

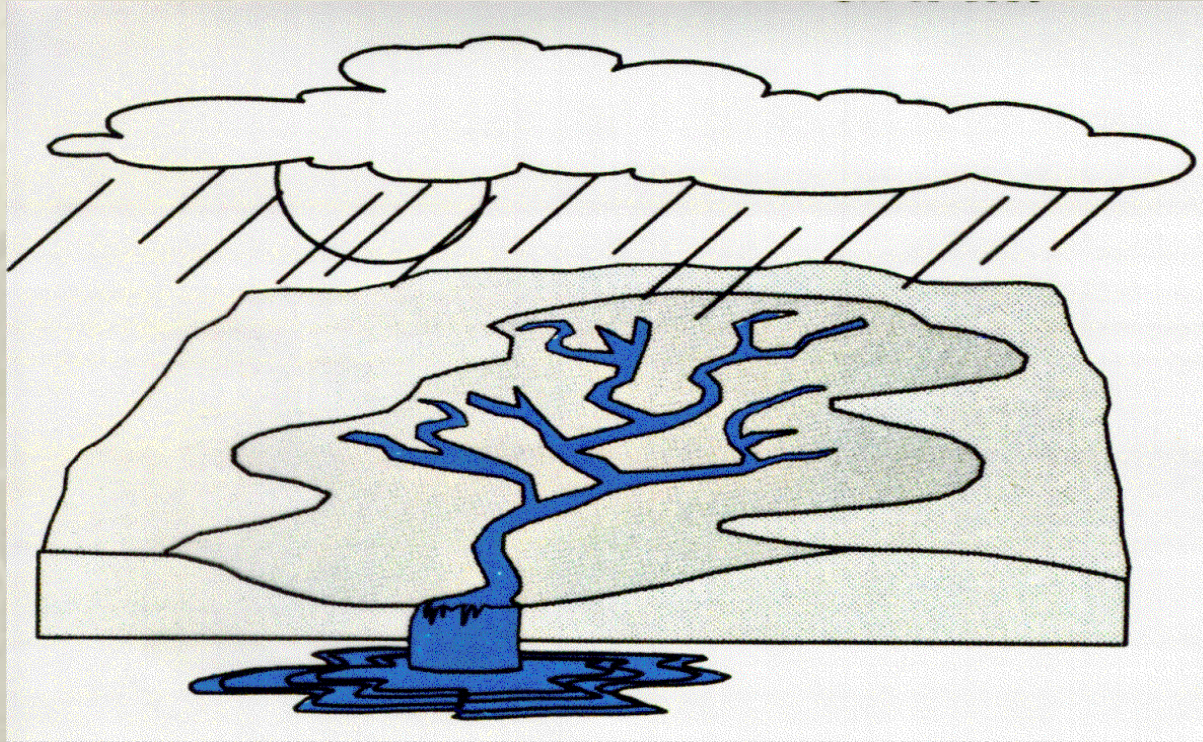
# South Carolina Surface Water Quality Monitoring: Waccamaw Basin



Presented by Amy Bennett

- ❖ Overview of DHEC Ambient Monitoring  
Where, why and for what?
- ❖ Overview of monitoring in the  
Waccamaw Basin in SC
- ❖ Waccamaw TMDL for Dissolved Oxygen
- ❖ Other Monitoring, Water Quality  
Efforts, 319 Grants
- ❖ New News?

# watershed



an area of land from which all water, including runoff, drains to a creek, lake, wetland, or estuary of lower elevation



| [Broad](#) | [Catawba](#) | [Edisto](#) | [Pee Dee](#) | [Salkehatchie](#) | [Saluda](#) | [Santee](#) | [Savannah](#) |




State of South Carolina  
Monitoring Strategy  
For  
Calendar Year 2015

Technical Report No. 1208-14  
January 2015



Prepared By:


David Chestnut  
Surface Water Monitoring and Dam Safety Section  
Division of Water Monitoring, Assessment, and Protection  
Bureau of Water



David E. Wilson, Jr., P.E., Project Coordinator  
Chief, Bureau of Water



Sandra Flemming, State Quality Assurance  
Management Officer  
Assistant Chief, Bureau of Environmental Health  
Services



Elizabeth McGuire  
Monitoring Coordinator, USEPA Region IV

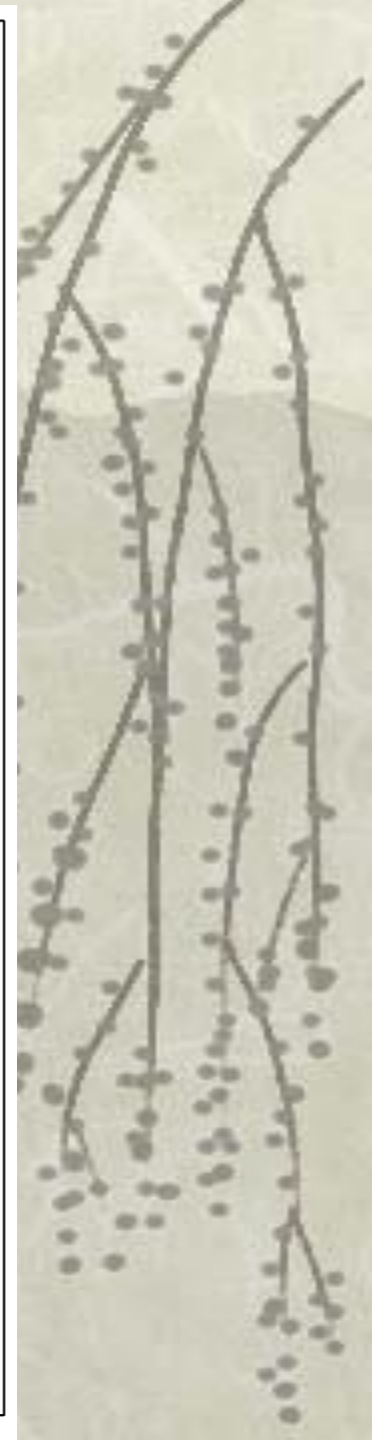
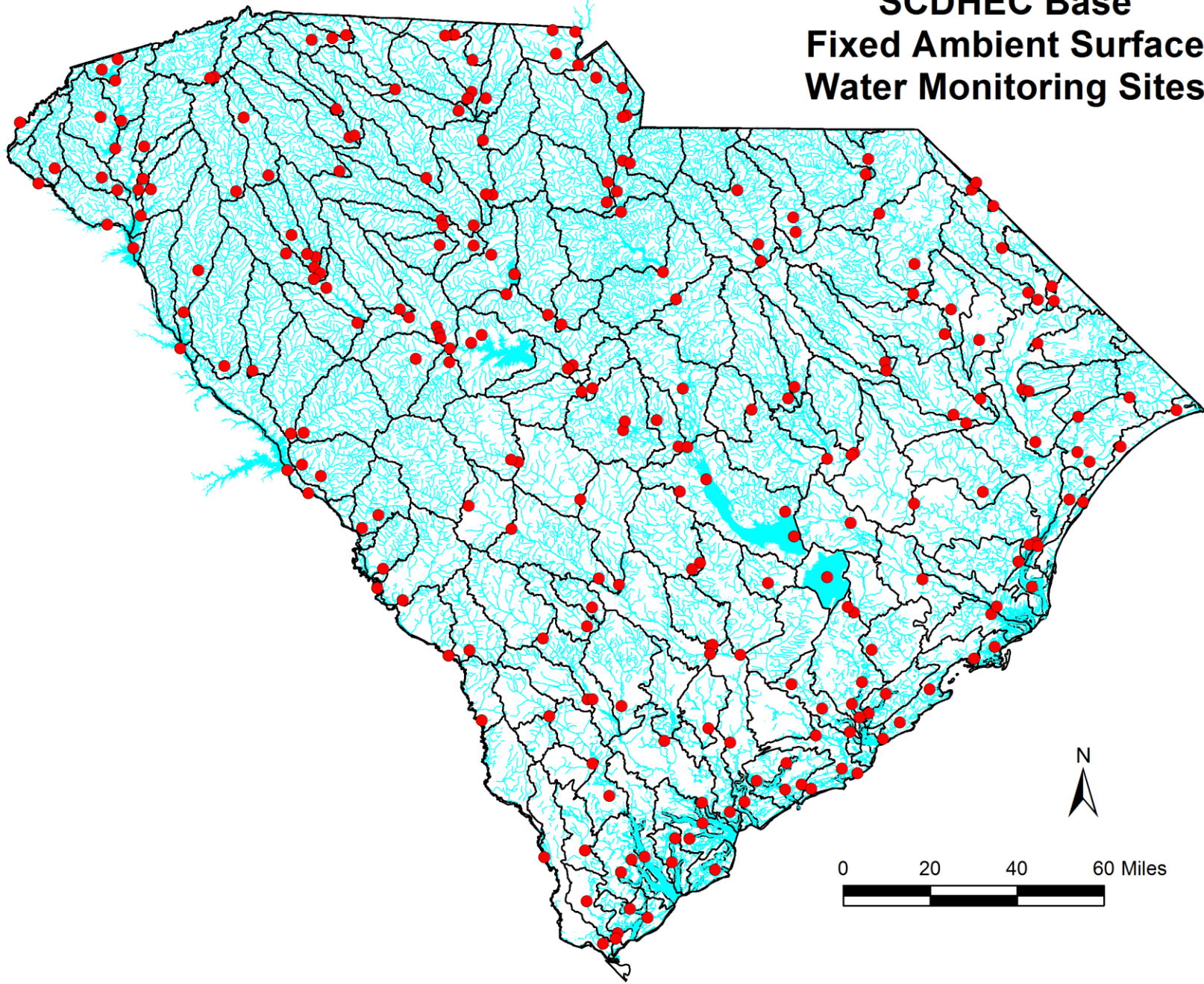


