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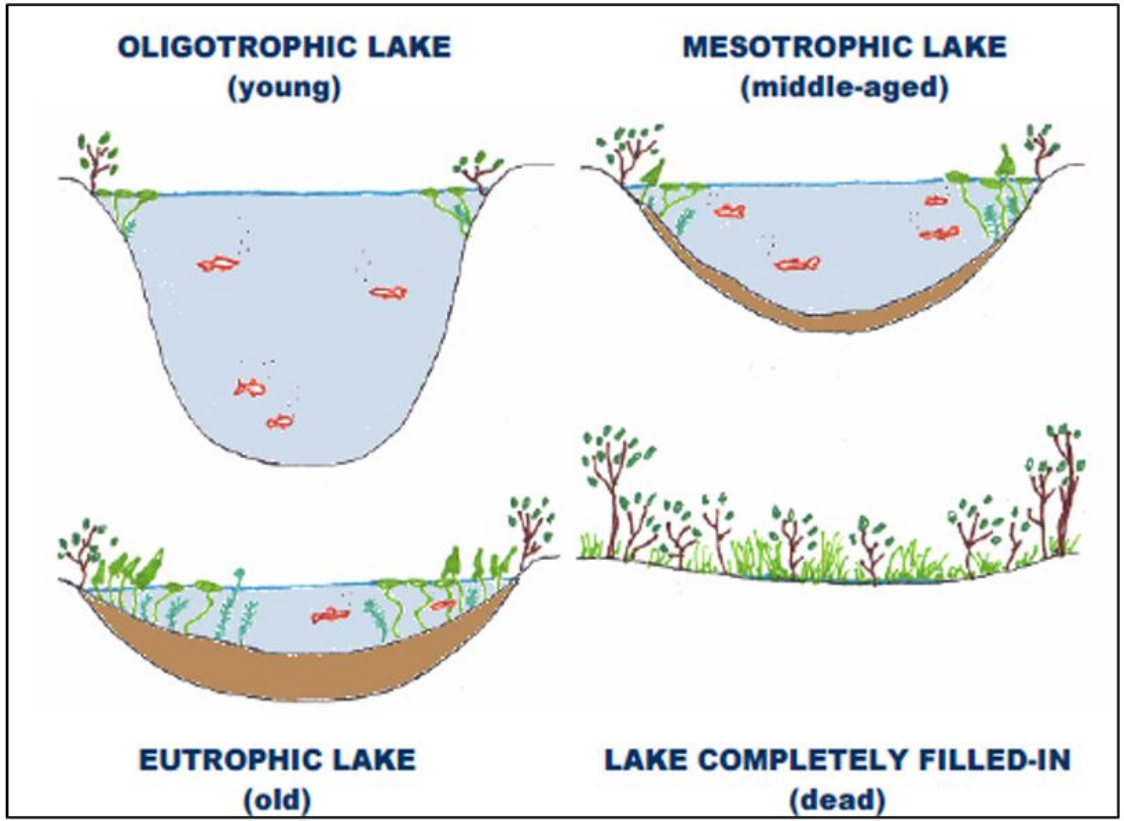
Resource Assessment Service
Maryland Department of Natural Resources (DNR/RAS)

How does a lake age?



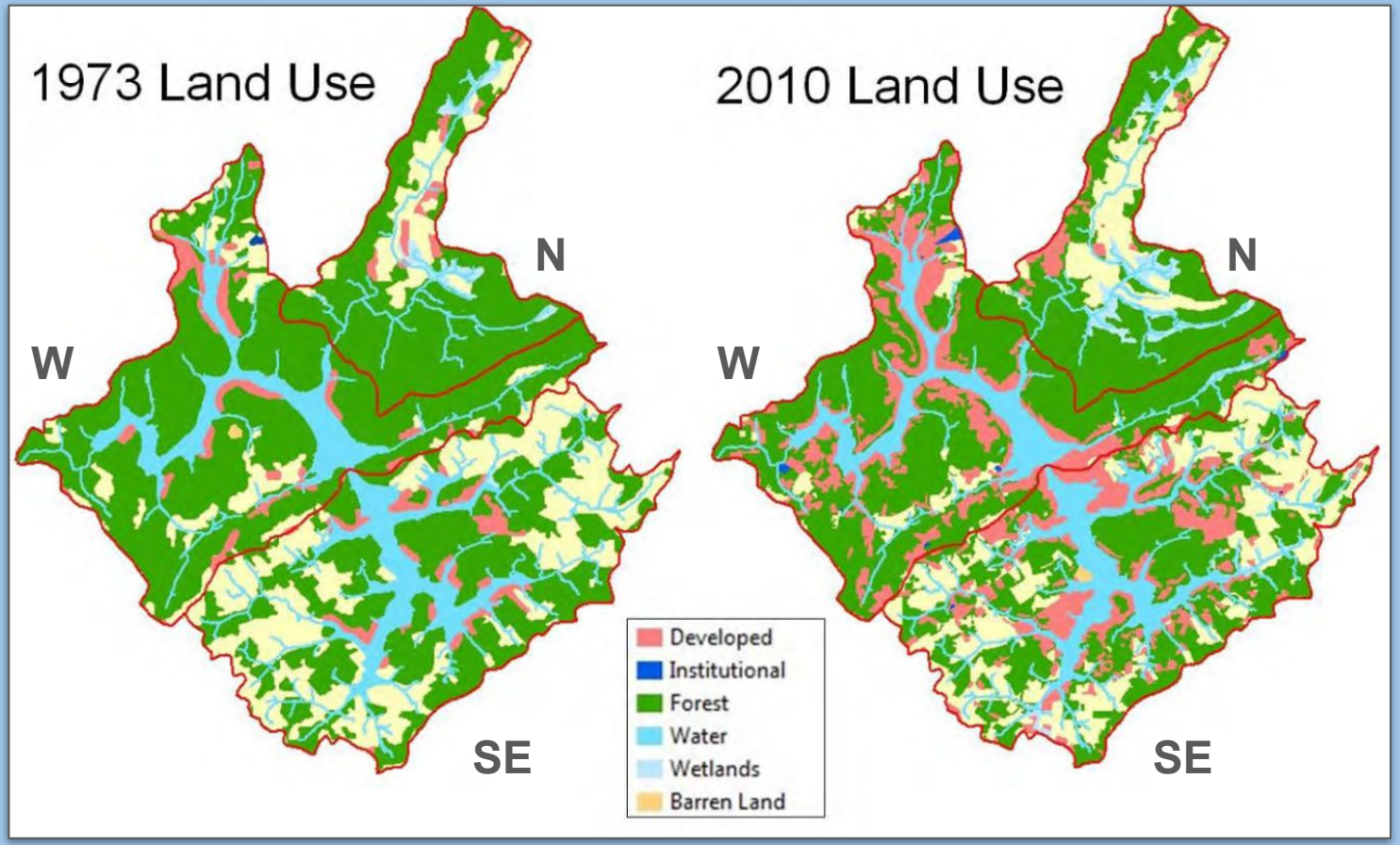
NHLakes.org

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.

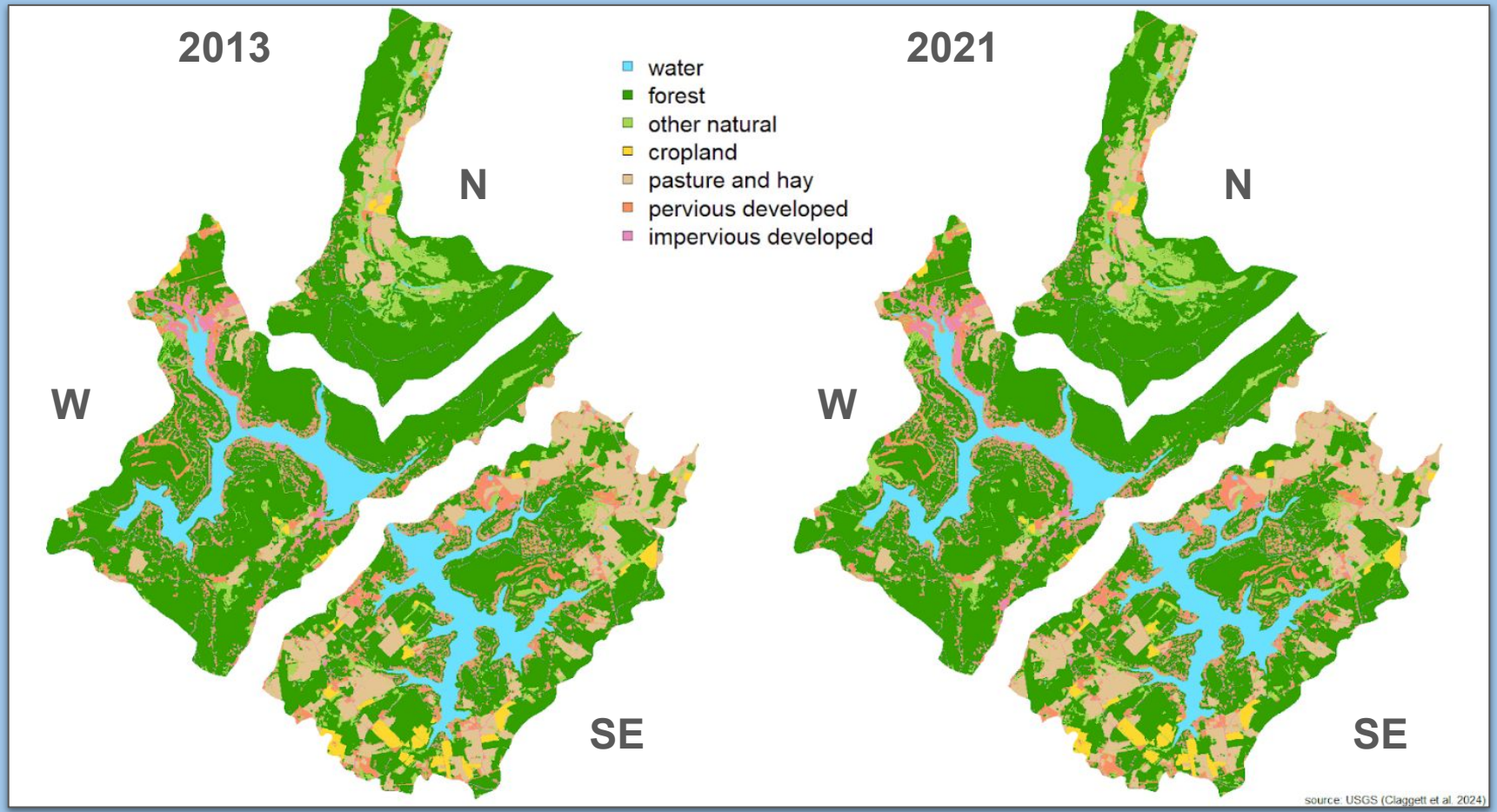
Eutrophic - Shallow, nutrient-rich with high plant growth; dominant in areas where humans have a significant environmental impact. These lakes can be plagued with frequent algal blooms, bottom layer anoxia, and poor water clarity. Typical fish: panfish, bass, catfish, and carp.

