Florida Department of Environmental Protection

Suwannee River Basin Management Action Plan

April 13, 2017

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Suwannee River Basin Management Action Plan (BMAP)

- BMAP overview.
- Legislative requirements (2016-1).
- Nitrogen Source Inventory Loading Tool.
- Loads to groundwater by source.
- Schedule.

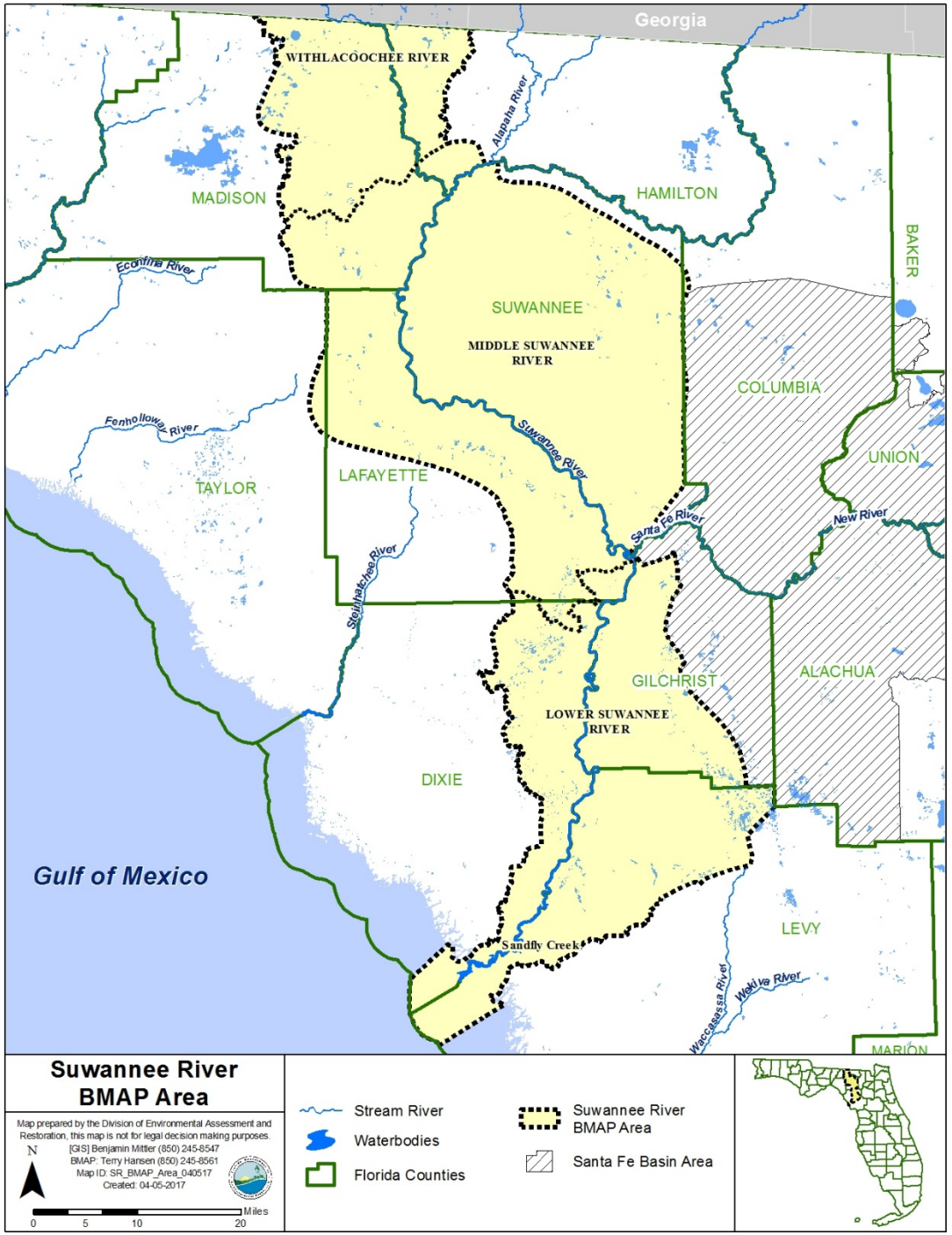
Suwannee River BMAP Area

Withlacoochee River: 41 springs
- 13, 1St and 2nd magnitude springs
- OFS* - Madison Blue

Middle Suwannee River: 103 springs
- 32, 1st and 2nd magnitude springs
- OFS* - Falmouth, Lafayette Blue, Peacock, and Troy

Lower Suwannee River: 31 Springs
- 17, 1st and 2nd magnitude springs
- OFS* – Fanning and Manatee

**OFS = Outstanding Florida Spring*



Water Quality Framework

Monitor and report progress annually.

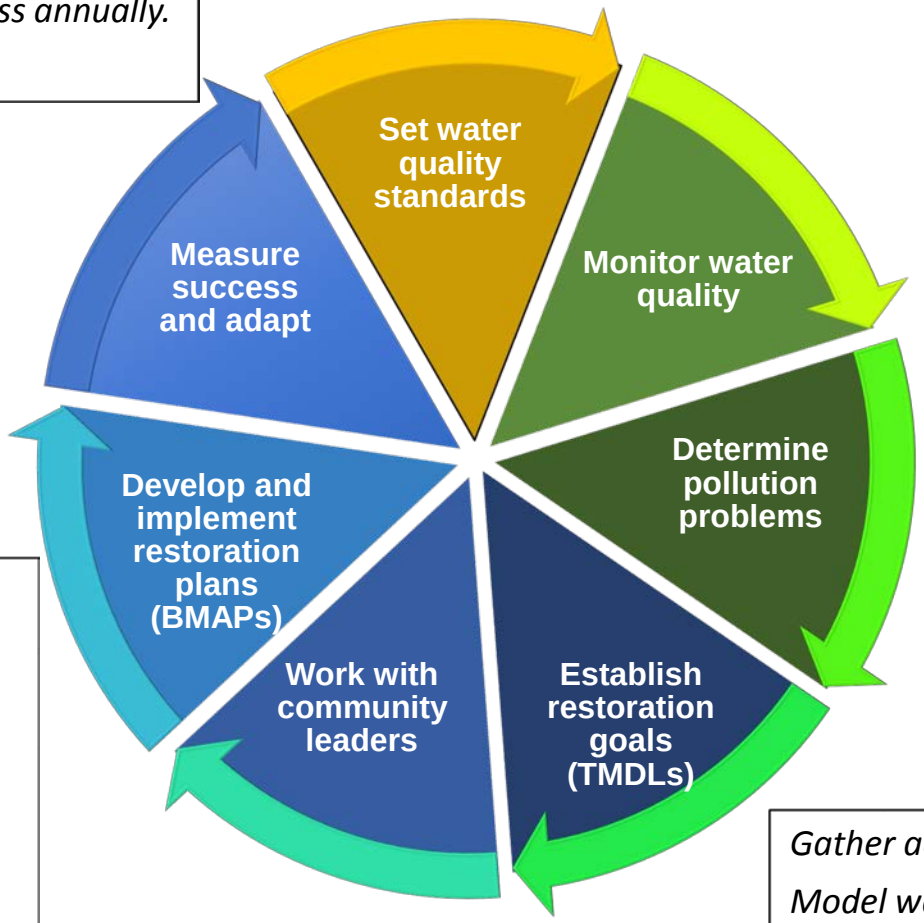
Adapt and change.

Collect data.

Analyze and verify.

List "impaired" waters.

REPEAT



Excessive nutrients

Bacteria

Mercury

Allocate responsibilities.

Identify projects.

- *Infrastructure*
- *Best Management Practices (BMPs)*

Establish schedules.

Identify success criteria.

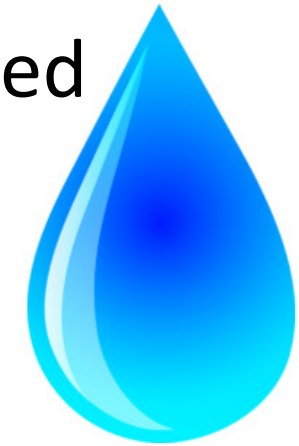
Gather additional data.

Model water quality.

Adopt pollutant reduction targets.

BMAP

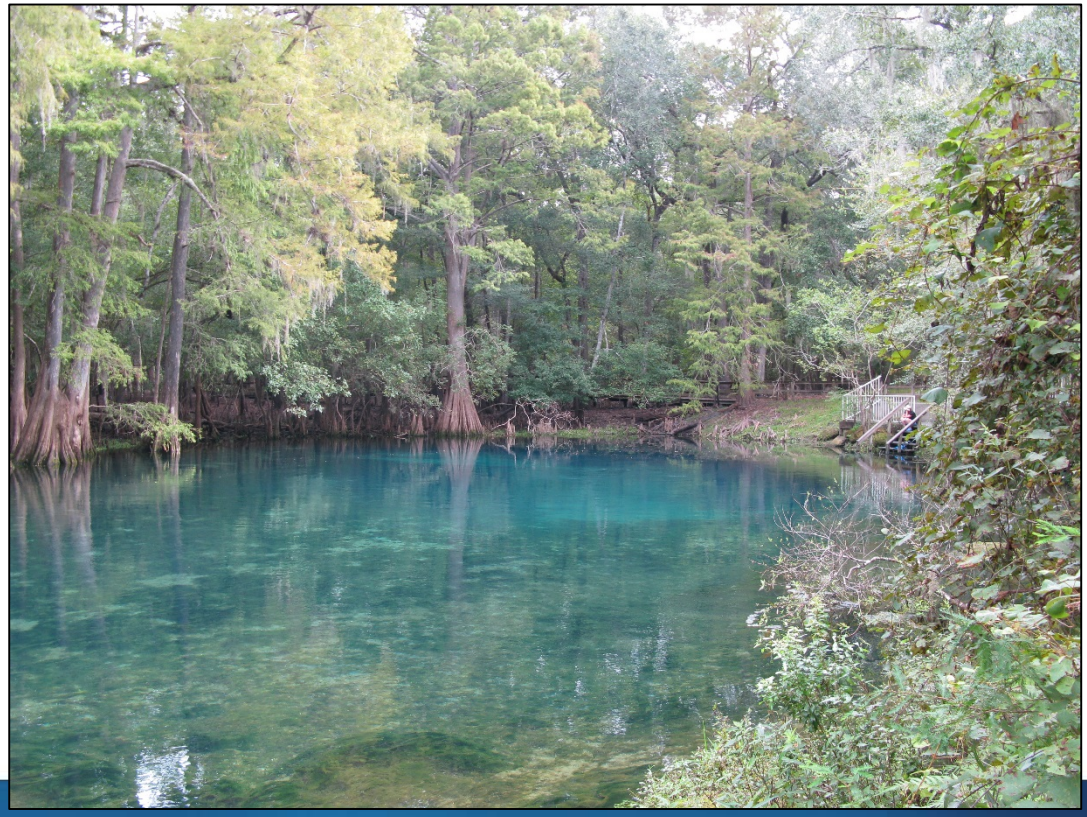
- Florida Department of Environmental Protection's (DEP's) method for restoring water quality to an impaired water body.
- BMAPs are adopted by DEP through a Secretarial Order.
- BMAPs are enforceable.
- BMAPs are reviewed annually and updated every five years.



Regulatory Framework

The process for preparing BMAPs is found in:

- Section 403.067, Florida Statutes (F.S.), known as the Florida Watershed Restoration Act.
- Spells out issues that are addressed within a BMAP.



Florida Springs and Aquifer Protection Act (2016-1)

- The 2016 Florida Springs and Aquifer Protection Act lists requirements for BMAPs for Outstanding Florida Springs (OFS):

BMAPs must be adopted within two years after initiation and must include detailed project, financial and water quality benefits information; five-year incremental milestones; and implementation plan designed with a target to achieve the TMDL* no more than 20 years after adoption (373.807(1)(b), F.S.).

**TMDL = Total Maximum Daily Load*

Florida Springs and Aquifer Protection Act (2016-1)

- Specifically the project list for the BMAP area must be:
  - Prioritized.
  - Include a planning level cost estimate and completion date.
  - Identify funding sources.
  - Identify point and nonpoint sources.
  - Implementation plan with TMDL achievement less than or equal to 20 years.
  - 5-, 10- and 15-year schedules for planning and funding.

Florida Springs and Aquifer Protection Act (2016-1)

- Specifically requires:
  - Identification of point sources and nonpoint source categories with estimated load allocations (**NSILT**).
  - Fertilizer ordinance for all local governments.
  - Agricultural BMPs.
- Delineate within the priority focus area (**PFA**):
  - List of projects.
  - Create an onsite sewage treatment and disposal system (OSTDS) Remediation Plan if OSTDS loads are greater than or equal to 20 % of nitrogen load, or determined to be needed by DEP.
- Prohibits within a PFA:
  - Wastewater treatment facilities greater than 100,000 gallons per day (GPD), UNLESS advanced wastewater treatment (AWT) is used.
  - New OSTDS on less than one-acre lots.
  - Ban on land application of biosolids.
  - Hazardous waste facilities.

PFA Requirements

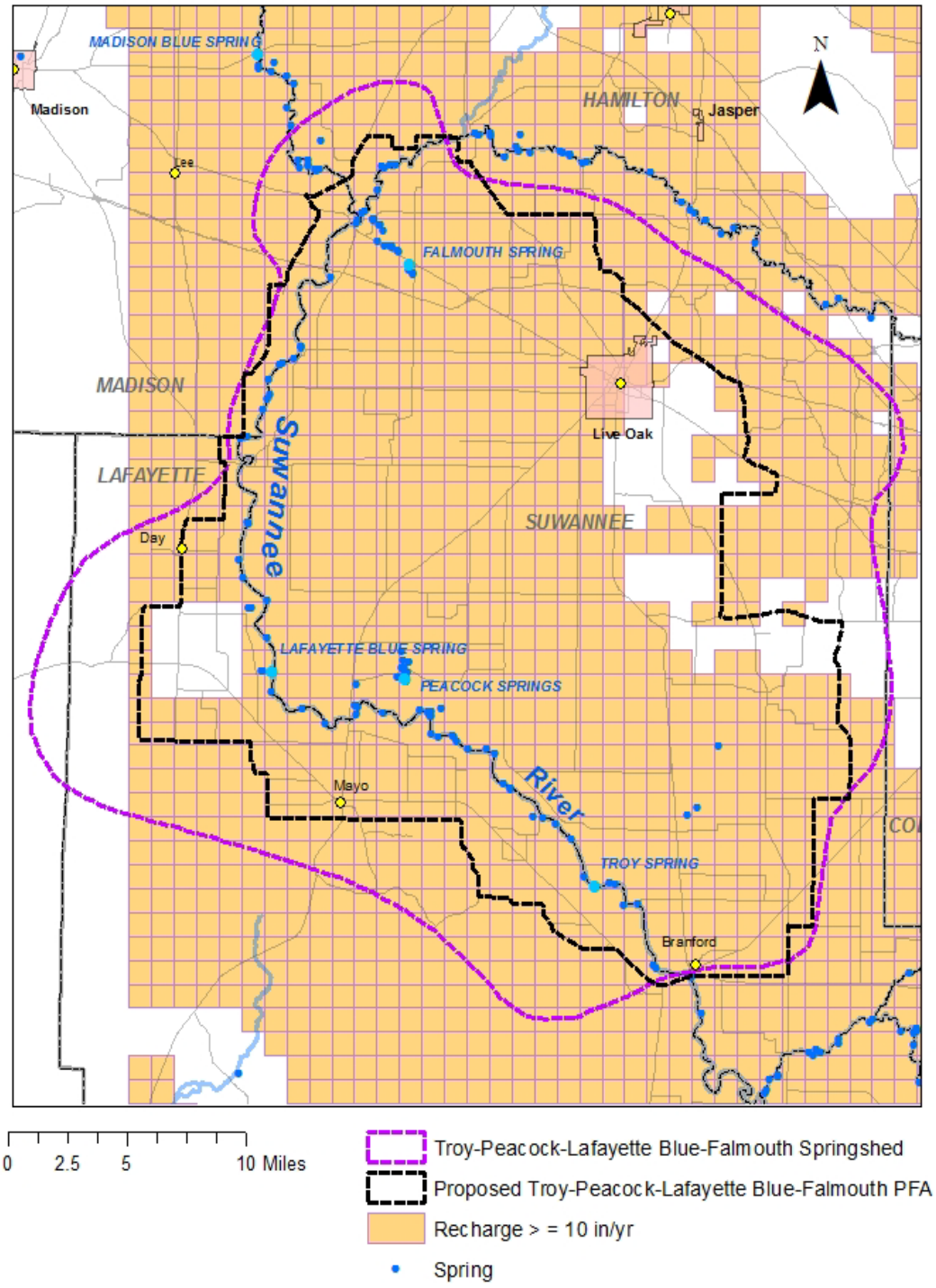
- Sub-Section 373.802, F.S.:
  - Definition: Area or areas of a basin where the Floridan Aquifer is generally most vulnerable to pollutant inputs where there is a known connectivity between groundwater pathways and an Outstanding Florida Spring (OFS).
- Sub-Section 373.803, F.S.:
  - Delineation considers factors that may lead to degradation of an OFS, such as:
    - Groundwater travel time to the spring
    - Hydrogeology
    - Nutrient load, etc.

