

The State of Deep Creek Lake -

Better understanding changing
water quality conditions since 2009

Deep Creek Water Foundation Symposium
October 25, 2025

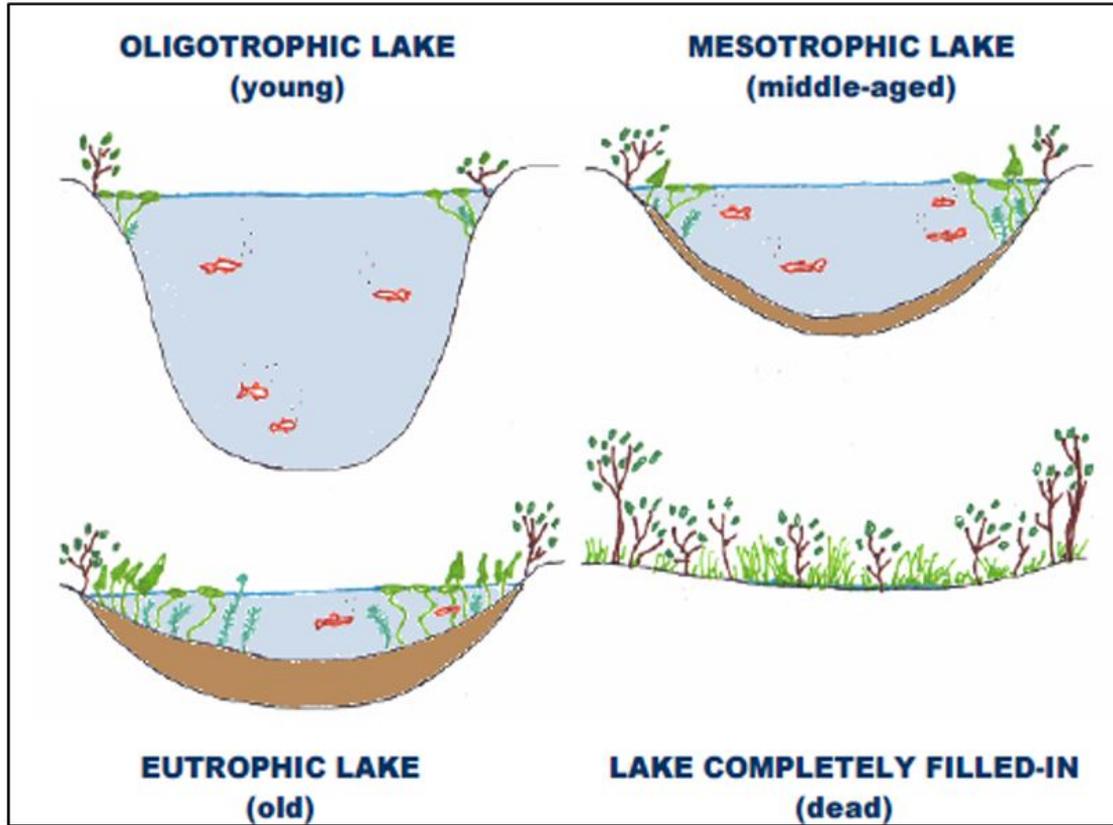
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Resource Assessment Service
Maryland Department of Natural Resources (DNR/RAS)





How does a lake age?

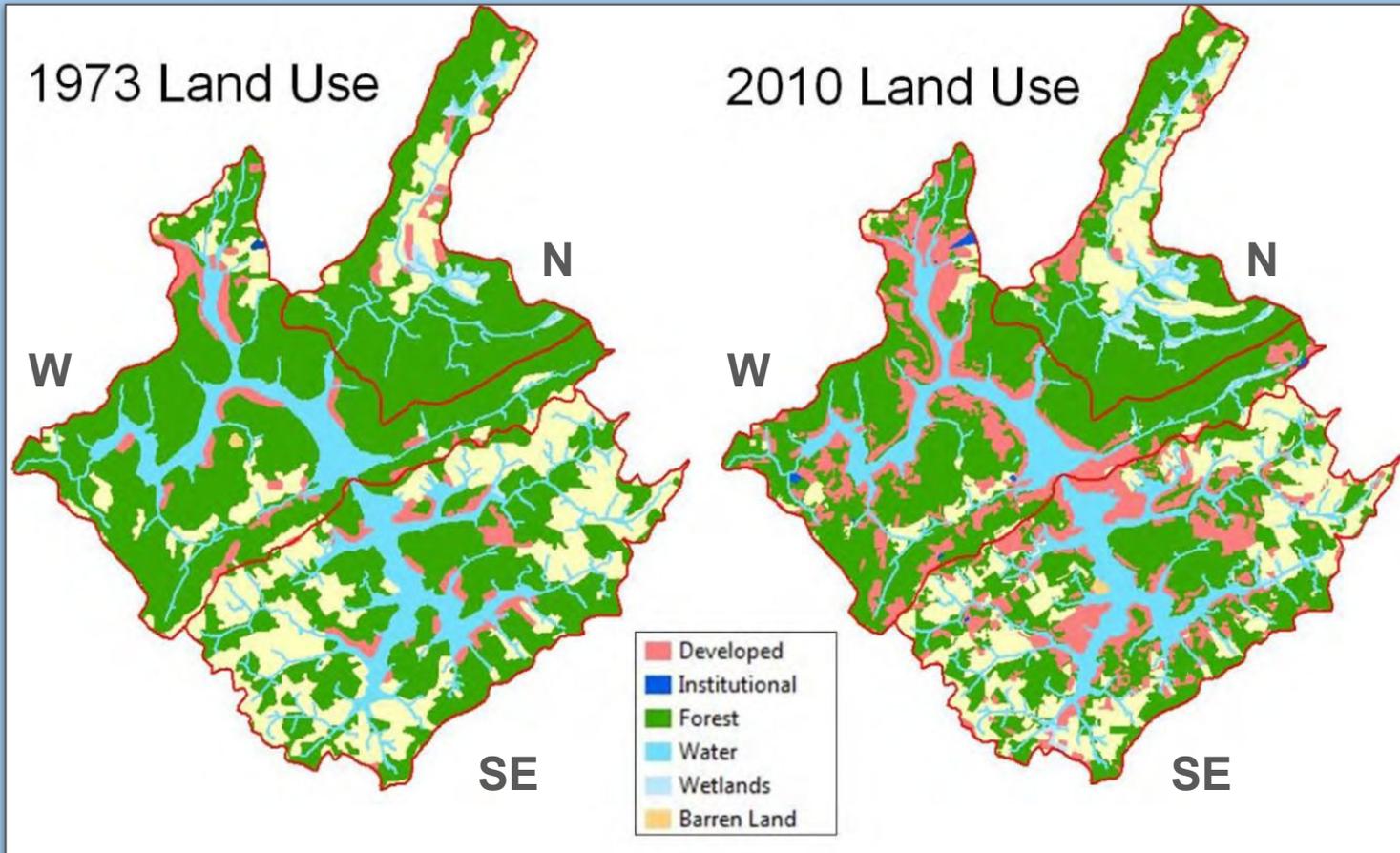


Oligotrophic - Often cold, deep, clear and abundant oxygen levels at all depths; found in areas with little nutrient runoff and little plant growth. Typical fish: lake trout, perch, and walleye.

Mesotrophic - Moderately productive and have features of both oligotrophic and eutrophic lakes. Still relatively clear, but there can be a buildup of sediment and nutrients. Typical fish: musky, northern pike, and bass.

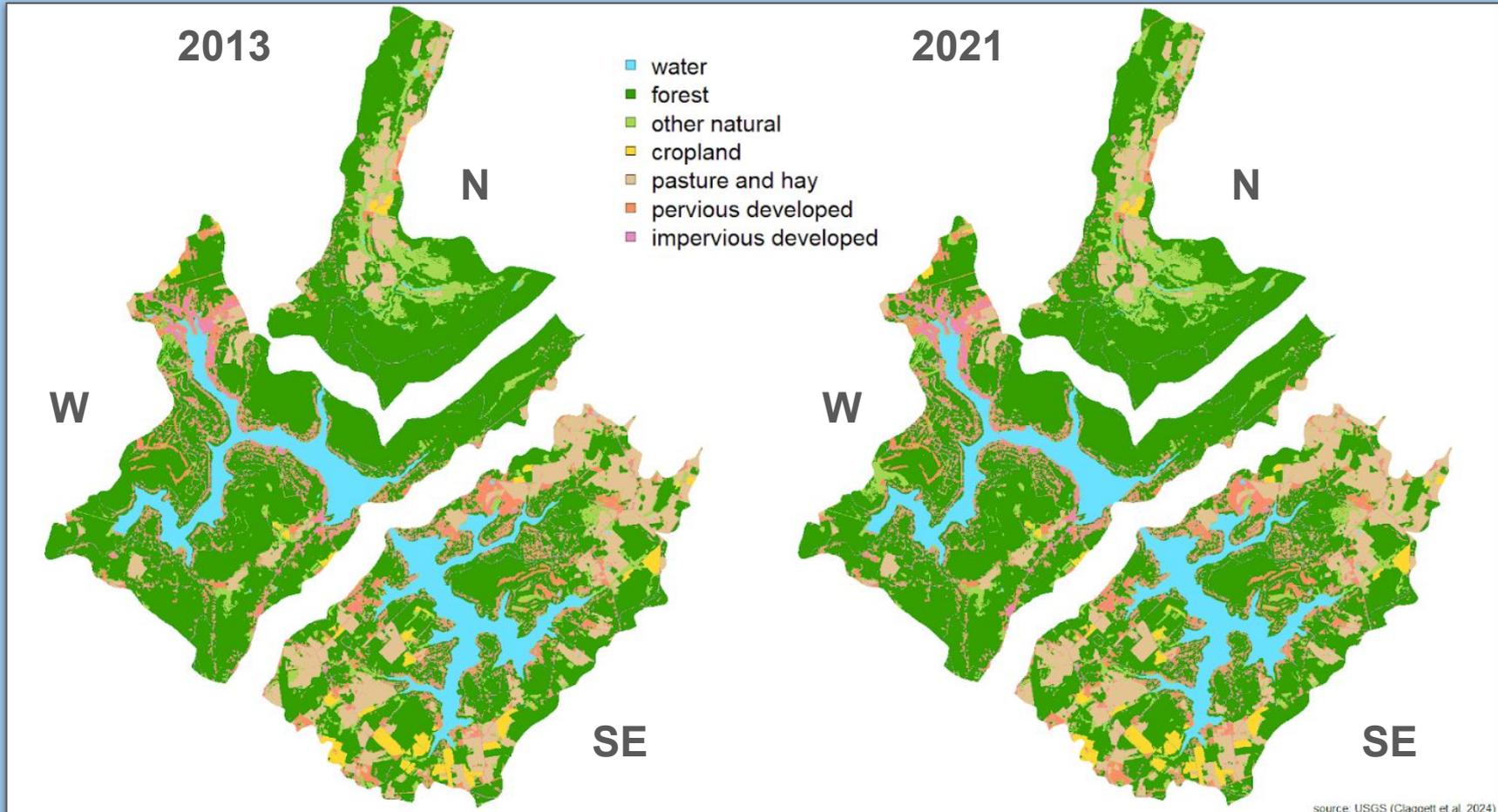
Eutrophic - Shallow, nutrient-rich with high plant growth; dominant in areas where humans have a significant environmental impact. These lakes can be plagued with frequent algal blooms, bottom layer anoxia, and poor water clarity. Typical fish: panfish, bass, catfish, and carp.

