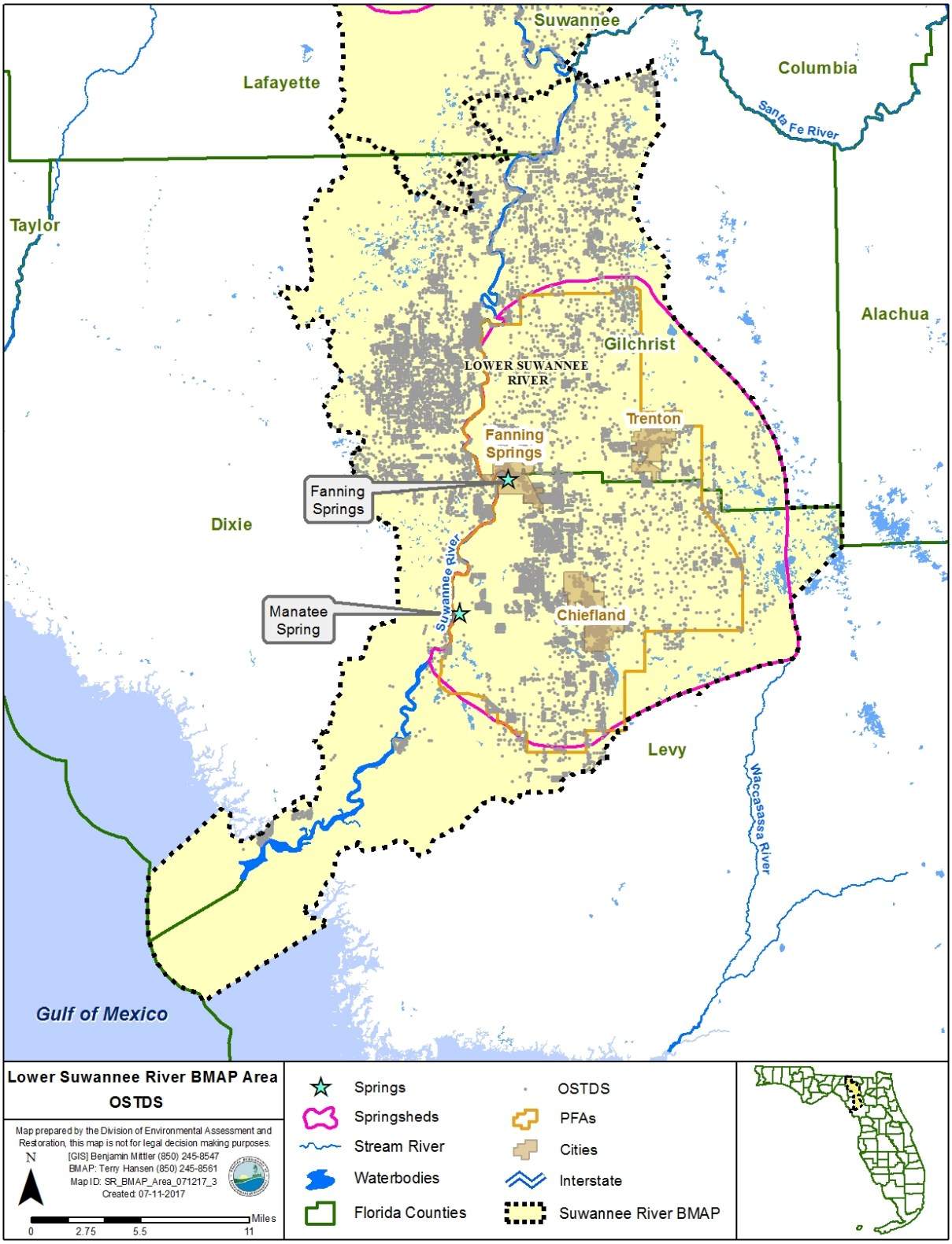

Figure 8. OSTDS locations in the Lower Suwannee River Sub-basin

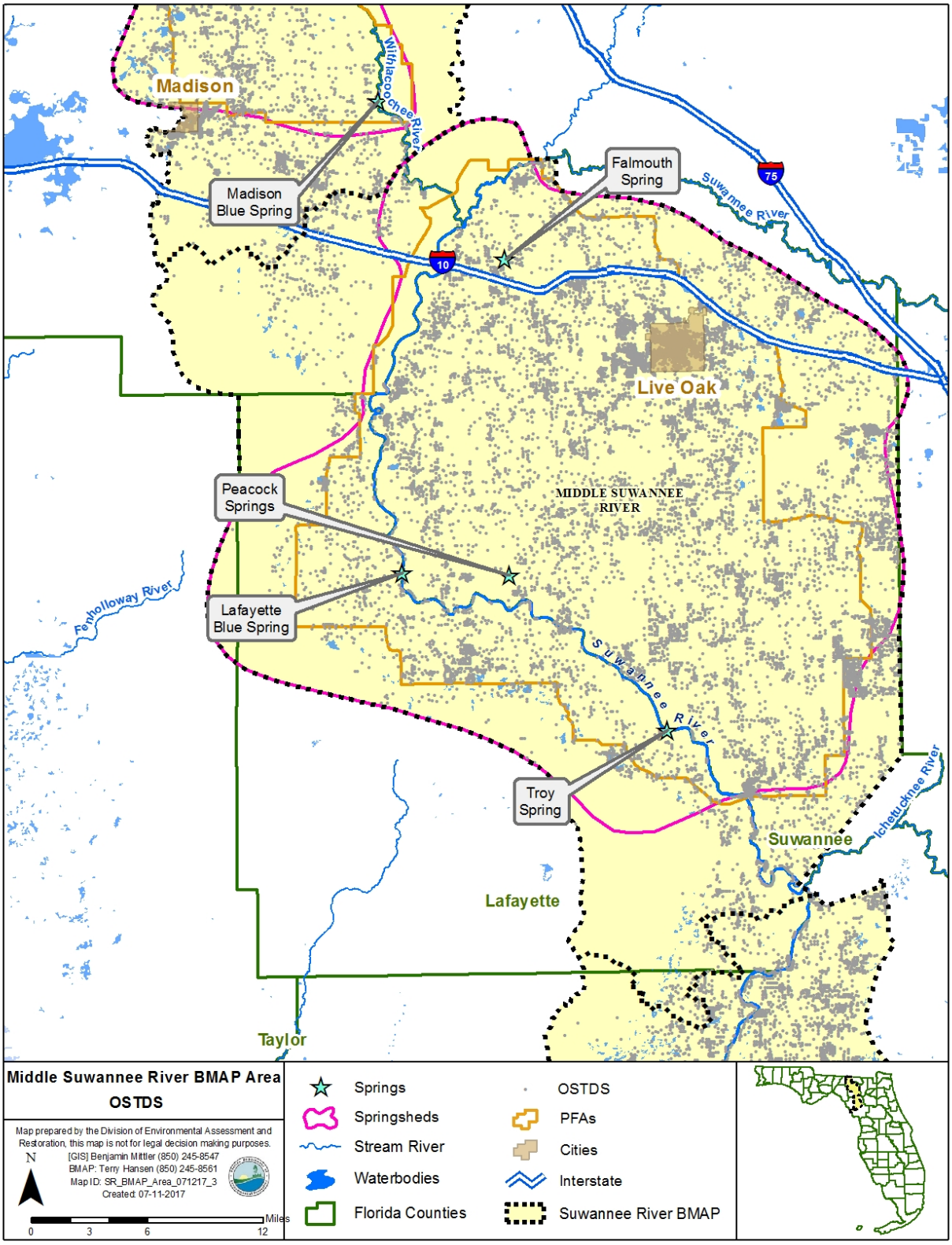

Figure 9. OSTDS locations in the Middle Suwannee River Sub-basin

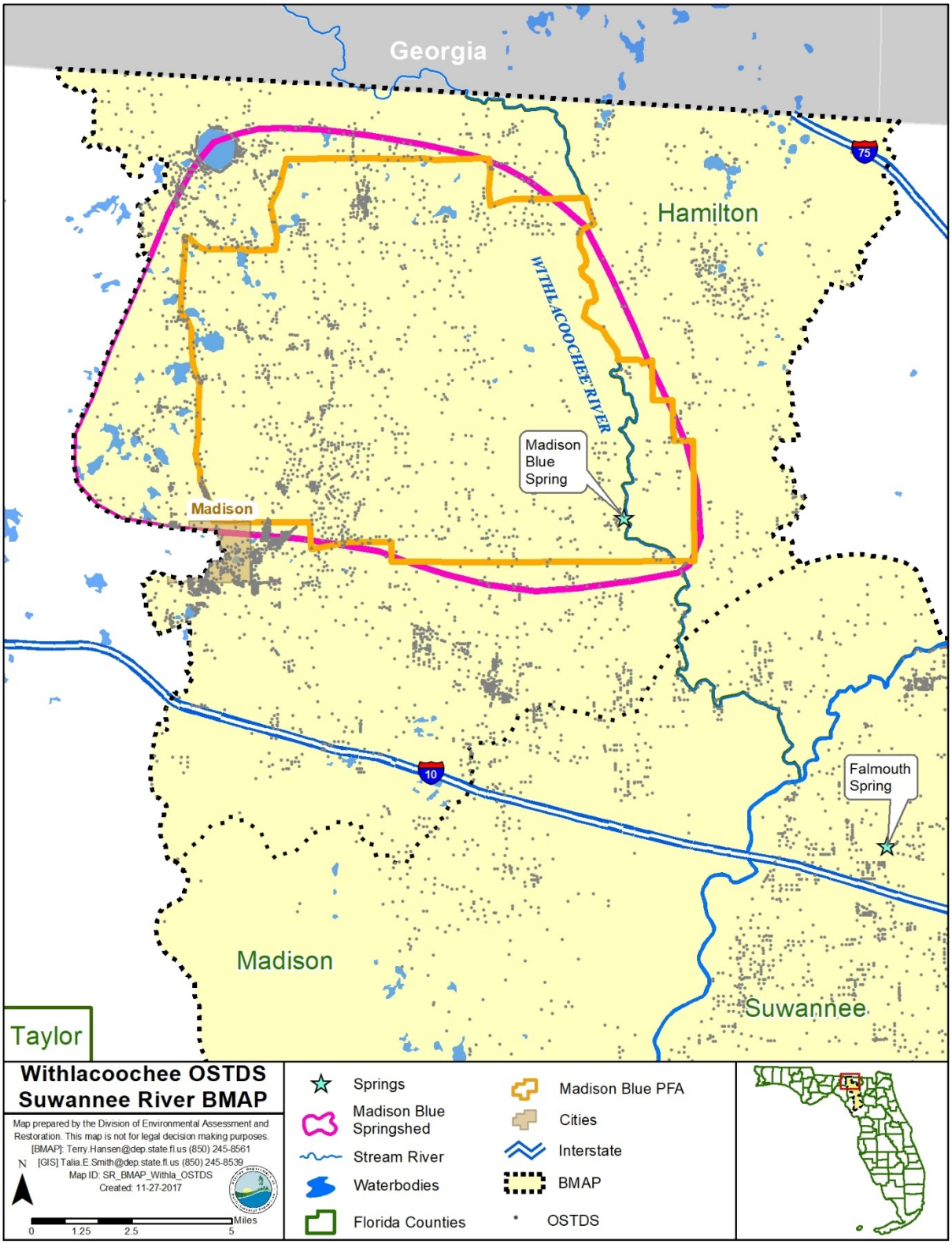

Figure 10. OSTDS locations in the Withlacoochee River Sub-basin

2.5 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.

2.5.1 Fertilizer Ordinance Adoption

As required by the Florida Legislature, as described in Subsection 373.807(2), 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.

2.5.2 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 11**). Additional environmental benefits could be credited if the counties and municipalities implement other public education efforts and source control ordinances (see **Table 12).**

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 11. 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.

2.5.3 Additional UTF Reduction Options

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 12**).

Table 12. Maximum UTF load reductions 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.

2.6 Agricultural Sources Management Strategies and Additional Reduction Options

Based on data including Florida Statewide Agriculture Irrigation Demand III geodatabase land use, FDACS identified agricultural acreage within the BMAP. An estimated 359,896 agricultural acres in the basin of land in the springshed area are considered agricultural, of which: 198,638 acres are identified as crop fertilizer lands, 155,135 acres are livestock lands, and 6,123 acres are identified as both fertilizer croplands and livestock lands.

2.6.1 FF Loading

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. FF includes commercial inorganic fertilizer applied to row crops, field crops, pasture, and hay fields. Some of the FF application sites are associated with dairies.

2.6.2 LW Loading

Agricultural practices specific to LW management were obtained through meetings with University of Florida Institute of Food and Agricultural Sciences (UF-IFAS) extension staff, FDACS field representatives, 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 LW at DEP-permitted dairies was estimated separately from other LW because specific permit information was available to account for loads, waste management practices, and nutrient management plans. The NSILT estimated total nitrogen load to groundwater from animal waste at permitted dairies is 339,182 lb-N/yr, or 3.5 % of the total nitrogen load to groundwater in the BMAP area. Commercial fertilizer applied to hay and silage at dairies is accounted for in the FF category.

2.6.4 Prioritized Management Strategies and Milestones

Subsection 403.067, F.S., requires agricultural nonpoint sources in a BMAP area either to 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 within the PFAs that do not implement applicable FDACS BMPs measures necessary to achieve pollution reduction levels established by DEP, or groundwater monitoring plans approved by a WMD or DEP. Failure to implement BMPs or conduct water quality monitoring that demonstrates compliance with pollutant reductions may result in enforcement action by DEP (s. 403.067(7)(b), F.S.).

FDACS will work with applicable producers within the BMAP area to implement BMPs. As of December 31, 2016, NOIs covered 187,312 agricultural 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 F** 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 534,760 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 DEP-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 167,000 lb-N/yr in reductions, for a total estimated permitted dairy reduction of 217,877 lb-N/yr.

For all livestock operations not included in the DEP-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 BMP implementation of all agricultural sources is 1,830,623 lb-N/yr.

