



Florida Department of Environmental Protection

Wacissa Springs Basin Management Action Plan (BMAP)

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Basin Coordinators

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Water Quality Framework

Monitor and report progress annually

Adapt and change – new statewide annual report

Collect data

Analyze and verify

List “impaired” waters

REPEAT

Measure success and adapt

Set water quality standards

Monitor water quality

Determine pollution problems

Excessive nutrients

Bacteria, Metals, and Other Impairments

Establish restoration goals (TMDLs)

Gather additional data

Evaluate water quality

Adopt pollutant reduction targets

Work with community leaders

Develop and implement restoration plans (BMAPs)

Allocate responsibilities

Identify projects

- Infrastructure
- Best Management Practices (BMPs)

Establish schedules

Identify success criteria





Wacissa River & Springs Basin Total Maximum Daily Loads (TMDLs)

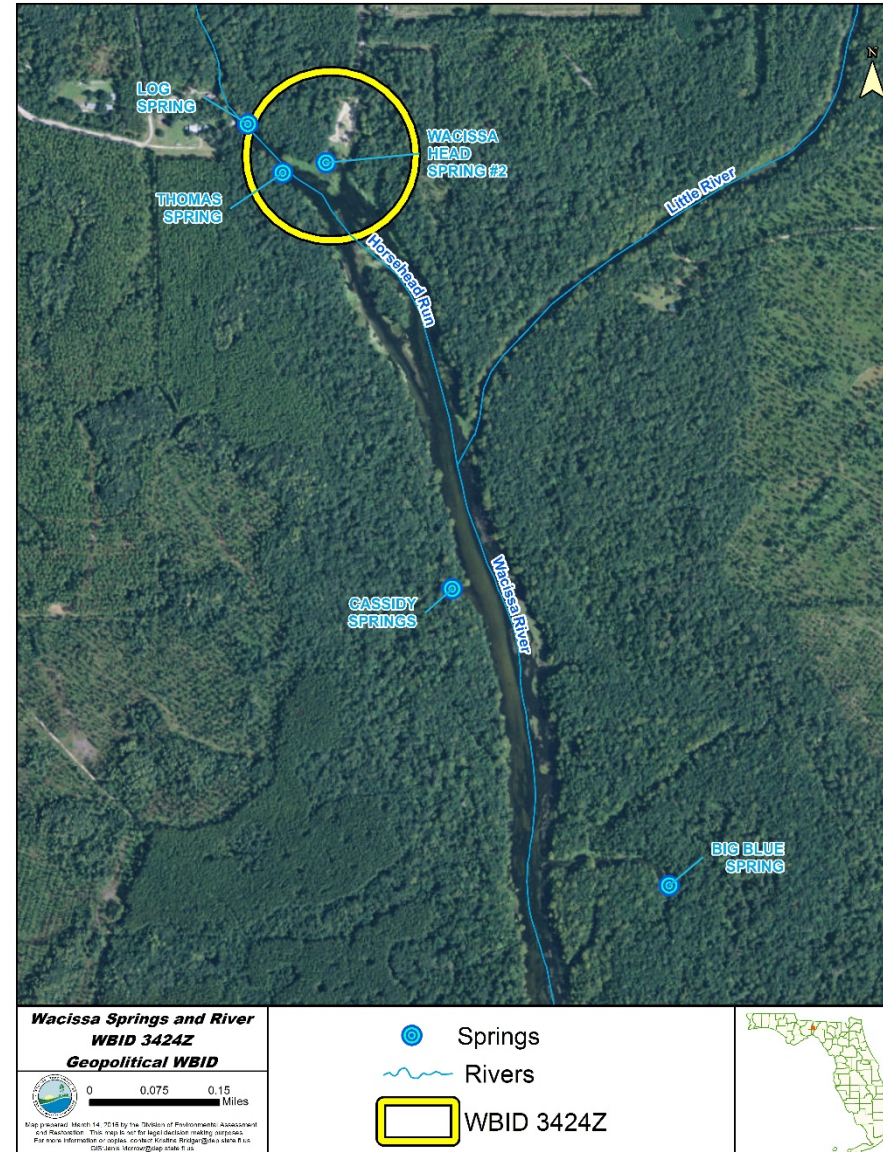
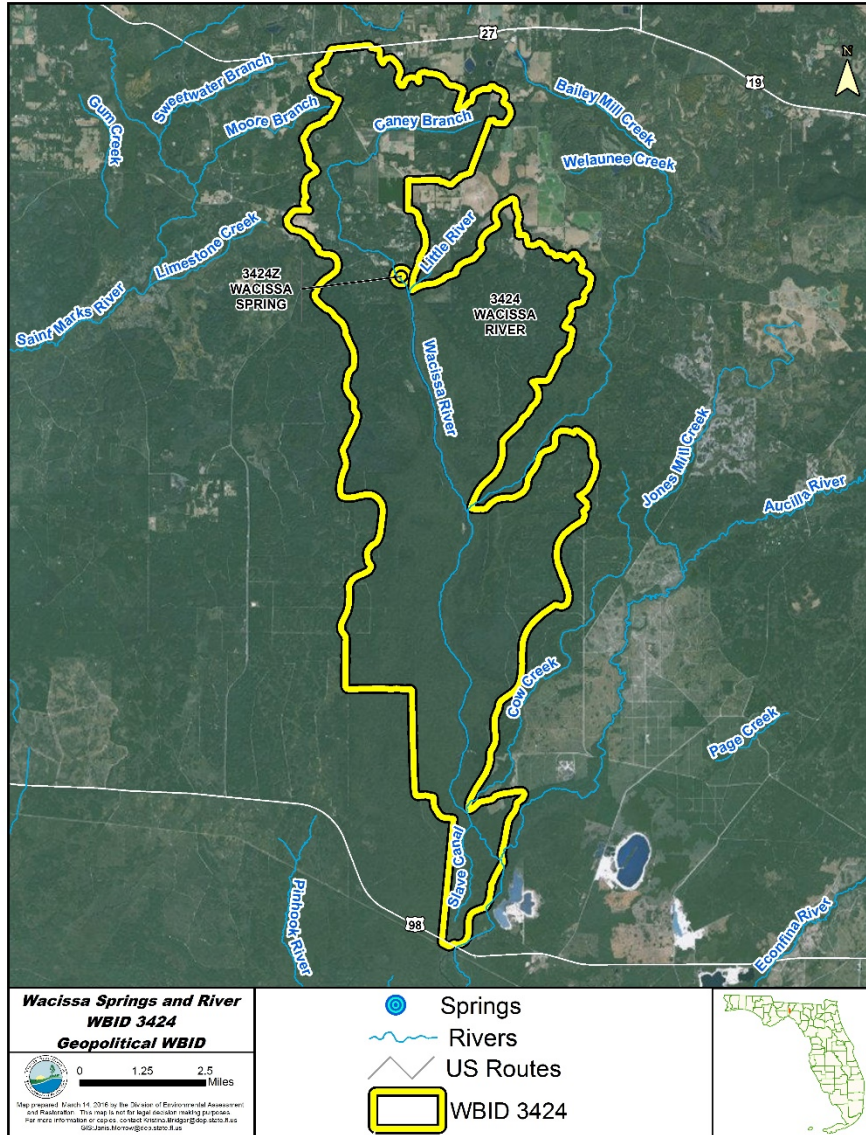
- TMDL
- Data Period of Record: January 1, 2005 through June 30, 2012
- Adopted June 2016
- TMDL Study Results:
 - Nitrate shown to be primary factor in causing algal blooms
- TMDL:
 - Springs - 0.24 milligrams per liter (mg/L) nitrate monthly average concentration (or lower) will not cause an imbalance in the flora or fauna





Wacissa

Total Maximum Daily Loads (TMDLs)





Wacissa

Total Maximum Daily Loads (TMDLs)

WBID	Parameter	TMDL (mg/l)	TMDL % Reduction	Wasteload Allocation for Wastewater	Wasteload Allocation for NPDES Stormwater	Load Allocation	MOS
Wacissa River (WBID 3424)	Nutrients (Nitrate)	0.20	39%	N/A	39%	39%	Implicit
Wacissa Springs (WBID 3424Z)	Nutrients (Nitrate)	0.24	38%	N/A	38%	38%	Implicit

TMDL Table 6.1

WBID: Waterbody identification area.



Regulatory Framework

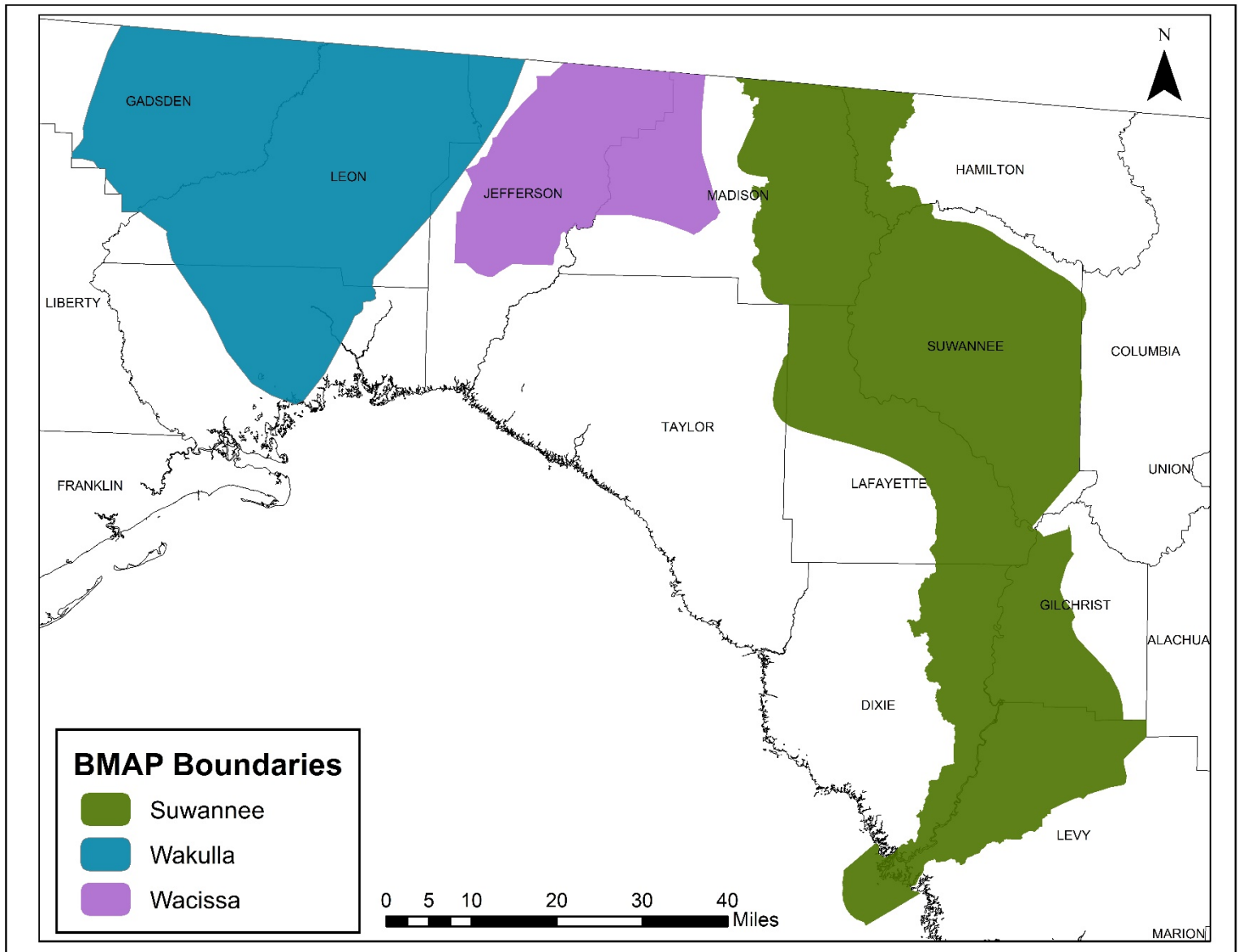
The process for preparing BMAPs is found in:

- Section 403.067, Florida Statutes (F.S.), known as the “Florida Watershed Restoration Act”
- The 2016 Florida Springs and Aquifer Protection Act lists requirements for BMAPs for OFS
- Requirement is to achieve TMDL in 20 years
 - Plan is to achieve:
 - 30 % reduction in 5 years
 - 80 % in 10 years
 - 100 % in 15 years





Regional BMAPs



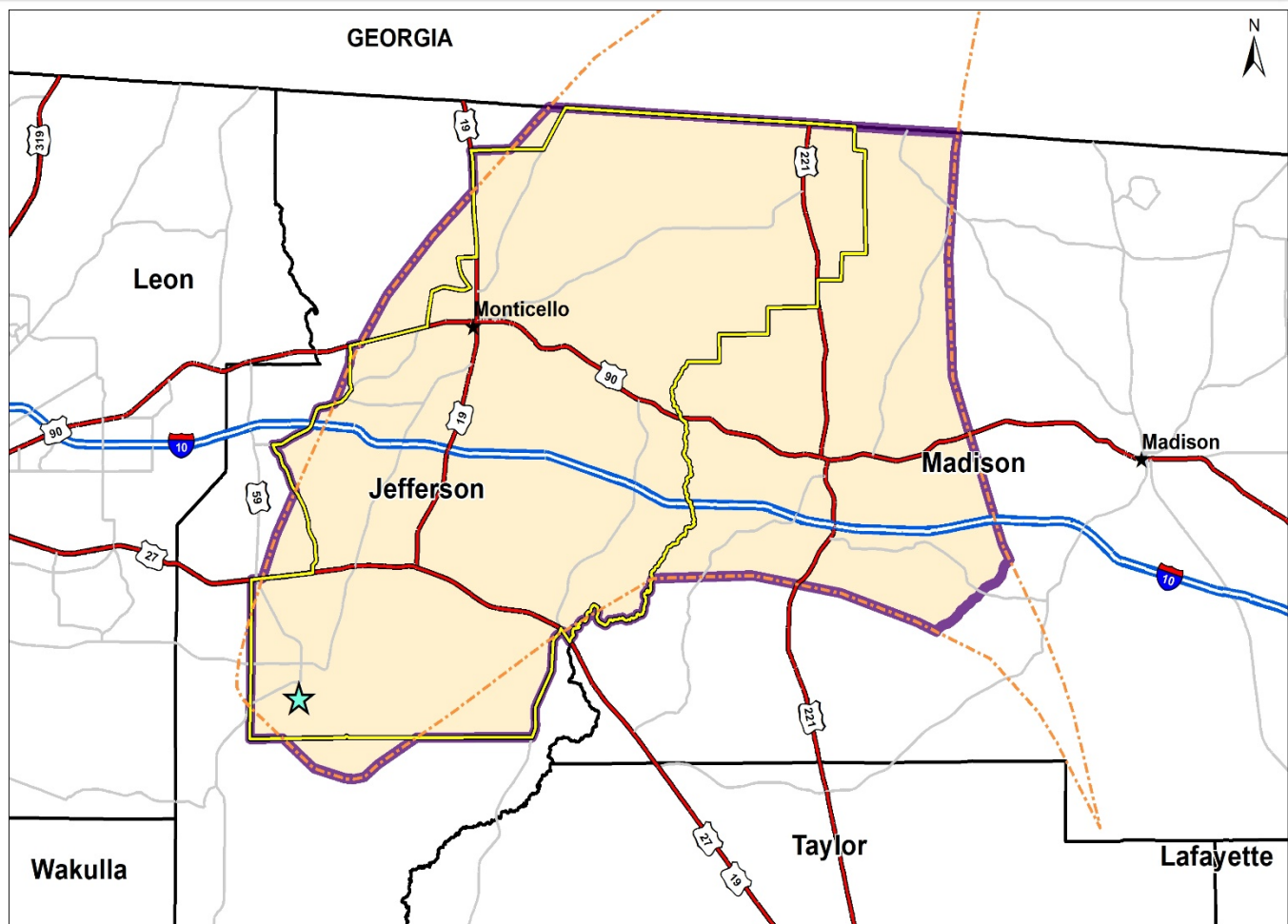


Wacissa BMAP Area

Land Uses:

- Upland Forest (43%)
- Agricultural (16%)
- Wetland/Water (37%)
- Urban/Built-Up (3%)
- Other (1%)

Both agricultural and urban BMPs are being implemented.