Changing Land Use (1973-2010)



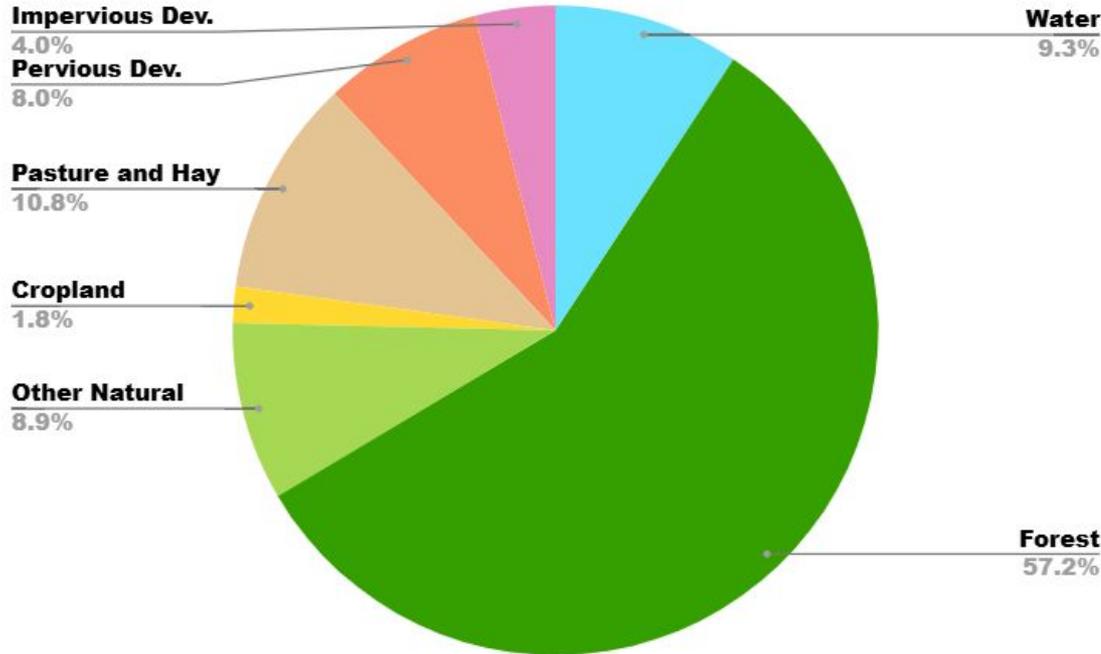
“Land use has not changed significantly over the almost 30 year span, with the majority of land in forests or barren lands.” Source: Deep Creek Watershed Draft Characterization Report July 2014

Changing Land Use (2013-2021)



Recent Land Use and Summary of Changes

Deep Creek Watershed - 2021



Major Land Use Changes (2013-2021)

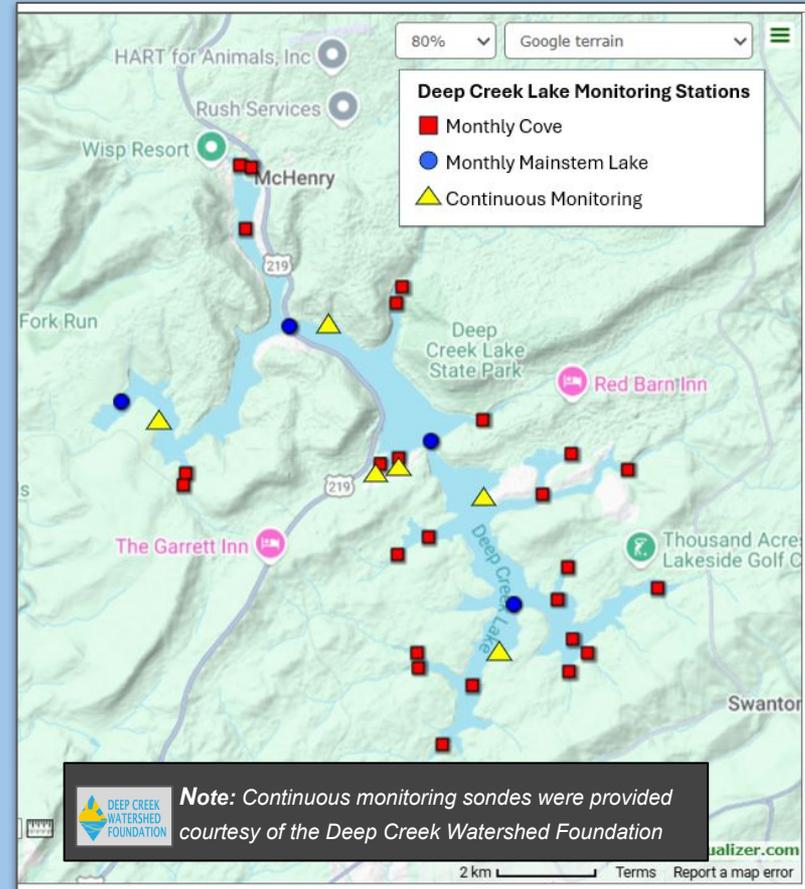
- ↓ - 2.3% Forest
- ↑ + 7.0% Impervious

Water Monitoring Stations (2025)

Deep Creek Lake Water Monitoring

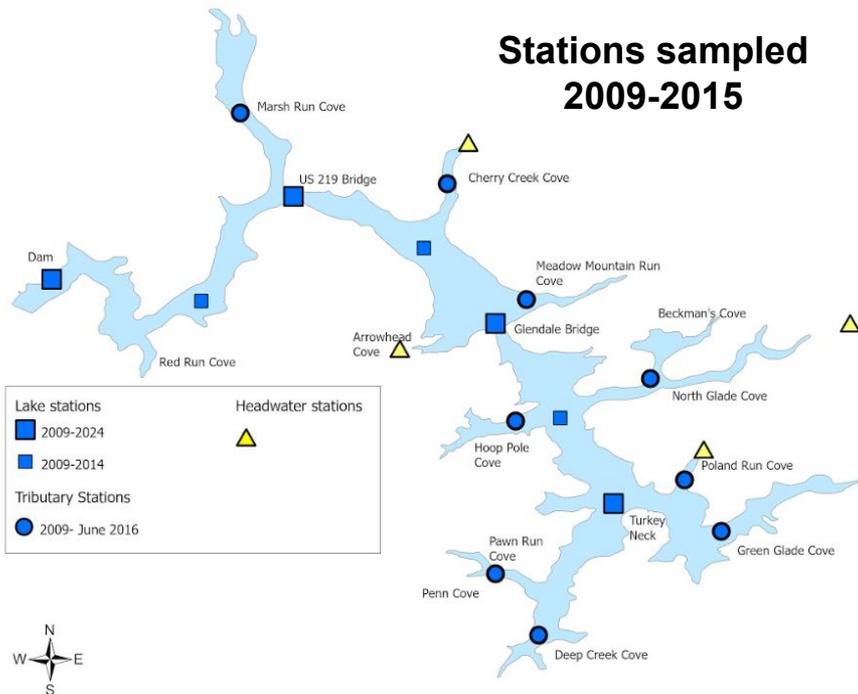
Monitoring Season - April - October

-  **Mainstem & Cove Stations (29)**
Monthly Nutrients, DO, Chlorophyll,
Water Temperature, Conductivity,
pH, Turbidity
-  **Continuous Monitoring Stations (6)**
- 15 minute DO, Chlorophyll, Water
Temperature, Conductivity, pH,
Turbidity.