2.6.5 Additional Agricultural Reduction Options

Further reductions may be achieved through implementing additional agricultural projects or practices, including land acquisition and conservation easements. SRWMD is implementing projects to encourage low input agriculture and water quality improvement technologies. Examples of these projects include providing incentives for producers to transition to less intensive cropping systems, changing land use to fallow or native landscape, or changing the type of cropping system. Other reductions associated with the implementation and modification of BMPs may be realized through ongoing studies and data collection. Basin-specific studies are underway to evaluate and demonstrate the effectiveness of BMPs on a site-specific basis.

Table 13 identifies possible these projects and practices with the estimated acreages. FDACS used the Florida Statewide Agricultural Lands Irrigated Database (FSAID) III to identify crop types and acreages where projects and practices could potentially be implemented.

Table 13. Estimated acreages for additional agricultural projects and practices

Action	Acreage
Precision Irrigation	88,940
Precision Fertilization	51,296
Soil Moisture Probes	95,845
Controlled Release Fertilizer	17,261
Rotational Production	50,048
Cover Crops	87,208
Line Five Storage Waste Ponds	0

The projects and practices listed in **Table 13** are a component of the reductions to groundwater that could be achieved through changes in practices (**Table 14**). 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 14. 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	204,761	5,794,980	4,346,235	2,897,490	1,448,745	579,498
75	153,571	4,346,235	3,259,676	2,173,118	1,086,559	434,624
50	102,831	2,897,490	2,173,118	1,448,745	724,373	289,749
25	51,190	1,448,745	1,086,559	724,373	362,186	144,875
10	20,476	579,498	434,624	289,749	144,875	57,950

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 identify a suite of agricultural projects and research agricultural technologies that could be implemented 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 need to 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.

2.7 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.

2.7.1 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 the DEP BMP manual, *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses* for an estimated 10 % reduction in load.

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 15**.

Table 15. 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**

2.8 WWTF Management Strategies

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.

2.8.1 Summary of Facilities

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

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

2.8.2 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 provide AWT that reduces total nitrogen in the effluent to 3 mg/L or lower, on an annual permitted basis.

DEP requires the nitrogen effluent limits listed below in any new or existing wastewater permit in the BMAP area, unless the utility/entity can demonstrate reasonable assurance that the reuse or land application of effluent would not cause or contribute to an exceedance 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 their facility would not cause a nitrate concentration that would be 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 16** will be applied as an annual average to all new and existing WWTFs with a DEP-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 16. Wastewater effluent standards for the BMAP area

95% of the Permitted Capacity (gpd)	TN Concentration Limits for RIBs and Absorption Fields (mg/L)	TN Concentration Limits for All Other Land Disposal Methods, Including Reuse (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.

DEP encourages the reuse of treated wastewater for irrigation as a water conservation measure. The expansion of reuse water for irrigation can 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 water quality will both reduce loads from this source and limit future increases in loading from reuse because of higher treatment levels.

2.8.3 Prioritized Management Strategies and Milestones

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.

2.9 Atmospheric Deposition Management Strategies

2.9.1 Summary of Loading

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 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 the total atmospheric deposition model or "TDEP." Deposition data from several monitoring networks—including Clean Air Status and Trends Network (CASTNET), the National Atmospheric Deposition Program (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 National Trends Network (NTN) wet deposition values to model total deposition. The TDEP model run used for the NSILT included data from 2011 to 2013.

2.9.2 Description of Approach

Atmospheric sources of nitrogen are local, national, and international. 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 be re-evaluated periodically.

2.10 Future Growth Management Strategies

New development primarily falls into to two general source categories: new urban development and new agriculture. Nutrient impacts from new development are addressed through a variety of mechanisms outlined in this BMAP as well as other provisions of Florida law. For instance, wastewater from all new and existing urban development is treated through either domestic WWTFs or OSTDS. New WWTFs must meet the stringent nitrogen limitations set forth in this BMAP. Existing WWTFs also must be upgraded to meet these same BMAP requirements. Florida law requires new development to connect to WWTFs where sewer lines are available. Where sewer is not available within the PFA, this BMAP still prohibits the installation of new OSTDS on lots of less than one-acre unless the system includes enhanced treatment of nitrogen, as described in **Appendix D**. Likewise, all new agricultural operations must implement FDACS-adopted BMPs and potentially other additional measures (**Section 2.6**), or must conduct water quality monitoring that demonstrates compliance with water quality standards. The associated increased load to groundwater from increases in irrigated farmland must also be addressed in

addition to the current loads. Future development must connect to central sewer, if available; or include nitrogen-reducing OSTDS as described in **Appendix D**.

Other laws such as local land development regulations, comprehensive plans, ordinances, incentives, environmental resource permit requirements, and consumptive use permit requirements, all provide additional mechanisms for protecting water resources and reducing the impact of new development and other land use changes as they occur. Through this array of laws and the requirements in this BMAP, new development must undertake nitrogen-reduction measures before the development is complete..

2.11 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 that can help reduce water quality impacts in the Suwannee River Basin. **Table 17** 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 17. SRWMD conservation land purchases through the Florida Forever Program

* Land acquisition costs incurred during fiscal year but no acres acquired.

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**

2.12 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, water management districts (WMDs), FDOH, and FDACS will implement management strategies using the annual Legacy Florida appropriation from the legislature of at least $50 million to reduce nitrogen in impaired OFS. DEP, working with the coordinating agencies, will continue to invest existing funds and explore other opportunities and potential funding sources for springs restoration efforts.

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 on 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 making adjustments in the BMAP when circumstances change or monitoring indicates the need for additional or more effective restoration strategies. Adaptive management measures may include the following:

- Implementing procedures to determine whether additional cooperative strategies are needed.

- Using criteria/processes for determining whether and when plan components need revision because of changes in costs, project effectiveness, social effects, watershed conditions, or other factors.

- Revising descriptions of stakeholders' roles during BMAP implementation and after BMAP completion.

- Updating information on corrective actions (and any supporting documentation) being implemented as data are gathered to refine project implementation schedules and performance expectations.

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

3.3 Water Quality and Biological 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 implementation involves an iterative process, the monitoring efforts are related to primary and secondary objectives. The primary objectives focus on achieving water quality targets, 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 as necessary.

Primary objectives:

- Measure the water quality and biological response in the impaired springs, river, and/or groundwater at the beginning of the BMAP period and during implementation.

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

- Focus BMP efforts by using water quality results combined with appropriate project information and land use in conjunction with statistical and spatial analysis tools.

Secondary objectives:

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

- Confirm and refine nutrient removal efficiencies of agricultural and/or urban BMPs.
- Develop an advanced BMP implementation plan.
- Identify and implement more effective nutrient reduction strategies.
- Use nitrogen isotope and tracer sampling for evaluating nitrogen contributions from organic and inorganic sources.

3.3.2 Water Quality 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 18** and **Table 19,** 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, nitrate 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.

Table 18. Core water quality indicators

Core Parameters
Chloride
Sulfate
Potassium
Ammonia as Nitrogen
Total Kjeldahl Nitrogen
Nitrate/Nitrite as Nitrogen

Table 19. Supplemental water quality indicators and field parameters

Supplemental Parameters
Specific Conductance
Dissolved Oxygen (DO)
pH
Temperature

Supplemental Parameters
Total Suspended Solids (TSS)
Nitrate and Oxygen Isotopes

Initially, data from the ongoing sampling effort being conducted by SRWMD will be used to determine progress towards the primary objectives. Surface water and groundwater monitoring network locations were selected to track changes in water quality and allow the annual evaluation of progress toward achieving the TMDL. **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. DEP and SRWMD will be responsible for activities to satisfy secondary monitoring objectives.

3.3.3 Biological Monitoring

Biological resource responses represent improvements in the overall ecological health of the Suwannee River Basin (see **Table 20**).

Table 20. Biological response measures for spring runs

Biological Response Measures
Chlorophyll *a*
Stream Condition Index (SCI) score
Linear Vegetation Survey (LVS) score
Rapid Periphyton Survey (RPS) score
Key fish populations

An RPS will be conducted to assess the abundance and variety of algae in the river. An LVS will be conducted to assess the types and density of vegetation present in the river and to identify the native versus non-native species. An SCI will be conducted to measure the number of different organisms present in the river. In addition, habitat assessments (HAs) will be conducted to assess the river conditions and habitat present to support the SCI evaluation. Water quality samples will also be collected with the biological monitoring.

3.3.4 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 has replaced the Florida Storage and Retrieval System (STORET). DEP pulls water quality data directly from WIN and U.S. Geological Survey (USGS) databases 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 collected by DEP are stored in the DEP Statewide Biological (SBIO) database. Biological data should be collected and regularly provided to DEP following the applicable standard operating procedures. All biological data collected in the last quarter of the calendar year should be uploaded or provided no later than April 1 of the following year.

The water quality 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.

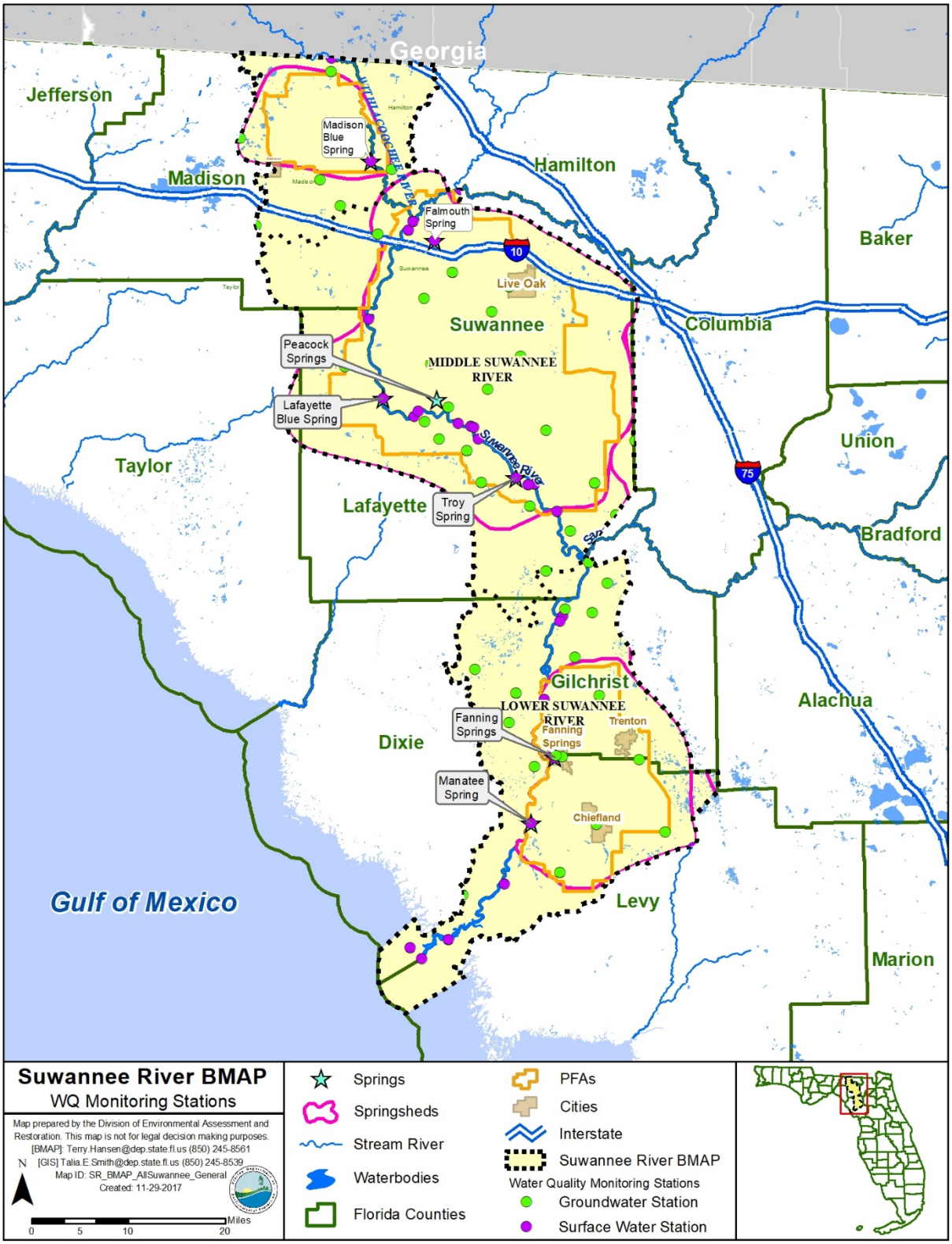

Figure 12. Groundwater and surface water stations sampled in the Suwannee River Basin

3.3.5 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 DEP 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. None of these linked materials are adopted into this BMAP.

- DEP Website: http://www.floridadep.gov
- DEP Map Direct Webpage: https://ca.dep.state.fl.us/mapdirect/
- Searchable online version of PFA maps: https://www.floridadep.gov/pfamap
- Florida Statutes: http://www.leg.state.fl.us/statutes:
    - Florida Watershed Recovery Act (Section 403.067, F.S.)
    - Florida Springs and Aquifer Protection Act (Part VIII of Chapter 373, F.S.)
- Florida Watershed Recovery Act (Section 403.067, F.S.)
- Florida Springs and Aquifer Protection Act (Part VIII of Chapter 373, F.S.)
- DEP Model Ordinances: http://fyn.ifas.ufl.edu/fert_ordinances.html
- 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: to https://www.freshfromflorida.com/Business-Services/Best-Management-Practices-BMPs/Agricultural-Best-Management-Practices
- FDACS BMP and Field Staff Contacts: http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy
- Florida Administrative Code (Florida Rules): https://www.flrules.org/
- SRWMD Surface Water Improvement and Management (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

Prioritization of Management Strategies

The management strategies in **Table B-1** are ranked with a priority of high, medium, or low. In 2016, the Florida Legislature amended the Watershed Restoration Act (Section 403.067, F.S.), creating additional requirements for all new or revised BMAPs. BMAPs must now include planning-level details for each listed project, along with their priority ranking.