Changing Land Use (1973-2010)



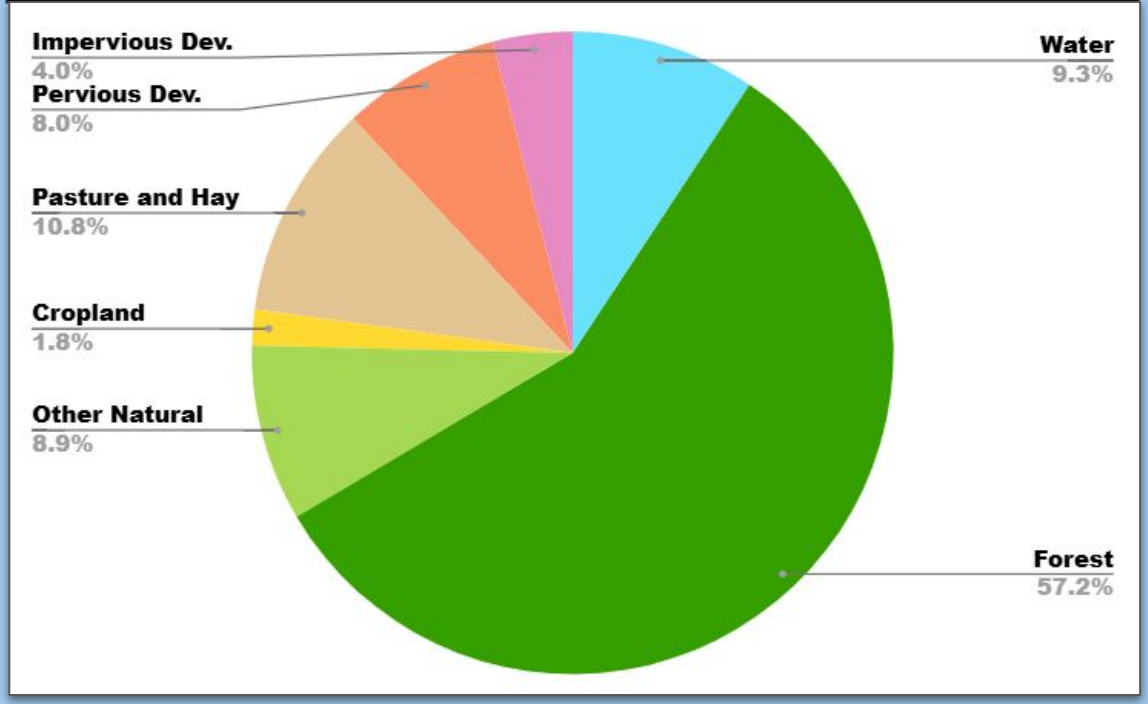
"Land use has not changed significantly over the almost 30 year span, with the majority of land in forests or barren lands." Source: Deep Creek Watershed Draft Characterization Report July 2014

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

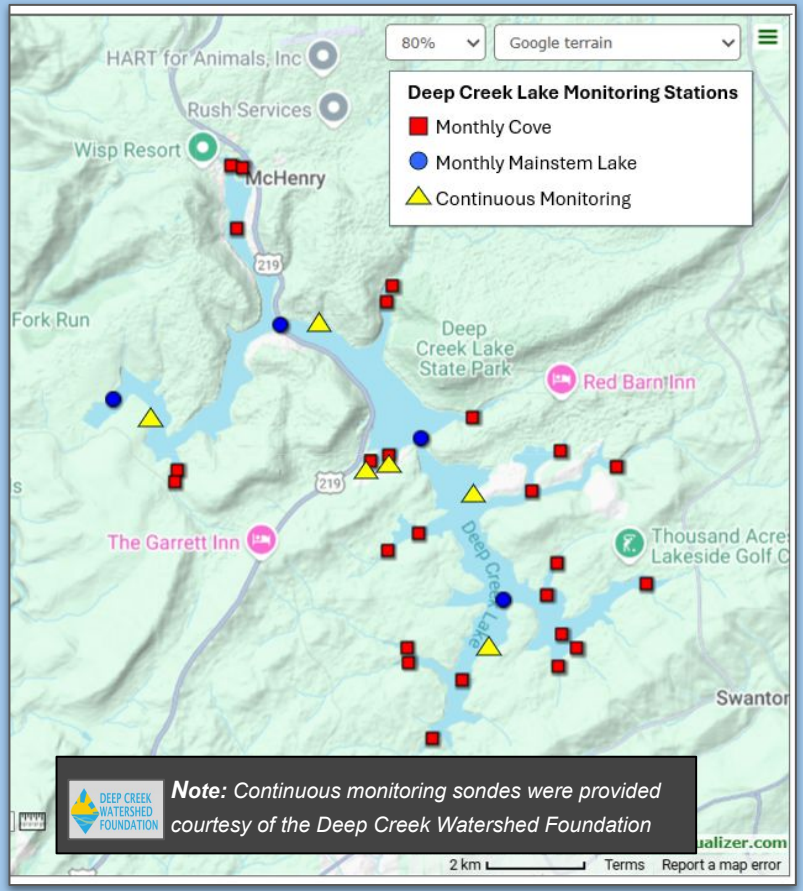
Water Monitoring Stations (2025)