Suwannee Basin PFAs

- PFAs delineated for OFS:
  - Withlacoochee River (Madison Blue)
  - Middle Suwannee River (Falmouth, Lafayette Blue, Peacock, and Troy)
  - Lower Suwannee River (Fanning and Manatee)

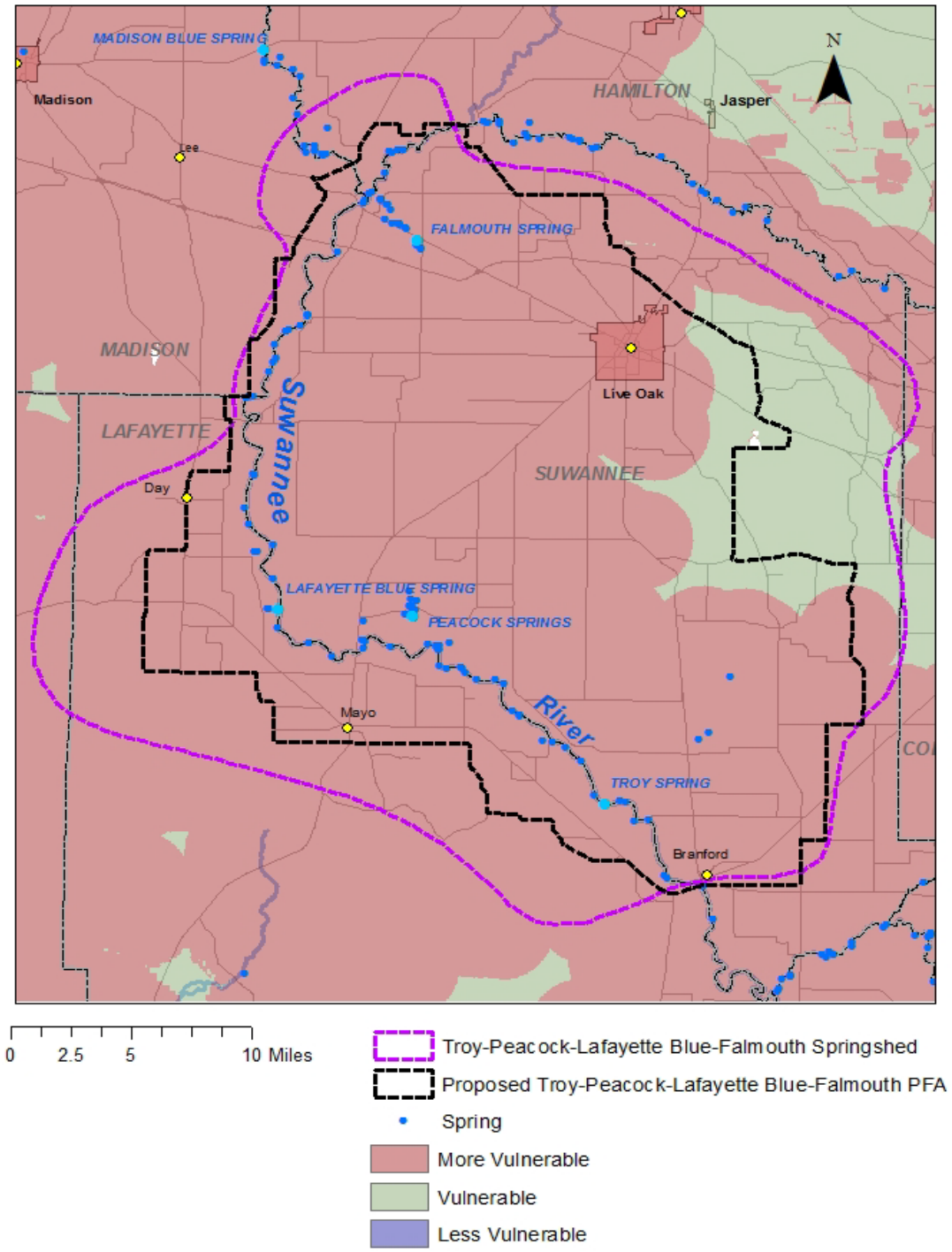
PFA Process

Middle Suwannee River Recharge



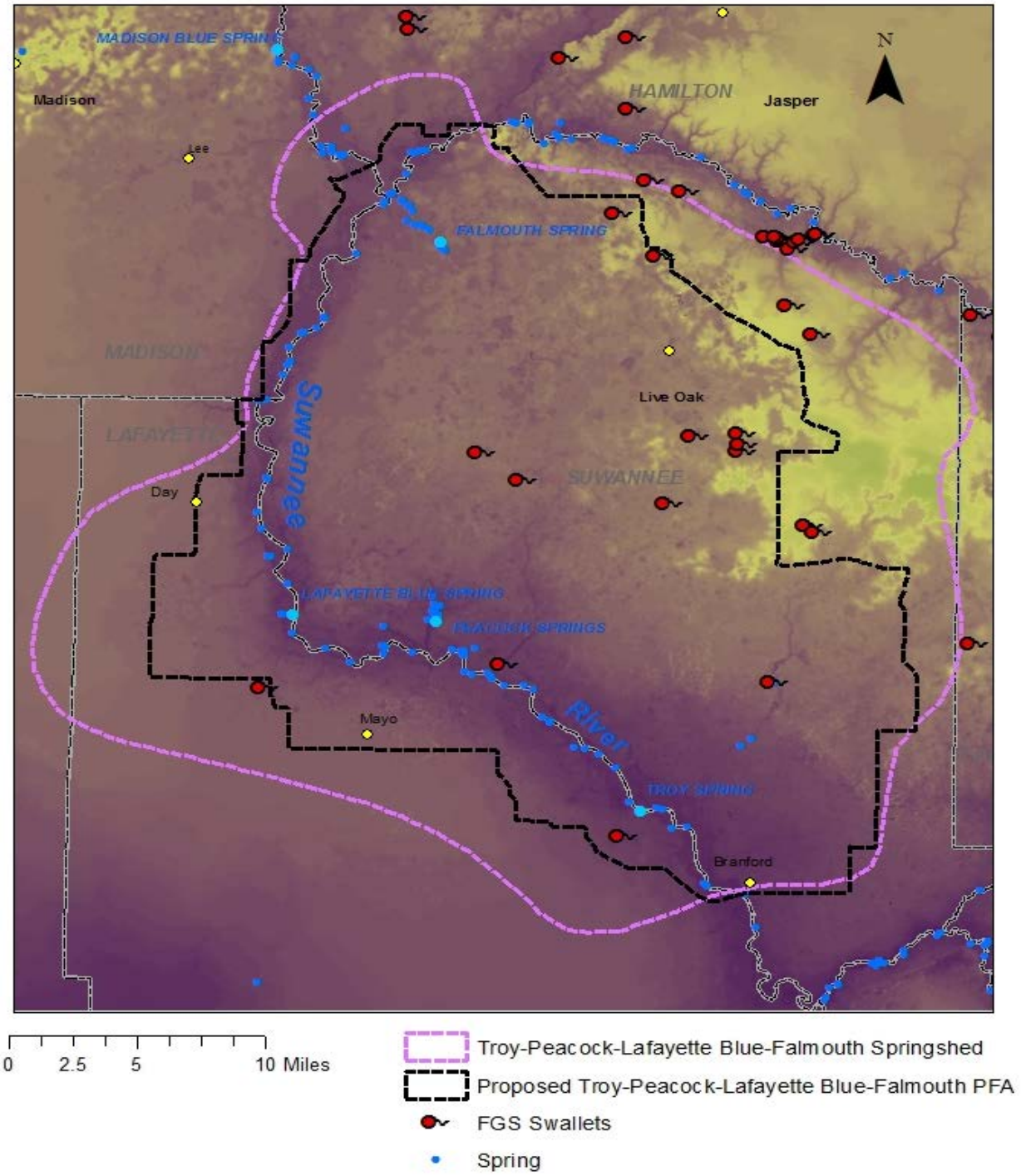
PFA Process

Middle Suwannee River Vulnerability



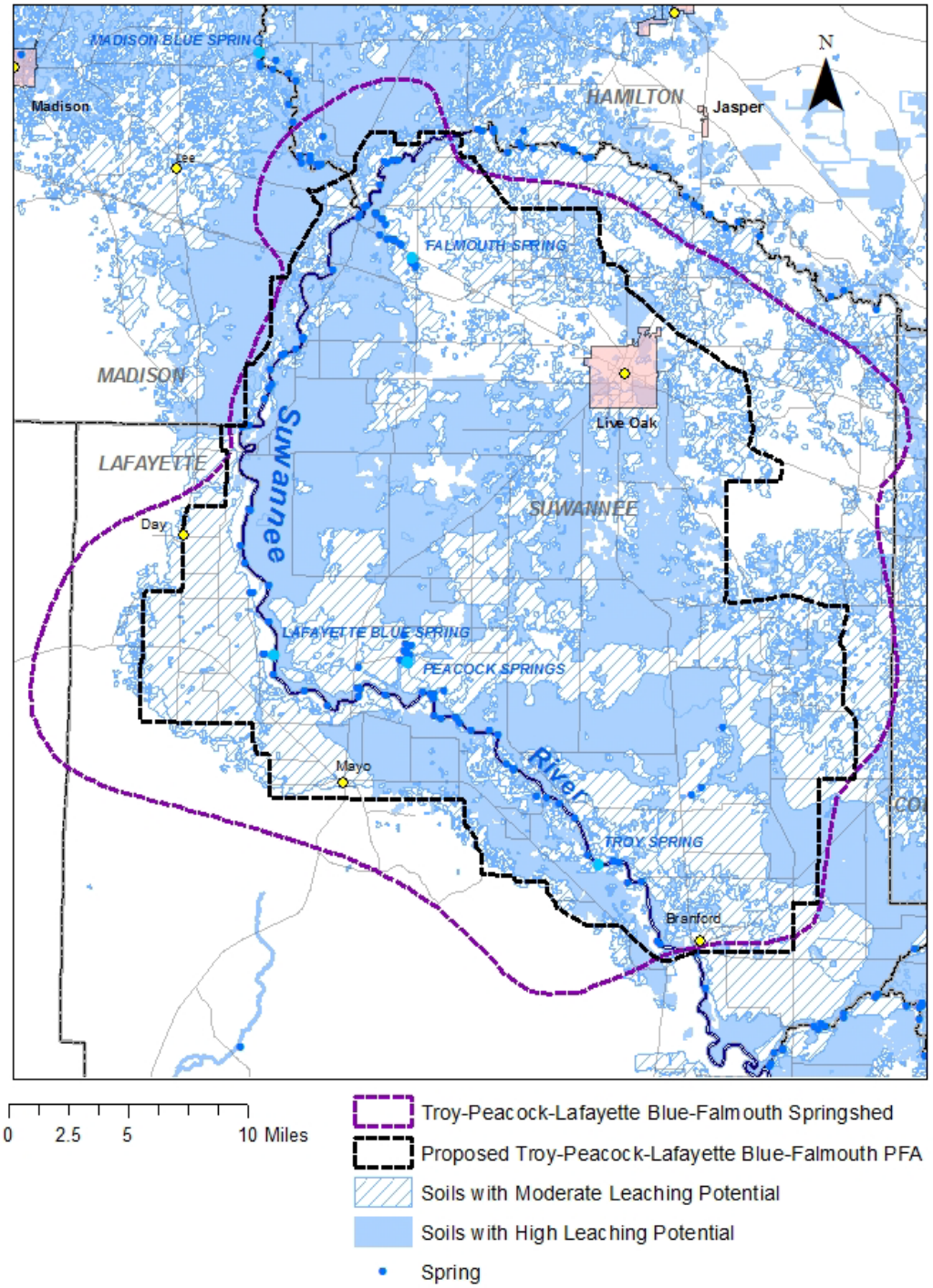
PFA Process

Middle Suwannee River
Stream to Sink Features



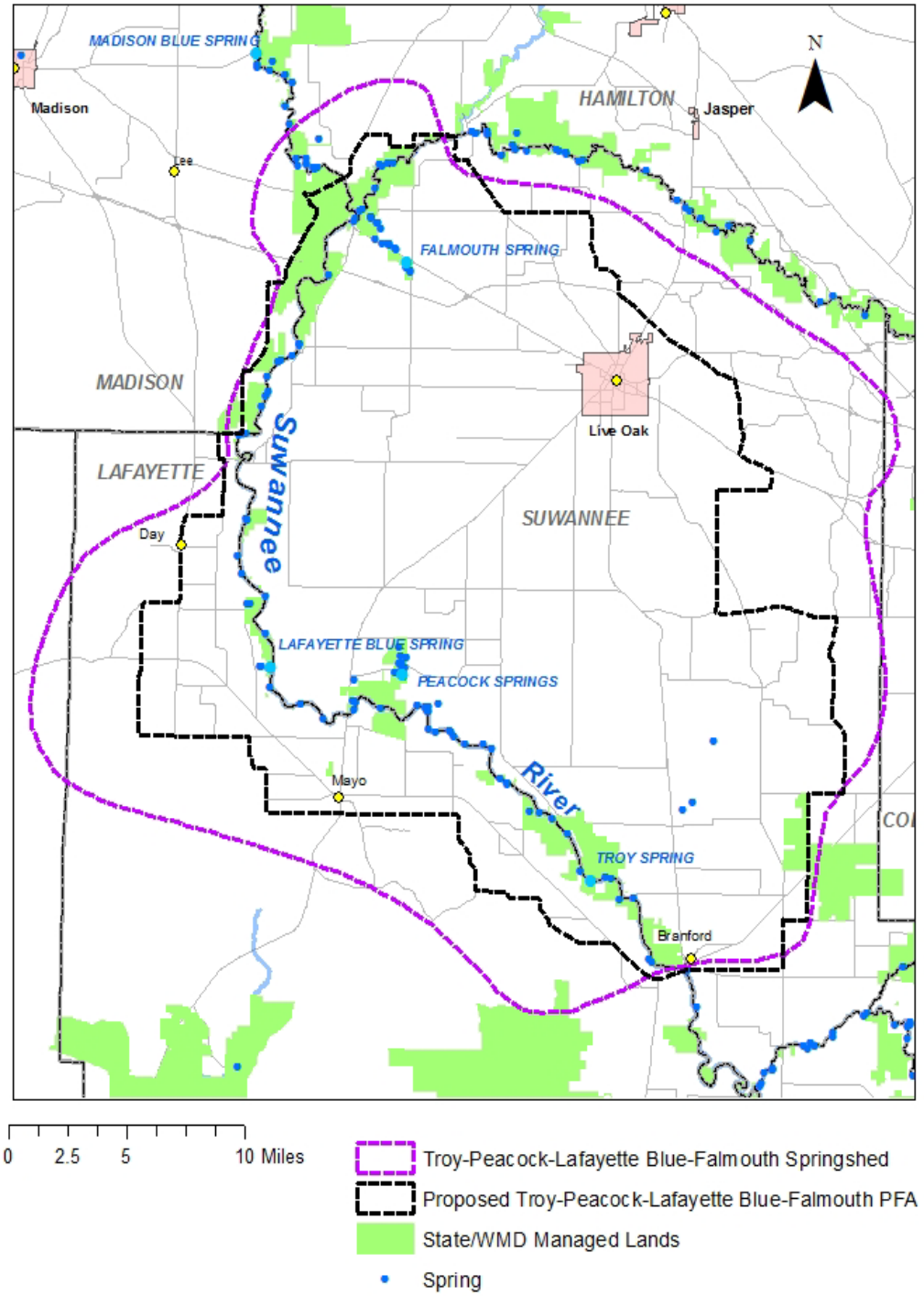
PFA Process

Middle Suwannee River Soils



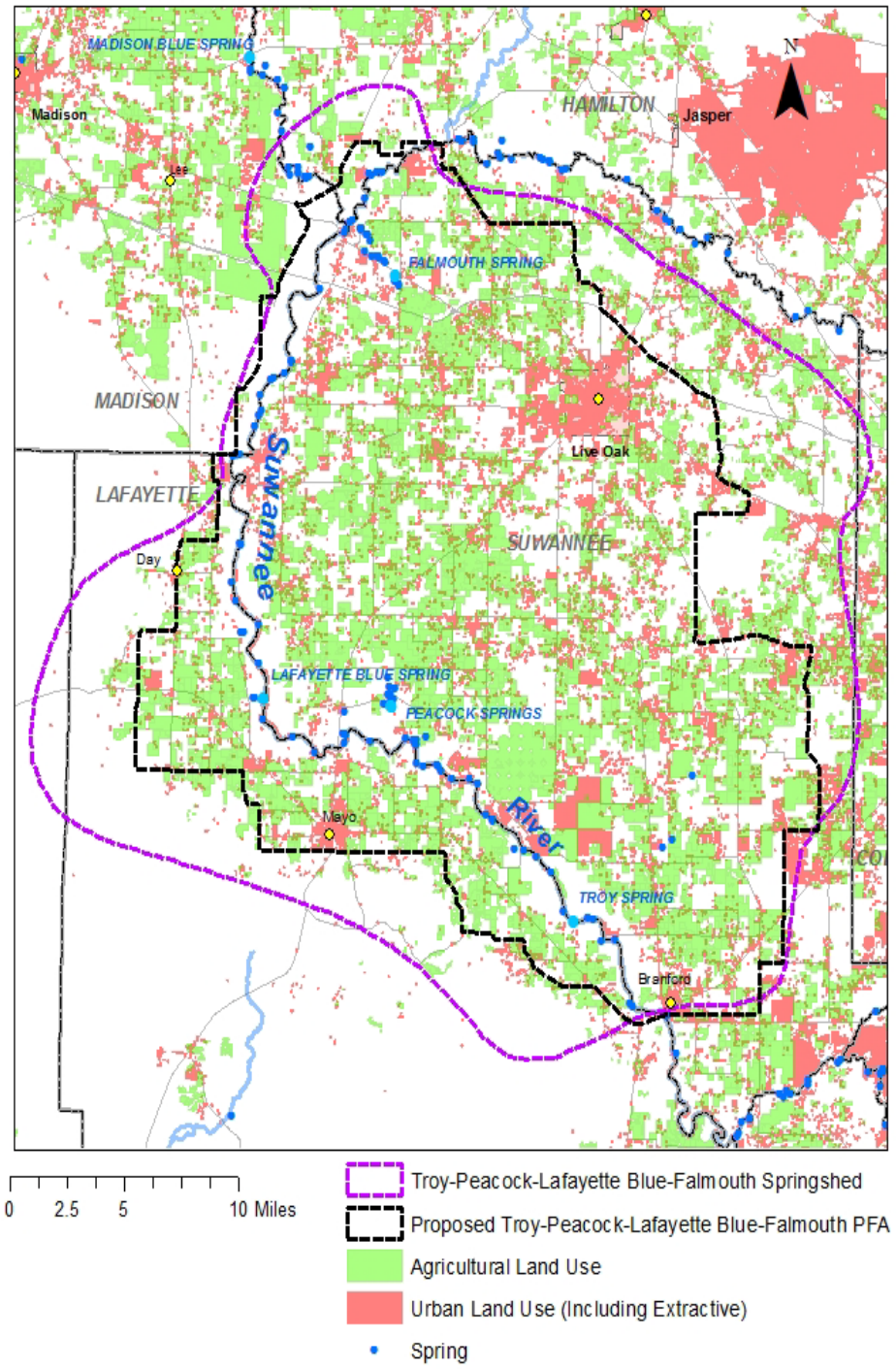
PFA Process