Project status was selected as the most appropriate indicator of a project's priority ranking based primarily on need for funding. Projects with a "completed" status were assigned a low priority. Projects classified as "underway" were assigned a medium priority because some resources have been allocated to these projects, but additional assistance may be needed for the project to be completed. High priority was assigned to projects listed with the project status "planned" as well as certain "completed" projects that are ongoing each year (any project with one of these project types: "street sweeping," "catch basin inserts/inlet filter cleanout," "public education efforts," "fertilizer cessation," "fertilizer reduction," or "aquatic vegetation harvesting"), and select projects that are elevated because substantial, subsequent project(s) are reliant on their completion.

Description of the Management Strategies

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

While the 20-year planning period for this BMAP is 2018 to 2036, projects completed since July 1, 2007, count toward the overall nitrogen reduction goals.

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. Agriculture load reductions (FDACS-01 and FDACS-02) assume 100 % enrollment and verification. Projects with a designation of TBD (to be determined) denotes information is not currently available, but will be provided by the stakeholder when it is available. Projects with a designation of N/A (not applicable) indicates the information for that category is not relevant to that project. Projects with a designation of "Not Provided" denotes that information was requested by DEP but was not provided by the lead entity.

Table B-1. Stakeholder projects to reduce nitrogen sources

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Lower Suwannee River Basin	AD-01	Rotational Grazing and Aerobic Digester Pilot Project	Not Provided.	BMPs	Underway	Not Provided	Not Provided	LW	Not Provided	Not Provided	Not Provided	Not Provided
Town of Branford	Middle Suwannee River Basin	BRAN-01	Advanced WWTF	Upgrade WWTF from secondary to advanced water treatment.	WWTF Upgrade	Planned	2017	2018	WWTF	TBD	$1,500,000	DEP/ SRWMD	TBD
Town of Branford	Middle Suwannee River Basin	BRAN-02	Branford Wastewater Effluent Pond Failure Repairs	Replace effluent pond at WWTP with tanks.	WWTF Upgrade	Underway	2015	2018	WWTF	TBD	$368,868	Town/ SRWMD	SRWMD: $231,500 Town: $137,368
City of Chiefland	Lower Suwannee River Basin	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	Underway	2016	2018	WWTF	TBD	$418,400	City/DEP	DEP: $376,560 City: $41,840
Dixie County	Lower Suwannee River Basin	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 N/natural flow through N/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	Underway	2016	2018	Other	TBD	$2,406,359	County/ DEP/ SRWMD	DEP: $2,200,000 SRWMD: $106,359 County: $100,000

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
Dixie County	Lower Suwannee River Basin	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	Underway	2016	2018	Other	TBD	$1,600,000	County/ DEP/ SRWMD	DEP: $1,500,000 SRWMD: $50,000 County: $50,000
FDACS	Basinwide	FDACS-01	BMPs Implementation and Verification - Farm Fertilizer	Implementation of existing BMPs on applicable acreage. Up to 15% reduction in load to groundwater.	BMPs	Underway	Not Provided	Not Provided	FF	869,247	$10,084,985 for BMP Implementation; BMP Verification TBD	FDACS	TBD
FDACS	Basinwide	FDACS-02	BMPs Implementation and Verification - Livestock Waste	Implementation of existing BMPs at applicable facilities. Up to 10% reduction in load to groundwater.	BMPs	Underway	Not Provided	Not Provided	LW	208,739	$7,909,822 for BMP Implementation; BMP Verification TBD	FDACS	TBD
Florida Department of Transportation (FDOT) District 2	Basinwide	FDOT-01	Fertilizer Elimination	Eliminate fertilizer in rights-of way.	Fertilizer Cessation	Completed	Not Provided	Not Provided	UTF	TBD	Not Provided	Not Provided	Not Provided

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
FDOT Central Office	Lower Suwannee River Basin	FDOT-02	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.	Study	Underway	2015	2018	Other	N/A	$180,101	SRWMD	SRWMD: $180,101
Florida Farm Bureau (FFB)	Basinwide	FFB-01	Agricultural Producer Workshops	Workshops with agricultural producers in the basin.	BMPs	Underway	Not Provided	Not Provided	FF	TBD	Not Provided	Not Provided	Not Provided
FFB	Basinwide	FFB-02	County Alliance for Responsible Environmental Stewardship (CARES)	Stewardship program active within the basin.	BMPs	Underway	Not Provided	Not Provided	FF	TBD	Not Provided	Not Provided	Not Provided
DEP Florida Park Service (FPS)	Lower Suwannee River Basin	FPS-01	Fanning Springs State Park Restoration	Replant submerged aquatic vegetation (SAV) in spring run of Fanning and Little Fanning Springs.	SAV Planting	Planned	TBD	TBD	Other	TBD	TBD	DEP	TBD
FPS	Lower Suwannee River Basin	FPS-02	Manatee Spring State Park Restoration	Replant SAV in spring run.	SAV Planting	Planned	TBD	TBD	Other	TBD	TBD	DEP	TBD
FPS	Middle Suwannee River Basin	FPS-03	Troy Spring State Park Restoration	Shoreline stabilization at spring run.	Shoreline Stabilization	Planned	TBD	TBD	Other	TBD	TBD	DEP	TBD
City of Fanning Springs	Lower Suwannee River Basin	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	Completed	2014	2015	OSTDS	1,300	$1,276,360	City/ DEP/ SRWMD	City: $662,000 DEP: $492,960 SRWMD: $121,440

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Lower Suwannee River Basin	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	Underway	2015	2018	OSTDS	4,300	$2,120,000	DEP/ SRWMD / City	DEP: $2,000,000 SRWMD: $120,000
City of Fanning Springs	Lower Suwannee River Basin	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	Underway	2016	2018	OSTDS	4,554	$3,395,100	City/ DEP/ SRWMD	DEP: $3,355,100 City: $40,000
City of Fanning Springs	Lower Suwannee River Basin	FS-04	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	Planned	TBD	TBD	WWTF	TBD	$7,000,000	City/ DEP/ SRWMD	TBD
City of Fanning Springs	Lower Suwannee River Basin	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	Planned	TBD	TBD	WWTF	TBD	#########	City/ DEP/ SRWMD	TBD

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
Gilcrhist County	Lower Suwannee River Basin	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	Underway	2016	2020	OSTDS	1,724	$5,979,740	DEP	DEP: $1,829,890 (Phase I)
Golf Courses	Lower Suwannee and Middle Suwannee River Basins	GC-01	Golf Course Reduction Credits	6% BMP credit on golf course load to groundwater, assuming 100% BMP implementation by golf course owners.	BMPs	Planned	TBD	TBD	STF	705	TBD	TBD	TBD
Lafayette County	Middle Suwannee River Basin	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	Underway	2016	2018	UTF	TBD	$152,550	SRWMD / County	SRWMD: $142,550 County: $10,000
Local Governments	Basinwide	LG-01	Public Education	Adopted fertilizer ordinance.	Education Efforts	Planned	TBD	TBD	UTF	1,466	TBD	TBD	TBD
City of Live Oak	Middle Suwannee River Basin	LO-01	Stormwater, Drainage, and Aquifer Recharge Well Rehabilitation	Installation of 60 wells for aquifer recharge.	Groundwater Management	Underway	Not Provided	Not Provided	Other	TBD	$7,200,000	City/ SRWMD	Not Provided
City of Live Oak	Middle Suwannee River Basin	LO-02	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	Underway	2014	2018	STF	TBD	$129,344	SRWMD	SRWMD: $129,344

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Middle Suwannee River Basin	LO-03	Live Oak 49/90 Lift Station Improvements	Install a mixer in the lift station to eliminate sewage spills and improve water quality.	WWTF Upgrade	Completed	2016	2017	WWTF	TBD	$15,363	City/ SRWMD	SRWMD: $12,690 City: $2,673
City of Live Oak	Middle Suwannee River Basin	LO-04	9th and Scriven Regional Stormwater Management Facility	Reduce flooding by increasing runoff treatment in stormwater facility.	Stormwater System Upgrade	Underway	2017	2018	UTF	TBD	$92,000	Not Provided	Not Provided
City of Live Oak	Middle Suwannee River Basin	LO-05	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	Planned	TBD	TBD	Other	TBD	$866,800	City/ DEP/ SRWMD	TBD
City of Live Oak	Middle Suwannee River Basin	LO-06	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	Planned	TBD	TBD	OSTDS	1,050	$1,089,300	City/ DEP/ SRWMD	TBD

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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 Madison	Withlacoochee River Basin	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	Underway	2017	2018	UTF	TBD	$77,525	SRWMD	SRWMD: $42,850 City: $34,675
Madison County	Withlacoochee River Basin	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	Underway	2017	2020	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
Various	Basinwide	OSTDS-01	Enhancement of Existing OSTDS - Voluntary	Repair, upgrade, replacement, drainfield modification, addition of effective nitrogen reducing features, initial connection to a central sewerage system, or other action to reduce nutrient loading, voluntarily taken by the owner of an OSTDS within the BMAP.	OSTDS Enhancement	Underway	2018	N/A	OSTDS	TBD	TBD	DEP	TBD
Permitted Dairies	Middle Suwannee River Basin	PD-01	Dairy Reduction Credits	15% BMP credit on dairy load to groundwater assuming 100% owner implemented BMPs on all dairy lands.	BMPs	Planned	TBD	TBD	Dairy	50,877	TBD	TBD	TBD

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
Suwannee County	Middle Suwannee River Basin	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	Underway	2017	Not Provided	OSTDS	39,894	$3,330,000	DEP / County	DEP: $2,780,000 County: $550,000
Sports Fields	Lower Suwannee and Middle Suwannee River Basins	SF-01	Sports Field Reduction Credits	10% BMP credit on sports field load to groundwater, assuming 100% BMP implementation by sports field owners.	BMPs	Planned	TBD	TBD	STF	346	TBD	TBD	TBD
SRWMD	Basinwide	SRWMD-01	Suwannee River SWIM Plan	Implementation and periodic review and update of the Suwannee River SWIM Plan.	Study	Underway	2015	2017	Other	N/A	$238,563	SRWMD	SRWMD: $238,563
SRWMD	Basinwide	SRWMD-02	Advanced Nutrient Management Through Center Pivots	Fertigation system installation and center pivot retrofits.	BMPs	Underway	2014	2018	FF	272,760	$1,190,700	DEP/ SRWMD	DEP: $915,000 SRWMD: $33,150 Producers: $242,500
SRWMD	Middle Suwannee River Basin	SRWMD-03	Improved Nutrient Application Practices in Dairy Operations - Phase 2	To date, nine agreements with dairies to install screen separators to reduce wastewater solids.	BMPs	Underway	2015	2018	Dairy	95,000	$2,670,000	DEP/ SRWMD	DEP: $2,120,000 SRWMD: $20,000 Producers: $530,000

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Middle Suwannee River Basin	SRWMD-04	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	Underway	2016	2019	Dairy	10,000	$1,800,000	DEP/ SRWMD	DEP: $1,500,000 SRWMD: $300,000
SRWMD	Middle Suwannee River Basin	SRWMD-05	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	Underway	2014	2018	Dairy	62,000	$1,885,590	DEP/ FDACS/ SRWMD/ Producers	DEP: $920,000 FDACS: $250,000 SRWMD: $298,004 Producers: $417,586
SRWMD	Basinwide	SRWMD-06	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	Underway	2016	2019	FF	225,000	$3,000,000	DEP	DEP: $3,000,000

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Basinwide	SRWMD-07	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	Underway	2017	2019	FF	32,700	$1,234,626	DEP/ Producers	DEP: $1,000,000 Producers: $234,626
SRWMD	Basinwide	SRWMD-08	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	Underway	7/4/1905	Annual	WWTF	TBD	$1,500,000/ annually	SRWMD	SRWMD: $1,500,000

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Basinwide	SRWMD-09	Precision Agricultural Practices	Provide cost-share funds to agricultural producers within the BMAP area to implement precision nutrient and irrigation management technology.	BMPs	Underway	2017	Not Provided	FF	TBD	$2,500,000	SRWMD	SRWMD: $2,500,000
SRWMD	Middle Suwannee River Basin	SRWMD-10	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	Underway	2015	2020	Other	TBD	$1,900,000	SRWMD/ Dixie County / DEP	DEP: $1,548,000 SRWMD: $277,000 Dixie County: $75,000
SRWMD	Middle Suwannee River Basin	SRWMD-11	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	Planned	TBD	TBD	Other	TBD	TBD	SRWMD/ DEP	TBD

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Lower Suwannee River Basin	SRWMD-12	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	Completed	2016	2018	Other	Not Provided	$140,000	SRWMD	SRWMD: $140,000
SRWMD	Lower Suwannee River Basin	SRWMD-13	Hart Springs Restoration	Improve water quality and spring flows.	Hydrologic Restoration	Completed	2014	2015	Other	Not Provided	$76,500	SRWMD	SRWMD: $76,500
SRWMD	Middle Suwannee River Basin	SRWMD-14	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	Underway	2016	2020	UTF	69	$183,600	DEP	DEP: $183,600
SRWMD	Middle Suwannee River Basin	SRWMD-15	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	Completed	2015	2016	Other	Not Provided	$104,587	SRWMD/ Suwannee County	SRWMD: $90,000 County: $14,587

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project 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	Middle Suwannee River Basin	SRWMD-16	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	Completed	2013	2016	Other	Not Provided	$112,378	County/ SRWMD	SRWMD: $105,000 County: $7,378
SRWMD	Middle Suwannee River Basin	SRWMD-17	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	Underway	2014	2018	Other	Not Provided	$152,985	County/ SRWMD	SRWMD: $145,985 County: $7,000
SRWMD	Middle Suwannee River Basin	SRWMD-18	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	Underway	2016	2020	FF	4,300	$630,000	DEP/ SRWMD	DEP: $600,000 SRWMD: $30,000
City of Trenton	Lower Suwannee River Basin	T-01	WWTF Improvements	Improvements to City's WWTF to provide advanced wastewater treatment.	WWTF Upgrade	Planned	TBD	TBD	WWTF	TBD	$6,200,000	City/ DEP/ SRWMD/ USDA	TBD
City of Trenton	Lower Suwannee River Basin	T-02	Trenton Lift Station #7 Rehabilitation	Rehabilitate existing lift station.	WWTF Upgrade	Completed	2014	2017	WWTF	Not Provided	$207,800	City/ SRWMD	SRWMD: $150,000 City: $57,800

Lead Entity	Location	Project Number	Project Name	Project Description	Project Type	Project Status	Start Date	Estimated Completion Date	Nitrogen Source Addressed by Project	Estimated Nitrogen Load Reduction (lb-N/yr)	Cost Estimate	Funding Source	Funding Amount
Wastewater Utilities	Lower Suwannee and Middle Suwannee River Basins	WU-01	Wastewater Treatment Facility Reduction Credits	Achieved by WWTF policy if implemented BMAP-wide, achieving 3 or 6 mg/L.	WWTF Upgrade	Planned	TBD	TBD	WWTF	17,533	TBD	TBD	TBD

Appendix C. PFAs

A PFA (Fanning and Manatee Springs, March 2017; Madison Blue Spring, August 2017; Troy, Peacock, Lafayette Blue and Falmouth Springs, January 2017) is defined 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. As required by the Florida Springs and Aquifer Protection Act, DEP delineated PFAs for the Lower Suwannee River, Middle Suwannee River, and Withlacoochee River Sub-basins. These PFAs are adopted and incorporated by reference into this BMAP. Detailed information on the PFAs is available in report format at the following link: http://publicfiles.dep.state.fl.us/dear/PFAs.