Deep Creek Lake Water Monitoring

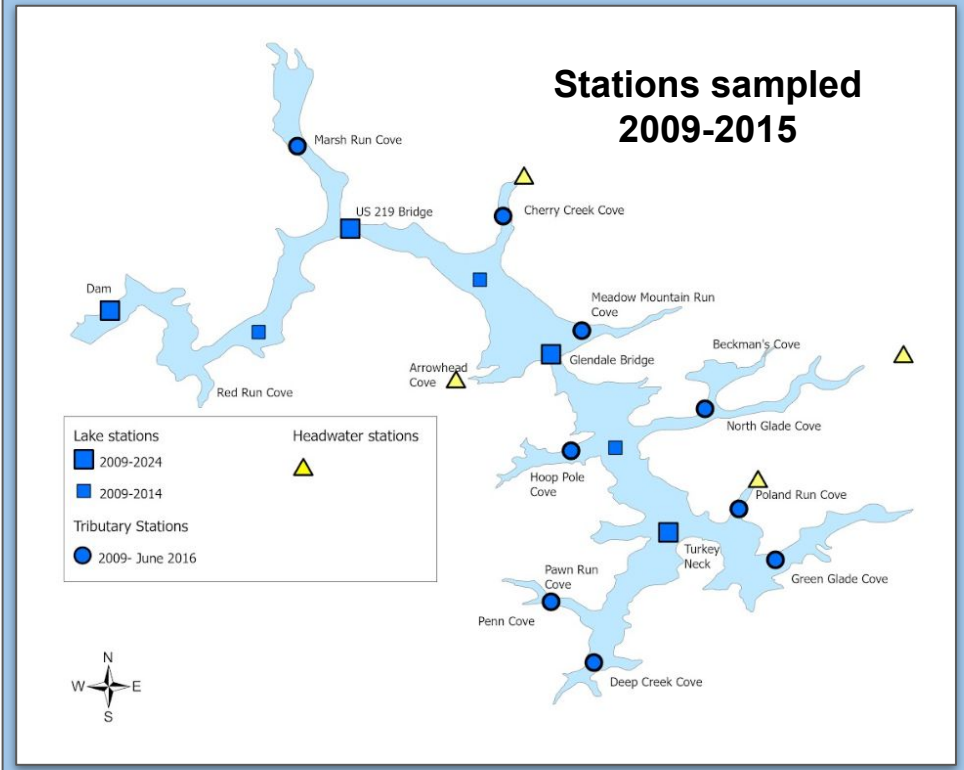
Monitoring Season - April - October

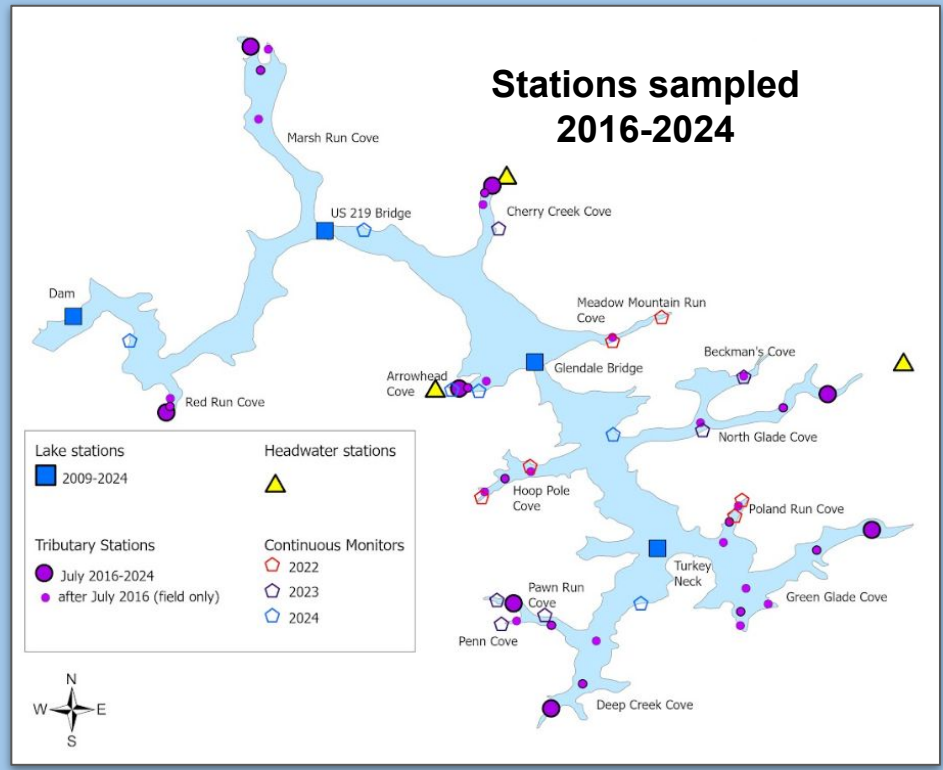
Mainstem & Cove Stations (29)
Monthly Nutrients, DO, Chlorophyll, Water Temperature, Conductivity, pH, Turbidity

Continuous Monitoring Stations (6)
- 15 minute DO, Chlorophyll, Water Temperature, Conductivity, pH, Turbidity.



Deep Creek Lake Water Monitoring Stations (2009-2024)



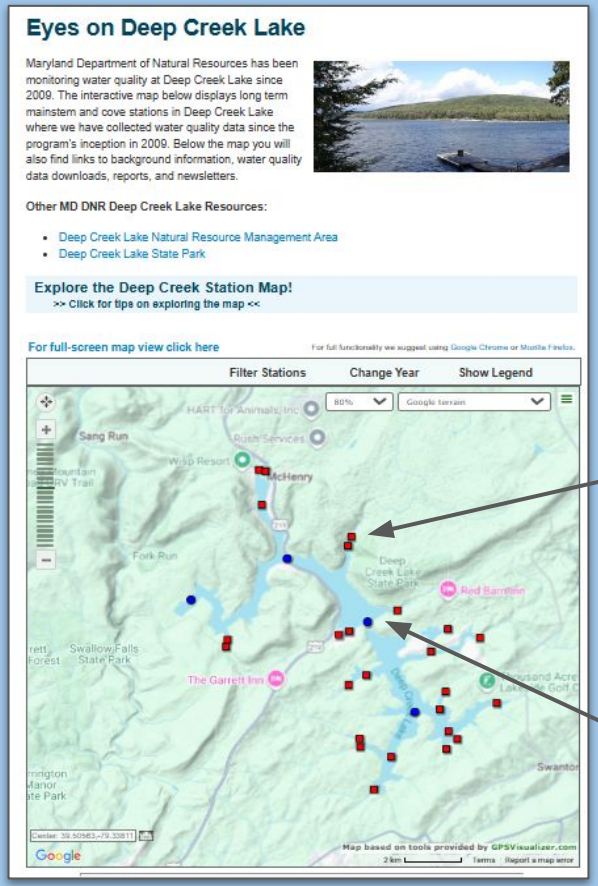


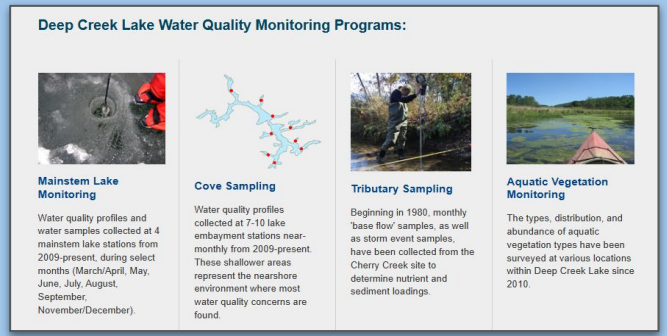
Eyes on Deep Creek Lake

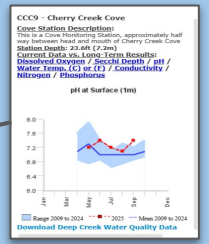
Maryland Department of Natural Resources Deep Creek Lake website with an interactive map

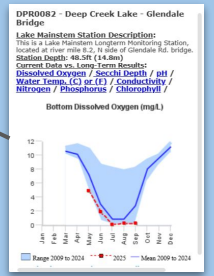
- Monitoring data
- Water quality data downloads
- Reports
- Newsletters

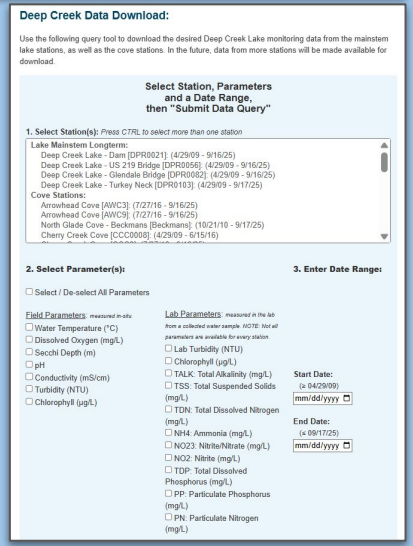
Eyesonthebay.dnr.maryland.gov/dcl/DeepCreekLake.cfm