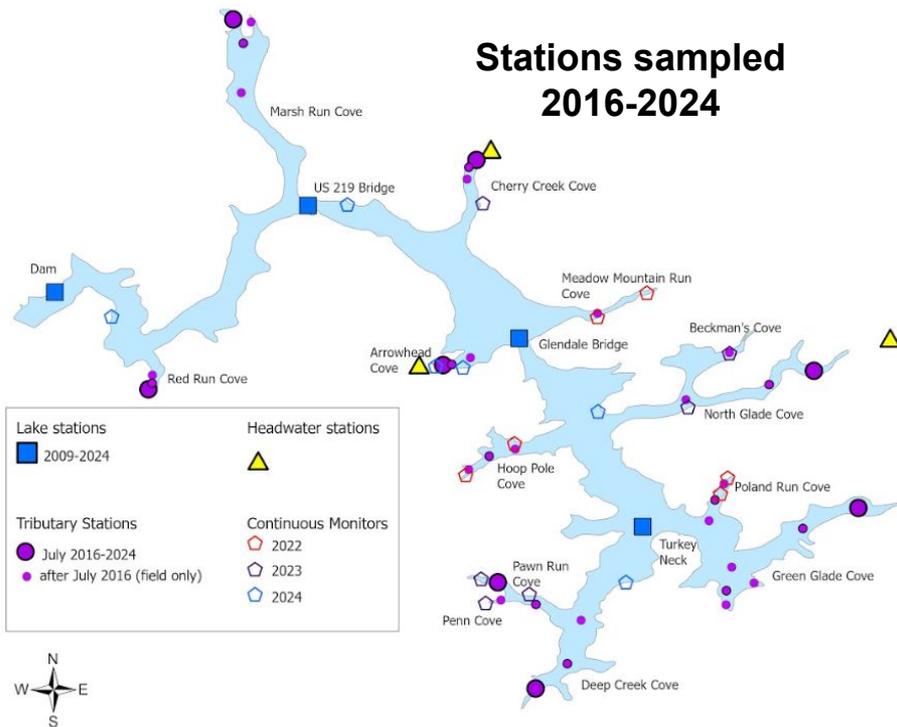


Deep Creek Lake Water Monitoring Stations (2009-2024)

Stations sampled 2009-2015



Stations sampled 2016-2024



Eyes on Deep Creek Lake

Maryland Department of Natural Resources
Deep Creek Lake website with an interactive map

- Monitoring data
- Water quality data downloads
- Reports
- Newsletters

Eyesonthebay.dnr.maryland.gov/dcl/DeepCreekLake.cfm

Eyes on Deep Creek Lake

Maryland Department of Natural Resources has been monitoring water quality at Deep Creek Lake since 2009. The interactive map below displays long term mainstem and cove stations in Deep Creek Lake where we have collected water quality data since the program's inception in 2009. Below the map you will also find links to background information, water quality data downloads, reports, and newsletters.



Other MD DNR Deep Creek Lake Resources:

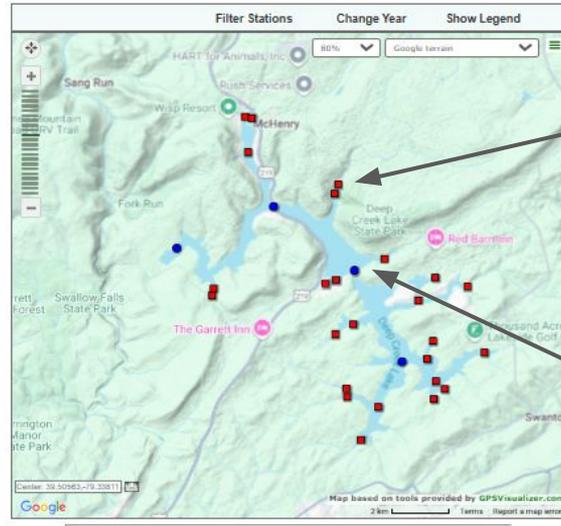
- Deep Creek Lake Natural Resource Management Area
- Deep Creek Lake State Park

Explore the Deep Creek Station Map!

>> Click for tips on exploring the map <<

For full-screen map view click here

For full functionality we suggest using Google Chrome or Mozilla Firefox.



Deep Creek Lake Water Quality Monitoring Programs:



Mainstem Lake Monitoring

Water quality profiles and water samples collected at 4 mainstem lake stations from 2009-present, during select months (March/April, May, June, July, August, September, November/December).



Cove Sampling

Water quality profiles collected at 7-10 lake embayment stations near-monthly from 2009-present. These shallower areas represent the nearshore environment where most water quality concerns are found.



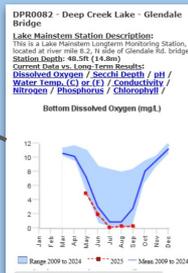
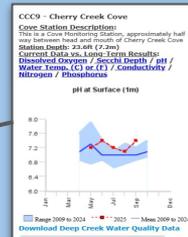
Tributary Sampling

Beginning in 1980, monthly 'base flow' samples, as well as storm event samples, have been collected from the Cherry Creek site to determine nutrient and sediment loadings.



Aquatic Vegetation Monitoring

The types, distribution, and abundance of aquatic vegetation types have been surveyed at various locations within Deep Creek Lake since 2010.



Deep Creek Data Download:

Use the following query tool to download the desired Deep Creek Lake monitoring data from the mainstem lake stations, as well as the cove stations. In the future, data from more stations will be made available for download.

Select Station, Parameters and a Date Range, then "Submit Data Query"

1. Select Station(s); press CTRL to select more than one station

Lake Mainstem Longforms:

- Deep Creek Lake - Dam (DPR0021) (4/29/09 - 9/16/25)
- Deep Creek Lake - US 219 Bridge (DPR0058) (4/29/09 - 9/16/25)
- Deep Creek Lake - Glendale Bridge (DPR0022) (4/29/09 - 9/16/25)
- Deep Creek Lake - Turkey Neck (DPR0193) (4/29/09 - 9/17/25)

Cove Stations:

- Arrowhead Cove (AWC3) (7/27/16 - 9/16/25)
- Arrowhead Cove (AWC3) (7/27/16 - 9/16/25)
- North Glade Cove - Beckmans (Beckmans) (10/21/10 - 9/17/25)
- Cherry Creek Cove (CCC0088) (4/29/09 - 6/15/16)

2. Select Parameter(s)

Select / De-select All Parameters

Field Parameters: measured in-situ

- Water Temperature (°C)
- Dissolved Oxygen (mg/L)
- Secchi Depth (m)
- pH
- Conductivity (mS/cm)
- Turbidity (NTU)
- Chlorophyll (µg/L)

Lab Parameters: measured in the lab from a collected water sample. NOTE: Not all parameters are available for every station.

- Lab Turbidity (NTU)
- Chlorophyll (µg/L)
- TALK: Total Alkalinity (mg/L)
- TSS: Total Suspended Solids (mg/L)
- TDN: Total Dissolved Nitrogen (mg/L)
- NH4: Ammonia (mg/L)
- NO2: Nitrite (mg/L)
- NO3: Nitrate/Nitrite (mg/L)
- TDP: Total Dissolved Phosphorus (mg/L)
- PP: Particulate Phosphorus (mg/L)
- PN: Particulate Nitrogen (mg/L)

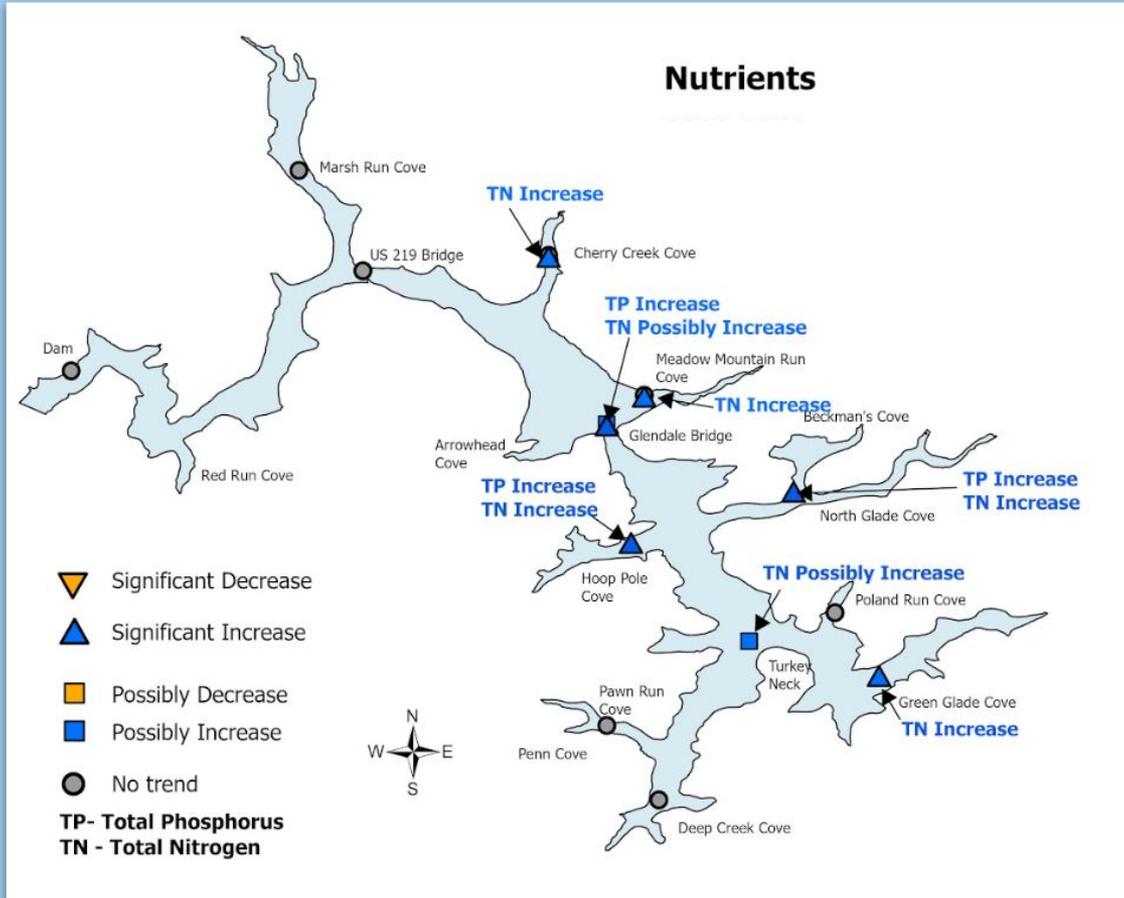
Start Date:

End Date:

Assessing Water Quality Changes since 2009

- **Analysis project period September 2025 - June 2026**
- **Initial focus on long-term water quality stations 2009 to 2024**
- **Run trends and characterize conditions**
 - **Due to changing monitoring priorities during 2009-2024, conditions at all stations will be characterized, but not all stations or time periods can be assessed for trends**
 - **Analysis of continuous and storm sample monitoring data has not been addressed in the first two months of analysis.**
- **Final report will be completed by 6/30/2026**

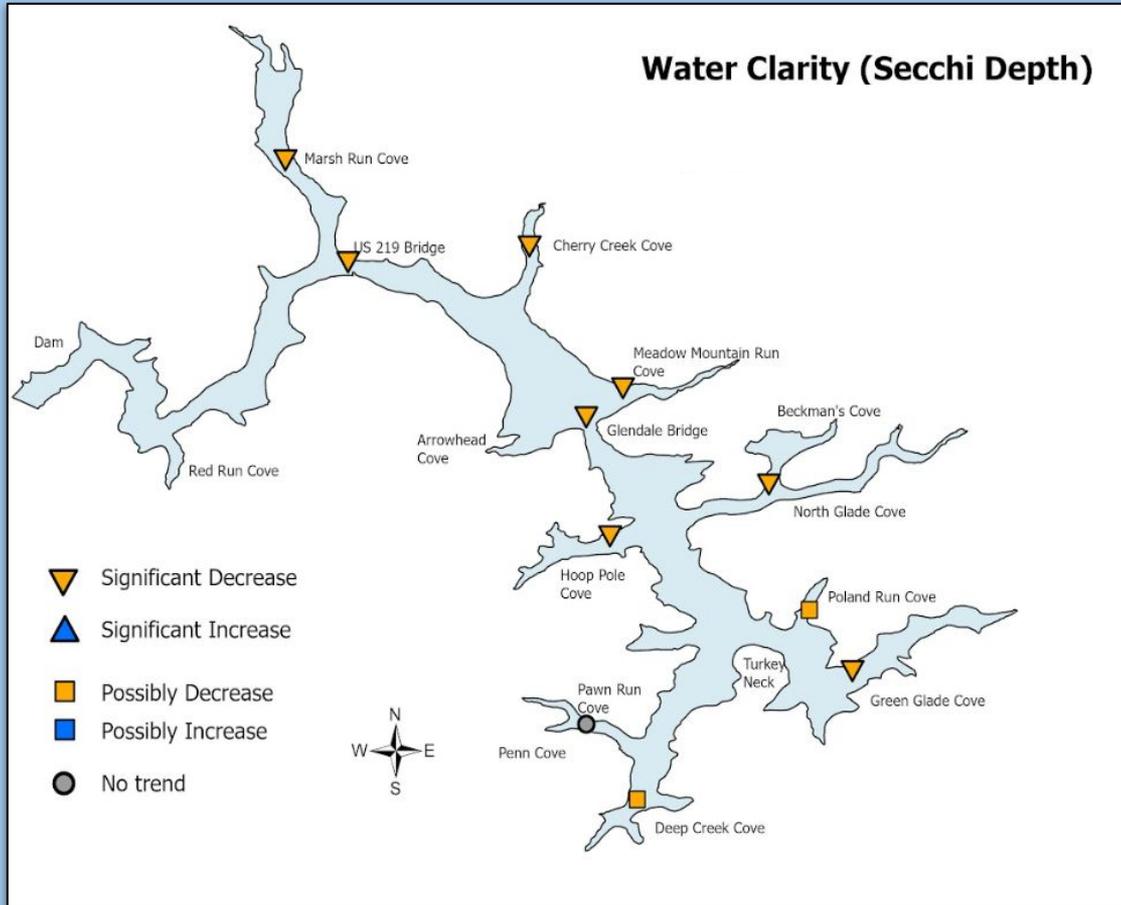
Nutrient Trends (2009-2015)



Nutrients - Excess nutrients, mainly nitrogen and phosphorus, can act like fertilizer, causing excessive growth of algae.

Sources of Nutrients - Wastewater treatment facilities, septic, runoff from land in urban areas during rains, and from farming. Some can also come from weathering of rocks.

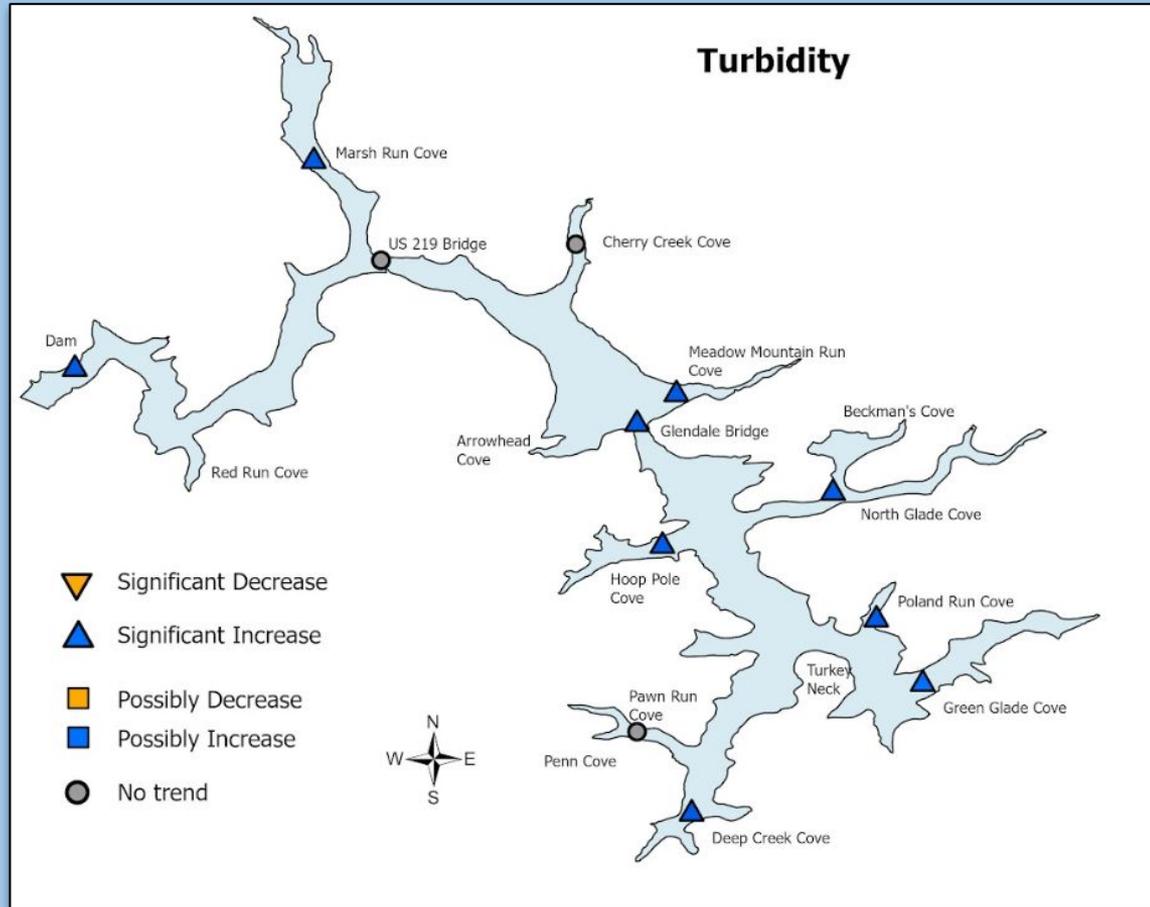
Water Clarity Trends (2009-2015)



Water Clarity - Water clarity (Secchi Depth) is a measure of how far light can penetrate through the water column.

What impacts Water Clarity - Decreased water clarity is often due to excessive algal growth. However, increased turbidity can also decrease water clarity. Turbidity can be due to land run-off, shore-line erosion, pollution, resuspension of bottom sediments, dredging operations, or during high periods of fresh-water input from rivers and streams.

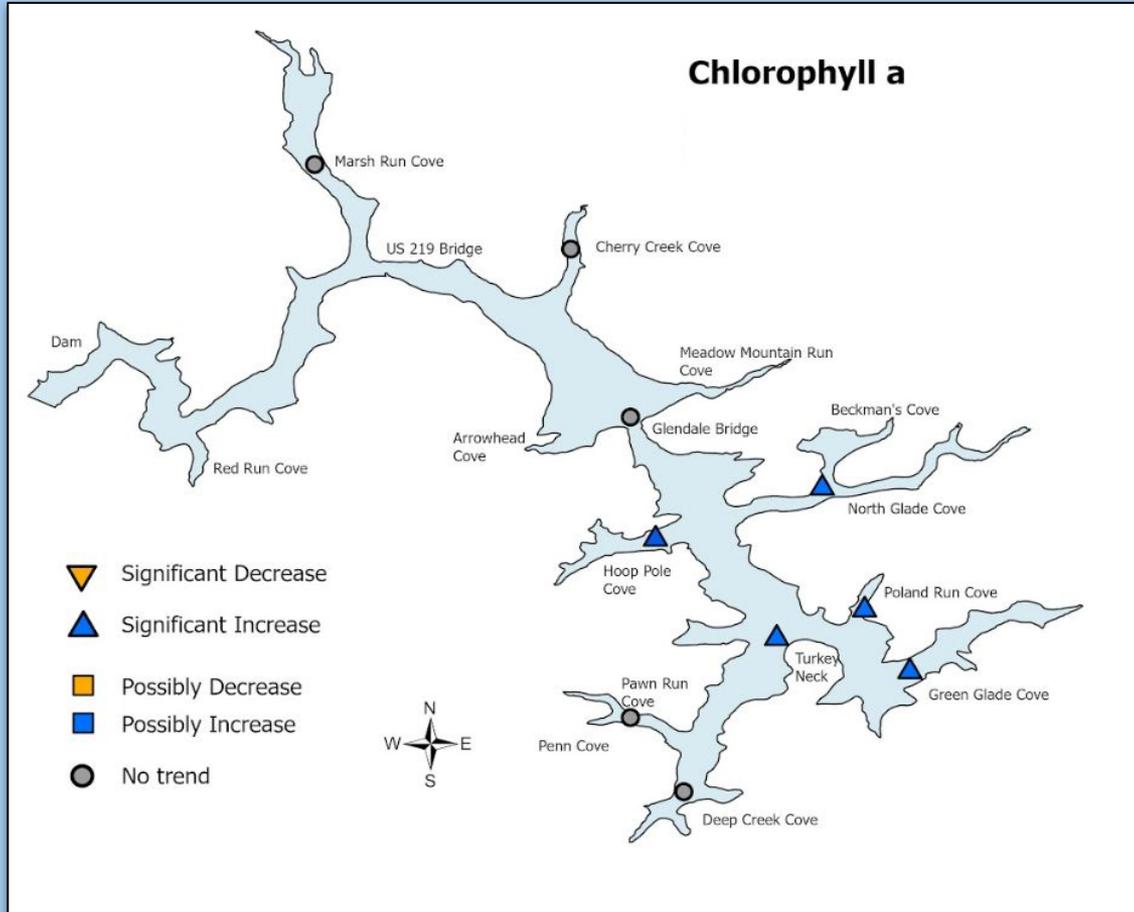
Turbidity Trends (2009-2015)



Turbidity - Is a measurement of water clarity, specifically the amount of light that is scattered by material in the water.

