



StreamSmart Data Report Highlights:

Water Quality across the Beaver Lake Watershed

January 2026



Table of Contents

- 1** The Value of Beaver Lake
- 2** The Value of StreamSmart
- 3** Land Use and Water Quality
- 4** War Eagle Creek
- 6** West Fork of the White River
- 7** Holman Upstream and Downstream
- 8** Conclusion and Key Findings
- 9** References and Further Reading

The Value of Beaver Lake

Beaver Lake is one of Northwest Arkansas's most important natural resources. It provides drinking water to over 600,000 people, and supports recreation, agriculture, and our regional economy. The health of Beaver Lake is shaped by the rivers and creeks that flow into it. What happens on the land - like how we farm, build, and develop - impacts those smaller waterways, which ultimately affects the water we all rely on. For these reasons, it's important to monitor water quality across the watershed and identify any changes over time.

This report summarizes findings from the StreamSmart Citizen Science Program, where volunteers collect long-term water quality data across the Beaver Lake Watershed (Figure 1). While the full technical report is available online¹, this document highlights some of the key findings.

Beaver Lake Watershed Fast Facts

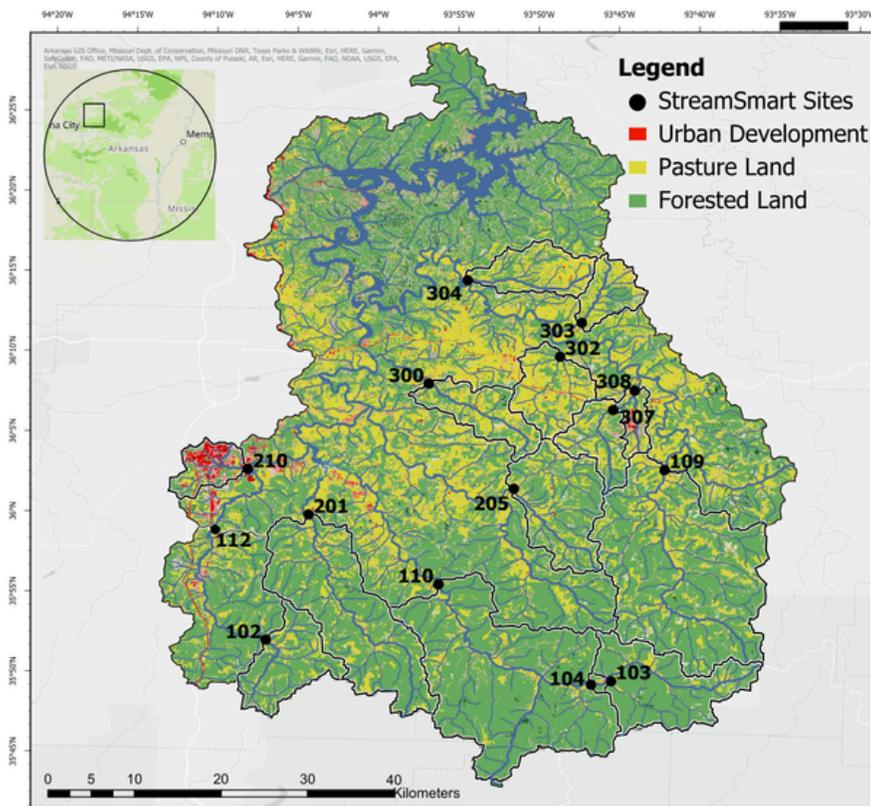


Figure 1. Map of the Beaver Lake Watershed colored by land use. StreamSmart monitoring sites are marked with black circles.

 **1,186 square miles** - area of the Beaver Lake watershed

 Land use in the watershed:

- **60%** forested
- **29%** pastureland
- **6%** urban development

 **600,000 people** get their drinking water from Beaver Lake (roughly 1 in every 5 Arkansans!)

 **94.5 miles of impaired waters** in the watershed²

The Value of StreamSmart

StreamSmart is a volunteer-powered water quality monitoring program managed by H2Ozarks in partnership with the Beaver Water District (BWD) and Arkansas Water Resources Center (AWRC). Trained volunteers collect quarterly water samples and record site observations at 15 sites across the watershed, representing smaller creeks and streams that are not covered by other monitoring agencies. Operating under a quality assurance project plan (QAPP), volunteers collect high quality scientific data that contribute to one of the longest, highest-resolution datasets for tributaries feeding Beaver Lake. *These small streams matter* – they often reveal early warning signs of water quality problems and help identify where restoration efforts will be most effective.