Middle Suwannee River State Lands



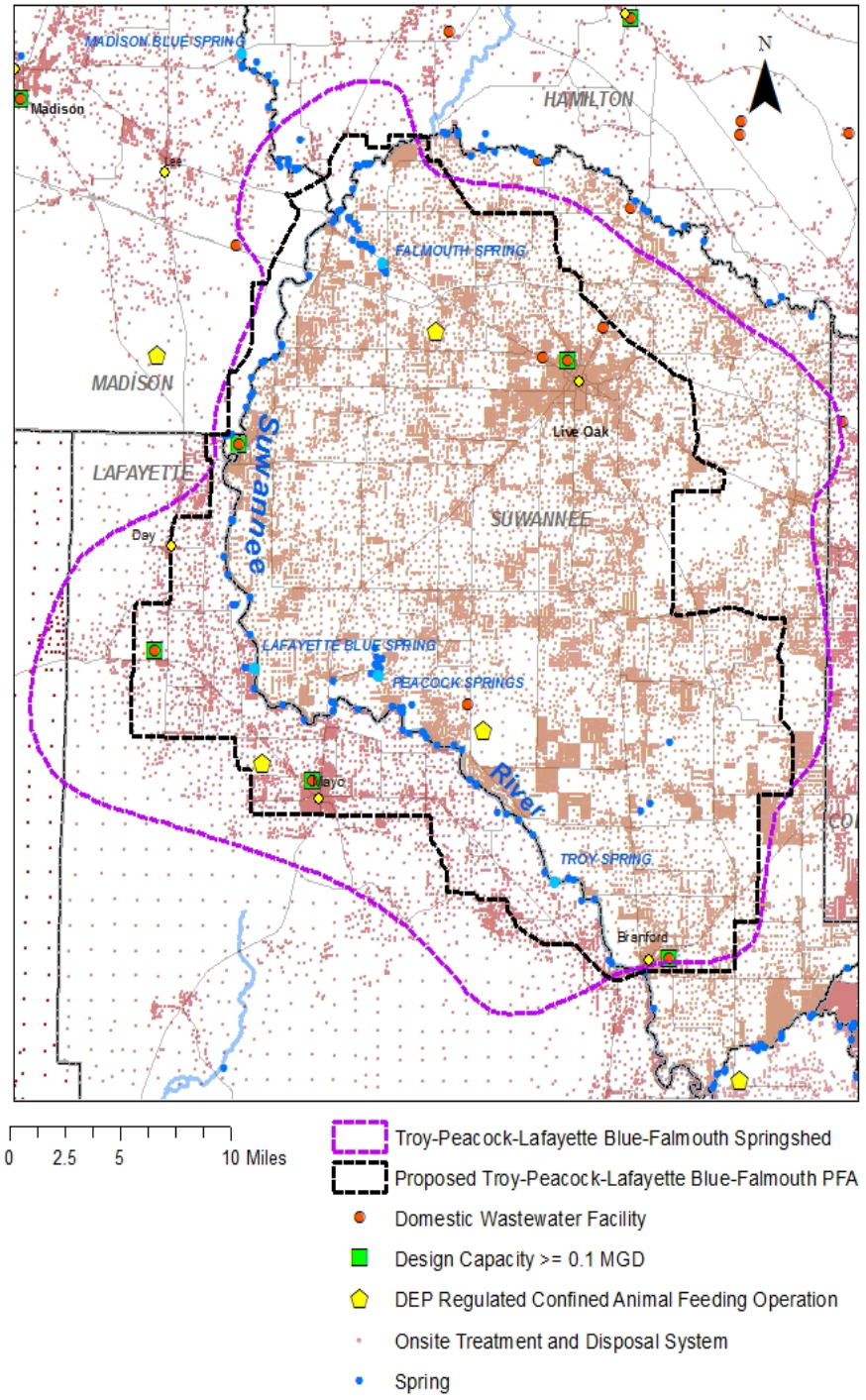
PFA Process

Middle Suwannee River
Land Use



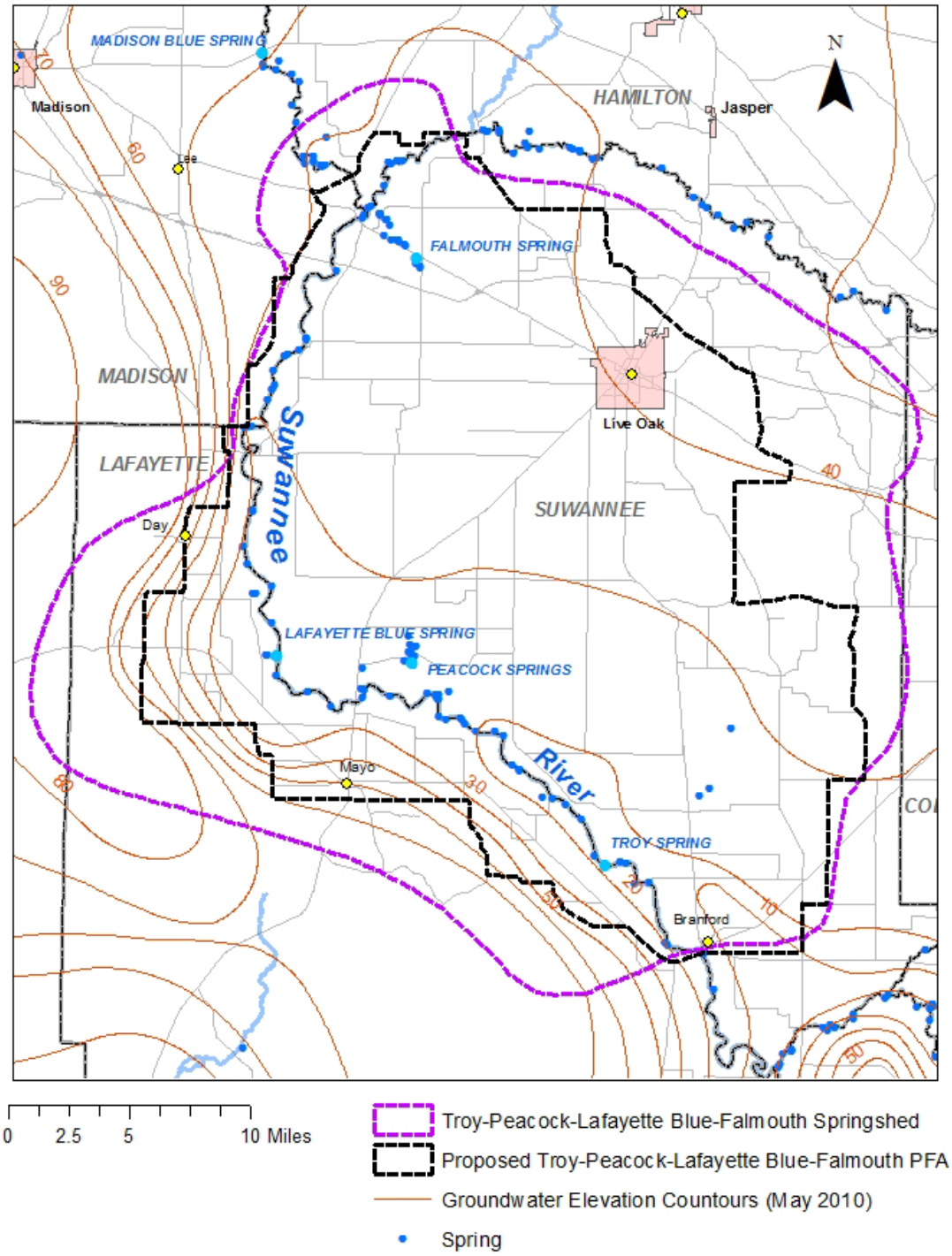
PFA Process

Middle Suwannee River Wastewater and Animal Feeding Operations



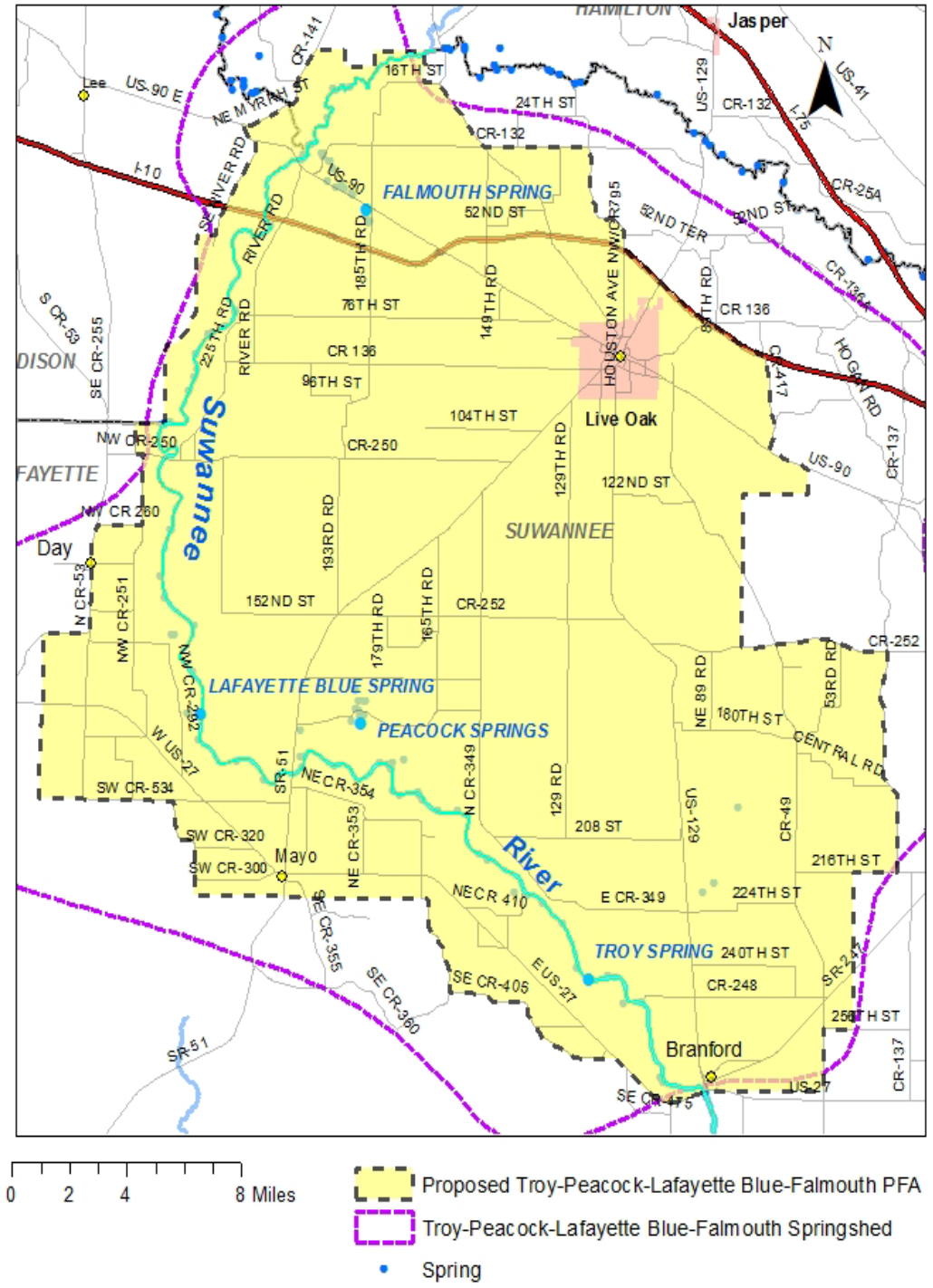
PFA Process

Middle Suwannee River Elevation Contours



PFA Process

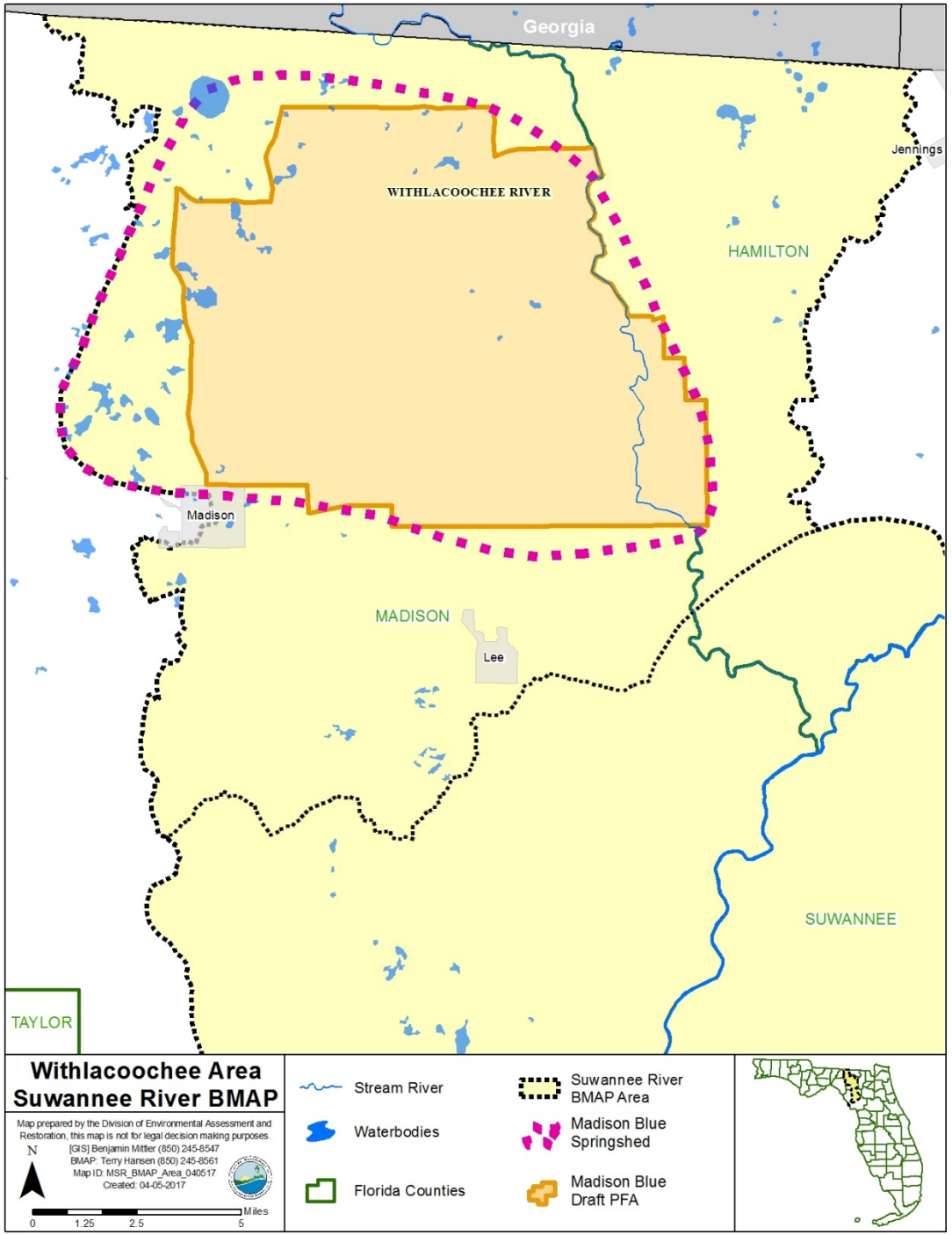
Middle Suwannee River Boundaries



PFA

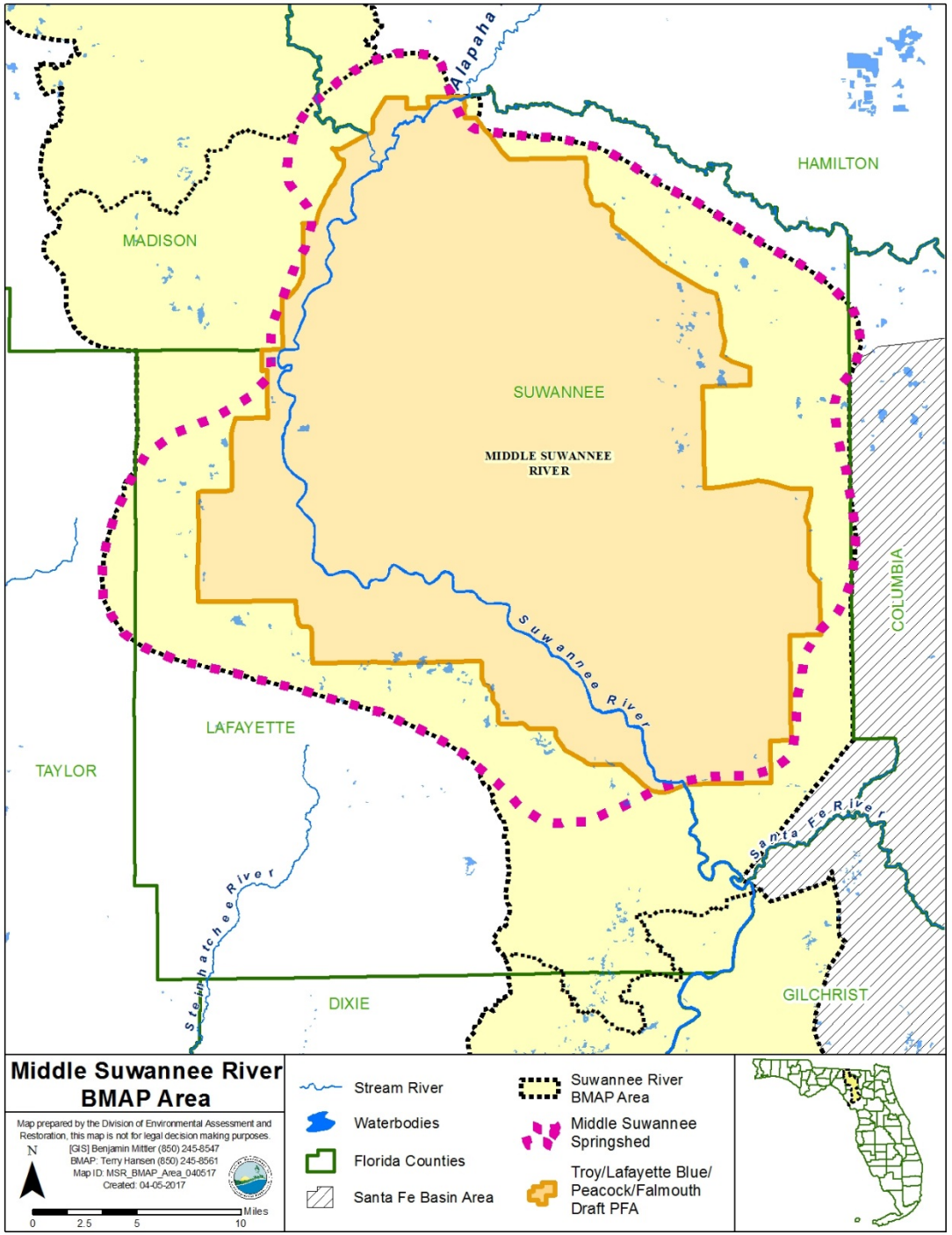
Withlacoochee River PFA

(Madison Blue OFS)



PFA

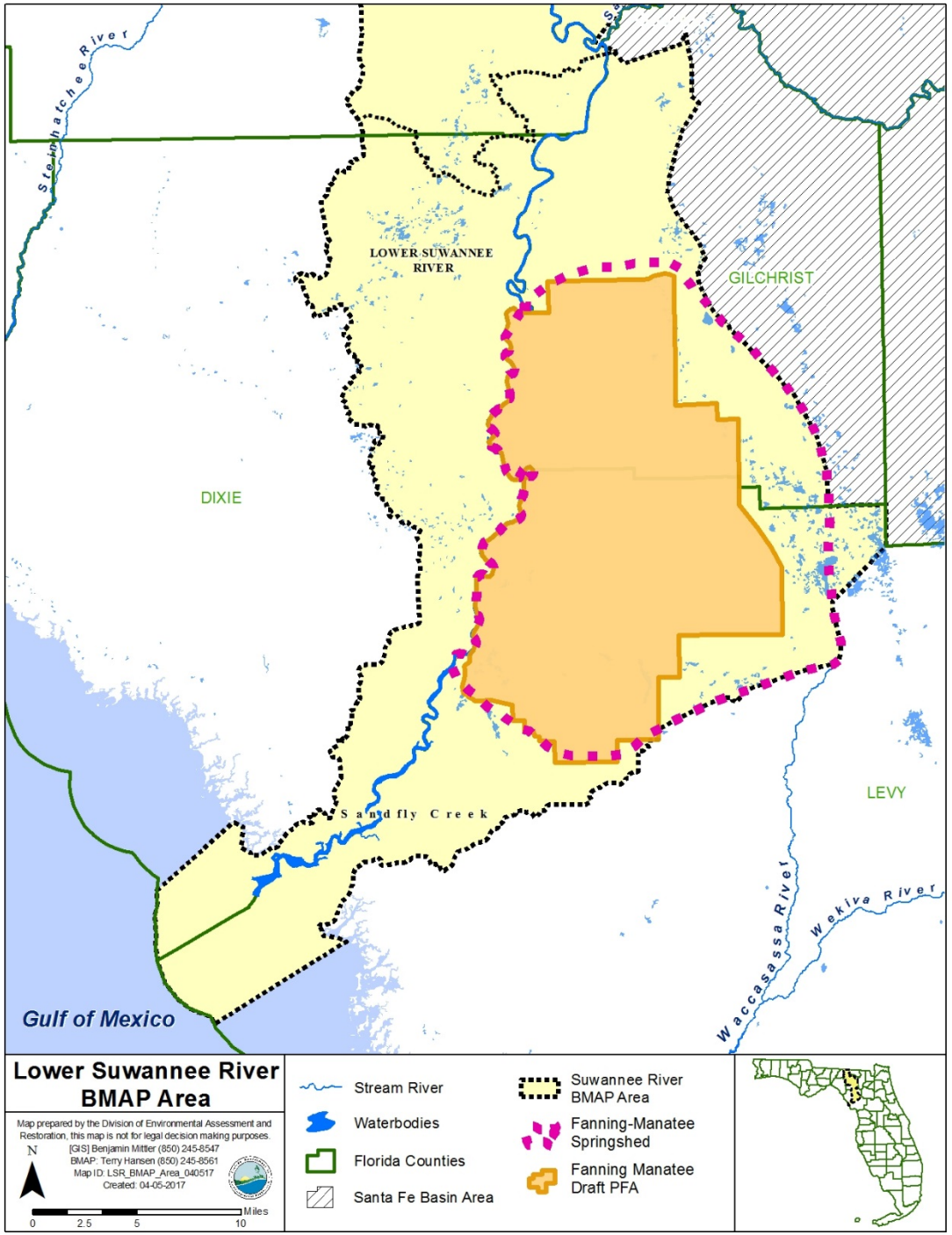
Middle Suwannee River PFA
(Falmouth, Lafayette Blue, Peacock, and Troy OFS)