Sources of Turbidity - Clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms all impact turbidity levels.

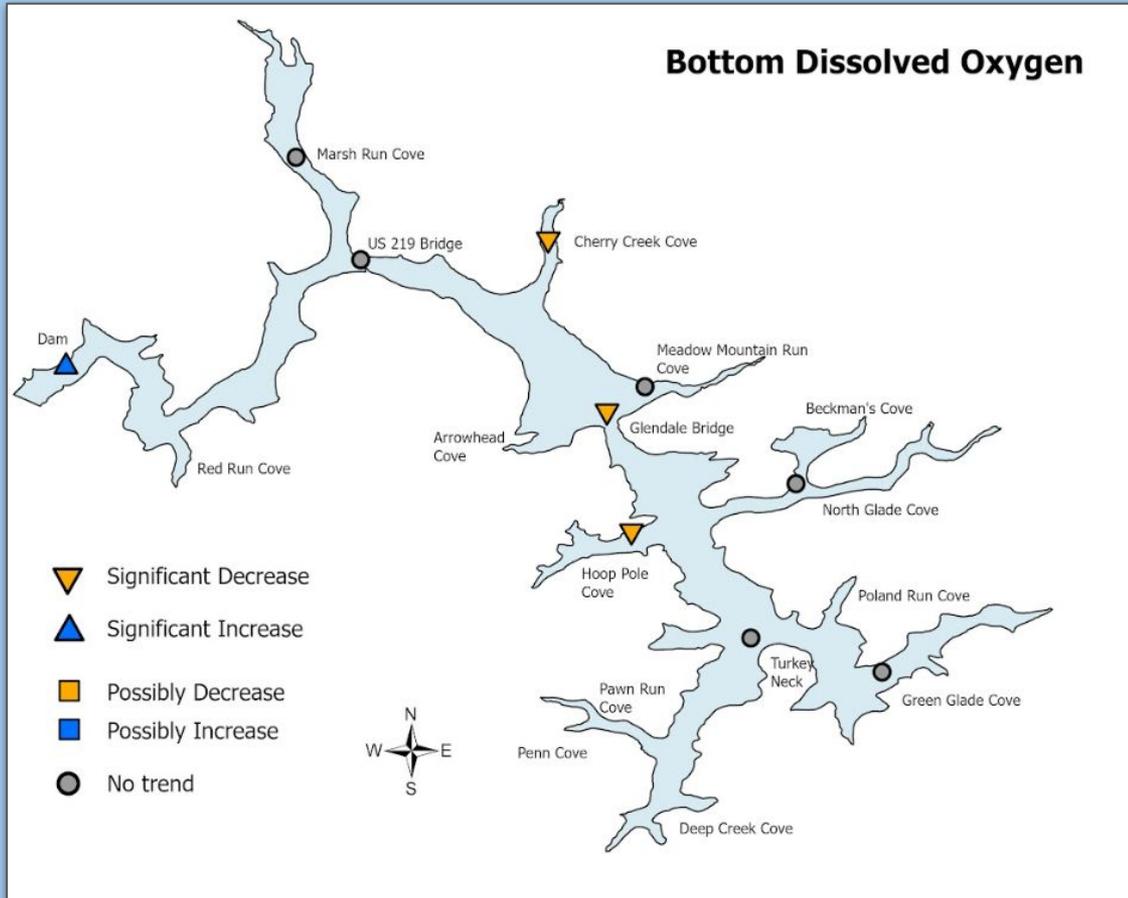
Chlorophyll Trends (2009-2015)



Chlorophyll - The amount of algae in the water is measured by the chlorophyll concentration. It is the main chemical responsible for photosynthesis in plants.

Importance - Excess algae, usually caused by an excess of nutrients which stimulate their growth, can also make the water cloudy, or turbid, blocking the light needed by underwater plants.

Bottom Dissolved Oxygen Trends (2009-2015)

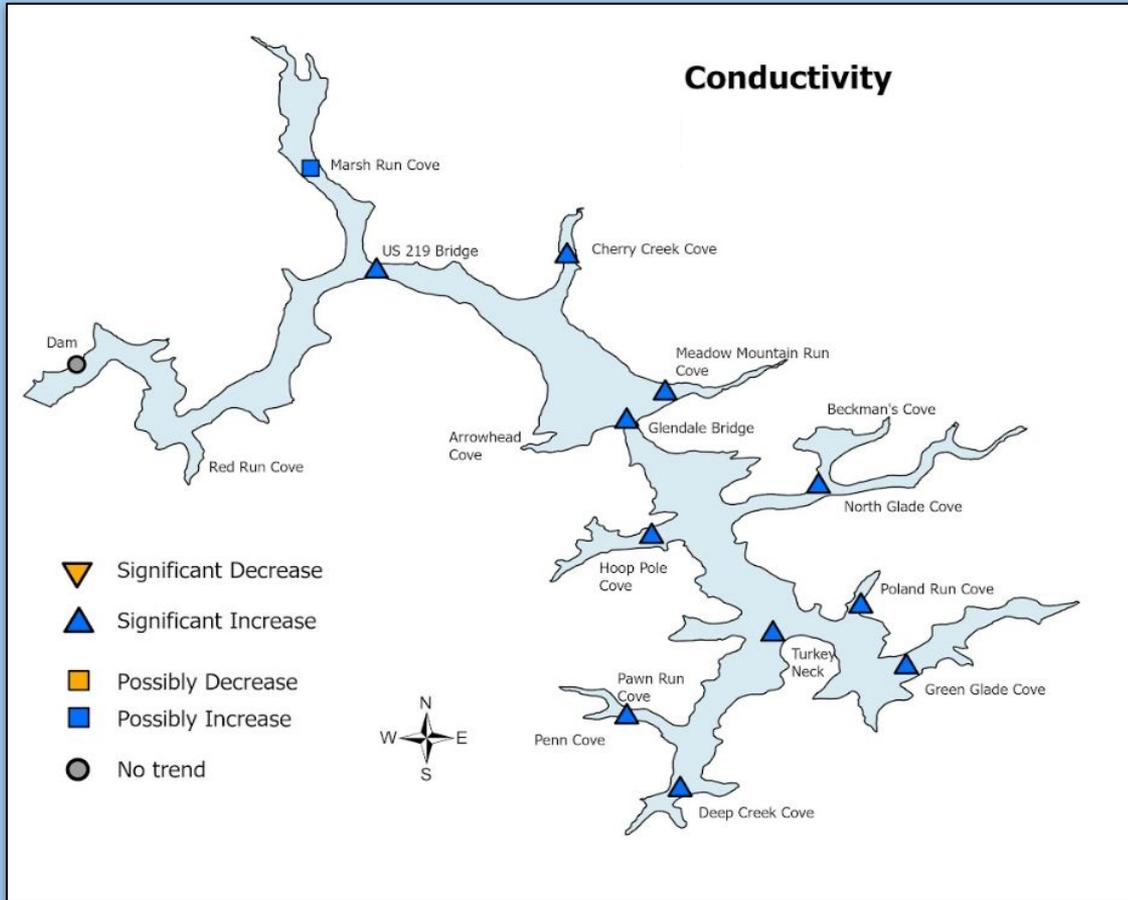


Dissolved Oxygen -

Important measure of habitat quality; without oxygen, all of the living resources familiar to us perish.

Factors impacting Oxygen Levels - Water temperature, algae levels and bacterial decomposition.