Bobbi Carter  
Quality Assurance Officer, USEPA Region IV

# Purpose of the Ambient Surface Water Quality Monitoring Program

- ❖ The collection and analysis of data to make water quality management decisions and meet federal reporting requirements:
  - State-scale summary of condition of aquatic resources (§305(b), State Legislature)
  - Assess water quality status & identify specific waters not meeting standards (§303(d), Watershed Reports)
  - Determine long-term trends in specific constituents at individual sites (§303(d), Watershed Reports)
  - Collect data for Wasteload Allocation Models
  - Support specific NPDES permit limits
  - Evaluate effectiveness of SCDHEC programs

# SCDHEC Base Fixed Ambient Surface Water Monitoring Sites



# Components of the current Ambient Monitoring Network design

## ❖ Fixed Monitoring Network

- Long-term trends at sites
- Consistent statewide coverage year after year

## ❖ Statistical Survey Monitoring

- State-Scale Statistical Survey of resource condition
- Long-term trends at state-scale
- Sample new locations





# Fixed Monitoring Network Surface Water Chemistry Monitoring Sites

- ❖ Sampled bi-monthly (every other month), every year
- ❖ Long-term trends at individual sites
- ❖ Consistent statewide coverage year after year



# Statistical Survey Component

- ❖ Sampled monthly for 1 year
- ❖ State-scale survey of resource condition
  - Make comprehensive statements about state-scale WQ conditions
  - State-scale trends in WQ
- ❖ Sample previously unsampled locations



# Indicators

# Core Freshwater Parameters - All Physical & Chemical Sites

## Every Site Visit

Water Temp

pH

Turbidity

Kjeldahl Nitrogen

Ammonia N

*Escherichia coli*\*

## Additional at Lake Sites

Secchi Depth

Dissolved Oxygen

BOD<sub>5</sub>

Total Phosphorus

Nitrate/Nitrite

Alkalinity

Chlorophyll-a (May-Oct)



# Core Freshwater Parameters - All Physical & Chemical Sites

## Quarterly

Cadmium

Chromium

Copper

Iron

Mercury

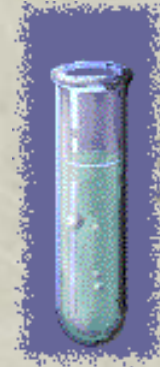
Nickel

Zinc

Lead

## Annually

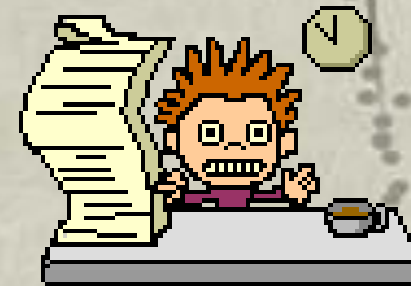
Hardness



# Federal Reporting Requirements

## ❖ §303(d) List

- Listing of known impaired waters (in SC case = sites)
  - Including pollutants (stressors) responsible for impairment
- Does not require size estimates
- Submitted to EPA every two years
- Based on all legally-defensible monitoring data



# Becoming “impaired”

**Sample  
Collection**

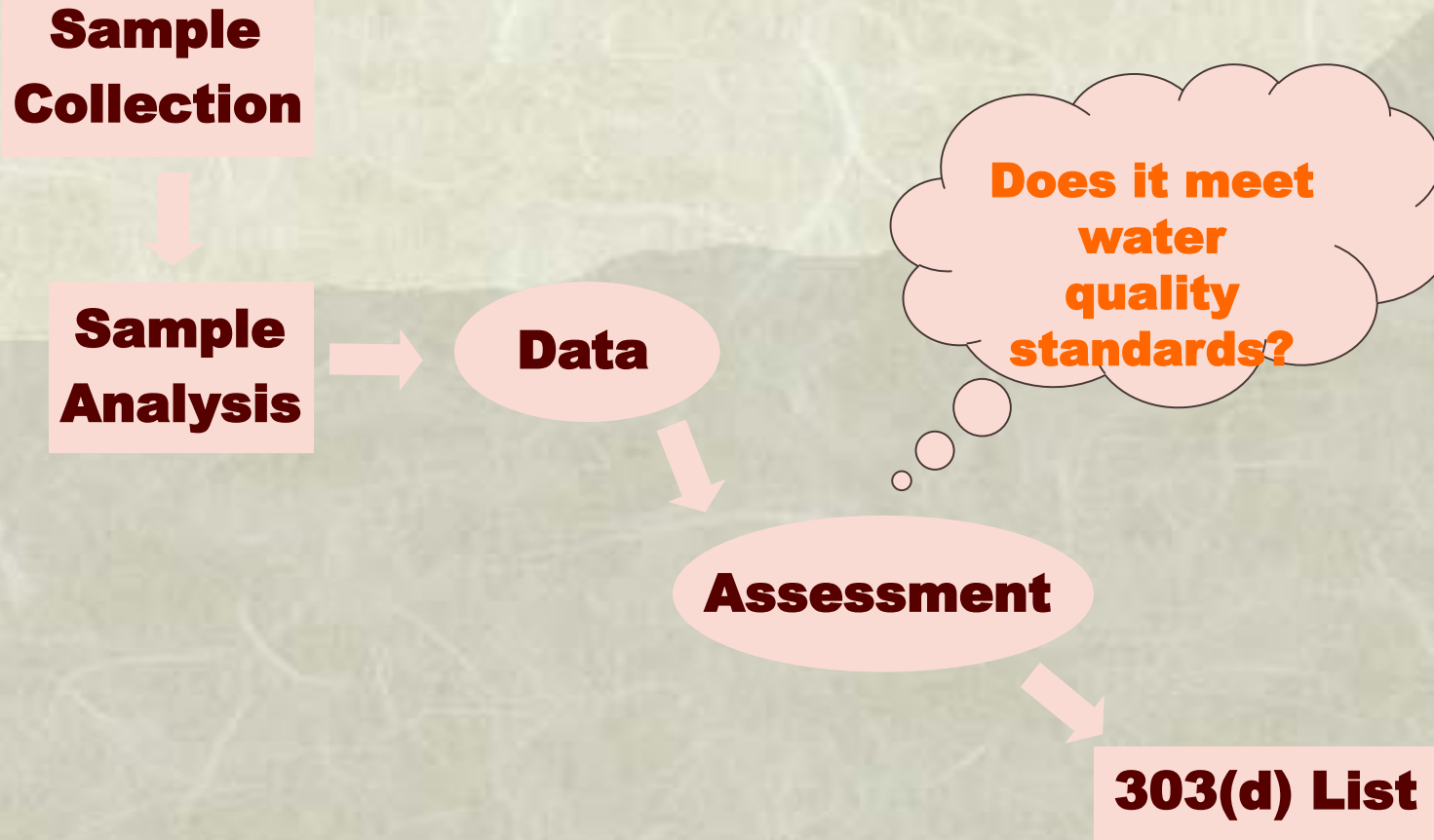
**Sample  
Analysis**

**Data**

**Assessment**

**303(d) List**

**Does it meet  
water  
quality  
standards?**



# Impaired for what??

## 4 Use Classifications

- Aquatic Life Use Support
- Recreational Use Support
- Fish Consumption (Human Health)
- Shellfish Consumption (Human Health)



# Recreational Use Support

- ❖ Degree to which water quality supports recreational activities in and on the water
- ❖ ~CWA "Swimmable"



## Fecal Coliform Bacteria\*

(dropped after 2012)

*Escherichia coli*\*

(new beginning in 2013)



# Aquatic Life Use Support

- ❖ Degree to which water quality supports a balanced aquatic community
- ❖ ~CWA "Fishable"

Dissolved Oxygen

pH

Metals

Ammonia

Macroinvertebrate

Turbidity

Community

(wadeable streams)

Nutrients (lakes)

Chlorophyll-a (lakes)



# 2014 303(d) Aquatic Life Impairments in the Waccamaw

TMDL TARGET DATE(S)++	BASIN	HUC_12	STATION	LOCATION	COUNTY	USE	CAUSE
2020	PEEDEE	030402060903	RS-06165	STERITT SWAMP AT BRIDGE ON UNNUMBERED DIRT RD(STERITT SWAMP RD) ACROSS FROM HORRY CO SOLID WASTE AUTHORITY 4.8 MI E OF CONWAY	HORRY	AL	DO
2021	PEEDEE	030402060802	RS-05561	HELLHOLE SWAMP AT S-26-67 6.6 MI SW OF LORIS	HORRY	AL	DO
2021	PEEDEE	030402060803	MD-158	CRAB TREE SWAMP AT LONG ST BL OUTFALL OF CONWAY #1 POND	HORRY	AL	DO
2022	PEEDEE	030402060803	MD-107	KINGSTON LK NR PUMP STA ON LAKESIDE DR CONWAY	HORRY	AL	DO
2022	PEEDEE	030402060803	RS-10389	BROWN SWAMP AT US 701	HORRY	AL	DO
2024	PEEDEE	030402060905	PD-638	BEAR SWAMP AT S-26-110	HORRY	AL	BIO

