BASIN MANAGEMENT ACTION PLAN

for the Implementation of Total Maximum Daily Loads for Nutrients by the Florida Department of Environmental Protection in the Lower and Middle Suwannee River Basin

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

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Lower and Middle Suwannee River BMAP entities

- **Florida Department of Agriculture and Consumer Services**
- **Suwannee River Partnership**
- **Suwannee River Water Management District**
- **Madison County**
- **Lafayette County**
- **Suwannee County**
- **Gilchrist County**
- **Levy County**
- **Dixie County**
- **Hamilton County**
- **Florida Department of Transportation**
- **Fanning Springs**
- **Chiefland**
- **Mayo**
- **Bell**
- **Trenton**
- **Branford**
- **Live Oak**
- **Jasper**
- **Jennings**
- **Lee**

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Explanation
BMAP	Basin Management Action Plan
BMP	Best Management Practice
CARES	County Alliance for Responsible Environmental Stewardship
DEP	Florida Department of Environmental Protection
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
ERP	Environmental Resource Permit
FAR	Florida Administrative Register
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FAWN	Florida Automated Weather Network
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FFS	Florida Forest Service
FNAI	Florida Natural Areas Inventory
F.S.	Florida Statutes
FWRA	Florida Watershed Restoration Act
FYN	Florida Yards and Neighborhoods
GIS	Geographic Information System
GPS	Global Positioning System
gpd	Gallons Per Day
LA	Load Allocation
LID	Low Impact Development
MFL	Minimum Flows and Levels
mgd	Million Gallons Per Day
mg/L	Milligrams Per Liter
MIL	Mobile Irrigation Lab
MS4	Municipal Separate Storm Sewer System
NNC	Numeric Nutrient Criteria
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OAWP	Office of Agricultural Water Policy
OFS	Outstanding Florida Spring
QA/QC	Quality Assurance/Quality Control
RFA	Restoration Focus Area
RIB	Rapid Infiltration Basin
RIVER	Regional Initiative Valuing Environmental Resources
SOP	Standard Operating Procedure
SRF	State Revolving Fund
SRP	Suwannee River Partnership
SRWMD	Suwannee River Water Management District
SSAC	Site-Specific Alternative Criteria
STORET	Storage and Retrieval (Database)
SWIM	Surface Water Improvement and Management
TMDL	Total Maximum Daily Load
TN	Total Nitrogen

Acronym/Abbreviation	Explanation
UF–IFAS	University of Florida–Institute of Food and Agricultural Sciences
USDA	U.S. Department of Agriculture
WBID	Waterbody Identification (Number)
WIN	Watershed Information Network
WLA	Wasteload Allocation

SUMMARY

LOWER AND MIDDLE SUWANNEE RIVER AND THE WITHLACOOCHEE BASIN

The basin management action plan (BMAP) for the Lower and Middle Suwannee River Basin encompasses an area of more than a million acres (1,225,999 acres) and includes eastern Dixie, eastern Madison, western Hamilton, northeast and eastern Lafayette, western Levy, and western Gilchrist Counties and the majority of Suwannee County. The Florida portion of the Withlacoochee Basin and associated springs is also included in the BMAP area, based on high nitrogen levels that flow into the Suwannee Basin at the convergence of the Withlacoochee and Suwannee Rivers near Falmouth. The BMAP area contains 62 first- and second-magnitude springs, including 7 Outstanding Florida Springs (OFS). Additionally, there are 113 lesser magnitude springs in the BMAP area.

Urban areas in the basin include Live Oak and Branford in Suwannee County, Lee and Madison in Madison County, Jasper and Jennings in Hamilton County, Mayo in Lafayette County, Bell and Trenton in Gilchrist County, and Fanning Springs and Chiefland in Levy County. Specifically, portions of the Lower and Middle Suwannee River, as well as Manatee Springs, Fanning Springs, Branford Spring, Ruth Spring, Troy Spring, Royal Spring, and Falmouth Spring, have been determined to be impaired for nitrate. Water quality data indicate that the Withlacoochee River has elevated nitrogen concentrations and some Withlacoochee springs have elevated nitrate levels.

TOTAL MAXIMUM DAILY LOAD (TMDL)

The verified period for the Group 1 waterbodies, including the Lower and Middle Suwannee River, was June 1, 2000, through June 30, 2007. Data from this period indicated that the Lower and Middle Suwannee River, Lower Suwannee Estuary, Manatee Springs, Fanning Springs, Branford Spring, Ruth Spring, Troy Spring, Royal Spring, and Falmouth Spring were impaired for nutrients. The TMDL established a target of a monthly average 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 LOWER AND MIDDLE SUWANNEE RIVER BMAP

The Lower and Middle Suwannee River BMAP will be implemented through a 5-, 10- and 15-year schedule with milestones to achieve the TMDL within 20 years of adoption. The process provides for changes in management activities over time, while the level of implementation differentiates effort among stakeholders based on location and source type.

Initially, best management practices (BMPs) will be implemented to start the restoration process. Stakeholders in the basin will implement BMPs that are focused on pollution prevention (*e.g.,* decreasing nutrient inputs) while additional long-term nutrient-reducing activities are also being implemented.

ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION

Through the implementation of projects, activities, and additional source assessments described in this BMAP, stakeholders expect the following outcomes:

- Reduction in nutrients in the Withlacoochee, Lower and Middle Suwannee River, and associated springs.
- Decrease in algal mass in the spring basins and runs.
- Adoption of applicable fertilizer and irrigation ordinances.
- Implementation of applicable agricultural BMPs.
- Development and implementation of applicable nonagricultural BMPs.

BMAP COST

The majority of the projects identified in the BMAP have limited direct capital costs associated with them. Stormwater control/hydrologic restoration projects in Gilchrist County have an estimated cost of $22.5 million, financed through municipal bonds. Cost-share funding for the implementation of agricultural BMPs in the basin to date has exceeded $25 million collectively from the Florida Department of Agriculture and Consumer Services (FDACS), the Suwannee River Water Management District (SRWMD), agricultural producers, and the U.S. Department of Agriculture (USDA).

BMAP FOLLOW-UP

The initial monitoring plan will use data currently being collected by the SRWMD and other entities for the river and associated springs and entered into the STOrage and RETrieval (STORET) database (or the Watershed Information Network [WIN]). The research component of the monitoring plan will focus on collecting data for use in refining the implementation of BMPs in the basin and determining future courses of action. Subsequently, the monitoring plan will be used to help assess BMP effectiveness and identify areas to be considered for additional load reductions.

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

1.1 Water Quality Standards and Total Maximum Daily Loads (TMDLs)

Florida's water quality standards are designed to ensure that surface waters can be used for their designated purposes, such as drinking water, recreation, and agricultural water supply. Currently, most surface waters in Florida, including those in the Withlacoochee, Lower, and Middle Suwannee River Basins, are categorized as Class III waters, meaning that they must be suitable for recreation and must support the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. **Table 1** lists all designated use categories for Florida surface waters.

Table 1. Designated use attainment categories for Florida surface waters

[1] Within each class, the designated uses of less stringently regulated classifications are included, with certain exceptions.

Category[1]	Description
Class I	Potable water supplies
Class II	Shellfish propagation or harvesting
Class III	**Recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife**
Class III-Limited	Fish consumption, recreation or limited recreation, and/or propagation and maintenance of a limited population of fish and wildlife
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use (*no current Class V designations*)

The Florida Department of Environmental Protection (DEP) develops and adopts TMDLs for the waterbody segments it identifies as impaired. A TMDL is the maximum amount of a specific pollutant that a waterbody can assimilate while maintaining its designated uses. The impaired waters in the Withlacoochee and Lower and Middle Suwannee River Basins addressed in this basin management action plan (BMAP) are all Class III waters. TMDLs have been established for the Lower and Middle Suwannee River Basins, identifying the amount of nutrients and other pollutants they can receive and still maintain Class III designated uses. A TMDL has not been established for the Withlacoochee River and associated springs, but restoration targets consistent with achieving the Suwannee River TMDL are listed in **Section 1.2.6**.

1.2 Lower and Middle Suwannee River BMAP

1.2.1 TMDL Implementation

Adopted TMDLs may be implemented through BMAPs, which contain strategies to reduce and prevent pollutant discharges through various means. The Florida Watershed Restoration Act (FWRA) contains provisions that guide the development of BMAPs and other TMDL implementation approaches.

1.2.2 Stakeholder Involvement

Stakeholder involvement is critical to the success of the TMDL program. The BMAP development process is structured to achieve cooperation among a broad range of interested parties. Under statute, DEP invites stakeholders to participate in the BMAP development process and encourages public participation to the greatest extent practicable.

All technical meetings were open to the public and noticed in the *Florida Administrative Register* (FAR). Public meetings on the proposed Verified List and the Suwannee River TMDL were held before each was adopted. A public workshop on the BMAP was held at the Suwannee River Water Management District (SRWMD) on October 25, 2011, and basin county commissioners were briefed in the first half of 2013. The draft Lower and Middle Suwannee River BMAP was presented at a public meeting at the SRWMD on October 1, 2013. The Withlacoochee River and associated springs were added to the BMAP in late 2015, and a public meeting for the revised BMAP was held on May 13, 2016.

Meetings were held with Lower and Middle Suwannee River–area local governments, county commissions, potentially affected state agencies, and other stakeholders from 2012 through 2016 to explain the BMAP process and, specifically, the technical approach being used in the Lower and Middle Suwannee River Basin. Stakeholder involvement is essential to develop, gain support for, and secure commitments to implement the BMAP.

1.2.3 Plan Purpose and Scope

The purpose of this BMAP is to implement load reductions to achieve the nutrient TMDLs for the associated impaired waters in the Withlacoochee River and the Lower and Middle Suwannee River Basins. It outlines specific projects that will achieve load reductions and provides a schedule for implementation. The document also describes a monitoring approach to determine where future actions will need to occur, to measure progress toward meeting load reductions, and to report on how the TMDLs will be achieved. The previously adopted Santa Fe River BMAP complements this BMAP for the Withlacoochee River and the Lower and Middle Suwannee River Basins, and together they provide a restoration plan for these portions of the Suwannee Basin.

For assessment purposes, DEP divides basins into water assessment polygons with a unique waterbody identification (WBID) number for each watershed or stream reach. WBIDs 3422, 3422D, 3422J, 3422L, 3422R, 3422S, 3422T, 3422U, and 3422Z have all been verified as impaired for nutrients with

subsequently adopted TMDLs that are addressed in this BMAP. **Figure 1, Figure 2,** and **Figure 3** show the WBIDs and first- and second-magnitude springs in the Lower Suwannee, Middle Suwannee, and Withlacoochee Basins covered in this BMAP.

The Withlacoochee River and its springs have elevated nitrogen levels and, therefore, contribute to the nitrogen impairments downstream. The BMAP planning area shown in **Figure 4** encompasses over 1 million acres and provides a basis for determining where management actions are proposed. For the purpose of this report, the terms Lower and Middle Suwannee River Basin and Lower and Middle Suwannee River BMAP Planning Unit are used interchangeably and refer to the Lower and Middle Suwannee River BMAP planning area.

Table 2 lists the first- and second-magnitude springs by basin covered by this BMAP. There are 13 springs in the Withlacoochee Basin, 32 springs in the Middle Suwannee Basin, and 17 in the Lower Suwannee River Basin. **Table 3** lists the number of lesser magnitude springs in each basin.

If a TMDL or site-specific alternative criterion (SSAC) does not exist for a specific spring, the default numeric nutrient criteria (NNC) concentration of 0.35 milligrams per liter (mg/L) of nitrate does apply.

Table 2. First- and second-magnitude springs in the Suwannee BMAP area

An asterisk indicates an Outstanding Florida Springs (OFS).

Spring Name	Magnitude	Basin	WBID
Troy Spring*	1	Middle Suwannee	3422T
Lafayette Blue Spring*	1	Middle Suwannee	3528Z
Manatee Spring*	1	Lower Suwannee	3422R
Madison Blue Spring*	1	Withlacoochee	3315Z
Falmouth Spring*	1	Middle Suwannee	3422Z
Fanning Springs*/Little Fanning Spring	1	Lower Suwannee	3422S
Thomas Spring (Suwannee)	2	Middle Suwannee	3523
Hart #2 Springs	2	Lower Suwannee	3422N
Hart Springs #1	2	Lower Suwannee	3422N
Hart Springs #3	2	Lower Suwannee	3422N
Turtle Spring	2	Lower Suwannee	3422M
Fletcher Springs	2	Lower Suwannee	3422
GIL84971 (Gilchrist)	2	Lower Suwannee	3422
Rock Sink Spring (Dixie)	2	Lower Suwannee	3422
Pothole Spring (Dixie)	2	Lower Suwannee	3422
Sun Springs	2	Lower Suwannee	3422
Guaranto Spring	2	Lower Suwannee	3422K
Rock Bluff Springs	2	Lower Suwannee	3673
Charles Spring	2	Middle Suwannee	3422Y
Otter Spring	2	Lower Suwannee	3693
Little River Spring	2	Middle Suwannee	3496Z
Mearson Spring	2	Middle Suwannee	3422P
Copper Spring	2	Lower Suwannee	3422A
Little Otter Spring (Gilchrist)	2	Lower Suwannee	3422A
Bonnet Spring (Suwannee)	2	Middle Suwannee	3483
Challenge Sink	2	Middle Suwannee	3483
Orange Grove Spring	2	Middle Suwannee	3483
Peacock Slough/Peacock Springs I*/ Peacock Springs III/Peacock State Park Karst Window (Suwannee)	2	Middle Suwannee	3483
Telford Spring	2	Middle Suwannee	3422X
Royal Spring	2	Middle Suwannee	3422U
Branford Spring	2	Middle Suwannee	3422J
Running Springs #1	2	Middle Suwannee	3422W
Running Springs #2	2	Middle Suwannee	3422W
Owens Spring	2	Middle Suwannee	3568
Fara Spring	2	Middle Suwannee	3422B
Bathtub Spring (Suwannee)	2	Middle Suwannee	3422B
Anderson Spring	2	Middle Suwannee	3422B
Brantley Spring	2	Middle Suwannee	3422B
LAF718971 (Lafayette)	2	Middle Suwannee	3422B
LAF718972 (Lafayette)	2	Middle Suwannee	3422B

Spring Name	Magnitude	Basin	WBID
LAF924971 (Lafayette)	2	Middle Suwannee	3422B
LAF929973 (Lafayette)	2	Middle Suwannee	3422B
Suwannee Blue Spring	2	Middle Suwannee	3422B
Perry Spring	2	Middle Suwannee	3422B
Shingle Spring	2	Middle Suwannee	3422B
HAM610981 (Hamilton)	2	Withlacoochee	3315
HAM610982 (Hamilton)	2	Withlacoochee	3315
HAM610983 (Hamilton)	2	Withlacoochee	3315
HAM610984 (Hamilton)	2	Withlacoochee	3315
MAD610982 (Madison)	2	Withlacoochee	3315
MAD612981 (Madison)	2	Withlacoochee	3315
MAD612982 (Madison)	2	Withlacoochee	3315
Morgan Spring	2	Withlacoochee	3315
Tanner Spring (Hamilton)	2	Withlacoochee	3315
Pot Spring	2	Withlacoochee	3315
Rosseter Spring	2	Withlacoochee	3315
Suwanacoochee Spring	2	Withlacoochee	3315A
Ellaville Spring	2	Middle Suwannee	3422Q