Program Fast Facts



37 active volunteer citizen scientists



25 sites with data



12 teams



750 water samples taken



15 active stream sites



5,580 laboratory measurements analyzed

Common terms and definitions

Land Use is how people use land. In this report, categories include: 1) forested – with tree cover and relatively little human impact; 2) pasture – for grazing livestock and growing grasses or forage crops; and 3) urban – developed for people to live and work.

Total Nitrogen (TN) measures all forms of nitrogen in water (such as nitrate, ammonia, and organic nitrogen) that is needed for plant growth but can be harmful when concentrations are too high.

Total Phosphorus (TP) measures all phosphorus (dissolved and attached to particles). Like TN, TP is needed for plant growth, but excesses can be harmful for water quality.

Turbidity measures “murkiness” and suspended particles of silt and organic matter in the water. High turbidity can be a sign of erosion or too much algal growth.

Conductivity measures dissolved minerals (like salts) in the water based on how well the water conducts electricity. High conductivity can be a sign of urban runoff and wastewater impacts.



Daniel at Brush Creek



Phil at Baldwin Creek

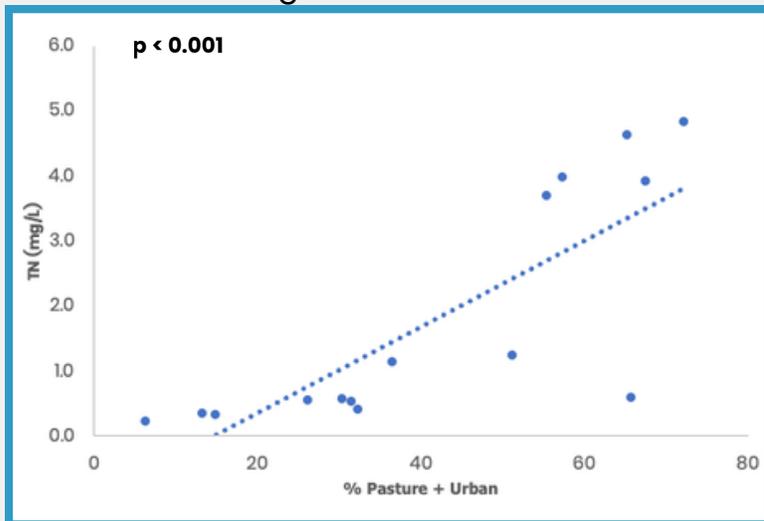
Land Use and Water Quality

StreamSmart data show a connection between land use and nutrients like nitrogen and phosphorus. While nutrients are essential for life, in excess amounts, they can cause water quality problems like algal blooms and low dissolved oxygen (DO). These issues can harm fish and other aquatic life.

Streams draining more pasture and urban areas tend to have higher nutrient concentrations (Figure 2). Total nitrogen (TN) is very strongly linked to pasture and urban land use ($p < 0.001$). Total phosphorus (TP) appears to increase along the same land use gradient, although the relationship is not statistically significant ($p > 0.05$). These findings highlight that agricultural and urban areas can contribute to nutrient pollution in water ways, typically from rainfall runoff from the landscape. We can change how we manage these lands to improve water quality.

