

Lake Monroe Watershed Management Plan, 2022: Executive Summary



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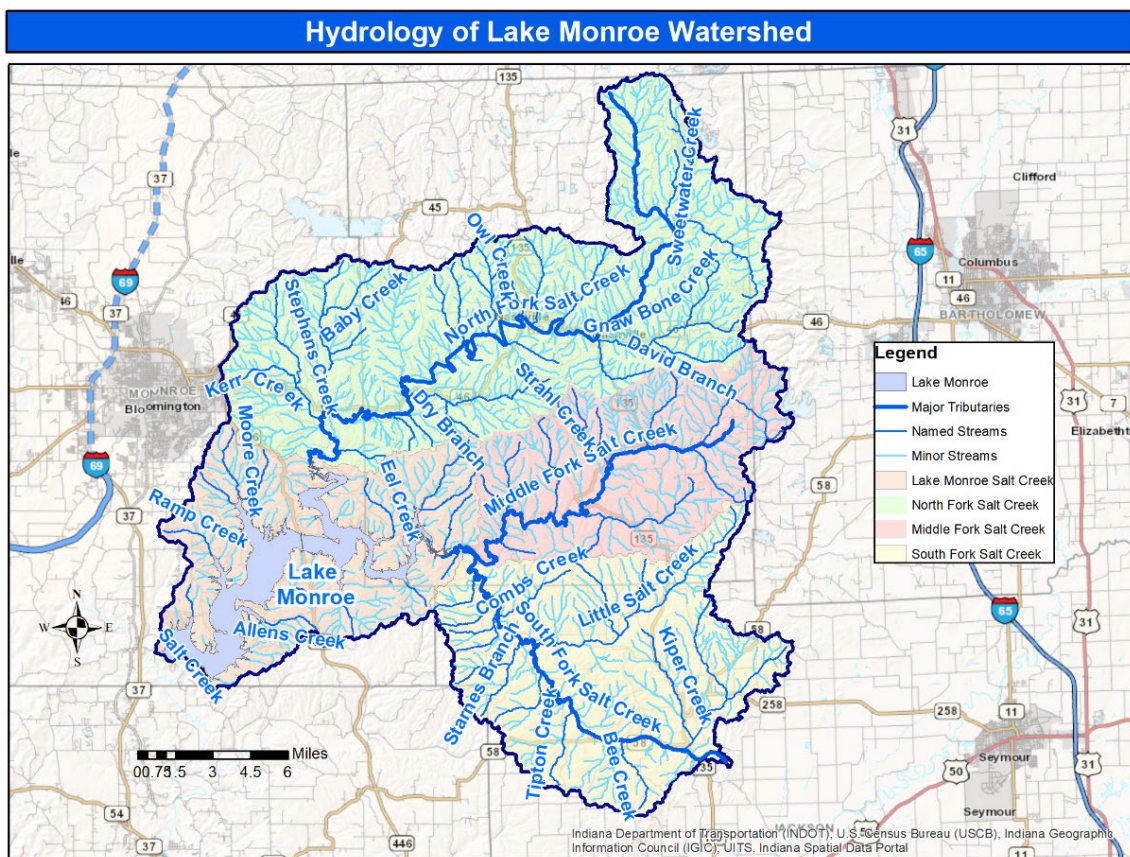
Friends of Lake Monroe has published a watershed management plan

Lake Monroe is the largest lake in Indiana, providing drinking water for over 130,000 people and generating over \$40 million annually in recreational spending. Friends of Lake Monroe worked for three years to develop the 2022 Lake Monroe Watershed Management Plan.

The 2022 Management Plan is available to the public at libraries in Monroe, Brown, and Jackson Counties, as well as online at <https://friendsoflakemonroe.org/watershed-plan/>. It identifies the top threats to water quality in Lake Monroe and provides an action plan to address those threats over the next 20 years. Protecting water quality in Lake Monroe will require reducing phosphorus, nitrogen, sediment, and E. coli loads entering the lake from the watershed.

The Lake Monroe watershed spans 441 square miles

Water quality in the lake is directly connected to activities in its watershed, the area of land that drains into the lake. Lake Monroe's watershed is large (441 square miles) and spans portions of Brown, Jackson, and Monroe Counties. Topography is steep, and soil is highly erodible. Over 82% of the watershed is forested and farming is generally limited to the wide valleys of Lake Monroe's three main tributaries (North Fork, Middle Fork, and South Fork Salt Creek). The area is largely rural and an estimated 9,000 households are served by on-site septic systems. Pollutants in the watershed such as fertilizer, animal manure, sediment, and septic system leakage are washed into the lake when it rains.