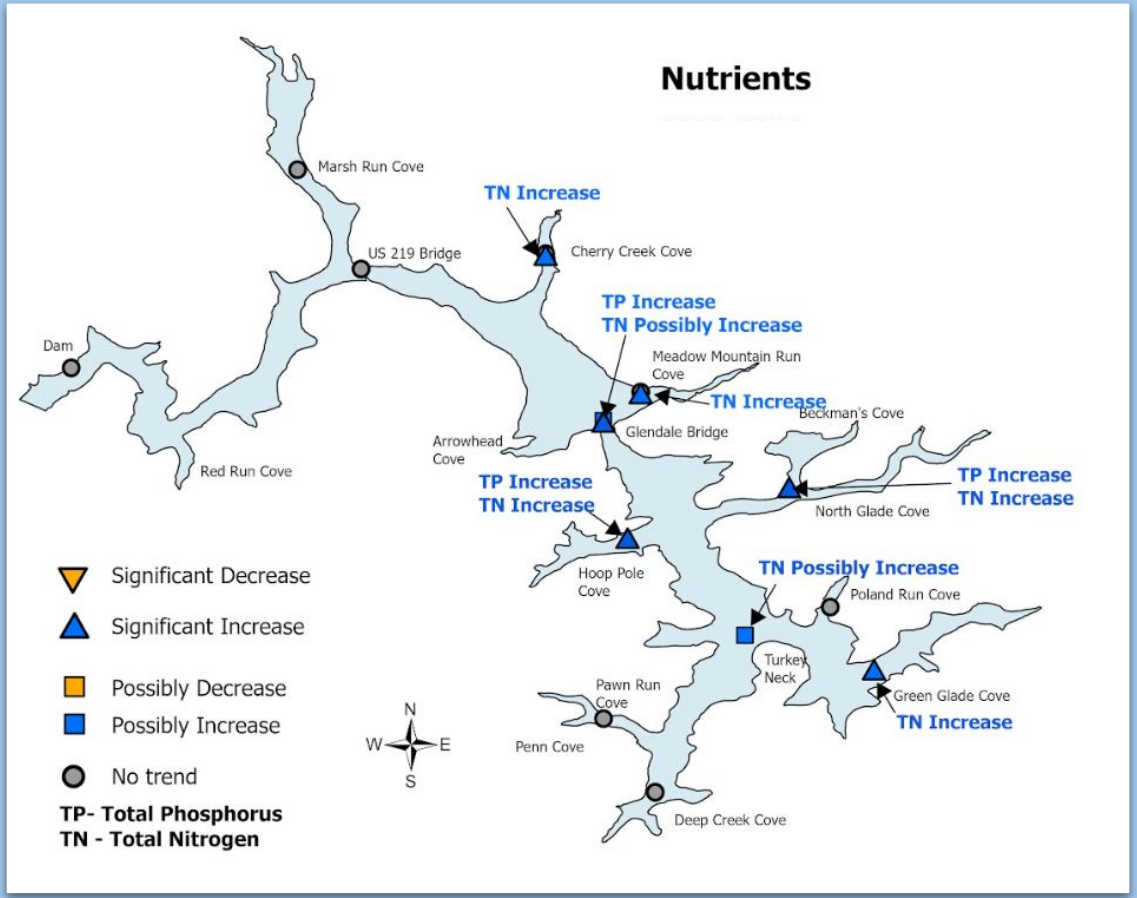




Assessing Water Quality Changes since 2009

- 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

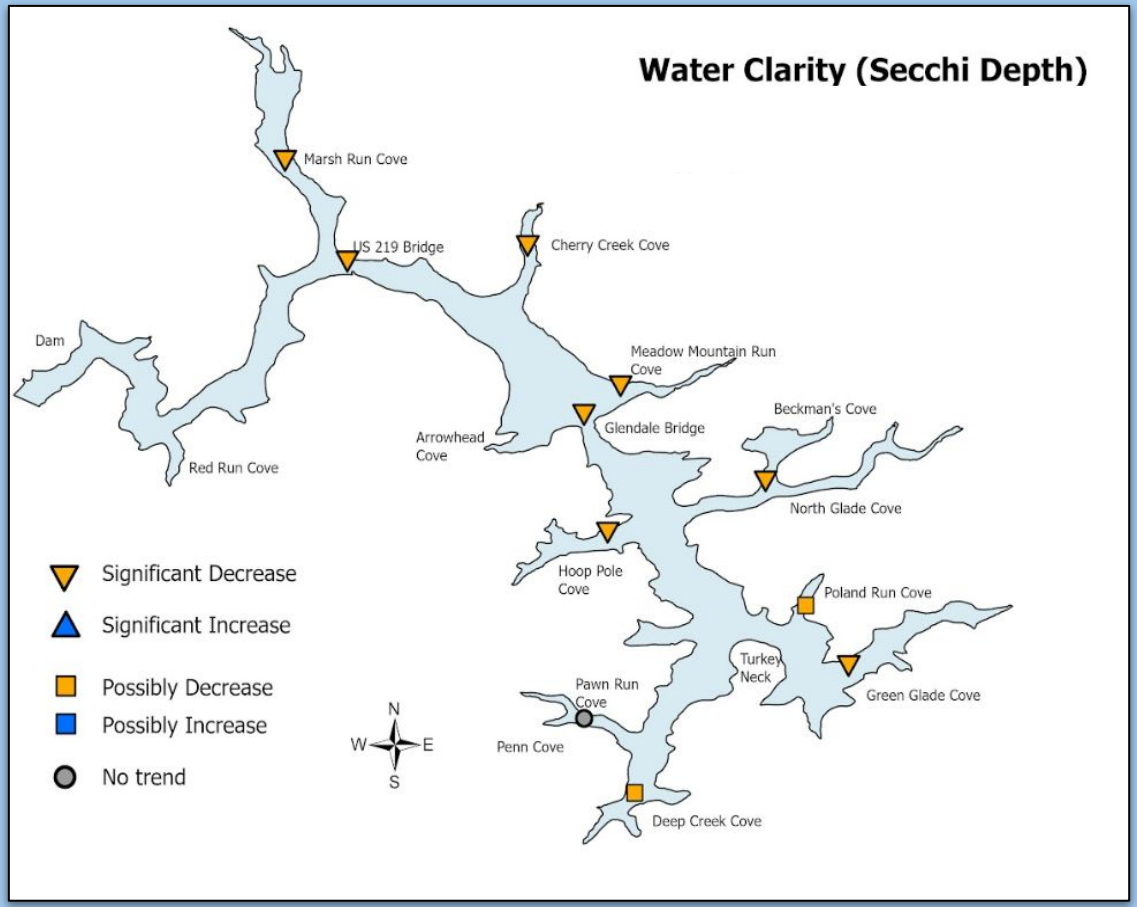
Nutrient Trends (2009-2015)



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.

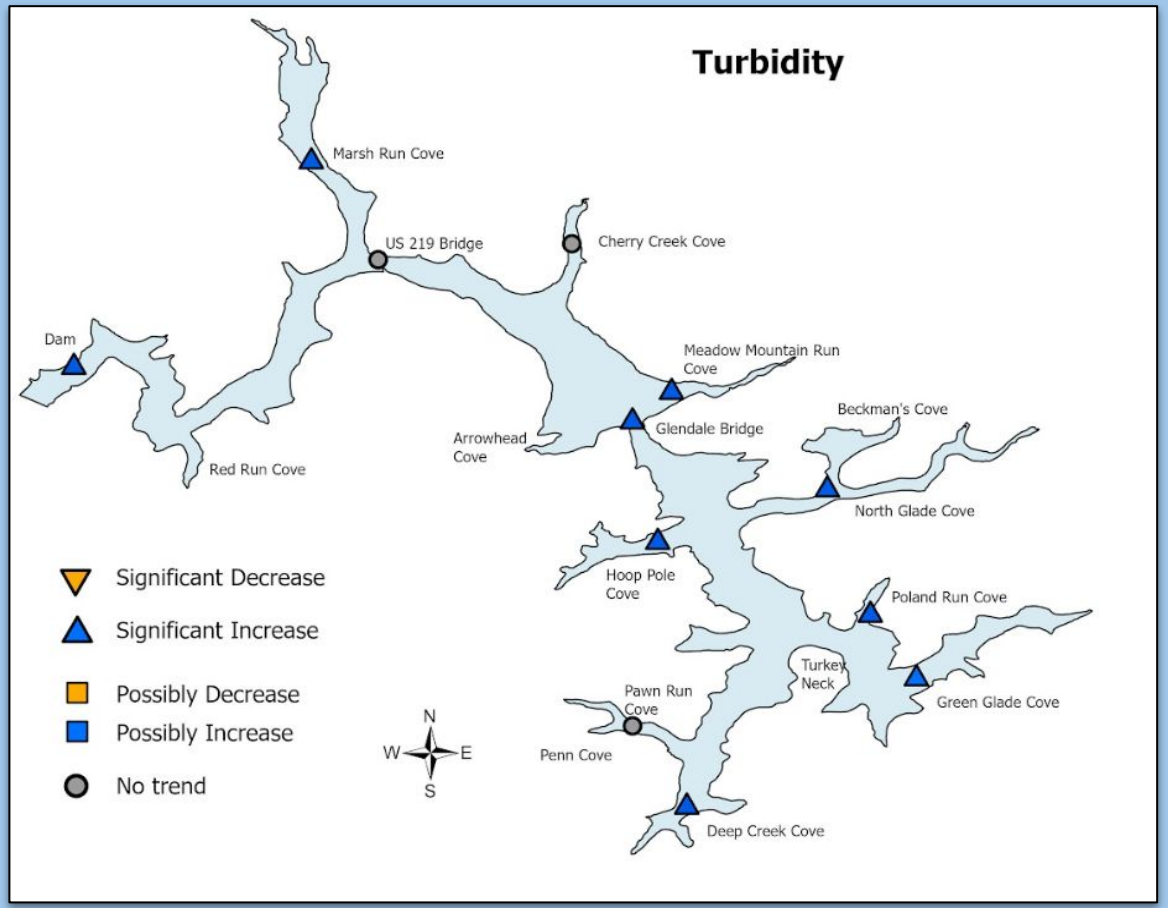
Water Clarity Trends (2009-2015)



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.

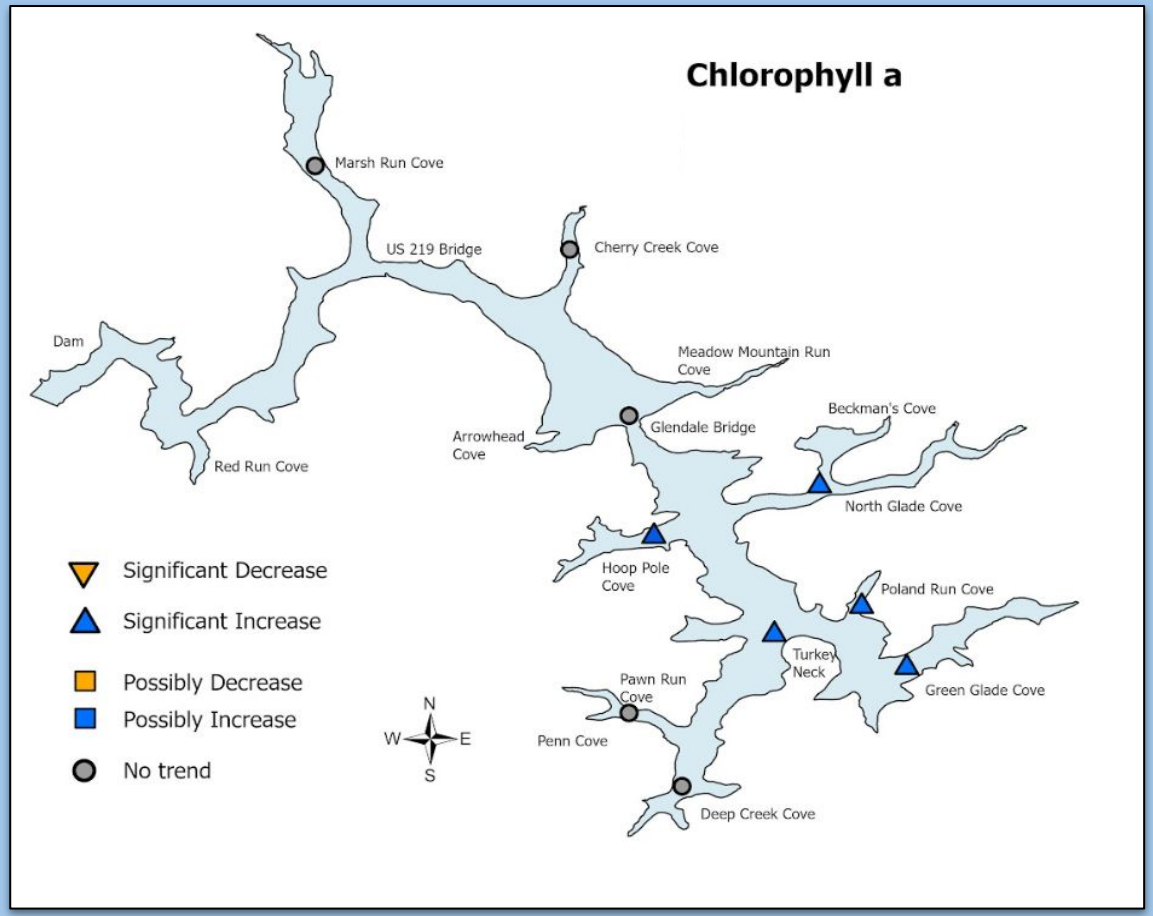
Turbidity Trends (2009-2015)