Land Use Compared to Nutrient Concentrations

Total Nitrogen vs. % Pasture + Urban



Total Phosphorus vs. % Pasture + Urban

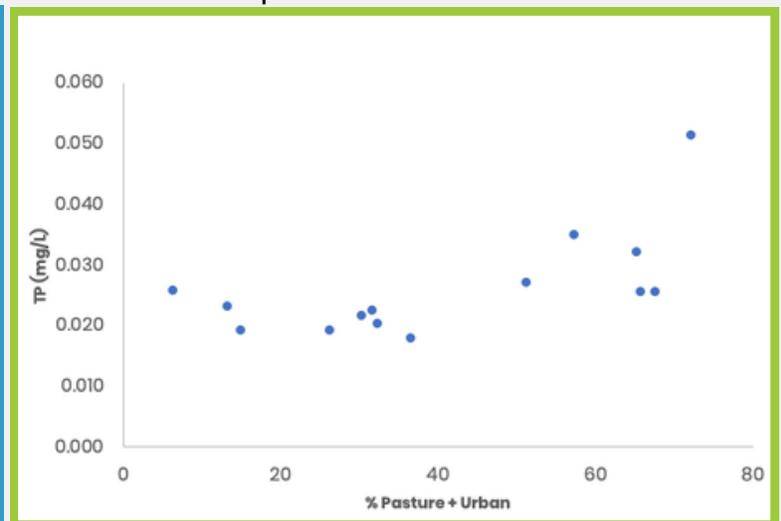


Figure 2. Relationships between land use and total nitrogen (left) and total phosphorus (right) concentrations (from Feb 2022 – Dec 2025) for all active StreamSmart sites.

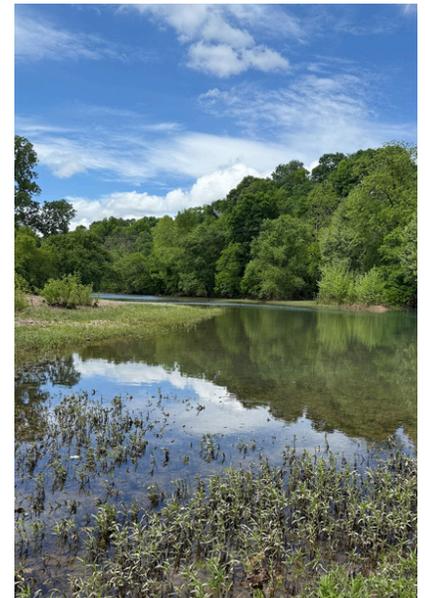
These results reinforce a key message: *how we use land across the watershed impacts stream and lake health.*

To protect our water resources and ensure that communities have reliable access to safe, clean water, land use needs must be balanced with watershed health. Data from the StreamSmart program monitors the health of the watershed and helps inform decision-makers. Supported by strong partnerships and dedicated volunteers, this program helps protect Beaver Lake and safeguards clean water for future generations.

War Eagle Creek

War Eagle Creek (WEC) is one of the largest and most scenic tributaries flowing into Beaver Lake. However, it is impaired due to low dissolved oxygen (DO), with the source of impairment listed as agricultural and unknown².

StreamSmart volunteers monitor six sites in this subwatershed – one on the upstream portion of WEC and five on tributaries flowing into it further downstream. The data show increasing nitrogen (Figure 3) and phosphorus (Figure 4) at some of these sites flowing into WEC (statistically significant, $p < 0.01$).



War Eagle Creek: May 2025

Glade Creek, Clear Creek, and Holman Creek Upstream from Huntsville show significant increases in total nitrogen (TN) over time (Figure 3). Clifty Creek and Holman Creek Downstream from Huntsville have consistently high TN concentrations ranging from about 2 mg/L up to over 7 mg/L in some cases.