Map prepared by the Division of Environmental Assessment and Restoration.
This map is not for legal decision making purposes.
[GIS] Andrew Morris (850) 245-8426
[BMAP] Terry Hansen (850) 245-8561
Map ID: Wacissa (BMAP/PFA/Springshed)
Created: 05-01-2018



- ★ Wacissa Spring
- ★ Wacissa Springshed
- ★ Wacissa PFA
- ★ Wacissa BMAP

- ★ Cities
- Interstate
- Primary and US Highways
- Secondary, State and County Highways
- Florida Counties



2016-1 Requirements

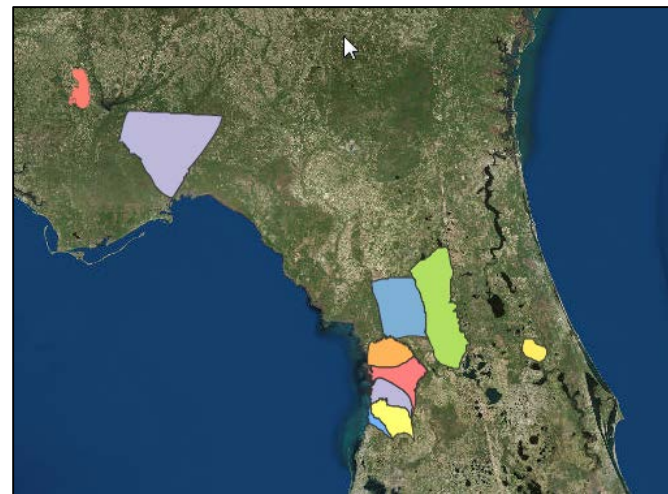
INCLUDE:

- Priority Focus Area (PFA) delineation
Area(s) of basin where Floridan Aquifer is generally most vulnerable
- Identification of point source or category of nonpoint sources with the estimated allocation of the load for each.
 - Nitrogen Source Inventory Loading Tool (NSILT)



NSILT

- Quantifies nitrogen (N) sources and loading to groundwater, and highlights source categories where reductions in N loading could help achieve restoration of impaired waters
- Customizes the nitrogen inventory for each spring basin or BMAP area to account for hydrogeologic and land use differences
- Uses source category percentages to estimate the necessary and achievable reductions



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 SantaFe River Basin

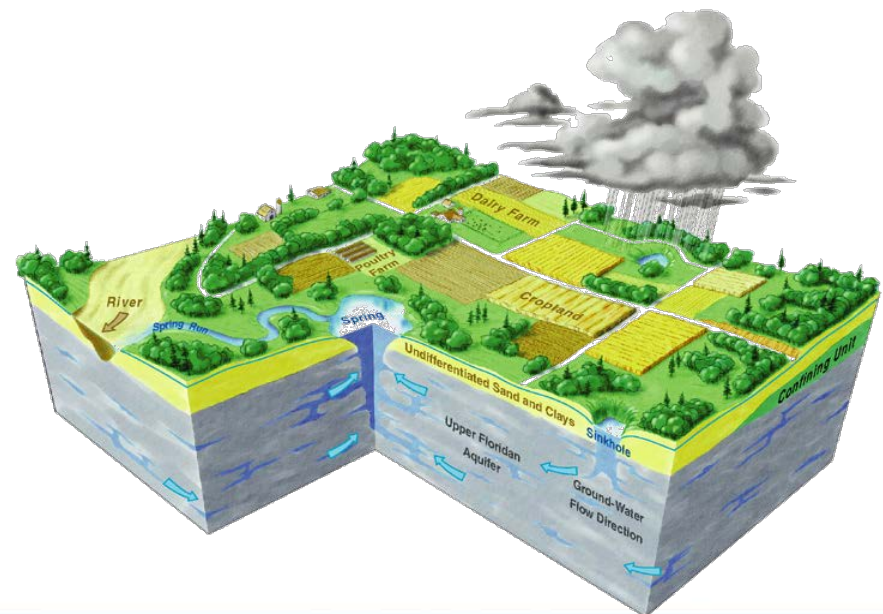
Celeste Lyon

May 16, 2018



Nitrate-Impaired Spring Waters

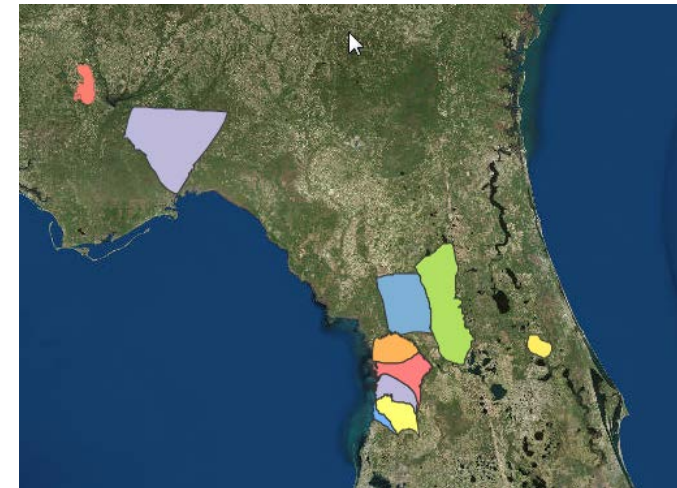
- The water quality in several Outstanding Florida Springs in the Suwannee River Basin is impaired due to elevated nitrate concentrations
- Many sources contribute nitrogen in each springshed:
 - atmospheric deposition
 - fertilizers (farm and non-farm)
 - septic tanks
 - land application of wastewater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





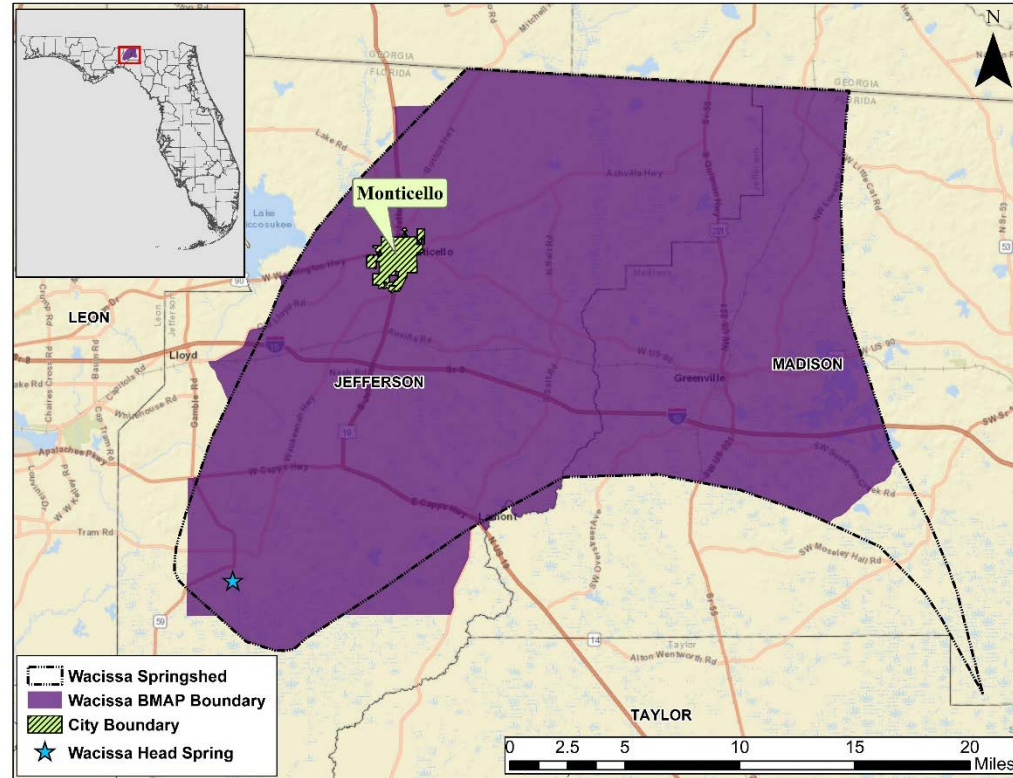
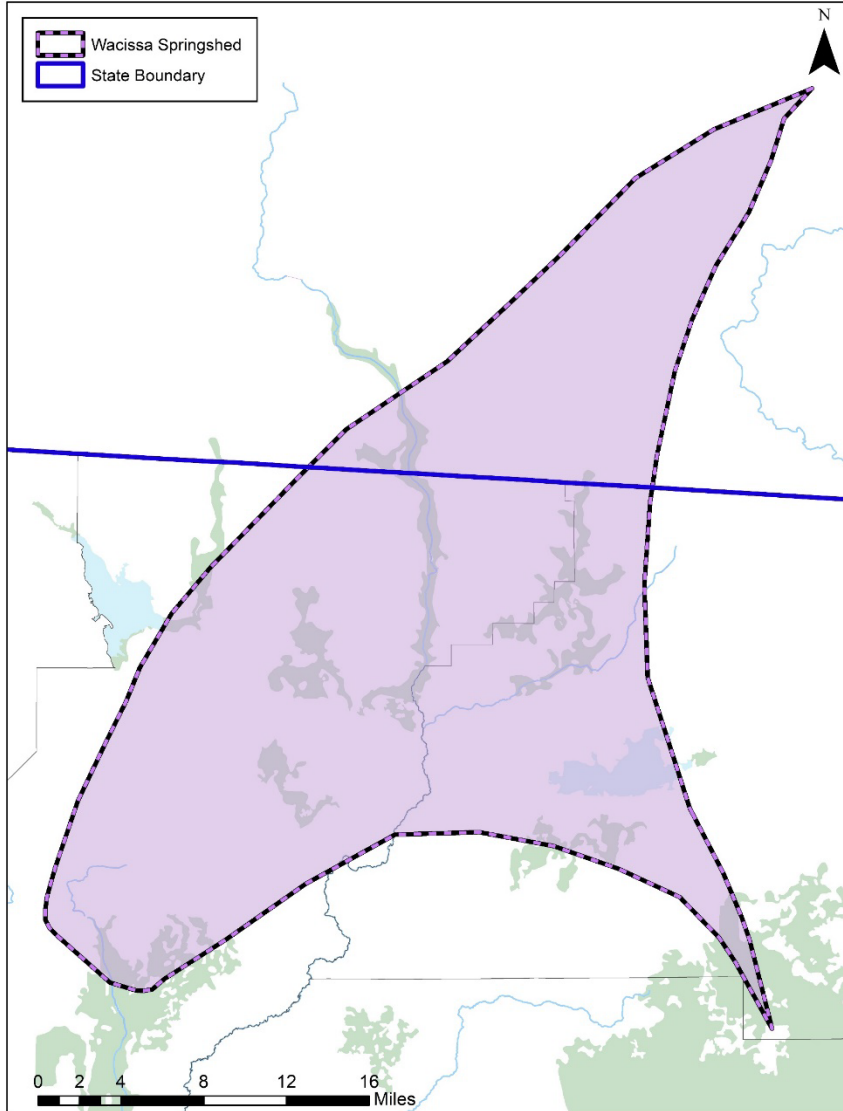
Nitrogen Source Inventory and Loading Tool