# 2014 303(d) listings for Recreational impairment in the Waccamaw

TMDL TARGET DATE(S)++	BASIN	HUC_12	STATION	LOCATION	COUNTY	USE	CAUSE
2024	PEEDEE	030402060705	PD-363	SIMPSON CREEK AT SC 905	HORRY	REC	ECOLI
2017	PEEDEE	030402060803	MD-107	KINGSTON LK NR PUMP STA ON LAKESIDE DR CONWAY	HORRY	REC	ECOLI
2016	PEEDEE	030402060803	MD-158	CRAB TREE SWAMP AT LONG ST BL OUTFALL OF CONWAY #1 POND	HORRY	REC	ECOLI
2016	PEEDEE	030402060803	RS-04375	CRAB TREE SWAMP AT BRIDGE ON US 501 1.5 MI NW OF CONWAY	HORRY	REC	ECOLI
2016	PEEDEE	030402060906	RS-03332	UNNAMED TRIBUTARY TO INTERCOASTAL WATERWAY AT SC 707 1.2 MI ENE OF SOCASTEE & SC 544	HORRY	REC	ECOLI

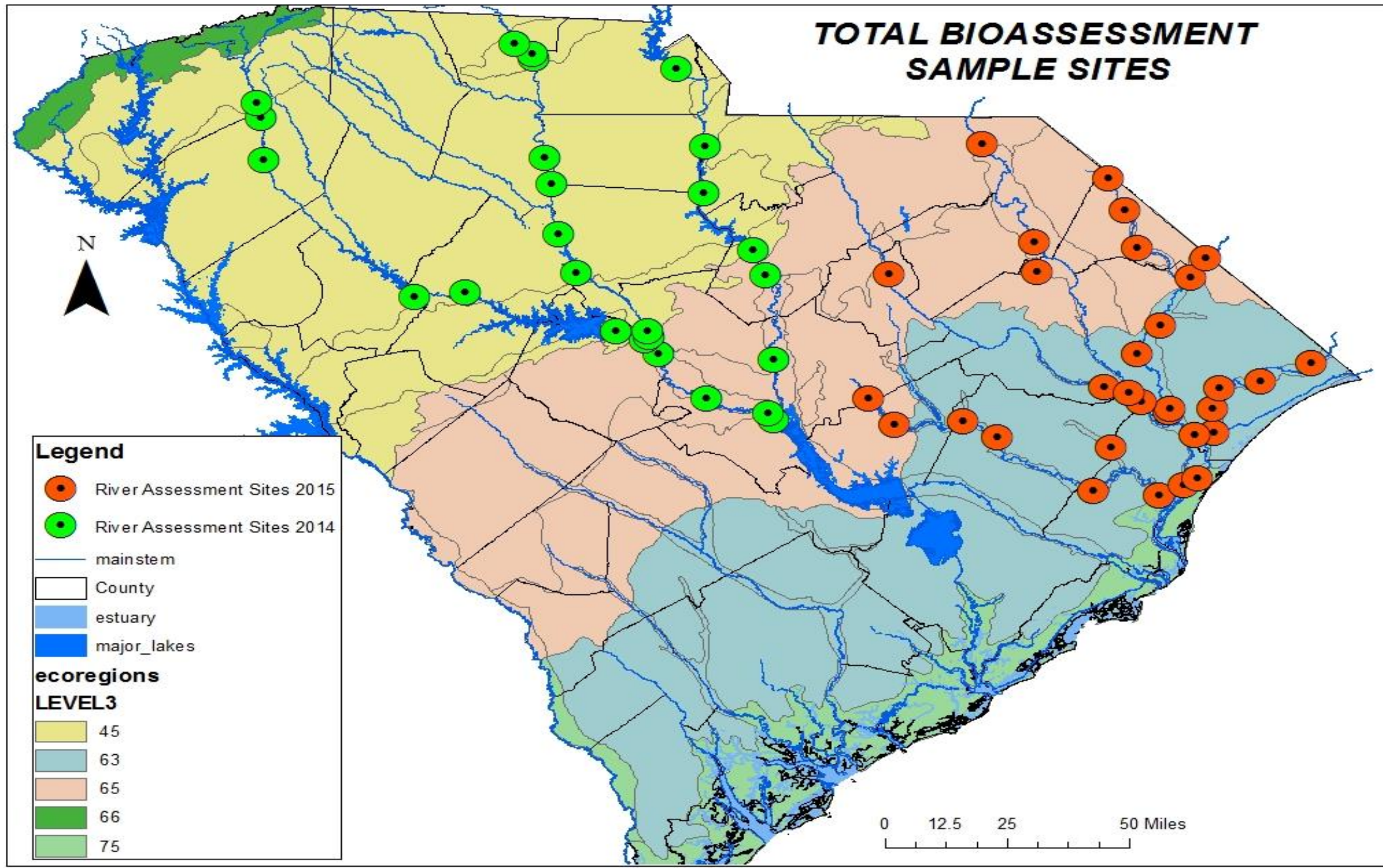
# Fish Tissue Monitoring

- ❖ ~60 sites visited annually statewide
- ❖ At least 2 species per site
- ❖ 5 Individuals per species each treated as a separate sample
- ❖ Mercury on each sample (individual)



TMDL TARGET DATE(S)++	BASIN	HUC_12	STATION	LOCATION	COUNTY	USE	CAUSE
2027	PEEDEE	030402060704	MD-124	WACCAMAW RVR AT SC 9 7.0 MI W OF CHERRY GROVE	HORRY	FISH	HG
2027	PEEDEE	030402060902	CSTL-553	WACCAMAW RIVER @ SC 31	HORRY	FISH	HG
2027	PEEDEE	030402060902	CSTL-554	WACCAMAW RIVER @ SEC RD 105	HORRY	FISH	HG
2027	PEEDEE	030402060904	CSTL-555	WACCAMAW RIVER @ SEC RD 901	HORRY	FISH	HG
2027	PEEDEE	030402060905	CSTL-556	WACCAMAW RIVER @ PITCH LANDING	HORRY	FISH	HG
2027	PEEDEE	030402060905	MD-144	WACCAMAW RIVER @ TODDVILLE	HORRY	FISH	HG
2027	PEEDEE	030402060906	CSTL-558	INTRACOASTAL WATERWAY @ SOCASTEE	HORRY	FISH	HG
2027	PEEDEE	030402060907	MD-136	WACCAMAW RVR 1/4 MI UPSTRM OF JCT WITH INTRACOASTAL WTRWY	HORRY	FISH	HG
2027	PEEDEE	030402060907	MD-145	WACCAMAW RVR 1 MI DS OF BUCKSVILLE LANDING AT BIG BEND IN RVR	HORRY	FISH	HG
2027	PEEDEE	030402061002	CSTL-557	WACCAMAW RIVER @ BUCKSPORT LANDING	HORRY	FISH	HG
2027	PEEDEE	030402061002	MD-138	WACCAMAW RVR AT CHANNEL MARKER 57	GEORGETOWN	FISH	HG
2027	PEEDEE	030402061003	MD-140	WACCAMAW RIVER @ SANDY ISLAND	GEORGETOWN	FISH	HG
2027	PEEDEE	030402061003	MD-141	WACCAMAW RIVER @ HAGLEY LANDING	GEORGETOWN	FISH	HG