PFA

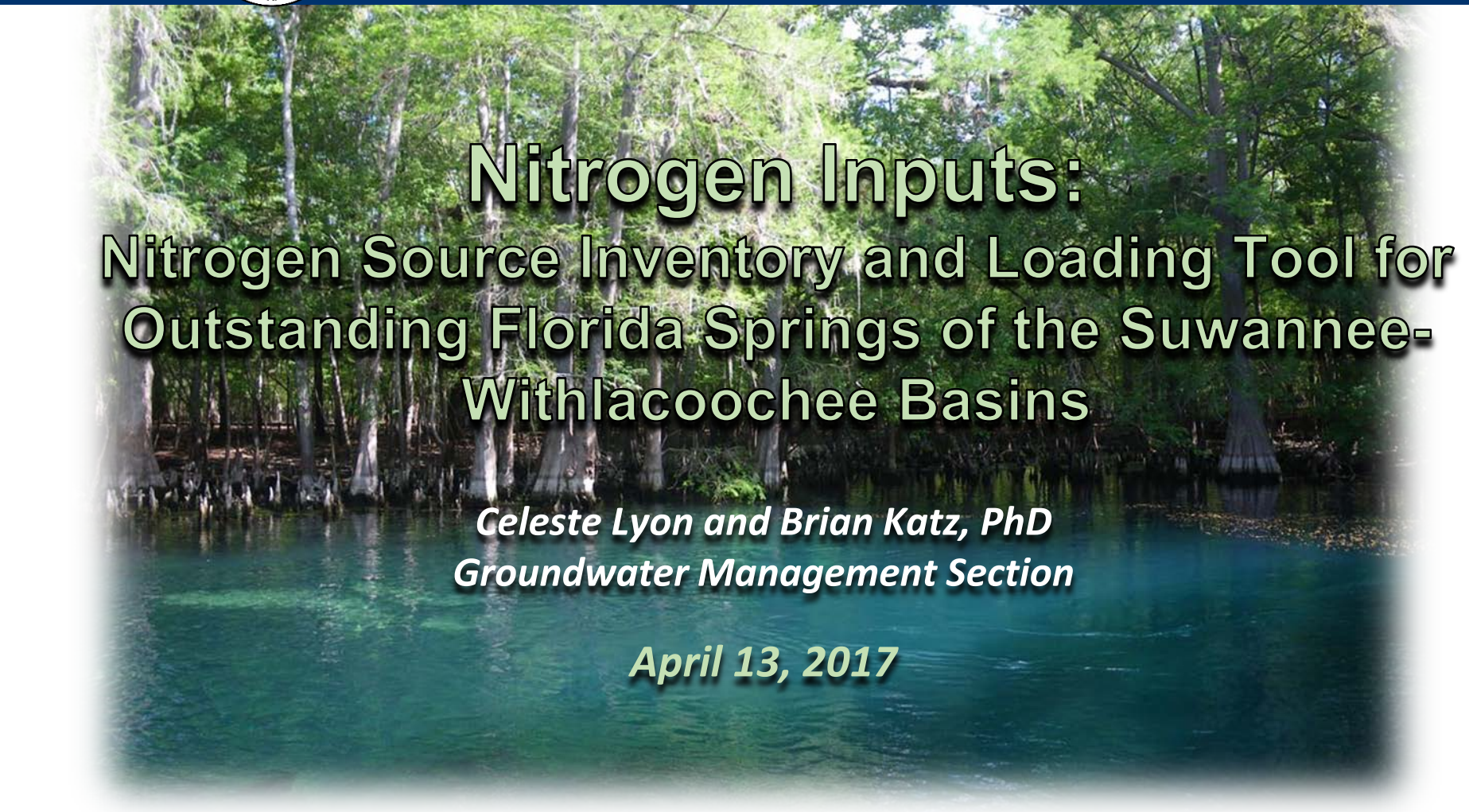
Lower Suwannee River PFA

(Fanning and Manatee OFS)



Florida Department of Environmental Protection

Division of Environmental Assessment and Restoration



Nitrogen Inputs:

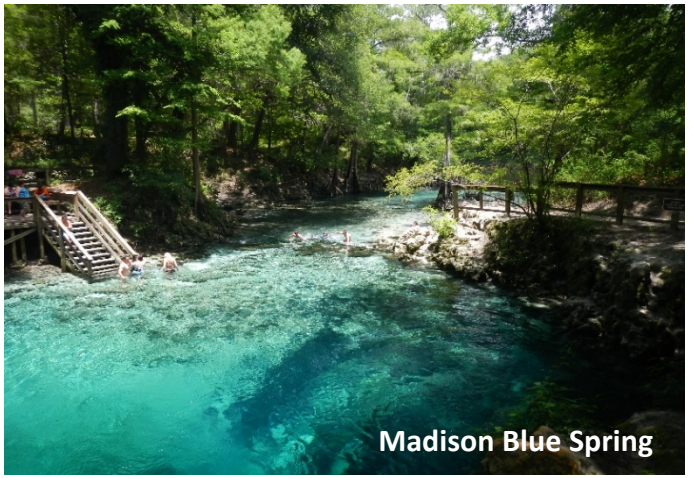
Nitrogen Source Inventory and Loading Tool for Outstanding Florida Springs of the Suwannee-Withlacoochee Basins

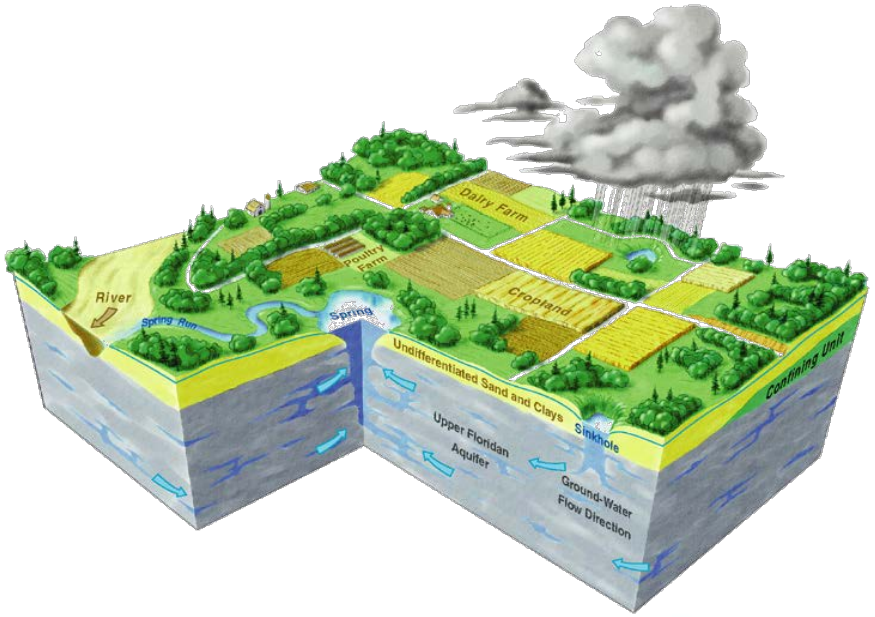
Celeste Lyon and Brian Katz, PhD
Groundwater Management Section

April 13, 2017

Nitrate-Impaired Spring Waters

- The water quality in several Outstanding Florida Springs in the Suwannee River Basin is impaired due to elevated nitrate concentrations
- Many sources contribute nitrogen in each springshed:
  - atmospheric deposition
  - fertilizers (farm and non-farm)
  - septic tanks
  - land application of wastewater
  - livestock manure


Madison Blue Spring



Nitrogen Source Inventory and Loading Tool

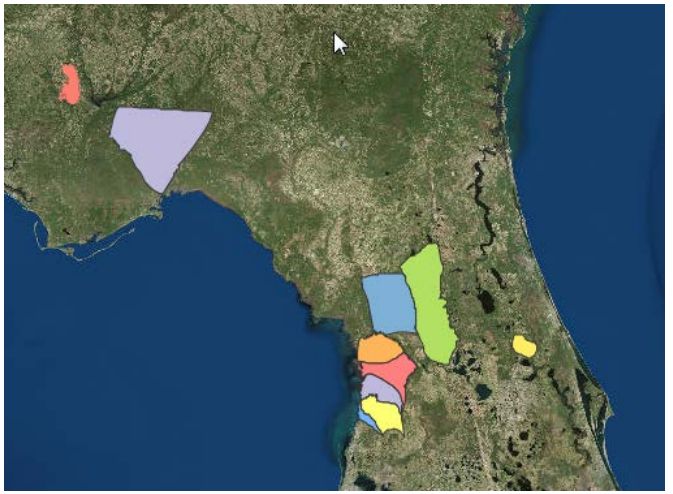
- Quantifies nitrogen sources and loading to ground water, and highlights source categories where reductions in N loading could help achieve restoration of impaire waters


Troy Spring

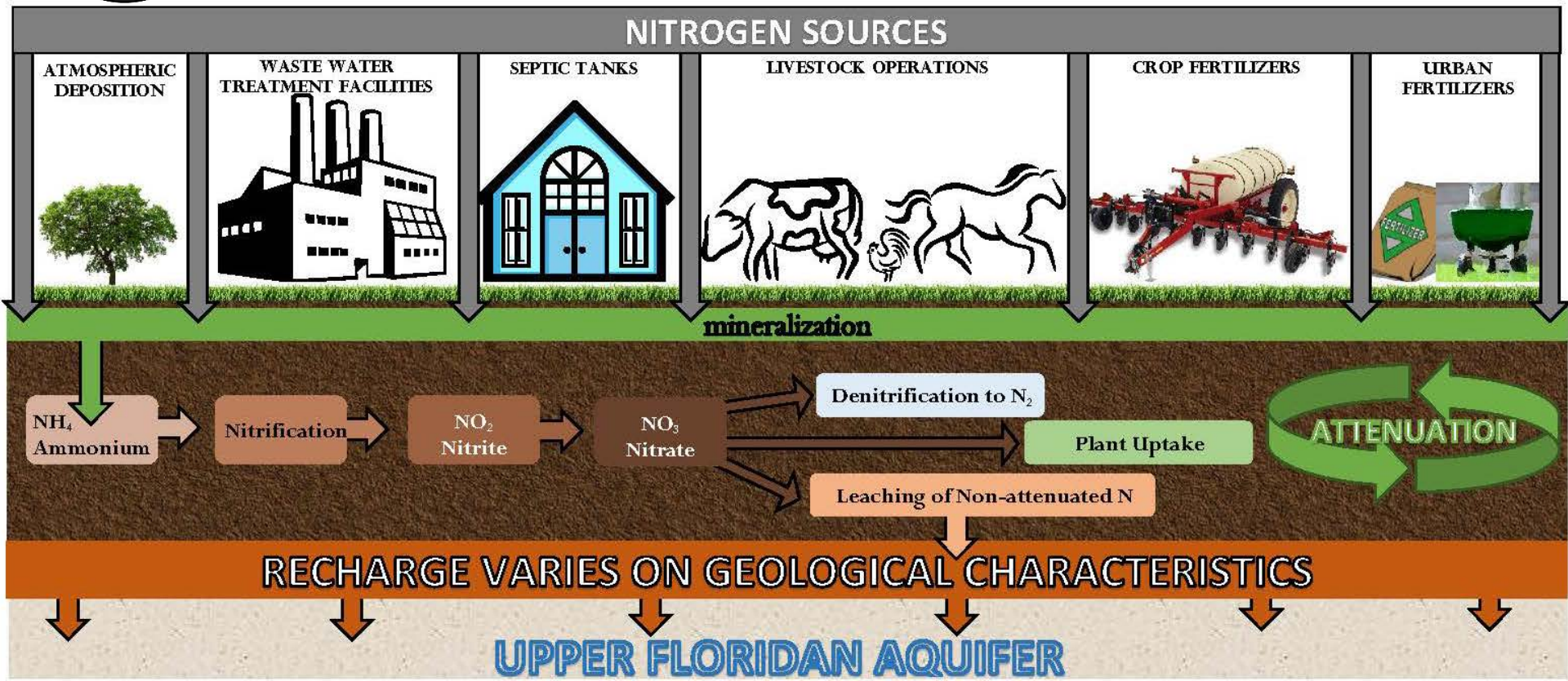

Fanning Spring

- We customize the inventory for each spring basin or BMAP area to account for hydrogeologic and land use differences

- Inventories have been completed for several BMAP areas (Wakulla, Jackson Blue, Silver, Rainbow, Volusia Blue, Springs Coast Springs

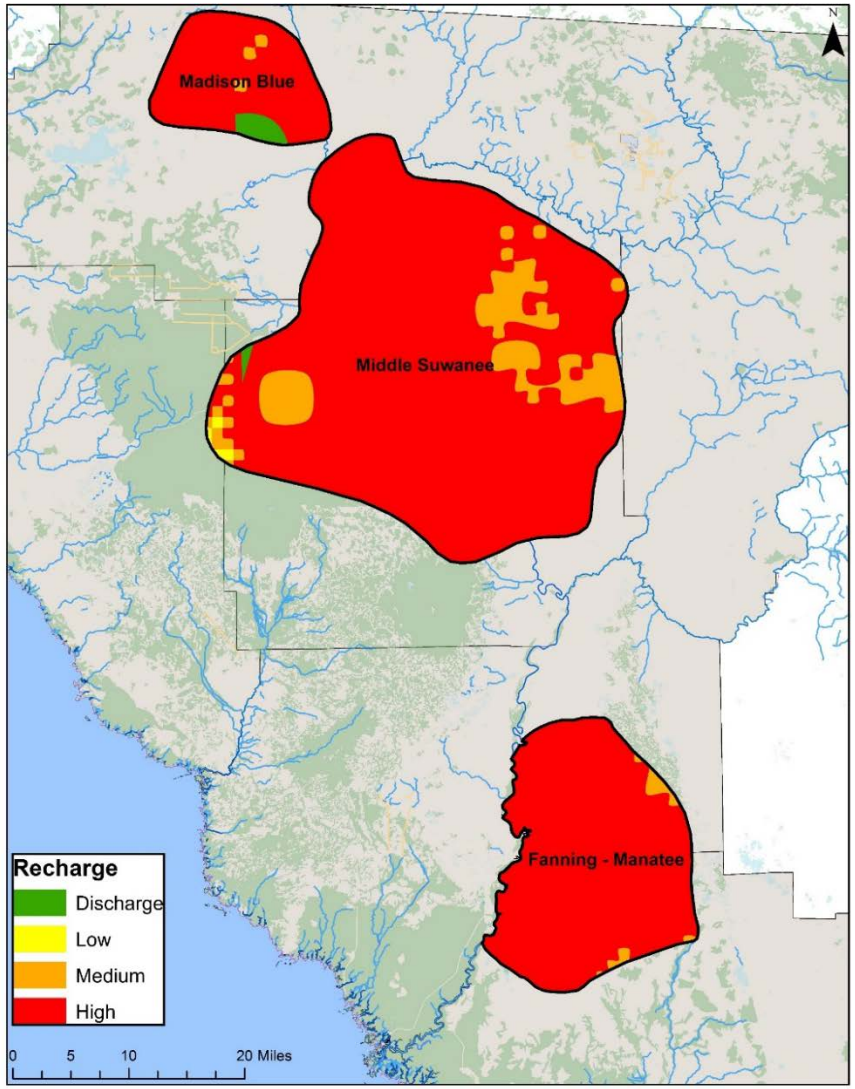


Nitrogen Cycle and Nitrogen Attenuation



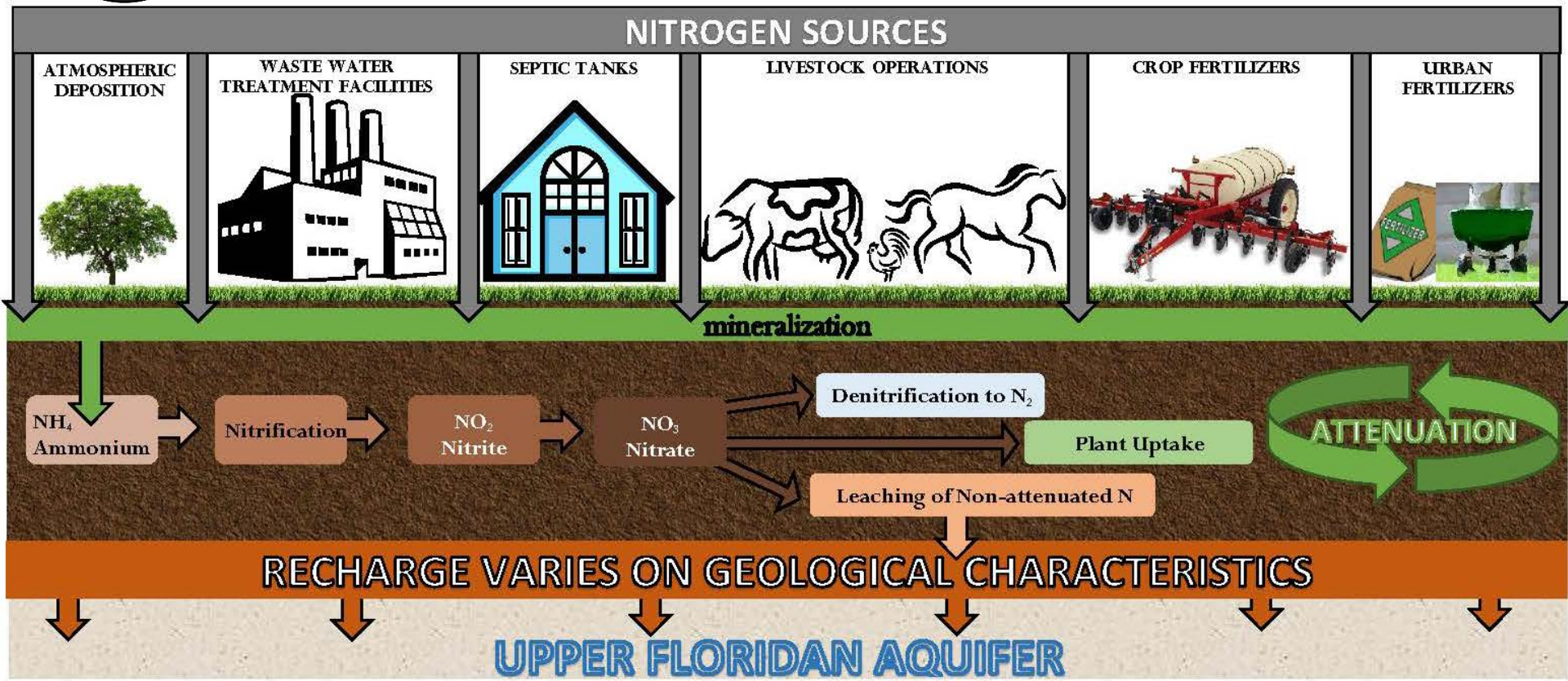
LEACHING OF N TO GROUND WATER is related to many factors, such as variable soil conditions, fertilizer material, livestock type, crop types, irrigation, recharge to the aquifer.

Groundwater Recharge and Nitrogen Attenuation



- **The amount of nitrate that is transported to the UFA in a given year is related to the rate of recharge to the aquifer (soil properties, hydrogeology, rainfall**
- (FGS, USGS, WMD).
  - **High Recharge: > 10 in/yr**
  - Medium Recharge: 3-10 in/yr
  - Low Recharge: 0-3 in/yr
- **A weighting factor is assigned to recharge category to account for additional attenuation:**
- **High, 0.9**
- **Medium, 0.5**
- **Low, 0.1**

Nitrogen Cycle and Nitrogen Attenuation



NSILT Process is on-going:

We fine-tune and revise nitrogen loading estimates to groundwater as new information becomes available, and after getting feedback from stakeholders.