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





Springshed and BMAP Boundaries





Estimating Nitrogen Loads to Groundwater

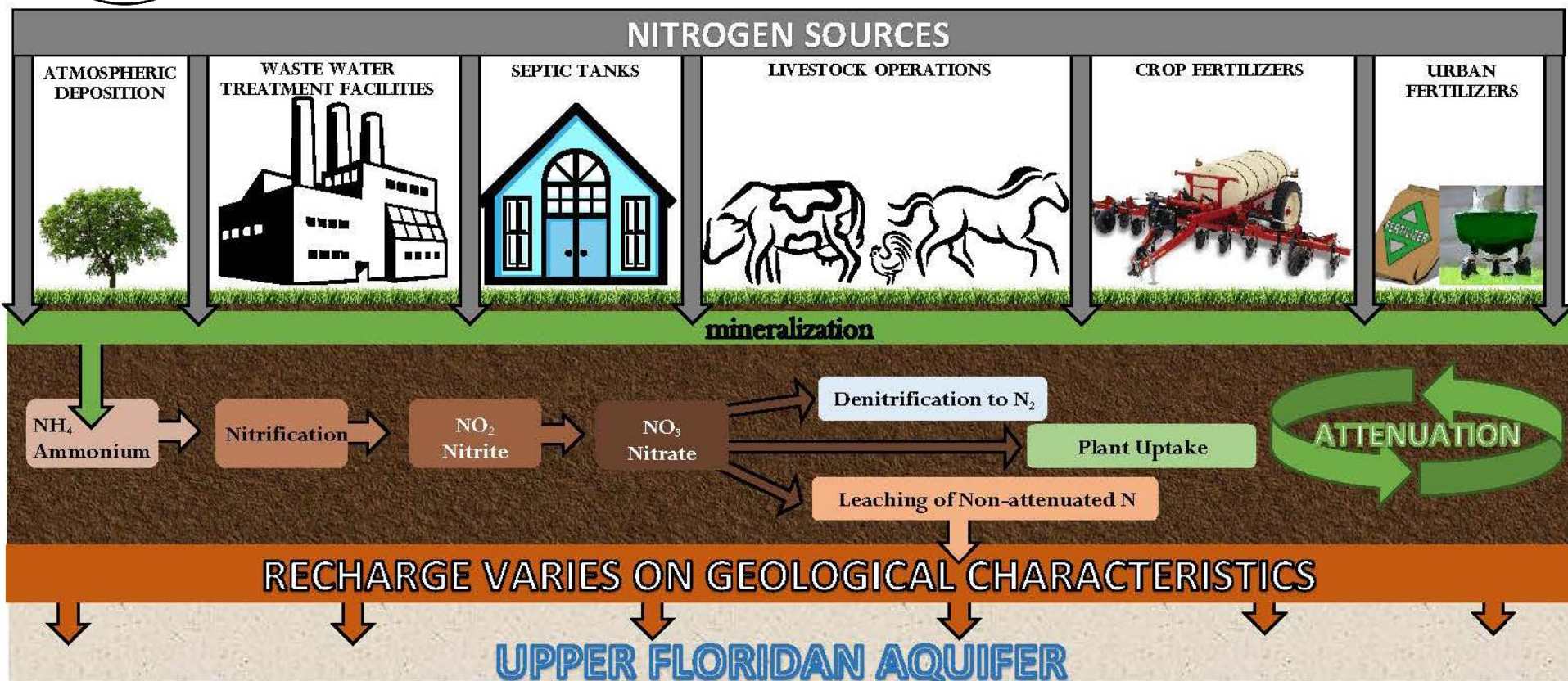
Steps:

1. Estimate the inputs of nitrogen to the land surface from the source inventory information **(best available and most current)**.
2. Apply attenuation factors based on the various environmental processes that could transform the various forms of nitrogen in the subsurface (such as denitrification, nitrification of ammonia, uptake by plants, mineralization of organic nitrogen).
3. Apply areal weighting factors that are based on the rate of recharge to groundwater to estimate nitrogen loads to groundwater.
4. Fine-tune estimates after getting feedback from stakeholders.





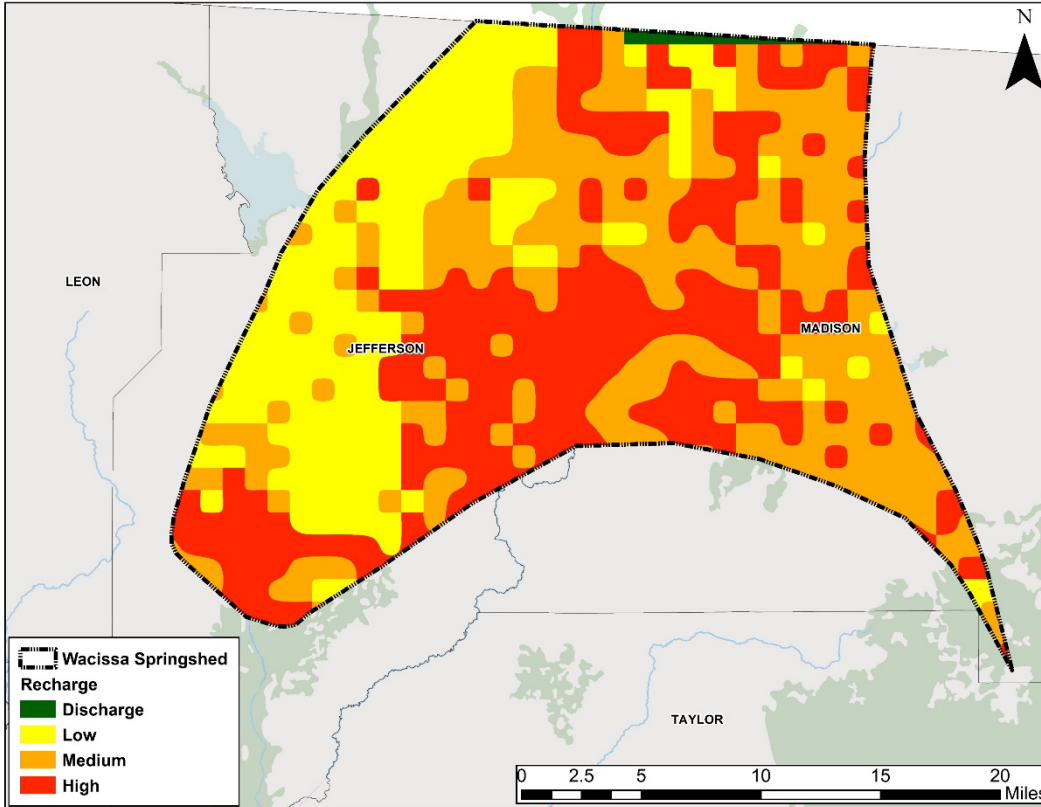
Nitrogen Cycle and Nitrogen Attenuation



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.



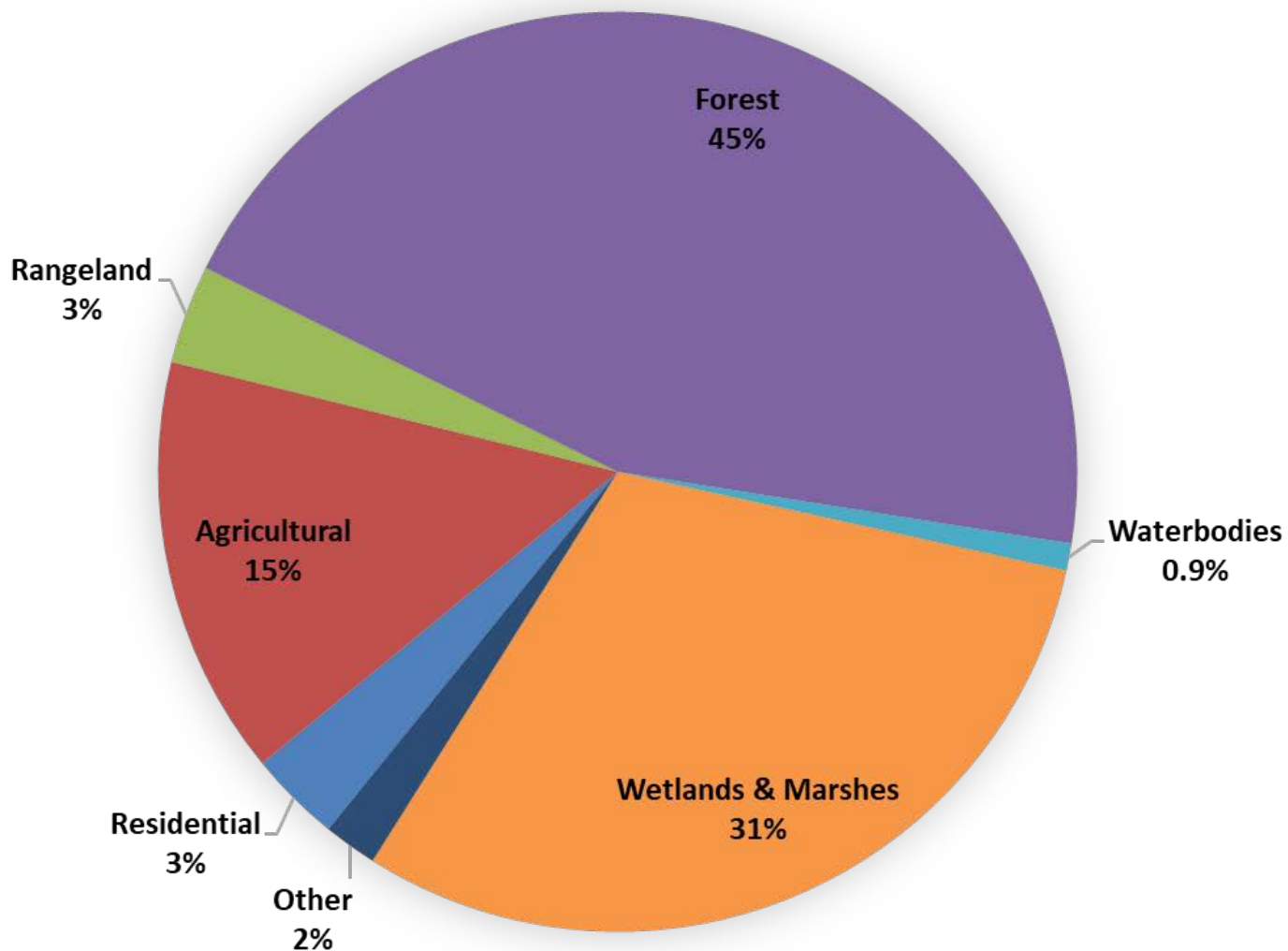
Groundwater Recharge and Nitrogen Attenuation



- ◇ Inputs to land and loads to groundwater are calculated by recharge region within the springshed
- ◇ USGS recharge map based on soil properties, hydrogeology, rainfall
 - ◇ **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**



Land Use





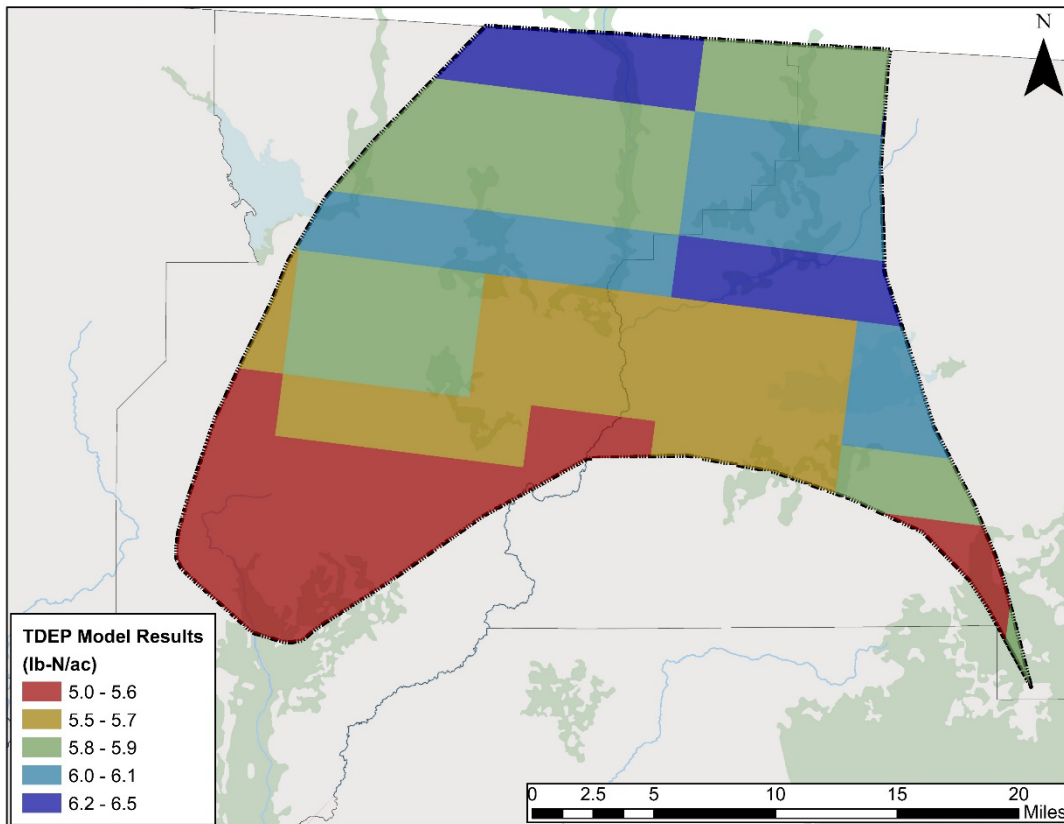
Source Categories

- Land Use evaluation provides potential groundwater sources of nitrate
 - Farm Fertilizer (FF)
 - Livestock Waste (LW)
 - Dairies
 - Urban Turfgrass Fertilizer (UTF)
 - Sports Turfgrass Fertilizer (STF)
 - Atmospheric Deposition (AD)
 - Wastewater Treatment Facilities (WWTP)
 - Onsite Treatment and Disposal Systems (OSTDS)



Atmospheric Deposition

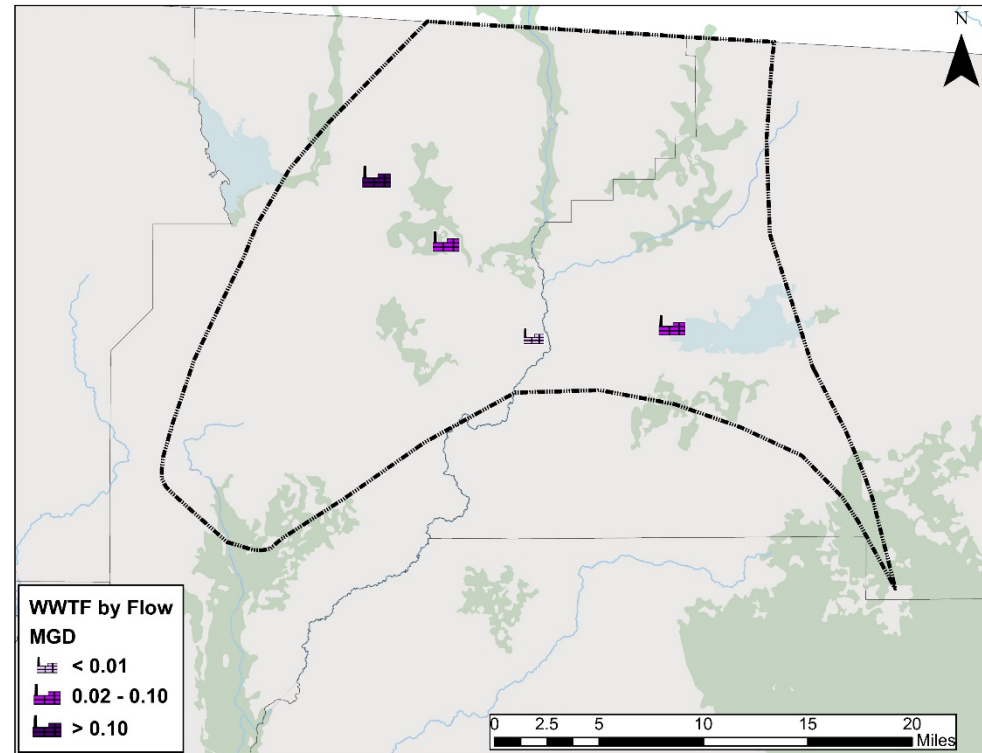
- ◇ TDEP model
 - ◇ U.S. EPA method to estimate spatially continuous atmospheric deposition
 - ◇ Nationwide total deposition model for N and S
 - ◇ Estimated deposition based on monitoring stations and modeled atmospheric concentrations
 - ◇ Model year is an average from 2011 to 2013
 - ◇ Average TN deposition
 - ◇ Range 5.0 – 6.5 lb-N/ac/yr





