

NC Ambient Lake Assessment Program Overview including Coastal Lakes

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Intensive Survey Unit

Within the Environmental Sciences Section

To collect and interpret biological, chemical and physical data.

Intensive Survey Programs:

Ambient lake monitoring

Lake TMDL studies

Intensive surveys for special studies

Technical training/ Regional support

Ambient Lakes Monitoring Program Objectives

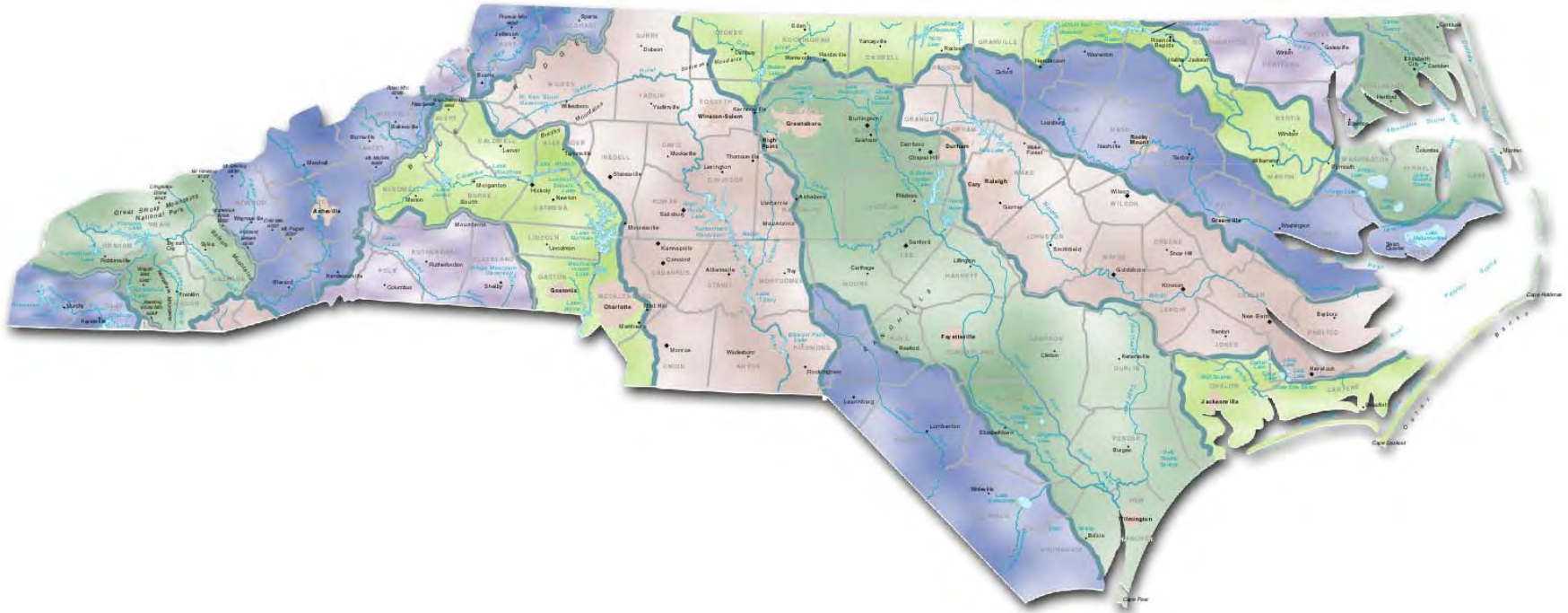
Our Objectives:

- Identify long-term trends
- Determine state of nutrient enrichment (trophic state)
- Assess water quality for use support and water quality standards