Outstanding Florida Springs

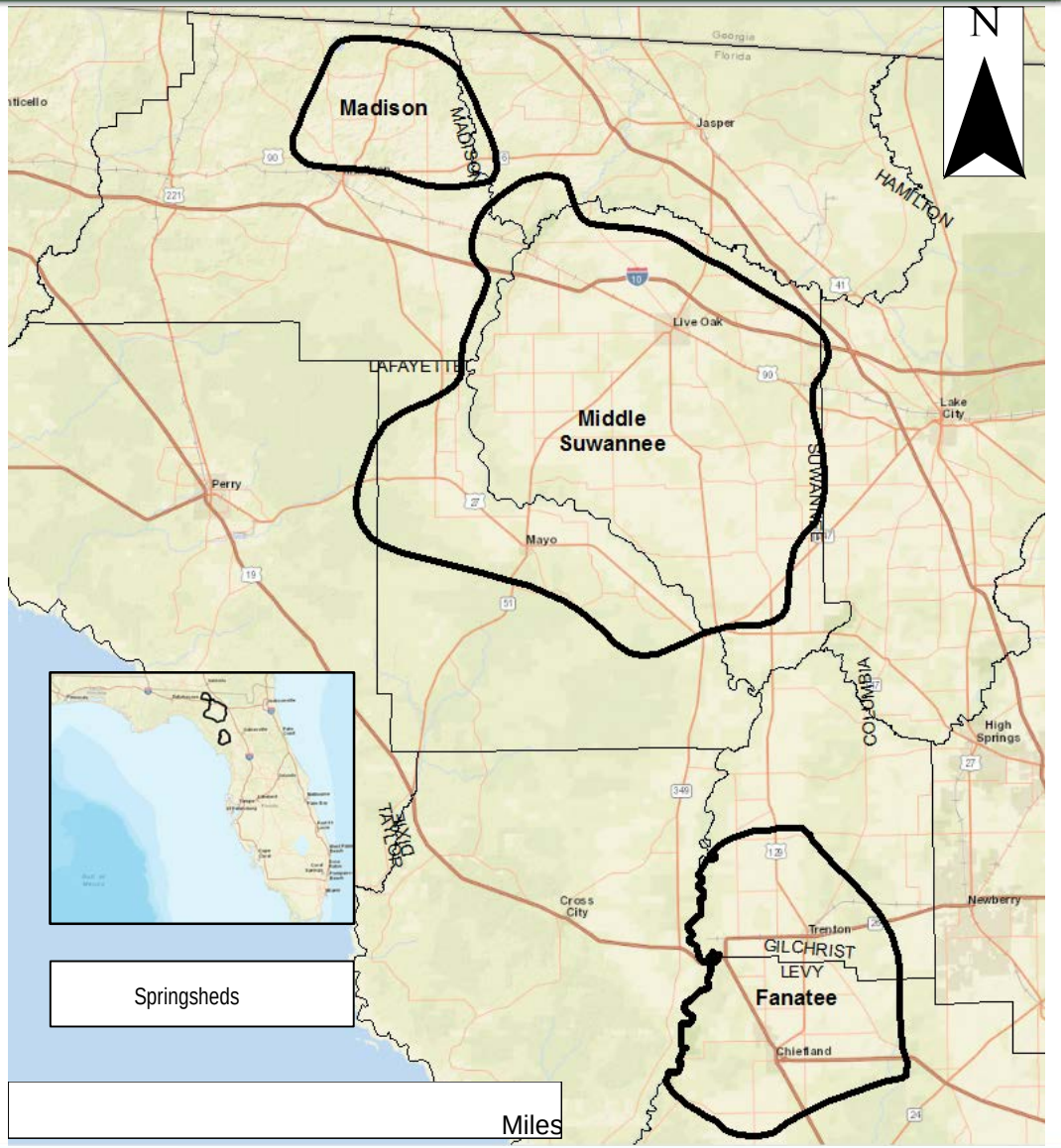
Outstanding Florida Springs in this BMAP area were aggregated into three general springshed areas to more efficiently organize information and implement restoration actions:

- **Madison Blue Spring** (and associated springs of Withlacoochee River)
- **Middle Suwannee Springs** combined springshed (including Troy, Peacock, Lafayette Blue, Falmouth and major second magnitude springs)
- **Fanning and Manatee Springs**

Inventories Conducted for 3 Springshed Areas

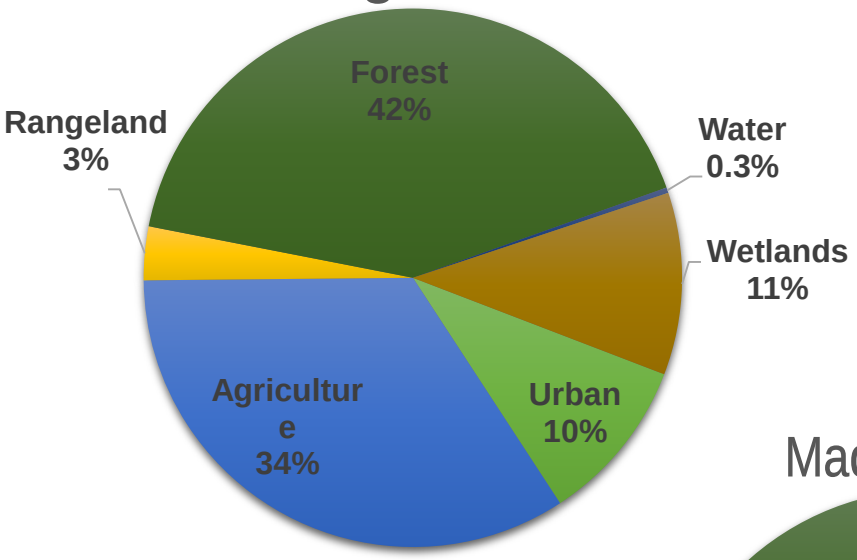
Springshed Area	County	Acres
Fanning-Manatee	Gilchrist	80,233
Fanning-Manatee	Levy	119,694
Madison Blue	Hamilton	5,672
Madison Blue	Madison	79,116
Middle Suwannee	Columbia	1,148
Middle Suwannee	Hamilton	11,937
Middle Suwannee	Lafayette	134,920
Middle Suwannee	Madison	15,171
Middle Suwannee	Suwannee	386,144
Middle Suwannee	Taylor	5,644

Evaluation included portions of 6 counties

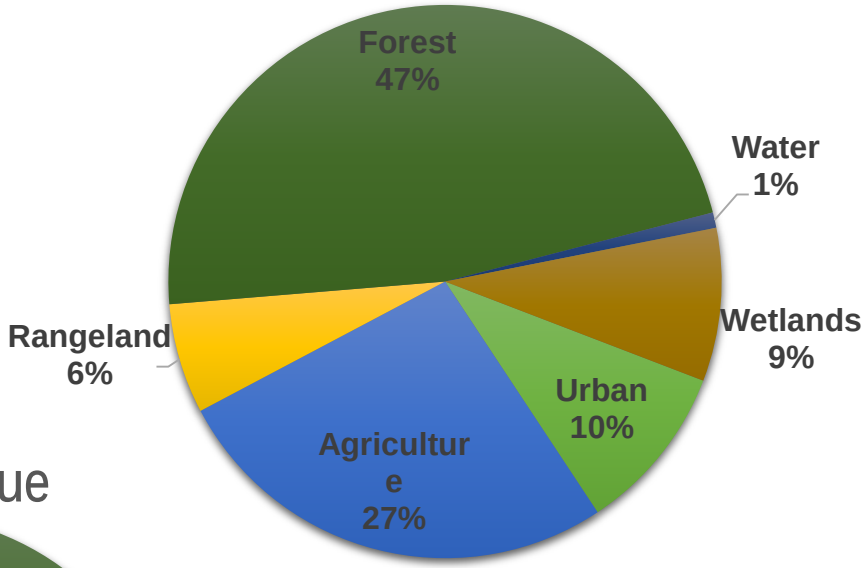


Land Use

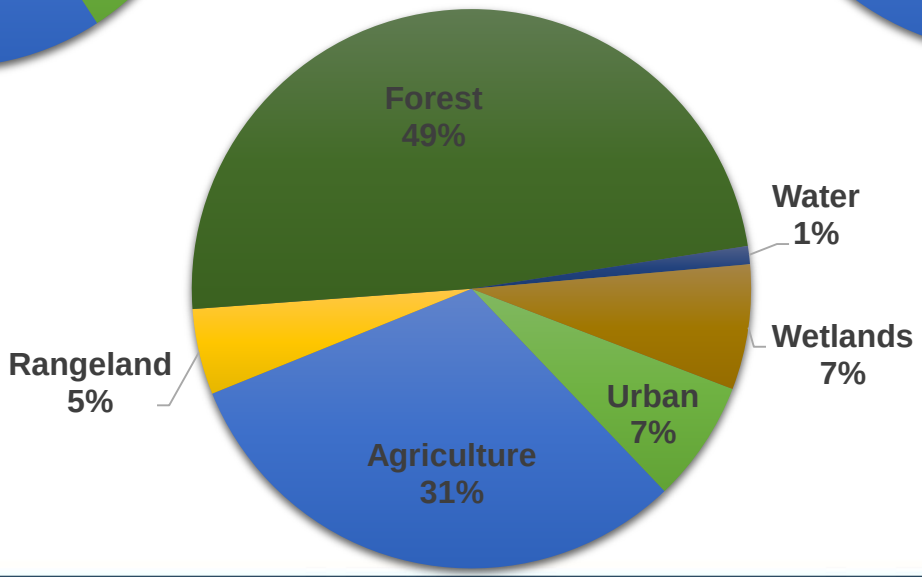
Fanning-Manatee



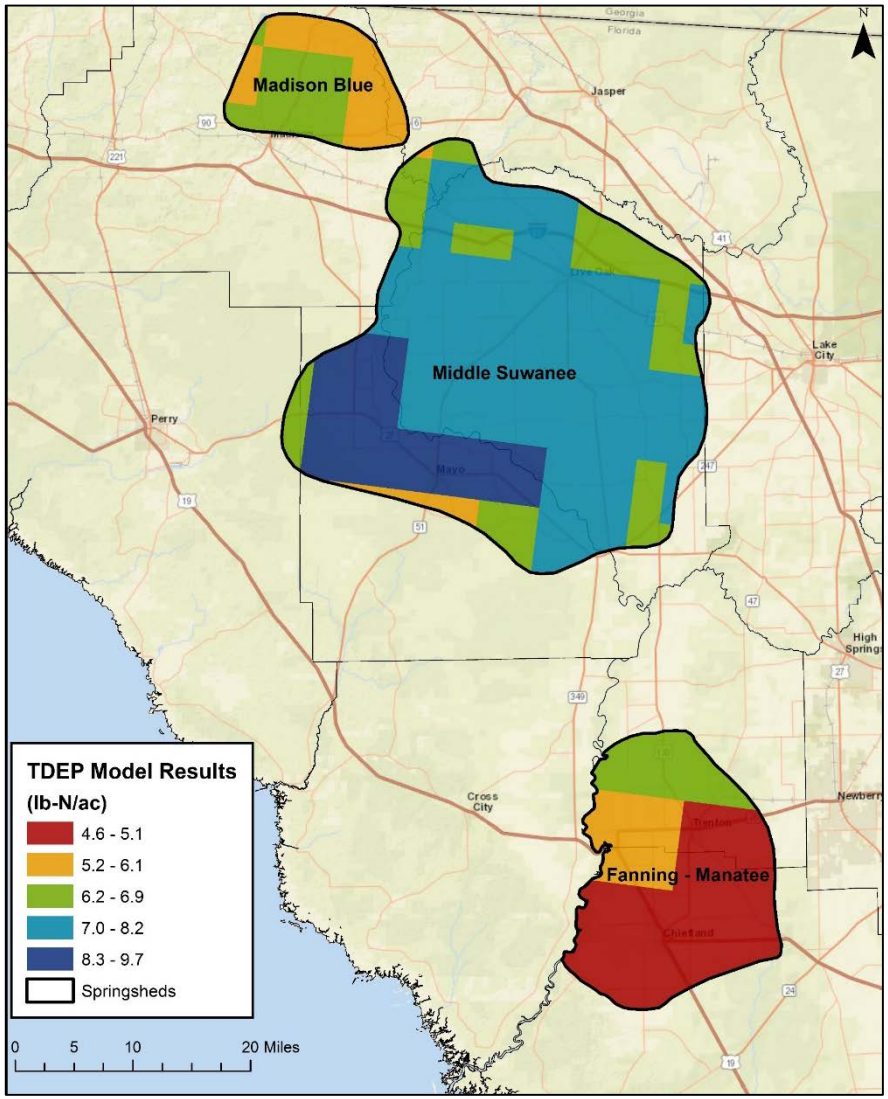
Middle Suwannee



Madison Blue



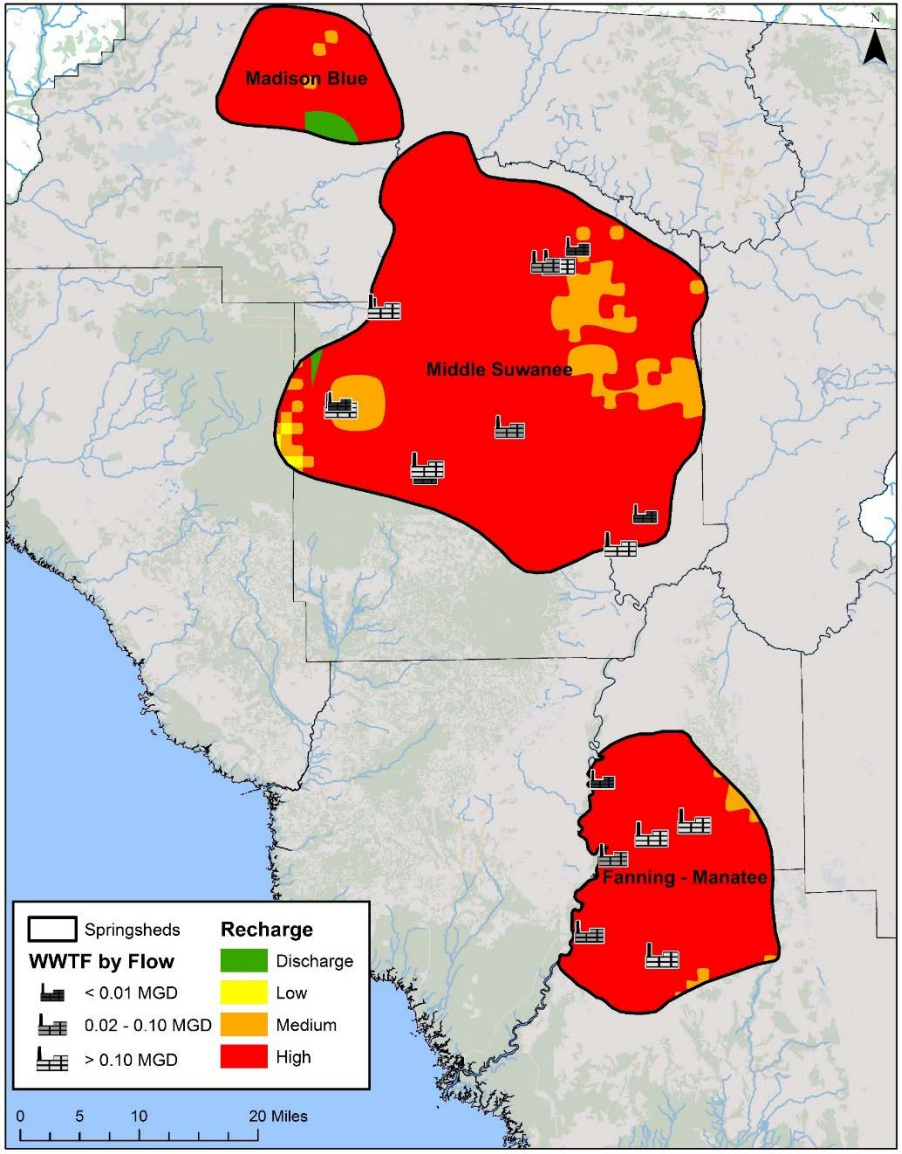
Atmospheric Deposition



- TDEP model
  - U.S. EPA method to estimate spatially continuous atmospheric deposition
  - Nationwide total deposition model for N and S
  - Estimated deposition based on monitoring stations and modeled atmospheric concentrations
  - Model year is an average from 2011 to 2013
  - Average TN deposition
    - Range 4.6 - 9.7 lb-N/ac/yr

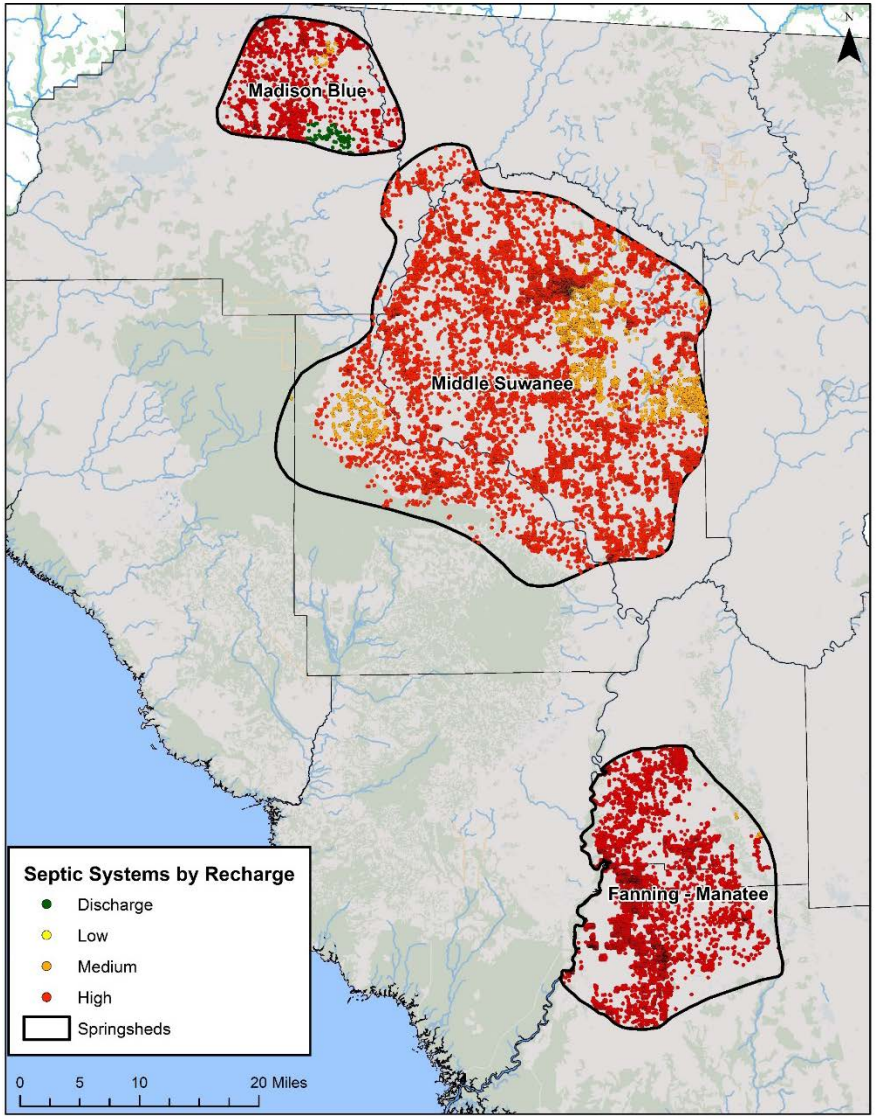
Domestic Wastewater Treatment Facilities

- TN effluent concentrations as reported to DEP
- NO_3 used to project TN data, if necessary
- Effluent data separated based on treatment type
  - RIBs, Absorption Fields
  - Sprayfields
  - Reuse



Septic Systems

- Septic count taken from DOH's Florida Water Management Inventory (FLWMI)
- Accuracy of this data was verified using an aerial analysis
- Calculate # of people relying on septic tanks
- Average annual input to septic tank = 9.012 lb-N/person (US EPA)



Estimating Livestock Populations and Waste

Livestock	Waste Factor (lb-N/day)
Beef Cows	0.337
Other Beef Cattle	0.31
Chicken, broilers	0.002
Chicken, layers	0.003
Calves	0.068
Equine	0.273
Goats	0.035
Hogs	0.19
Sheep	0.198
Turkeys	0.006

Literature review provided information on common livestock animals in Florida

- Animal waste factors

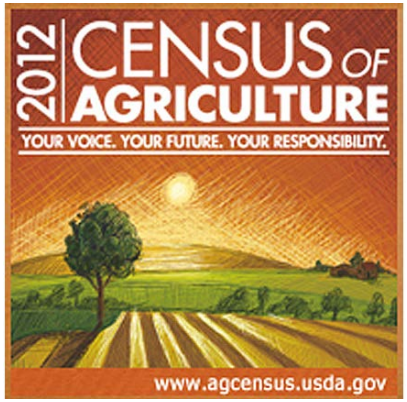
2012 Census of Agriculture (CoA)