Table 3. Lesser magnitude springs in the BMAP area

Other Springs	Number
Lower Suwannee	14
Middle Suwannee	71
Withlacoochee Basin	28

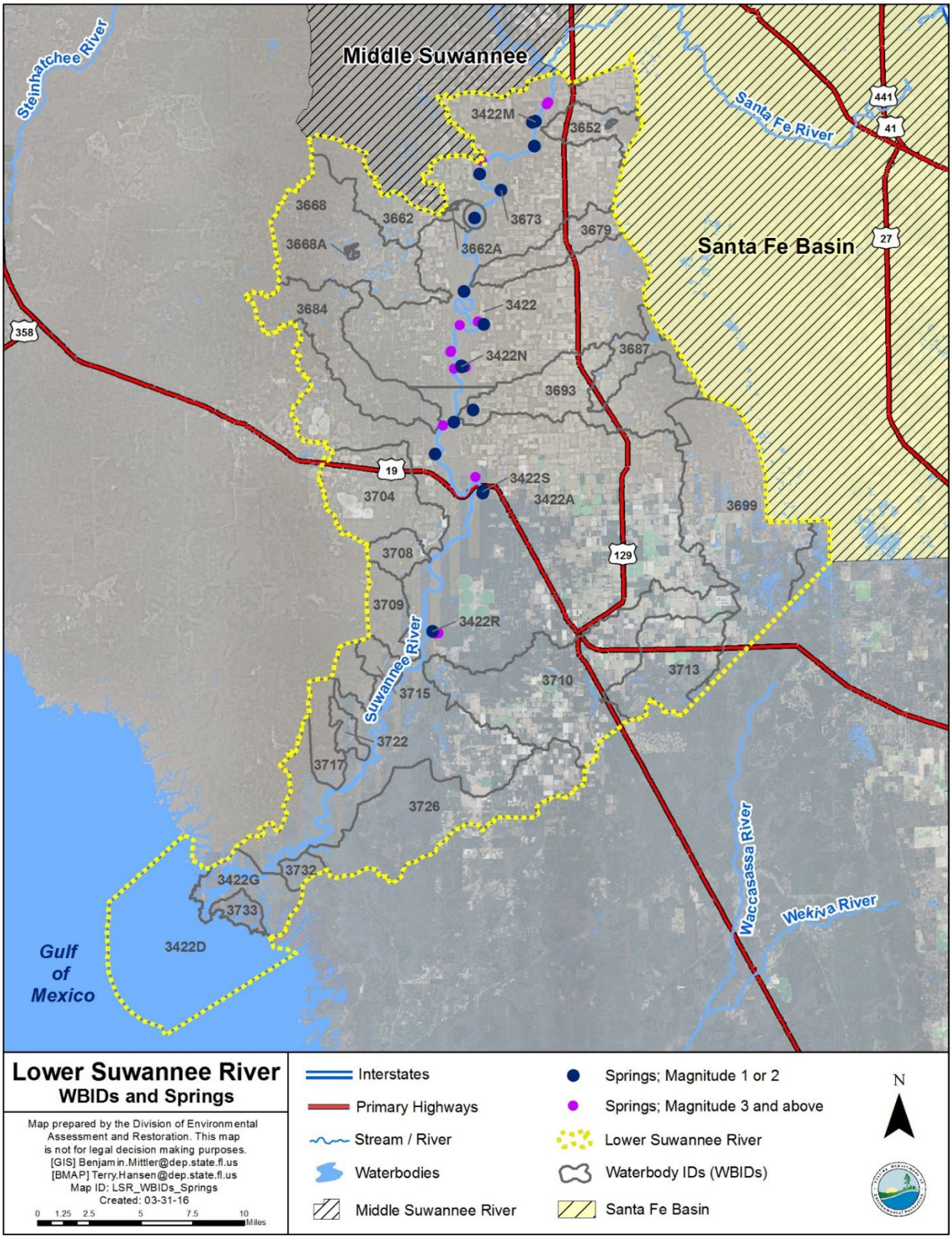


Figure 1. Lower Suwannee River WBIDs and springs

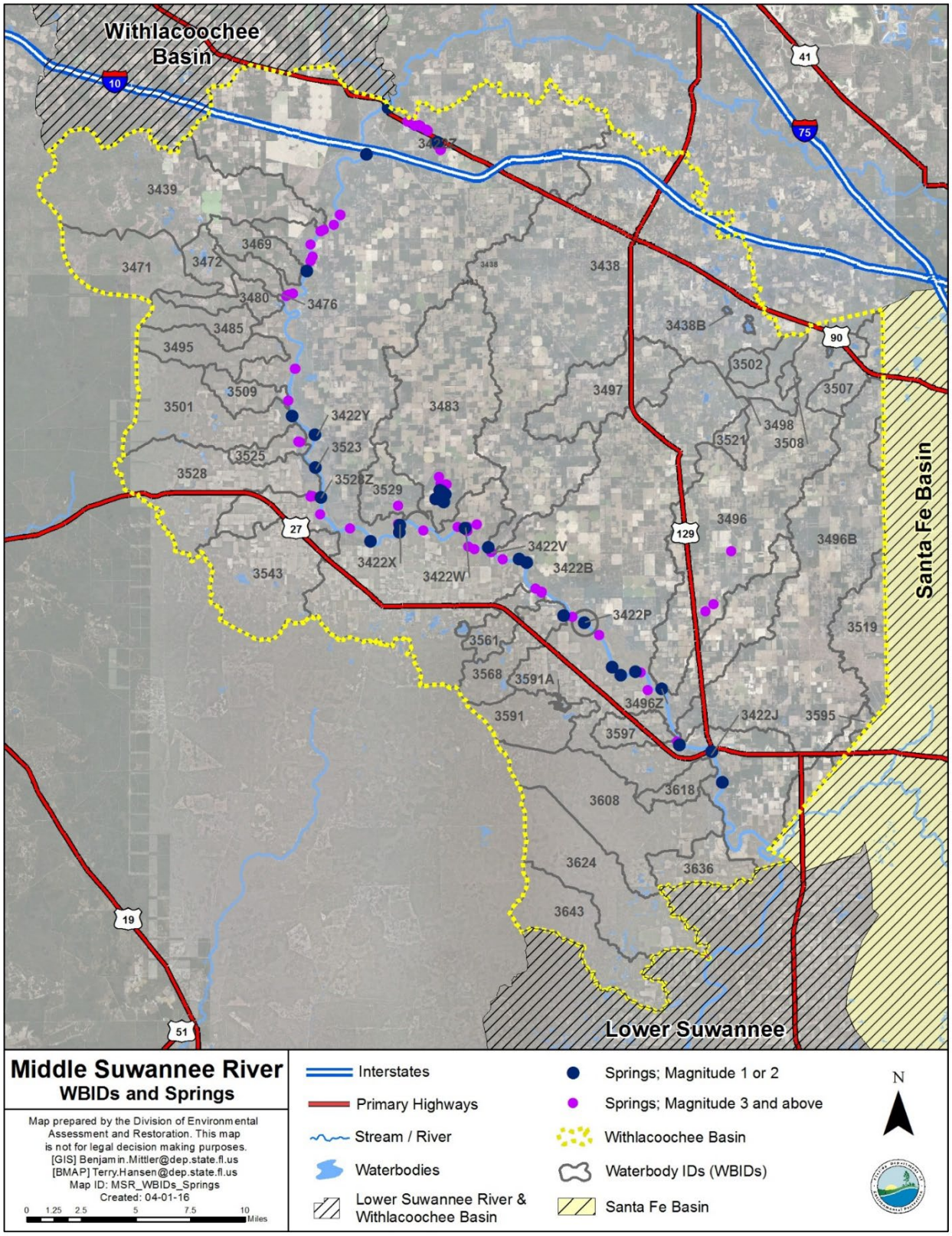


Figure 2. Middle Suwannee River WBIDs and springs

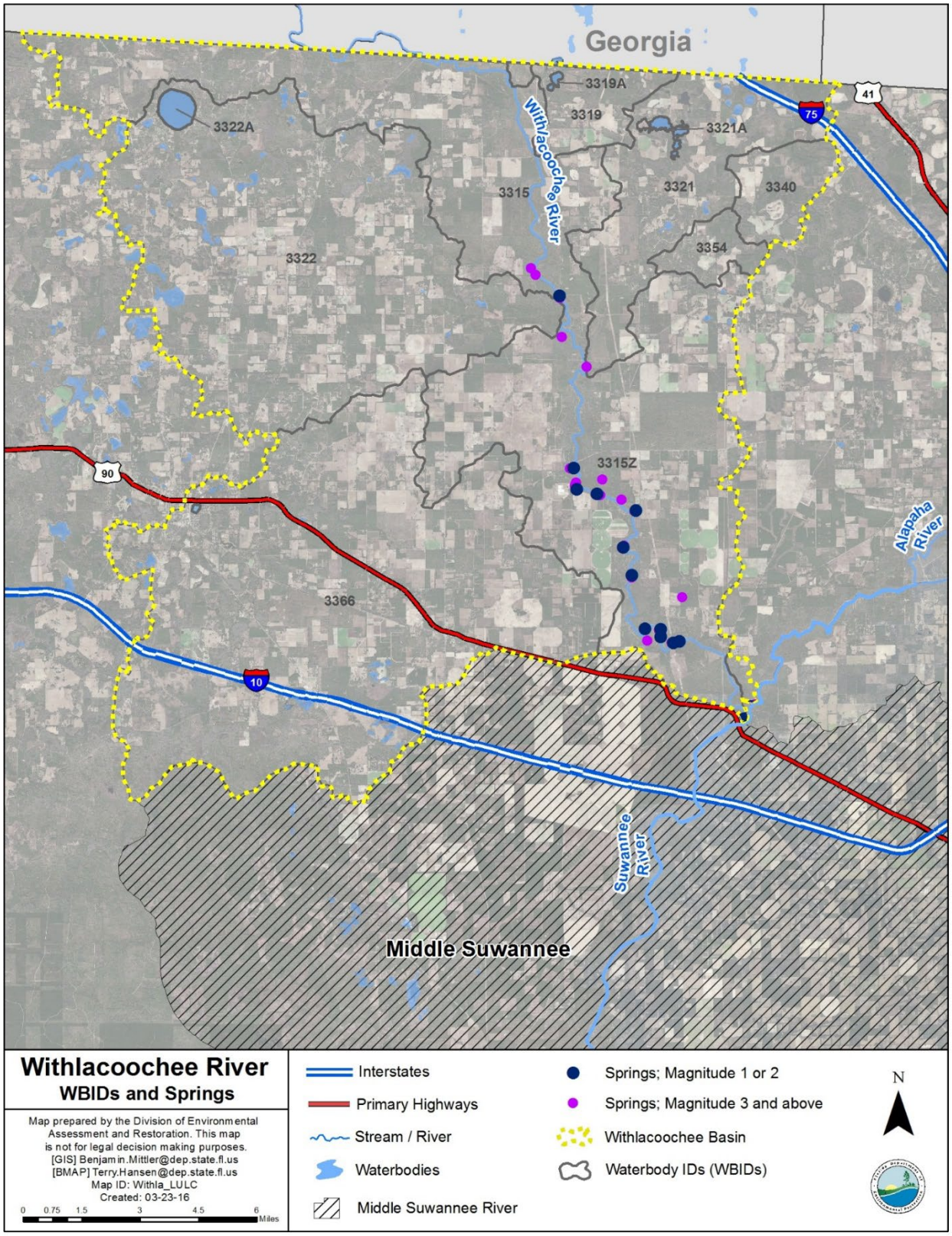


Figure 3. Florida's Withlacoochee River WBIDs and springs

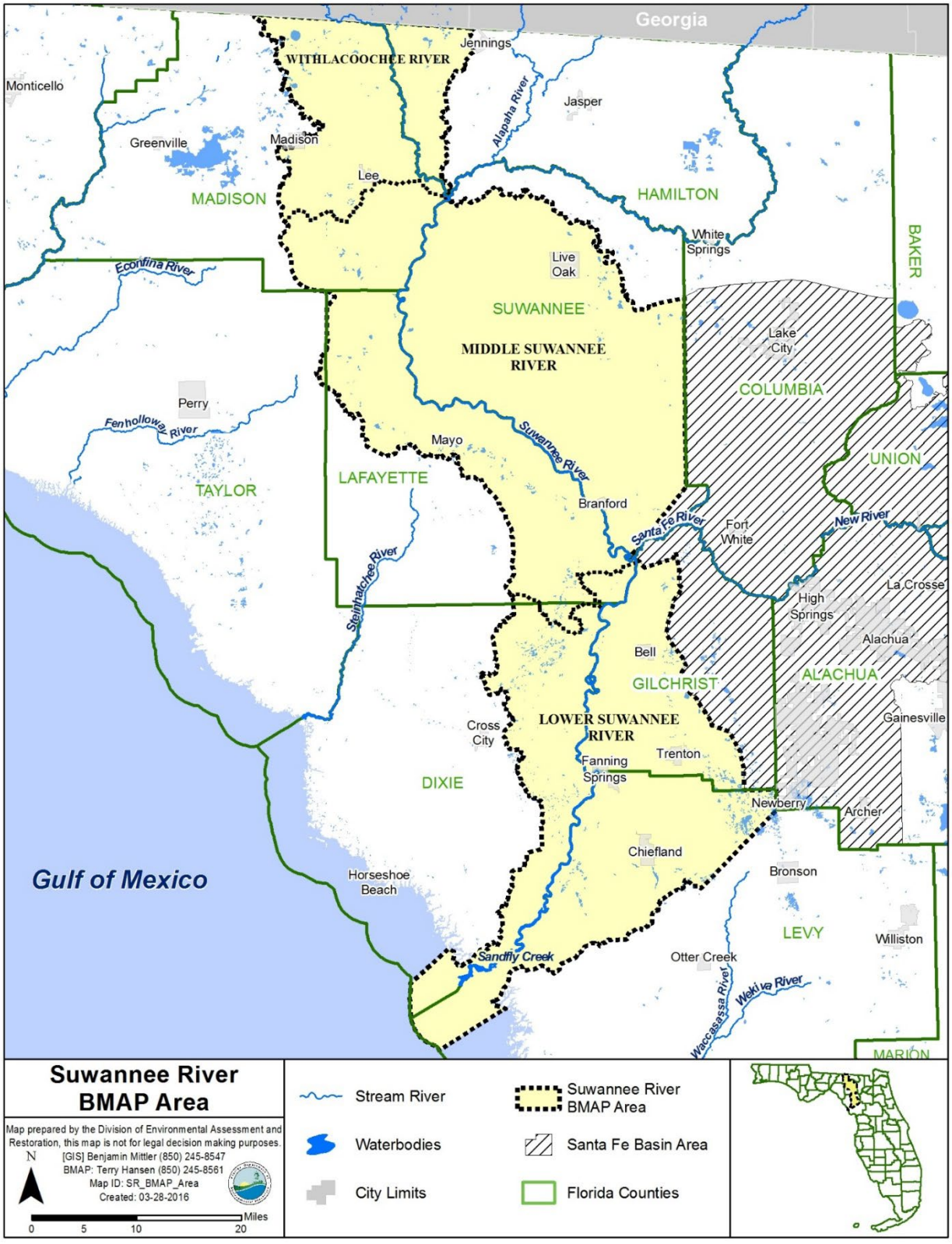


Figure 4. Suwannee River BMAP area

1.2.4 Pollutant Reduction and Discharge Allocations

1.2.4.1 *Allocation Categories*

The rules adopting TMDLs must establish reasonable and equitable allocations that will alone, or in conjunction with other management and restoration activities, attain the TMDL. Allocations may be to individual sources, source categories, or basins that discharge to the impaired waterbody. The allocations identify either how much pollutant discharge each source designation may continue to contribute, or the percentage reduction of loading. The TMDL allocation categories are as follows:

- **Wasteload Allocation (WLA)** – The allocation to point sources permitted under the National Pollutant Discharge Elimination System (NPDES) Program includes the following:
  - **Wastewater Allocation** is the allocation to industrial and domestic NPDES wastewater facilities.
  - **NPDES Stormwater Allocation** is the allocation to NPDES stormwater permittees that operate municipal separate storm sewer systems (MS4s). These permittees are treated as point sources under the TMDL program.
- **Load Allocation (LA)** – The allocation to nonpoint sources, including agricultural runoff and stormwater from areas that are not covered by an MS4.

1.2.4.2 *Allocations Implemented by the BMAP*

The FWRA states that the BMAP must equitably allocate pollutant reductions to individual basins, as a whole to all basins, or to each identified point source or category of nonpoint sources, as appropriate. Allocations are determined based on a number of factors listed in the FWRA, including cost-benefits, technical and environmental feasibility, implementation time frames, and others. The BMAP utilizes the typical nutrient source categories identified in a nutrient source inventory to estimate pollutant reductions. The main nutrient sources in this BMAP generally consist of agricultural loads and nonagricultural loads. The load allocations apply collectively to all nonpoint sources. To assist in load allocations, detailed nutrient source inventories may be completed for selected OFSs in future iterations of this BMAP.

1.2.5 Nonpoint Source Best Management Practice (BMP) Approach

Similar to the Santa Fe River BMAP, the primary approach to load reductions in the Lower and Middle Suwannee River BMAP will be BMP based. BMPs are individual or combined management and/or structural practices determined through research, field testing, and expert review to be the most effective and practicable means for improving water quality, taking into account economic and technological considerations.

The geology of the BMAP planning area for the Lower and Middle Suwannee River consists of a karstic limestone subsurface overlain in a limited area with lower permeability (sandy clay) surficial sediments (surface watershed) and overlain in a larger area by higher permeability (sand) surficial sediments (springshed). This results in a situation where some entities are located in both the area within the surface watershed *and* a specific springshed, while others are only in a springshed that exhibits no characteristics of a surface watershed.

Because of this complexity, the Lower and Middle Suwannee River TMDL implementation process will adhere to the 5-, 10- and 15-year reduction schedules that will be established. This process provides for changes in management activities over time, while the level of implementation differentiates effort among stakeholders based on location and source type.

Initially, BMPs will be implemented to decrease nutrient inputs. These BMPs will do the following:

1. Focus on pollution prevention.
2. Address all identified sources.
3. Achieve nutrient reductions or provide information on which to base future activities for achieving nutrient reductions.

Section 3.3 summarizes the BMP-related activities scheduled in the Lower and Middle Suwannee River BMAP area. While all agricultural nonpoint sources are required to implement applicable BMPs (or conduct water quality monitoring) upon the promulgation of this BMAP, DEP initially may provide additional emphasis for BMP implementation on geographically defined restoration areas and/or on specific commodities.

As appropriate, new or modified BMPs may be introduced in future BMAP iterations. This additional agricultural BMP implementation includes the evaluation of adopted BMP manuals and possible

identification of new or modified practices that would provide additional nutrient reductions. If the Florida Department of Agriculture and Consumer Services (FDACS) adopts any such practices, the related rule(s) must allow producers a reasonable time to implement them. As needed, this process of improvement will be continued.

Stakeholders who implement the required management actions identified in the BMAP are deemed to be in compliance with the requirements of Section 403.067, F.S.

Table 4. BMPs being implemented in the Lower and Middle Suwannee River Basin

Stakeholder Group	Action
Agricultural producers	Submit notices of intent (NOIs) and implement BMPs
County governments	Develop and implement ordinances
Municipalities	Adopt ordinances
FDACS in conjunction with DEP	Identify commodity groups on which to concentrate resources for BMP implementation

Even with a BMP-based implementation approach, nutrient reductions will need to be quantified. Nitrate load reductions to be achieved by BMAP projects will be estimated to the greatest extent possible. Monitoring of the Withlacoochee River, Lower and Middle Suwannee Rivers, and associated springs, as well as localized ground water sampling, will be carried out to determine the degree of restoration being achieved.

1.2.6 Lower and Middle Suwannee River Basin TMDLs

DEP adopted nutrient TMDLs for certain waters in the Lower and Middle Suwannee River Basin in November 2008. This BMAP covers the 85 WBIDs in the Upper and Lower Suwannee Planning Units identified in the TMDL document. The TMDL document contains a complete listing of the WBID numbers and names of these planning units.

Table 4 lists the TMDLs and pollutant load allocations adopted by rule for the Lower and Middle Suwannee Planning Units. Although DEP has not adopted TMDLs or associated load reductions for the Withlacoochee River and associated springs, the default NNC for springs of 0.35 mg/L nitrate and for North Central Region Rivers of 1.87 mg/L TN have been used to provide restoration targets for these springs and waters.

The nutrient TMDLs in the planning units are expressed as a nitrate concentration. To achieve the nitrate target of 0.35 mg/L in the Lower and Middle Suwannee River Basin, the nitrate loads from nonpoint sources need to be reduced by the percent reductions set forth in **Table 5**.

Table 5. Lower and Middle Suwannee River Planning Unit TMDLs

Planning Unit	WBID	Parameter	TMDL (Nitrate as Nitrogen) (mg/L)	WLA for NPDES Wastewater	WLA for NPDES Stormwater	% reduction
Lower Suwannee	3422R	Nitrate, monthly average	0.35	Not applicable	Not applicable	79%
Lower Suwannee	3422S	Nitrate, monthly average	0.35	Not applicable	Not applicable	92%
Lower Suwannee	3422D	Nitrate, monthly average	0.35	Not applicable	Not applicable	30% to 50%
Middle Suwannee	3422B	Nitrate, monthly average	0.35	Not applicable	Not applicable	0% to 51%
Middle Suwannee	3422J	Nitrate, monthly average	0.35	Not applicable	Not applicable	61%
Middle Suwannee	3422L	Nitrate, monthly average	0.35	Not applicable	Not applicable	92%
Middle Suwannee	3422T	Nitrate, monthly average	0.35	Not applicable	Not applicable	81%
Middle Suwannee	3422U	Nitrate, monthly average	0.35	Not applicable	Not applicable	74%
Middle Suwannee	3422Z	Nitrate, monthly average	0.35	Not applicable	Not applicable	62%

1.3 Assumptions and Considerations Regarding TMDL Implementation

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

1.3.1 Assumptions

The following assumptions and facts were important in the BMAP development process:

- The use of appropriate BMPs will reduce nutrient loads from nonpoint sources throughout the BMAP area.
- Because the basin has a large surface area, atmospheric deposition is a significant, uncontrollable source of nutrients and is not included in any reduction strategies.