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. Irrespective of the percent contribution from OSTDS, DEP has determined that an OSTDS remediation plan is necessary to achieve the TMDLs and to limit the increase in nitrogen loads from future growth.

D.1 Plan Elements

D.1.1 Installation of New OSTDS

Per statute, new OSTDS on lots of less than one acre are prohibited within PFAs, if the addition of the specific systems conflicts with an OSTDS remediation plan incorporated into an OFS BMAP (see Section 373.811(2), F.S.). This OSTDS remediation plan prohibits new conventional systems on lots of less than one acre within the PFAs, unless the OSTDS includes enhanced treatment of nitrogen or unless the OSTDS permit applicant demonstrates that sewer connections will be available within 5 years. To aid in implementation, the DEP Map Direct webpage includes a detailed downloadable springs PFA boundary shapefile. DEP also maintains on its website an interactive map of the PFA and BMAP boundaries; the map can be easily searched for specific street address locations.

FDOH permits the installation of new OSTDS pursuant to Chapter 64E-6, F.A.C., which includes not only systems installed on a property where one has not previously been installed, but also systems installed to replace illegal systems, systems installed in addition to existing systems, and other new systems. FDOH permitting requirements with respect to the definition of "new" or "less than one acre" will be followed for this remediation plan. To meet the enhanced treatment of nitrogen requirement the system must include at least one of the following nitrogen reducing enhancements:

- Features allowed pursuant to FDOH rule, such as in-ground nitrogen-reducing biofilters (media layer systems)

- Features consistent with and identified in the FDOH Florida Onsite System Nitrogen Removal Strategy Studies report, such as in-tank nitrogen-reducing biofilters

- Other FDOH-approved treatment systems capable of meeting or exceeding the NSF International (NSF) Standard 245 nitrogen removal rate before disposing the wastewater in the drain field, such as aerobic treatment units (ATU) and performance-based treatment systems (PBTS). 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.1.2 Modification or Repair of Existing OSTDS

At this time, this remediation plan does not require the addition of nitrogen reducing enhancements upon modification or repair of existing OSTDS.

D.1.3 Other Plan Elements

Statutes also require that OSTDS remediation plans contain the following elements.

- An evaluation of credible scientific information on the effect of nutrients, particularly forms of nitrogen, on springs and spring systems. (See **Section D.2**.)
- Options for repair, upgrade, replacement, drain field modification, the addition of effective nitrogen-reducing features, connection to a central sewer system, or other action. (See **Section D.3**.)
- A public education plan to provide area residents with reliable, understandable information about OSTDS and springs. (See **Section D.4**.)
- Cost-effective and financially feasible projects necessary to reduce the nutrient impacts from OSTDS. (See **Section 2** and **Appendix B**.)
- A priority ranking for each project for funding contingent on appropriations in the General Appropriations Act. (See **Section 2** and **Appendix B**.)

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.2 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 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. Additional technical support information concerning the NSILT can be found in **Appendix E**.

D.3 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 connection to 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	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	62,307	42,631	13,523	133,955	91,653
Medium	0	0	0	0	0	0
Total	**6,290**	**62,307**	**42,631**	**13,523**	**104,127**	**71,672**

As required by statute, this OSTDS remediation plan identifies remediation options for existing OSTDS, including repair, upgrade, replacement, drain field modification, the addition of effective nitrogen-reducing features, connection to a central sewer system, or other action. More simply, remediation options can be classified as enhancement or replacement. Enhancement options consist of systems identified in either existing FDOH rules or existing and ongoing FDOH studies, or systems not otherwise prohibited by FDOH. Examples of enhancements include in-ground nitrogen-reducing biofilters (media layer systems); in-tank nitrogen-reducing biofilters; and ATU or PBTS capable of meeting or exceeding the NSF Standard 245 nitrogen removal rate before disposing wastewater in the drain field.

Nitrogen impacts from new development could also be reduced through prohibiting new conventional OSTDS on all lots in the PFAs, throughout the BMAP area, or both.

DEP, FDOH, and local governments will develop programs to help fund the additional costs required to upgrade existing OSTDS to include nutrient reducing features. Although upgrading existing OSTDS to include nitrogen reducing features is not required by this BMAP, upgrades would be beneficial within the PFAs and throughout the BMAP area. The funding program will be designed to prioritize OSTDS where it is most economical and efficient to add nutrient reducing features (i.e., systems needing a permit for a repair or modification, within the PFA, and on lots of less than one acre).

To facilitate incorporation of nitrogen reducing features at the time of a permit to repair or modify an existing OSTDS, FDOH will pursue regulatory solutions to accomplish the following objectives:

- Update OSTDS rule language regarding permits, variances, and waivers to include consideration of DEP-adopted OSTDS remediation plans.

- Update OSTDS rules to allow installation of passive remediation systems, including but not limited to systems featuring liners, nitrogen reducing material, or both underneath the drain field.