# TOTAL BIOASSESSMENT SAMPLE SITES

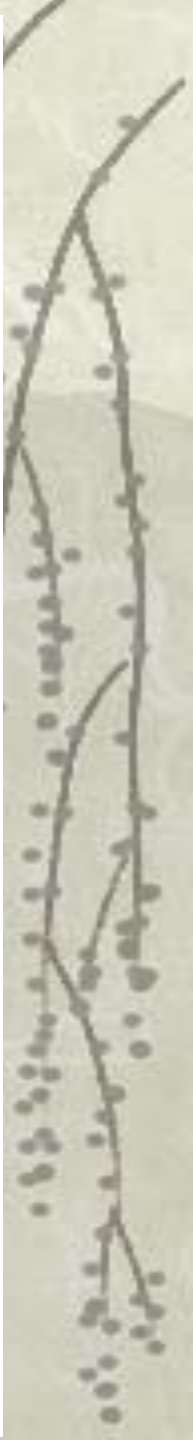


**Legend**

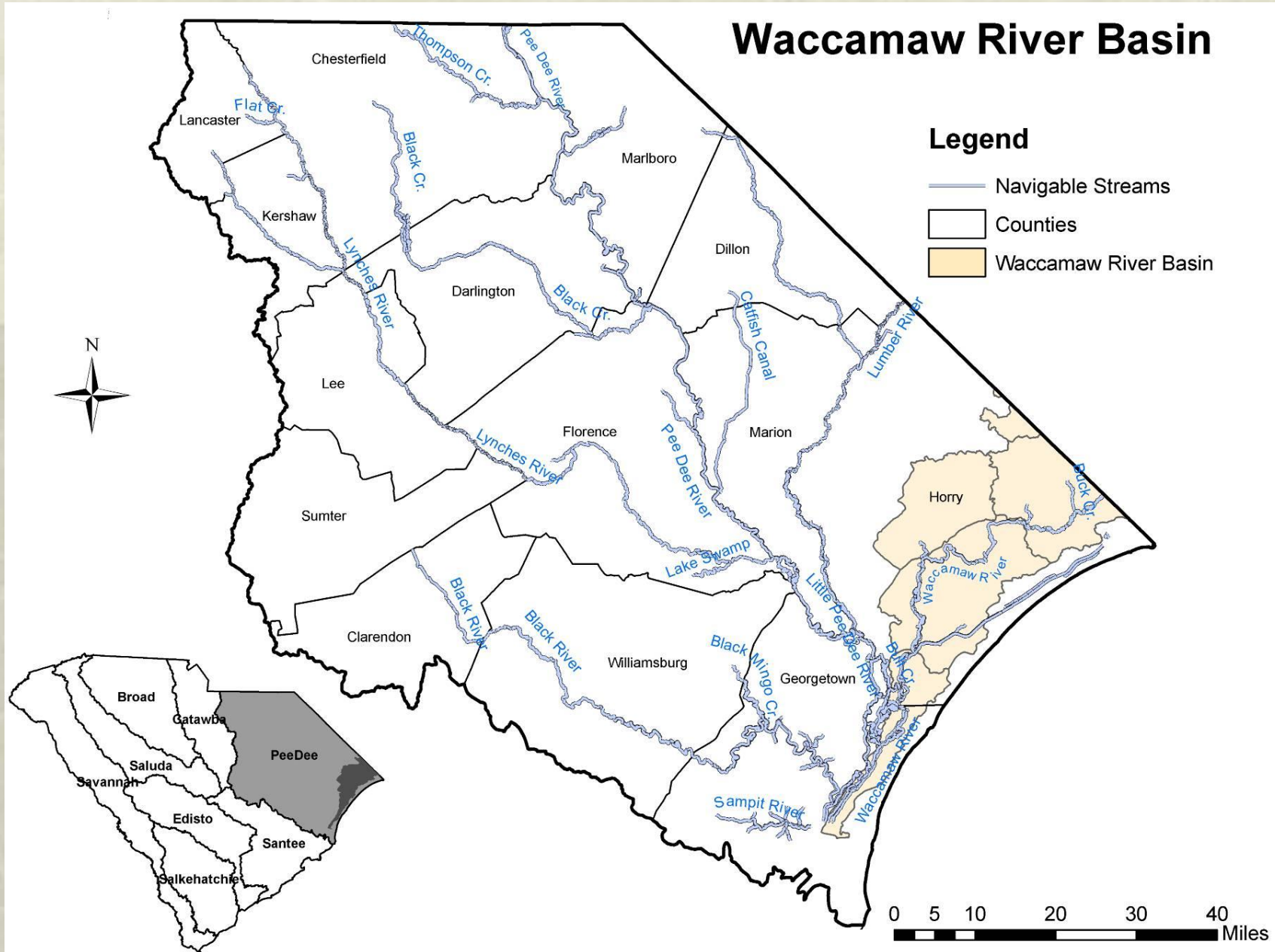
- River Assessment Sites 2015
- River Assessment Sites 2014
- mainstem
- County
- estuary
- major\_lakes

**ecoregions**  
**LEVEL3**

- 45
- 63
- 65
- 66
- 75



# Let's look at the Waccamaw








# DHEC Monitoring Stations in the Waccamaw Basin



## Legend



-  Counties
-  HUC 8 Boundary
-  HUC 10 Boundary
-  Streams



## Active DHEC WQMS

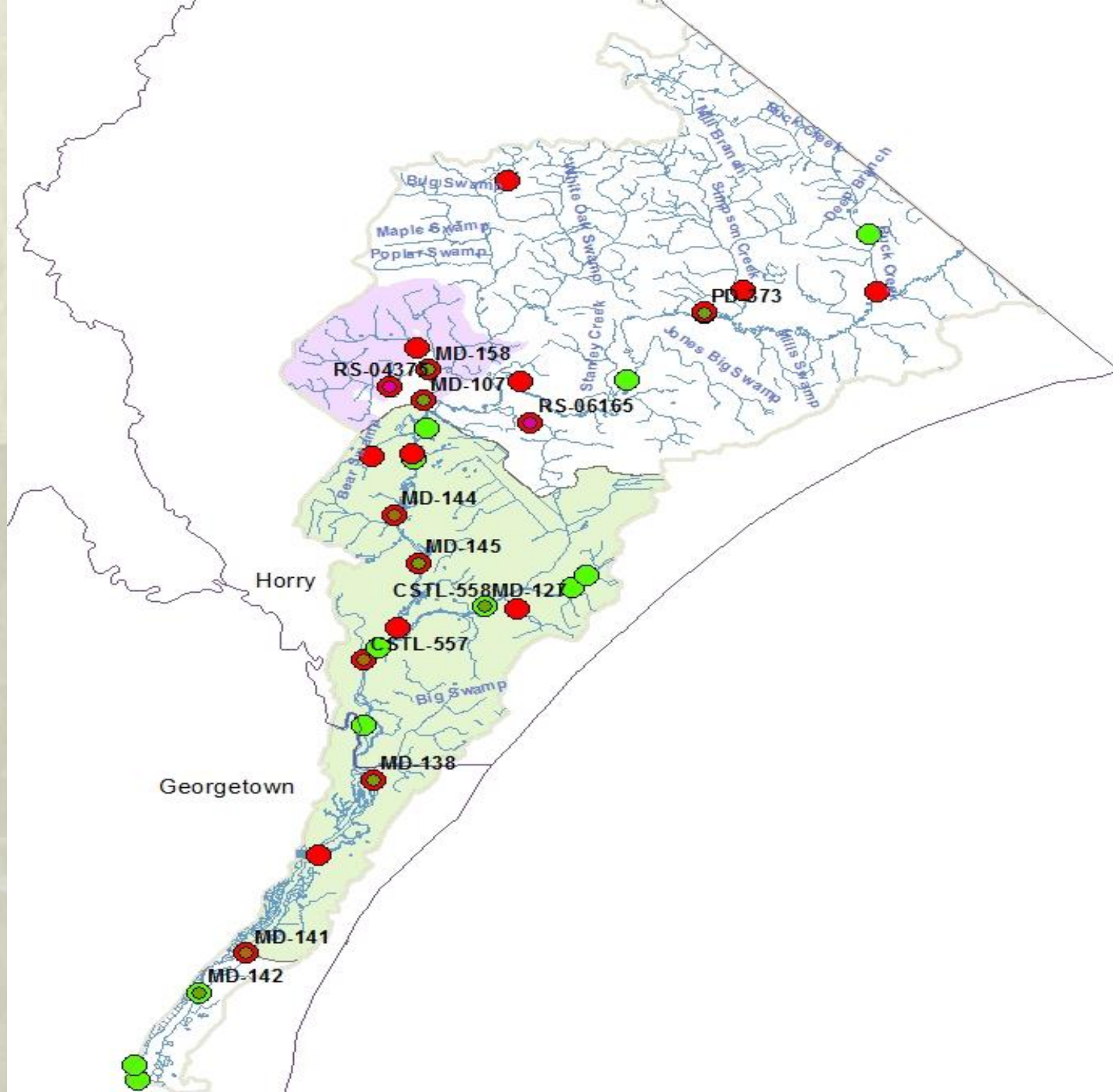
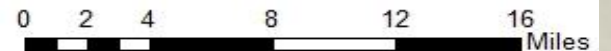
-  FISH
-  RANDOM
-  WQMS