- BMAP implementation will occur according to the 5-, 10-, and 15-year schedules, including the evaluation of progress and identification of areas requiring additional actions.

- By law, agricultural producers who implement FDACS-adopted BMPs applicable to their operations (identified through the submittal of a NOI) or conduct water quality monitoring and show they are not a contributing source have a presumption of compliance with state water quality standards.

- The TMDL applied to no NPDES or MS4 point sources that are directly discharging to surface waters and impacting the Lower and Middle Suwannee River.

- The permitted facilities discharging to the Withlacoochee River are required to meet or not exceed the default NNC for TN prior to discharge.

- Activities that improve the loading to surface waters will also reduce nitrogen loading to ground water and, eventually, to the springs in the Withlacoochee Basin.

Many projects related to agricultural activities have already been undertaken in the Suwannee Basin as part of the Suwannee River Partnership (SRP), and details of some of these projects are presented later in this document. The SRP is also working with those operations for which FDACS does not currently have a BMP manual to either update existing U.S. Department of Agriculture (USDA) conservation plans, or to develop a conservation plan, and submit an NOI to implement the plan. The implementation of these plans would provide a presumption of compliance with state water quality standards. FDACS currently is developing a poultry BMP manual and has adopted a dairy BMP manual as an alternative to a conservation plan.

1.3.2 Considerations

This BMAP requires all agricultural stakeholders in the basin to implement the required BMPs (or conduct water quality monitoring with an agency-approved plan). However, the full attainment of the TMDL targets will be a long-term process. While some of the projects and activities contained in the BMAP are recently completed or currently ongoing, there are many projects with significant estimated load reductions that may take many years to realize their reductions.

Given that the river may have a delayed response to the reduced loading and to fully meeting applicable water quality standards, regular follow-up and continued coordination and communication by stakeholders will be essential to ensuring that management strategies are being carried out and that their incremental effects are assessed. Any additional management actions required to achieve the TMDL will be developed as part of BMAP follow-up.

During the BMAP process, the following items were identified that should be continued or undertaken in future watershed management cycles:

1. Continually updating the FDACS NOI database.
2. Continually evaluating various sources of land use data and updating the land use geographic information system (GIS) layer for agricultural and nonagricultural uses.
3. Increasing participation in the BMP program by enrolling additional agricultural operations.
4. Evaluating domestic wastewater facilities for nitrate removal efficiencies and the Florida Department of Health (FDOH) septic tank database for more accurate information.
5. Identifying existing BMPs that may provide the greatest nutrient reductions and verifying that these BMPs are being implemented where applicable.
6. Collecting information on fertilizer use and irrigation.
7. Monitoring ground water for nutrients, selected indicators, and oxygen and nitrogen isotopes.
8. Evaluating the importance of upstream sources in the Suwannee and Withlacoochee Basins.
9. Improving the assessment of nitrogen sources to ground water in the Withlacoochee River area.
10. Identifying additional projects to benefit the Withlacoochee River and springs.

Chapter 2: LOWER AND MIDDLE SUWANNEE RIVER BASIN SETTING

2.1 Jurisdictions, Population, and Land Uses

The population in the Lower and Middle Suwannee River Basins is estimated at 54,000 people in 22,000 households, while in the Withlacoochee Basin an estimated 18,518 people occupy 6,739 households, for an average household size of 2.5 people. The population is concentrated in small urban areas, with the largest concentrations of people living in the towns of Live Oak and Chiefland in the eastern portion of in the BMAP area and the City of Madison in the northwest portion of the BMAP area.

Land use in the BMAP area is mainly silviculture and agriculture. **Table 6** and **Table 7** show the overall land uses and specific types of agricultural land uses based on 2010 land use information. **Figure 5, Figure 6,** and **Figure 7** show the land uses in the Middle Suwannee River Basin, the Lower Suwannee River Basin, and the Florida portion of the Withlacoochee River Basin, respectively. **Figure 8** displays the 2010 agricultural land uses throughout the entire BMAP area.

2.2 Hydrogeology

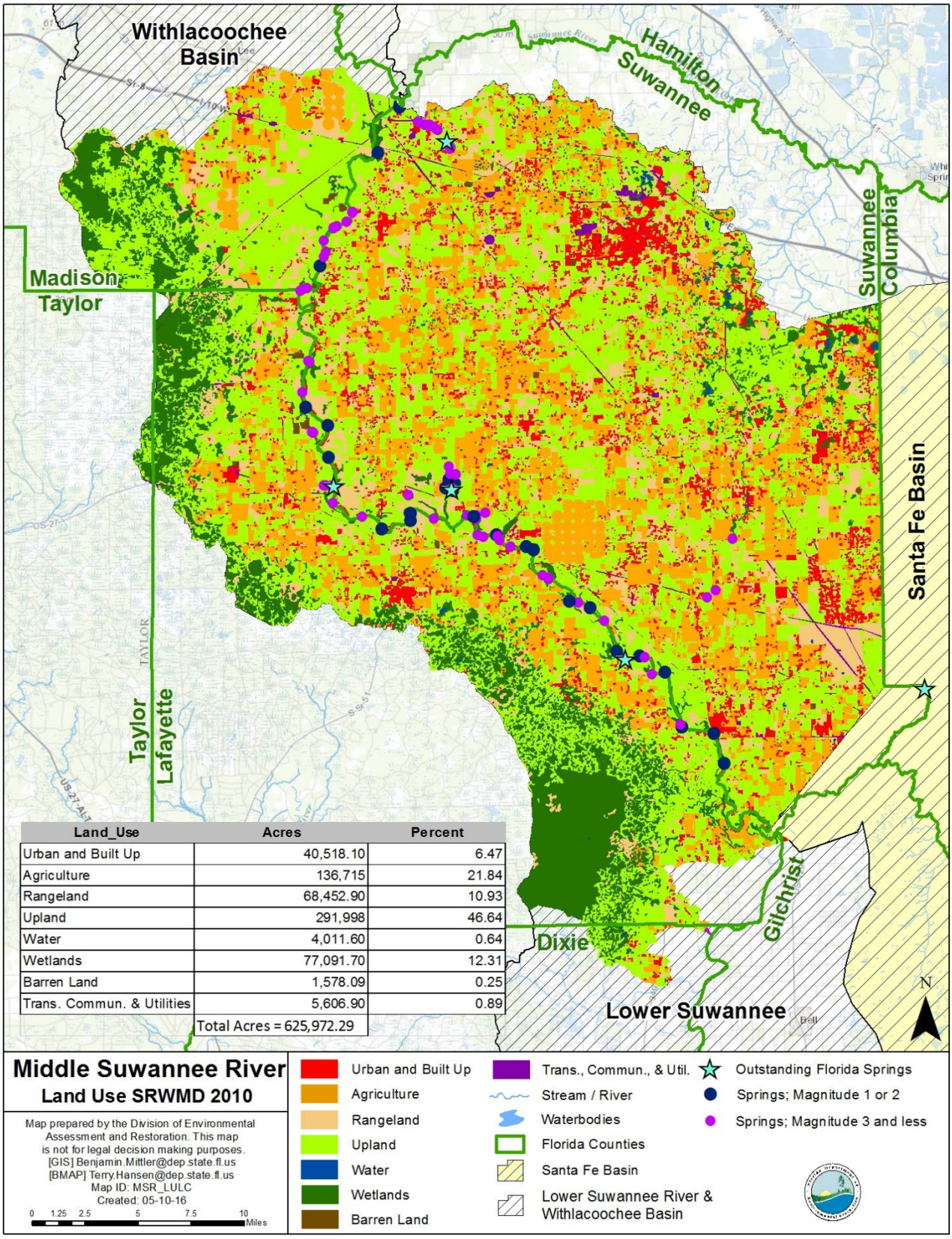
The Suwannee River Basin drains approximately 10,000 square miles of south Georgia and north Florida, discharging an annual average flow of approximately 10,000 cubic feet per second (cfs) (DEP 2001). The Suwannee River is the second largest river in the state in terms of flow. Within the Suwannee Basin, the Alapaha, Withlacoochee, and Upper Suwannee watersheds lie almost entirely in Georgia. These are dominated by surface water runoff, as are the Florida portions of the basin in the Northern Highlands region. After crossing the Cody Scarp, ground water discharges from springs and diffuse seepage strongly influence the Suwannee River and make up its baseflow. The Withlacoochee River contains multiple springs and contributes to the Suwannee River at its confluence.

Table 6. Land use classifications in the Lower and Middle Suwannee River and Withlacoochee River Basins in 2010

Land Use	Lower Suwannee (acres)	Middle Suwannee (acres)	Withlacoochee (acres)
Urban and Built-Up	36,780.4	40,518.1	9,739.41
Agriculture	88,588.1	136,715	40,717.1
Rangeland	24,528.3	68,452.9	20,749.8
Upland Forest (including silviculture)	181,822	291,998	84,028.2
Water	7,838.14	4,011.6	2,156.87
Wetland	82,833.8	77,091.7	15,303.2
Barren Land	678.15	1,578.09	200
Transportation, Communication, and Utilities	2,422.8	5,606.9	1,639.23
Total	**425,491.6**	**625,972.29**	**174,533.8**

Table 7. Agricultural land use classifications in the Lower and Middle Suwannee River Basin in 2010

Land Use	Middle Suwannee (acres)	Lower Suwannee (acres)	Withlacoochee (acres)
2110: Improved Pastures	56,864	32,650	13,818
2120: Unimproved Pastures	1,530	472	396
2130: Woodland Pastures	3,366	2,451	997
2140: Row Crops	2,229	188	292
2150: Field Crops	11,203	2,864	14,935
2153: Hay Fields	51,549	43,397	7,809
2230: Other Groves (Pecan, Avocado, Coconut, Mango, *etc*)	1,397	270	158
2310: Cattle Feeding Operations	981	132	14
2320: Poultry Feeding Operations	1,249	17	141
2400: Nurseries and Vineyards	52	65	20
2410: Tree Nurseries	899	1,934	78
2420: Sod Farms	358	193	126
2430: Ornamentals	448	44	40
2500: Specialty Farms	57	3	18
2510: Horse Farms	1,152	1,748	87
2520: Dairies	459	659	0
2540: Aquaculture	10	3	7
2600: Other Open Lands (Rural)	227	58	51
2610: Fallow Crop Land	2,687	1,438	1,730
Total	136,715	88,588	40,717



Land_Use	Acres	Percent
Urban and Built Up	40,518.10	6.47
Agriculture	136,715	21.84
Rangeland	68,452.90	10.93
Upland	291,998	46.64
Water	4,011.60	0.64
Wetlands	77,091.70	12.31
Barren Land	1,578.09	0.25
Trans. Commun. & Utilities	5,606.90	0.89
	Total Acres = 625,972.29	

Figure 5. Major land use categories in the Middle Suwannee River Basin in 2010

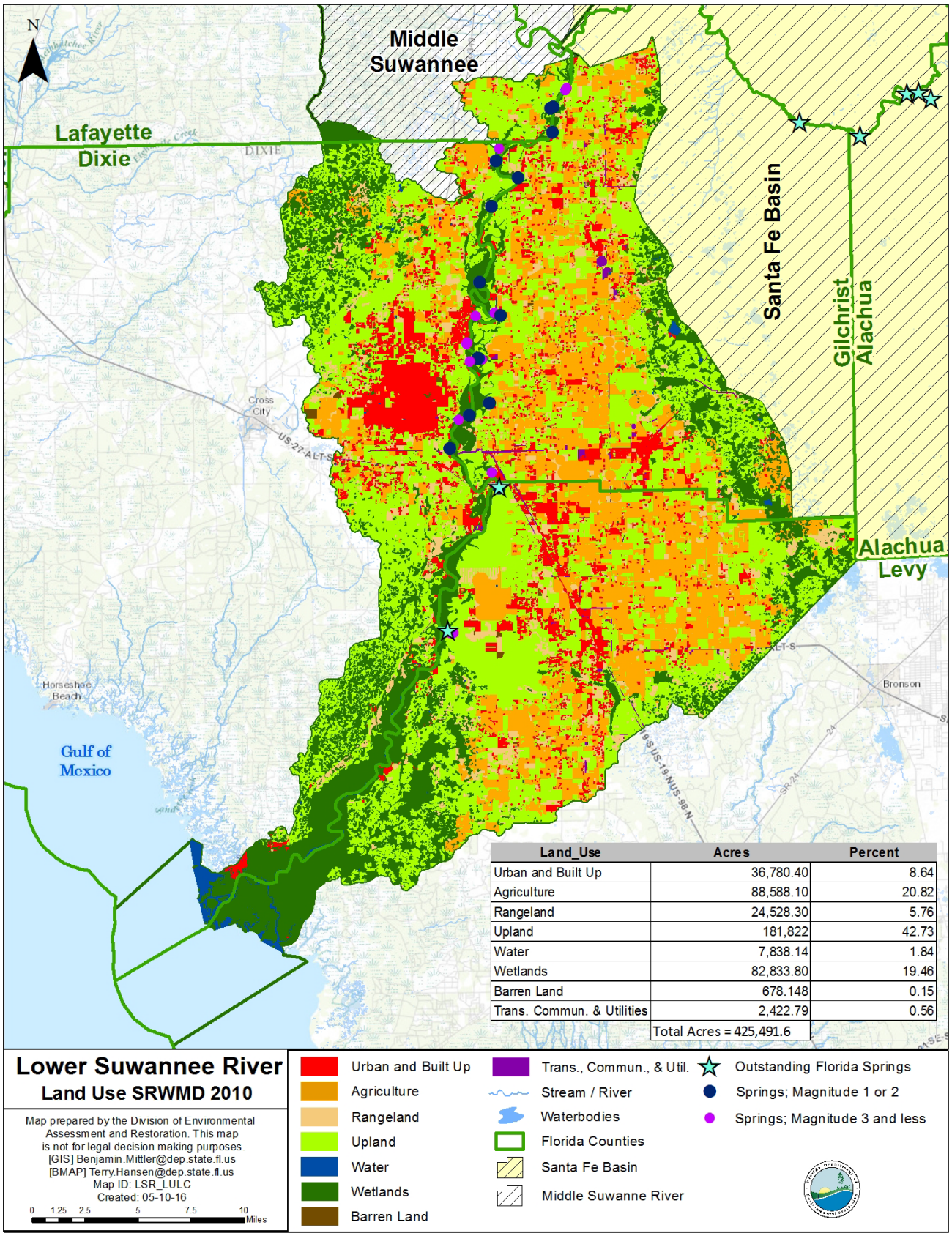
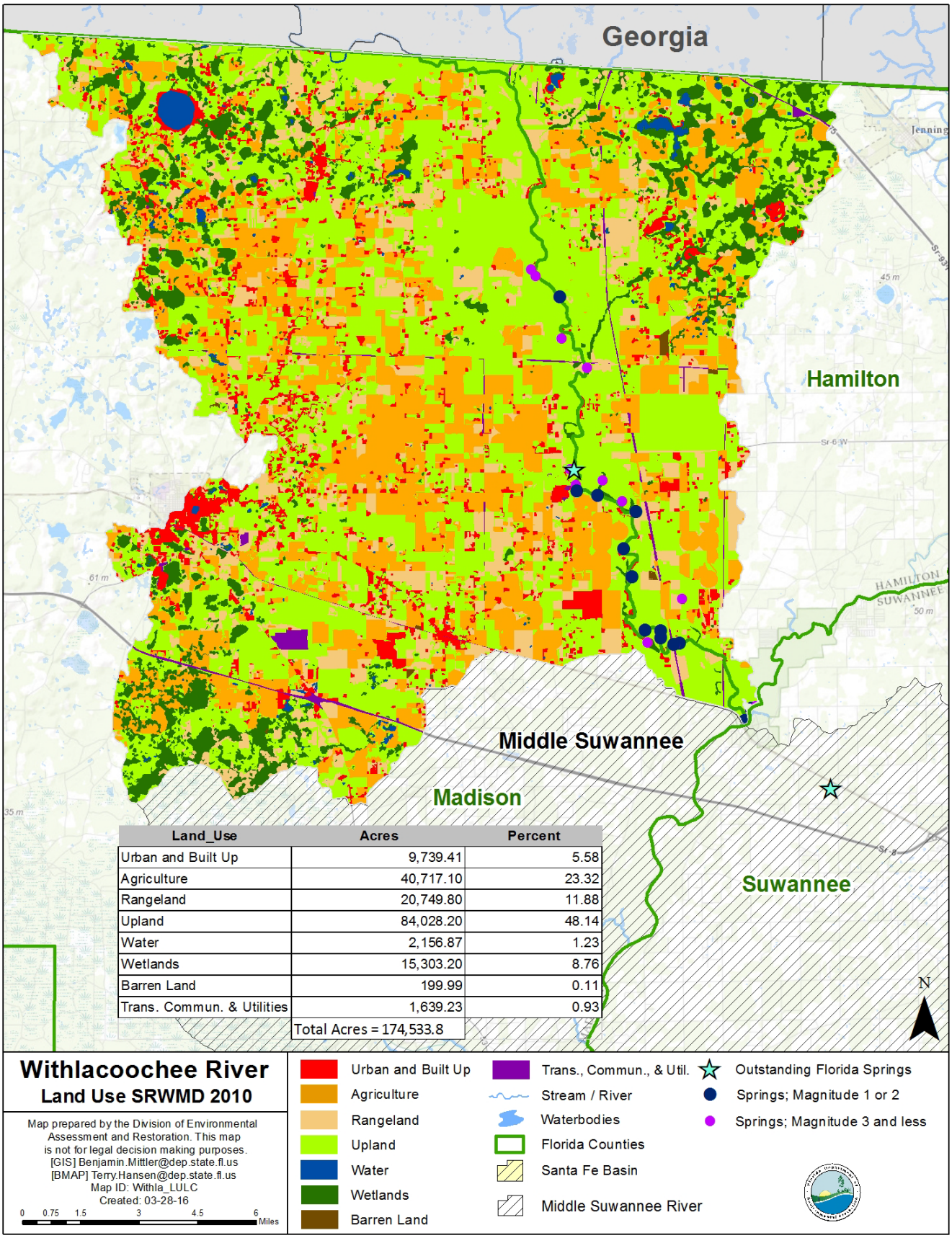


Figure 6. Major land use categories in the Lower Suwannee River Basin in 2010



Land_Use	Acres	Percent
Urban and Built Up	9,739.41	5.58
Agriculture	40,717.10	23.32
Rangeland	20,749.80	11.88
Upland	84,028.20	48.14
Water	2,156.87	1.23
Wetlands	15,303.20	8.76
Barren Land	199.99	0.11
Trans. Commun. & Utilities	1,639.23	0.93
	Total Acres = 174,533.8	