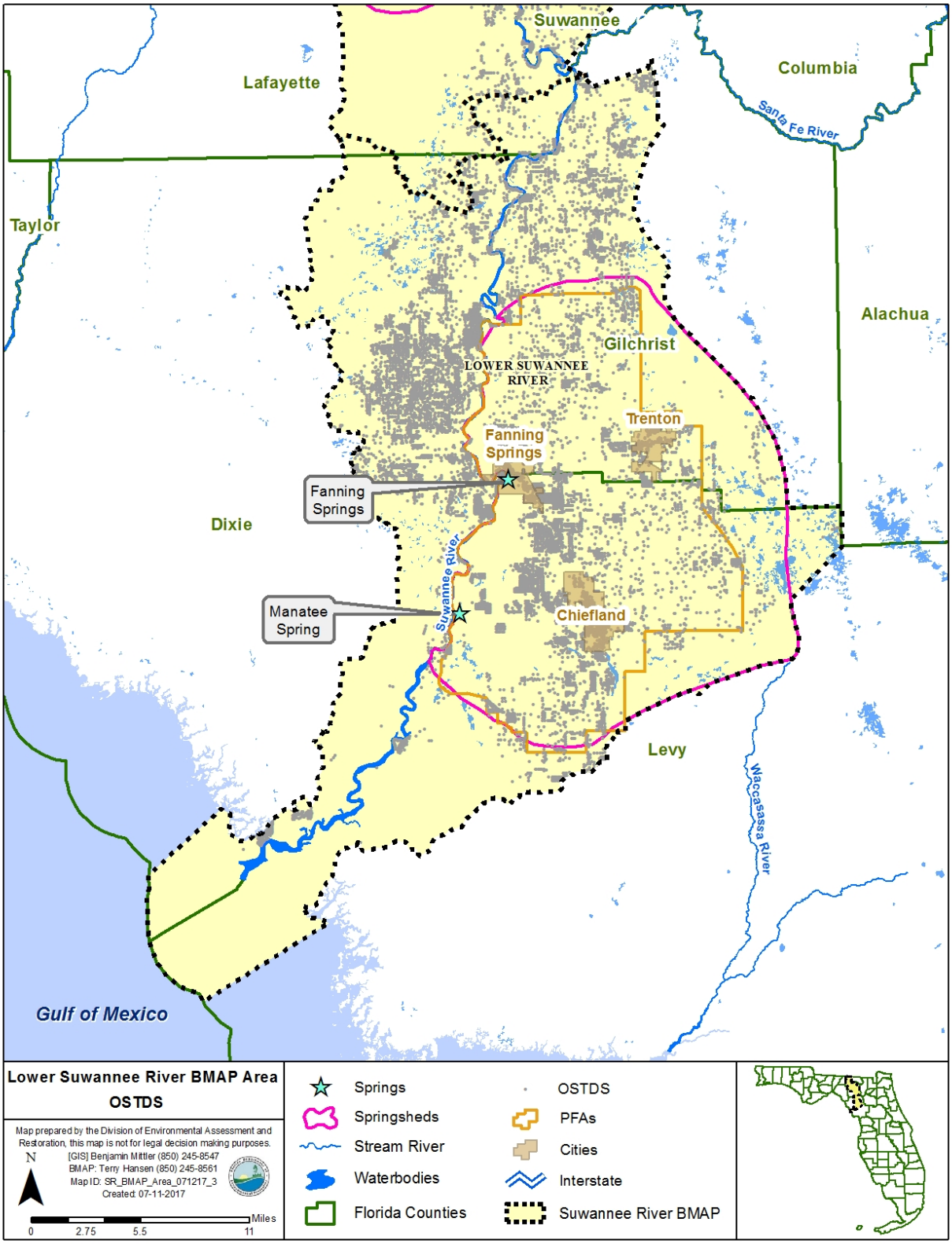

Figure D-1. OSTDS locations in the Lower Suwannee River Sub-basin PFA

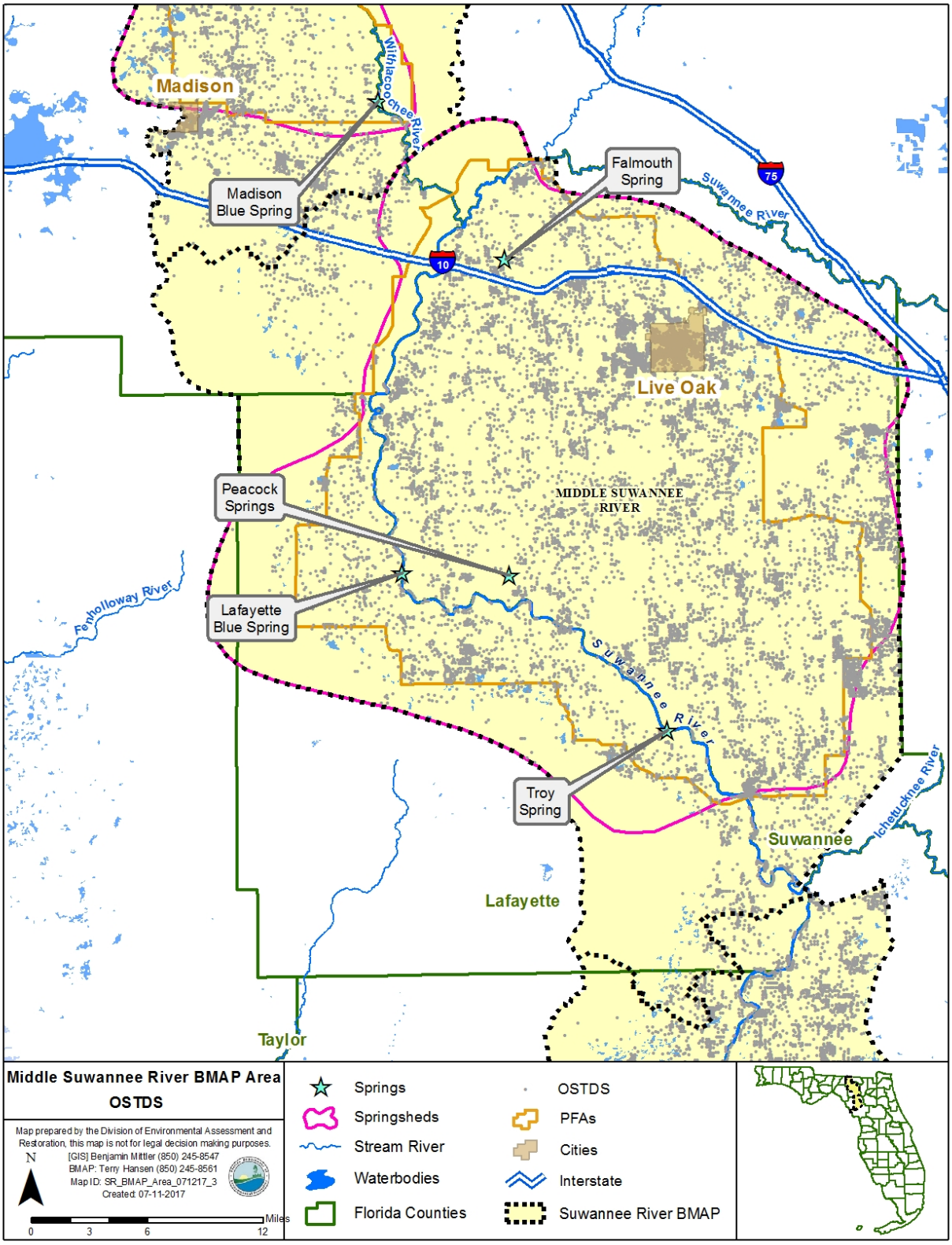

Figure D-2. OSTDS locations in the Middle Suwannee River Sub-basin PFA

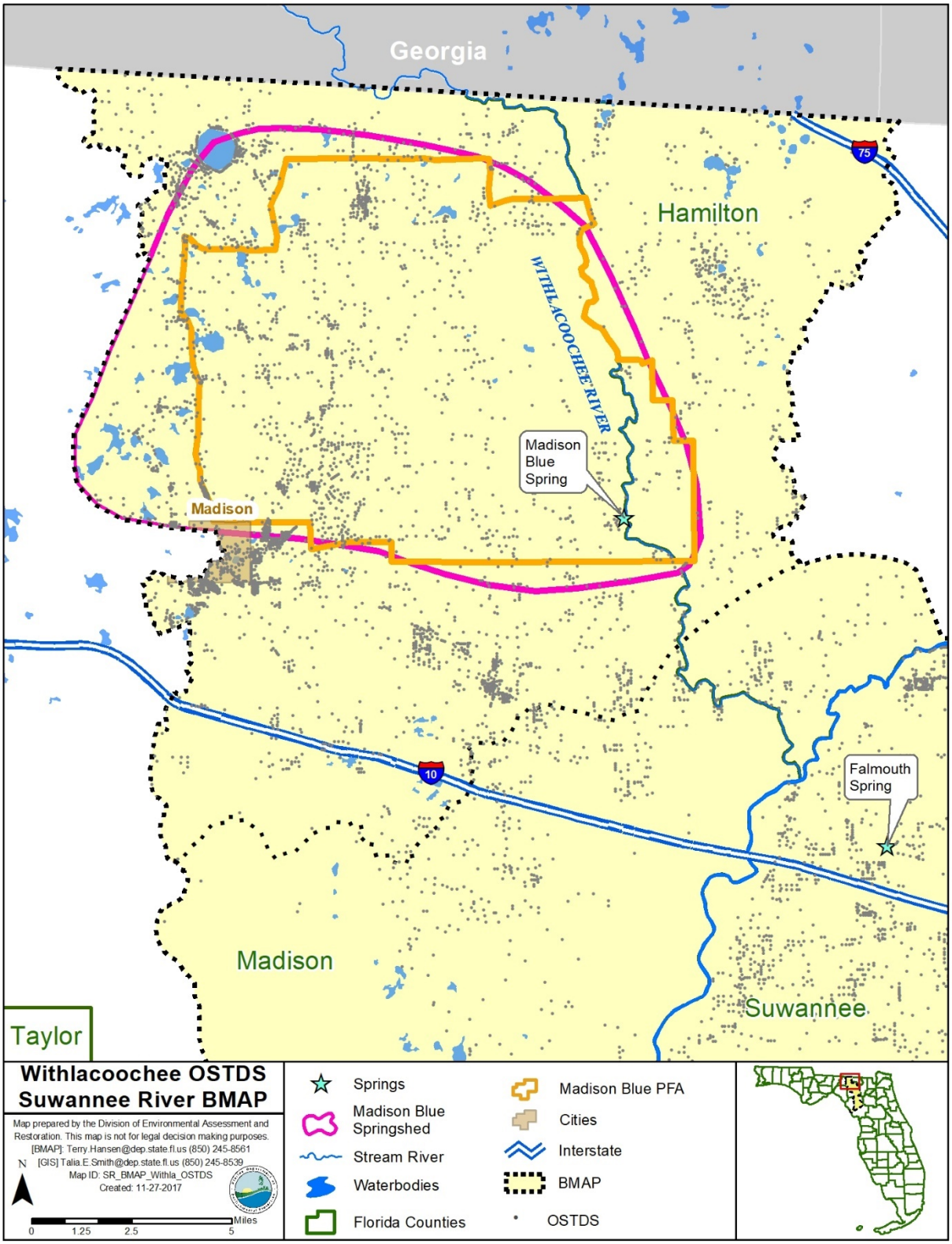

Figure D-3. OSTDS locations in the Withlacoochee River Sub-basin PFA

D.4 Public Education Plan

DEP and FDOH will develop and disseminate educational material focused on homeowners and guidance for builders and septic system contractors. The materials will identify the need for advanced, nitrogen reducing OSTDS along with the requirements for installing nitrogen reducing technologies under this OSTDS remediation plan. DEP will coordinate with industry groups such as Florida Home Builders Association and the Florida Onsite Wastewater Association (FOWA).

Appendix E. Technical Support Information

E.1. NSILT Data

An NSILT workbook was completed for each of the three springsheds in the Suwannee River Basin BMAP: Lower Suwannee River, Middle Suwannee River, and Withlacoochee River. This technical support information identifies the data sources relied upon during NSILT development and documents the major assumptions used by DEP when applying the NSILT approach to the springsheds in the Suwannee River Basin BMAP.

The general NSILT approach involves estimating the nitrogen load to the surface for various source categories based on land use. The NSILT subjects the surface loading to recharge and attenuation to derive the estimated load to groundwater at the top of the aquifer. The estimated load to groundwater determines the scope of reduction strategies needed in the BMAP for each source category. For additional information about the general NSILT approach, see any of the NSILT reports posted online at http://publicfiles.dep.state.fl.us/DEAR/NSILT/.

E.1.1 General Data Inputs

Hydrogeology and Aquifer Recharge
Aquifer recharge information is based on a merged layer that combines the 2002 USGS recharge layer for the intermediate and Floridan aquifer systems, and the 2009 aquifer recharge layer produced by USGS for the Florida Natural Area Inventory.

Land Use
Land use information is from SRWMD based on the 2011 Florida Land Use Cover and Forms Classification System (FLUCCS) and 2016−2017 property appraiser data for Suwannee, Gilchrist, Madison, Levy, Columbia, Lafayette, and Hamilton Counties.

E.1.2 Land Surface Nitrogen Inputs

Atmospheric Deposition
Atmospheric deposition information is derived from the TDEP hybrid model *(*Schwede and Lear 2014*)* that inputs wet and dry monitoring network data for the U.S. and calculates an estimated TN deposition load. The data set is comprised of data from 2011 to 2013.

WWTFs
The average annual input of nitrogen to the land surface was estimated for each effluent land application site in the BMAP area using TN concentration and discharge volume data available in the DEP Wastewater Facility Regulation (WAFR) database. The range of years for which data were available varied with the individual WWTFs; however, the majority of the data were from 2015 to 2016.

OSTDS

In 2014, FDOH began the Florida Water Management Inventory (FLWMI), a statewide project to develop GIS mapping attributes for water use and wastewater treatment method for all parcels by county. The results of this inventory can be obtained from FDOH.

Results from the 2016 release of the FLWMI were used to estimate the total number of septic systems within the BMAP area boundary. ArcGIS files provided the locations of both known and estimated septic systems.

The population served by the OSTDS was estimated using the 2010 U.S. Census Bureau data. Data were used to estimate the effective population and OSTDS usage. Several literature sources have reported a per capita contribution of 9.012 lb-N/yr, and this value was multiplied by the number of people using septic tanks within the different regions of the BMAP area (U.S. Environmental Protection Agency [EPA] 2002; Toor et al. 2011; Viers et al. 2012).

UTF

Urban turfgrass areas fertilization rates are derived from a 2008 SWFWMD study (Martin 2008). The results provided input data on percent of the population that fertilize, the applicator (landscape professional versus homeowner), and application rates.

The type of property where fertilizer is applied is estimated for nonresidential and residential parcels. The acreage receiving fertilizer is estimated the same for both parcel types by using county property appraiser data and zoning data. Impervious and pervious land areas are determined for each parcel.

Nonresidential parcels are assumed to be fertilized by a commercial service provider at a rate of 21.78 lb-N/acre (ac). Residential parcels are evaluated by estimating the percentage of the property fertilized and the probability of fertilization, listed below in **Table E-1**. For residential parcels, these factors are determined by utilizing property values (higher valued properties fertilize more often and in greater amounts) and parcel type (single-family residences fertilize more frequently than other residence types).

Table E-1. Distribution of property values and the probability of fertilization within the three springsheds

Springshed	Property Value Label	Property Value	Probability of Fertilization (%)
Middle Suwannee River	Low	< $50,000	10
	Medium	$50,001 - $125,000	75
	High	> $125,001	90
Lower Suwannee River	Low	< $55,000	10
	Medium	$55,001 - $145,000	75
	High	> $145,001	90
Withlacoochee River	Low	< $50,000	10
	Medium	$50,001 - $125,000	75

Springshed	Property Value Label	Property Value	Probability of Fertilization (%)
	High	> $125,001	90

STF

Sports turfgrass areas include golf courses and sporting facilities. Golf course input is estimated utilizing the statewide fertilizer application rate of 4.5 lb-N/1,000 square feet/yr.

Sporting facilities are assessed based on property appraiser data. Acreage of sports turfgrass is verified using aerial imagery. The commercial lawn service fertilizer application rate for nonresidential parcels is used (21.78 lb-N/ac).

Dairies

DEP permits and industry feedback are used to obtain herd size and characteristics for both permitted and non-permitted dairies. The nitrogen waste factor for each cattle type is based on published literature values (see **Table E-2**; Ruddy et al. 2006; Cabrera et al. 2006). The confinement and grazing times; waste management and disposal methods: and herd characteristics are assessed individually for each dairy when detailed information is provided.

Table E-2. Daily waste factors for dairy cattle

Livestock	Waste Factor (lb-N/day)
Lactating Dairy Cow	0.794
Dry Dairy Cow	0.397
Heifer/Springer	0.243
Springers	0.198
Bulls	0.375
Calves- Dairy	0.088

Poultry

Poultry operations are identified using SRWMD land use, property appraiser data, and FDACS detailed information on the annual number of birds and litter and manure management practices. For the Suwannee River Basin, an average cycle bird factor of 0.154 lb-N/day is applied to the annual number of birds to account for 8-week rotations throughout a given year. Input is calculated based on the amount of waste generated and storage and application practices; 0.159 lb-N/day for broiler chickens and 0.003 lb-N/day for layer chickens (Ruddy et al. 2006). For all poultry operations, FDACS indicated that 50% of the litter is sold and applied to buyers outside of the springsheds; therefore, only 50% of the nitrogen from litter is included in the total input.

Cow-Calf Operations

For cow-calf operations, population numbers are derived from the 2016 U.S. Department of Agriculture (USDA) Survey of Agriculture and the estimated quantity of pasture acreage is

based on SRWMD land use. The nitrogen waste factor for each animal type is based on published literature values (see **Table E-3;** Goolsby et al. 1999; Chelette et al. 2002; Ruddy et al. 2006).

Table E-3. Daily waste factors for beef cattle

Livestock	Waste Factor (lb-N/day)
Beef Cows	0.337
Other Beef Cattle	0.311
Calves-Beef	0.068

Miscellaneous LW

Populations of other livestock animals (goats, sheep, hogs, etc.) are estimated from the USDA census of agriculture and SRWMD land use coverage adjusted by percent of land likely to contain livestock in the springsheds. The nitrogen waste factor for each animal type is based on published literature values and subdivided into locations and recharge area. The nitrogen waste factors per animal are listed in **Table E-4** (Goolsby et al. 1999; Chelette et al. 2002; Ruddy et al. 2006; Meyer 2012; Sprague and Gronberg 2013).

Table E-4. Daily waste factors for miscellaneous livestock

Livestock	Waste Factor (lb-N/day)
Chicken, broilers	0.002
Chicken, layers	0.003
Equine	0.273
Goats	0.035
Hogs	0.19
Sheep	0.198
Turkeys	0.006

FF

Crop acreage was identified by using a composite land use coverage. The FDACS FSAID III Irrigated Lands Geodatabase (ILG), SRWMD land use, and the Cropscape dataset produced by the National Agricultural Statistics Service (NASS) were used to assign and classify crop types grown on identified agricultural acreages.

Agricultural fertilizer is applied at varying rates, depending on crop type and farm practices. Estimated applications rates are based on UF-IFAS recommendations and adjusted rates based on producer feedback. The rates are listed below in **Table E-5.** Application rates are applied to the calculated acreages for the corresponding crop types to estimate FF input. Input calculated for poultry operations is subtracted out from the total FF input to account for poultry manure that is used as fertilizer.

Table E-5. Summary of crop types and assumed nitrogen application rates

Crop	Application Rate (lb-N/ac/yr)	Crop	Application Rate (lb-N/ac/yr)
Blueberries	50	**Pasture**	80
Carrots	300	**Pasture_Rye**	110
Carrots_Corn	550	**Pasture_Rye_Watermelons**	340
Carrots_Rye	300	**Peaches**	90
Container Nursery	90	**Peanuts**	20
Corn	250	**Peanuts_Oats**	50
Corn_Oats	250	**Peanuts_Pasture**	100
Corn_Rye	250	**Peanuts_Rye**	50
Corn_SmallGrains	250	**Peas**	60
Cotton	125	**Pecans**	90
Cropland and Pastureland	60	**Potatoes**	200
Field Corn	250	**Row Crops**	106
Field Crops	90	**Rye**	100
Field Nursery	90	**SmallVeg**	151
Green Beans	120	**Sod**	50
Hay	240	**Sod Farms**	50
Hay AFO	370	**Soybeans**	35
Hay Fields	240	**Soybeans_Carrots**	335
Hay_Bermuda	320	**Soybeans_DryBeans**	75
Hay_Oats	230	**SweetCorn**	250
Improved Pastures	100	**SweetCornCoverCrop**	250
Melons	175	**SweetPotatoes**	60
Millet_Rye	165	**Tree Nurseries**	90
Nurseries and Vineyards	90	**Vegetables**	151
Oats	100	**Vegetables_SpringOnion**	301
Ornamentals	90	**Watermelon**	175
Other Groves	90		

Estimated Nitrogen Inputs to Land Surface

Table E-6 identifies the estimated input from each source category by recharge area.