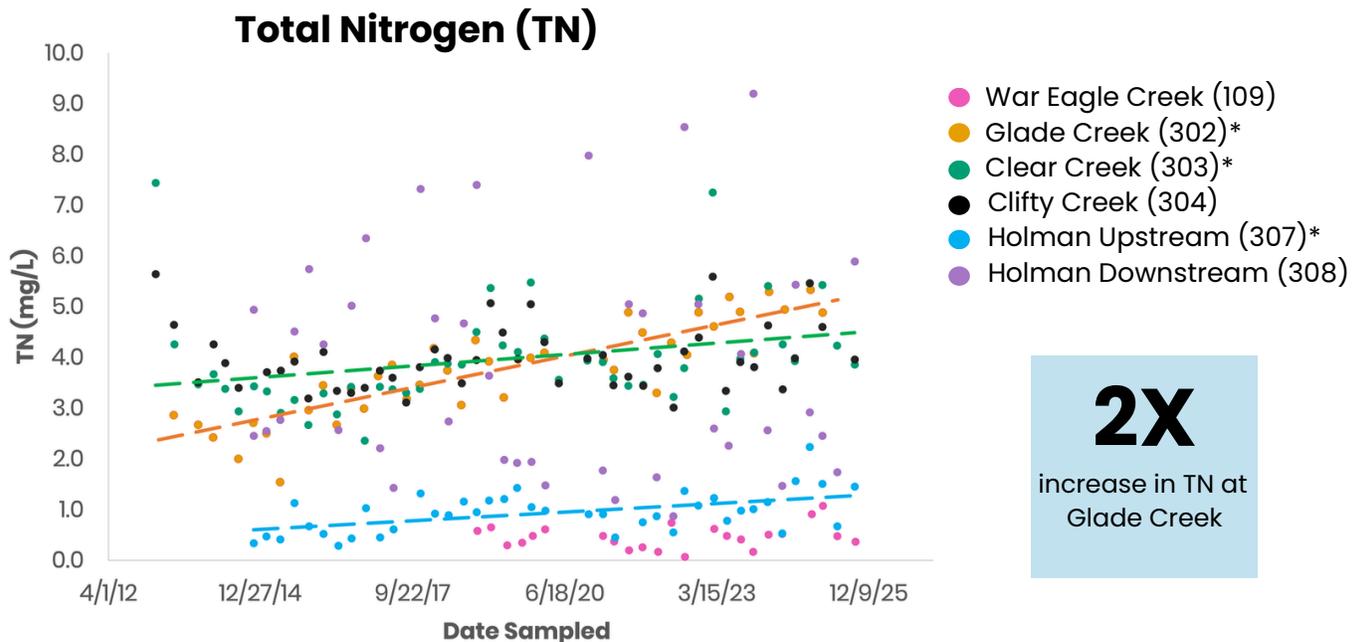


Figure 3: Total nitrogen concentrations over time at each site in the WEC subwatershed. *Dashed lines indicate statistically significant increases over time.

Nutrient management is especially complex in Ozark waters due to our karst topography, which allows water to move quickly through cracks and openings in the ground without filtering out pollutants.

Glade Creek and Clear Creek also show significant increases in total phosphorus (TP) over time (Figure 4). Holman Creek Downstream from Huntsville has maintained very high TP concentrations over time, ranging from 0.024 mg/L up to over 1.0 mg/L.



Grimsley and Mark at Clifty Creek.