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.

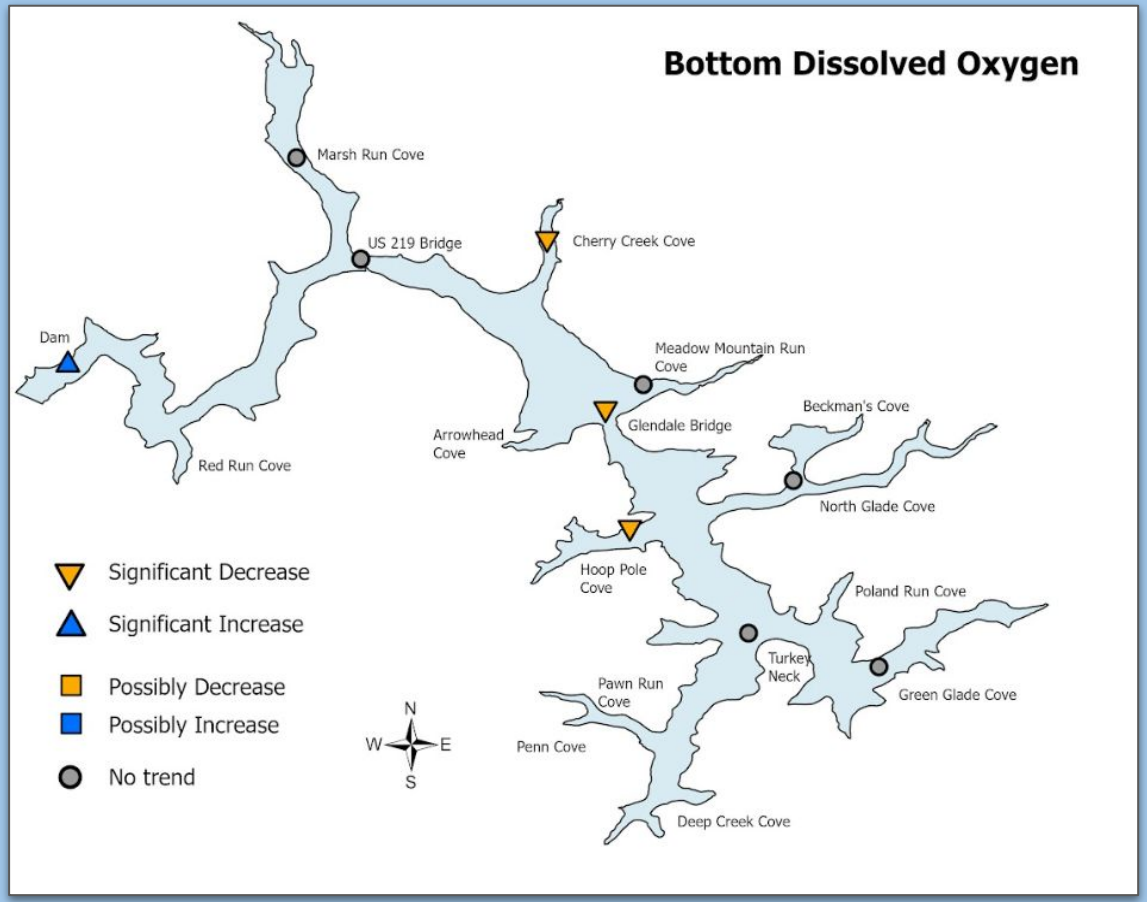
Chlorophyll Trends (2009-2015)



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.

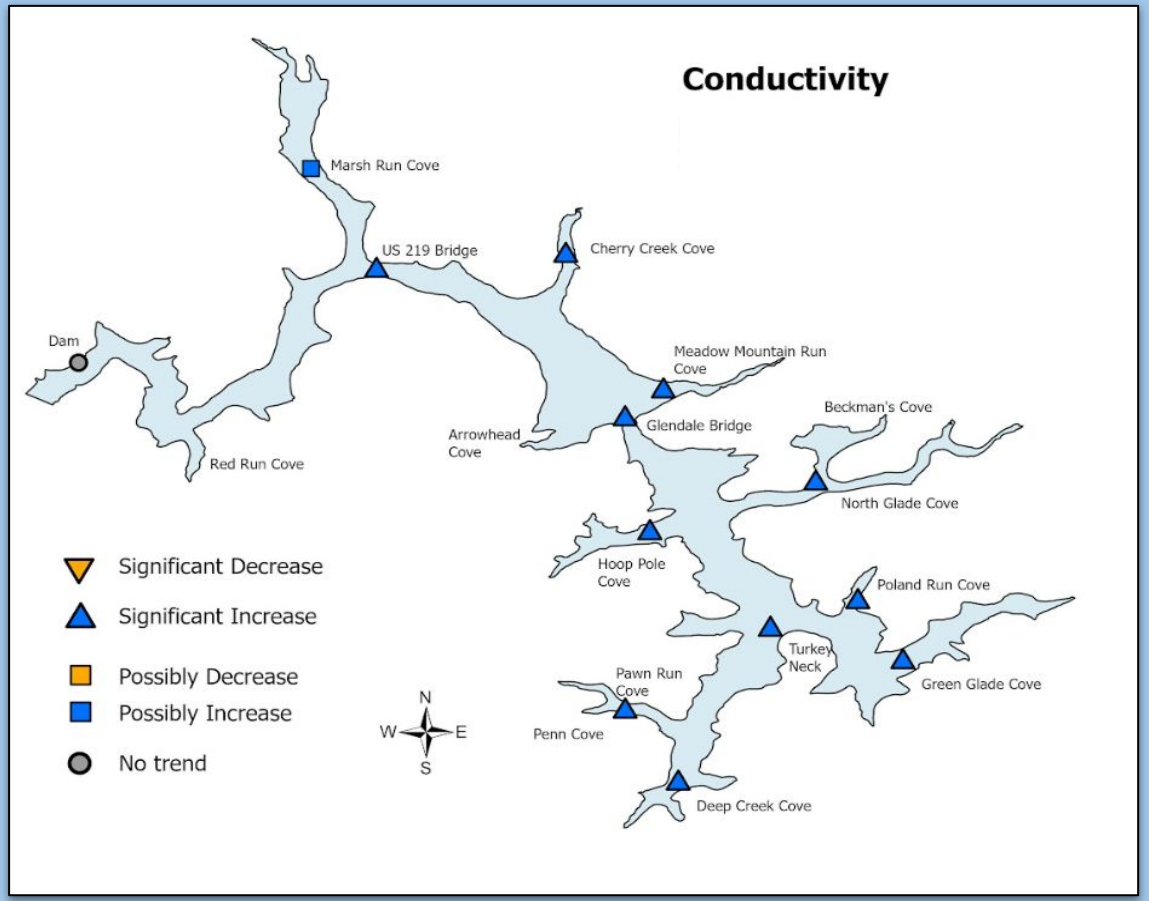
Bottom Dissolved Oxygen Trends (2009-2015)



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.