Table E-6. Estimated nitrogen inputs to the land surface by source category and recharge area within the three springsheds (lb-N/yr)

Spring-shed	Recharge	Atm Dep	WWTF	OSTDS	UTF	STF	FF	LW-Dairy	LW-Poultry	LW-Other	Total
Middle Suwannee River	High	3,761,876	13,834	222,174	318,743	10,511	11,115,156	1,660,365	1,664,826	3,864,295	**22,631,780**
	Medium	454,722	2,447	32,572	53,281	46	894,073	-	213,399	442,478	**2,093,019**
	Low	13,325	-	22	-	-	-	-	-	20	**13,367**
	TOTAL	**4,229,923**	**16,282**	**254,768**	**372,024**	**10,557**	**12,009,230**	**1,660,365**	**1,878,224**	**4,306,793**	**24,738,166**
	High	1,047,349	134,474	137,302	289,328	18,902	6,421,877	1,867,342	-	1,636,122	**11,552,696**

Spring-shed	Recharge	Atm Dep	WWTF	OSTDS	UTF	STF	FF	LW-Dairy	LW-Poultry	LW-Other	Total
Lower Suwannee River	Medium	24,766	-	146	9,017	-	4,071	-	-	20,360	**58,361**
	TOTAL	**1,072,115**	**134,474**	**137,448**	**298,346**	**18,902**	**6,425,949**	**1,867,342**	**-**	**1,656,482**	**11,611,057**
Withlacoo-chee River	High	468,215	-	36,916	30,359	-	1,864,694	-	31,536	384,177	**2,815,897**
	Medium	12,110	-	883	324	-	53,309	-	-	1,259	**67,885**
	TOTAL	**480,325**	**-**	**37,799**	**30,684**	**-**	**1,918,003**	**-**	**31,536**	**385,436**	**2,883,782**

E.1.3 Nitrogen Attenuation and Loading to Groundwater

The two types of attenuation that are evaluated are biochemical attenuation factors (BAFs) and hydrogeological attenuation (i.e., recharge).

BAFs and Uncertainty Factors

The BAFs used to account for the processes affecting the movement of nitrogen from each source category in the subsurface are based on literature review of studies in Florida and similar areas. The BAFs in **Table E-7** are the result of this evaluation. The BAF is used to estimate what percent of the surface input could infiltrate to groundwater. For example, if 70 % of urban fertilizer is biologically attenuated, then the remaining 30 % could infiltrate to the groundwater.

The environmental attenuation of nitrogen from specific sources within the categories can vary substantially, both spatially and with depth in the subsurface, and will affect the amount of nitrogen leaching to groundwater and the relative contribution of nitrogen from each source category. The range in nitrogen attenuation can result from variability in soil properties, crop types, agricultural practices, nitrogen storage, volatilization of ammonia to the atmosphere, uptake by vegetation, denitrification, and other removal processes. The potential range in nitrogen attenuation for each source is shown in **Table E-7**.

Table E-7. Range of environmental attenuation of nitrogen from a detailed literature review

* Dairies showed a range of attenuation based on practices. Permitted dairies exhibit practices that result in higher attenuation.

N Source Category	Low-Level Attenuation (%)	Attenuation Used for This Analysis (%)	High-Level Attenuation (%)
Atmospheric Deposition	85	90	95
WWTFs-RIBs	10	25	40
WWTFs-Sprayfield	50	60	75
WWTF-Reuse	50	75	85
Septic Tanks	40	50	75
Livestock Operations	80	90	95
Dairies	30	50 and 85*	90
Farm Fertilizers	50	80	90
Urban Fertilizers	50	70	85

Hydrogeological Attenuation (i.e., Recharge)

Most of the nitrogen in a given year does not reach groundwater due to hydrogeologic nitrogen attenuation processes and variations in the rate of aquifer recharge. In areas of the Suwannee River Basin BMAP where recharge rates are categorized as medium (3.01 to 10 in/yr) or high (greater than 10 in/yr), the UFA is more vulnerable to contamination than in areas where recharge rates are low (0 to 3 in/yr).

The recharge rate for the area where the surface input is calculated is based on the composite recharge map previously described. To account for variations in recharge rates to the UFA, non-attenuated nitrogen inputs in high rate recharge areas are multiplied by a weighting factor of 0.9, while nitrogen inputs are multiplied by a weighting factor of 0.5 for medium rate recharge areas and 0.1 for low. Groundwater discharge areas were not included in the calculations of nitrogen loads to the groundwater contributing area, as these areas do not contribute nitrogen to the aquifer.

Estimated Nitrogen Loads to Groundwater

The surface inputs by source category are adjusted by applying the BAFs for the appropriate source category and location-based recharge factors to estimate the load to groundwater by source category.

It is important to note that this load is estimated for the top of the aquifer. As the load interacts with the aquifer, additional factors likely modify it prior to discharge at the spring vents. The estimated loads for each springshed are identified in **Table E-8.**

Table E-8. Estimated nitrogen load to groundwater by source category and recharge area within the three springsheds (lb-N/yr)

Springshed	Recharge	Atm Dep	WWTF	OSTDS	UTF	STF	FF	LW-Dairy	LW-Poultry	LW-Other	Total
Middle Suwannee River	High	338,569	4,618	99,978	86,061	2,838	2,000,728	452,734	149,834	347,787	**3,483,146**
	Medium	22,736	854	8,143	7,992	7	89,407	-	10,670	22,124	**161,933**
	Low	1,332	-	1	-	-	-	-	-	0	**1,334**
	TOTAL	**362,637**	**5,472**	**108,122**	**94,053**	**2,845**	**2,090,135**	**452,734**	**160,504**	**369,911**	**3,646,414**
Lower Suwannee River	High	94,261	50,173	61,786	78,119	5,104	1,155,938	252,091	-	147,251	**1,844,723**
	Medium	1,238	-	36	1,353	-	407	-	-	1,018	**4,053**
	TOTAL	**95,500**	**50,173**	**61,822**	**79,471**	**5,104**	**1,156,345**	**252,091**	**-**	**148,269**	**1,848,776**
Withlacoo-chee River	High	42,139	-	16,612	8,197	-	335,645	-	2,838	34,576	**440,008**
	Medium	605	-	221	49	-	5,331	-	-	63	**6,269**
	TOTAL	**42,745**	**-**	**16,833**	**8,246**	**-**	**340,976**	**-**	**2,838**	**34,639**	**446,276**

E.2 NSILT References

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Appendix F. FDACS Information on BMPs

F.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 FSAID ILG III, which provides crop and associated irrigation system information. The acreage for nonirrigated lands was derived from SRWMD 2013 to 2014 land use data for agricultural areas not included in the FSAID ILG III. Acreages for livestock lands were estimated using SRWMD land use data.

Table F-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 F-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 F-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 F-2** and **Table F-3.**

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

Table F-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 F-1. 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

Crop Type	Acres Outside Springsheds	Springshed Acres Lower Suwannee River	Springshed Acres Withlacoochee River	Springshed Acres Middle Suwannee River	Total Acres
Melons	158			559	718
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 F-2. 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.

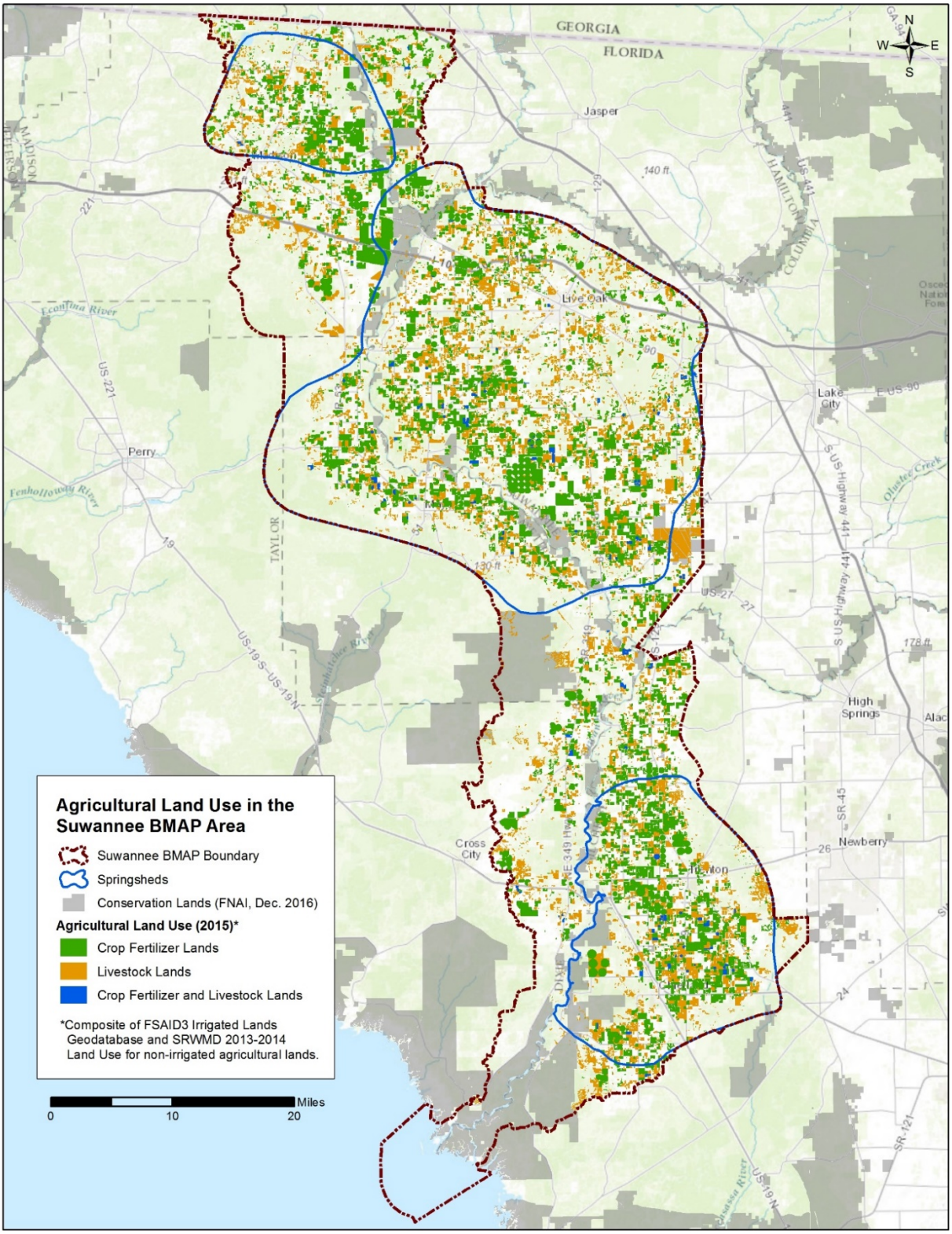

Figure F-1. Composite of agricultural lands in the Suwannee River Basin BMAP area

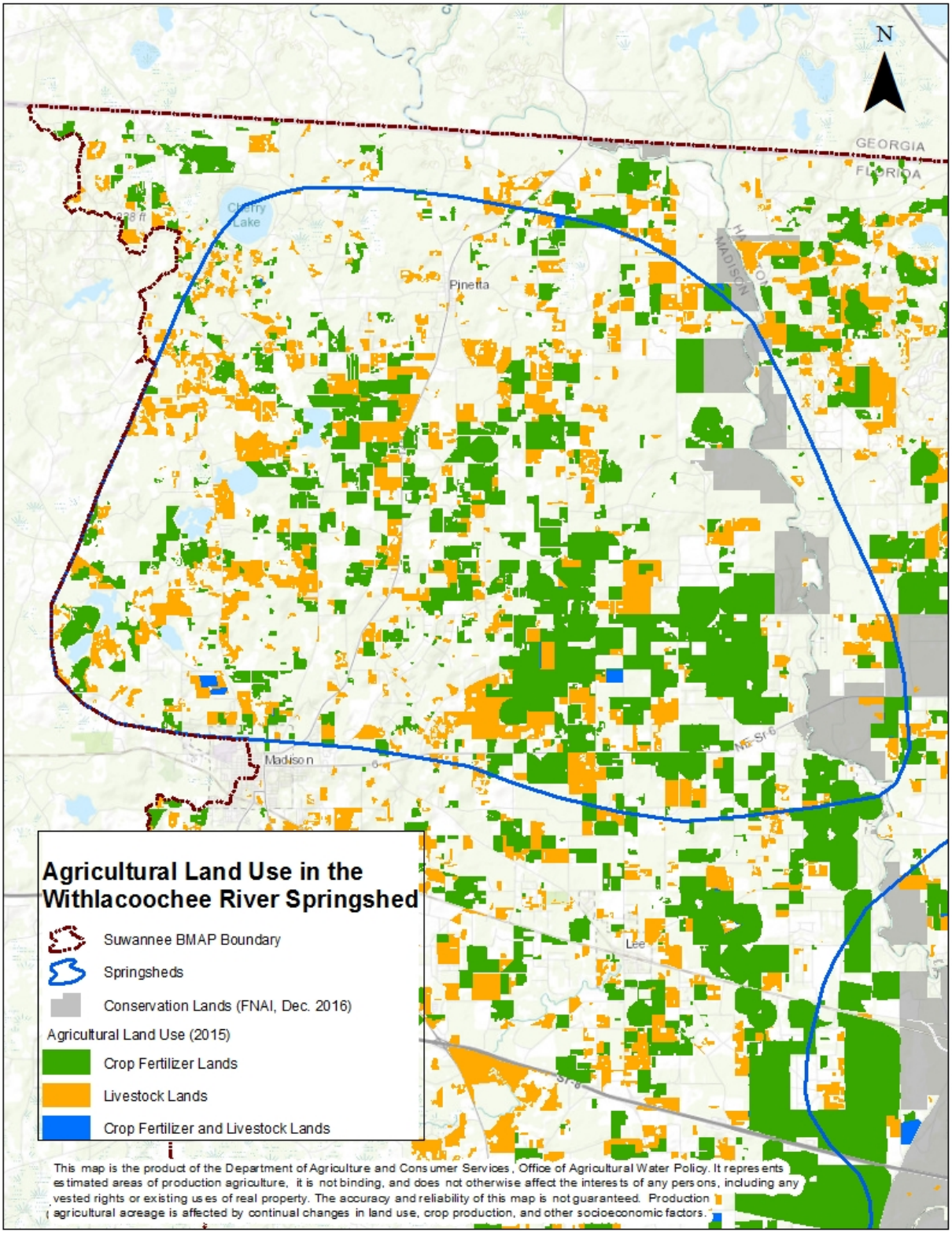

Figure F-2. Composite of agricultural lands in the Withlacoochee River Springshed