Hundreds of community members and organizations participated

A big part of the planning process was building community support and collaboration. More than 20 partner organizations spanning Monroe, Brown, and Jackson Counties participated in the plan development. Over 100 community members attended our public forums and voiced their concerns about Lake Monroe. Over 200 community members learned about the project through public presentations and school programs. Over 100 community members volunteered to assist with water quality sampling in the watershed.



Hundreds of measurements were made to understand water quality



Our water quality monitoring program had three main components. Lake Monroe was sampled monthly from April 2020 through October 2020. Four tributaries feeding Lake Monroe and the tailwaters leaving Lake Monroe were sampled monthly from April 2020 through March 2021. Two sampling blitz events were held to collect samples from 125 sites in the watershed to get a snapshot view of water quality in both large and small streams. Over 240 stream crossings throughout the watershed were inspected to document streambank erosion, width of riparian buffer, livestock access to streams, and other stream conditions. This information was used to develop sediment and nutrient budgets for the lake and to identify areas of concern in the watershed.

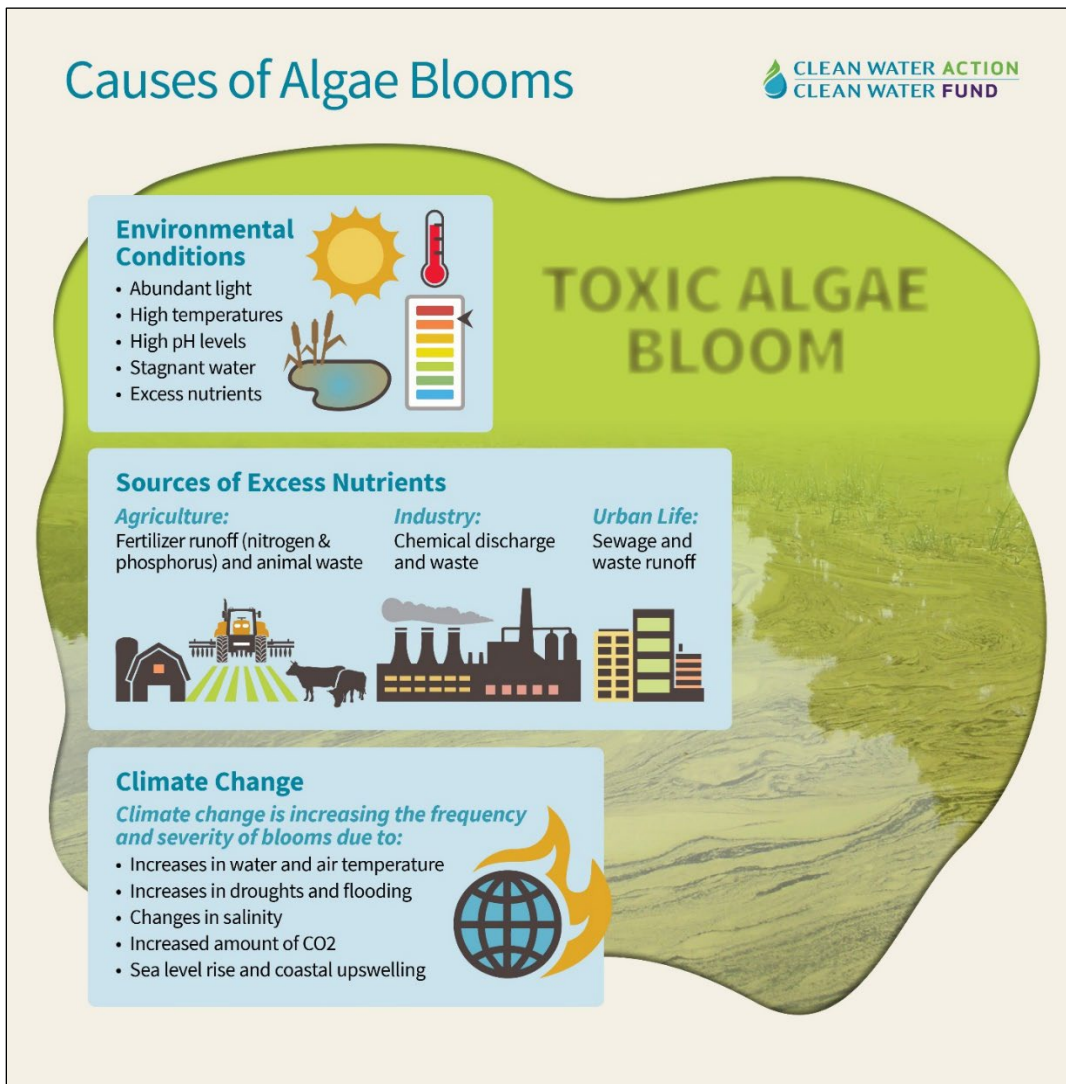
Harmful algal blooms impact recreation and drinking water treatment