## 2014 303(d) Assessed Sites

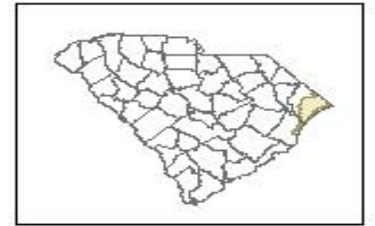
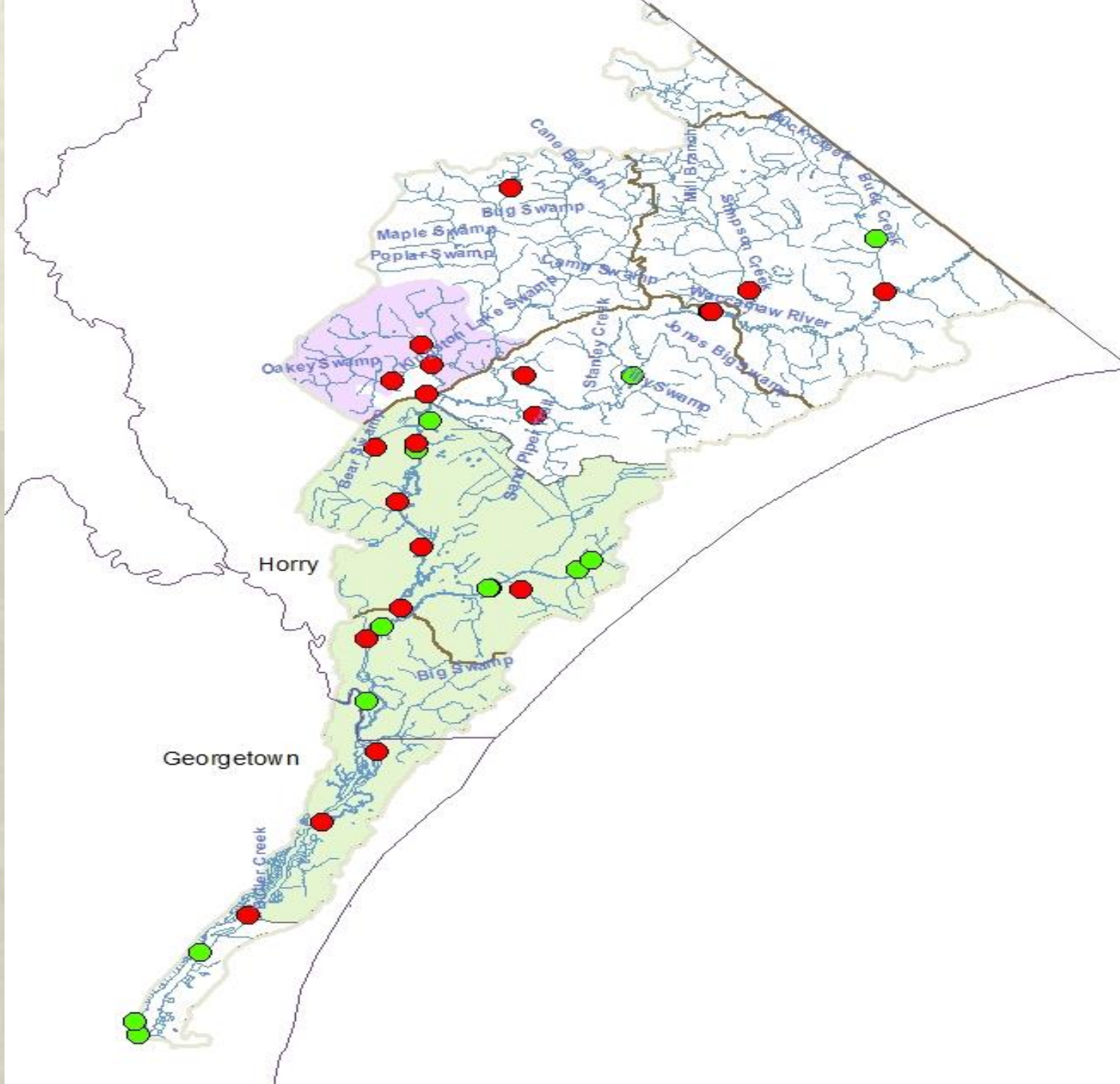
### STATUS

-  Impaired
-  Not on List

-  TMDL Sheds
-  DHEC 319 Project



# 2014 303(d) Assessed Sites in the Waccamaw Basin



## Legend

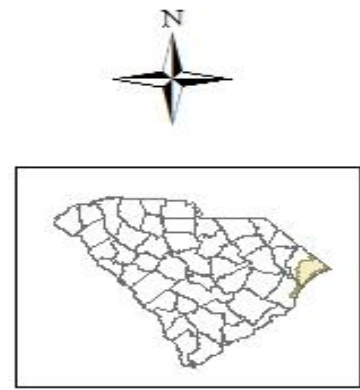
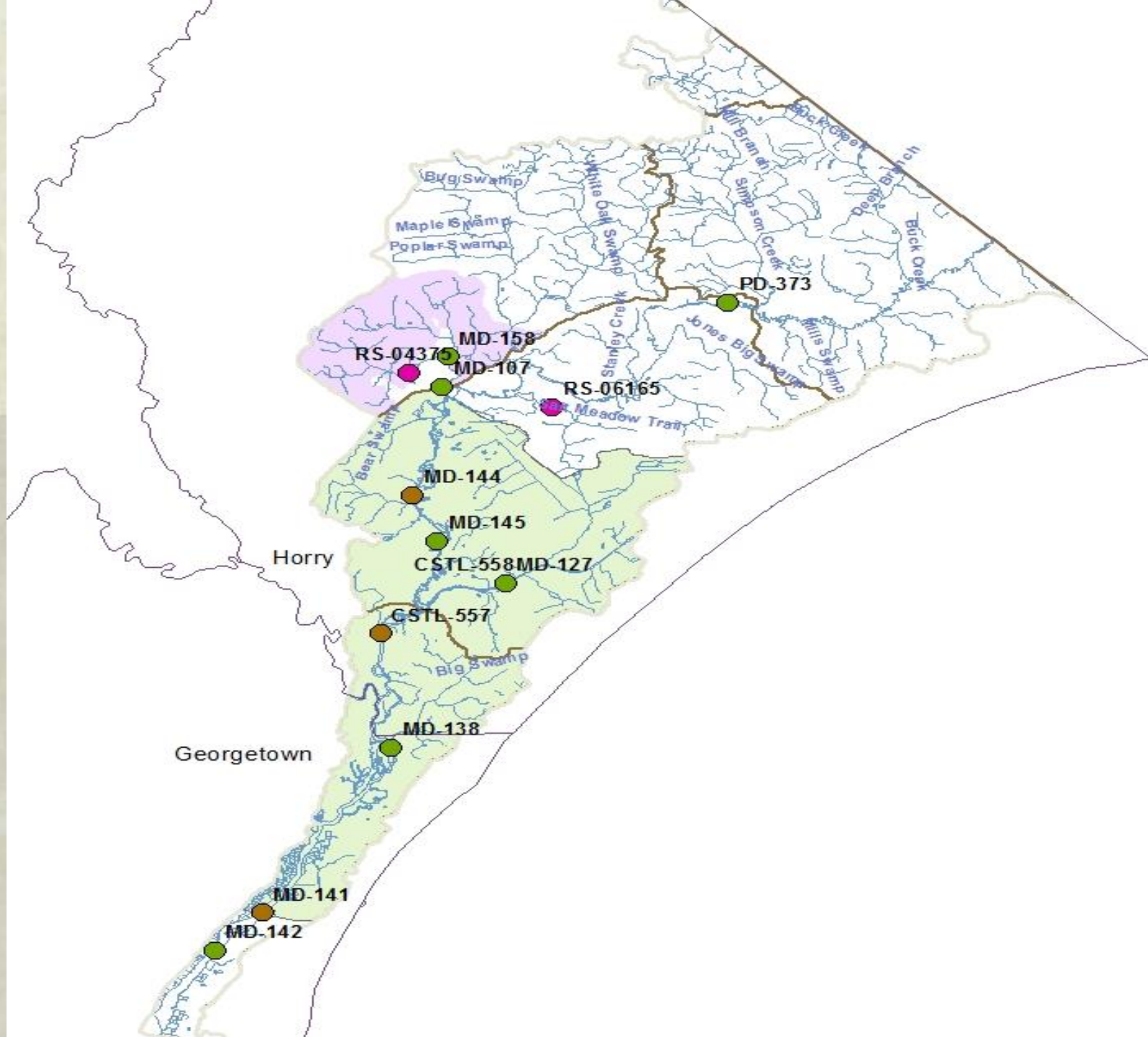
- Counties
- HUC 8 Boundary
- HUC 10 Boundary
- Streams

## 2014 303(d) Assessed Sites STATUS

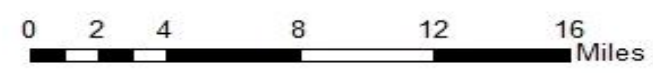
- Impaired
- Not on List
- TMDL Sheds
- DHEC 319 Project



# Active DHEC Monitoring Stations in the Waccamaw Basin



- Legend**
- Counties
  - HUC 8 Boundary
  - HUC 10 Boundary
  - Streams
- Active DHEC WQMS**
- FISH
  - RANDOM
  - WQMS
  - TMDL Sheds
  - DHEC 319 Project