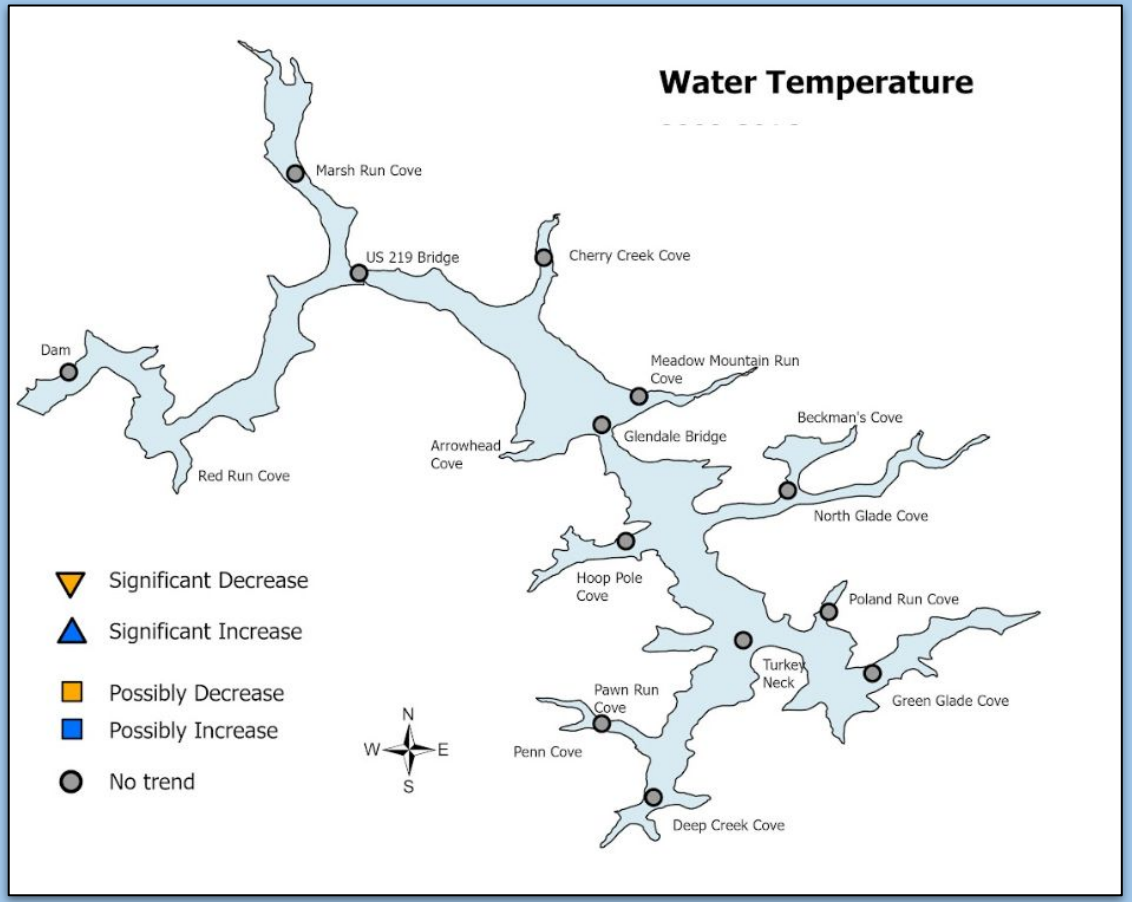
Conductivity Trends (2009-2015)



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

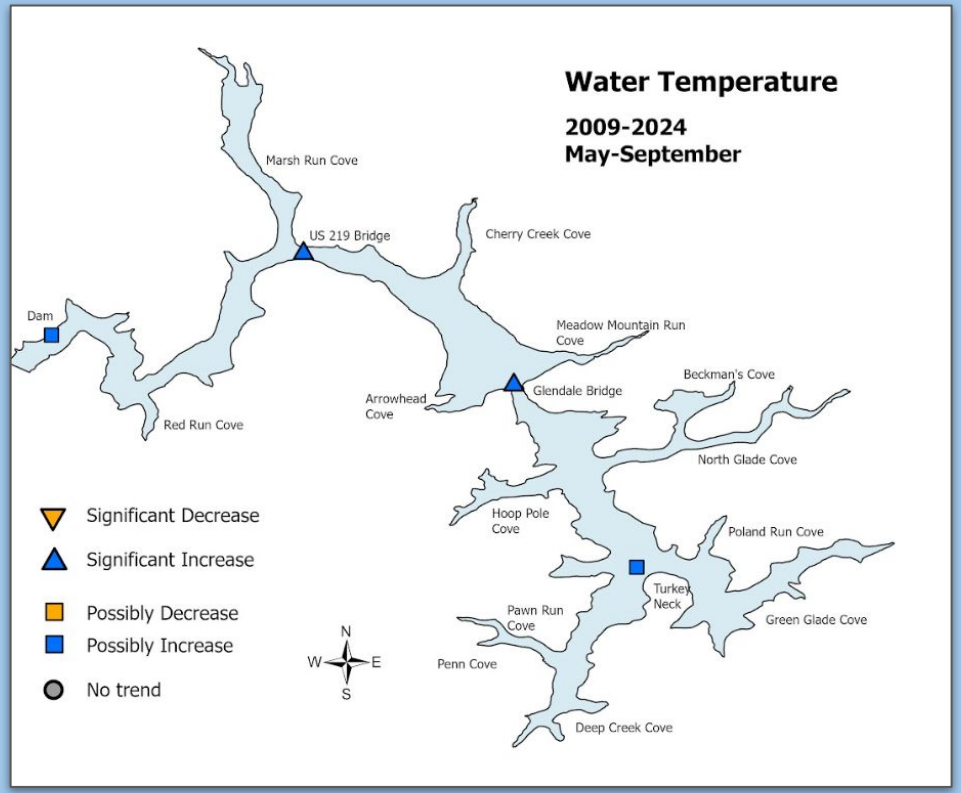
Sources impacting Conductivity - Because dissolved salts and other inorganic chemicals conduct electrical current, fertilizer runoff, sewage, road salt application and soil geology impact conductivity.

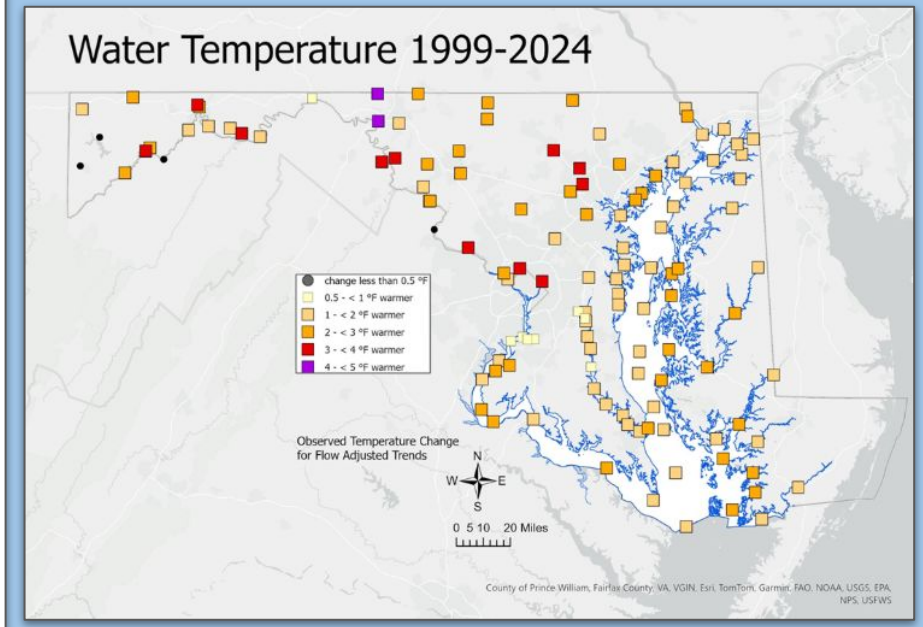
Water Temperature Trends (2009-2015)



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.

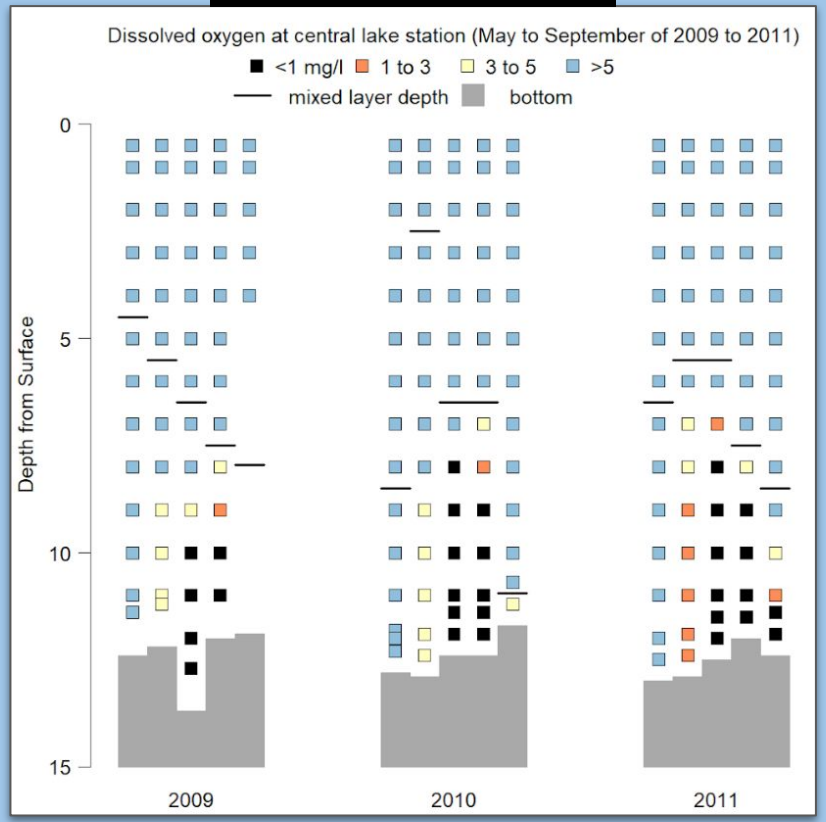
Water Temperature Trends (2009-2024)