Domestic Wastewater Treatment Facilities

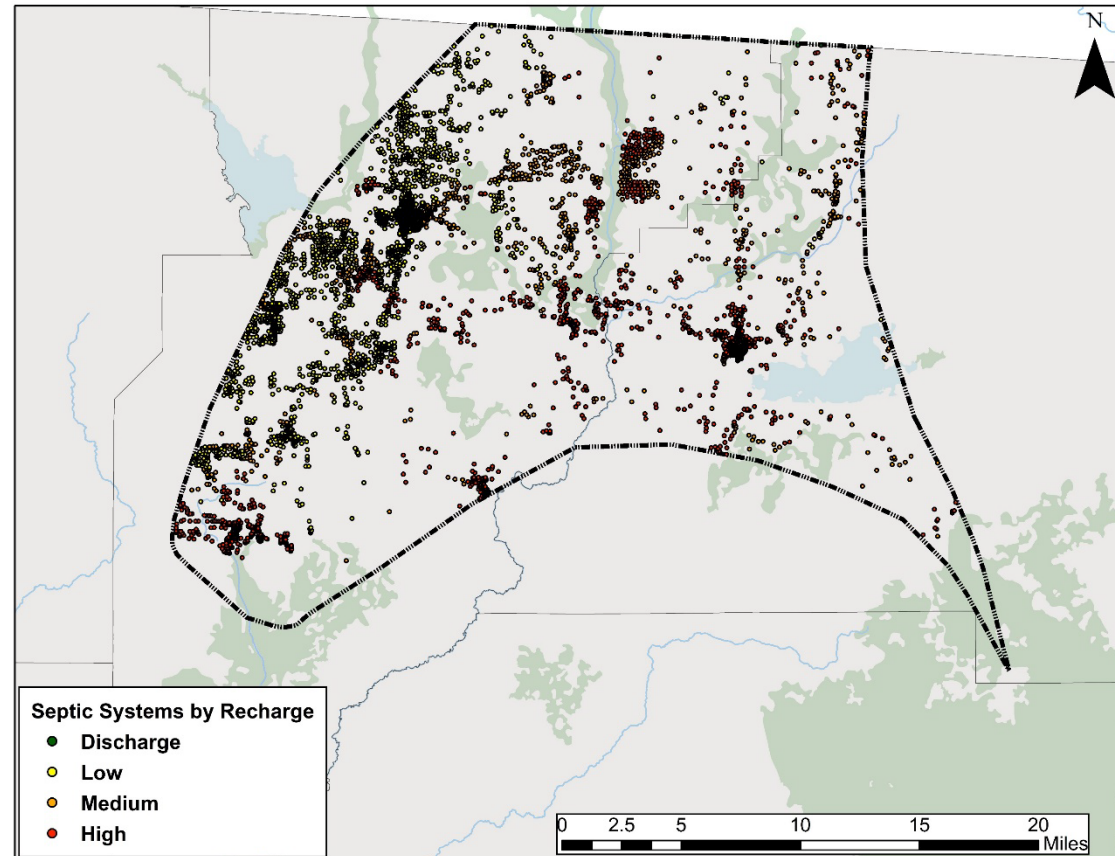
- ◇ TN effluent concentrations as reported to DEP
- ◇ NO_3 used to project TN data, if necessary
- ◇ Effluent data separated based on treatment type
 - ◇ RIBs, Absorption Fields
 - ◇ Sprayfields
 - ◇ Reuse





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

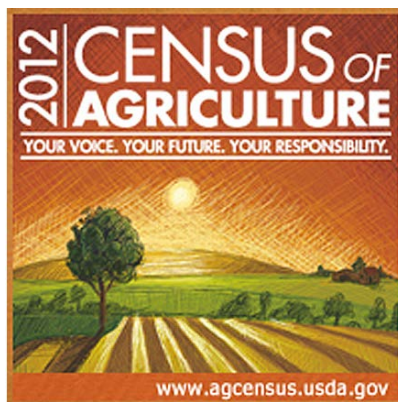
2012 Census of Agriculture (CoA)

- # 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.

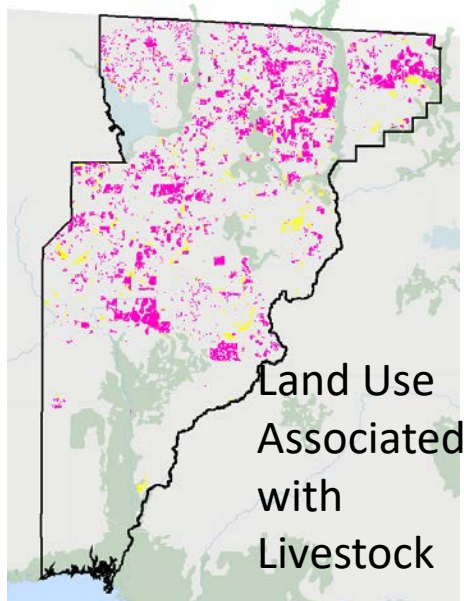


Land Use Description
Cattle Feeding Operations*
Feeding Operations*
Horse Farms
Improved Pastures*
Poultry Feeding Operations
Range Land, Herbaceous (Dry Prairie)*
Specialty Farms
Unimproved Pastures*

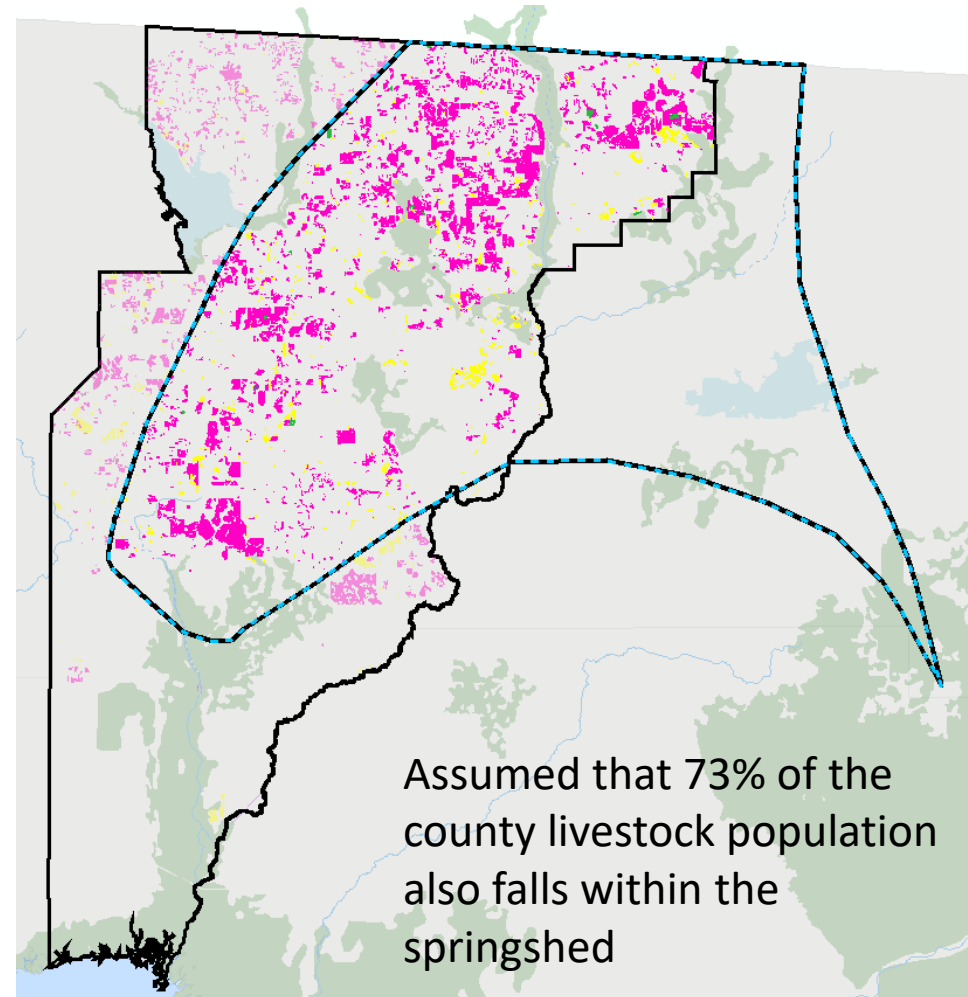
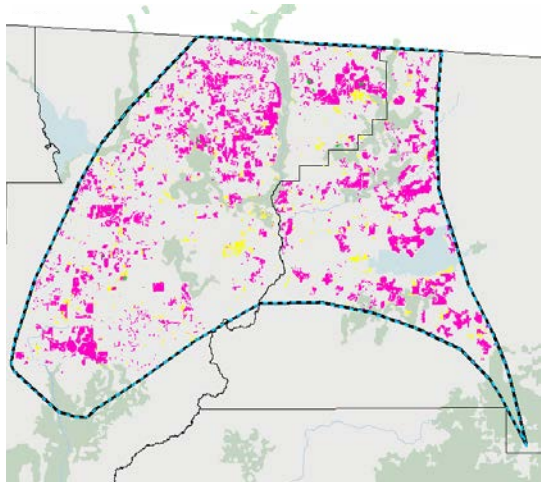
* Used to determine lands where beef cattle are likely to be present



Land Use Percentages: Livestock



73% of land use associated with livestock in Jefferson County falls within the springshed





Estimating Beef Cattle (Cow/Calf) Inputs

County livestock waste
land use areas

Land Use Description

Cattle Feeding Operations*

Feeding Operations*

Horse Farms

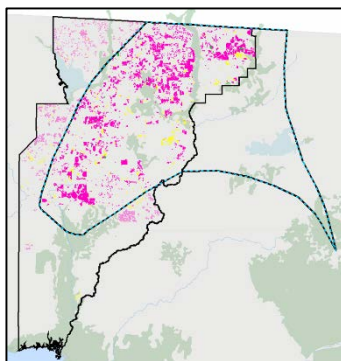
Improved Pastures*

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

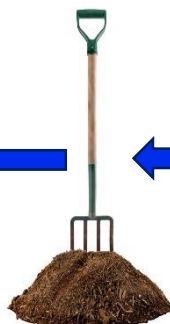


Subtract known Dairy
population to find Beef
Cattle Population #s

Apply daily N waste
factors
X 365 days

35% of Total Beef
Cattle population
assumed to be calves

Total N input from
Livestock waste



Calves = Apply daily N waste
factors
X 183 days



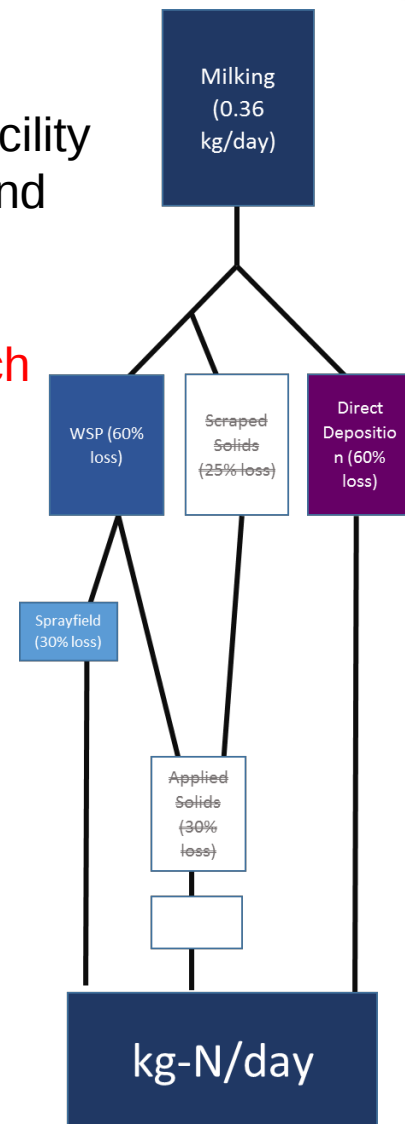


Estimating Dairy Waste Inputs

Permitted Dairy Operations

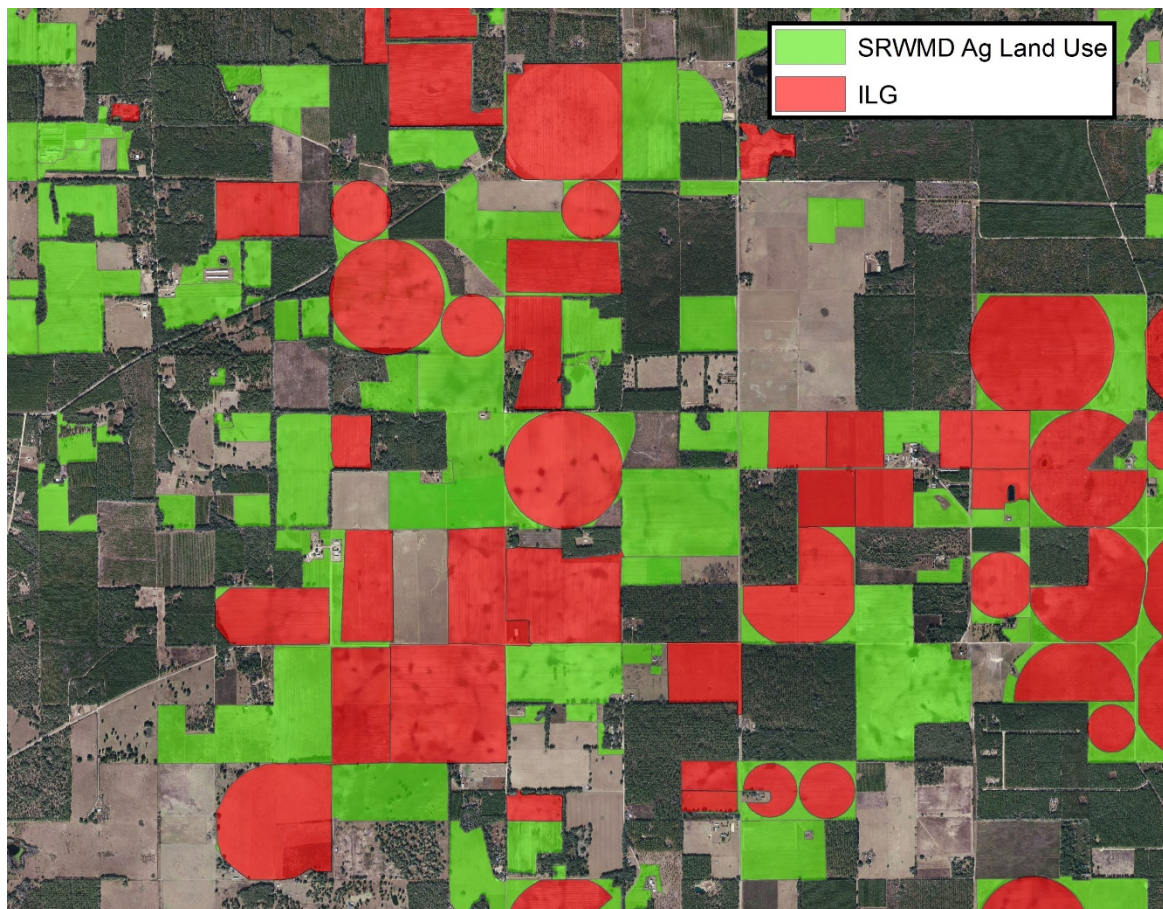
Detailed information is obtained from the DEP industrial wastewater facility permits on herd sizes, type of cows, confinement and grazing times, and waste management and disposal information

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





Farm Fertilizer



Irrigated lands and crop type based on FSAID geodatabase.