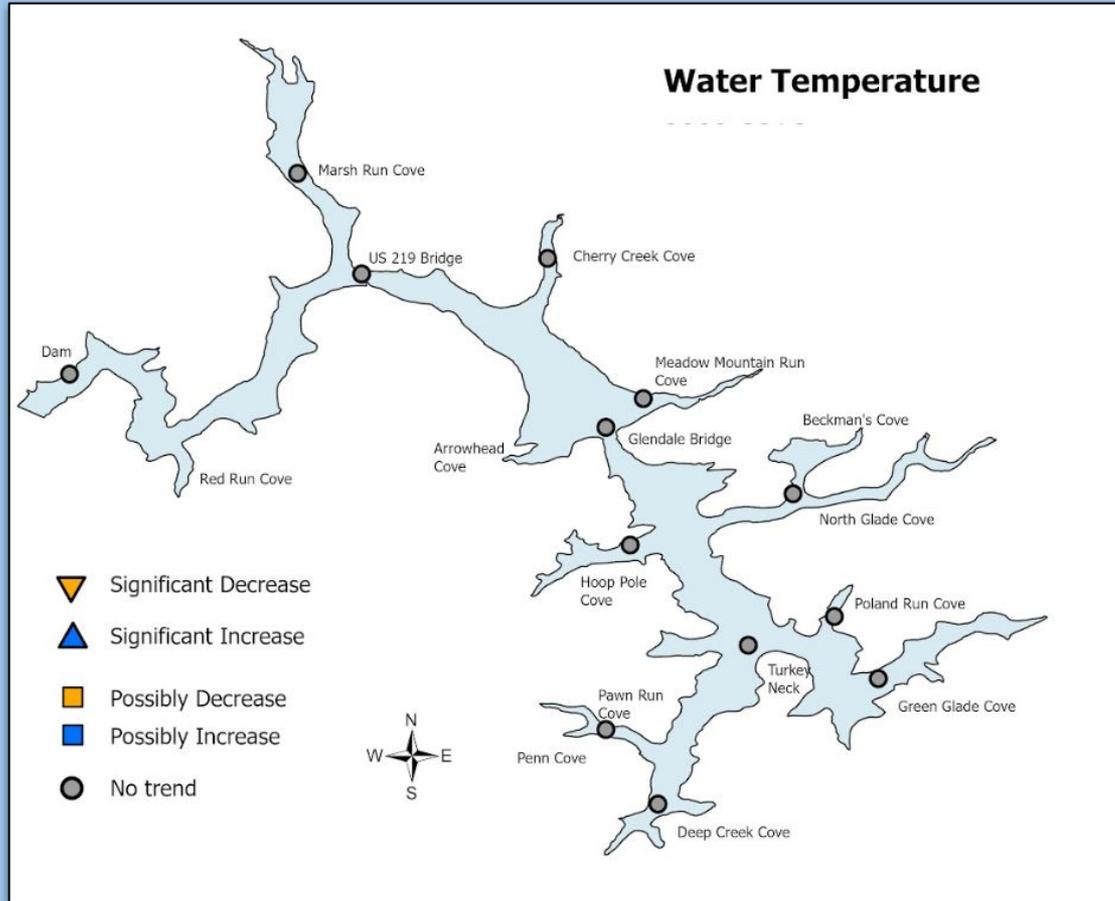
Conductivity Trends (2009-2015)



Conductivity - A measure of the ability of water to pass an electrical current.

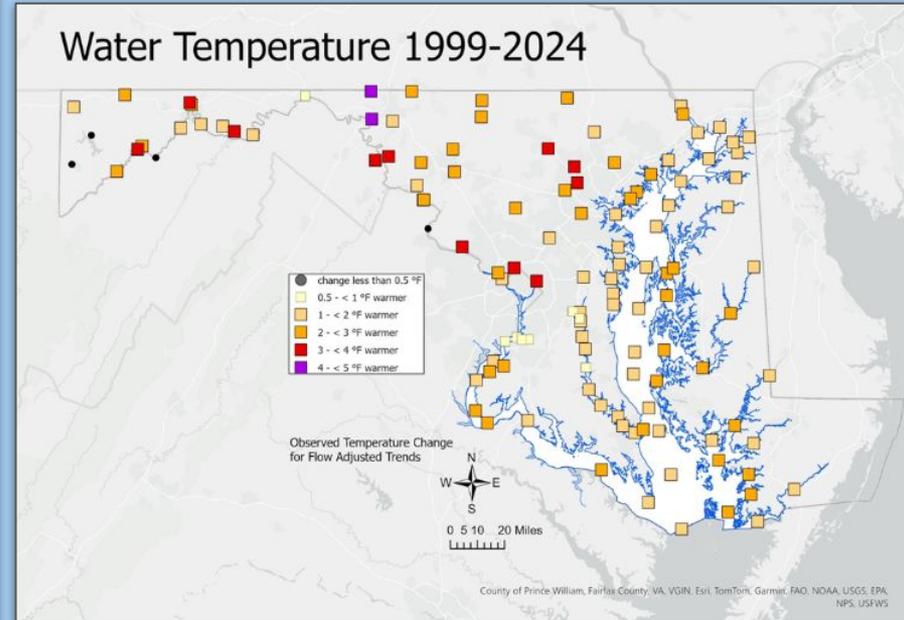
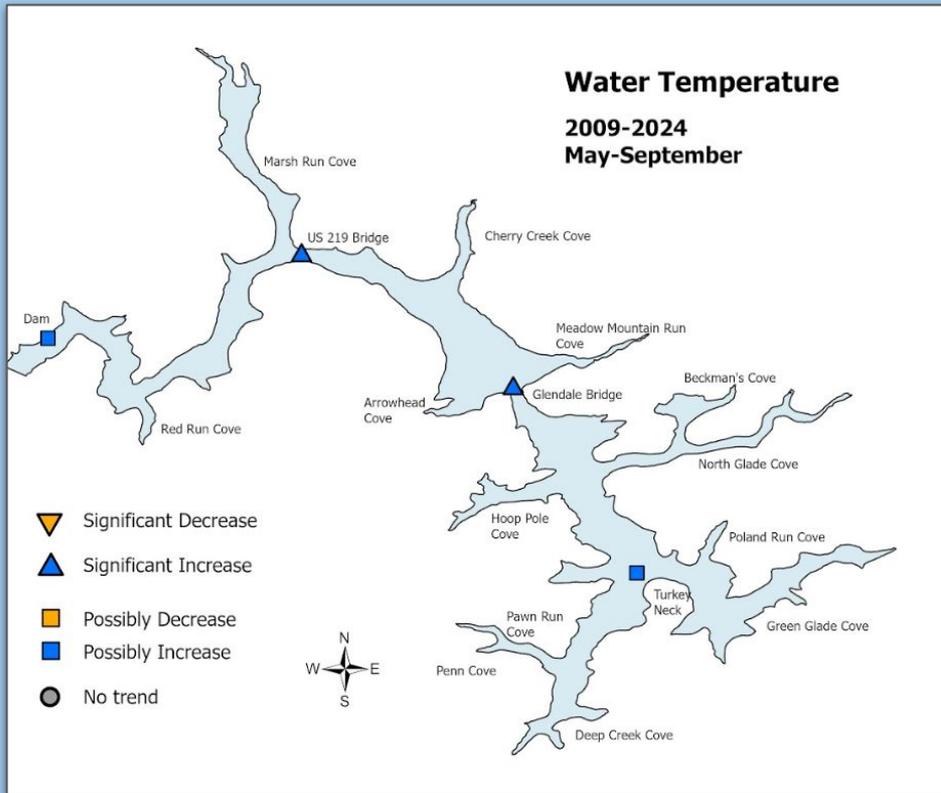
Sources impacting Conductivity - Because dissolved salts and other inorganic chemicals conduct electrical current, fertilizer runoff, sewage, road salt application and soil geology impact conductivity.

Water Temperature Trends (2009-2015)



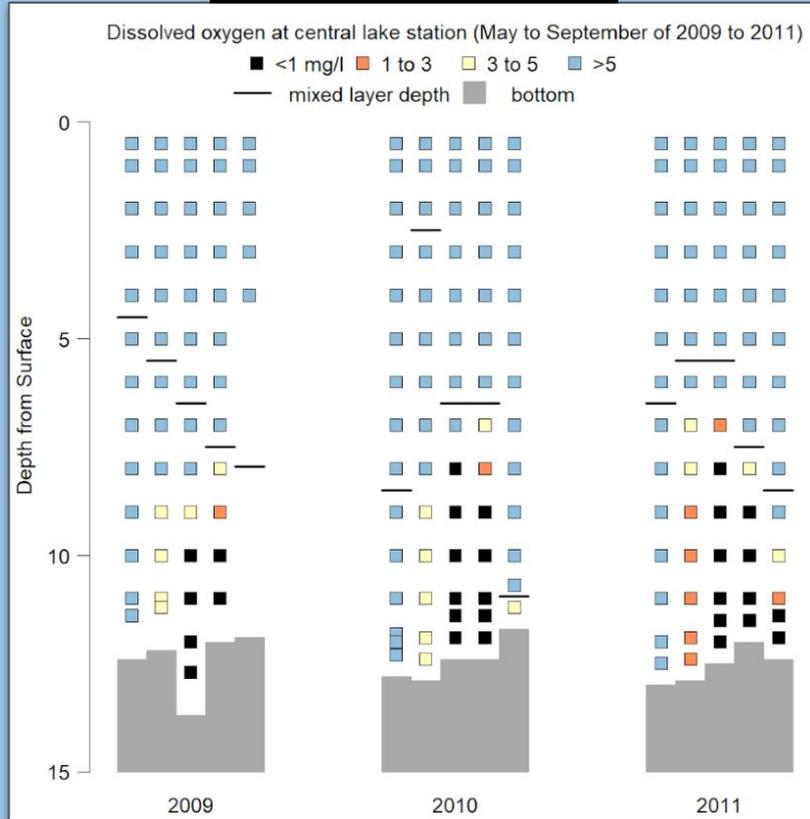
Water Temperature - Many aquatic organisms flourish only in a specific range of water temperatures. Higher water temperatures promote the growth of algae and bacteria, but also reduce levels of dissolved oxygen in the water, which can negatively impact the growth and productivity of other aquatic life.