0304020605, -07



**Legend**

HUC 10 Boundary

Streams

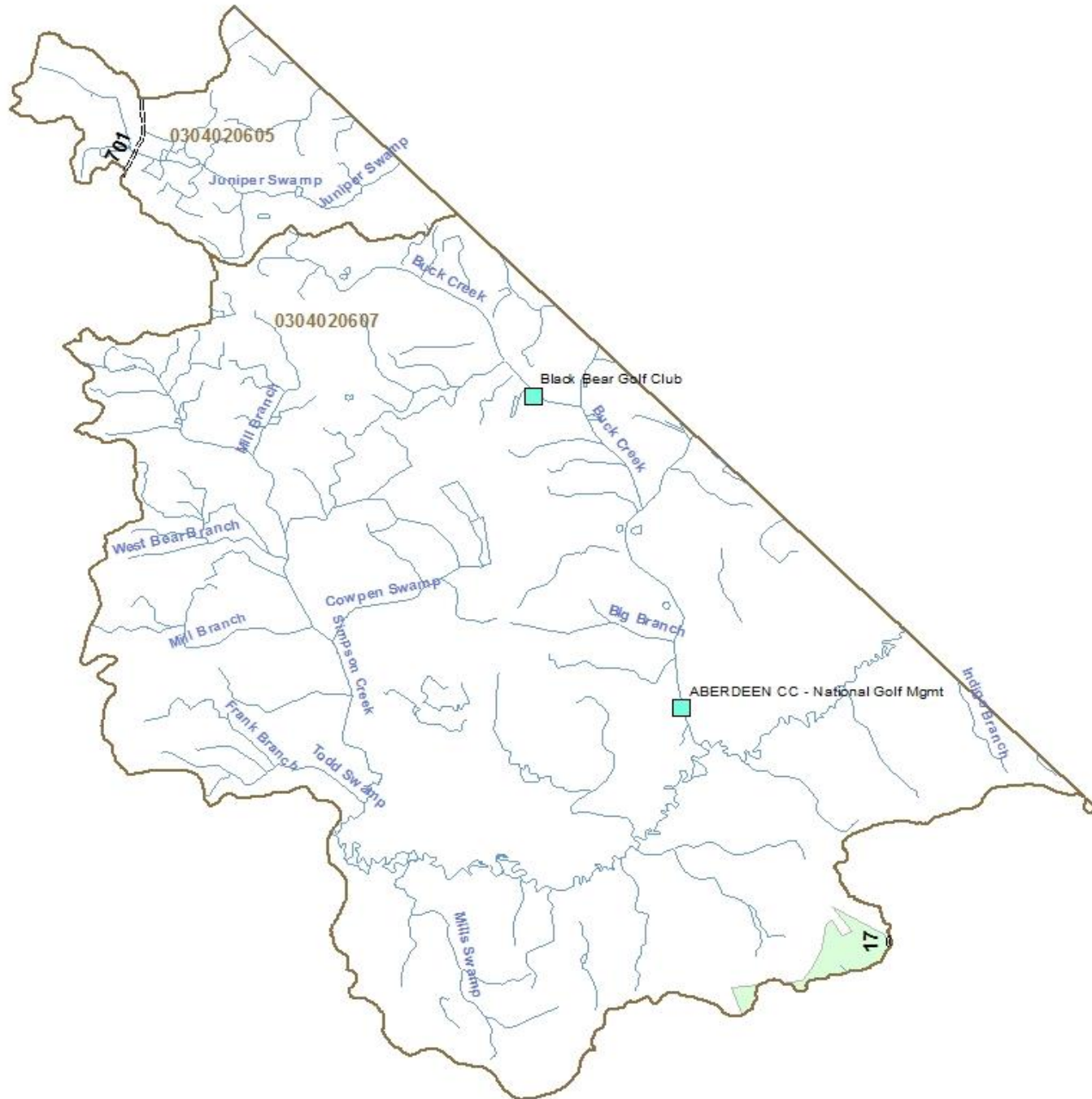
Surface Water Intakes

**MS4 Type**

Phase II



0 0.5 1 2 3 4 Miles



0304020608

### Legend

 HUC 10 Boundary

 Streams

### Active DHEC WQMS

 FISH

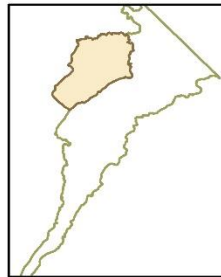
 RANDOM

 WQMS

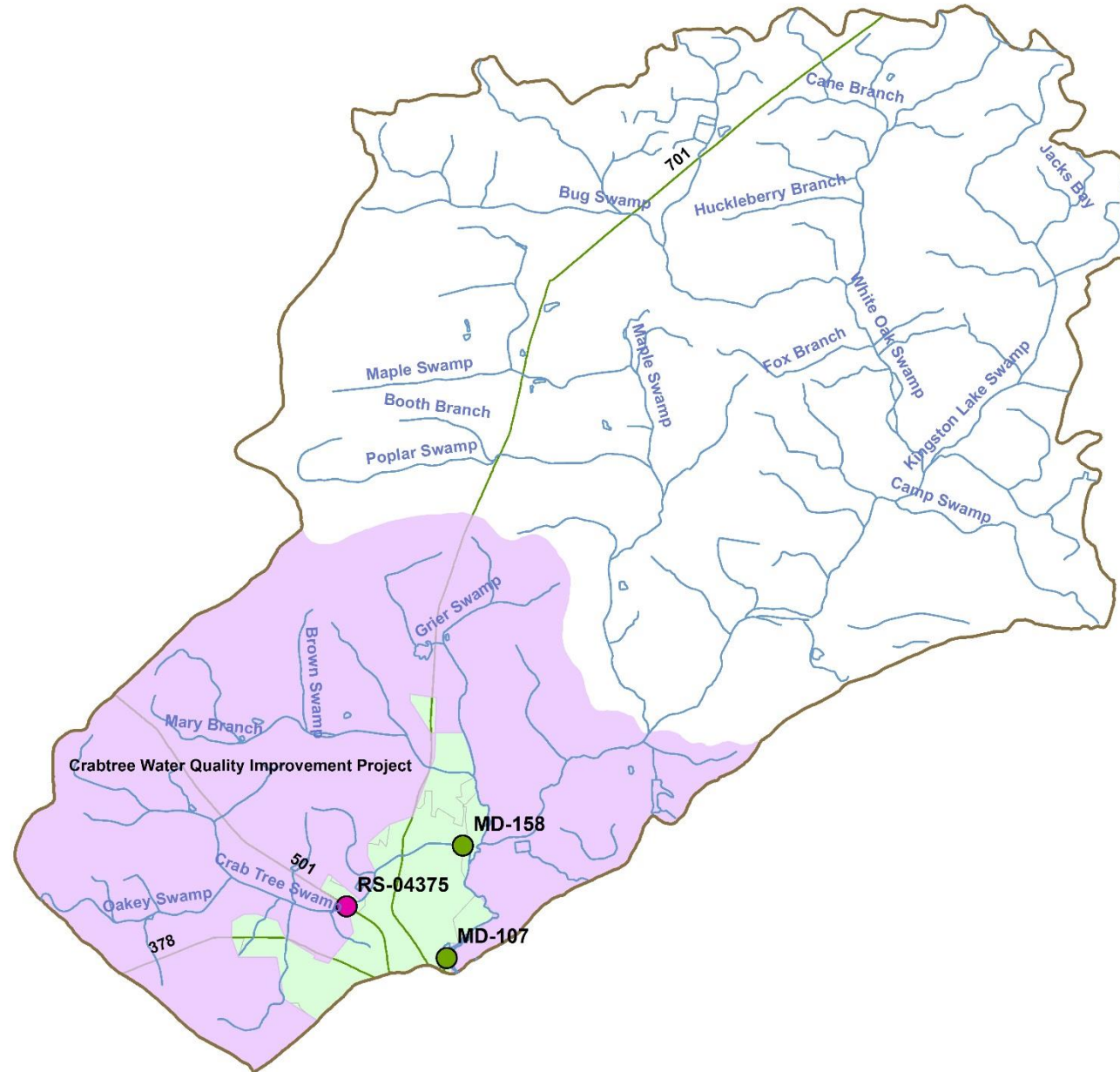
 Section 319 Project

### MS4 Type

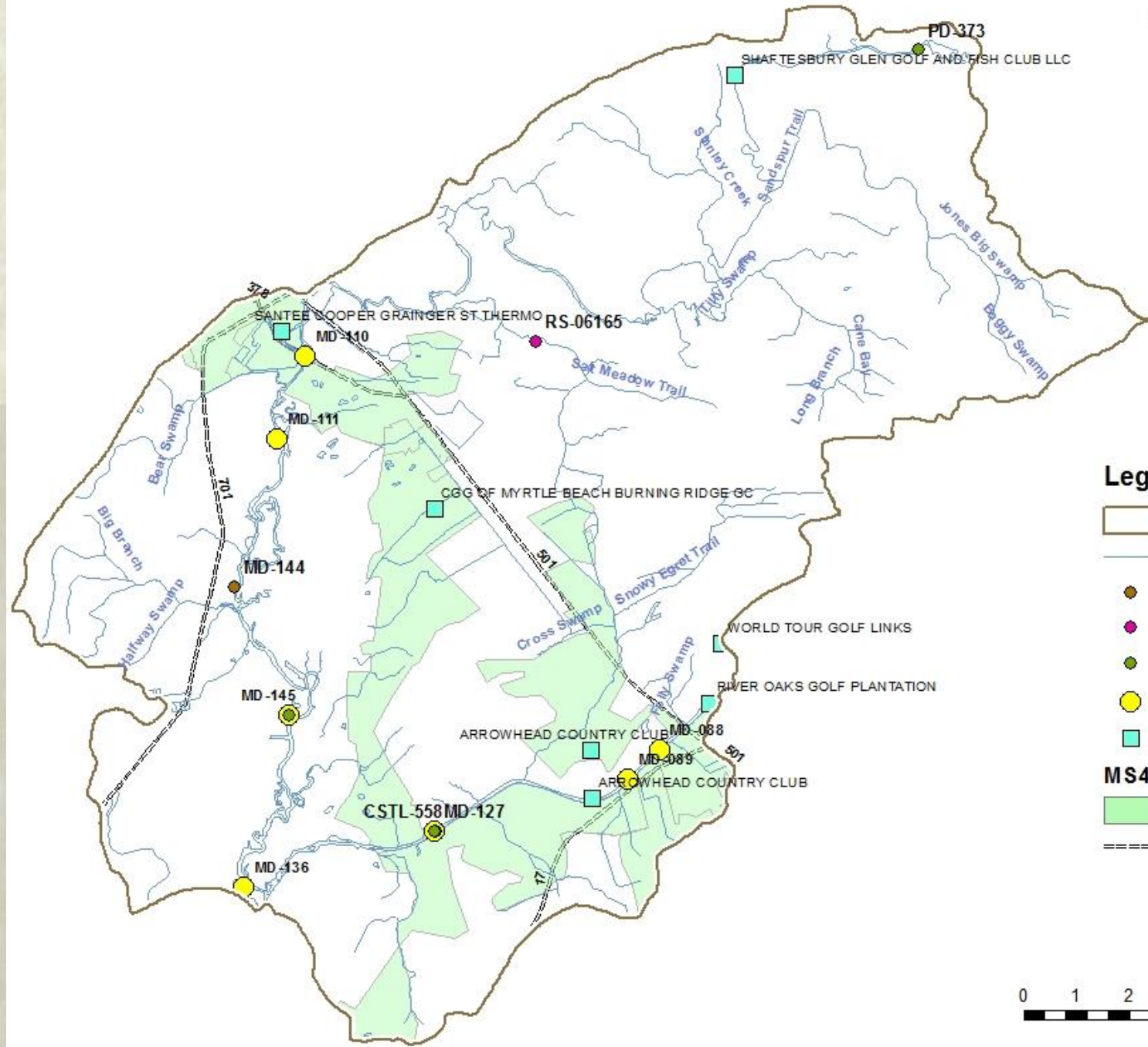
 Phase II












0 0.5 1 2 3 4 Miles



0304020609



**Legend**










-  HUC 10 Boundary
-  Streams
-  FISH
-  RANDOM
-  WQMS
-  DO TMDL Sites
-  Surface Water Intakes
- MS4 Type**
-  Phase II
-  US Highways

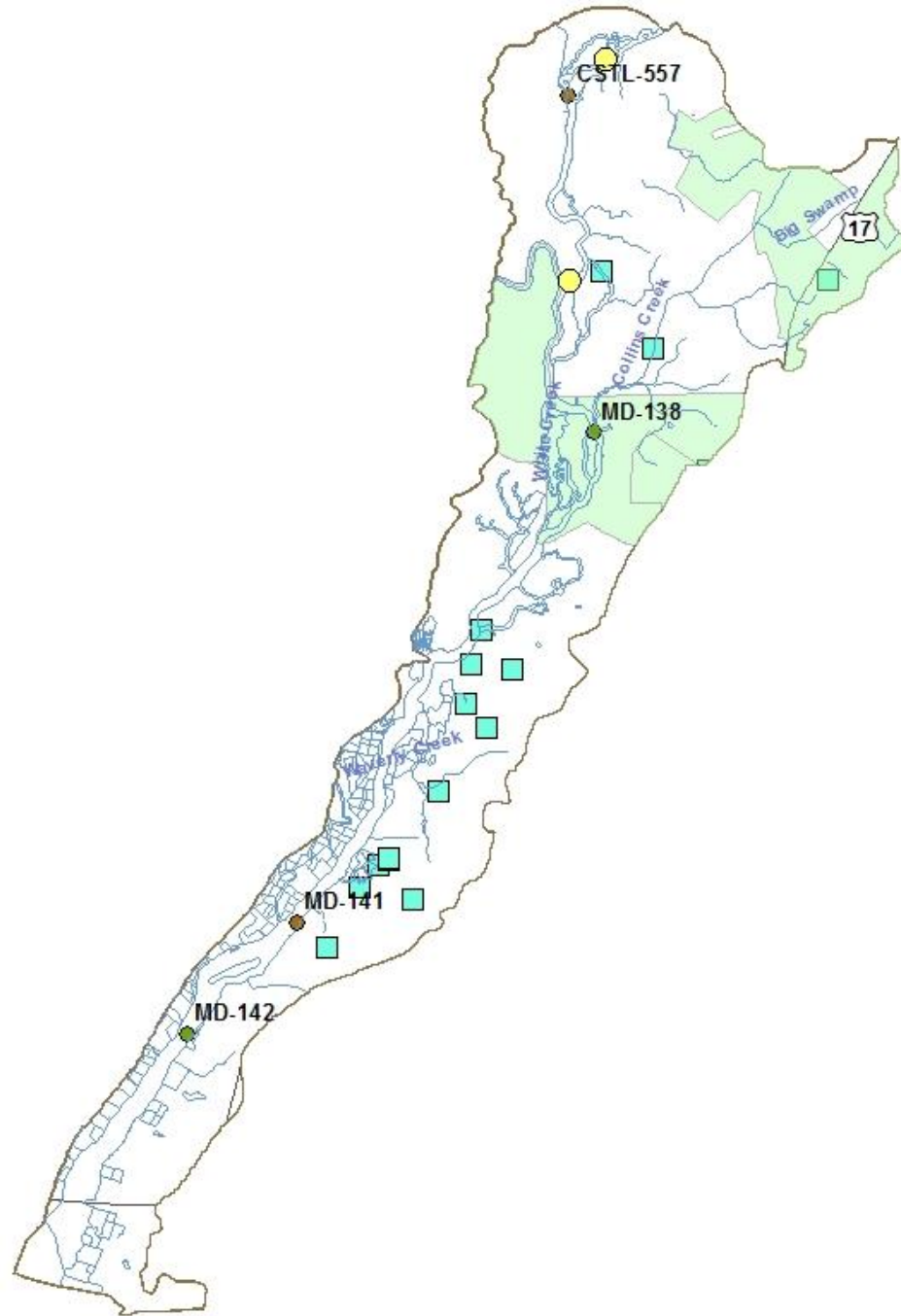


0304020610



**Legend**

-  HUC 10 Boundary
-  Streams
-  FISH
-  RANDOM
-  WQMS
-  DO TMDL Sites
-  Surface Water Intakes
- MS4 Type**
-  Phase II
-  US Highways



# 2014 303(d) Waccamaw DO TMDL Status

		WACCAMAW RVR AT US 501 BY PASS									
PEEDEE	030402060905	AROUND CONWAY	MD-110	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		WACCAMAW RVR AT COX'S FERRY ON									
PEEDEE	030402060905	CO RD 110	MD-111	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		INTRACOASTAL WTRWAY AT SC 544 7.5									
PEEDEE	030402060906	MI SW OF MYRTLE BEACH	MD-127	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