Harmful algal blooms (HABs) are caused by a type of plankton called cyanobacteria. Although they are often referred to as blue-green algae, they are technically bacteria. Several species of cyanobacteria have the potential to produce toxins. Even when cyanotoxins are absent, swimmers can experience skin irritation and the algae can cause taste and odor issues in drinking water. Recreational advisories based on elevated levels of blue-green algae were issued at Lake Monroe for the Fairfax and Paynetown beaches annually 2011-2021. City of Bloomington Utilities has recently upgraded their algae monitoring equipment and treatment train options to quickly respond to elevated algae levels in the raw water entering their drinking water treatment plant.



Nutrients promote harmful algal blooms

Lakes with phosphorus concentrations over 20 µg/L are considered eutrophic and can be expected to have more severe and frequent algal blooms. Phosphorus concentrations in Lake Monroe historically and today are regularly above that threshold. North Fork Salt Creek appears to be the largest contributor of phosphorus with the South Fork not far behind. Potential sources of phosphorus include fertilizer (from agricultural, commercial, or residential usage), animal manure, septic system leachate, and sediment.

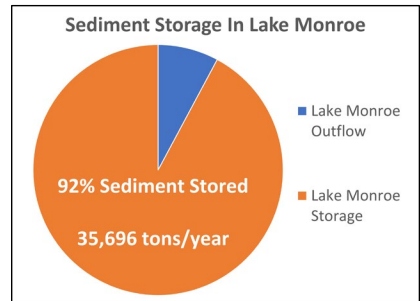


Elevated nitrogen concentrations also increase the likelihood of harmful algal blooms. Nitrogen levels in Lake Monroe were above target levels in more than half of the 2020 samples. South Fork Salt Creek appears to be the largest contributor of nitrogen by a significant margin. This correlates strongly with the fact that the South Fork sub-watershed has the highest percentage of agricultural land. Potential sources of nitrogen include fertilizer, animal manure, septic system leachate, and sediment.

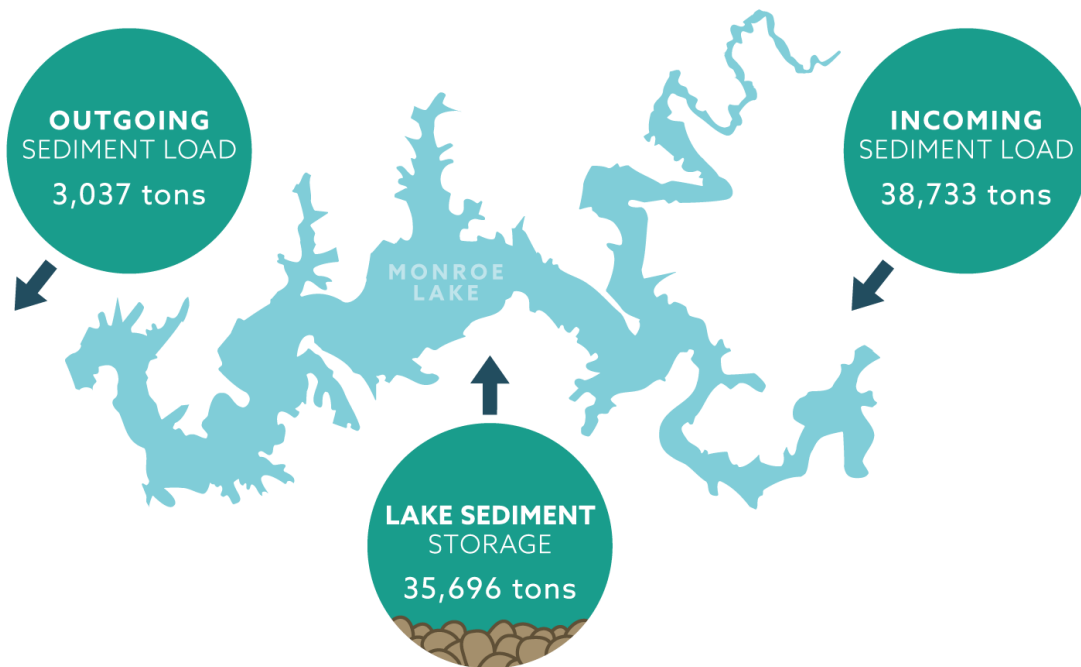
There are other factors that influence algal blooms such as high water temperature and low mixing of water, seen most commonly in the late summer. Climate change models suggest that Indiana is likely to experience warmer weather and more severe summer droughts, which would encourage algal blooms. Since the weather is beyond our control, it is critical to reduce nutrient loads entering Lake Monroe.