Figure 7. Major land use categories in the Withlacoochee Basin in 2010

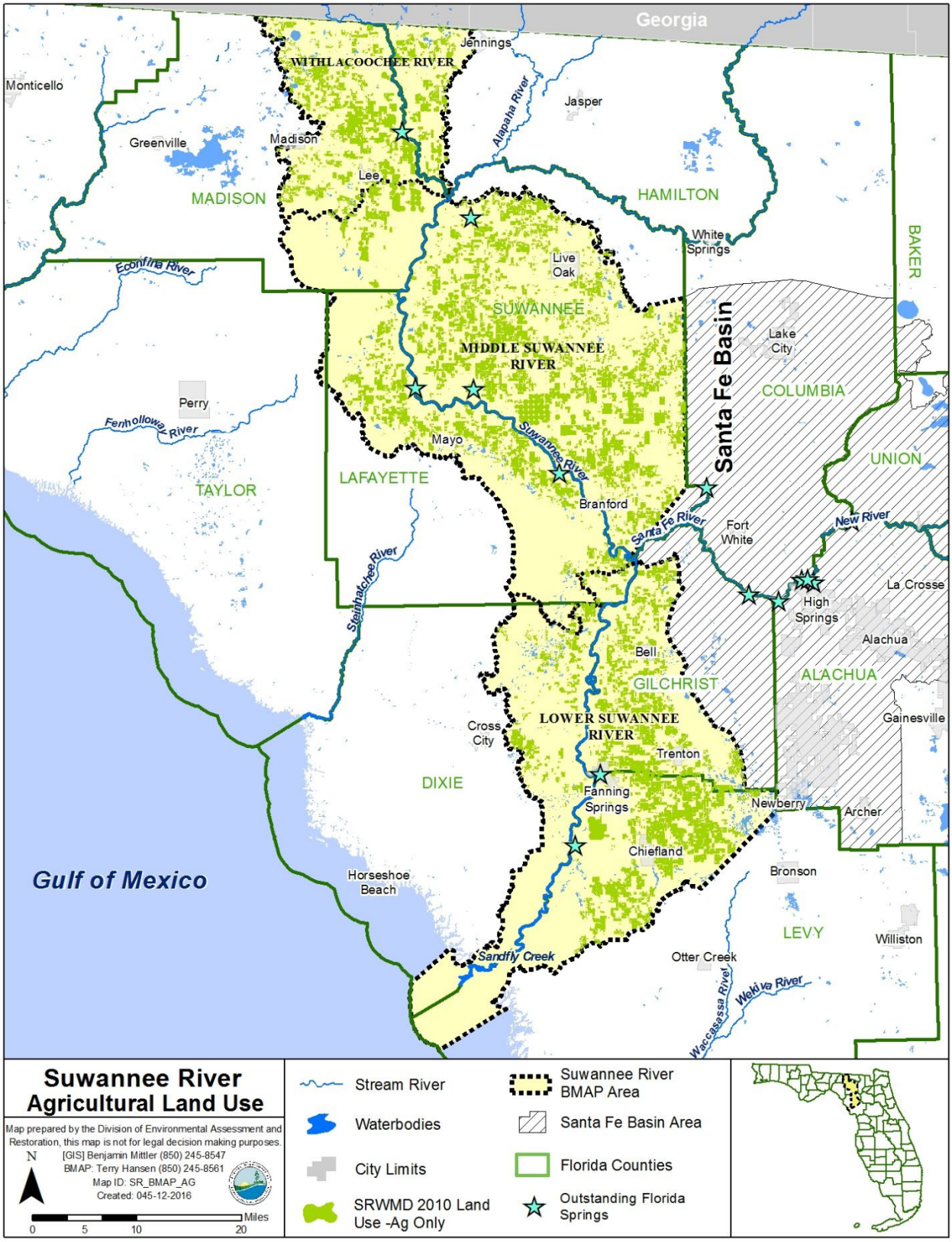


Figure 8. Agricultural acreage in the Lower and Middle Suwannee River BMAP area in 2010

The Suwannee River Basin contains two major physiographic regions: the Northern Highlands and the Gulf Coastal Lowlands. Separating the two is the Cody Scarp, a steep face that constitutes the most prominent topographic feature in Florida. Much of the lowlands make up a karst plain where natural sinkholes are abundant and natural limestone springs occur. Although the highlands contain some springs, most of the BMAP area's more than 250 springs are in the lowlands. Springs are especially abundant along the Suwannee River where the river has cut into the upper portion of the limestone bedrock.

Figure 9 (taken from SRWMD 2010) shows the upper Floridan aquifer confinement conditions for the entire SRWMD, including the Suwannee River.

2.3 Water Quality Trends

Water quality trends in the Suwannee River have shown an increase in nitrate levels since 1954. For the Suwannee River Basin, the largest increase has occurred in the Middle Suwannee Basin from Dowling Park to Branford. **Figure 10** (taken from the TMDL report [Hallas and Magley 2008]) shows historical nitrate data for the Suwannee River at Branford from 1954 to 2007. The SRWMD plots historical nitrate water quality data for numerous springs and ground water monitoring sites.

Figure 10 (from Hallas and Magley 2008) shows the monthly average nitrate + nitrite concentrations in the Lower Suwannee River Basin from 1994 to 2006 increasing over time. The Middle Suwannee exhibits a similar trend.

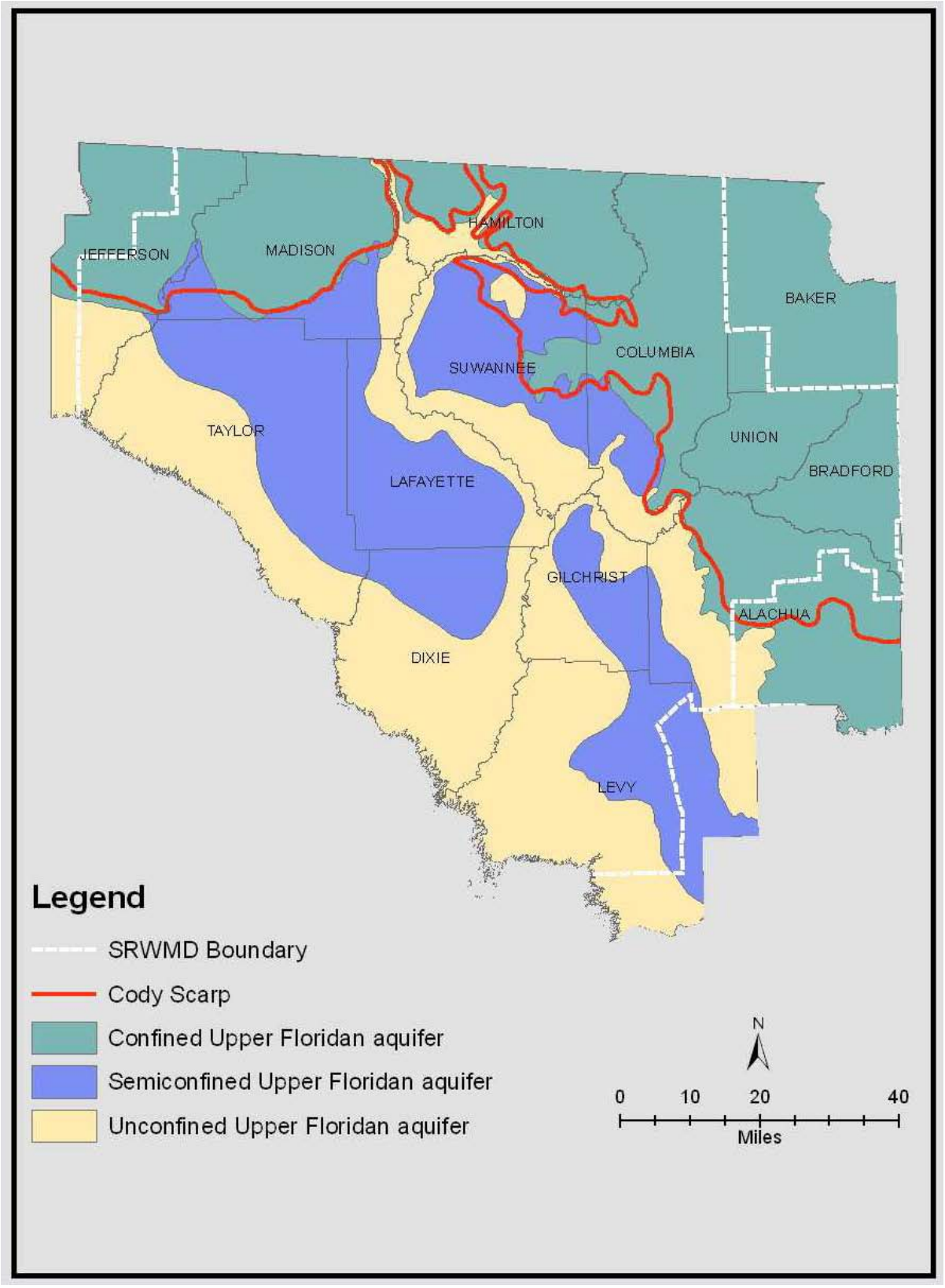


Figure 9. Confinement conditions of the upper Floridan aquifer in the SRWMD (SRWMD 2010)

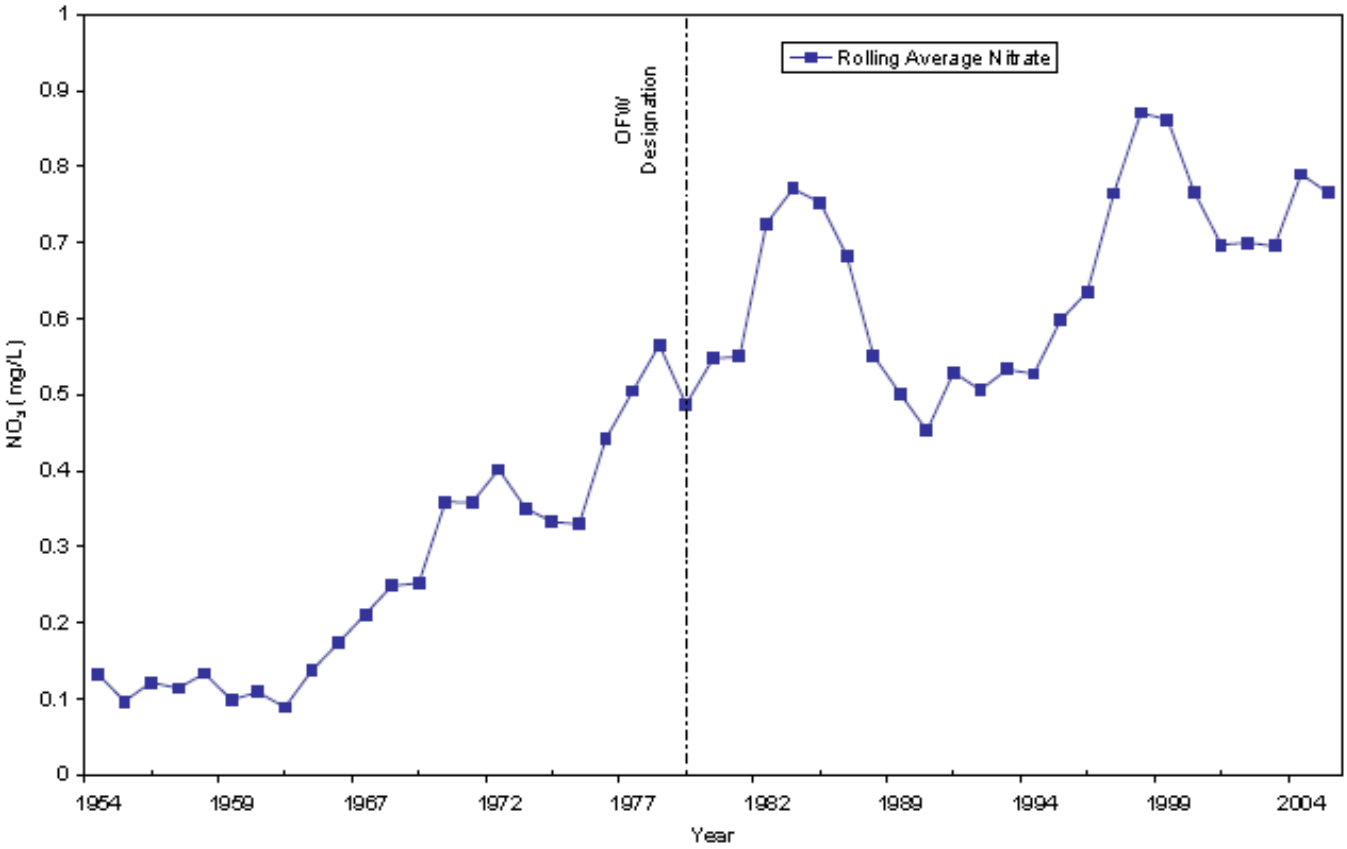


Figure 10. Historical nitrate data (mg/L) for the Suwannee River at Branford, 1954–2007 (Hallas and Magley 2008)

Table 8. Nitrate + nitrite concentrations (mg/L) in the Lower Suwannee River WBIDs, 1999–2006 (Hallas and Magley 2008)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	0.943	0.513	0.662	0.960	0.790	0.505	0.360	0.663	0.666	1.001	0.744	0.905
2000	0.951	0.881	0.868	0.415	0.492	0.209	0.504	0.766	0.630	0.658	1.048	0.811
2001	0.510	0.584	0.781	0.244	0.651	0.396	0.463	0.516	0.791	0.690	0.913	0.645
2002	0.796	0.633	0.274	0.395	0.679	0.351	0.388	0.390	0.580	0.526	0.709	0.536
2003	0.269	0.740	0.066	0.136	0.641	0.689	0.565	0.423	0.501	0.850	0.709	1.077
2004	1.080	0.513	0.269	0.805	0.965	0.672	0.643	0.664	0.282	0.128	0.439	0.568
2005	0.456	0.776	0.509	0.106	0.390	0.600	0.771	0.390	0.872	1.233	1.286	0.910
2006	0.893	0.493	0.558	1.005	.0992	0.596	1.222	0.644	0.897	0.856	0.855	0.859
Monthly average	**0.737**	**0.642**	**0.498**	**0.508**	**0.700**	**0.502**	**0.614**	**0.557**	**0.652**	**0.743**	**0.838**	**0.789**
Monthly % reduction	**53%**	**45%**	**30%**	**31%**	**50%**	**30%**	**43%**	**37%**	**46%**	**53%**	**58%**	**56%**
Maximum of monthly averages	**0.838**											
Maximum% reduction	**58%**											

2.3.1 Trends in Withlacoochee River Springs

The 41 multiple springs that feed the Withlacoochee River south of the Cody Scarp include Madison Blue, Morgan, Pot, Tanner, and Rossetter Springs. The water quality in these springs needs to meet the default NNC nutrient criteria established for springs. All these springs contribute flow to the Withlacoochee River and eventually to the Suwannee River.

Recent water quality data for these springs, as shown in **Table 9**, indicate that all the springs in the area have nitrate levels above the NNC of 0.35 mg/L and tend to be impaired by the presence of algal mats, a potential indication of nutrient impairment. Depending on the spring, water quality data were collected in 1998 and/or during two sampling efforts in 2015. The elevated nitrogen concentrations from these springs are contributors to the elevated nitrogen levels in the Suwannee River. The lowest concentration observed across all the samples was at Rossetter Springs, with a 0.66 mg/L concentration of nitrate as nitrogen. The highest concentration measures was at Pot Spring, with a 1.95 mg/L nitrate as nitrogen concentration.

Table 9. Water quality data for springs in the Lower Withlacoochee River Basin

SPRING NAME	SAMPLING DATE	DATA SOURCE	NITRATE AS NITROGEN (MG/L)
Rossetter Spring	9/1/2015	Geosyntec	0.66
Rossetter Spring	12/17/2015	Geosyntec	0.67
HAM612982	6/12/1998	WR99-02	1.46
HAM612982	9/1/2015	Geosyntec	1.84
HAM612982	12/17/2015	Geosyntec	1.60
New Spring #1	9/1/2015	Geosyntec	Not sampled
New Spring #1	12/17/2015	Geosyntec	1.50
New Spring #2	9/1/2015	Geosyntec	1.71
New Spring #2	12/17/2015	Geosyntec	1.60
New Spring #3	9/1/2015	Geosyntec	Not sampled
New Spring #3	12/17/2015	Geosyntec	1.60
MAD612982	6/12/1998	WR99-02	1.62
MAD612982	9/1/2015	Geosyntec	1.92
MAD612982	12/17/2015	Geosyntec	1.60
Pot Spring	6/15/1998	WR99-02	1.77
Pot Spring	9/1/2015	Geosyntec	1.95
Pot Spring	12/17/2015	Geosyntec	1.70
Tanner Spring	6/12/1998	WR99-02	0.93
Tanner Spring	9/1/2015	Geosyntec	0.79
Tanner Spring	12/17/2015	Geosyntec	0.70
Morgan Spring	6/10/1998	WR99-02	1.32
MAD610981	6/10/1998	WR99-02	1.27
MAD610982	6/10/1998	WR99-02	1.02
HAM610981	6/10/1998	WR99-02	0.85
HAM610982	6/10/1998	WR99-02	1.48
HAM610983	6/10/1998	WR99-02	1.29
HAM610984	6/10/1998	WR99-02	1.41
MAD612981	6/12/1998	WR99-02	1.57

Chapter 3: POLLUTANT SOURCES, ANTICIPATED OUTCOMES, AND MANAGEMENT STRATEGIES

3.1 Summary of Sources in the BMAP Area

Potential nutrient sources in the Lower and Middle Suwannee River Basin BMAP comprise a variety of point and nonpoint sources. DEP typically utilizes land use to generate the major nonpoint source categories for estimating loads. The major categories in the BMAP include organic agricultural nutrients, livestock, inorganic agricultural nutrients, fertilizer; OSTDS, wastewater treatment plants (WWTPs), urban fertilizer and golf courses, and atmospheric deposition.

There are no Phase I or Phase II MS4 permittees in the Lower and Middle Suwannee River BMAP area. Other point sources in the basin, such as wastewater and other NPDES-permitted facilities, have no direct discharge into the river or surface water features that discharge to the river, and their impact on the ground water that feeds the springs has not been determined.

Katz *et al.* (1999) completed a study to determine the age of the water flowing from the springs along the Suwannee River and the likely sources of the water entering the river. **Figure 9** (from Hallas and Magley 2008) shows the calculated potential nonpoint sources of nitrogen to the Middle and Lower Suwannee River using the equations in Hornsby (1998) and data from 2007. Additionally, Katz *et al.* (1999) concluded that nitrate concentrations in spring waters of the Suwannee River Basin have closely followed the estimated contributions of nitrogen from fertilizers to ground water and that the high-nitrate water continues to recharge the ground water system over a period of less than ten years. A more detailed analysis of the nutrient sources and their contribution to ground water could be completed for BMAP updates if needed.