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

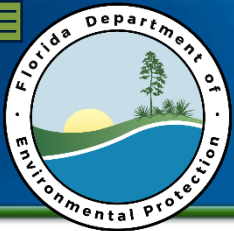
Application rates based on UF-IFAS recommended rates as well as producer feedback.



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





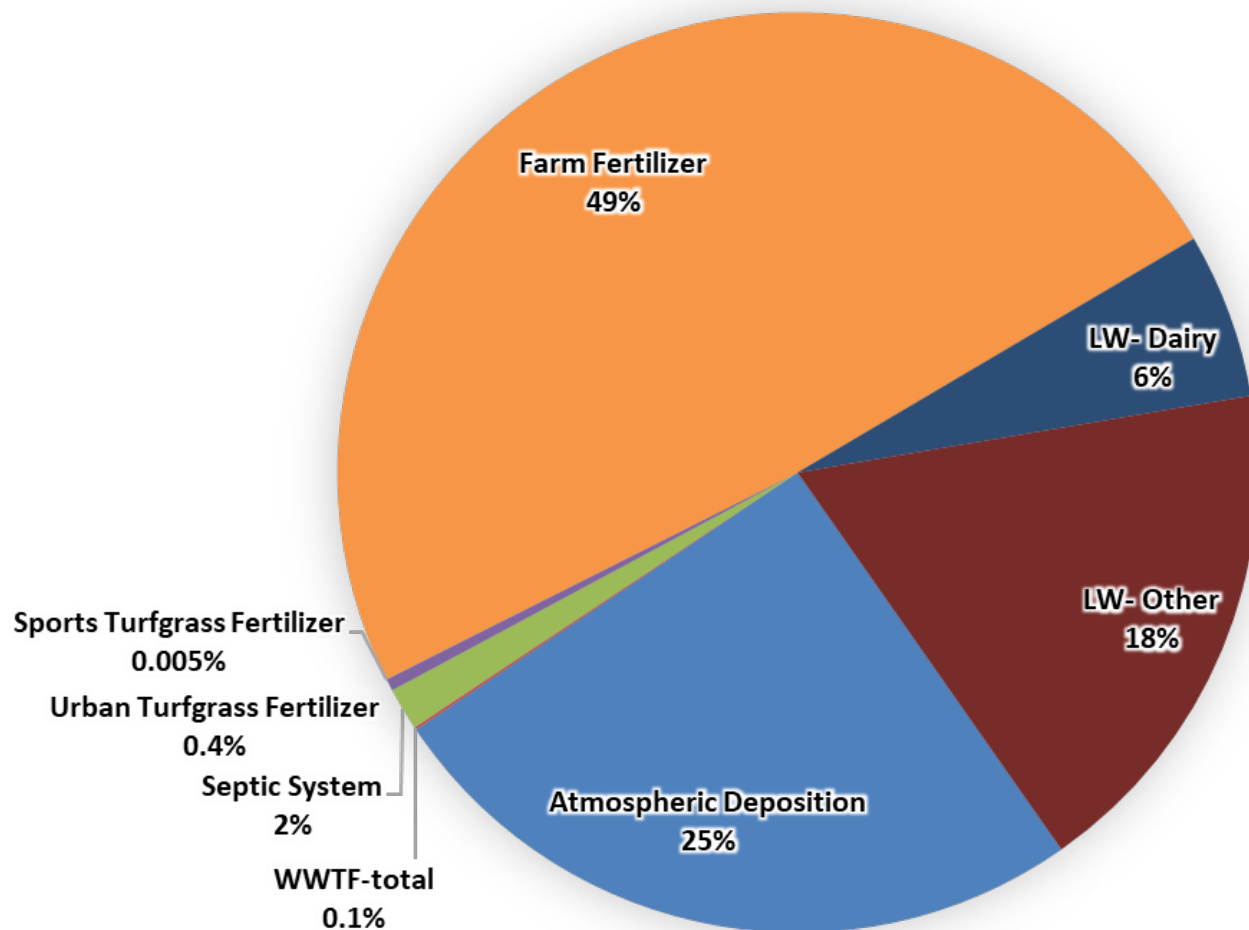
Sports Turfgrass Fertilizers

- ◇ 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





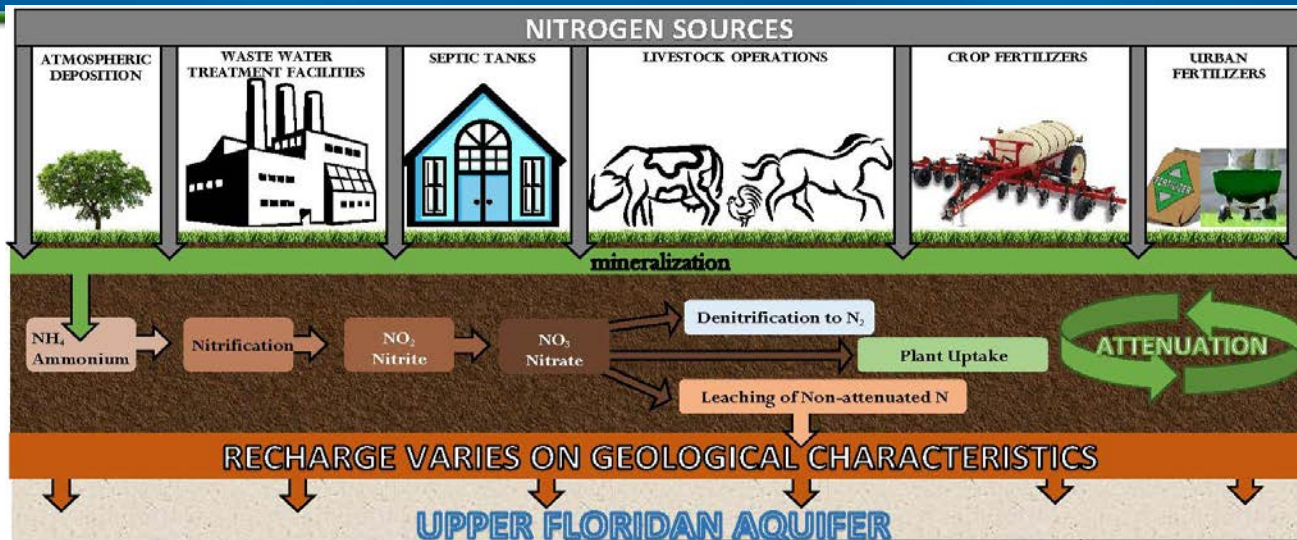
Estimates of Nitrogen Inputs



7,520,879 lb-N/yr



Biochemical Attenuation Factors

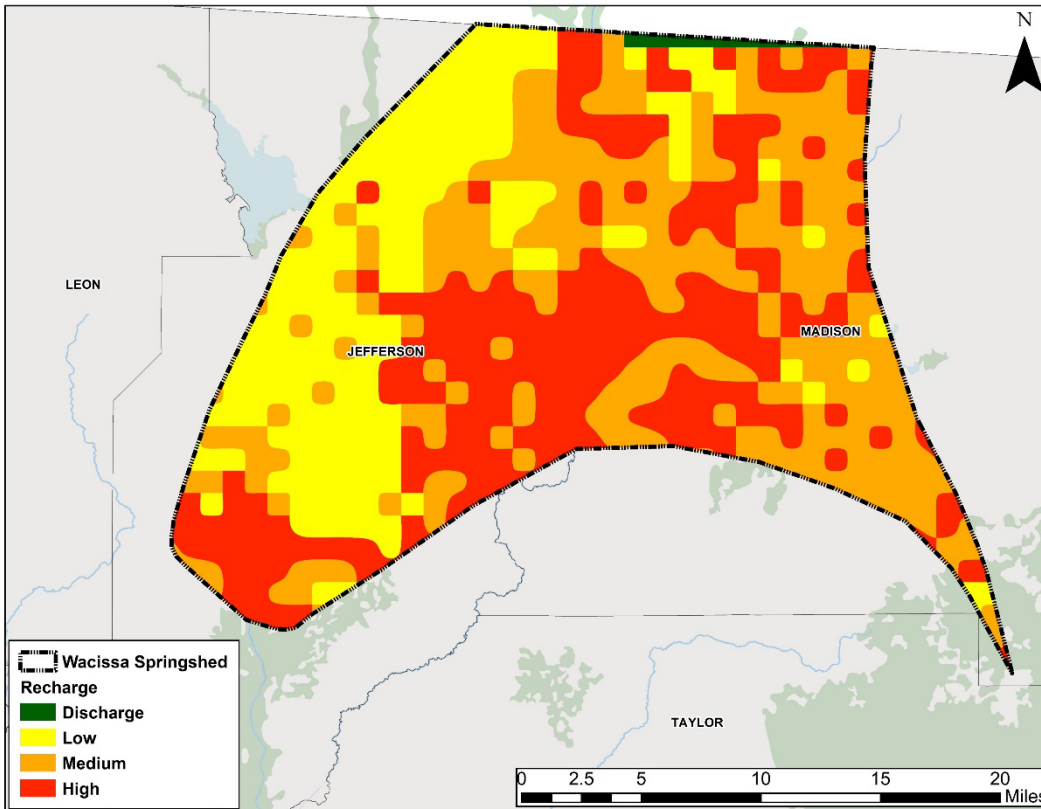


Loading Category	N Attenuation Factor	N Leaching
Atmospheric Deposition	90%	10%
Septic Systems	50%	50%
WWTF-RIB	25%	75%
WWTF-Sprayfield	60%	40%
WWTF-Reuse	75%	25%
Urban Turfgrass Fertilizers	70%	30%
Sports Turfgrass Fertilizers	70%	30%
Farm Fertilizers	80%	20%
Livestock- Dairy	85%	15%
Livestock- Other	90%	10%

- ♦ 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



Hydrogeological Attenuation Factors Based on Recharge to UFA



- ◇ Recharge factors are used to estimate the percentage of the non-attenuated nitrogen expected to reach the aquifer in a year

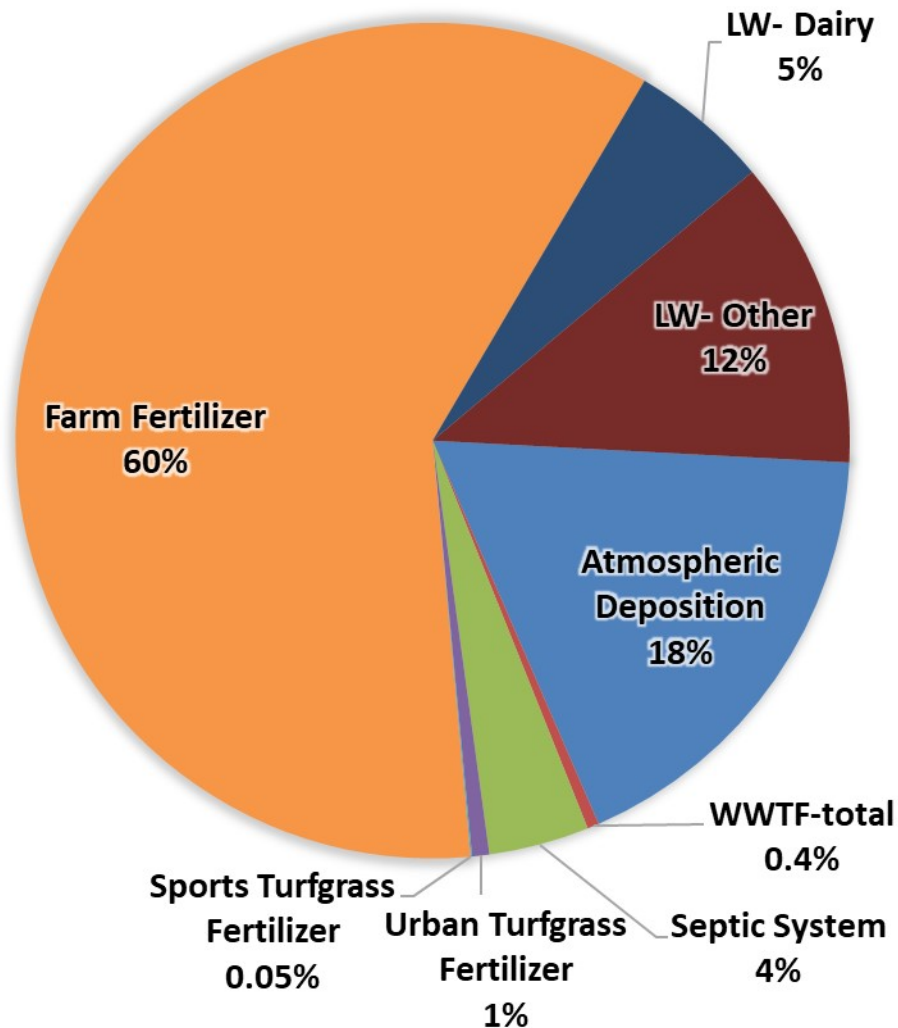
 **10%**

 **50%**

 **90%**



Nitrogen Load to Groundwater



572,439 lb-N/yr



Questions





PFA Delineation

- 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 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.