- # of livestock (categorized by animal)
- Full county data ONLY

2016 USDA Survey

- # of beef cattle

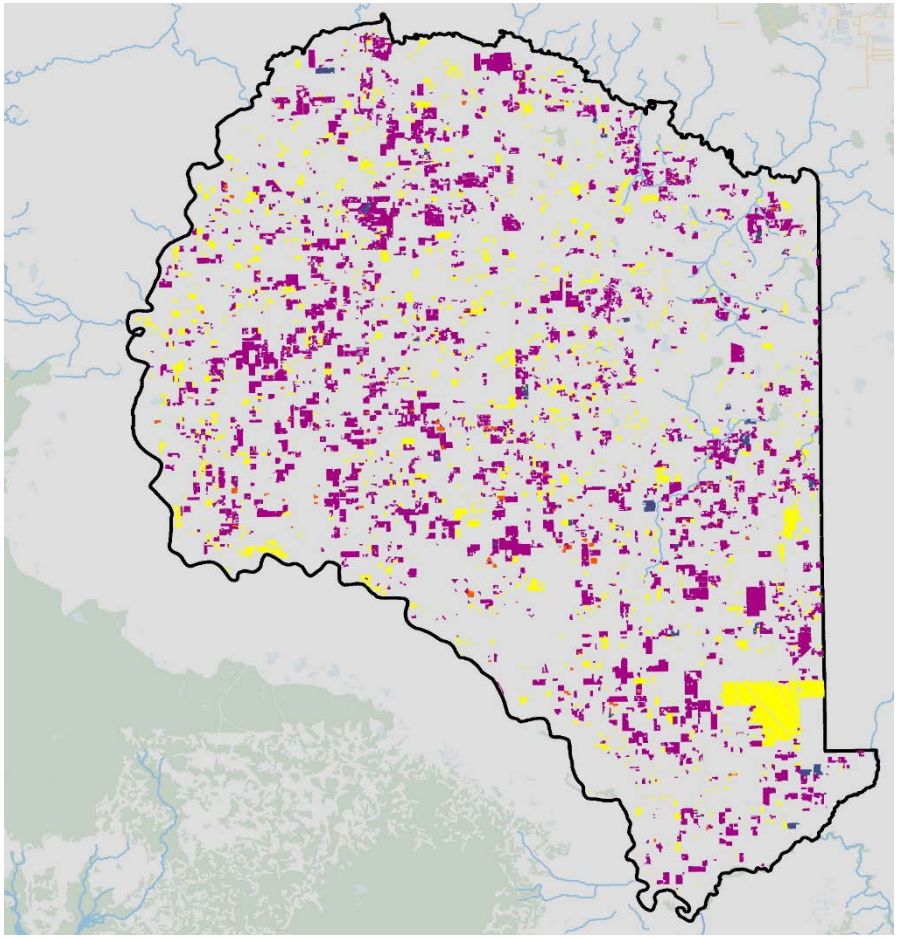
Use County-level land use information to estimate livestock population within the springsheds.

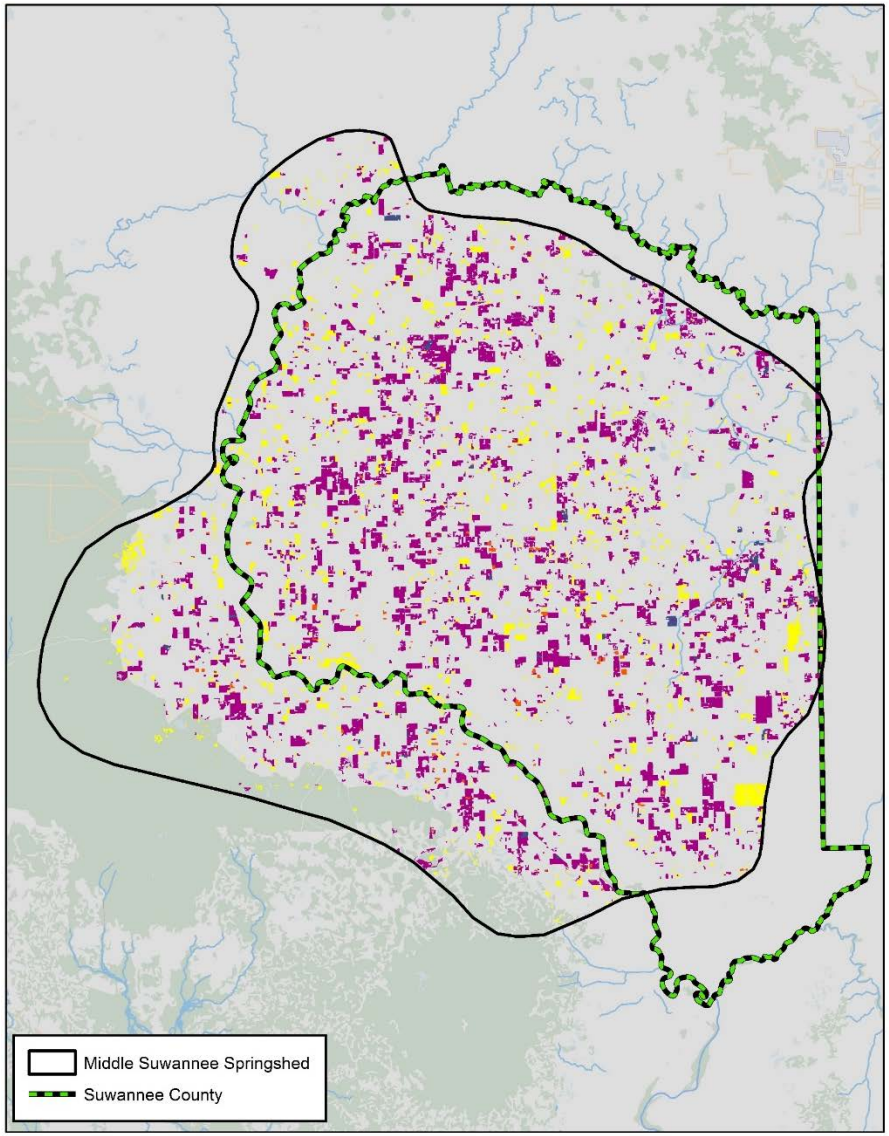


Land Use Description
Cattle Feeding Operations*
Feeding Operations*
Horse Farms
Improved Pastures*
Poultry Feeding Operations
Range Land, Herbaceous (Dry Prairie)*
Specialty Farms
Unimproved Pastures*

* Used to determine lands where beef cattle are likely to be present

Land use Percentages: Livestock





Primary Livestock Waste Contributors

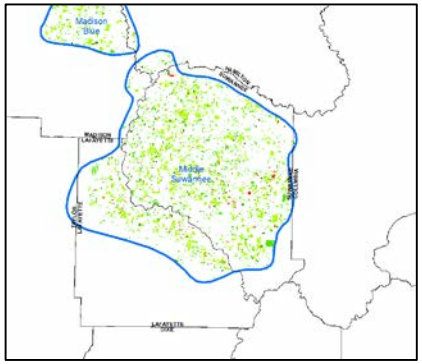
- Dairy Operations
- Poultry Operations
- Cow/Calf Operations (Beef Cattle)

Estimating Beef Cattle (Cow/Calf) Inputs

County livestock waste land use areas

Land Use Description
Cattle Feeding Operations*
Feeding Operations*
~~Horse Farms~~
Improved Pastures*
Range Land, Herbaceous (Dry Prairie)*
~~Specialty Farms~~
Unimproved Pastures*

Identify percentage of livestock waste land use areas that fall within springsheds

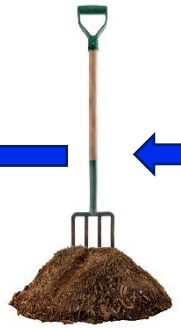


USDA 2016 Survey County Total Cattle Population #s

Subtract known Dairy population to find Beef Cattle Population #s

35% of Total Beef Cattle population assumed to be calves

Calves = Apply daily N waste factors **X** 183 days



Apply daily N waste factors **X** 365 days

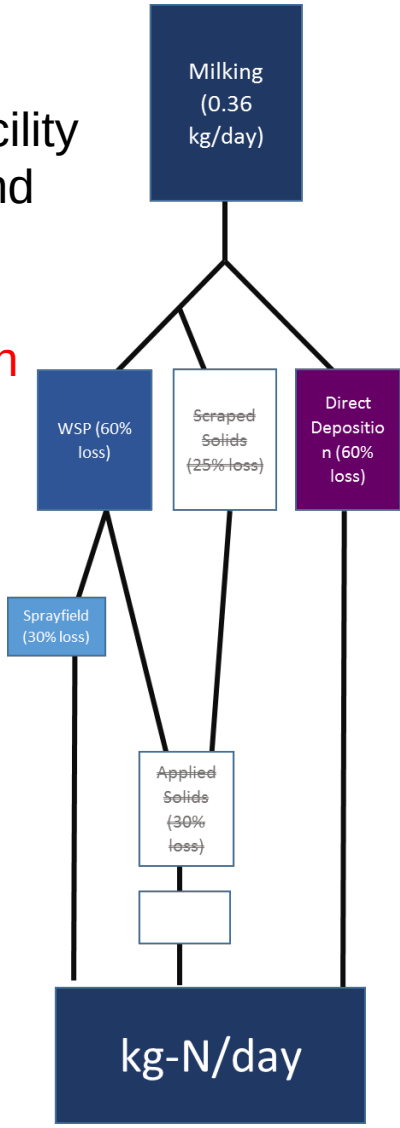
Total N input from Livestock waste

Estimating Dairy Waste Inputs

Permitted Dairy Operations

Detailed information is obtained from the DEP industrial wastewater facility permits on herd sizes, type of cows, confinement and grazing times, and waste management and disposal information

The specific waste handling process was assessed individually for each dairy because of differences in operation from site to site



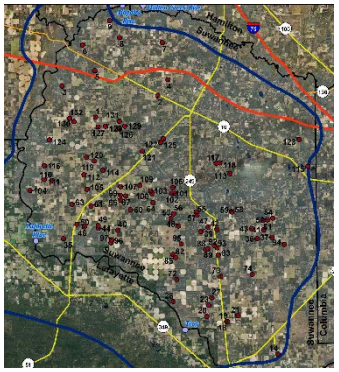
Non-Permitted Dairy Operations*

Obtained herd size, confinement and waste treatment practice information from FDACS field staff and Southeast Milk

* A dairy operation containing less than 700 mature dairy cows

stimating Poultry Inputs

Identification of poultry operations



Account for rotation of birds to determine average **annual** population

Apply Daily N Waste Factors x 365

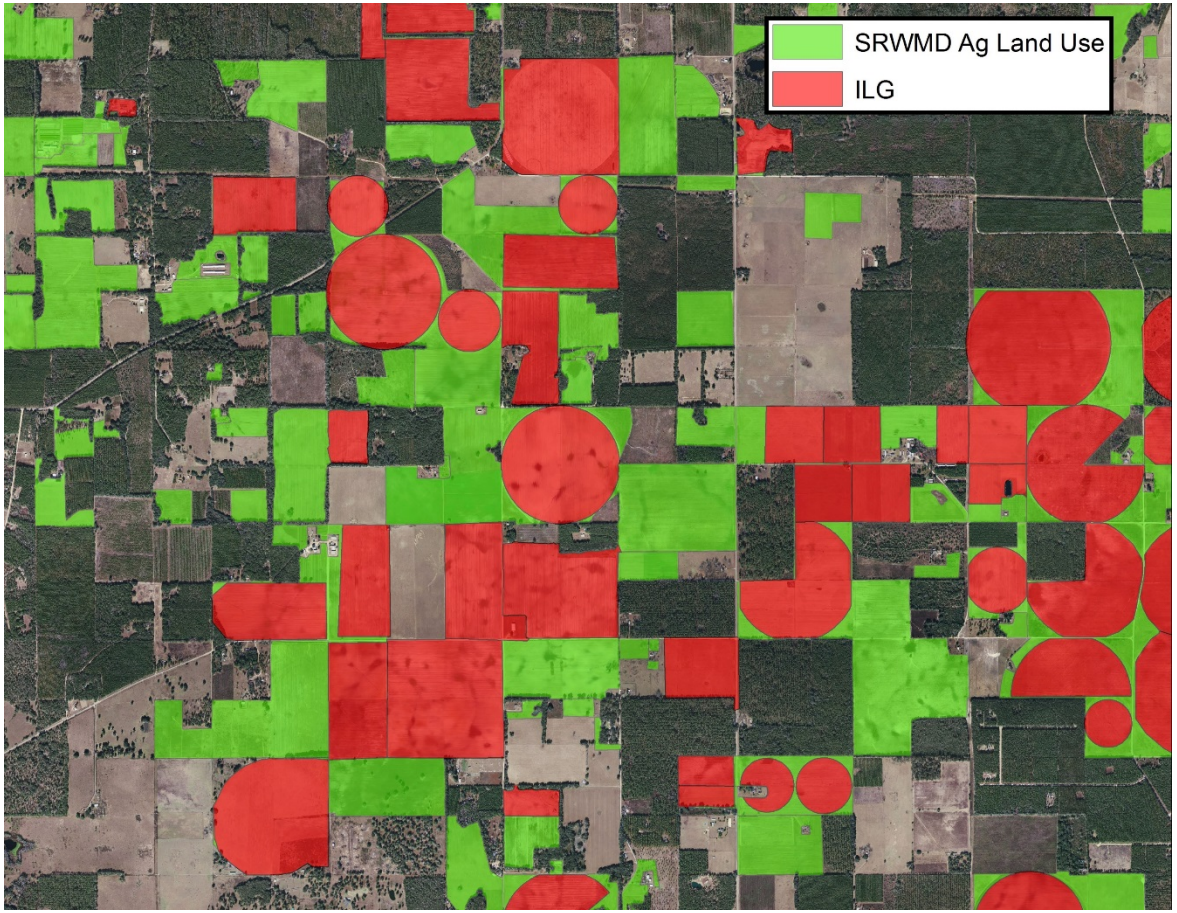
Layer Chicken DWF (lb-N)	Broiler Chicken DWF (lb-N/day)
0.003	0.002

Volatization during storage

Litter brokerage and offsite application

Total N Input from Poultry Operations

Combination of Three Agricultural Land Use Tools to Estimate Crop Type and Acreage



Irrigated lands and crop type based on FSAID irrigated lands geodatabase (ILG).

Outside of ILG, agriculture areas based on WMD land use.

Crop fertilizer application rates were applied to the acreages identified within springsheds based on crop type.

Application rates based on UF-IFAS recommended rates as well as producer feedback.

Urban Turfgrass Fertilizers

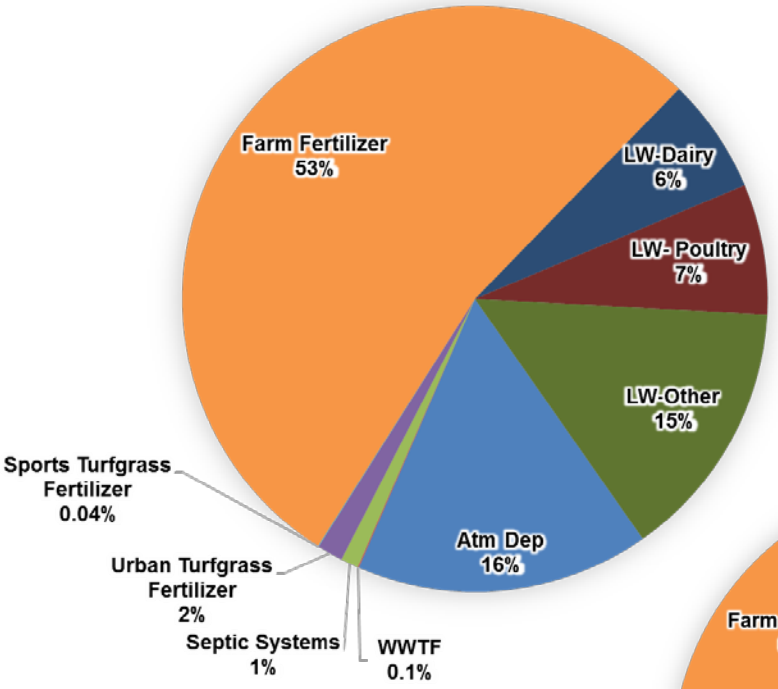
- Acreage likely to receive fertilizer estimated from PA data and property values
  - Residential
  - Non-residential
- Maximum fertilizable acreage was capped at 1 acre
- **Annual Application Rates based on SWFWMD study**
- Property values used to assess probability of fertilization

Sports Turfgrass Fertilizers

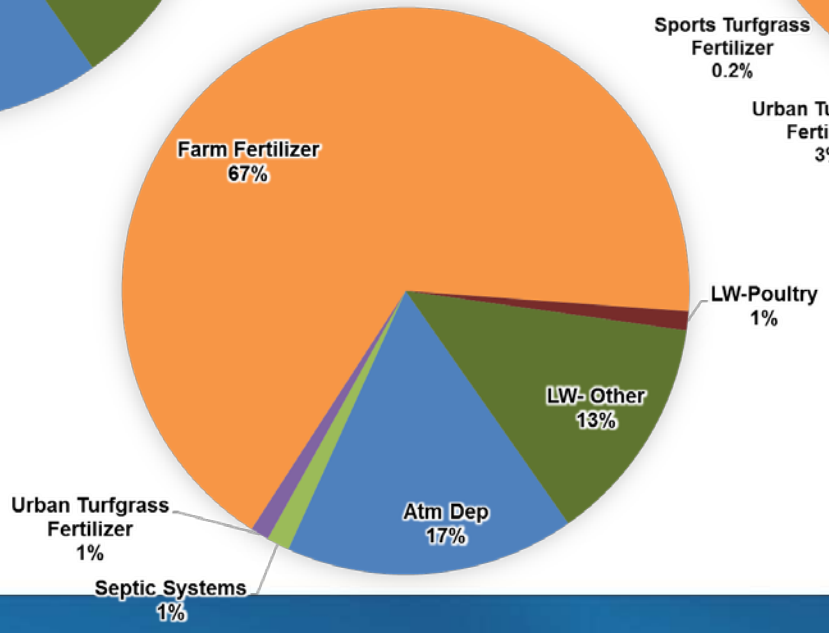
- Sports fields
  - Acreage estimates from aerial analysis of PA landuse data
  - Application rates based on lawn service company estimates
- Golf Courses
  - Acreage estimated through PA landuse data
  - Annual application rate = 4.5 lb-N/1,000 sq ft