Water Temperature Trends (2009-2024)

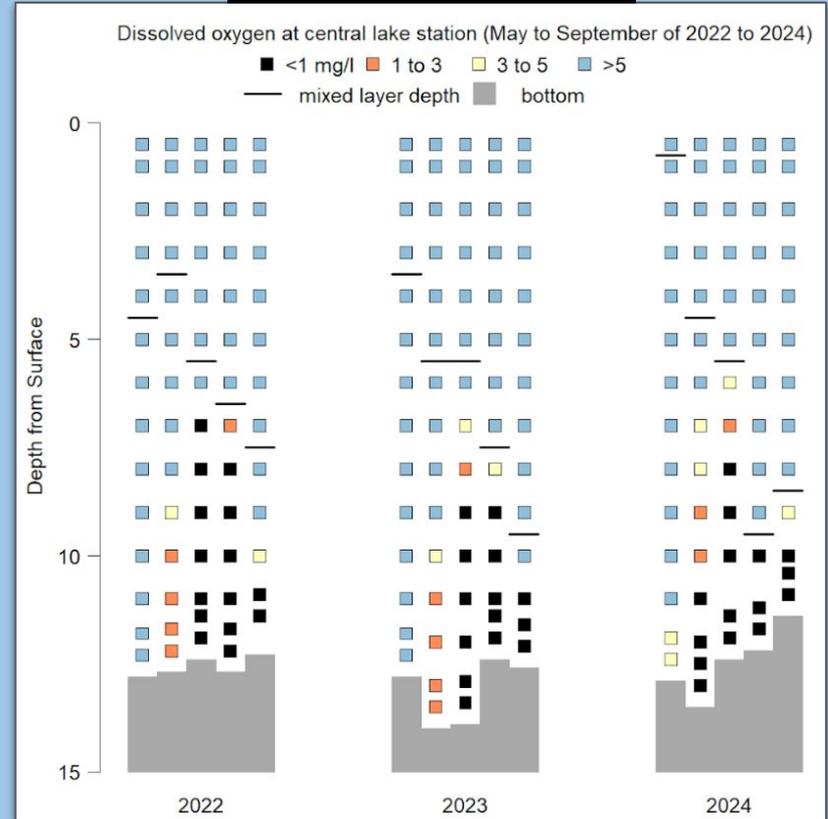


Dissolved Oxygen (2009-2024)

Glendale Road Bridge

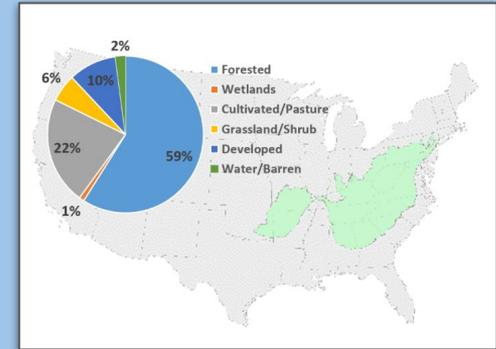


Glendale Road Bridge



Other Methods to Assess Lake Conditions

National Lakes Assessment (EPA) - Rates a lake against other similar lakes in the population of lakes in their ecological region (Southern Appalachian) – similar climate, ecological features, and plant and animal communities.

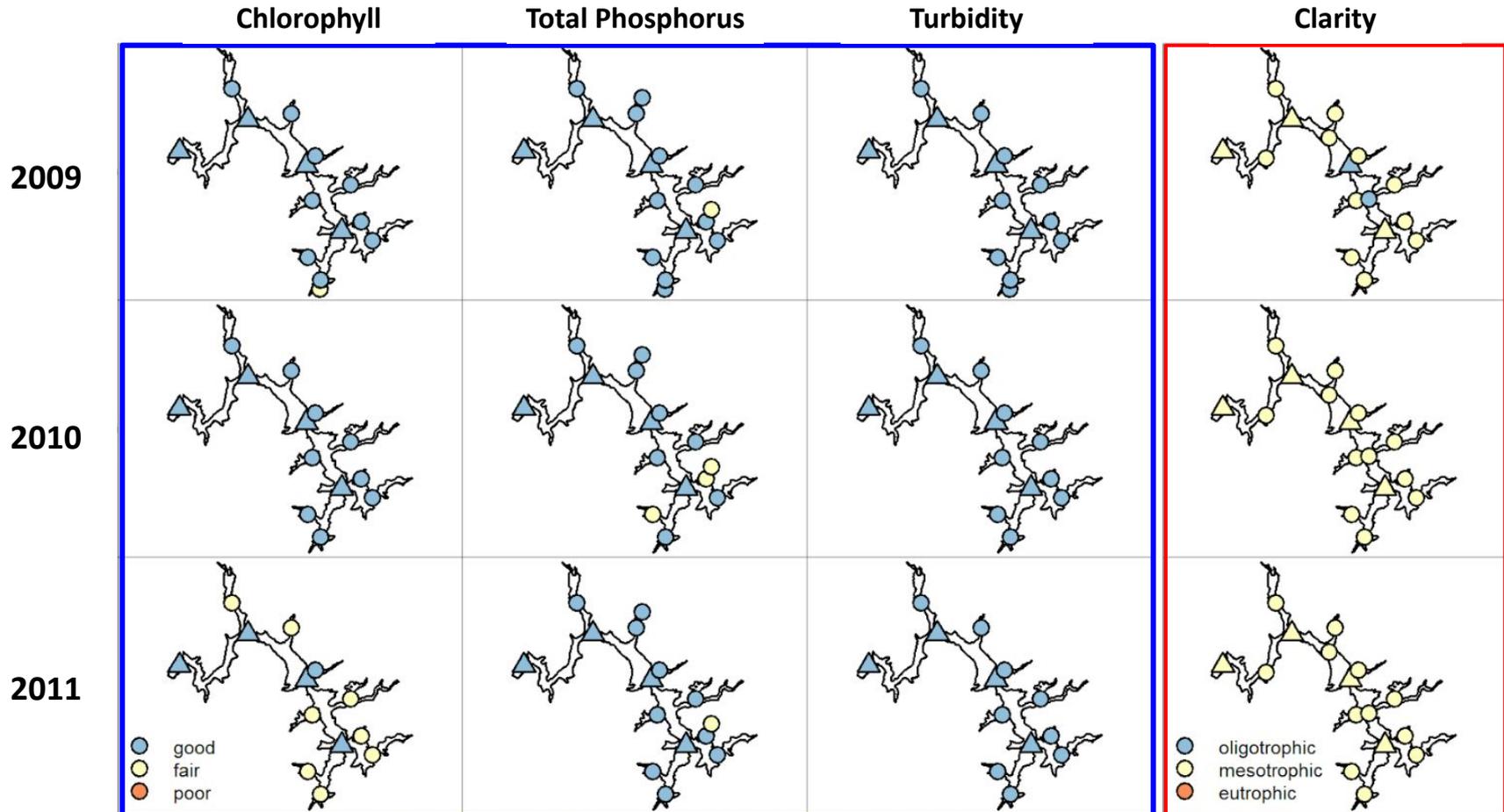


Trophic Status Index (TSI) - Rates lakes on the amount of biological productivity

Trophic Class	TSI	Productivity
Oligotrophic	0-40	Low productivity, good WQ
Mesotrophic	40-60	Moderate productivity, fair WQ
Eutrophic	60-100	High productivity, poor WQ

National Lakes Assessment Indicators (EPA)

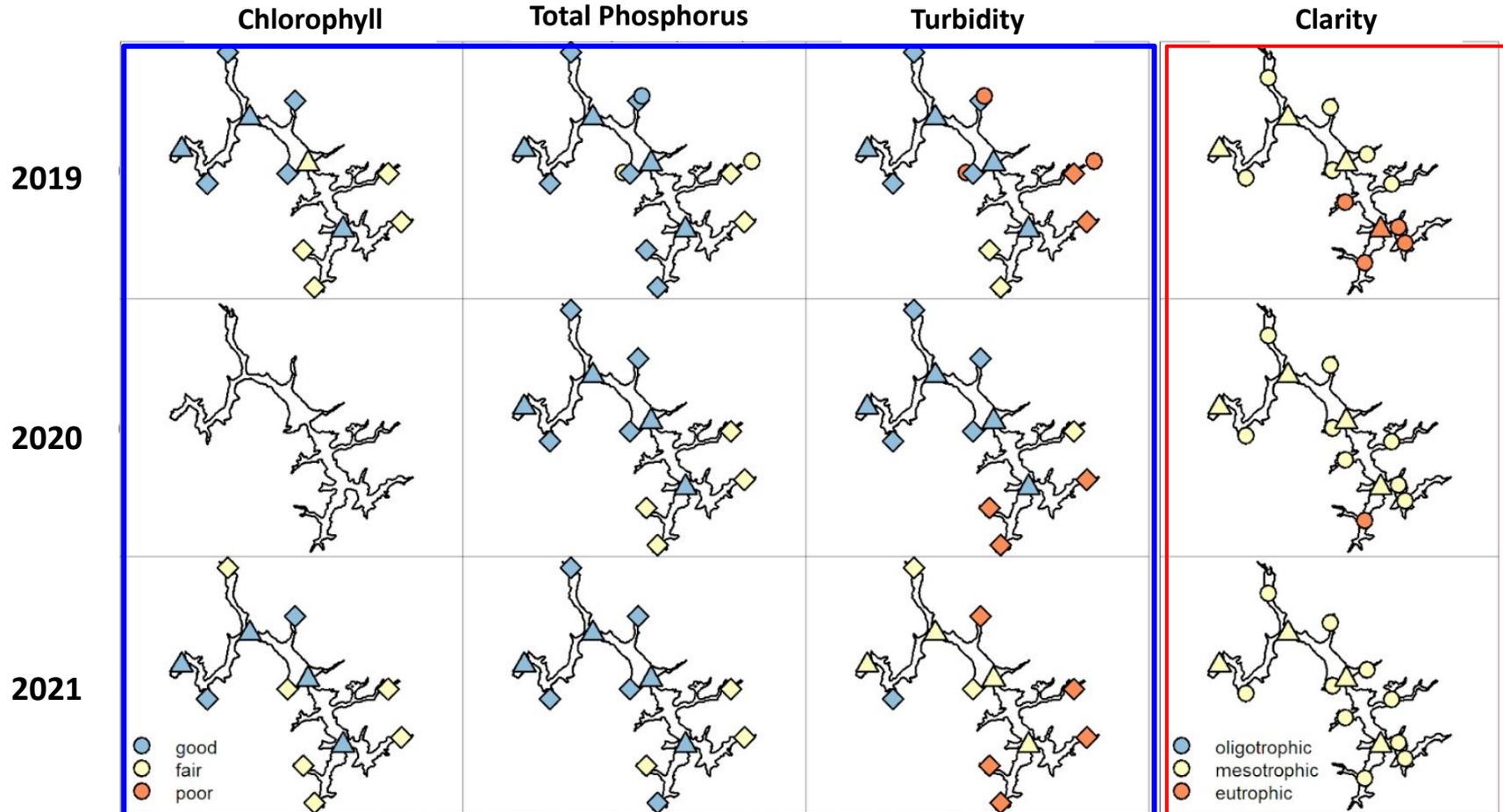
Trophic State Index



categories: EPA, 2022 National Lakes Assessment, Southern Appalachians Ecoregion

National Lakes Assessment Indicators (EPA)