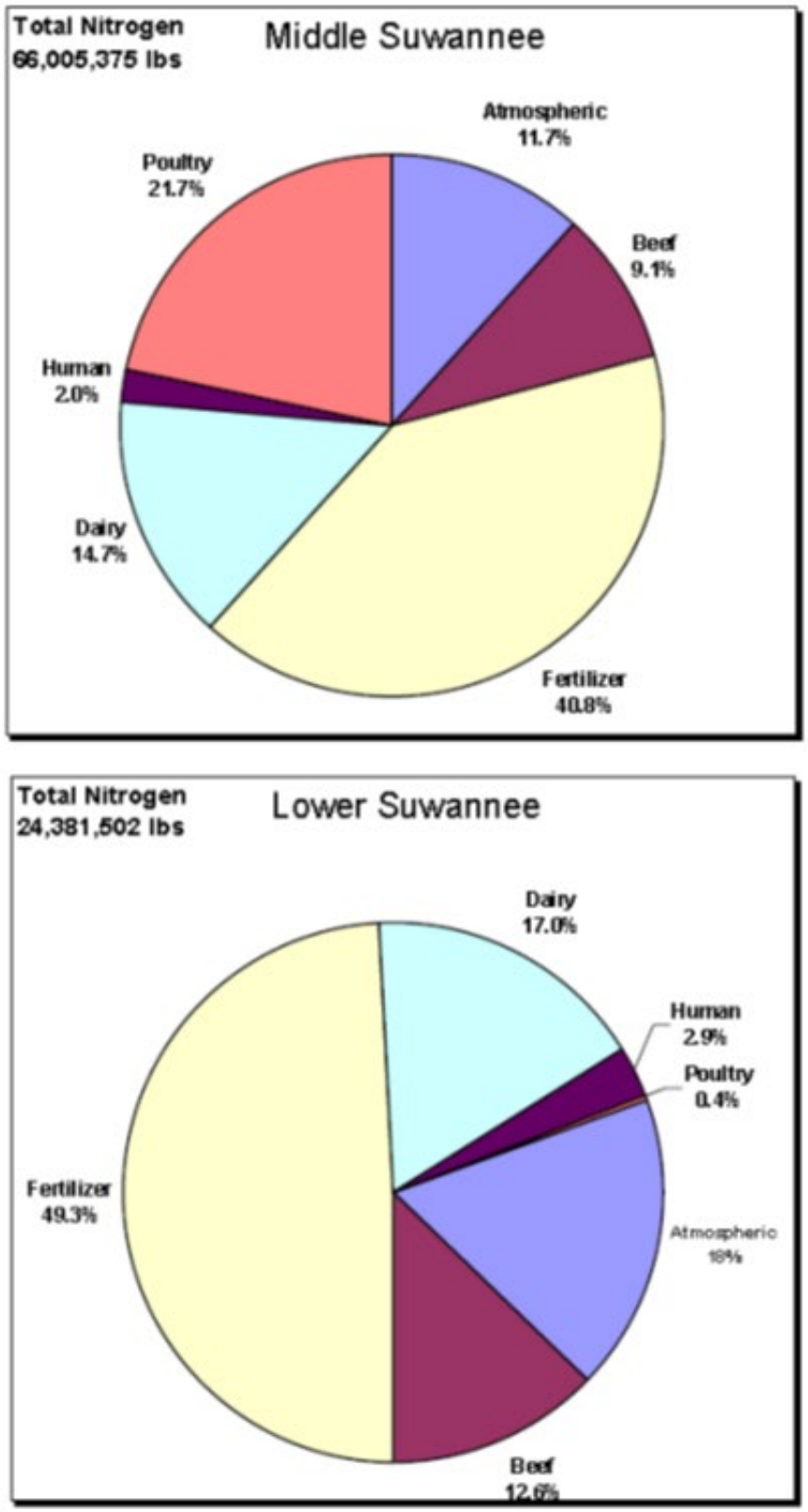


Figure 11. Calculated sources of nitrogen to the Middle and Lower Suwannee River (top and bottom graphs, rRespectively), based on 1999 land use (Hallas and Magley 2008)

3.2 Anticipated Outcomes of BMAP Implementation

With the implementation of the projects outlined in this BMAP, reductions in nutrient loads are expected to improve conditions in the river such that it meets applicable water quality standards. Initially, the BMAP is anticipated to generate the following actions:

- The implementation of both FDACS-adopted agriculture and silviculture BMPs.
- The development of county springshed protection ordinances.
- The development and implementation of urban BMPs for fertilizer use and irrigation practices in conjunction with applicator training requirements.
- The determination of nitrate isotope species in ground water from monitoring wells located in the springsheds but distant from the springs.
- A specific plan for addressing potential nitrate sources to the springs as well as the possible identification of a Priority Focus Area (or Areas) for the OFSs in the BMAP area.

As BMAP implementation progresses, the anticipated outcomes include the following:

- Reduced nitrate levels in monitoring wells and springs.
- Improved information on the effectiveness of existing BMPs.
- As needed and practicable, modified or new BMPs developed and implemented for agricultural lands.
- As needed, the development and implementation of ordinances for septic tank maintenance.
- The identification of additional nutrient reduction strategies for nonagricultural areas.

3.3 Management Strategies

The stakeholders in the basin are required to carry out the management strategies in this BMAP to reduce nutrient loadings to a level consistent with achieving the TMDL within 20 years of BMAP adoption. Initially, these actions primarily consist of the implementation of BMPs for agricultural

stakeholders and the development and implementation of BMPs and various ordinances for nonagricultural stakeholders. This section details the agricultural BMPs and management actions required under the BMAP. The implementation of the Lower and Middle Suwannee River BMAP will adhere to the schedule developed for meeting the 5-, 10-, and 15-year milestones for nutrient reductions.

3.3.1 Types of Management Strategies

Management actions are eligible for credit towards nutrient reductions if they came on line in January 2007 or later. Stakeholders were asked to review the project types (shown in **Table 10**) and determine which had been undertaken. Many are not applicable to the Suwannee Basin due to its low population density and rural nature.

Basinwide projects proposed or under way in the Lower and Middle Suwannee River BMAP area include educational programs, agricultural BMP implementation, land use development guidelines, and ordinances for nonagricultural fertilizer use. Due to the basin's rural setting and low population density, most of the projects are regional in nature, with the dual goals of water quality improvement and water conservation. The projects are summarized in **Table 10**.

Table 10. Project types

Project Type	Information Needed for Review	Notes
Structural stormwater – new development	Environmental Resource Permit (ERP) number	Credit for any structural project will only be provided for reductions above and beyond SRWMD ERP requirements.
Structural stormwater – retrofit	Design parameters	
Nonstructural – street sweeping	Weight or volume of material collected annually	Applies to roads in planning area.
Nonstructural – public education	Activities include Florida Yards and Neighborhoods (FYN) Program and ordinances, public service announcements (PSAs), informational pamphlets, informational website	
On-site treatment/ wastewater management	Information to be used in ArcNLET model, a publicly available model	Should clearly identify entity implementing project and jurisdiction in which project occurred.
Agricultural BMPs	Acreage enrolled by commodity	Applicable to all commercial growers in BMAP area.
Local ordinances and land development regulations	Ordinance number, name, and brief description	Any local land use regulations or ordinances that support or require nutrient reductions should be provided.
Research and studies	Scope of services or description of study purpose and expected outcome	Research and studies designed to address key unknowns about Suwannee system may be considered.
Other nutrient reduction projects	Determined case by case	Projects not captured in categories above but that achieve nutrient load reductions should be submitted and will be considered on case-by-case basis.

3.3.2 Summary of Required and Proposed Management Strategies

Table 11 sets forth the projects and activities. The projects listed in the table will be completed or implemented by the end of the five-year BMAP iteration. Additional reductions are expected to be necessary in future BMAP updates to meet the loads specified in the TMDLs. The BMAP projects and activities represent a considerable local, regional, and state investment in a multifaceted approach to water quality protection and restoration in the Middle and Lower Suwannee River system. Responsible entities submitted these projects and activities to DEP with the understanding that the projects and activities would be included in the BMAP and completed or ongoing in a timely manner, thus requiring each entity to implement the proposed projects and activities and achieve the assigned load reduction estimates.

However, the list of projects and activities is meant to be flexible enough to allow for changes that may occur over time. Any change in listed projects and activities, or in the deadline to complete these actions, must first be approved by DEP. Substitute projects and activities must result in equivalent or greater nutrient reductions than expected from the original projects and activities.

The table also includes proposed projects. These need additional research for suitability of application in the Suwannee River Basin, and therefore there is no timetable for their implementation. Additional work consisting of pilot studies or limited implementation will be required before widespread application can be considered. These projects or other similar ones will be developed and implemented in a timely manner. The annual reports will detail their progress.

A proposed project of significance is SRWMDs springs pilot program that will invite agricultural operations, landowners, counties and cities, private companies, and other entities within specific geographical areas to submit proposals of non-regulatory cost-effective strategies to reduce water use and improve water quality by reducing and removing nutrient loads. Potential improvement strategies will fall under two categories: agricultural land uses, and advanced water quality improvement technologies. Proposals will be reviewed and ranked based on cost-effectiveness and overall positive impact to the area. The goal of the pilot program is to reduce nutrient impacts on water resources while maintaining a strong, sustainable agricultural industry and private land ownership. The pilot program is meant to work in concert with ongoing efforts to achieve accelerated results in key watersheds.

Table 11. Suwannee River Basin BMAP projects

Project Number	Project Description	Location	Lead Entity	Partners	Project Type	Acres Treated	Structural or Nonstructural	Project Status	TN Reduction (lbs/yr)	Estimated Costs (if available)
AG-1	Rotational Grazing and Anaerobic Digester Pilot Project-Alliance Dairy	Gilchrist and Levy Counties	Alliance Dairy		BMP demonstration project		Structural	Ongoing	Not estimated	
AG-2	Replacement of Corner (of Field) End-Guns with Subsurface Irrigation	Basinwide	SRWMD	Agricultural producers/ FDACS/ DEP	BMP demonstration project		Structural	Planned	6,000	$240,000
AG-3	Tailwater Recovery and Nutrient Recapture	Basinwide	SRWMD	Agricultural producers/ FDACS/ DEP	BMP demonstration project		Nonstructural	Planned	8,799	$2,280,000
AG-4	Agricultural BMPs	Basinwide	Agricultural producers	SRP/ FDACS	BMPs		Nonstructural	Ongoing	Not estimated	
AG-5	County Alliance for Responsible Environmental Stewardship (CARES)	Basinwide	Agricultural producers	TBD	BMPs		Non-structural	Ongoing	Not estimated	
AG-6	Fertigation System Installation and Center Pivot Retrofits	Basinwide	SRWMD	TBD	BMPs – cost-share		Structural	Completed	1,000,000 lbs fertilizer/yr and 1,000 mg/yr ground water	$1,000,000
AG-7	USDA Natural Resources Conservation Service (NRCS) Cost-Share	Basinwide	NRCS	Agricultural producers	BMPs – Cost-share		Nonstructural	Ongoing	Not estimated	
AG-8	Advanced Nutrient Management through Center Pivots	Basinwide	Agricultural producers	TBD	BMPs – cost-share		Structural	Planned	2.3 million lbs/yr of fertilizer not applied to crops	
AG-9	Improved Water Conservation through Center Pivots	Basinwide	Agricultural producers	TBD	BMPs – cost-share		Structural	Planned	Retrofit ~120 center pivot irrigation	$1,190,700

Project Number	Project Description	Location	Lead Entity	Partners	Project Type	Acres Treated	Structural or Nonstructural	Project Status	TN Reduction (lbs/yr)	Estimated Costs (if available)
									systems. 5.26 million gallons per day (mgd) water use reduction is estimated.	
LC-1	Springshed Protection/ Development Ordinance – Levy County	Levy County	Levy County	TBD	Source control		Nonstructural	Planned	Not estimated	
DIX-1	Hydrologic Restoration – Mallory Swamp II	Dixie and Lafayette Counties	Dixie County	Lafayette County	Hydrologic restoration		Structural	Planned	Not estimated (rehydrate ponds and wetlands and improve aquifer recharge)	$1,852,000
FDOT-1	Right-of-Way Fertilizer Elimination	Basinwide	FDOT		Source control		Nonstructural	Ongoing	Not estimated	
FFB-1	Agricultural Producer Workshops	Basinwide	Florida Farm Bureau	SRP	Source control		Nonstructural	Ongoing	Not estimated	
FOR-1	Cooperative Forestry Assistance Program	Basinwide	Florida Forestry Service	TBD	BMPs		Nonstructural	Ongoing	Not estimated	
FS-1	Fanning Springs Water Quality Improvement Project	City of Fanning Springs	City of Fanning Springs	TBD	Individual system phase out to sewer	Areas 1-4	Structural	Under construction	1,300	$1,276,400
FS-2	Fanning Springs Water Quality Improvement Project	City of Fanning Springs	City of Fanning Springs	TBD	Individual system phase out to sewer	Area 10	Structural	Planned /Funded	1,200	$2,120,000
GC-1	Water and Sewer Feasibility Study – Hart Springs Area	Hart Springs	Gilchrist County	TBD	Individual system phase out to sewer		Structural	Planned	Not estimated	
IFAS-1	Suwannee Irrigation and Nutrient BMP Evaluation	Basinwide	University of Florida– Institute of Food and Agricultural	TBD	Research		Nonstructural	Planned	Not applicable	$500,000

Project Number	Project Description	Location	Lead Entity	Partners	Project Type	Acres Treated	Structural or Nonstructural	Project Status	TN Reduction (lbs/yr)	Estimated Costs (if available)
			Sciences (UF–IFAS)							
LOCAL-1	Educational Activities	Basinwide	Lafayette, Suwannee, Gilchrist, Levy, Dixie Counties; Fanning Springs, Chiefland, Mayo, Bell, Trenton, Branford, and Live Oak	TBD	Source control		Nonstructural	Ongoing	Not estimated	
LOCAL-2	Fertilizer Application Ordinance	Basinwide	Lafayette, Suwannee, Gilchrist, Levy, and Dixie Counties	TBD	Source control		Nonstructural	Planned	Not estimated	
POTASH-1	Eagle Lake/ Upper Suwannee River Springs Enhancement Project	Upper Suwannee River, Blue Sink Spring, Mattair Springs, and Suwannee Springs	Potash Corp.	Public/ Private Partnership	BMPs – cost-share		Nonstructural	Planned	Reduce ground water withdrawals by 20 million gallons per day (gpd) and reduce nutrient loading to Upper Suwannee River, Blue Sink Spring, Mattair Springs, and Suwannee Springs.	$3,600,000
SR-1	Otter Springs Restoration	Otter Springs	SRWMD	Gilchrist County	Hydrologic restoration		Nonstructural	Under way	Not estimated (improve water quality	$140,000

Project Number	Project Description	Location	Lead Entity	Partners	Project Type	Acres Treated	Structural or Nonstructural	Project Status	TN Reduction (lbs/yr)	Estimated Costs (if available)
									and spring flows)	
SR-2	Hart Springs Restoration	Hart Springs	SRWMD	Gilchrist County	Hydrologic restoration		Nonstructural	Underway	Not estimated (improve water quality and spring flows)	$76,700
SR-3	Regional Initiative Valuing Environmental Resources (RIVER) Program	Basinwide	SRWMD	TBD	Source control		Nonstructural	Ongoing	Not estimated	$1,500,000

Table 12. Proposed projects

Project Number	Project Name	Implementation Area	Lead Entity/ Partners	Type	Status	Estimated Nitrogen Reduction (lbs/yr)	Estimated Costs (if available)
PLAN-1	Irrigation Well Sampling and Mobile Irrigation Lab (MIL) Program	Basinwide	DEP/SRWMD/FDACS	BMP	Planned		
PLAN-2	Underlayment Collection System at Dairies	Basinwide	DEP/SRWMD/FDACS	Advanced BMP	Planned		
PLAN-3	Groundwater Nitrate Mitigation with Interceptor Wells	Basinwide	DEP/SRWMD/FDACS	Advanced BMP	Planned		
PLAN-4	Slow (Coated) Release Fertilizer Application for Row Crops	Basinwide	DEP/SRWMD/FDACS	Advanced BMP	Planned		
PLAN-5	Nitrification Inhibitor for Dairies	Basinwide	TBD	Advanced BMP	Planned		$150,000
PLAN-6	Municipal Wastewater Denitrifying Bioreactor Evaluation	Basinwide	TBD		Planned		$250,000
PLAN-7	Evaluation of Nitrogen Removal in Rapid Infiltration Basins	Basinwide	TBD	Research	Planned		$200,000

PROJECT NUMBER	PROJECT NAME	IMPLEMENTATION AREA	LEAD ENTITY/ PARTNERS	TYPE	STATUS	ESTIMATED NITROGEN REDUCTION (LBS/YR)	ESTIMATED COSTS (IF AVAILABLE)
	(RIBs) by Modifying Hydraulic Loading						
PLAN-8	Further Evaluation of Denitrifying Wall Approaches	Basinwide	TBD	Research	Planned		$50,000
PLAN-9	Evaluation of Legacy Agriculture Loads	Basinwide	TBD	Research	Planned		$100,000
PLAN-10	Agriculture Irrigation Fertilizer Offset (Pump and Fertilize)	Basinwide	TBD	Advanced BMP	Planned		$115,000
PLAN-11	FDOT Stormwater Pond Retrofit with Denitrification Capacity	Basinwide	TBD	Advanced BMP	Planned		$200,000
PLAN-12	Modified Drainage, Capture and Treatment of High-Traffic Areas on Dairies	Basinwide	TBD	Advanced BMP	Planned		$250,000
PLAN-13	Live Oak – South Walker Avenue Stormwater Management Facility Expansion	Live Oak	TBD		Planned		$158,500
PLAN-14	Live Oak – 9th and Scriven Regional Stormwater Management Facility	Live Oak	TBD		Planned		$600,000
PLAN-15	Live Oak – Northeast Regional Stormwater Management Facility	Live Oak	TBD		Planned		$1,400,000
PLAN-16	Live Oak – Duval and Lisle Stormwater Management Facility Expansion	Live Oak	TBD		Planned		$64,500
PLAN-17	Live Oak – Hillman Regional Stormwater Management Facility	Live Oak	TBD		Planned		$1,564,500
PLAN-18	Fanning Springs – Wastewater Collection System Expansion/ Septic Tank Removal	Fanning Springs	TBD	Septic tank phase out to sewer Areas 5-9	Planned	10,700	$6,500,000
PLAN-19	Fanning Springs – Lancaster/Trenton/ Alliance Wastewater Treatment	Fanning Springs	TBD	Wastewater upgrade/WWTF	Planned	5,300	$10,000,000

PROJECT NUMBER	PROJECT NAME	IMPLEMENTATION AREA	LEAD ENTITY/ PARTNERS	TYPE	STATUS	ESTIMATED NITROGEN REDUCTION (LBS/YR)	ESTIMATED COSTS (IF AVAILABLE)
PLAN-20	Otter and Hart Springs Wastewater Treatment		TBD	Wastewater upgrade	Planned		$5,000,000
PLAN-21	Tile Drainage under Dairy HIA	Basinwide	TBD	Advanced BMP	Planned	5,500	$750,000
PLAN-22	Dairy Drop Nozzles	Basinwide	TBD	Advanced BMP	Planned	8,364	$1,100,000
PLAN-23	Leachate Fraction – Nurseries	Basinwide	TBD	Advanced BMP	Planned		$350,000
PLAN-24	Wet RIBS	Basinwide	TBD	Advanced BMP	Planned		$150,000
PLAN-25	Site Assessments Legacy Loads (319 Areas, Poultry/Dairy)	Basinwide	TBD	Research	Planned		$75,000
PLAN-26	Conservation Tillage Equipment	Basinwide	TBD	Advanced BMP	Planned		$250,000
PLAN-27	Nursery Tailwater	Basinwide	TBD	Advanced BMP	Planned		$600,000
PLAN-28	Sod Based Rotation Incentive/Fencing – Economic Analysis	Basinwide	TBD	Research	Planned		$300,000
PLAN-29	Subsurface Irrigation for Pasture	Basinwide	TBD	Advanced BMP	Planned		$420,000
PLAN-30	Springs Pilot Project	Basinwide	DEP/SRWMD/FDACS	Advanced BMP	Planned		TBD
PLAN-31	WWTF Improvements & Treatment / Recharge Wetlands	City of Trenton	City of Trenton SRWMD DEP USDA-RD	Advanced Wastewater Treatment & Aquifer Recharge	Planned	4,260	$6,200,000
PLAN-XX	Stormwater Drainage & Aquifer Recharge Well Rehabilitation and Pretreatment Retrofits	60 wells in City of Live Oak	Live Oak SRWMD FDEP	Advanced BMP	Planned	4,800 lbs aquifer recharge vol. TBD	$7,200,000

3.4 Agricultural BMP Implementation

Agricultural nonpoint sources in a BMAP area are required by state law (Subsection 403.067[7], Florida Statutes [F.S.]) either to implement the Florida Department of Agriculture and Consumer Services (FDACS)-adopted BMPs or to conduct water quality monitoring prescribed by DEP or the SRWMD, to demonstrate compliance with water quality standards. Failure either to implement BMPs or conduct monitoring may bring enforcement action by DEP or the SRWMD.