PFA Requirements

- Prohibitions

- 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 Class A or B biosolids w/o approved NMP.
- New Hazardous waste facilities.

- Additional Requirements for Biosolids and Septage Application Practices

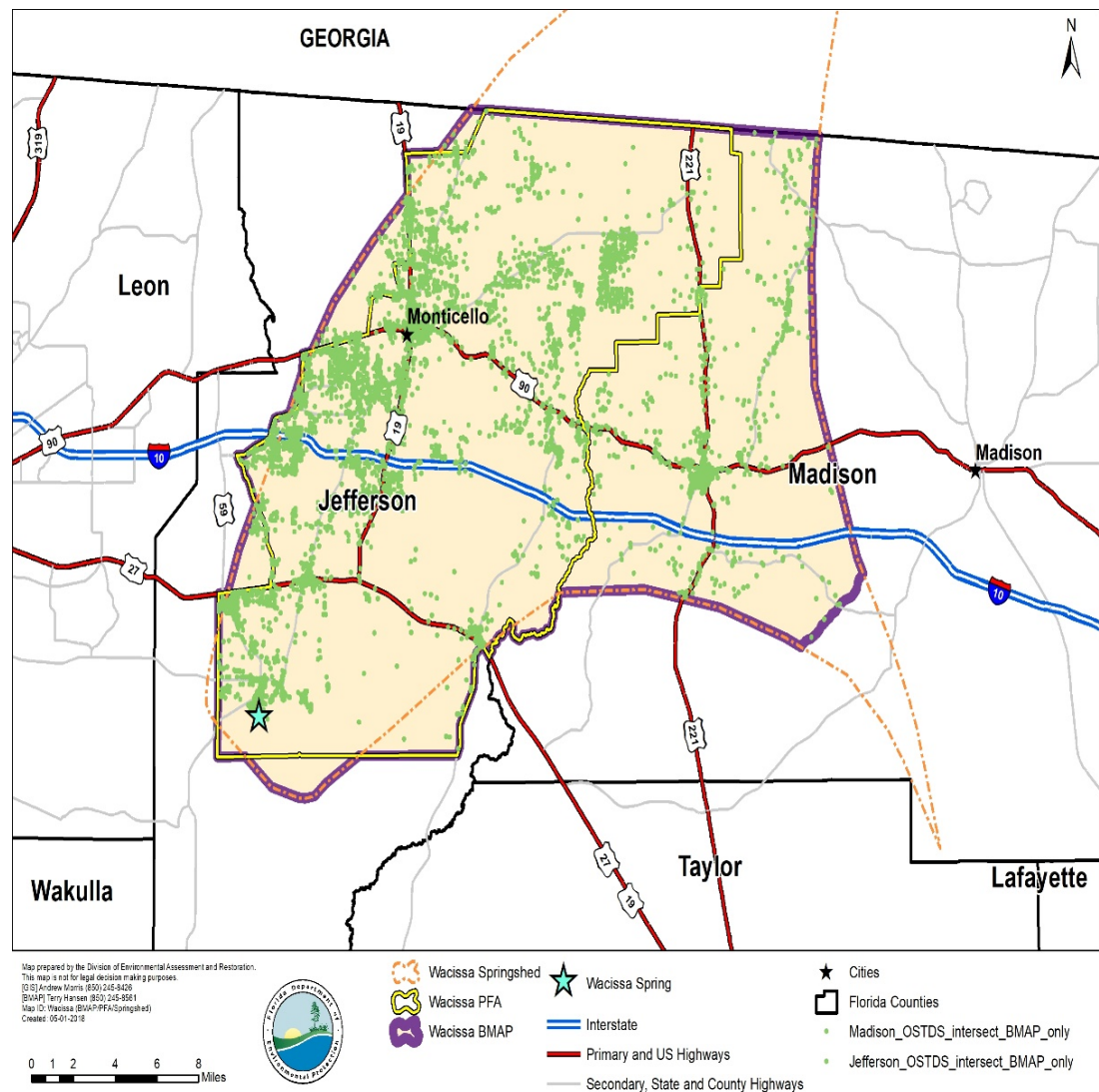
- Requirements for newly permitted sites or at renewal
- Verified BMPs for agricultural operations
- Effective nutrient management practices
- Groundwater monitoring requirements



PFA/NSILT Requirement

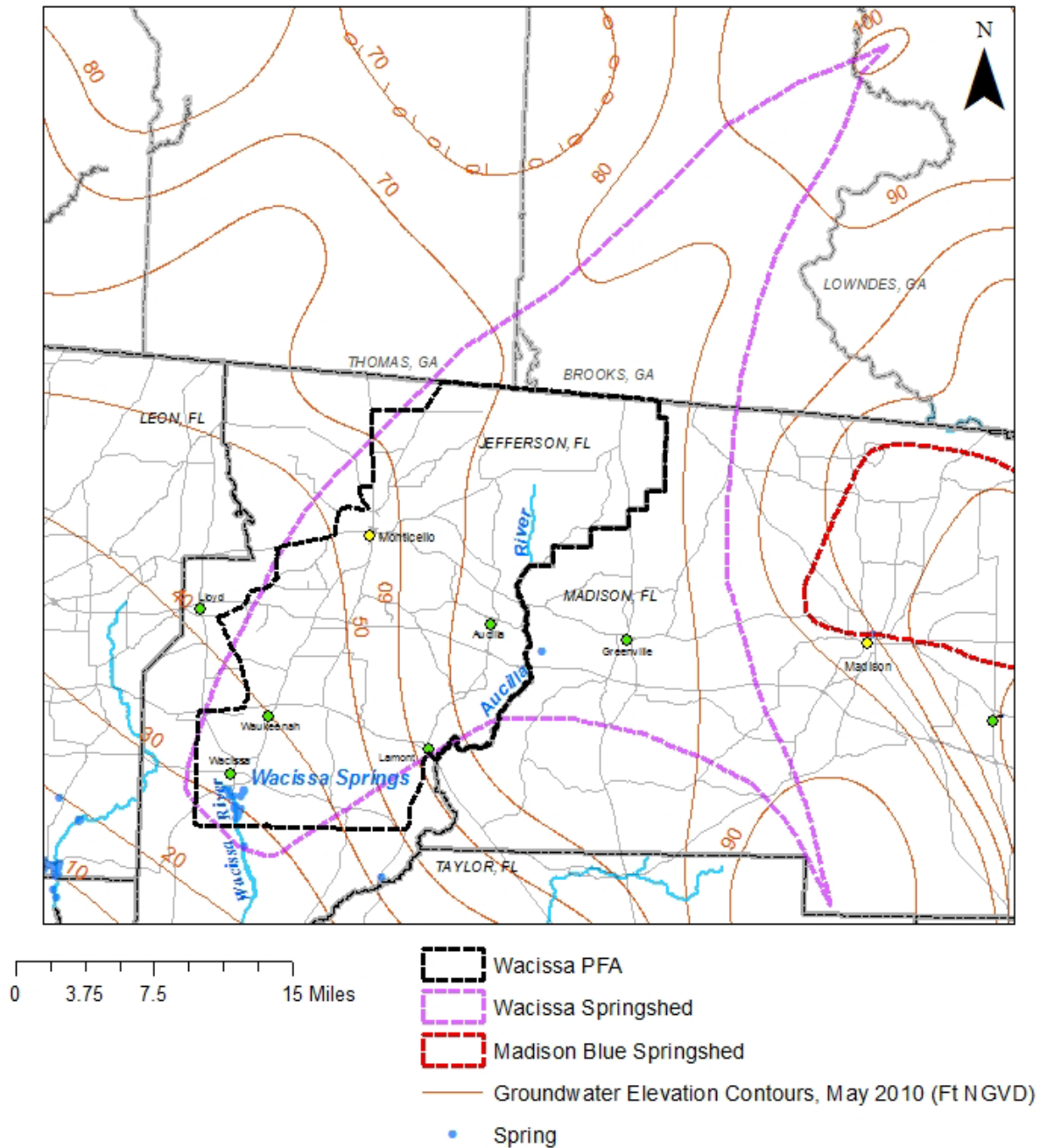
- **Priority Focus Area (PFA)** – developed for OFS(s) and used to focus restoration efforts
- **Nitrogen Source Inventory Loading Tool (NSILT)** – developed for OFS springsheds to estimate sources of nitrogen to groundwater

Used to determine if >20% load is from OSTDS



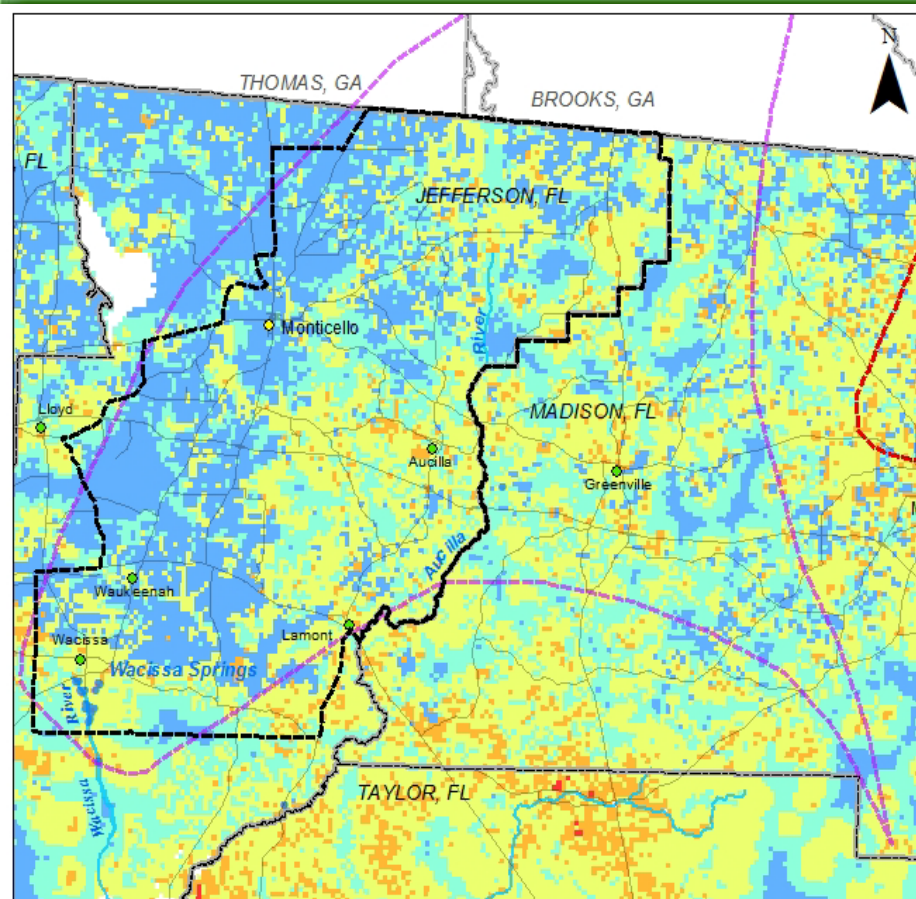


PFA – Boundary





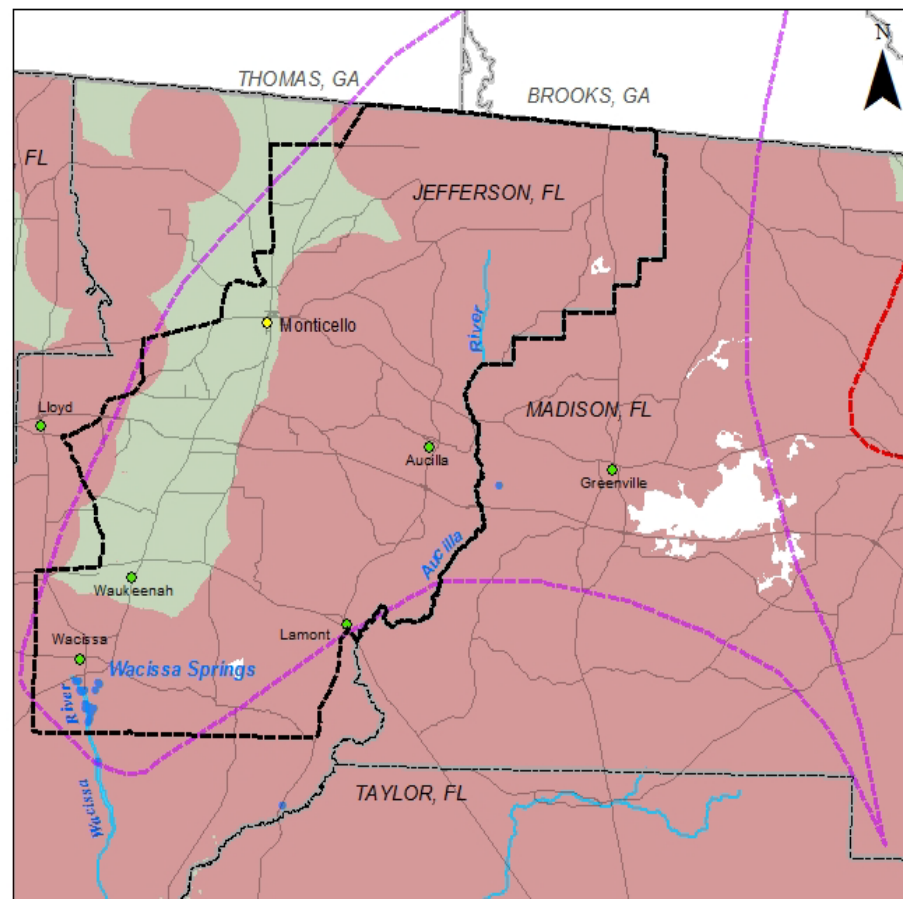
PFA – Recharge and Vulnerability



FNAI Recharge-based Priority

- Wacissa PFA
- Wacissa Springshed
- Madison Blue Springshed
- Spring

- Priority 1- Highest
- Priority 2
- Priority 3
- Priority 4
- Priority 5
- Priority 6