PEEDEE	030402060907	WACCAMAW RIVER @ PEACH TREE	MD-136	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
PEEDEE	030402060907	WACCAMAW RIVER @ BUCKSVILLE	MD-145	HORRY	AL	DO	Not Supporting	WnTMDL	013-99	7/27/99	
		WACCAMAW RVR NR MOUTH OF BULL									
PEEDEE	030402061002	CK AT CHANNEL MARKER 50	MD-137	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		WACCAMAW RVR & ICWW 1 MI BL JCT-									
PEEDEE	030402061002	AT BUCKSPORT LANDING	MD-146	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		INTRACOASTAL WTRWAY AT PT 3 MI N									
PEEDEE	030402080301	OF BRDG ON US 501	MD-085	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		INTRACOASTAL WTRWAY JUST N OF									
PEEDEE	030402080301	BRDG ON US 501	MD-087	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		INTRACOASTAL WTRWAY 1 MI S OF									
PEEDEE	030402080301	BRDG ON US 501	MD-088	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		INTRACOASTAL WTRWY 2 MI S OF									
PEEDEE	030402080301	BRDG ON US 501	MD-089	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		INTRACOASTAL WTRWY 4 MI N OF									
PEEDEE	030402080301	BRDG ON US 501	MD-091	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	
		INTRACOASTAL WTRWY (LITTLE RVR)									
PEEDEE	030402080301	ON SC 9 (US 17)	MD-125	HORRY	AL	DO	Fully Supporting	InTMDL	013-99	7/27/99	