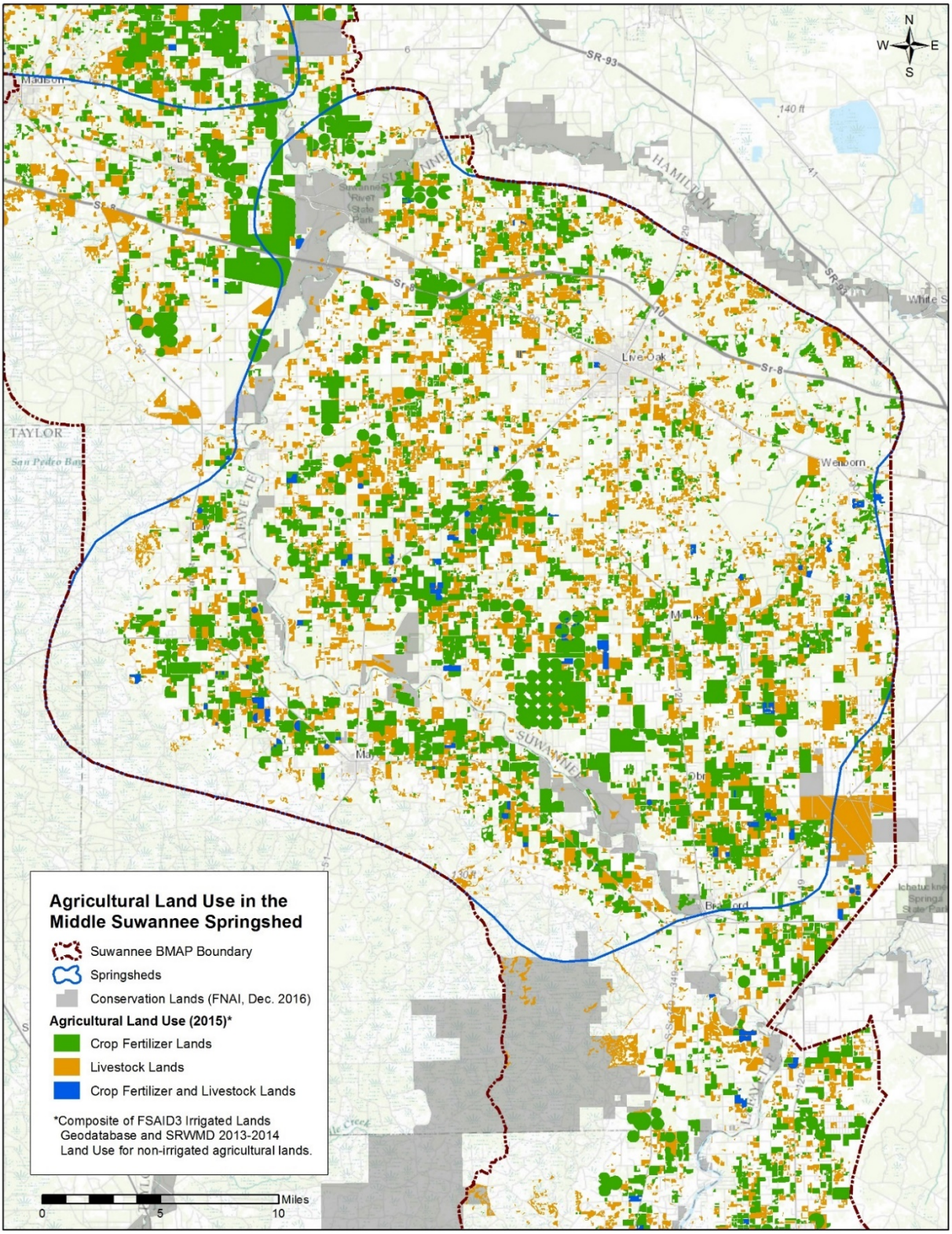

Figure F-3. Composite of agricultural lands in the Middle Suwannee River Springshed

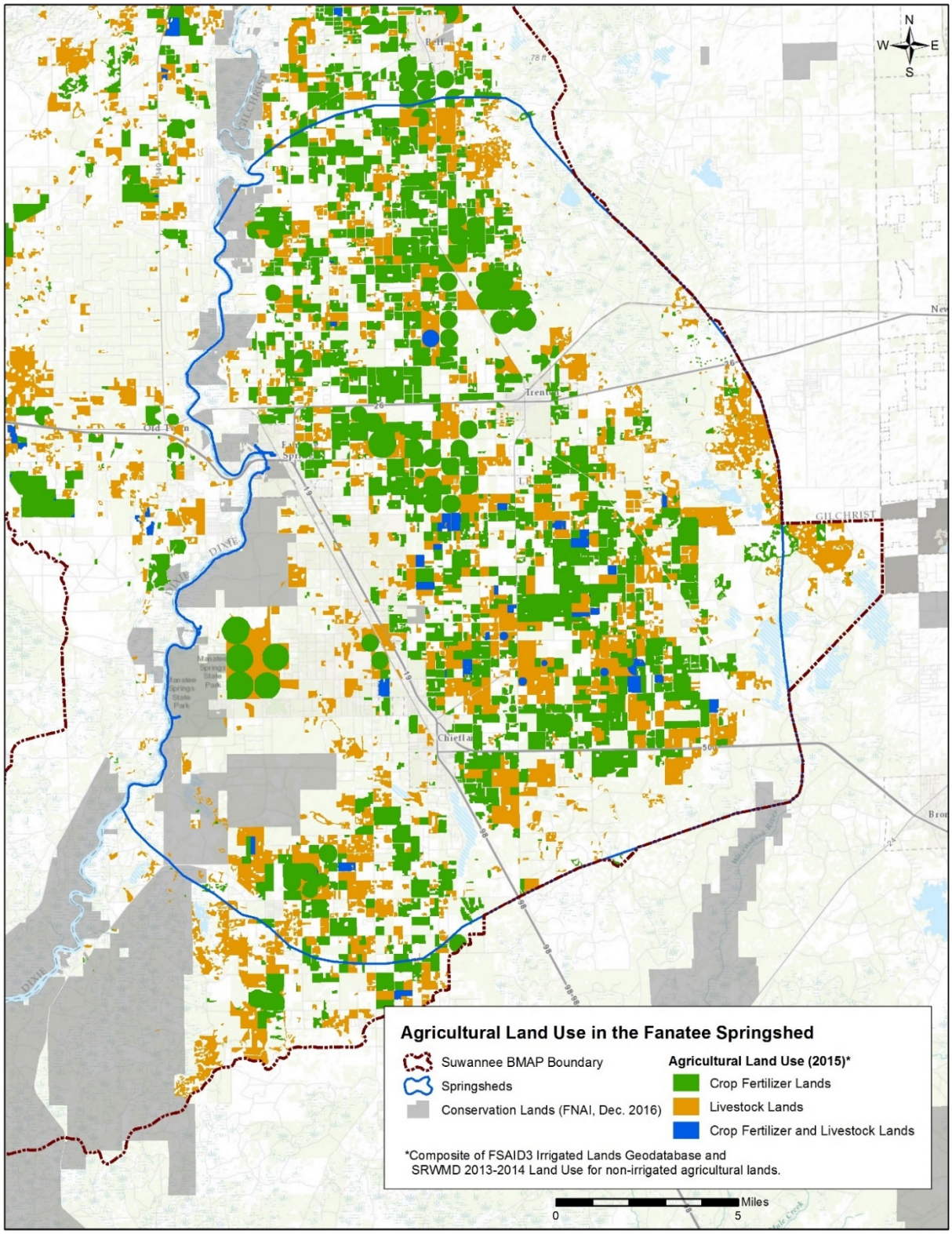

Figure F-4. Composite of agricultural lands in the Lower Suwannee River Springshed

F.2 Agricultural BMPs

Through the Office of Agricultural Water Policy, 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. Adopted BMPs are initially verified by the FDEP as reducing nutrient loss (e.g., total nitrogen and total phosphorus [TP]) to the environment. OAWP BMPs are published in commodity-specific manuals that cover key aspects of water quality and water conservation. The BMP categories include:

- Nutrient Management practices that help determine appropriate source, rate, timing, placement of nutrients (including both organic and inorganic sources) to minimize impacts to water resources.

- Irrigation and Water Table Management practices that address methods for irrigating to reduce water and nutrient losses to the environment and to maximize the efficient use and distribution of water.

- Water Resource Protection practices such as buffers, setbacks, and swales to reduce or prevent the transport of nutrients and sediments from production areas to water resources.

The Notice of Intent to Implement (NOI) and BMP checklist are incorporated into each manual.

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.

OAWP outreach to solicit enrollment extends to all types of agricultural operations, but is more intensive in BMAP areas because of the relationship of BMPs to the presumption of compliance with water quality standards in a BMAP area. FDACS field staff works with producers to enroll in the FDACS BMP program by signing a Notice of Intent to Implement BMPs, and enrollment is based on the expectation that producers recognize and address the water quality and conservation issues associated with their operations. Upon completion of all information in the BMP checklist, an NOI must be signed by the landowner or the landowner's authorized agent (who may be the producer if the producer is not the landowner).

F.3 BMP Enrollment

Figure F-5 shows the acres enrolled in the FDACS BMP Program in the Suwannee River Basin as of December 31, 2016. **Figure F-6**, **Figure F-7**, and **Figure F-8** are maps focused on BMP enrollment in the three watersheds. **Table F-3** 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 only enrollment for the land classified as agriculture based on the composite land use is included in **Table F-3**. **Table F-4** lists the acreage of production agriculture enrolled in each of the BMP programs by springshed.

As of December 31, 2016, there are NOIs that cover 187,312 agricultural 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, respectively, while the Withlacoochee River Sub-basin Watershed has over 41,000 agricultural acres. Outside the springsheds, 41,000 agricultural acres are enrolled. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time.