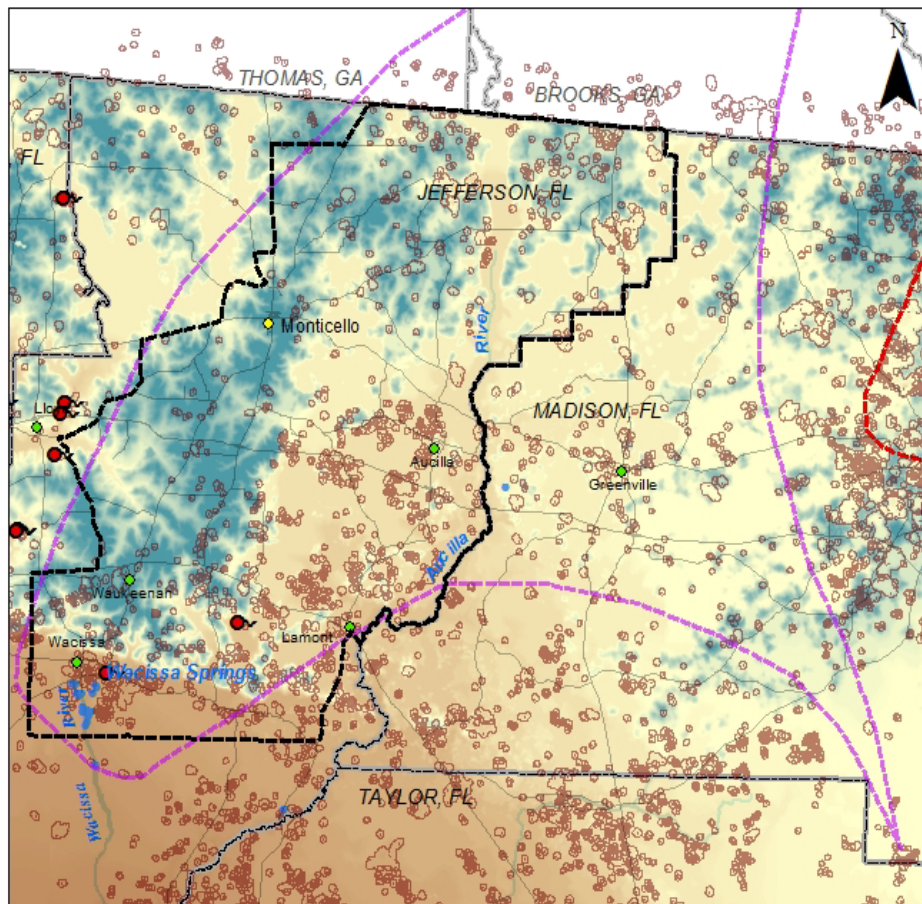


0 2.5 5 10 Miles

- Wacissa PFA
- Wacissa Springshed
- Madison Blue Springshed
- More Vulnerable
- Vulnerable
- Less Vulnerable
- Spring



PFA – Elevation & Leaching

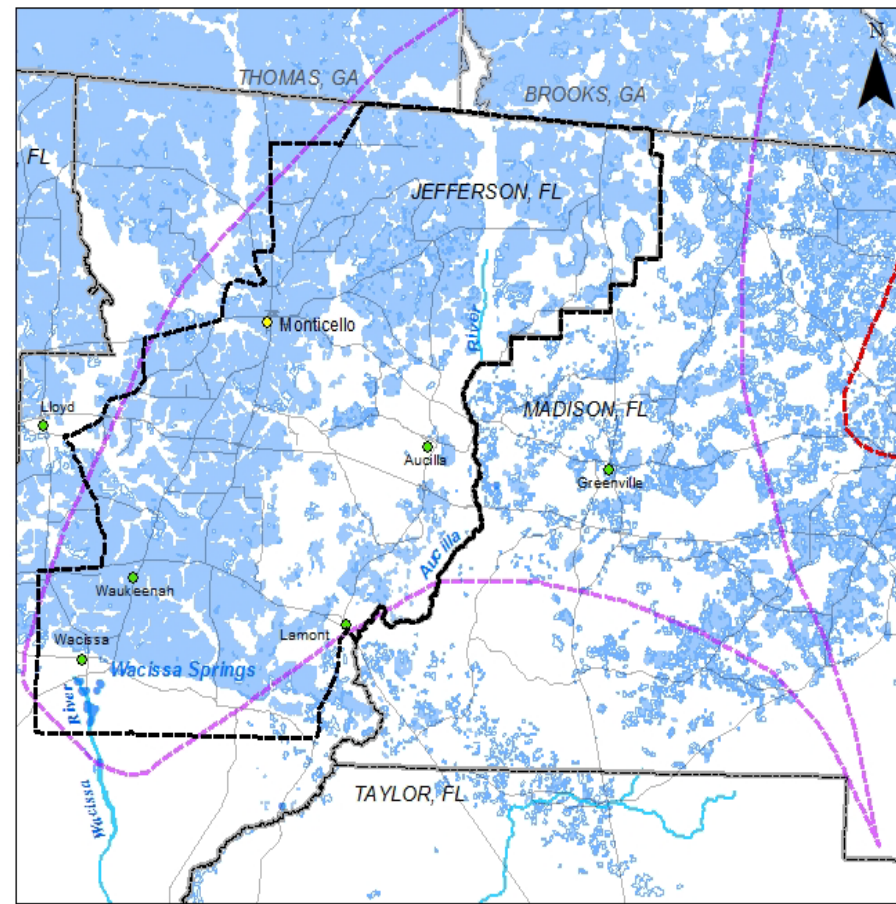


0 2.5 5 10 Miles

- Wacissa PFA
- Wacissa Springshed
- Madison Blue Springshed
- FGS Swallets
- Closed Depressions
- Spring

Digital Elevation Model

Ft NGVD
High : 230
Low : 20

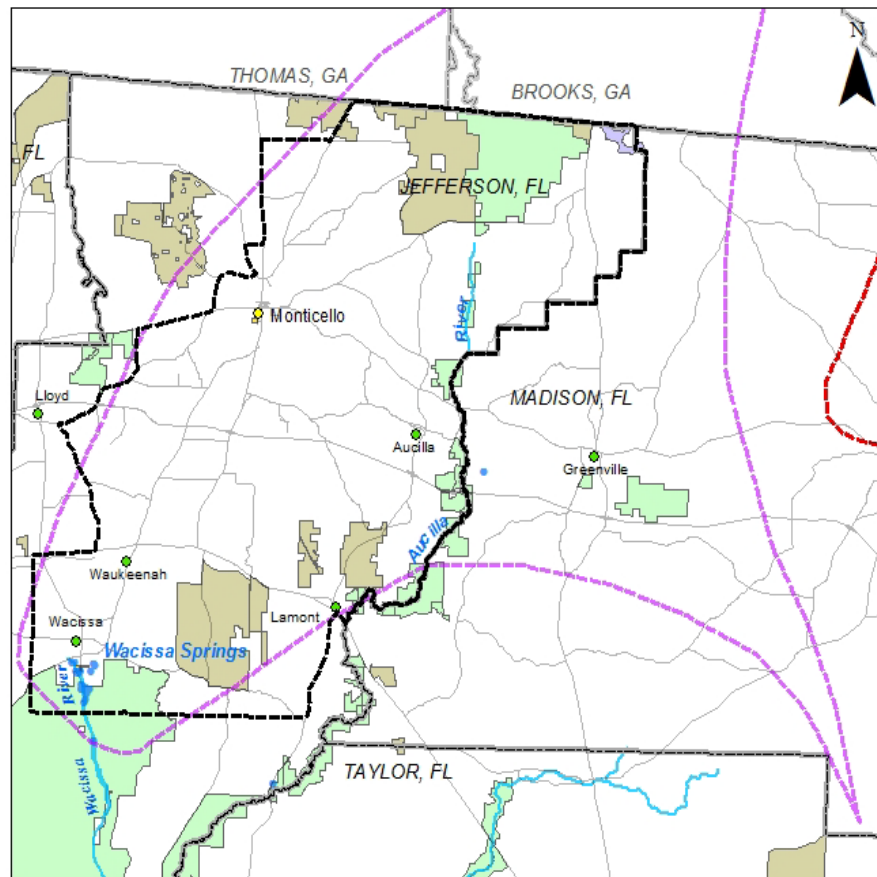


0 2.5 5 10 Miles

- Wacissa PFA
- Wacissa Springshed
- Madison Blue Springshed
- Soils with High Leaching Potential
- Soils with Moderate Leaching Potential
- Spring

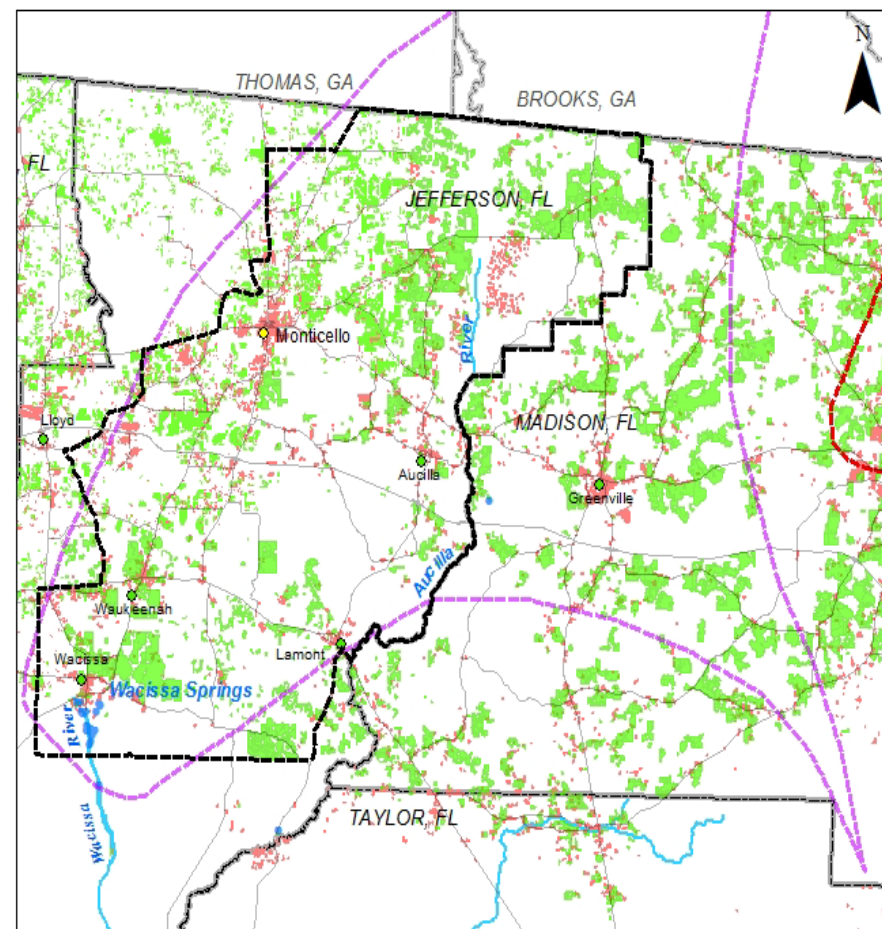


PFA – Conservation Lands & Land Use



0 2.5 5 10 Miles

- Wacissa PFA
- Wacissa Springshed
- Madison Blue Springshed
- Federal
- State
- Local
- Private
- Spring

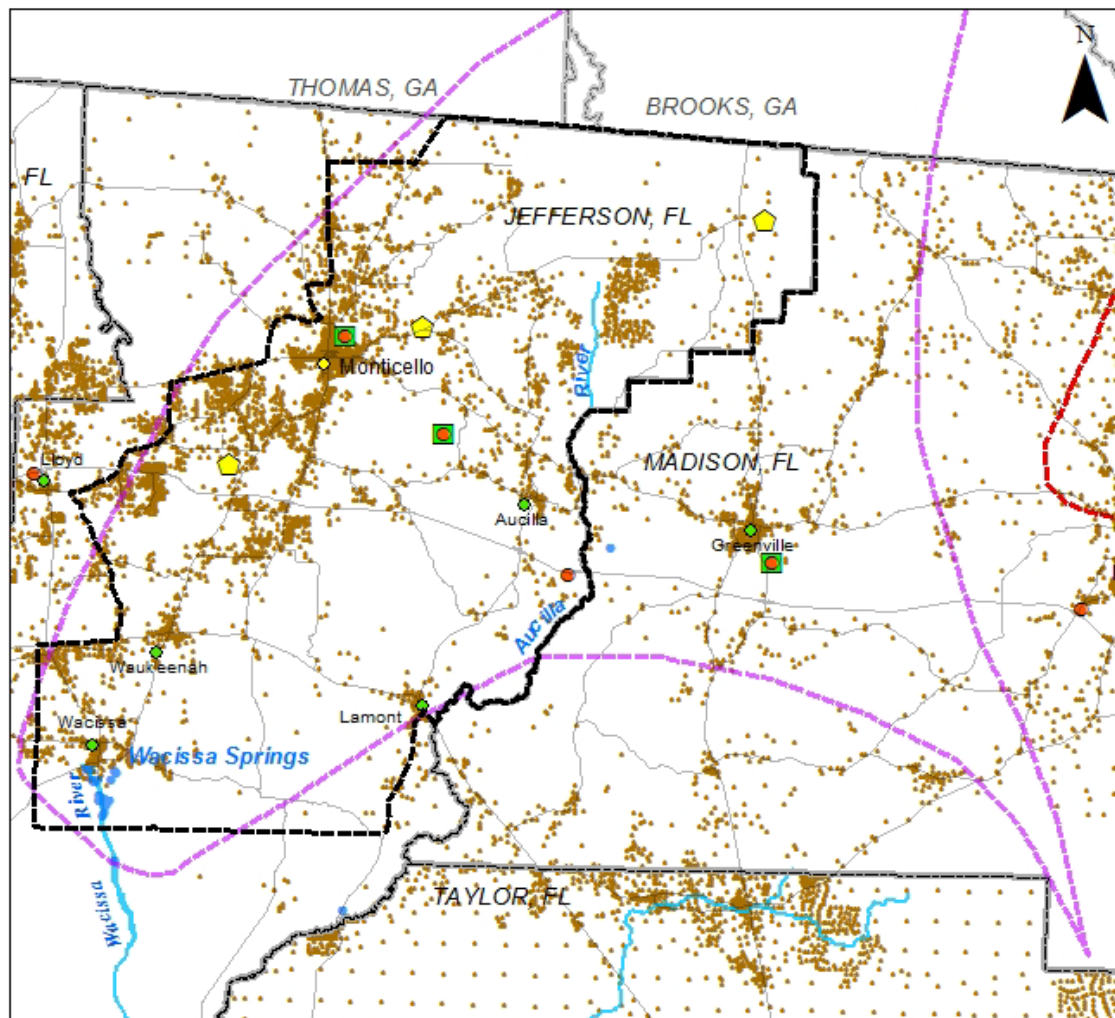


0 2.5 5 10 Miles

- Wacissa PFA
- Wacissa Springshed
- Madison Blue Springshed
- Agricultural Land Use
- Urban Land Use
- Spring