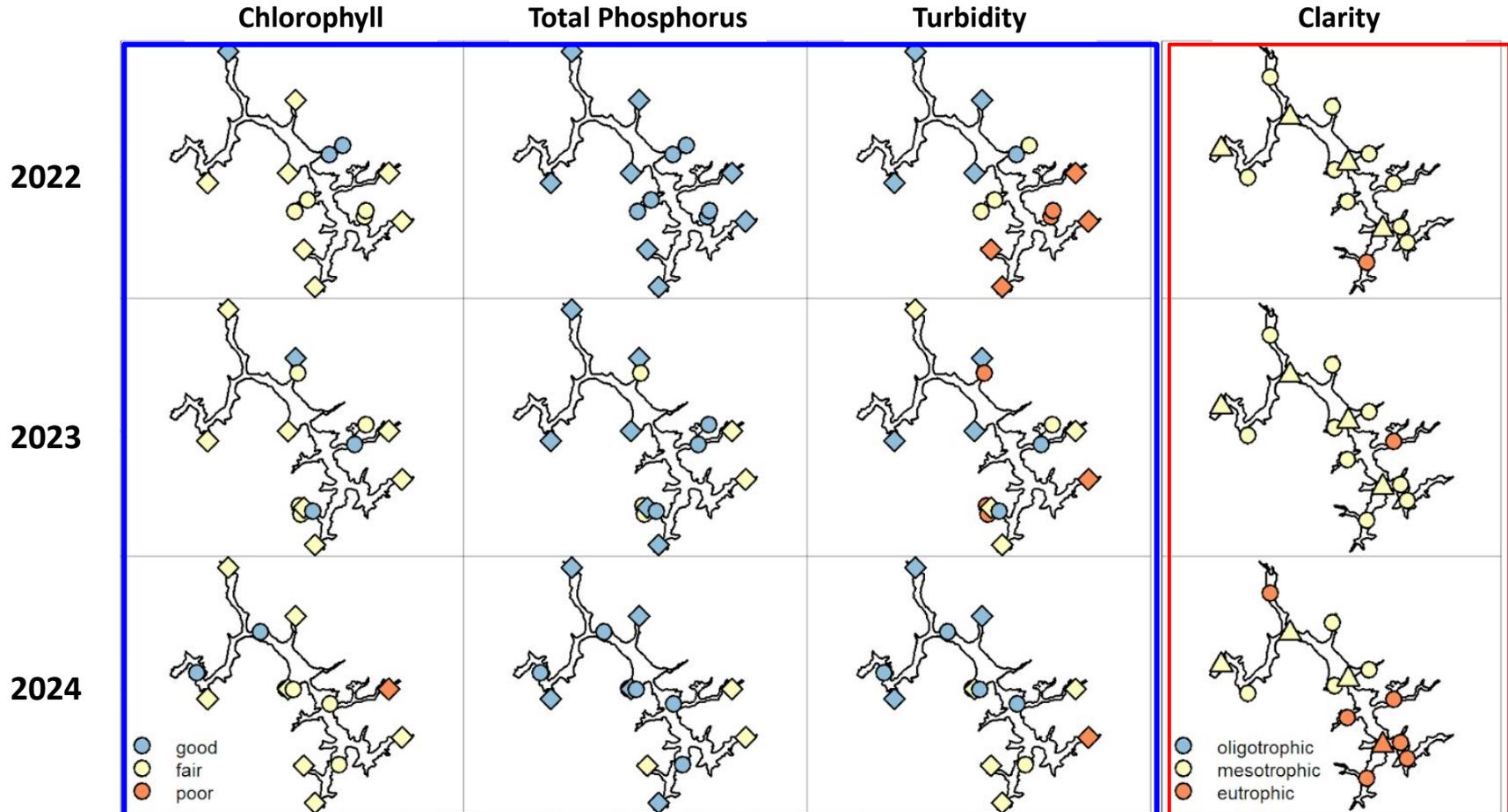
Trophic State Index



categories: EPA, 2022 National Lakes Assessment, Southern Appalachians Ecoregion

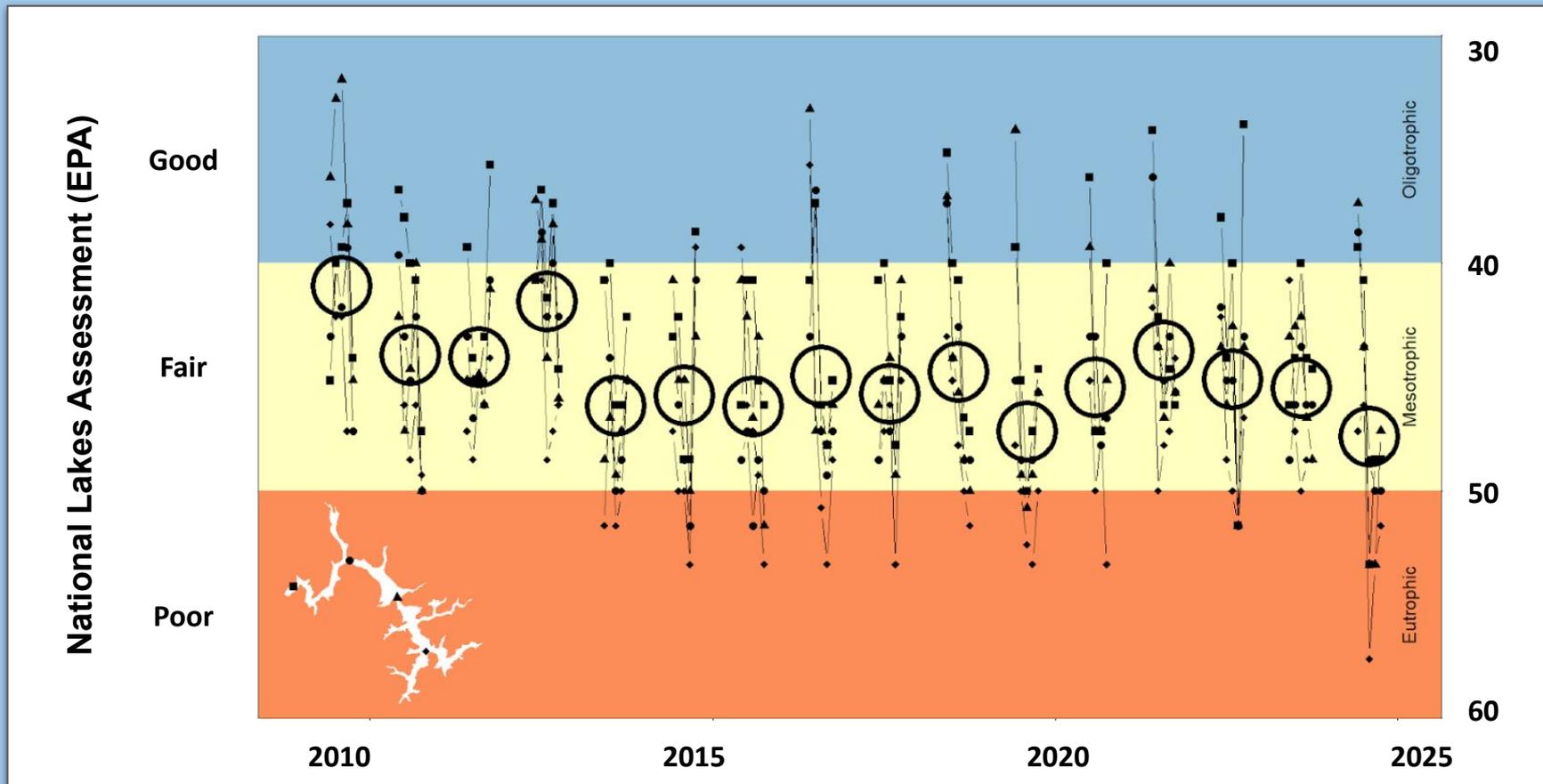
National Lakes Assessment Indicators (EPA)

Trophic State Index



categories: EPA, 2022 National Lakes Assessment, Southern Appalachians Ecoregion

Water Clarity at Main Lake Stations (2009-2024)



Conclusions

- Lake conditions are generally good to fair.
- While the watershed is primarily forested (~57%), impervious surfaces are increasing, but levels still relatively low (~4%).
- Trends from the 2009 to 2015 period indicate degrading trends in water clarity, bottom dissolved oxygen, chlorophyll, conductivity, nutrients at several lake areas.
- Throughout 2009 to 2024, degrading water quality conditions appear to be increasing in Deep Creek Lake, especially in the southern lake areas.

Conclusions (Continued)

- **Since 2009, while still considered fair, there has been a significant decline in main lake water clarity.**
- **Since 2009, surface water temperatures at main lake stations areas have increased ~1F.**
- **Since 2009, bottom dissolved oxygen conditions at Glendale Road Bridge have degraded.**

Special Thanks

- **DNR Resource Assessment Service monitoring, data management, web and analysis teams** - for collecting, processing, web posting, analyzing data, review and helpful comments
- **DNR Park Service** - for funding the collection and analysis
- **Administrative Council** - for review and helpful comments
- **Deep Creek Watershed Foundation** - for providing the water quality sondes and holding this important symposium
- **David Myerberg** - for the insight, guidance and coordination to turn the ideas into this successful Deep Creek Lake Science Symposium



Thank You!

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