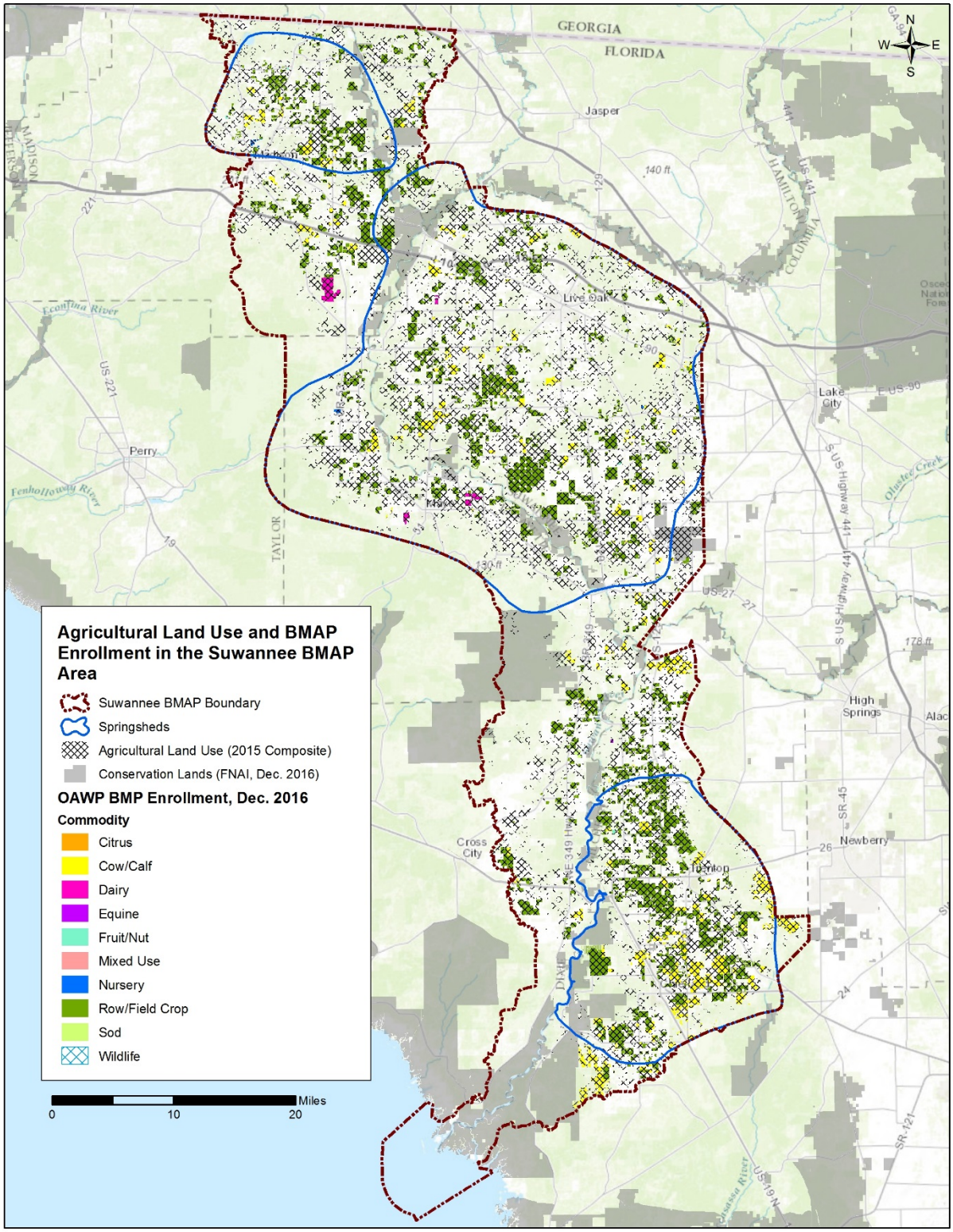

Figure F-5. BMP enrollment in the Suwannee River Basin as of December 31, 2016

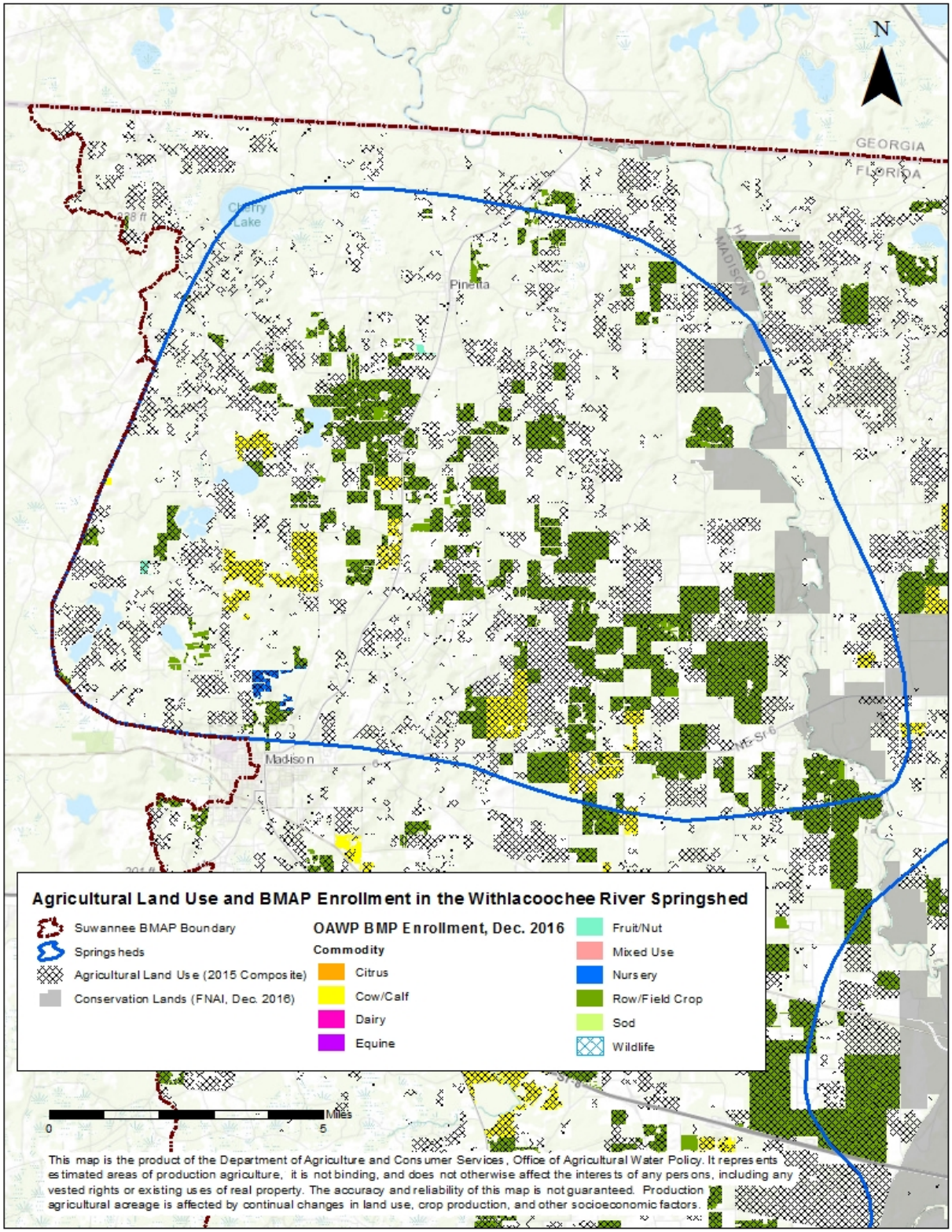

Figure F-6. BMP enrollment in the Withlacoochee River Springshed as of December 31, 2016

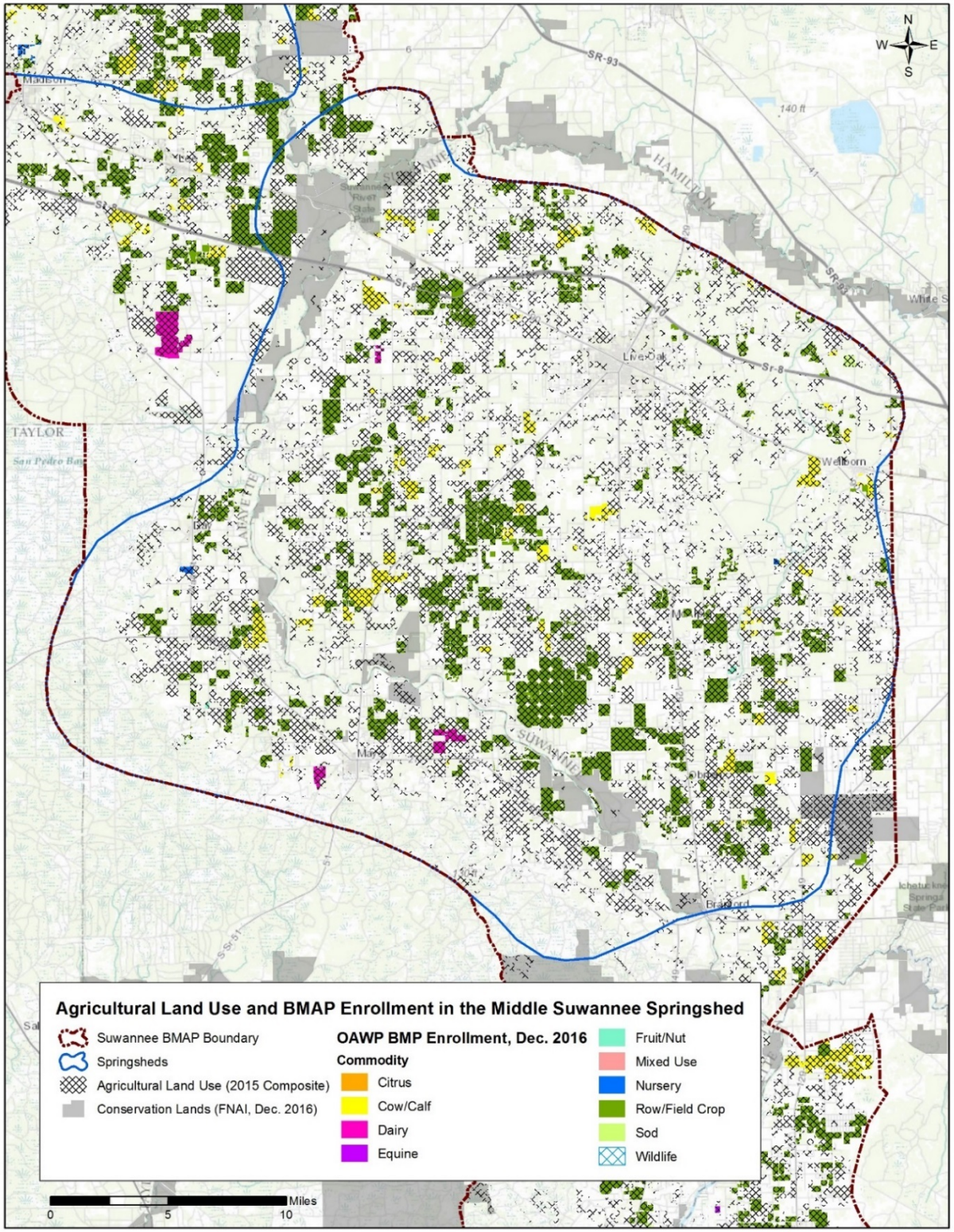

Figure F-7. BMP enrollment in the Middle Suwannee River Springshed as of December 31, 2016

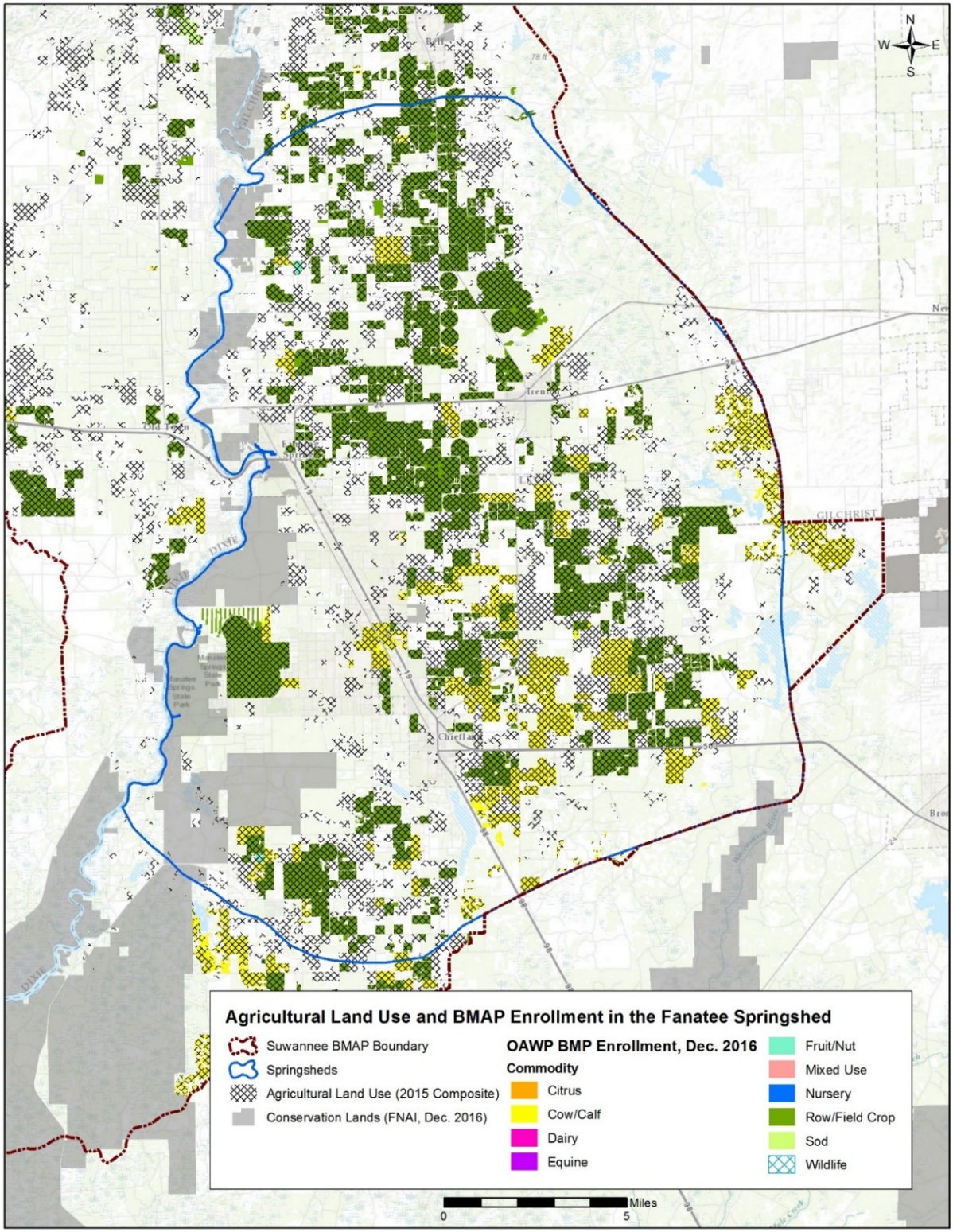

Figure F-8. BMP enrollment in the Middle Suwannee River Springshed as of December 31, 2016

Table F-3. Agricultural acreage and BMP enrollment in the Suwannee River Basin BMAP area as of December 31, 2016

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

Table F-4. 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**

F.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.

F.5 OAWP Implementation Verification (IV) Program

OAWP established an Implementation Assurance (IA) Program in 2005 in the Suwannee River Basin as part of the multi-agency/local stakeholder Suwannee River Partnership. In early 2014, OAWP began to streamline the IA Program to ensure consistency statewide and across commodities and BMP manuals. The IA Program was based on interactions with producers during site visits by OAWP staff and technicians as workload allowed. For the visits, field staff and technicians used a standard form (not BMP specific) developed in 2014, that focused on nutrient management, irrigation management, and water resource protection BMPs common to all of the BMPs that were adopted by rule. Once completed, these paper forms were submitted to OAWP staff and compiled into a spreadsheet, and the data were reported annually.

On November 1, 2017, the OAWP's Implementation Verification rule (Chapter 5M-1, F.A.C.) became effective. The IV program provides the basis for assessing the status of BMP implementation and for identifying enrolled producers who require assistance with BMP implementation. The components of the IV program are 1) site visits; 2) implementation status reporting on common practices that apply across all BMP manuals; 3) technical assistance; and 4) external reporting. Implementation verification is confirmed by field staff through site visits and by producers through annual common practices status reports.

Site visits to agricultural operations by OAWP field staff and contract technicians are the most effective means to determine the status of BMP implementation. These visits also provide an opportunity to identify needs for assistance with implementation and explore potential improvements. Resource limitations prevent site visits from occurring on all enrolled operations every year, and for that reason, site visits are prioritized. The program objective is for field staff to conduct site visits for 5-10% of active NOIs each year, with approximately 10% of the site visit locations selected randomly.

Per the implementation verification rule, each year, producers participating in the BMP program will be requested to participate in reporting on the status of implementation of common practices only for their operations. Lack of response from enrollees with parcels in a BMAP area raises the priority of the operation for a site visit from field staff. Where a need is identified, the OAWP may facilitate technical assistance for the producer from UF-IFAS or other resources, including third-party vendors. In some cases, cost share support may be available. Data from producers and site visits will be used to complete the annual reports on the status of BMP implementation as required by s. 403.0675(2), F.S., beginning July 1, 2018.

F.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 identify a suite of agricultural projects and research agricultural technologies that could be implemented on properties where they are deemed technically feasible and if funding is made available. Acreages provided by FDACS are preliminary estimates of the maximum acreages and will need to 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 F-5** summarizes these efforts.

Table F-5. 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.