Dissolved Oxygen (2009-2024)

Glendale Road Bridge



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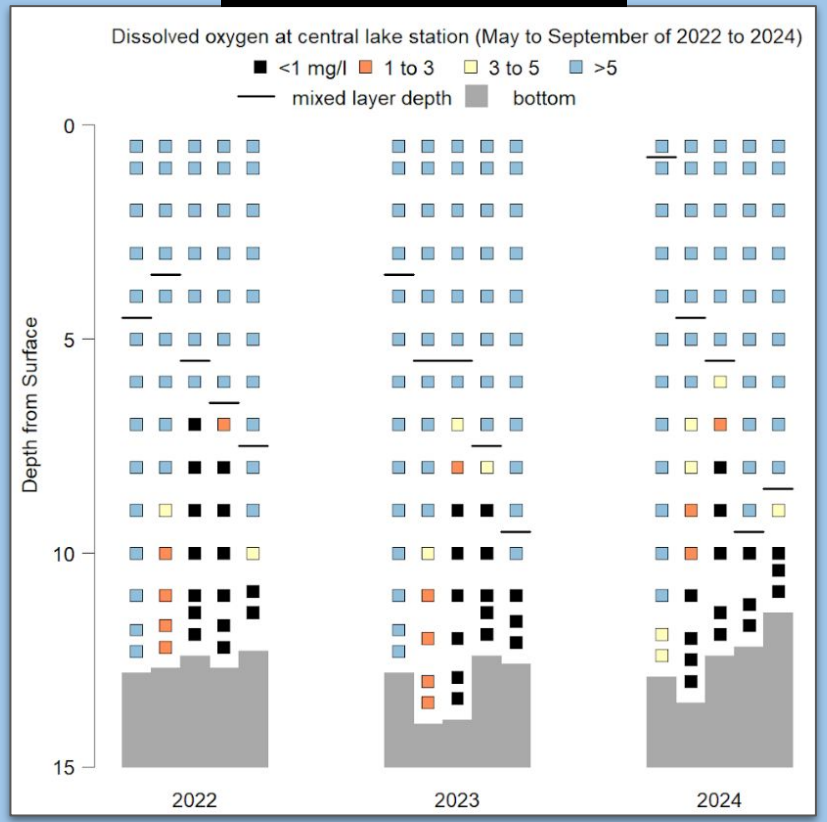
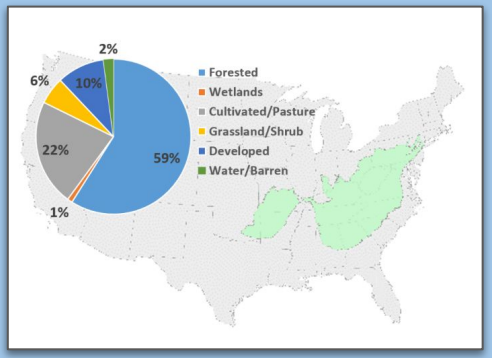


Other Methods to Assess Lake Conditions

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.

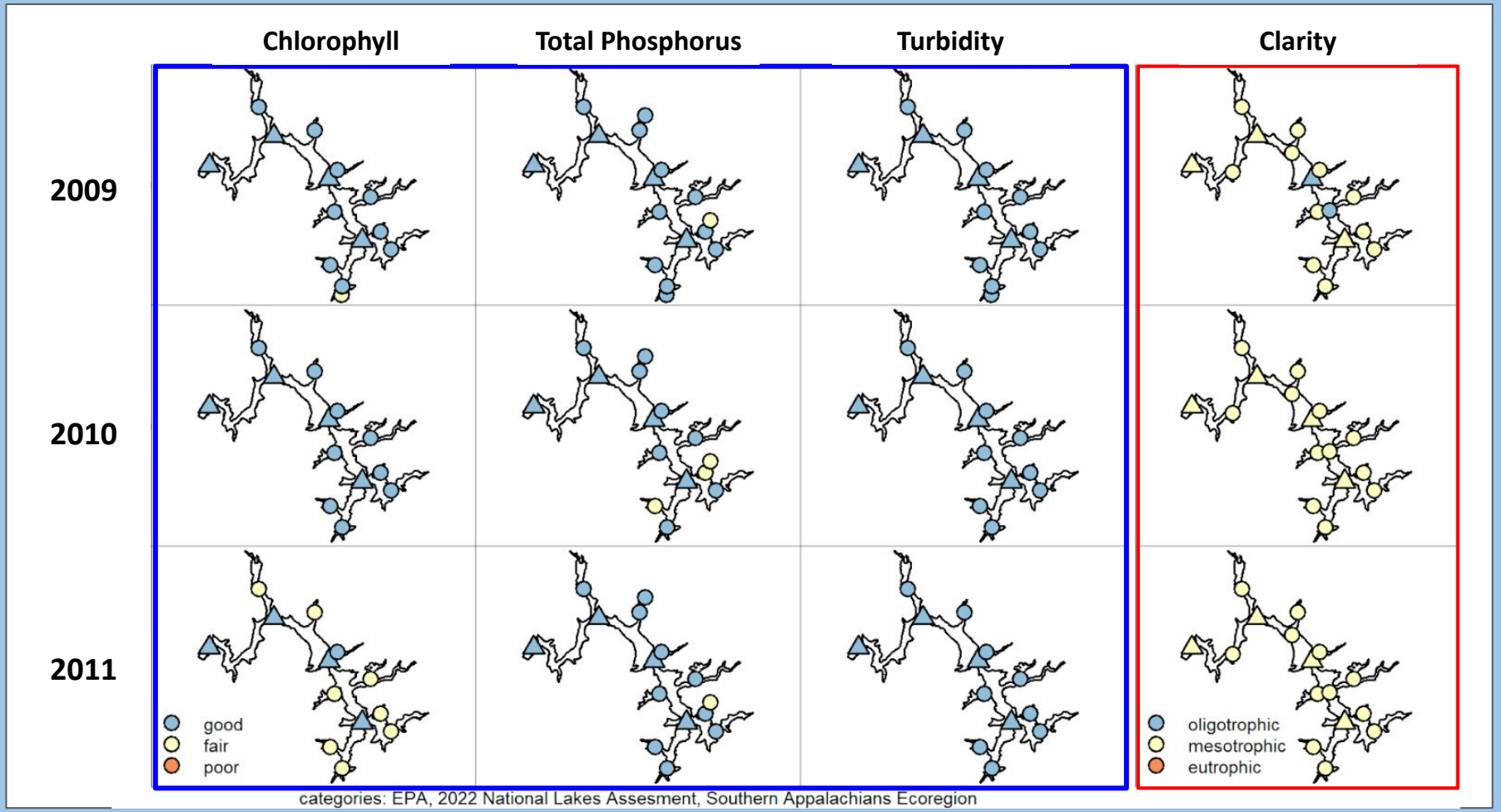


Trophic Status Index (TSI) - Rates lakes on the amount of biological productivity

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)