Pursuant to Paragraph 403.067(7)(c), F.S., the implementation of FDACS-adopted, DEP-verified BMPs in accordance with FDACS rules provides a presumption of compliance with state water quality standards. Growers who implement BMPs may be eligible for cost share from FDACS, the SRWMD, or others to defray partially the costs of implementation. Through the Office of Agricultural Water Policy (OAWP), the Florida Forest Service (FFS), and the Division of Aquaculture, FDACS develops, adopts, and assists producers in implementing agricultural BMPs to improve water quality and water conservation.

The breakdown of agricultural land uses in the Suwannee BMAP area, according to 2010 SRWMD land use data, is shown in **Table 13**. **Figure 12** shows the approximate location of these agricultural lands based on 2010 SRWMD land use. The primary agricultural land use in the Suwannee River Basin is improved pasture.

Table 13: Agricultural land uses in the Suwannee River Basin (2010 SRWMD land use)

Land Use Code	Code Description	Total Acres
2110	Improved Pastures	103,334.9
2120	Unimproved Pastures	2,398.1
2130	Woodland Pastures	6,814.8
2140	Row Crops	2,708.7
2150	Field Crops	29,008.5
2153	Hayfields	102,755.0
2230	Other Groves	1,824.9
2310	Cattle Feeding Operations	1,126.6
2320	Poultry Feeding Operations	1,406.4
2400	Nurseries and Vineyards	137.3
2410	Tree Nurseries	2,911.2
2420	Sod Farms	676.7
2430	Ornamentals	532.3
2500	Specialty Farms	77.9
2510	Horse Farms	2,988.5
2520	Dairies	1,117.8
2540	Aquaculture	19.4
2600	Other Open Lands (Rural)	336.7
2610	Fallow Crop Land	5,854.9
3300	Mixed Rangeland	21,824.1
	Total	**287,854.7**

Land use data are helpful as a starting point for estimating agricultural acreage and developing BMP implementation strategies; however, there are inherent limitations. The time of year during which land use data are collected (through aerial photography) affects the accuracy of photo interpretation and can result in inappropriate analysis of the data and hamper decision making. Another limitation is that the specific agricultural activity being conducted is not always apparent. For example, acreage under the improved pasture classification may be used for cattle grazing, consist of forage grass that is periodically harvested and sold for hay, or comprise a fallow vegetable field awaiting planting. Operations that fall into this land use category fertilize at different rates (*e.g.,* hay operations and some other commodities typically fertilize at or below rates recommended by UF–IFAS; therefore, it is meaningful for the purposes of evaluating potential nutrient impacts to identify specific land uses on a property, rather than assuming that operations and present conditions are uniform across a specific land use). Because of error in the collection and characterization of land use data and changes in land use over time, land use acreage estimates are subject to adjustment, as discussed later in this section.

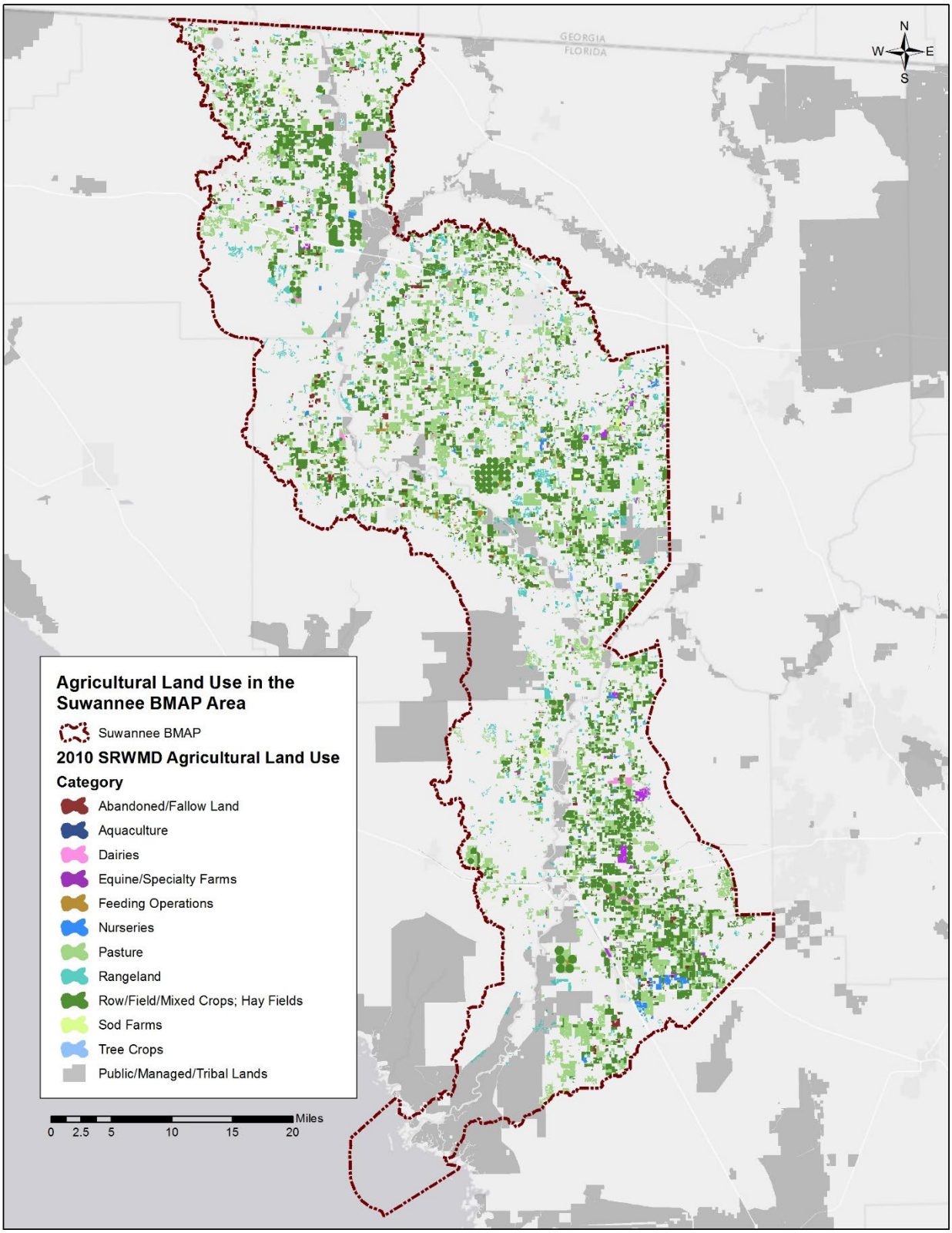


Figure 12. Agricultural lands in the Suwannee River Basin

Table 13 shows more enrollment in the vegetable and agronomic crop BMP manual than the total acreage of row/field/mixed crops, according to 2010 SRWMD land use. This discrepancy can be attributed to changes in land use since the creation of the 2010 SRWMD land use data layers. This land use is likely not representative of agricultural land use in the Suwannee River BMAP area, as agricultural land uses in this basin have changed significantly in the last several years.

3.4.1 Agricultural BMPs

BMPs are individual or combined practices determined through research, field testing, and expert review to be the most effective and practicable means for improving water quality, taking into account economic and technological considerations. FDACS has authority for establishing agricultural BMPs through the FFS (Silviculture BMP Program), Division of Aquaculture (Aquaculture Certification Program), and OAWP (all other agricultural BMP programs). As of March 2016, the OAWP has adopted manuals for cow/calf, statewide citrus, vegetable and agronomic crops, nurseries, equine operations, specialty fruit and nut, sod, and dairy operations. Manual development is under way for poultry operations, and adoption is expected in late 2016.

The OAWP BMPs fall into two categories—structural and management. Structural BMPs—*e.g.,* water-control structures, fencing, and tailwater recovery systems—involve the installation of structures or changes to the land and are usually more costly than management BMPs. Management BMPs, such as nutrient and irrigation management, comprise the majority of practices and often are not readily observable.

Nutrient management addresses fertilizer type, amount, placement, and application timing, and it includes practices such as soil and tissue testing, application methods, correct fertilizer formulations, and setbacks from water resources. Irrigation management consists of maintenance, scheduling, and other measures that improve the overall efficiency rating of irrigation systems. In most areas of the state, FDACS-funded MILs are available to evaluate irrigation system efficiency and provide recommendations to producers to improve efficiency. The implementation of these recommendations results in billions of gallons of water saved throughout the state and helps reduce nutrient runoff and leaching. In the SRWMD area from July 2009 through December 2015, the MIL program calculated that 3.017 million gallons per day (mgd) were saved from 218 irrigation systems evaluated. This figure equates to an average of 14,000 gallons per day per irrigation system.

Table 14 identifies key management and structural BMPs that would be applicable to agricultural operations in the basin. By definition, BMPs are developed to be technically and economically feasible. However, FDACS BMP manuals do contain some BMPs that may be affordable only with financial assistance through cost-share programs. The BMP checklists allow producers to indicate whether implementing a BMP requires financial assistance. Through cost-share programs, FDACS works with producers to implement applicable key BMPs that otherwise are not affordable.

For assistance with enrolling in the OAWP BMP Program or with obtaining cost-share funds, interested producers should contact OAWP staff. Information on BMP manuals and field staff contact information can be obtained online. Printed BMP manuals can be obtained from local extension offices at county agricultural extension centers, USDA NRCS offices, or by contacting OAWP field staff.

Table 14. Key management and structural BMPs adopted by FDACS OAWP

BMP Category	BMP	Description
Nutrient Need Determination	Soil and Tissue Testing	Used to base fertilizer applications on plant needs and available nutrients in the soil; helps prevent overapplication of fertilizer.
Nutrient Need Determination	Nutrient Budgeting	Adjustment of fertilizer regime to account for other nutrient sources, such as biosolids, legumes, manure, and nutrient-laden irrigation water; helps prevent overapplication of fertilizer.
Nutrient Application Management	Precision Application of Nutrients	Use of specialized equipment for precise placement of nutrients on targeted areas at specified rates; reduces total amount used and prevents stray applications.
Nutrient Application Management	Equipment Calibration/Maintenance	Ensures proper functioning of equipment; prevents misapplication or overapplication of fertilizer materials.
Nutrient Application Management	Split Fertilizer Applications	Multiple applications timed with optimal growth stages; allows plants to assimilate nutrients more efficiently; reduces nutrient loss in leaching and runoff.
Nutrient Application Management	Controlled-Release Fertilizer	Use of fertilizer formulations that have a controlled nutrient-release curve; reduces nutrient loss to leaching and runoff.
Nutrient Application Management	Fertilizer Application Setbacks from Waterbodies (*e.g.,* wetlands, watercourses, sinks, springs, *etc*.)	Establishes zone where no fertilizer will be applied; reduces nutrient loadings to waterbodies.
Irrigation Management	Irrigation Scheduling	Planning when to irrigate to reduce water and nutrient losses, based on available soil moisture content, evapotranspiration levels, recent rainfall, and time of day.
Irrigation Management	Soil Moisture and Water Table Monitoring	Use of devices that measure water table level and amount of water in soil; is a key component of proper irrigation scheduling.
Irrigation Management	Tailwater Recovery	Use of downgradient catchment ponds to trap irrigation tailwater to be reused on cropland; reduces off-site transport of nutrients and conserves water.

BMP Category	BMP	Description
Treatment and Erosion Control	Filter Strips	Vegetated strips of land designed to reduce nutrients and sediments in surface water runoff from fields, pastures, and livestock high-intensity areas before it reaches downstream waterbodies.
Treatment and Erosion Control	Vegetative Buffers	Establishment of riparian and/or wetland buffers to attenuate and assimilate nutrient- or sediment-laden surface flows coming from cropped/grazed areas.
Treatment and Erosion Control	Ditch Maintenance and Retrofits	Use of rip rap, sediment traps, staging structures, and permanent vegetative bank cover to minimize erosion and transport of nutrient-laden sediments.
Livestock Management (Applicable to Cow/Calf and Equine Operations)	Manure Management	Appropriate storage and disposal of animal waste.
Livestock Management (Applicable to Cow/Calf and Equine Operations)	Alternative Water Sources	Use of upland livestock watering ponds and/or water troughs; minimizes manure deposition in waterbodies.
Livestock Management (Applicable to Cow/Calf and Equine Operations)	Rotational Grazing	Movement of cattle to different grazing areas on planned basis; prevents concentrated waste accumulations and denuding of pasture areas. May involve fencing.
Livestock Management (Applicable to Cow/Calf and Equine Operations)	High-Intensity Areas Location	Siting of cowpens, supplemental feed areas, *etc.,* away from waterbodies to minimize nutrient loading.
Operations Management	Fertilizer Storage	Proper location/**s**torage of bulk fertilizer products to prevent nutrient loadings.
Operations Management	Fertilizer Mix/Load	Use of appropriate dedicated or temporary mix/load areas located away from waterbodies to prevent nutrient loading.
Operations Management	Employee Training	Training provided to farmworkers on how to implement BMPs.
Operations Management	Record Keeping	Proper record keeping provides accountability in implementation of BMPs, and assists producer in making nutrient and irrigation management decisions.

3.4.2 BMP Enrollment

Table 15 summarizes the land use data figures for agriculture in the BMAP area, the acreages associated with commodity types addressed by OAWP BMP manuals, and the acres enrolled in BMP programs. **Figure 13** shows the acres enrolled in BMPs as of December 31, 2015.

Not all of the acreage listed as agriculture in **Table 15** is included in enrollment figures, because the NOIs document only the estimated total number of acres where applicable BMPs are implemented, not the entire land use acreage mapped as agriculture. Land use data can contain nonproduction acres (such as buildings, parking lots, and fallow acres) that will not be counted on the NOIs submitted to the OAWP. There also may be acreage that is not appropriate for enrollment in OAWP BMPs, such as lands not in commercial production (defined as operations conducted as a business).

As of December 31, 2015, there are 566 NOIs that cover 187,160.5 acres, equating to 65% enrollment in the Suwannee River Basin. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time.

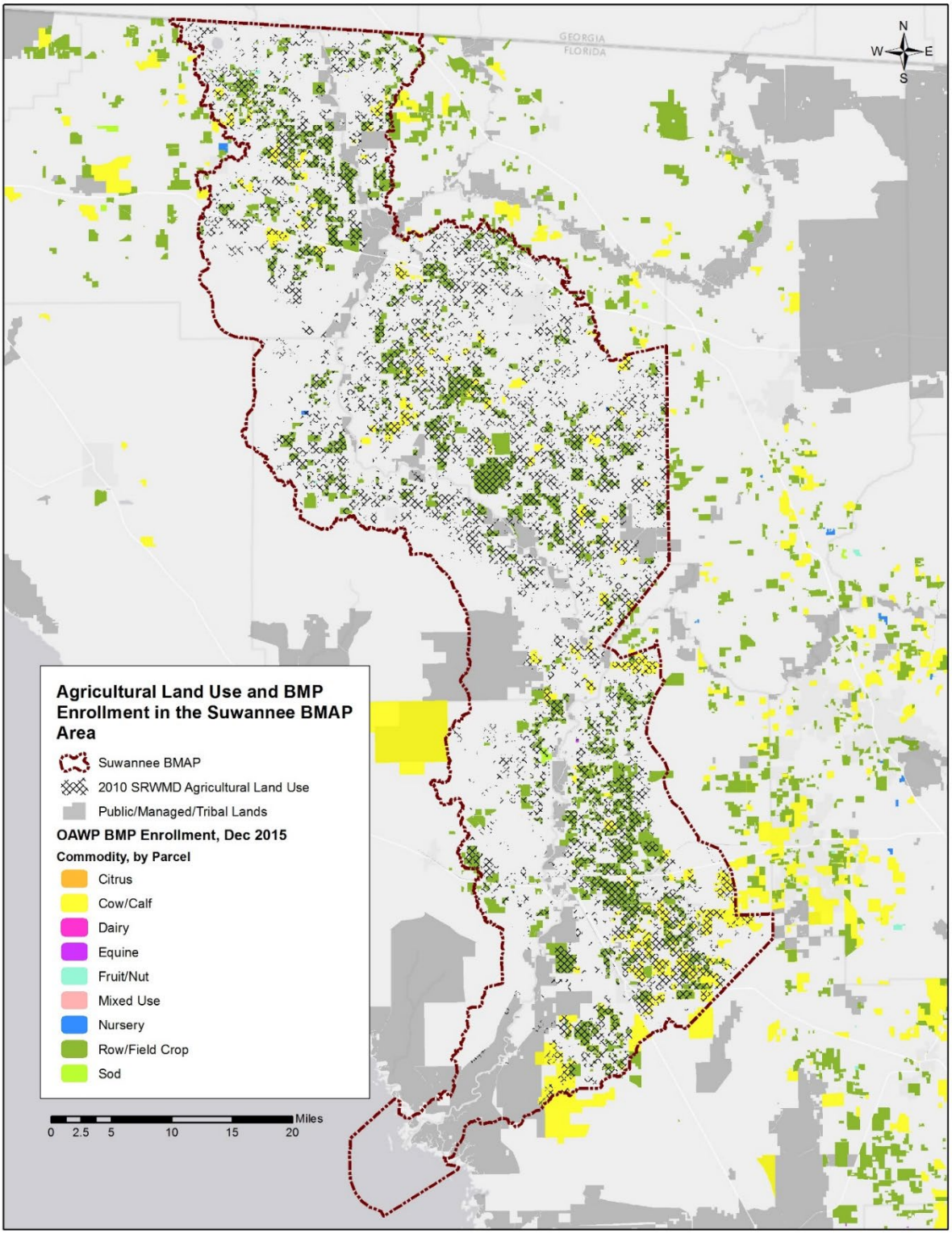


Figure 13. BMP enrollment in the Suwannee River Basin as of December 31, 2015

Table 15. Agricultural acreage and BMP enrollment for the Suwannee River BMAP area as of December 31, 2015

N/A = Not applicable.
[1] Enrollment numbers will depend on the ability of field staff to identify and locate producers and whether producers choose to implement BMPs or monitor their water quality. Also, specific agricultural land uses and number of agricultural operations may change from year to year. Progress on enrollment, based on best available information, will be included in the BMAP annual update.
[2] Acreage in the hayfields category is likely an overestimate, as the aerial imagery is collected in the winter when producers are growing winter forage. FDACS staff will review the most recent aerial imagery to determine if any of the acreage identified as hayfields should actually be in the row/field/mixed crop category.