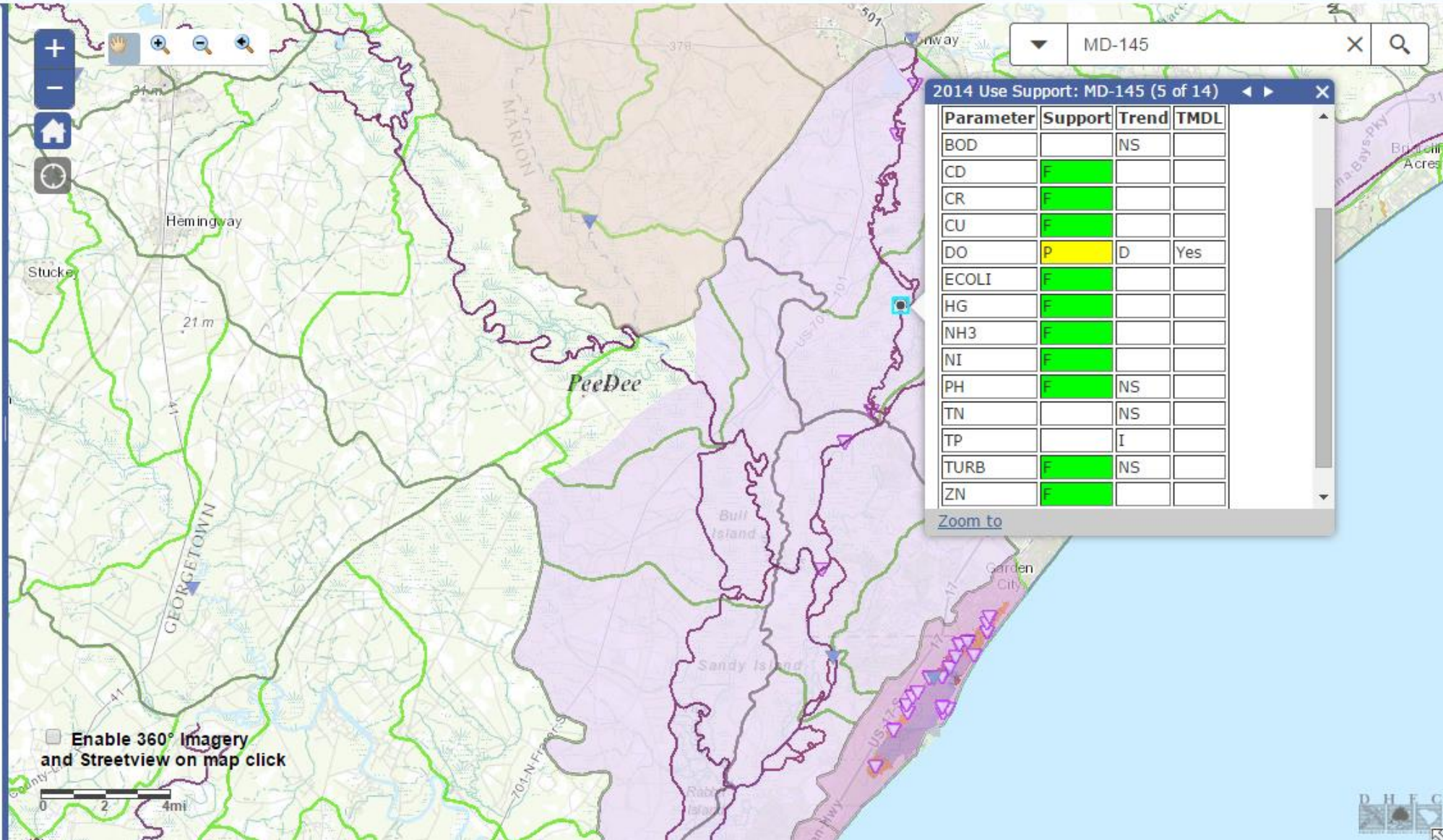
Map

### Watershed Layers

- Bureau of Water Permits
- Public Water Supply
- Water Monitoring Stations
  - Beach
  - Special Study
  - Macroinvertebrate
  - Ambient Groundwater
  - Shellfish Harvest
  - Ambient Surface (Fixed)
  - Ambient Surface (Historic)
  - Ambient Surface (Random)
- Water Quality Assessments
  - 2014 Use Support and Trends
    - Stations
  - Impaired Waters - 303(d)
  - Modeled Stream Reaches
  - Approved TMDL Sites
  - Approved TMDL Watersheds
  - Shellfish Harvest Emergency C
  - Shellfish Harvest Classification
    - Approved
    - Restricted
    - Prohibited
  - DHEC 319 Projects

Measure and Drawing Tools

Basemaps

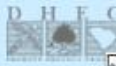


MD-145

2014 Use Support: MD-145 (5 of 14)

Parameter	Support	Trend	TMDL
BOD		NS	
CD	F		
CR	F		
CU	F		
DO	P	D	Yes
ECOLI	F		
HG	F		
NH3	F		
NI	F		
PH	F	NS	
TN		NS	
TP		I	
TURB	F	NS	
ZN	F		

Zoom to





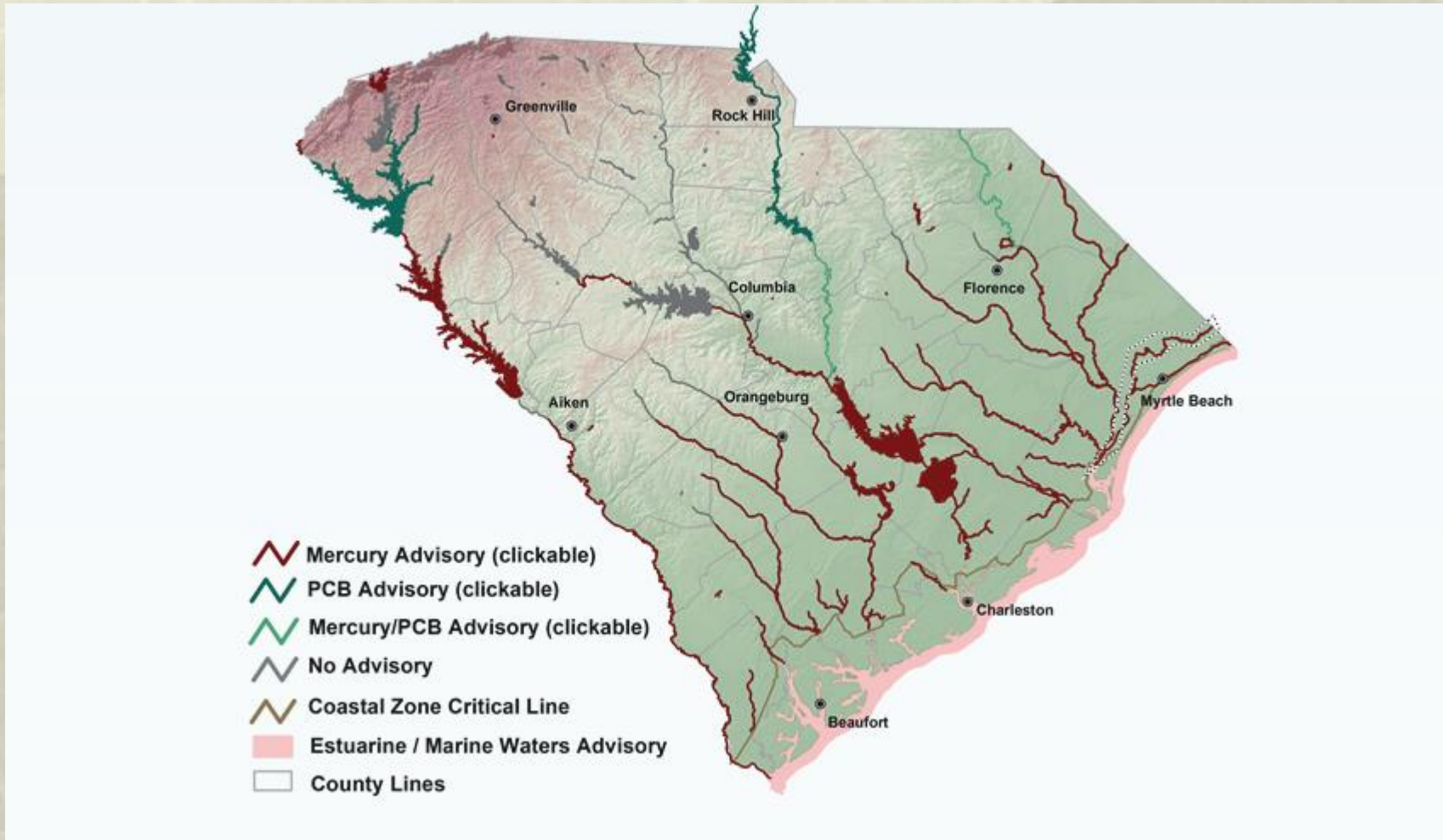
# SC Watershed

Map

- Watershed Layers**
- + Bureau of Water Permits
- + Public Water Supply
- Water Monitoring Stations**
- Beach
- Special Study
- Macroinvertebrate
- Ambient Groundwater
- Shellfish Harvest
- Ambient Surface (Fixed)
- Ambient Surface (Historic)
- Ambient Surface (Random)
- Stream
- Lake
- Estuary

- Water Quality Assessments**
- 2014 Use Support and Trends**
- + Stations
- + Impaired Waters - 303(d)
- Modeled Stream Reaches
- Approved TMDL Sites
- Approved TMDL Watersheds
- Shellfish Harvest Emergency Closures
- + Shellfish Harvest Classifications
- DHEC 319 Projects
- + **Water Advisories**
- + MS4-Municipal Separate Storm Sewer System
- Watershed Boundaries**
- Major River Basin (Outline)
- + Major River Basins
- 10-Digit Hydrologic Units
- 12-Digit Hydrologic Units
- County Boundary
- + Water Classification
- National Wetland Inventory
- Floodplains
- + **County Parcels**
- + Nat'l Land Cover 2011

# Fish Consumption Advisory Map



## Waccamaw River

From NC/SC State Line to U.S. Hwy 17

### **DO NOT EAT ANY**

Bowfin (Mudfish)  
Largemouth Bass

---

### **One meal per month**

Chain Pickerel

---

### **One meal per week**

Black Crappie  
Bluegill  
Redear Sunfish  
Blue Catfish  
Channel Catfish  
Warmouth

---

Any Questions?  
Discussion?

Amy Bennett  
[bennetam@dhec.sc.gov](mailto:bennetam@dhec.sc.gov)  
803-898-4249