Sediment carries nutrients and accumulates in the lake

Sediment carries both phosphorus and nitrogen as it moves through the watershed. While sediment movement is natural in streams and rivers, human activity can increase the rate of sedimentation due to soil disturbance, channelized streams, and faster runoff rates. Reservoirs accumulate sediment, so minimizing sedimentation is key to maximizing the lifespan of Lake Monroe. Sediment can also carry other pollutants.



Water quality monitoring in Lake Monroe showed generally low levels of total suspended solids. However, monitoring of the main tributaries and the outlet of the lake showed that significant volumes of sediment are accumulating in the lake. Lake Monroe retains almost 92% of the sediment that enters, with an estimated accumulation rate of 35,696 tons per year. The North Fork sub-watershed appears to be the largest contributor of sediment.



Multiple sources of sediment were identified

Approximately 76% of the Lake Monroe watershed is considered highly erodible due to its steep slopes and soil type. One potential source of sediment is streambank erosion, which was documented at 86% of observed stream sites. Another potential source is conventionally tilled cropland. There are roughly 10,000 acres of cropland (4% of the watershed) and conventional tillage is still commonly practiced. Other potential sources of sediment include livestock with free access to streams, construction sites with insufficient erosion control, and forestry sites with insufficient erosion control.



Community members expressed concern that boating may be contributing to lakeshore erosion. While insufficient data was available to quantify the impact of boating on erosion, established no-wake zones should be respected to reduce the possibility of exacerbating shoreline erosion and stirring up sediment from the lake bottom.

Fecal contamination from humans and animals is widespread in streams

E. coli is an indicator of fecal contamination. While *E. coli* itself is generally not harmful, many other harmful bacteria and viruses are present in fecal matter. *E. coli* levels in all the 2020 Lake Monroe samples were well below the state standard of 235 CFU/100 ml (CFU = colony forming units of bacteria). However, historical beach sampling data shows *E. coli* exceedances in 2015 and 2016 ranging from 632 CFU/100 ml to >2,400 CFU/100 ml.



There were multiple *E. coli* exceedances in streams throughout the watershed. The South Fork sub-watershed appears to be the largest contributor of *E. coli*. Source analysis indicates that both human and animal fecal contamination are present. This widespread contamination renders streams unsafe for swimming or wading and contributes to nutrient overloading in the lake. Potential sources include livestock manure, pet waste, wildlife manure, and septic system leachate.

Actions in the watershed are needed to improve water quality in the lake

Anything on the ground in the watershed can be washed into the lake when it rains. The key to protecting and improving water quality in the lake is to keep pollutants such as sediment, fertilizer, animal manure, and septic system leakage from reaching the streams that flow into Lake Monroe. A key strategy will be increasing the use of best management practices on agricultural, forested, residential, and urban land in the watershed.

Best management practices for livestock can reduce nutrient and bacteria input



Livestock are one potential source of nutrients and bacteria. This source can be addressed by increasing the use of conservation practices like fencing livestock out of streams (as shown in photo to the left), installing heavy use area protection, and improving manure management. Streams can be further protected by planting pollinator habitat or trees along streams to create a riparian buffer that filters runoff before it reaches the stream and helps stabilize the stream banks.