2010 SRWMD Land Use	2010 Acres	Related FDACS BMP Programs	Acreage Enrolled[1]	Related NOIs
Pasture and Mixed Rangeland	134,371.9	Cow/Calf	48,209.2	129
Row/Field/Mixed Crops	31,717.2	Vegetable/Agronomic Crops	138,493.9	428
Hay Fields[2]	102,755.0	Vegetable/Agronomic Crops	N/A	N/A
Fallow Cropland	5,854.9	No Enrollment Needed	N/A	N/A
Other Groves	1,824.9	Specialty Fruit and Nut	100.6	4
Nurseries	3,580.8	Statewide Nurseries	129.7	3
Sod Farms	676.7	Sod	187.0	1
Cattle Feeding Operations	1,126.6	Conservation Plan Rule	0.0	N/A
Poultry Feeding Operations	1,406.4	Conservation Plan Rule/Future Poultry Manual	0.0	N/A
Specialty Farms	77.9	Conservation Plan Rule	0.0	N/A
Horse Farms	2,988.5	Equine	40.0	1
Dairies	1,117.8	Dairy	0.0	N/A
Other Open Lands – Rural	336.7	No Enrollment Needed	N/A	N/A
Aquaculture	19.4	*Division of Aquaculture*		
Total	**287,854.7**	**N/A**	**187,160.5**	**566**

3.4.3 Agricultural BMP Load Reduction Estimates

Due to inaccuracies in the 2010 land use data and to changes in land use since 2010, agricultural loadings may be less than perceived. However, there are no detailed allocations in this BMAP, and so the total estimated load or required reductions for agriculture are not defined. Consequently, an estimated average load reduction percentage was derived for agriculture in this basin, based on an averaged range of expected reductions for agricultural BMPs in Florida. Percentages represent the relative amount of nitrogen reduction expected for "typical" agricultural BMP implementation, which includes nutrient management, stormwater retention, limited wetland retention/restoration, and rotational livestock grazing practices, as applicable to the commodity and operation. A BMP average efficiency of 30% is applied to the entire Suwannee River BMAP area. Agricultural BMP implementation in the Suwannee River BMAP area is anticipated to reduce agricultural loadings of nitrogen on the applicable agricultural operations.

If DEP plans to develop an estimate of agricultural loadings in the future, the development of a basin- and commodity-specific agricultural loading/reduction model may be considered.

3.4.4 FDACS OAWP Role in BMP Implementation and Follow-Up

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

When 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 the 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 the SRWMD and other partners in the process.

3.4.5 OAWP Implementation Assurance (IA) Program

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

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

Site visits, the second component, are conducted by OAWP field staff and technicians as workload allows. For the visits, field staff and technicians use a standard form (not BMP manual specific) developed in 2014. This site-visit form focuses on nutrient management, irrigation management, and water resource protection BMPs common to all of the adopted BMP manuals. The paper forms are submitted to OAWP staff and compiled into a spreadsheet, and the data are reported annually. From 2007 to 2015, the OAWP conducted 1,936 site visits.

However, it is difficult to compare data collected prior to the implementation of the single form developed in 2014 because of regional differences (*e.g.,* different forms and information asked) in the administration of the IA Program. According to the OAWP database, the agency has conducted 96 site visits since 2013 in the Suwannee River BMAP Basin. In 2013, the OAWP began tracking the BMAP basins where IA site visits were conducted, and thus this number does not include site visits conducted in the BMAP area prior to 2013.

In late 2014, the OAWP commenced efforts to revise and restructure its current IA Program, and these efforts are ongoing as a result of 2016 legislation (2016–1, Laws of Florida).

3.4.6 Beyond BMPs

The FWRA requires that, where water quality problems are demonstrated despite the appropriate implementation, operation, and maintenance of adopted agricultural BMPs, FDACS must re-evaluate 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 water management district monitoring activities.

If agricultural acreage corrections and BMP implementation do not fully account for reductions in estimated agricultural loadings, it may be necessary to implement cost-assisted field- and/or regional-level treatment options that remove nutrients from farm discharges. However, this treatment approach can be a technical challenge due to the karst geology and complex ground water network in the Suwannee Basin. As needed, FDACS and DEP will work with local, regional, state, and federal partners to explore opportunities and funding sources to develop and implement effective treatment or other nutrient load reduction projects.

3.4.7 Ongoing and Future Actions in the Suwannee Basin

3.4.7.1 Ongoing Activities

SRP staff are working closely with farmers in the Lower and Middle Suwannee River Basin and other areas in the SRWMD to enroll in and implement BMPs. These activities, which will be ongoing, are as follows:

- Enroll commercial agricultural acres in the appropriate FDACS BMP programs.
- Provide technical assistance to producers in understanding and implementing BMPs.
- Deliver BMP cost-share funds, as available. The cost-share funds that have been provided for BMPs and BMP crop tools through the SRP and its supporting members in the Lower and Middle Suwannee River Basin exceed $25 million, with the majority contributed by the NRCS. FDACS and the SRWMD continue to work together with the NRCS to provide funding, as available. FDACS and SRP staff are looking to other sources, such as federal grants, to supplement reduced revenues.

- As funding is available, continue to conduct on-farm demonstrations of key BMPs and communicate the benefit of BMP implementation to other area farmers.

- Work with UF–IFAS and others to conduct workshops and field days to discuss and demonstrate BMPs.

- Continue to recognize farms that implement BMPs through the CARES Program. More than 400 farms have been recognized in the Suwannee Basin.

- Continue BMP follow-up site visits (implementation assurance) to poultry, dairy, cow/calf, and vegetable/row crop farms.

3.4.7.2 Future Activities

Relatively recent and planned future activities include the following:

- SRP staff will work with dairy and poultry producers in the basin to review their existing USDA NRCS conservation plans for consistency with the recently adopted Conservation Plan Rule, assist with any needed revisions to the plan, and assist producers in submitting NOIs. FDACS currently has adopted a dairy BMP manual, which will be an alternative to the Conservation Plan Rule and is developing a poultry BMP manual.

- As funding is available, FDACS will work with the SRWMD, DEP, UF–IFAS, and others to conduct research and demonstration projects and, as feasible, phase in any new BMPs, technologies, or BMP enhancements that may be developed.

- Through voluntary programs, SRP staff will work with growers to learn about new production schemes that may have added environmental benefits and are economically viable.

- FDACS will assist DEP in determining whether/where to conduct BMP effectiveness studies (trends and/or full-scale verification).

- As needed, explore the feasibility of agency-funded projects for achieving nutrient reductions beyond those provided by BMPs.

In addition, FDACS and SRP staff will assist DEP in evaluating the need for outreach/education for property owners conducting noncommercial agriculture-related activities and, as resources allow, assist DEP, UF–IFAS Extension, NRCS, and local governments in providing outreach/education.

3.4.8 SRP

The Suwannee River/Santa Fe River TMDL document (Hallas and Magley 2008) states: "A unique advantage in these basins is the existence of the Suwannee River Partnership, a proven organization that has proactively addressed water quality issues over the past ten years with advances in pollution reduction, scientific understanding, and community awareness. The Department [DEP] maintains that this Partnership is on the right path and should continue moving in that direction after the establishment of this TMDL. The Partnership will play a significant role (in) the Basin Management Action Plan process."

The SRP is a group of federal, state, and local agencies; state associations; private businesses; and other organizations that have come together to improve water quality and conserve water in the Suwannee and surrounding watersheds in the SRWMD. The mission of the SRP is "to provide research-based solutions that protect and conserve the water resources within the SRWMD by emphasizing the implementation of voluntary or incentive-based programs."

FDACS and SRWMD fund five technicians districtwide. Two technicians work primarily in the Suwannee River Basin, and a third technician provides service in the Lower Suwannee and Lower Santa Fe Basins. The fifth technician was hired to focus efforts in the Santa Fe BMAP area, with emphasis on the Santa Fe Restoration Focus Area (RFA). Priority activities for the SRP include the following:

- One-on-one assistance to farmers to enroll in and implement FDACS BMPs.
- Educational workshops, field days, informational materials, and other means of promoting the understanding and implementation of BMPs.
- BMP implementation assurance through site visits and mailed surveys to gauge grower participation and evaluate program strengths and weaknesses.
- Cost-share funds to agricultural producers to help purchase crop tools they can use to manage fertilizer and irrigation. Crop tools include soil moisture probes, automated weather station systems, global positioning system (GPS) guidance units, and

fertilizer application equipment. SRP staff work with farmers to evaluate how well these tools are being used, identify areas that need improvement, and identify new technology that may be used.

— Progressive Farms was a demonstration project involving 22 farms districtwide. UF–IFAS staff worked with these producers to install new techniques and technologies and evaluate their success, and to share their experiences with other farmers in the region, thus expanding the use of BMPs and BMP tools.

The SRP has succeeded in obtaining a high level of participation by the agricultural industry. Approximately 82% of row/field crop and hay farms, 90% of dairies, and 99% of poultry farms districtwide are implementing practices that help protect and save water. FDACS adopted a dairy BMP manual in late 2015 and is currently developing a poultry BMP manual. However, FDACS adopted a Conservation Plan Rule in 2010 that allowed these and other specified operations to enroll formally in FDACS BMP Program if they have or develop conservation plans that meet the rule criteria. SRP staff recently worked, with NRCS to update comprehensive nutrient management plans, a component of a producer's conservation plan, to reflect changes in potential nutrient loads from poultry operations. These producers will submit NOIs to implement BMPs under the FDACS Conservation Plan Rule, and efforts through the SRP will be made to obtain funds to enroll both poultry and dairy operations in the poultry and dairy BMP Programs.

3.4.9 Actions To Address Future Growth and BMP Implementation

The FWRA (Subparagraph 403.067[7][a][2], F.S.) requires that BMAPs "identify the mechanisms by which potential future increases in pollutant loading will be addressed." Population growth and land use changes in the basin are showing that the proposed management actions will need to be periodically revised and updated to reflect the continuing changes in the agricultural and nonagricultural landscape.

Aerial surveys were conducted for the SRWMD and DEP in 2004 and 2008. Future growth in the basin was estimated by comparing previous changes in land use on these aerial surveys—specifically, the conversion of agricultural land to urban uses. Between 1998 and 2008 the amount of urban and built-up land use increased from 9,639 acres to 65,507 acres, with the largest change occurring in the lower portion of the basin, while agricultural land use (nonsilviculture) decreased from 329,385 acres to 259,374 acres.

The increased urban use of land in the Lower and Middle Suwannee River Basin will increase demands on the basin's ground water resources. To address these demands, the SRWMD completed a water supply assessment in 2010 for the entire district. It adopted a Minimum Flow and Level (MFL) for the Lower Suwannee River, and estimates that the Middle Suwannee River MFL will be completed in 2016 and that the Withlacoochee MFL will be completed in 2017.

Protection regulations for springshed or karst-sensitive areas are one way in which county governments may direct future growth. In the Lower and Middle Suwannee River Basin, Levy County has in place a springshed protection ordinance and corresponding Comprehensive Plan requirements.

All the counties in the BMAP area are interested in maintaining the rural character of the area and are developing density guidelines for unincorporated areas that will be included in their Comprehensive Plans.

Continuing the reductions in nutrient loads to the Lower and Middle Suwannee River Basin is an important part of addressing future growth while achieving the TMDL. Projects will need to be developed and implemented on a continuing basis to achieve this goal. Future projects should be evaluated and detailed in the report update process. Examples of projects include the following:

- Green industry practices.
- The development of a countywide electronic septic tank permit database with the goal of tracking septic tank maintenance and failures.
- Springshed protection and development guidelines for vulnerable areas.

The impacts of future agricultural and silvicultural growth in the Lower and Middle Suwannee River Basin will be addressed by implementing applicable BMPs and documenting the nutrient reductions achieved, as well as by developing and implementing additional projects. The following sections describe some of the ongoing activities that address future growth. Additionally, examples of the types of projects that would support nutrient reductions include the following:

- The identification of "small farms" and other farms not currently covered by an FDACS BMP Program.
- The development of a BMP educational plan for these small farm producers.

- The implementation and verification of applicable BMPs on the identified small farm acreage.

- The identification of BMPs that are key to achieving nutrient reductions. Some of these BMPs may require cost-share funding to be implemented.

- The exploration of agricultural practices such as sod-based rotation farming and rotational grazing for dairies.

- Projects to demonstrate how well current FDACS-adopted BMPs work and to make recommendations for BMP revisions where necessary.

- Forestry projects to explore previously under researched areas of BMPs and to recommend BMP revisions where necessary.

- The development and implementation of fertilizer ordinances for nonagricultural stakeholders.

CHAPTER 4: ASSESSING PROGRESS AND MAKING CHANGES

Successful BMAP implementation requires commitment and follow-up. Stakeholders have committed and are required to implement the assigned projects and activities within the first five years of this BMAP. For impaired OFS, the Florida Springs and Aquifer Protection Act requires DEP to adopt implementation plans designed to achieve the TMDL no more than 20 years after the adoption of a BMAP, with 5-, 10-, and 15-year targets. This chapter contains the water quality monitoring component sufficient to assist with these evaluations.

4.1 Tracking Implementation

DEP will work with stakeholders to collect and organize monitoring data and track project implementation. This information will be presented in annual tracking reports. Stakeholders have agreed to meet periodically after the adoption of the BMAP to follow up on plan implementation, share new information, and continue to coordinate on TMDL-related issues. The following types of activities may occur at these meetings:

IMPLEMENTATION DATA AND REPORTING

- Collect project implementation information from stakeholders, review BMP/NOI documentation, and compare all the information 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 4.2**.
- Prioritize areas for advanced BMP implementation efforts.
- Evaluate ongoing focused BMP implementation efforts and adapt the process as needed.

SHARING NEW INFORMATION

- Report on results from water quality monitoring and trend information.
- Provide updates on new projects and programs in the basin that will help reduce nutrient loading.

— Identify and review new scientific developments for addressing nutrient loads and incorporate any new information into annual Progress Reports.

COORDINATING TMDL-RELATED ISSUES

— Provide updates from DEP on the basin cycle and activities related to any impairments, TMDLs, and BMAP.

— Obtain reports from other basins where tools or other information may be applicable to the Lower and Middle Suwannee River TMDLs.

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

4.2 Water Quality Monitoring

4.2.1 Water Quality Monitoring Objectives

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

The primary and secondary objectives of the initial monitoring strategy for the Lower and Middle Suwannee River BMAP area are as follows:

PRIMARY OBJECTIVES

— Determine the levels of existing water quality parameters.

— Document nutrient trends in the Lower and Middle Suwannee River and associated springs.

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

SECONDARY OBJECTIVES

- Identify areas where ground water data might help in understanding the hydrodynamics of the system.
- Develop an advanced BMP implementation plan for future implementation.
- Determine and implement more effective nutrient reduction strategies.
- Determine the effectiveness of nitrogen isotope and tracer sampling for identifying organic or inorganic sources.

4.2.2 Water Quality Indicators and Resource Responses

To achieve the objectives listed above, the monitoring strategy focuses on two types of indicators to track water quality trends: core and supplemental (**Table 16** and **Table 17**, 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.

At a minimum, the core parameters will be tracked to determine the progress that has been made towards meeting the TMDL. In addition, resource responses to BMAP implementation may also be tracked. A significant amount of time may be needed for changes in water chemistry to be observed. However, resource responses represent improvements in the overall ecological health of the Lower and Middle Suwannee River (see **Table 18**).

Table 16. Core water quality indicators and field parameters

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

Table 17. Supplemental water quality indicators and field parameters

Supplemental Parameters	Anticipated Trend
Specific conductance	Monitored to support interpretation of core indicators
DO	Monitored to support interpretation of core indicators
pH	Monitored to support interpretation of core indicators
Temperature	Monitored to support interpretation of core indicators
Total suspended solids	Monitored to support interpretation of core indicators

Table 18. Anticipated resource responses from BMAP implementation

Resource Responses Suwannee
Increase in Stream Condition Index score
Increase in Linear Vegetation Survey score
Increase in Rapid Periphyton Survey score
Increase in key fish populations

4.2.3 Monitoring Network

Initially, data from the ongoing sampling effort in the Lower and Middle Suwannee River and associated springs being conducted by DEP and the SRWMD will be used to meet the primary objectives. These data will be entered into the STORET (or WIN) database. **Figure 14** shows the river and spring stations currently being sampled that will be used for the BMAP monitoring in the Suwannee and Withlacoochee Basins, respectively.

The secondary (research) objectives will be developed based on the results of the actions occurring in the Santa Fe Basin RFA. 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. Updates for this report and other springs sampling reports may be obtained at http://www.dep.state.fl.us/water/watersheds/bmap.htm.