Lake Monitoring

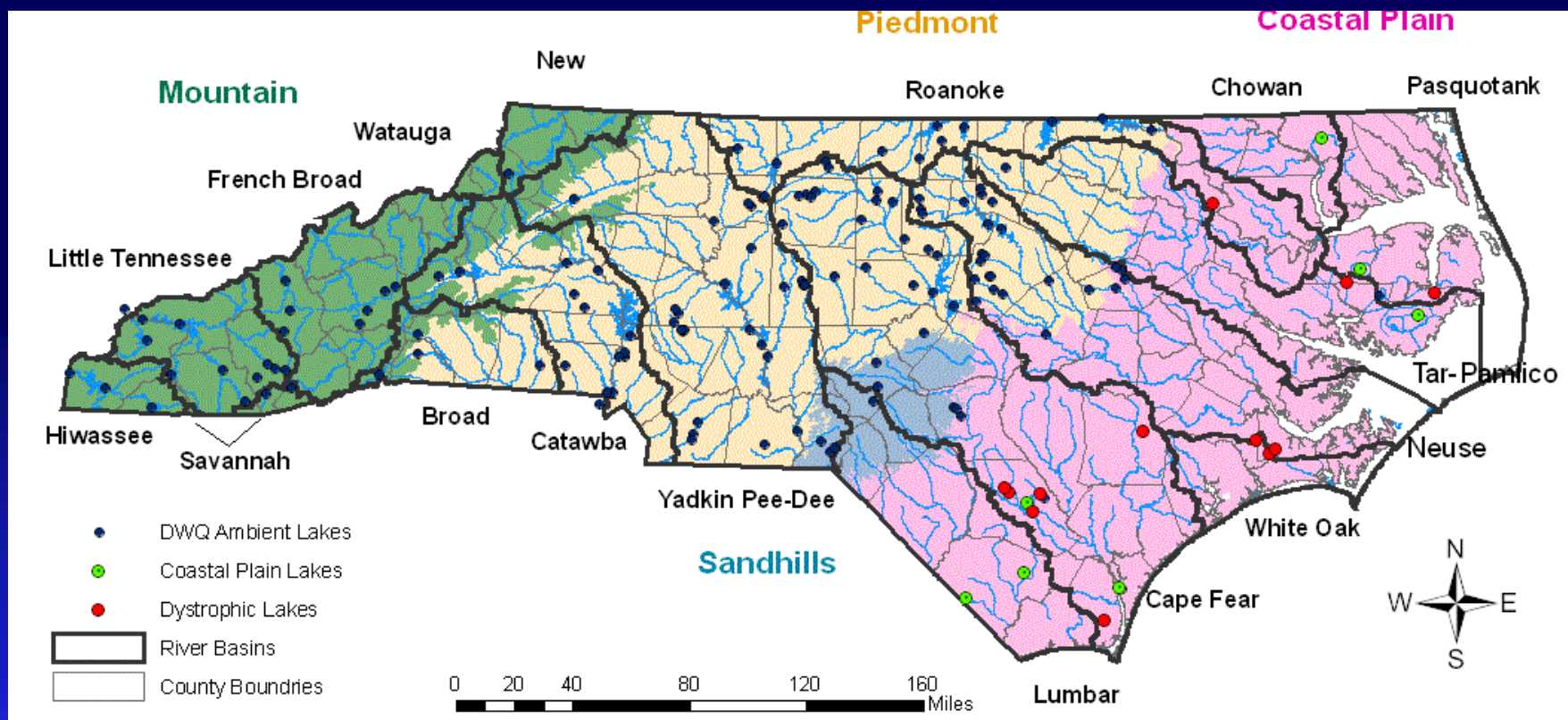
Ambient Lakes Program



Why NC DWQ monitors lakes across the state:

- Federal Clean Water Act
- Most are funded through 319 Grant
- 2005 Reservoir Drinking Water Act (SB 981)

DWQ Ambient Lakes



The Program Details

- Sample 160 lakes on 5-year rotating basin schedule
- Summertime (May through September) monthly monitoring
- 1-12 stations per lake
- Database includes 6500 + records dating back to 1981

How Lakes are Chosen

Lake Criteria:

- >10 acres
- Accessible to the public
- Water supplies
- Significant recreation
- Others as requested



Cedar Cliff Lake



Roberdel Lake

Physical Measurements

Field Measurements

Stratified Samples

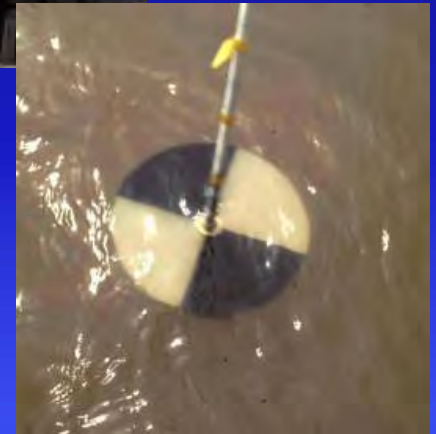
- Dissolved Oxygen (mg/L)
- Water Temperature (°C)
- Conductivity ($\mu\text{mhos/cm}$)
- pH

Non-stratified field measurement

- Secchi Depth (m)



Data Recording



Secchi Disk

Multiparameter Meters



Field Meter Pre and Post Sampling Calibration



Field Meter Used to Take Measurements

Meters Used:
YSI or Hydrolab
Multiparameter Meters

Ambient Lake Chemical Parameters

Typical Photic Zone Samples:

- Chlorophyll *a*
- Total Solids
- Total Suspended Solids
- Turbidity
- Nutrients (NH_3 , $\text{NO}_2 + \text{NO}_3$, TKN, Total P, Total N, TON, TIN)

Photic zone composite samples are collected with a labline at twice the secchi depth.