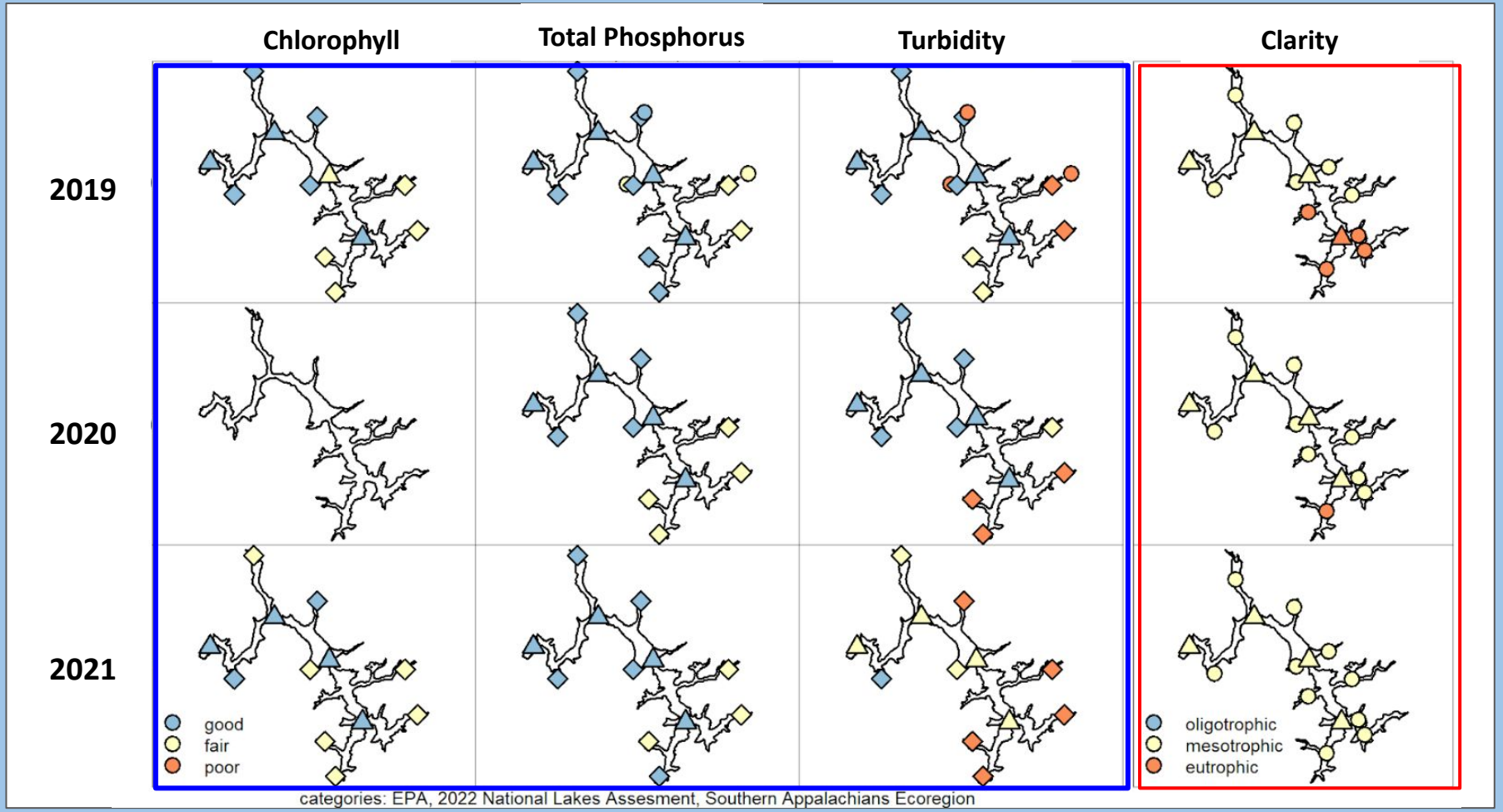
Trophic State Index



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

National Lakes Assessment Indicators (EPA)

Trophic State Index



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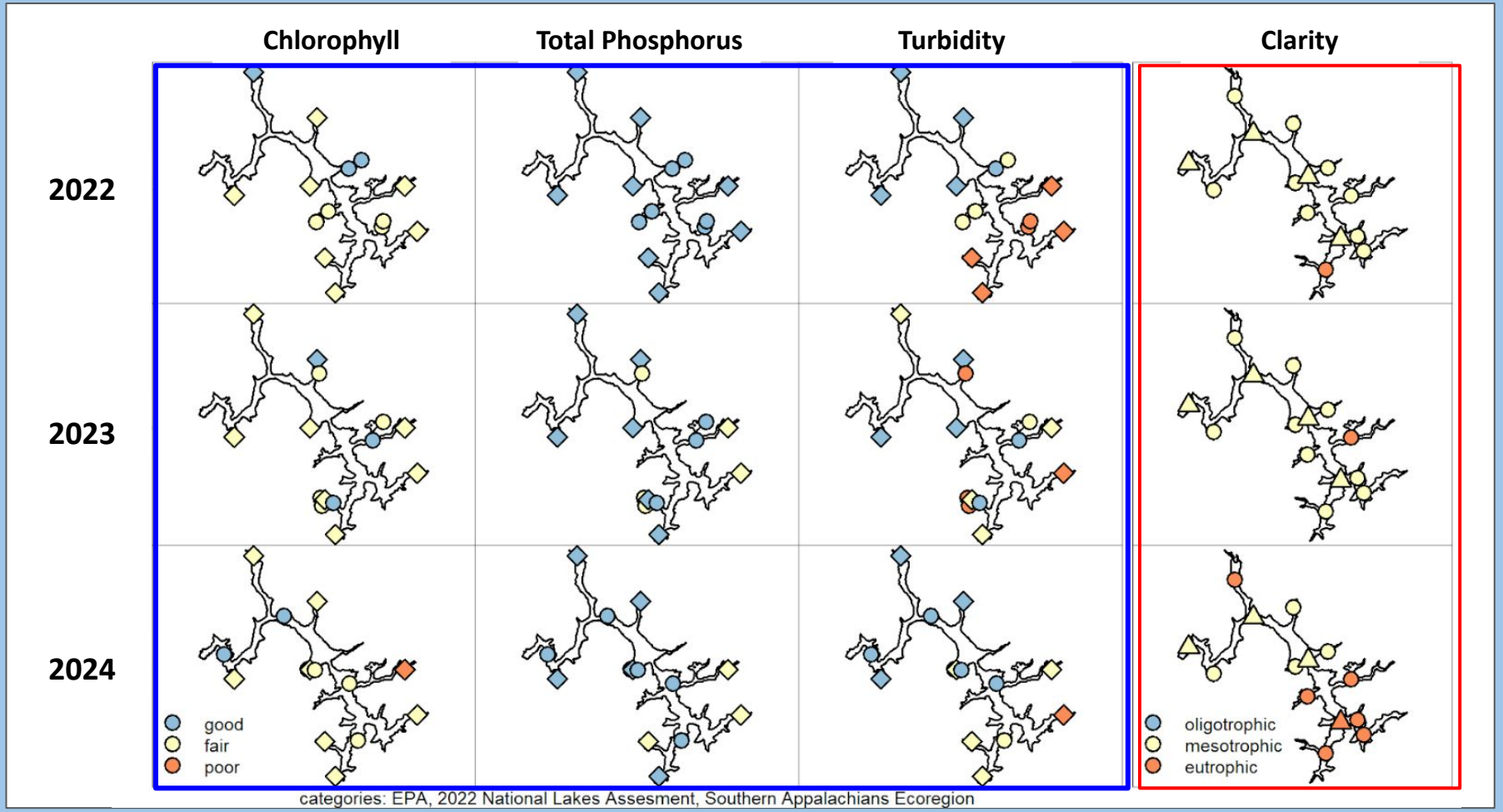
National Lakes Assessment Indicators (EPA)

Trophic State Index



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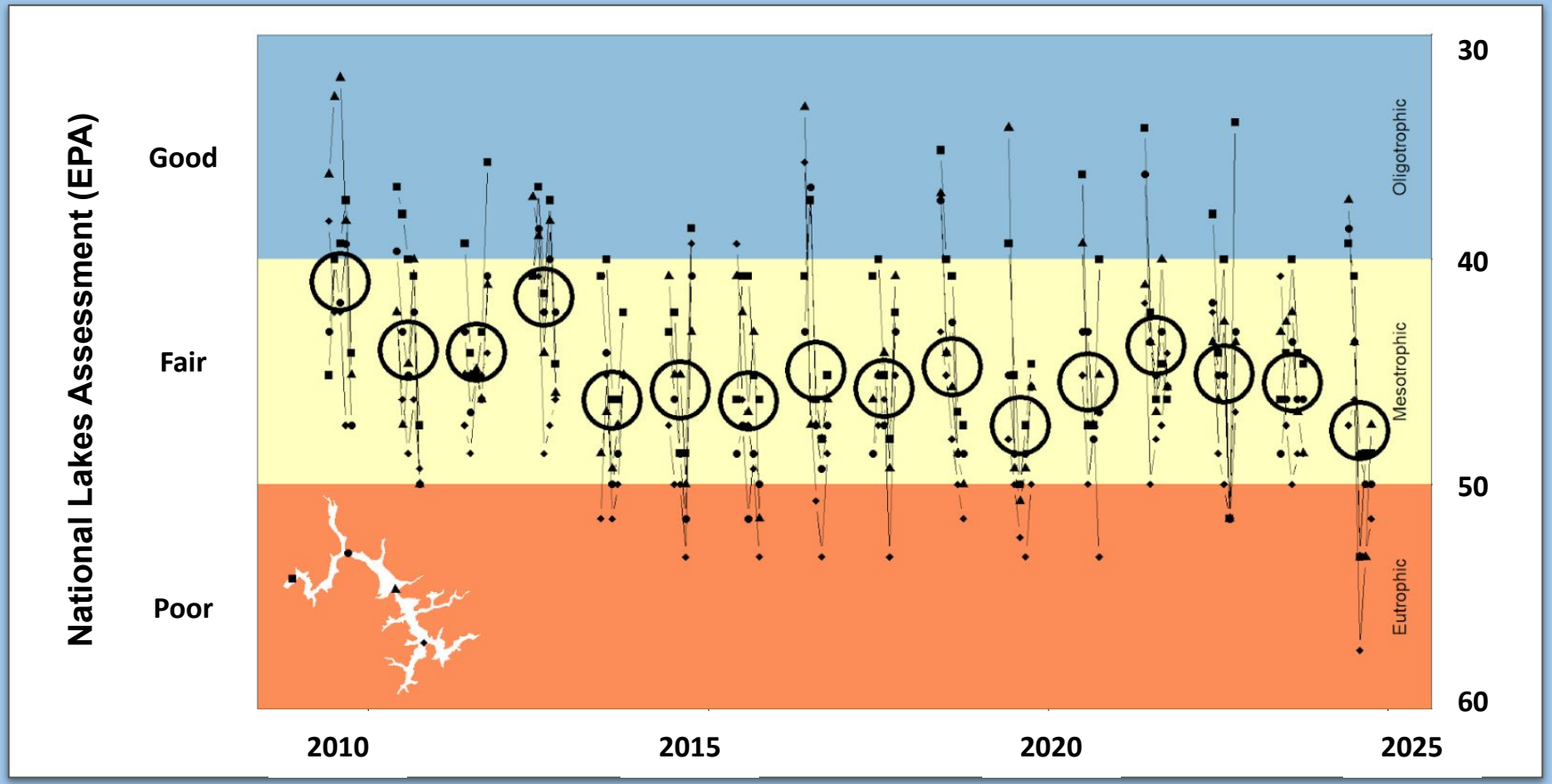
Water Clarity at Main Lake Stations (2009-2024)



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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