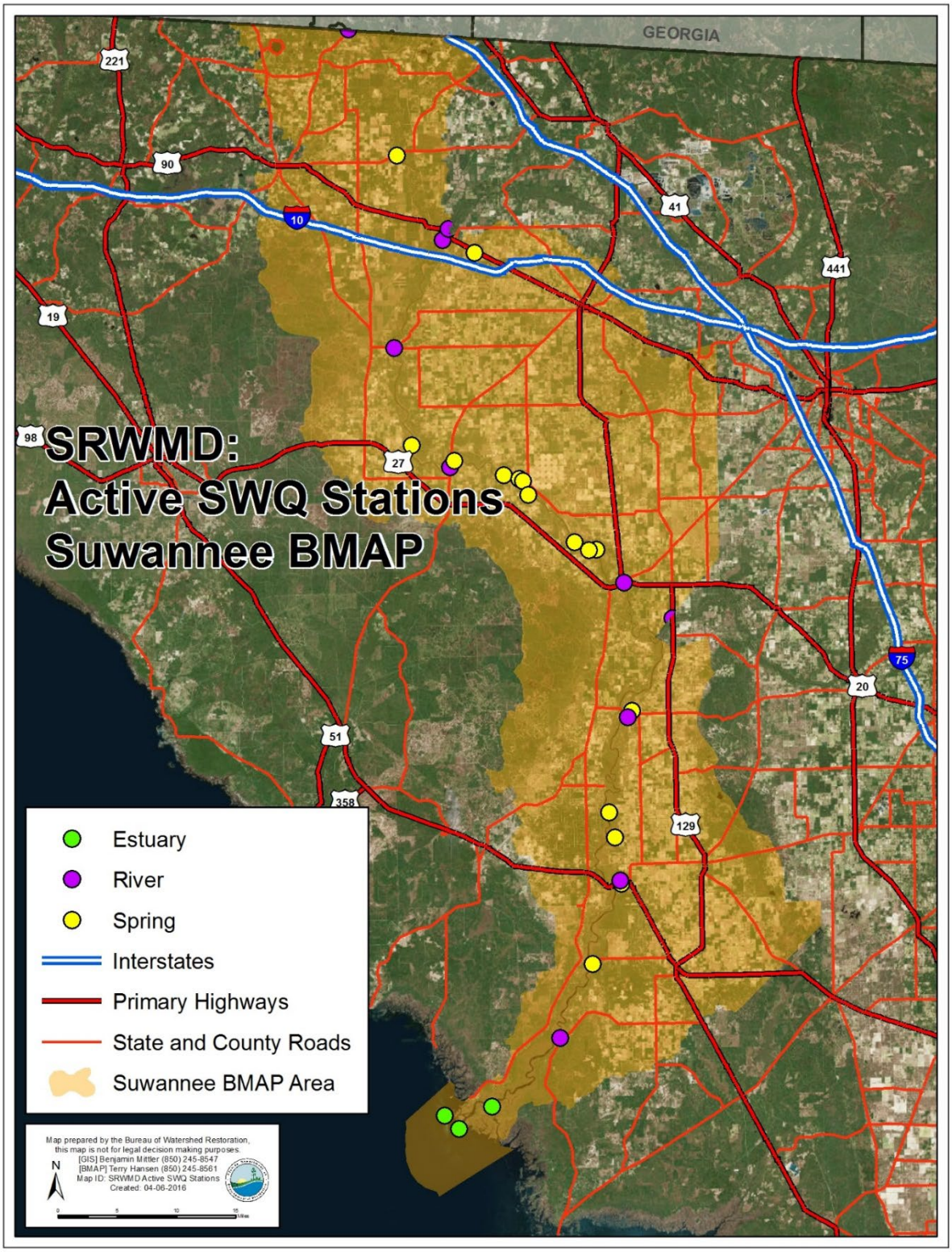


Figure 14. Stations currently sampled in the Lower and Middle Suwannee River

4.2.4 Assessing Progress in Agricultural Areas

The ongoing RFA in the Gilchrist Blue/Ginnie Springs area of the Santa Fe Basin will serve as a "lessons learned" process for measuring progress with agricultural sources in the Suwannee Basin.

The general steps for assessing progress while reducing nutrient inputs are as follows:

- **Step 1** – Identify all potential sources and estimated inputs of nitrate to create a baseline against which to measure change.

- **Step 2** – Identify strategic locations for ground water sampling and conduct ground water monitoring. This will provide information on nitrogen concentrations and sources and a water quality baseline against which changes due to management actions could be measured. An important consideration will be how to segregate agricultural impacts from other sources.

- **Step 3** – Implement management actions. For agriculture, this will include obtaining a specified degree of landowner participation in the BMP Program (*e.g.,* X% or X number of acres enrolled) and determining that the most current set of applicable BMPs is being implemented. For urban stakeholders, this will involve determining compliance with applicable ordinances and ensuring that listed projects are completed and operational.

- **Step 4** – Periodically monitor the wells and springs identified in Step 2 to collect information on changes in nitrogen concentrations and evaluate how well management actions are working.

- **Step 5** – If needed, explore opportunities to further reduce nitrogen losses without economic impacts to stakeholders. This may include measures that are economically feasible without cost-share, measures that require cost-share, and/or publicly funded water quality improvement projects.

4.2.5 Quality Assurance/Quality Control (QA/QC)

Stakeholders participating in the monitoring plan must collect water quality data in a manner consistent with DEP's standard operating procedures (SOPs) for QA/QC. The most current version of these procedures is available online (http://www.dep.state.fl.us/water/sas/sop/sops.htm). For BMAP-related

data analyses, entities should use National Environmental Laboratory Accreditation Conference (NELAC) and National Environmental Laboratory Accreditation Program (NELAP)–certified laboratories or other labs that meet the certification and other requirements outlined in the SOPs.

4.2.6 Data Management and Assessment

Data collected as part of this monitoring plan will need to be tracked, compiled, and analyzed to be useful in support of the BMAP. The Florida STORET database will serve as the primary resource for storing ambient data and providing access for all stakeholders, in accordance with Rule 62-40.540, F.A.C. The data being collected to meet the primary objectives are currently being uploaded to STORET, after the appropriate QA/QC checks have been completed. All applicable data collected by the entities responsible for monitoring will be uploaded to STORET regularly, but at least quarterly. DEP will be responsible for data storage and retrieval from STORET.

STORET uploads are only appropriate for data that represent ambient conditions. Other data will be maintained by the entity collecting the samples. Stakeholders agree to provide these data to other BMAP partners upon request and when appropriate for inclusion in BMAP data analyses and adaptive management evaluations.

Ground water data collected for the secondary objectives will not be uploaded to STORET.

4.3 Adaptive Management Measures

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

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

Key components of adaptive management to share information and expertise are tracking plan implementation; monitoring water quality and pollutant loads, waterbody nitrogen concentrations, and key biological responses such as algal abundance; and holding periodic meetings.

BMAP execution will be a long-term process. Some projects will extend beyond the first five years of the BMAP cycle. DEP and stakeholders will track implementation efforts and monitor water quality to measure effectiveness and ensure BMAP compliance. Stakeholders and DEP will meet periodically to discuss implementation issues, consider new information, and, if the watershed is not projected to meet the TMDL, determine additional corrective actions. Project implementation as well as program and activity status will be collected annually from the participating entities. Stakeholders will review these reports to assess progress towards meeting the BMAP goals.

CHAPTER 5: PROGRAMS SUPPORTING WATER QUALITY INITIATIVES IN THE SUWANNEE RIVER BASIN

5.1 Agriculture Efforts

Subsection 403.067(7), F.S., lays out the mechanisms for BMAP implementation. While the BMAP is linked by statute to permitting and other enforcement processes that target individual entities, successful implementation mandates that local stakeholders willingly and consistently work together to attain adopted TMDLs. This collaboration fosters the sharing of ideas, information, and resources. The stakeholders have demonstrated their willingness to confer with and support each other in their efforts. For example, the effectiveness of the FDACs and SRP BMP Program is shown by agricultural producers' willingness to sign up for the program and implement the appropriate BMPs (**Section 5.1** below summarizes specific examples of successful BMP implementation). Another example of effective collaboration is the development of springshed protection ordinances by county governments based on aquifer vulnerability studies.

5.1.1 EXAMPLES OF PROGRAMS

Multiple projects with the goal of reducing nutrient impacts to the basin are currently under way. The projects listed in this section are examples of these efforts from the SRP and the SRWMD.

5.1.1.1 Silviculture BMPs

Florida's first *Silviculture BMP manual* was published in 1979. Silviculture is a process, following accepted forest management principles, in which the trees constituting forests are tended, harvested, and reproduced (FDACS 2008).

Since then it has undergone several revisions as better science and new technologies have been developed. The most significant revision came in 1993 via the current Technical Advisory Committee (TAC). The TAC is composed of 22 members, appointed by the Commissioner of Agriculture, to represent diverse forestry interests, including forest industry, university, forestry consultants, non-industrial forest landowners, state and federal government, and conservation and environmental groups. The TAC continues to meet biennially, to provide input and guidance to the forestry BMP Program. The current Florida *Silviculture BMP Manual* was revised in 2008 by the TAC and is intended for use on all silviculture operations regardless of whether or not the operation is subject to other regulatory standards or permits. They are not intended for use during tree removal or land clearing operations associated with development or other activities that have non-forestry objectives.

Florida silviculture BMPs have been shown to be effective in protecting water quality and aquatic habitat by minimizing or eliminating the delivery of forestry-related sediments, nutrients, forest chemical and other contaminants, and by maintaining or improving both in-stream and riparian habitats. BMP effectiveness research studies conducted in Florida have shown no evidence of impacts to water quality or to aquatic ecosystems following intensive silviculture operations on a variety of sites and under varying site conditions where BMPs were implemented (Vowell 2001; Vowell and Frydenborg 2004).

The FFS is also assisting with two research projects in cooperation with the University of Florida, which are looking at the effectiveness of silviculture BMPs for forest fertilization. One study, which was just completed in November 2013, looked at the effectiveness of forest fertilization BMPs for protecting ground water from nutrient leaching. Study results showed that ground water concentrations of ammonium, total Kjeldahl nitrogen (TKN), and TP observed for wells monitored in the fertilization treatment area did not increase when compared to pre-fertilization baseline levels or distant control wells (Minogue *et. al.* 2013). There is also an ongoing study which looks at the effectiveness of forest fertilization BMPs for protecting nearby surface waters. This study was initiated in 2012 and is expected to be completed in 2017.

The FFS is the lead agency responsible for assisting landowners, loggers and forestry professionals with silviculture BMP implementation as well as conducting statewide silviculture BMP training and compliance monitoring. The FFS is committed to promoting forestry Rule 5I-6, F.A.C., and encourages both private and public forest landowners across the state to comply with the BMPs and the rule. Compliance with the rule involves submitting a Notice of Intent to Implement BMPs (NOI) to the FFS and thereby committing to follow BMPs during all current and future forestry operations. To date, over 4.8 million acres of private and public land have been enrolled in the program.

The FFS also monitors silviculture BMP compliance on public and private forestry operations with on-the-ground evaluations of randomly selected forestry sites. Implementation Survey reports are published every other year, the most recent of which is 2015. Since 1981, a total of 17 survey reports have been published, with over 5,000 individual forestry sites evaluated. The overall BMP compliance has ranged from a low of 84% to a high of 99.3% in 2015, with a cumulative average of 95%. The *2015 Silviculture BMP Implementation Survey Report* included sites from all 7 counties in the Lower and Middle Suwannee River BMAP area (Dixie, Gilchrist, Hamilton, Lafayette, Levy, Madison, and Suwannee). Data for these counties were collected from 39 different silviculture operations with a combined total of

658 applicable silviculture BMPs. The average overall silviculture BMP compliance rate for these seven counties in 2015 was 99.5%.

The FFS conducts BMP evaluations on state forests in Florida where forest management activities involve the implementation of BMPs. These evaluations continue to be an important aspect of the FFS mission in protecting and managing Florida's forest water resources. The FFS also conducts BMP follow-up surveys in the form of voluntary courtesy checks, targeting specific areas (such as TMDL watersheds). These courtesy checks are available to loggers, landowners, and contractors in an effort to enhance FFS outreach for BMP training.

The FFS Hydrology Section routinely conducts BMP training workshops each year. Workshops reach a variety of participants including loggers, forestry site preparation contractors, forestry road contractors, consulting foresters, government employees, forest landowners, and land managers. Program formats for these workshops include the Florida Master Logger Program, the Southeastern Wood Producers Association, private timber company contractors, internal training for FFS employees, and the general public.

The FFS is also actively assisting University of Florida researchers with ongoing research projects to evaluate forest fertilization impacts on ground and surface water quality and the effectiveness of Silviculture BMPs on mitigating these impacts.

5.1.1.2 SRP

SRP projects include both agricultural BMP implementation and education and outreach to agricultural and nonagricultural stakeholders in the basin. Work with producers on implementing BMPs in the SRP area, including the Lower and Middle Suwannee River Basin, has been extensive and has yielded good results. The activities conducted with farmers, and some of the benefits of those activities, include the following:

- During the past 12 years, SRP, UF–IFAS Extension agents, and others have organized more than 60 farmer field days and workshops related to irrigation and fertilizer management, other BMPs, TMDLs, water supply, crop updates, and more.
- At the UF–IFAS Suwannee Valley Agricultural Extension Center in Live Oak, the SRP has worked to demonstrate new technology that helps protect and conserve water. During the past 12 years, UF–IFAS and SRP staff have established crop

fertilization and irrigation demonstrations. Currently, demonstrations include sod-based rotation, high-residue conservation tillage, and advanced irrigation management. Using a USDA Conservation Innovation Grant, the SRP helped develop an advanced irrigation scheduling program that was incorporated in the University of Florida Florida Automated Weather Network (FAWN) to help crop farmers manage their irrigation more effectively using evapotranspiration rates, ambient air temperature, and rainfall data.

— On-farm demonstrations have played a key role in helping to encourage BMP implementation throughout the Suwannee and Santa Fe River Basins. The SRP established the Progressive Farms demonstration program in 2004, with the help of farmers/leaders in the crop industry, to demonstrate vegetable/agronomic crop BMPs. From 2004 to 2010, 22 farmers throughout the SRWMD area have demonstrated to their farming neighbors that BMPs work for them and for the environment. This program has allowed UF–IFAS and SRP staff to demonstrate new technology to manage fertilizer and irrigation more effectively. Along with the Crop Tools Cost-Share Program, Progressive Farms was instrumental in the widespread adoption (over 200 farms) of crop management tools such as GPS, soil moisture probes, and precision fertilizer application equipment. UF–IFAS determined that the Progressive Farms operations using these tools reduced their nitrogen application by an average of 50 pounds per acre and demonstrated the efficient use of irrigation water.

— In 2010, UF–IFAS Extension staff taught ten cooperating watermelon farms how to conduct sap tests with their own meters. An informal survey showed that these growers reduced early season irrigation by 50% and nitrogen applications by an average of 25 pounds per acre. One watermelon grower reduced nitrogen use by 50 pounds per acre on 200 acres. Collectively, these ten farms saved $48,000 in fertilizer and an additional $12,000 in fuel for irrigation pumping.

— Nitrogen fertilizer sales (for agricultural and nonagricultural uses) in counties within the SRWMD dropped from 28,606 tons (57.21 million pounds) in 1997–98 to 19,948 tons (40 million pounds) in 2009–10. While this change cannot conclusively be attributed to nutrient management BMPs, it can be assumed that BMP

implementation, fertilizer costs, and the heightened awareness of producers about the environmental impacts of nutrients on water quality all played a part.

5.1.1.3 CARES Program

The SRP, along with the Florida Farm Bureau, started the CARES Program in 2001 to recognize agricultural producers who are successfully implementing BMPs to help protect and conserve water. The program's approach to environmental stewardship helps farmers implement sound, positive environmental practices and establish and follow environmental management plans, while maintaining profitability. Interested farmers who are documented as implementing applicable BMPs are nominated by participating agencies and associations. Each farmer recognized as a participant in the CARES Program receives a CARES sign to display, letting neighbors and others know the farm is implementing BMPs. SRP has recognized more than 400 CARES farmers in the SRWMD during the last 15 years.

5.1.1.4 SRWMD RIVER Programs

Fourteen local governments in the SRWMD have been approved to receive nearly $1.5 million in cost-share funds for water conservation, alternative water supplies, flood protection, ecosystem restoration, and water quality improvement projects as part of the SRWMD RIVER Programs.

The RIVER cost-share funds will help provide the following improvements in the SRWMD:

- Reduce ground water pumpage and conserve 160 million gallons of water per year, 123.4 million gallons of which are in Water Resource Caution Areas.
- Remove 15 tons of nutrients entering natural water resources.
- Provide flood protection for 60 homes and several public facilities.
- Provide 130 acre-feet of floodplain storage.
- Reduce by more than 400 cubic feet, or three dump truck loads, the amount of sediment entering the Lower and Middle Suwannee River.
- Construct a regional water supply interconnect to provide clean, safe drinking water to residents and businesses.
- Provide improved water supply services for more than 10,000 customers.

Local governments approved for the RIVER Program were awarded funding through a ranking process based on various criteria, including the effectiveness of the proposed project to protect, conserve, or restore water resources. A minimum of one project was chosen for each drainage basin in the SRWMD that applied for the program. Guidelines for the projects include the following:

1. Projects that capture and treat stormwater using proven BMPs.
2. Projects that reduce the amount of nutrients and other stormwater pollutants at a reasonable cost.
3. Projects that control, fix, or relieve riverbank erosion.
4. Projects that improve water quality beyond any regulatory requirement associated with an agency permit or enforcement action.
5. Projects that upon completion will be maintained perpetually by the cooperating entity.

An example of a local project for the RIVER Cost-Share Program in the Lower and Middle Suwannee River BMAP area is the Lantana Road Erosion and Sedimentation Control in southern Lafayette County. The project was implemented in 2013, at an estimated cost of $41,000. Its goal was to improve water quality improvements with erosion and sediment control from the construction of a road and boat ramp along the Suwannee River.

APPENDICES

APPENDIX A: BIBLIOGRAPHY OF KEY REFERENCES AND WEBSITES

Key References

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Stormwater and Water Quality Protection Websites

Table A-1. Local and regional websites

- Bradford County
- City of Lake City
- Columbia County
- Gilchrist County
- Hamilton County
- Ichetucknee Springs Working Group
- Levy County
- Madison Blue Spring
- Madison County
- Santa Fe Springs Working Group
- SRP
- SRWMD
- The Ichetucknee Partnership (Facebook page)

Table A-2. National websites

- Center for Watershed Protection
- EPA Office of Water
- EPA Region 4 (Southeast U.S.)

Table A-3. State websites

- General Portal for State of Florida
- FDACS
- OAWP
- BMPs Implementation Assurance
- FFS
- Florida Department of Environmental Protection
- Watershed Management
- TMDL Program
- BMPs, Public Information, and Environmental Education Resources
- NPDES Stormwater Program
- Nonpoint Source Funding Assistance
- Florida Section 319 grant work plans and project summaries
- Surface Water Quality Standards
- Basin Status and Water Quality Assessment Reports: Suwannee (includes the Santa Fe River)
- Learning in Florida's Environment Program
- FDOH
- Standards for On-Site Sewage Treatment and Disposal Systems
- FDOT District 2
- Florida Farm Bureau–CARES Program

- **Florida Springs Initiative**
- **FNAI**
- **UF–IFAS**
- **Florida-Friendly Landscaping Program**
- **Florida Yards**