DWQ Laboratory analyzes all chemical samples.



Collecting photic zone sample

Sampling for Chemical Parameters

Other Samples Collected

Surface Samples for
Water Supply Reservoirs:

- Metals
- Chloride

All parameters listed are for normal ambient monitoring, special studies typically include others.



Collecting Water Samples



Getting to the sampling station

Lake TMDL Studies

- Lake TMDL studies collect data to support model development
- Many parameters are measured frequently at various locations over a long time period (2-5 years)
- *Examples:*
 - Jordan Lake
 - Falls Lake
 - High Rock Lake



A very cold day on High Rock Lake

North Carolina Trophic State Index

To measure the productivity of a lake we use:

CHL = Chlorophyll *a* ($\mu\text{g/l}$)

TON = Total Organic Nitrogen (mg/l)

TP = Total Phosphorus (mg/l)

SD = Secchi Depth (inches)

$$\text{NCTSI} = \text{TON}_{\text{Score}} + \text{TP}_{\text{Score}} + \text{SD}_{\text{Score}} + \text{CHL}_{\text{Score}}$$

North Carolina Trophic Index Scores

< -2.0	Oligotrophic
-2.0 - 0.0	Mesotrophic
0.0 - 5.0	Eutrophic
>5.0	Hypereutrophic

**DWQ Ambient Lake Monitoring
Program assigns a trophic state
status to sampled lakes during the
year it was monitored.**

Dystrophic Lakes

- Having brown acidic water that is low in dissolved oxygen.
- Brown color is a result of high concentrations of humic substances.
- They are often considered acidic and oligotrophic (low productivity).
- **NC Trophic State Index scores are not calculated for dystrophic lakes**



Great Lake

DWQ Coastal Region Lakes Monitoring

- DWQ Samples 22 Coastal Plain Lakes
- 13% of Lakes Sampled by DWQ
- 14 are Natural Lakes



Lake Waccamaw- Natural Lake



Lake Tabor- Reservoir

Ambient Coastal Region Lakes

Non-Dystrophic Lakes

Coastal Lakes	Lake Type	Sampling	
		Events	Stations
Cliff of the Neuse	Reservoir	12	1
GREENFIELD LAKE	Reservoir	9	2
LAKE TABOR	Reservoir	12	2
MERCHANTS MILLPOND	Reservoir	12	3
LAKE MATTAMUSKEET	Natural Lake	11	3
LAKE WACCAMAW	Natural Lake	18	3
PHELPS LAKE	Natural Lake	31	3
WHITE LAKE	Natural Lake	25	3

Dystrophic Lakes

Coastal Lakes	Lake Type	Sampling	
		Events	Stations
BOILING SPRINGS LAKE	Reservoir	13	3
CABIN LAKE (LIMESTONE LAKE)	Reservoir	8	3
WHITE MILLPOND	Reservoir	2	2
ALLIGATOR LAKE	Natural Lake	1	2
BAY TREE LAKE (Black Lake)	Natural Lake	13	2
CATFISH LAKE	Natural Lake	12	3
GREAT LAKE	Natural Lake	11	2
JONES LAKE	Natural Lake	22	2
LAKE ELLIS SIMON	Natural Lake	2	1
LONG LAKE	Natural Lake	2	2
PUNGO LAKE	Natural Lake	4	2
SALTERS LAKE	Natural Lake	13	2
SINGLETERY LAKE	Natural Lake	14	3
SWAN CREEK LAKE	Natural Lake	1	3



Phelps Lake- Natural Lake

Intensive Survey Special Studies on Lakes in the Coastal Plain

- The Eastern Regional Mercury Study- was to determine low level Hg concentrations in surface waters in eastern NC (2002)
 - Lake Phelps
 - Lake Waccamaw
 - Many Rivers and Streams
- Status of Phelps Lake after Wildfires- to determine if water quality changed after water was withdrawn to fight the fires. (2009)

Contact Info

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