Septic system maintenance and repair can reduce nutrient and bacteria input

Poorly functioning septic systems are another potential source of nutrients and bacteria. There are over 9,000 septic systems in the watershed. Many homeowners are unaware that their septic tank should be pumped and inspected about every 3 years. While a properly functioning septic system can be highly effective, another strategy to reduce potential leakage is to expand existing sewer lines and decrease the number of active septic systems.



Best management practices for cropland and forest can reduce sediment and nutrient input



Any activity that disturbs the soil increases the likelihood of sediment (and its associated nutrients) being washed into Lake Monroe. Common examples of soil disturbance are tillage for planting crops, building trails for timber harvests, and clearing sites for construction. Best management practices are available for all these situations that decrease the amount of sediment loss.

For cropland, strategies include cover crops, reduced tillage, filter strips of permanent vegetation at the edge of crop fields, and riparian buffers of permanent vegetation along stream banks. For forested land, strategies include developing a forest management plan, carefully planning trail locations, installing water bars, and seeding trails that are not in use.

Streambank and shoreline stabilization can reduce sediment and nutrient input



While some erosion of stream banks is inevitable (streams by nature move sediment downstream), human activities in the watershed can increase the volume of sediment being transported. Fluctuations in water level within the lake are also believed to directly exacerbate erosion of both the lakeshore and the stream banks. Strategies to address stream bank and lakeshore erosion include stabilization in areas where erosion is severe, fencing livestock out of streams, installing riparian buffers of permanent vegetation along stream banks,

adding vegetation to existing riprap, and instituting operational changes at the dam that would reduce water level fluctuations in Lake Monroe.

Our Action Plan is a twenty-year plan

Improving water quality by modifying the watershed is a long-term process. The 2022 Lake Monroe Watershed Management Plan outlines a twenty-year timeline of activities. Key strategies include

- Increasing the adoption of best management practices on agricultural and forested land.
- Expanding riparian buffer along streams.
- Maintaining and repairing septic systems.
- Encouraging green boating practices and “leave no trace” principles.
- Stabilizing key sections of shoreline and streambanks.
- Protecting and restoring floodplains, especially along the three main tributaries (South Fork, Middle Fork, and North Fork Salt Creek).
- Reducing the amount of littering in the watershed.
- Promoting collaboration between different governmental bodies in the watershed.
- Monitoring water quality to evaluate impacts.

Community Action, 2022

Friends of Lake Monroe has launched the “Lake Monroe Community Action Initiative” to promote the watershed management plan and begin implementation. The focus of this effort is to inform the local community about the watershed plan and engage their support in implementation. Specific components include hosting public forums, organizing a watershed summit for local leaders, launching a social media campaign about how to protect water quality in Lake Monroe, and laying groundwork for a larger implementation project this fall. This program is supported in part by the Community Foundation of Bloomington and Monroe County.



Another component of the initiative is a pilot septic system maintenance cost-share program in the Lake Monroe watershed portion of Monroe County. It will help reduce the cost of the septic tank pumpout that should be done every three years to keep a septic system in good shape and catch any problems while they are small. We hope to expand the program into neighboring counties in the future.

Best Management Practice Cost-Share Program 2022-2025

This fall, Friends of Lake Monroe anticipates receiving a second round of funding through the 319 grant program of the Indiana Department of Environmental Management. This grant would pay for a cost-share program subsidizing the installation of best management practices on land throughout the watershed. Examples include establishing pollinator habitat or trees adjacent to streams, fencing livestock out of streams, planting cover crops, and reforesting floodplains. The grant would also fund a variety of education and outreach programs including agricultural field days, forestry trainings, septic system maintenance workshops, boat tours, trash cleanups, green boating campaigns, and educational brochures mailed to every resident in the watershed.



Education and outreach will engage the community in making the plan a reality

Community support at both the individual and governmental level is key to making the Lake Monroe Watershed Management Plan successful. Making improvements to the watershed is a long-term effort that will require participation from governing bodies, landowners, and residents. Our goal is to activate the local community throughout the watershed to collaborate and protect our local water resources. Together we can ensure the health of Lake Monroe and its tributaries for years to come.

For more information, please contact
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Photo Credits

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