PFA – OSTDS & WWTP

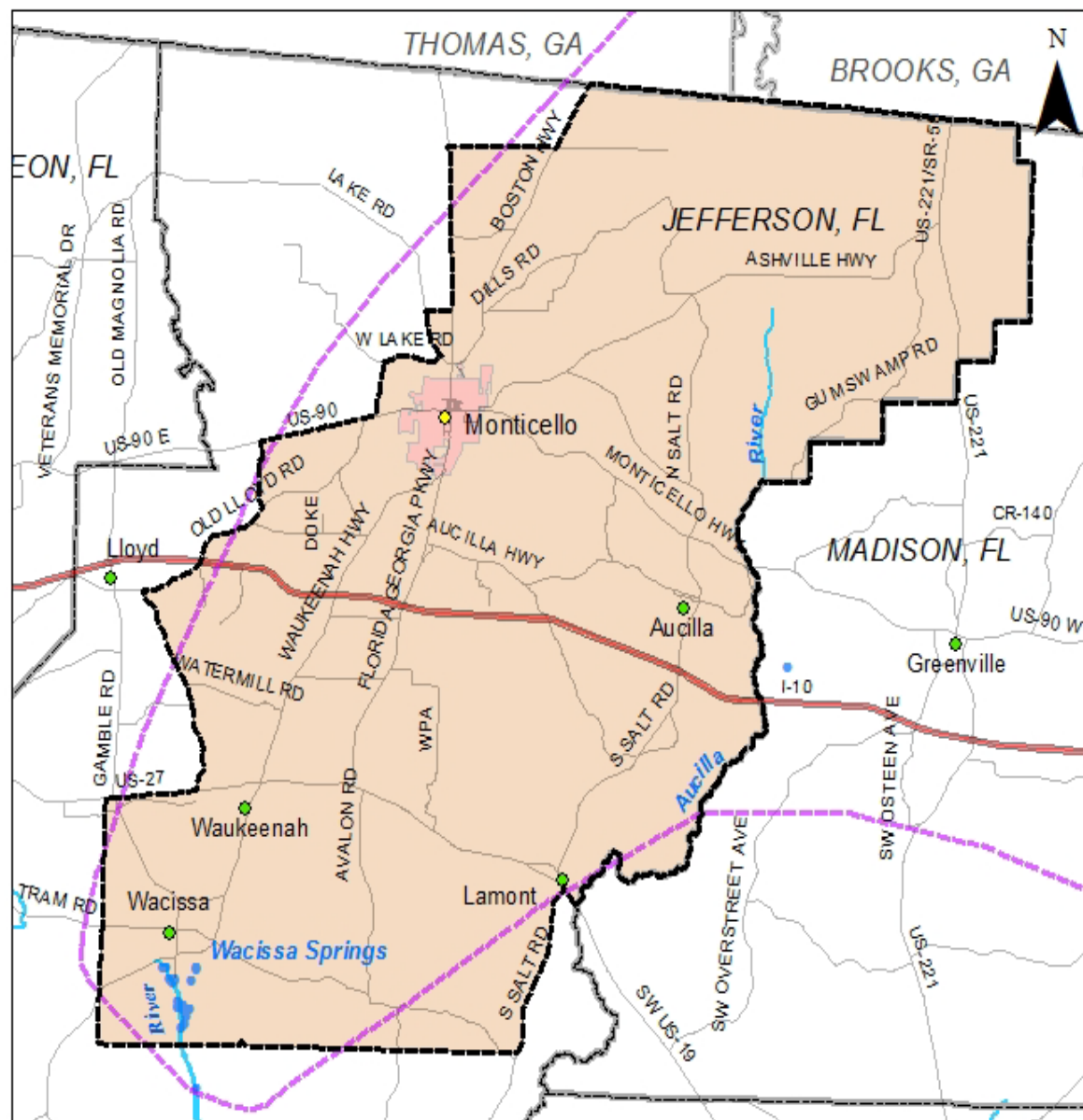


Jefferson County approximately 10,000
OSTDS in BMAP
Madison County approximately 2,400
OSTDS in BMAP

- Wacissa PFA
- Wacissa Springshed
- Madison Blue Springshed
- Domestic Wastewater Facility
- Design Capacity ≥ 0.1 MGD
- DEP Regulated Confined Animal Feeding Operation
- Onsite Treatment and Disposal System
- Spring



PFA – Boundary



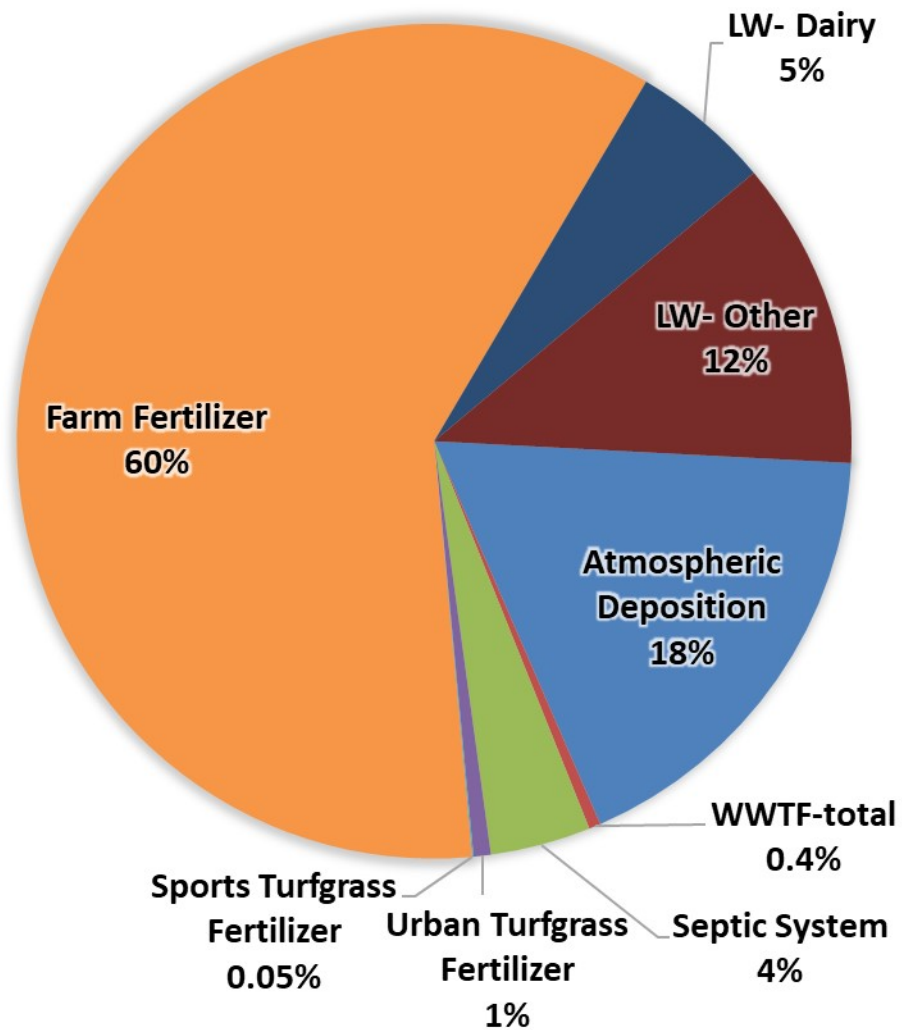
0 2 4 8 Miles

- Wacissa PFA
- Wacissa Springshed
- Spring



Wacissa

Nitrogen Loads to Groundwater



572,438 lbs-N/yr



Wacissa BMAP Nitrogen Reductions

Total Reduction Required to Meet the TMDLs			
	Total Load (lb-N/yr)	TMDL Load (lb-N/yr)	Required Reduction to Meet TMDL (lb-N/yr)
Spring Vent	296,596	165,487	131,109

Project Credit Analysis		
Nitrogen Source	Credits to Load to Groundwater (lb-N/yr)	Description
Onsite Sewage Treatment and Disposal Systems (OSTDS)	TBD	Credits identified for stakeholder OSTDS projects (onsite enhancement or sewer)
Urban Turfgrass Fertilizer (UTF)	200	DEP approved credits (up to 6 %) for public education activities as well as credits identified for stakeholder stormwater projects
Atmospheric Deposition (AD)		No reduction
Farm Fertilizer Reductions	51,500	15 % BMP credit on FF load to groundwater, assuming 100 % owner-implemented BMPs on all fertilized lands
Sports Turfgrass Fertilizer (STF)	10	6 % BMP credit for sports fields and 10 % BMP credit for golf courses (where applicable) on STF load to groundwater, assuming 100 % BMP implementation on golf courses and sports fields
Livestock Waste	6,800	10 % BMP credit on load to groundwater, assuming 100 % owner-implemented BMPs at all livestock facilities
Livestock Waste Permitted Dairy	4,600	15 % BMP credit on permitted dairy load to groundwater, assuming 100% owner-implemented BMPs at permitted dairies
Wastewater Treatment Facilities (WWTF)	2,000	Achieved by BMAP WWTF policy if BMAP-wide (achieving 3 or 6 mg/L total nitrogen concentration at discharge)
Total Credits	71,000	



Wacissa BMAP Nitrogen Reductions

Total Reduction Required to Meet the TMDLs			
	Total Load (lb-N/yr)	TMDL Load (lb-N/yr)	Required Reduction to Meet TMDL (lb-N/yr)
Spring Vent	296,596	165,487	131,109
Projects Credits			71,000
Additional Projects			60,000



Additional Potential Reductions

Additional Ag Practices Estimated Reduction Credit (lb-N/yr)

Action	High Recharge Area (100%)	Med. Recharge Area (100%)
Precision Irrigation	2,021	1,123
Precision Fertilization	24,223	13,457
Soil Moisture Probes	44,334	24,630
Controlled Release Fert.	7,096	3,942
Cover crops	71,345	39,636
Peanut hay pasture mix	476,107	264,504
Fertilizer Banders	39,172	21,762

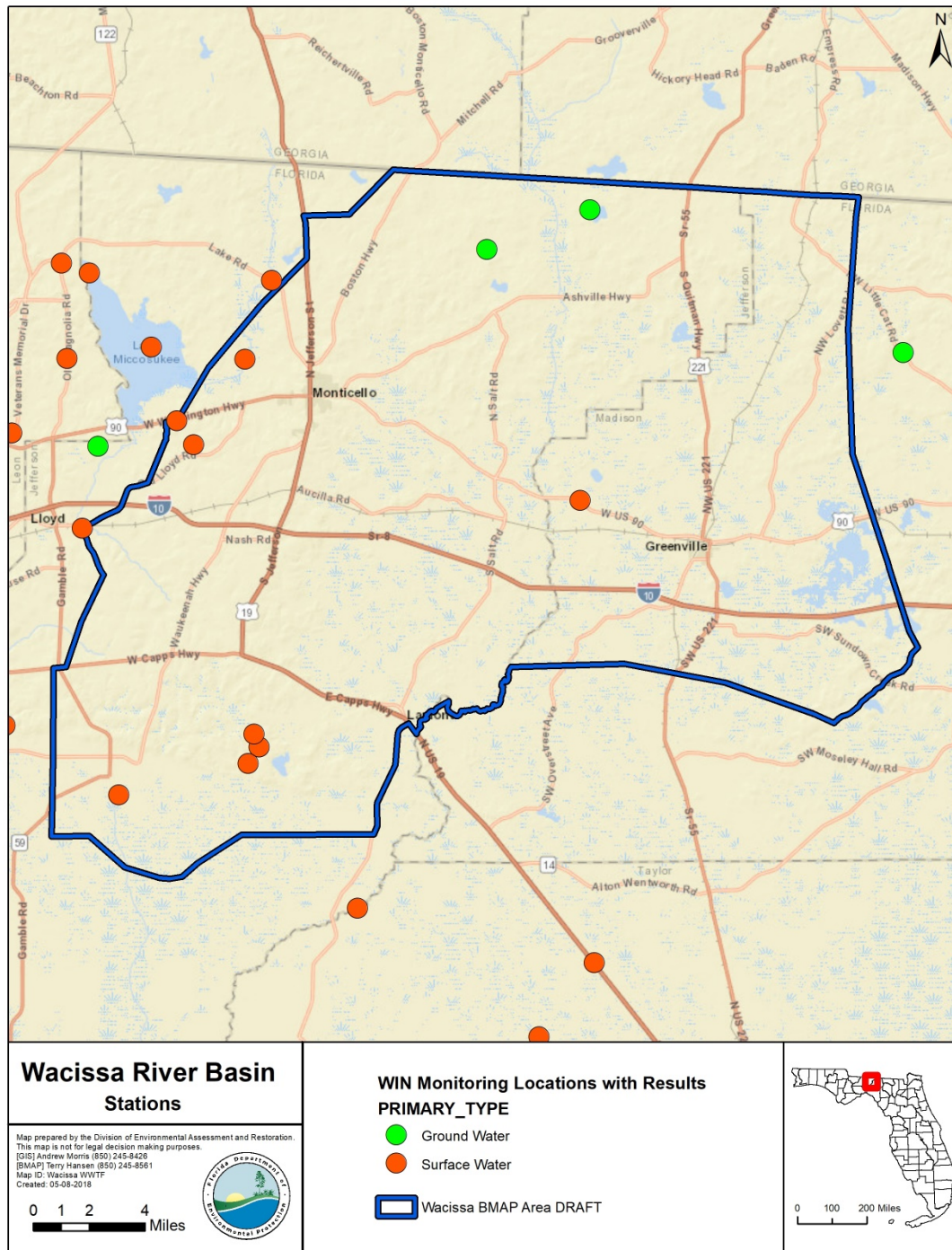


Additional Potential Reductions

Existing OSTDS in PFA (lb-N/yr)				
	High Recharge Area		Med. Recharge Area	
	Tanks	Credit	Tanks	Credit
Parcels <1 ac	161	1,000 lbs.	74	250 lbs.
Parcels >1ac	728	4,400 lbs.	715	2,400 lbs.



Monitoring





Statewide TMDL, BMAP, Minimum Flows and Levels (MFLs) Annual Report

- 403.0675(1), F.S. – requires a report that will include status of MFLs, TMDLs, and BMAPs
- Replacement of individual BMAP annual progress reports
- Annual meetings will continue
- Calendar year reporting
- Report will contain project information: funding, proposed priority ranking for implementation
- Progress made towards restoration goals
- Information will be requested in late November, due by the end of January
- Info. needed will include: entity activities, compliance, project information, and milestones
- Report is due to the Governor and Florida Legislature July 1, 2018 and every year thereafter



Questions?



<http://publicfiles.dep.state.fl.us/DEAR/BMAP/WACISSA/>