Estimates of Nitrogen Inputs

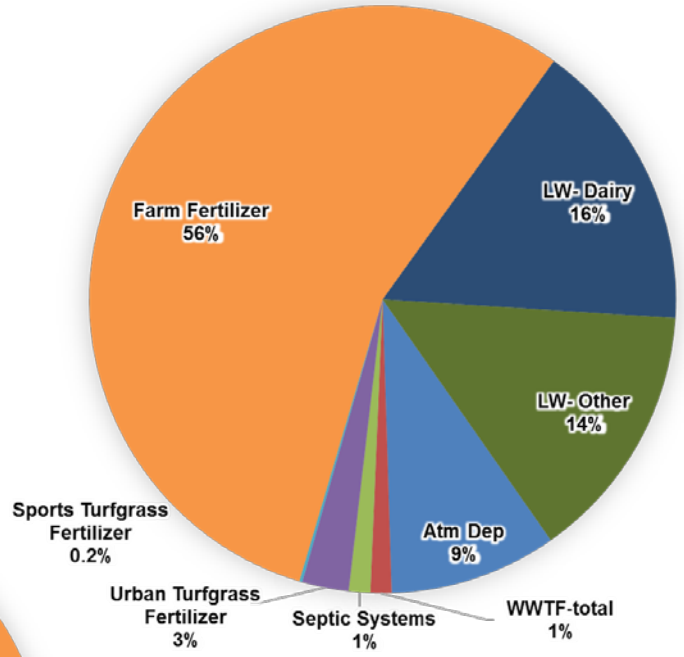
Middle Suwannee



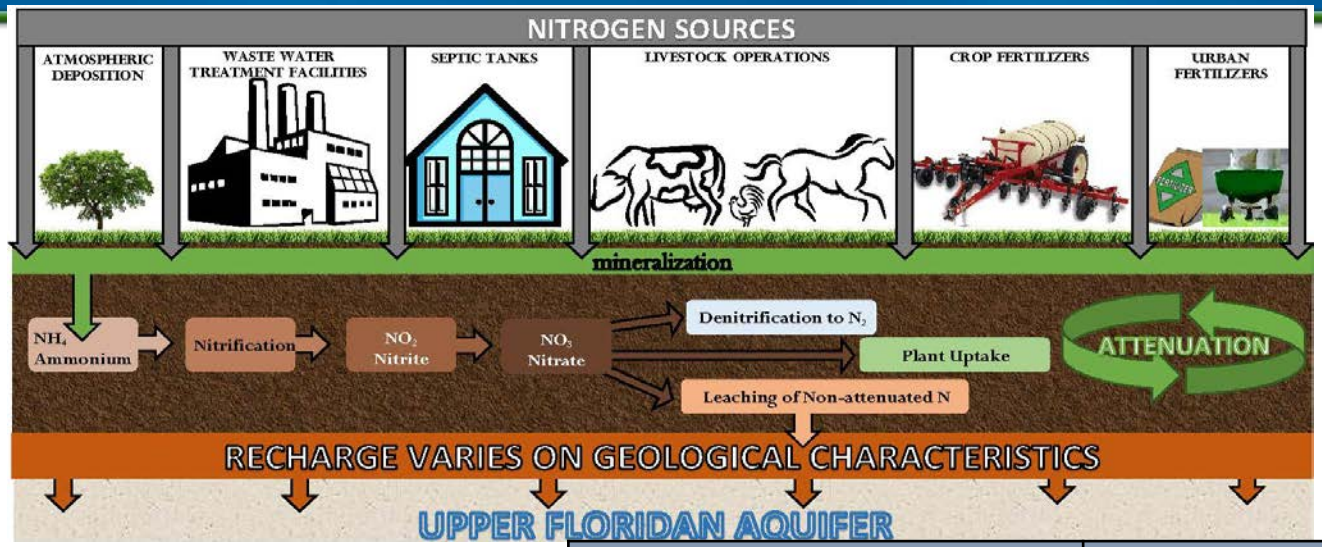
Madison Blue



Fanning-Manatee



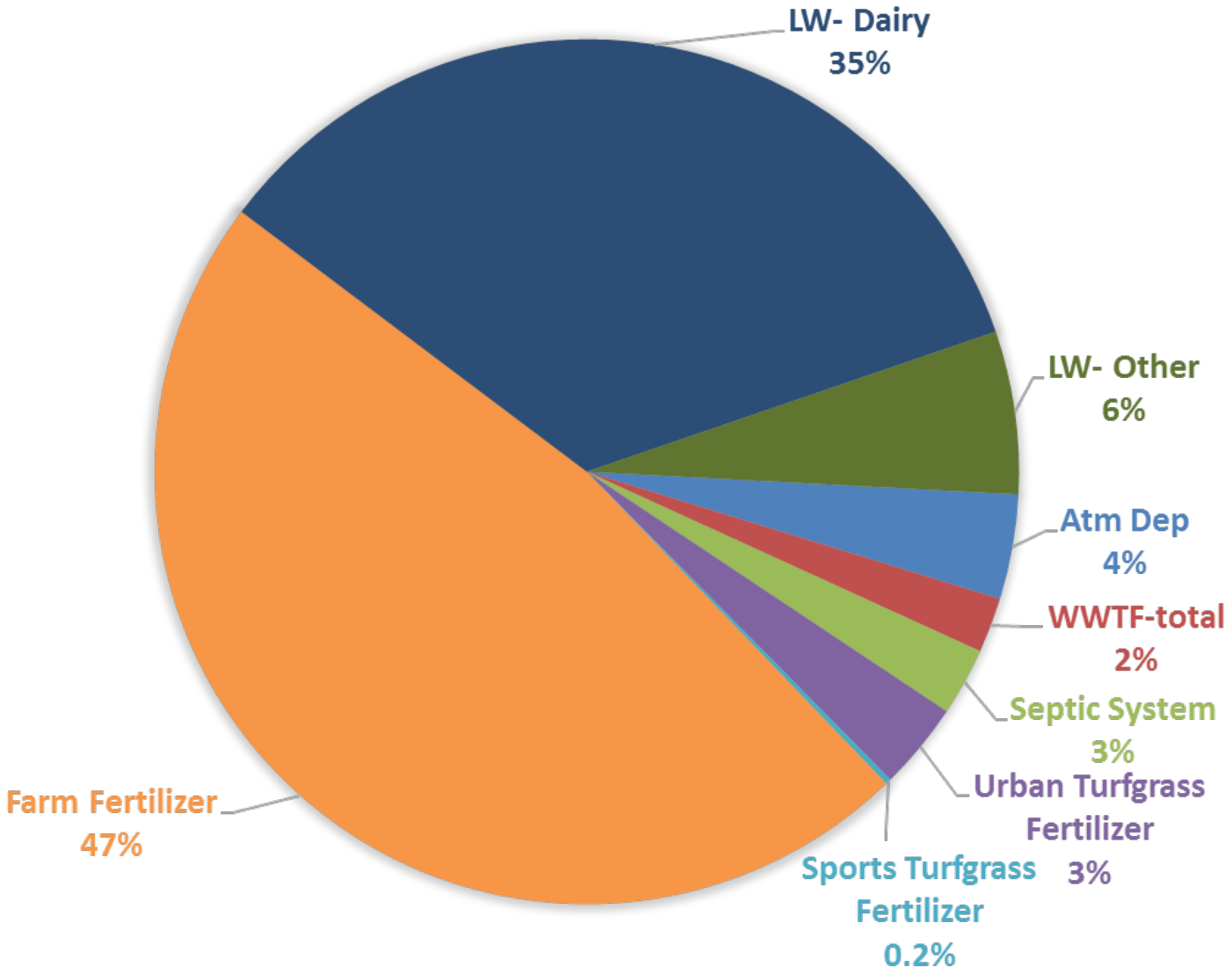
Biochemical Attenuation Factors



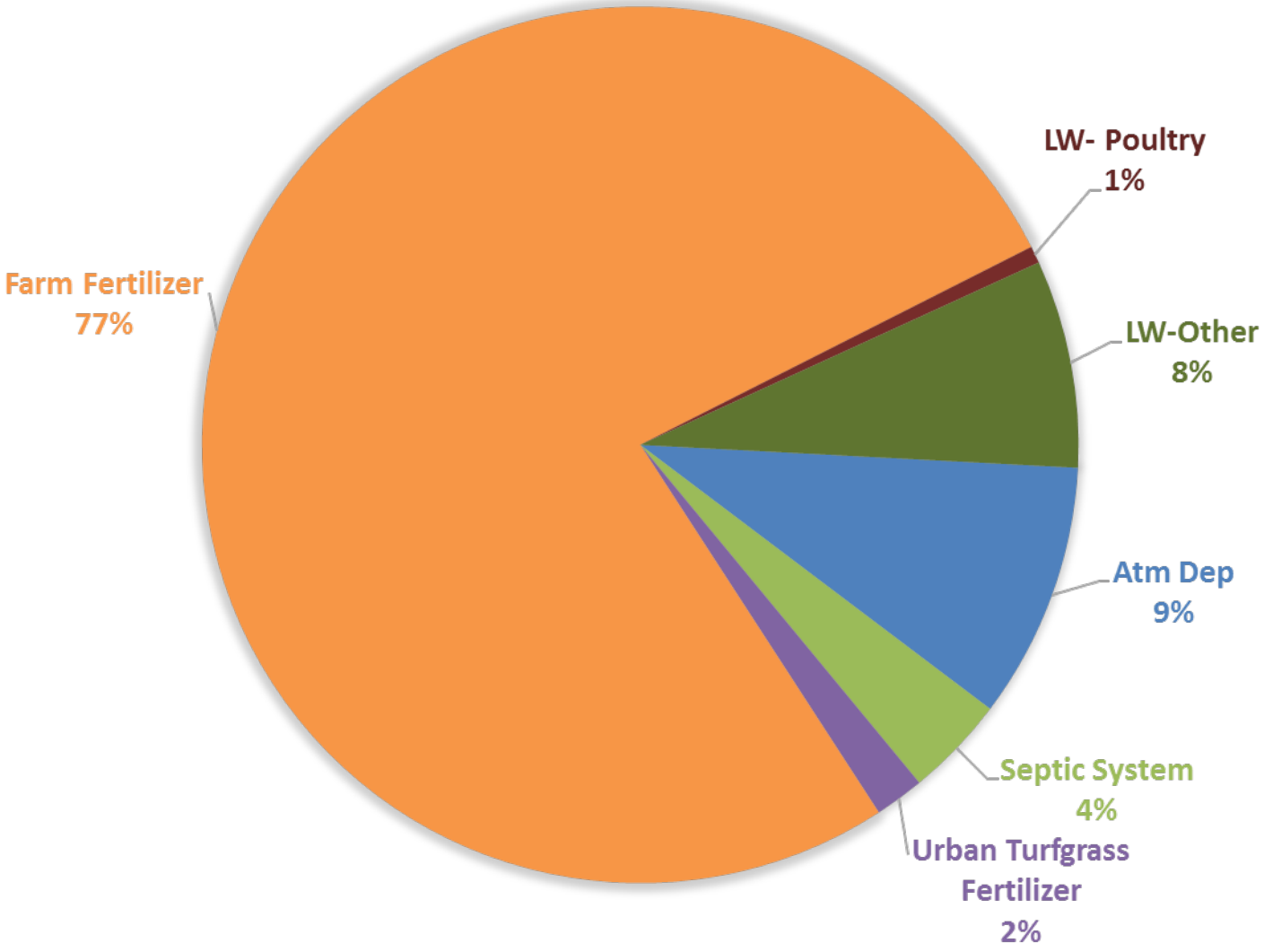
- Represent the percentage of N removed and therefore not available for leaching to groundwater
- Based on factors used in similar past studies and found in relevant literature

Loading Category	N Attenuation Factor	N Leaching
Atmospheric Deposition	90%	10%
Septic Systems	50%	50%
WWTF-RIB	25%	75%
WWTF-Sprayfield	60%	40%
WWTF-Reuse	75%	25%
Urban Turfgrass Fertilizers	70%	30%
Sports Turfgrass Fertilizers	70%	30%
Farm Fertilizers	80%	20%
Livestock- Dairy	50%	50%
Livestock- Poultry	90%	10%
Livestock- Other	90%	10%

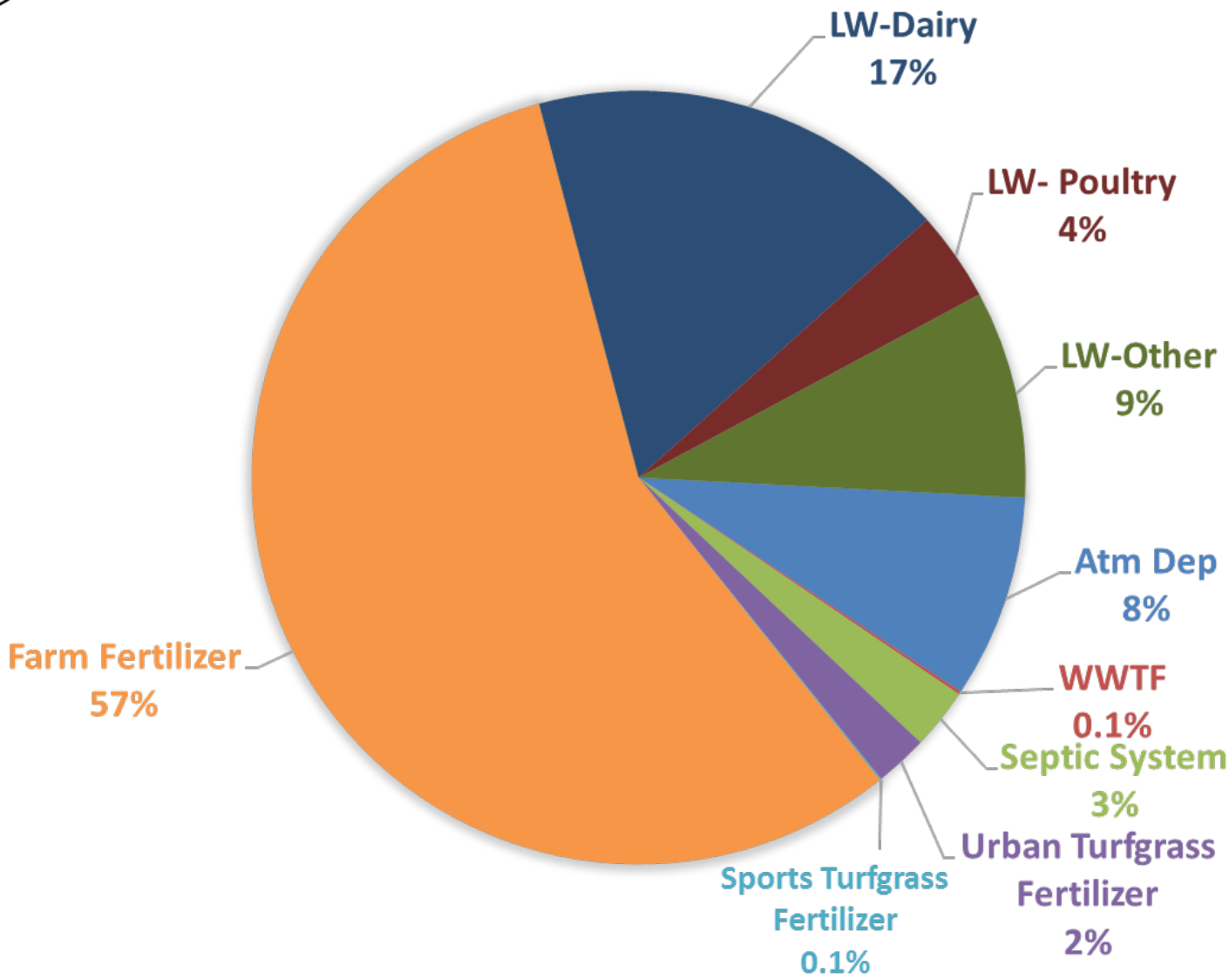
Fanning-Manatee- Nitrogen Load to Groundwater



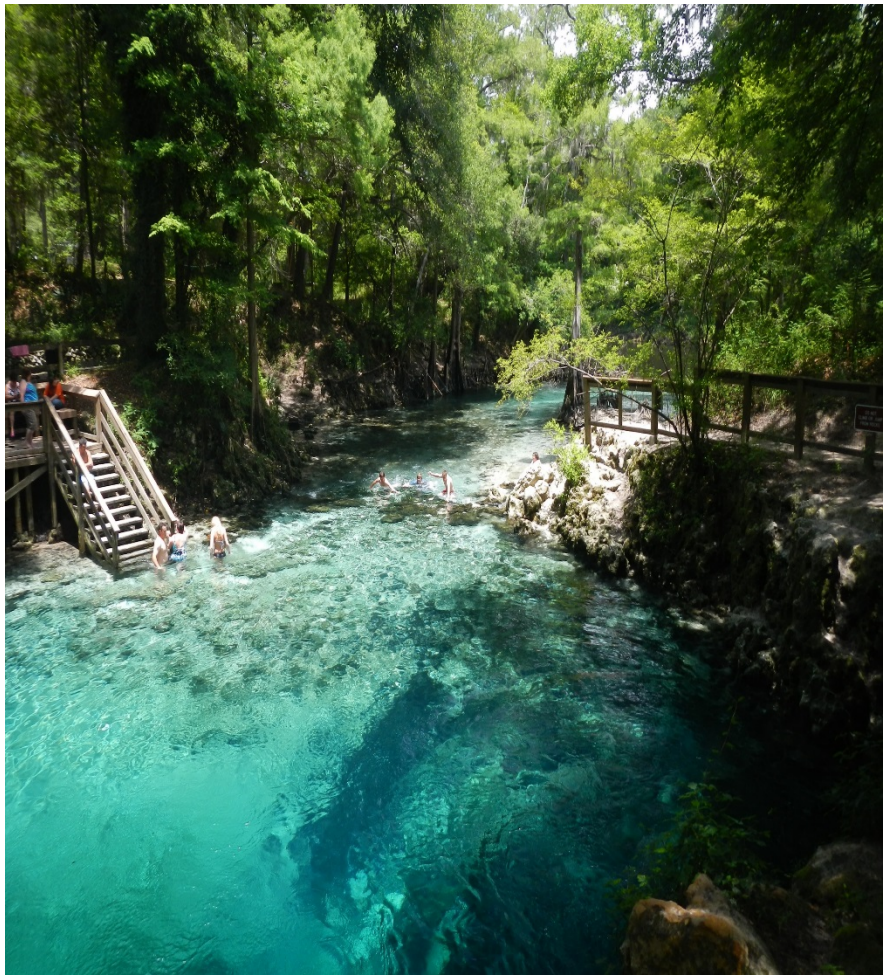
Madison Blue-Nitrogen Load to Groundwater



Middle Suwannee- Nitrogen Load to Groundwater



QUESTIONS??



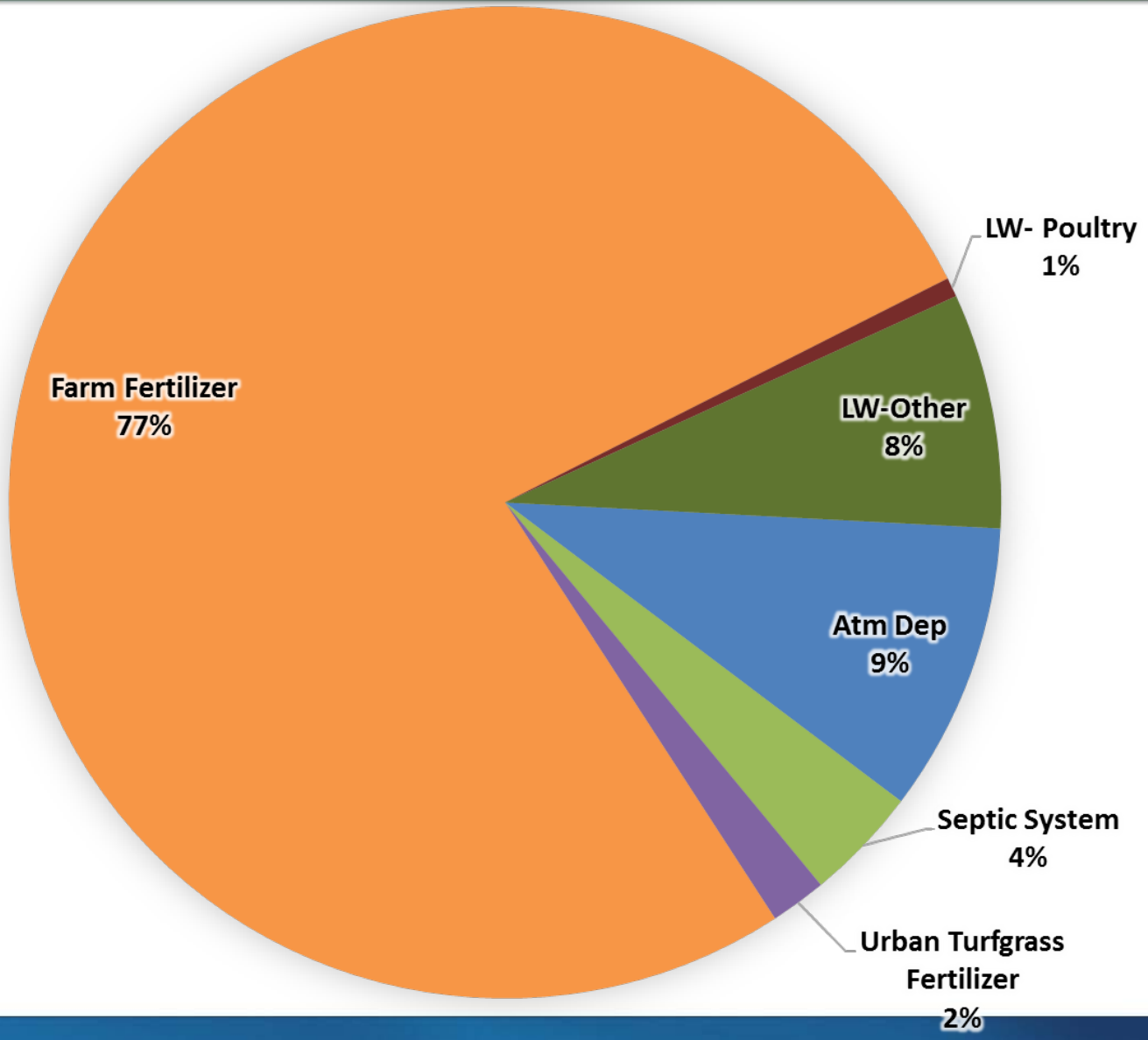
http://fdep.maps.arcgis.com/home/index.html

http://fdep.maps.arcgis.com/apps/MapJournal/index.html?appid=e71ecaa35bdd4caaba7a0c411691dfa7

Loads to Groundwater

Withlacoochee River Nitrogen Loading to Groundwater

Withlacoochee River



Withlacoochee River Nitrogen Reductions by Source

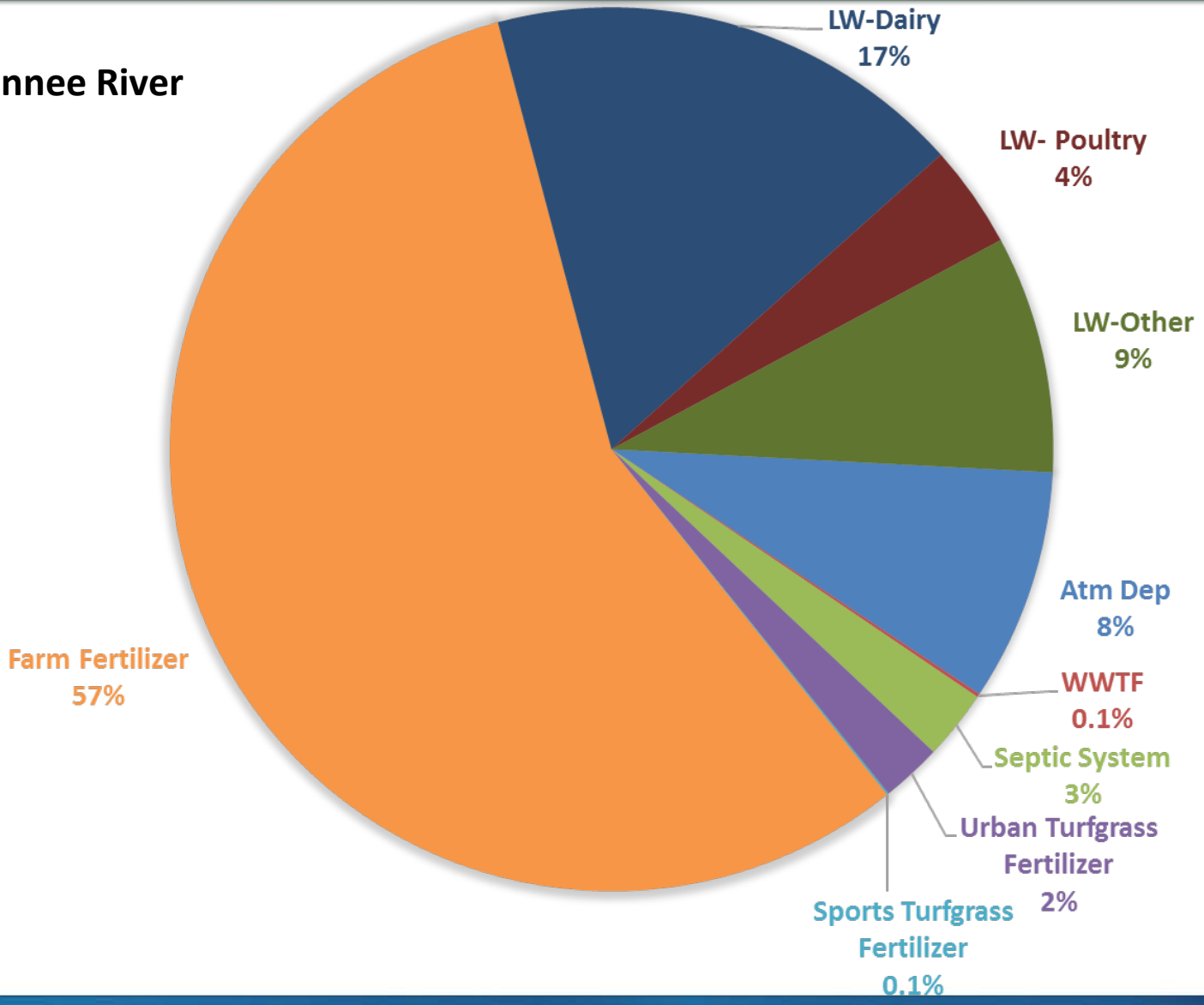
Source	Estimated Portion of Total Load (%)	Estimated Total Nitrogen Load to Groundwater (pounds of Nitrogen per year [lbs-N/yr])	Estimated Load Reduction (lbs-N/yr) [Groundwater Load – TMDL Load (x) %]
Septic systems	4 %	16,833	14,963
Urban turfgrass fertilizer	2 %	8,246	7,481
Atmospheric deposition	9 %	42,745	33,666
Farm fertilizer	77 %	346,652	288,033
Sports turfgrass fertilizer	0 %	-	-
Livestock waste – poultry and other	8 % + 1 %	36,948	29,926
WWTF	0 %	-	-
Totals	**100 %**	**451,424**	**374,069**

TMDL = Total Maximum Daily Load

Draft April 2017

Middle Suwannee River Nitrogen Loading to Groundwater

Middle Suwannee River



Middle Suwannee River Nitrogen Reductions by Source

Source	Estimated Portion of Total Load (%)	Estimated Total Nitrogen Load to Groundwater (pounds of Nitrogen per year [lbs-N/yr])	Estimated Load Reduction (lbs-N/yr) [Groundwater Load – TMDL Load (x) %]
Septic systems	2 %	108,122	87,971
Urban turfgrass fertilizer	2 %	94,053	77,414
Atmospheric deposition	9 %	362,637	299,101
Farm fertilizer	57 %	2,411,145	1,984,620
Sports turfgrass fertilizer	0.1 %	2,845	2,111
Livestock waste – dairy, poultry, and other	17 % + 4 % + 9 %	1,228,219	1,062,687
WWTF	0.1 %	5,472	4,926
Totals	**100 %**	**4,212,493**	**3,518,830**

TMDL = Total Maximum Daily Load

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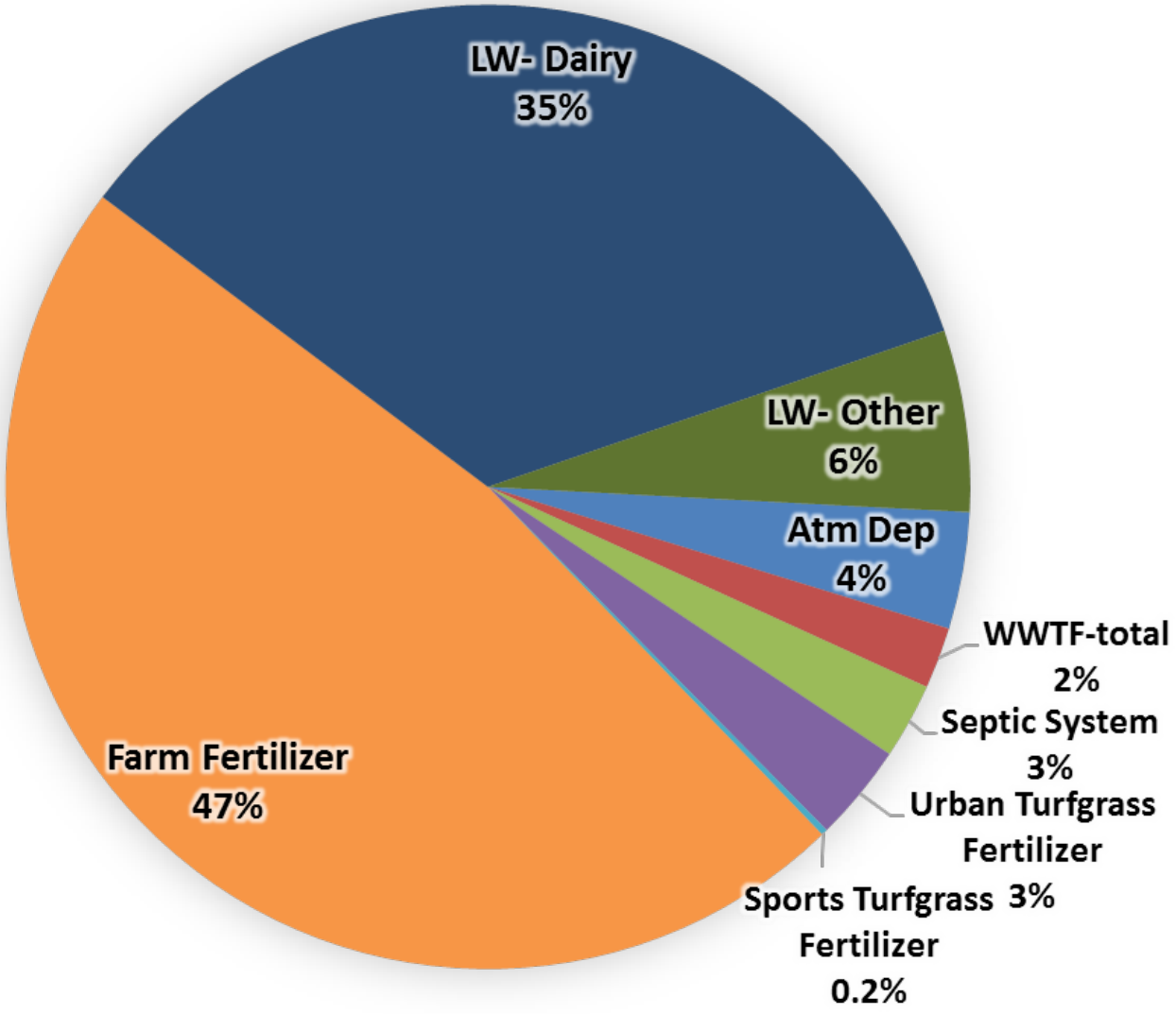
Lower Suwannee River Nitrogen Loading to Groundwater

Lower Suwannee River



Lower Suwannee River Nitrogen Reductions by Source (Fanning/Manatee)

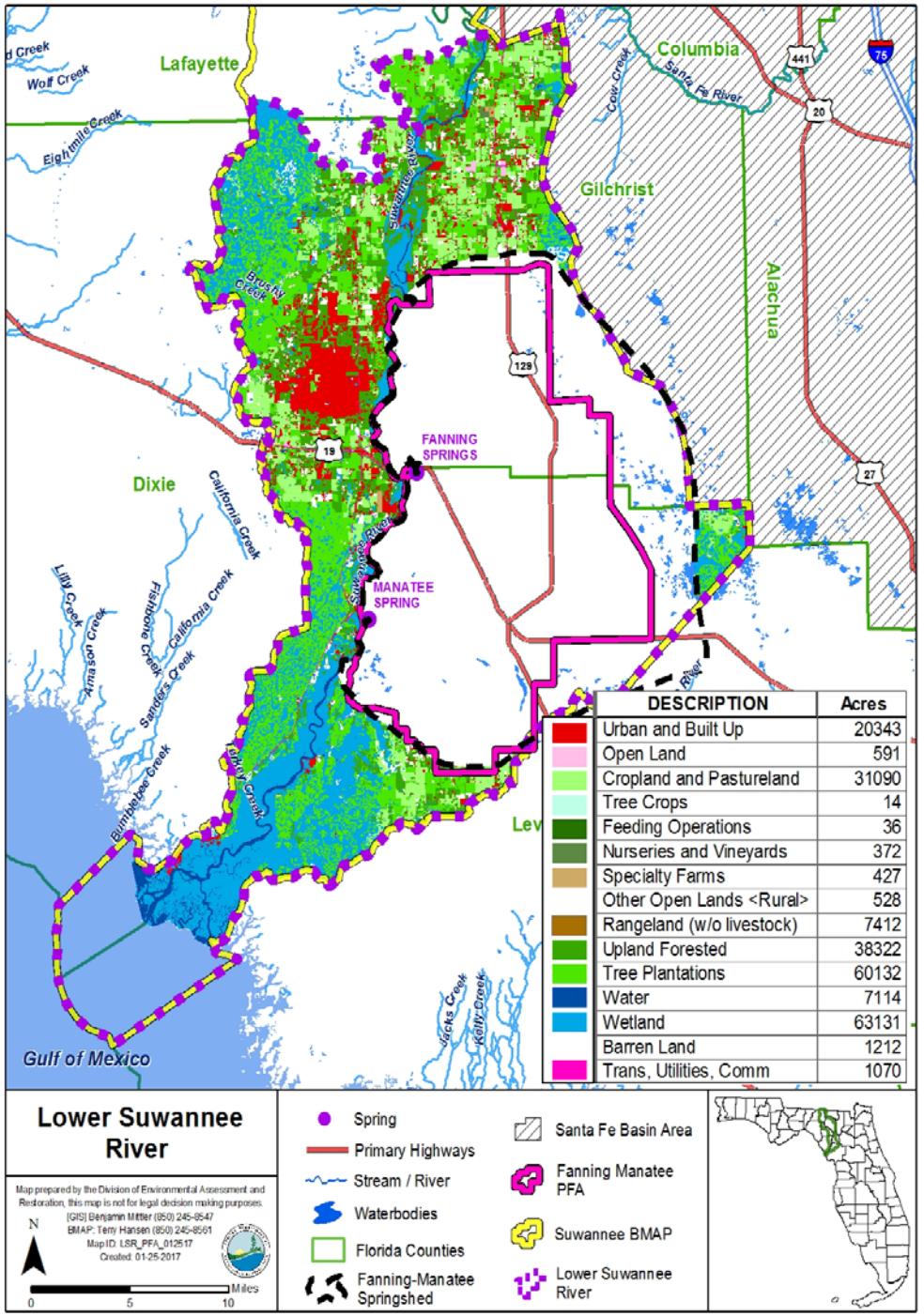
Source	Estimated Portion of Total Load (%)	Estimated Total Nitrogen Load to Groundwater (pounds of Nitrogen per year [lbs-N/yr])	Estimated Load Reduction (lbs-N/yr) [Groundwater Load – TMDL Load (x) %]
Septic systems	3 %	61,822	58,617
Urban turfgrass fertilizer	3 %	79,471	73,813
Atmospheric deposition	4 %	95,500	89,010
Farm fertilizer	47 %	1,156,345	1,076,808
Sports turfgrass fertilizer	0.2 %	5,104	4,342
Livestock waste – dairy and other	35 % + 6 %	884,288	824,974
WWTF	2 %	50,173	43,420
Totals	**100 %**	**2,332,703**	**2,170,983**

TMDL = Total Maximum Daily Load

Draft April 2017

PFA and BMAP area

Lower Suwannee PFA and BMAP Area



Total Suwannee River BMAP Nitrogen Reductions by Source

Source	Estimated Total Load Reduction to Groundwater Entire Suwannee River BMAP Area Millions (M) of pounds of Nitrogen
Septic systems	0.24M
Urban turfgrass fertilizer	0.16M
Atmospheric deposition	(0.319M)
Farm fertilizer	4.4M
Sports turfgrass fertilizer	0.007M
Livestock waste	4.3M
WWTF	0.05M

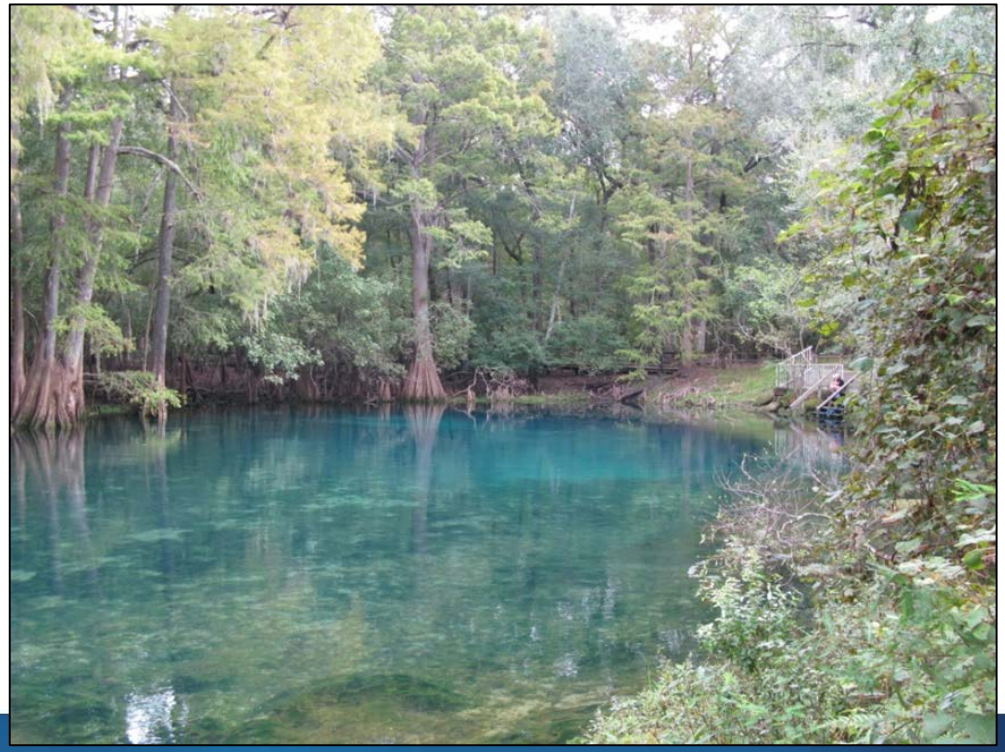
Draft April 2017

Source Category Needs to meet 5-year Reductions

- **Sports Turfgrass – Golf Courses**
  - Confirm rate of application for sports turfgrass facilities.
  - Document relevant BMP implementation.
- **Agriculture – Livestock**
  - Determine % reductions from BMP implementation.
  - Develop and implement additional BMPs.
- **Agriculture – Farm Fertilizer**
  - Document % reductions from BMP implementation.
  - Develop and implement additional BMPs.
- **Urban Turfgrass**
  - Document reductions.
  - Develop additional measures.
- **Septic Systems**
  - FDOH legislation to allow septic tank drain field enhancement.
  - Conversion plan.
- **WWTF**
  - Upgrade plans for facility(ies).

Monitoring

- www.mysuwanneeriver.com
- Real time water quality springs data (SUNA or EXO2) for the following sites:
  - Troy.
  - Fanning.
  - Manatee.
  - Madison Blue.
- Water resources:
  - SRWMD water data portal.
  - Nitrate map.
  - Springs dashboard.



Basin Management Action Plan

- BMAP area.
- PFAs for OFS.
- BMAP area load reductions based on NSILT estimates.
- 5-, 10-, and 15-year milestones.
- Projects to meet 5-, 10-, and 15- year milestones by source category adequate to meet TMDL in 20 yrs.
- Monitoring plan.

Basin Management Action Plan

- Schedule
  - Draft BMAP for public review in May 2017.
  - Public meeting in June 2017.
  - Proposed BMAP adoption in July 2017.

Basin Management Action Plan

Contact: Terry Hansen, P.G.

terry.hansen@dep.state.fl.us

http://www.dep.state.fl.us/water/

http://publicfiles.dep.state.fl.us/DEAR/BMAP/Suwannee/DRAFT BMAP