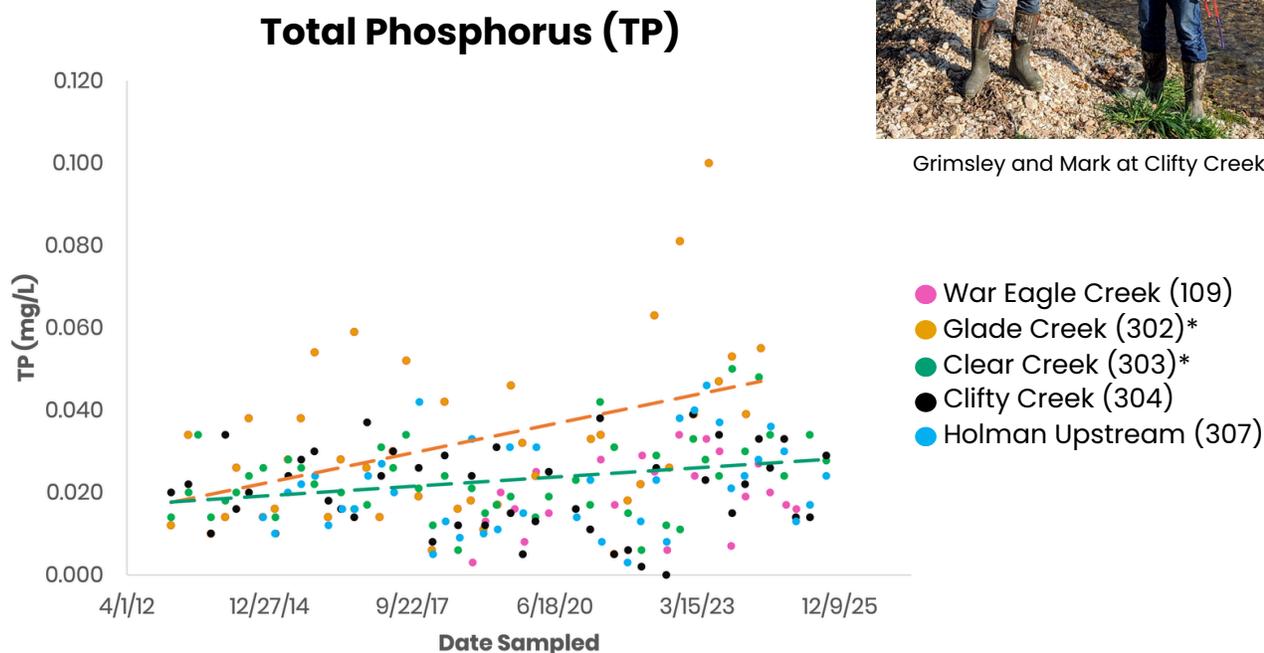


Figure 3: Total phosphorus concentrations over time at each site in the WEC subwatershed. *Dashed lines indicate statistically significant increases over time. **Holman Downstream had such high phosphorus values (0.024-1.042 mg/L) it was removed to prevent axis distortion.

Something on the landscape is changing to cause increasing nutrients at these sites. Changes in land use (such as converting pasture to urban) or land management activities (such as the land application of nutrients from various sources). By monitoring many tributaries in the WEC subwatershed, StreamSmart data can help identify where efforts should be made to improve watershed management and restoration efforts.

Key Takeaways

- Nutrient concentrations are increasing at three sites near WEC – Glade Creek, Clear Creek, and Holman Creek Upstream from Huntsville.
- These three sites are surrounded by more pastureland or are in rapidly developing areas, such as Glade Creek and Clear Creek.¹
- The higher nutrients in these smaller tributaries are likely contributing to the algal growth and decreased oxygen levels in War Eagle Creek.

West Fork of the White River

The West Fork of the White River (WFWR) flows from a highly forested area of the Boston Mountains into the more populated areas of West Fork and Fayetteville. Long recognized for its sediment and dissolved mineral challenges and listed as impaired by DEQ², the WFWR has received a lot of attention and funding for restoration efforts in recent years.



Riverside Park in the City of West Fork.
Photo Credit: Stefanie Reynolds

StreamSmart volunteers monitor three sites in this subwatershed – two on the WFWR itself (one upstream at Brentwood Park, and one more downstream at Baptist Ford), and one site on Town Branch, a tributary flowing into the WFWR in southeast Fayetteville.

In 2018, DEQ split the river into two assessment sections and delisted the upstream portion. StreamSmart data supports this decision, showing consistently low turbidity at upstream sites (Table 1). Conductivity, on the other hand, shows big increases from upstream to downstream, where it is lowest at Brentwood (95 $\mu\text{S}/\text{cm}$), higher at Baptist Ford (204 $\mu\text{S}/\text{cm}$), and highest at Town Branch (~500 $\mu\text{S}/\text{cm}$) in Fayetteville. These conductivity patterns may be both natural and human-influences, likely tied to geology and urbanization.

Site Name	Turbidity (NTU)	Conductivity ($\mu\text{S}/\text{cm}$)
Brentwood (Upstream)	4.08 (0.6-8.6)	95.8 (51.3-181.3)
Baptist Ford (Upstream)	2.07 (1.2-4.2)	204.2 (134.5-270.3)
Town Branch (Downstream)	2.9 (0.7-6.1)	492.3 (373.0-646.0)

5.2%

Urban land use at Brentwood¹

50%

Urban land use at Town Branch¹



Rita, Karan, Carol, and Jane, Brentwood Creek volunteers

Table 1: Average (bold) and range (parentheses) of turbidity and conductivity for the full period of record for WFWR sites.

Key Takeaways

- Turbidity remains low across all sites in these upstream reaches of the WFWR, supporting the delisting of this section of the river.
- Conductivity increases from upstream to downstream as urban development grows, signaling their connection.

Holman Upstream and Downstream

Holman Creek is located within the WEC subwatershed, draining about 44% pastureland, and the urban center of the City of Huntsville. The City's wastewater treatment plant (WWTP) discharges into Holman Creek between the two sites being monitored by StreamSmart volunteers, referred to as Holman Upstream and Holman Downstream.

Stream Smart data show significant differences in nutrient concentrations between the upstream and downstream sites. Concentrations at the upstream site generally remain low, but downstream concentrations frequently exceed thresholds of concern. These elevated nutrient concentrations are likely driven primarily by the WWTP effluent (a point source), with additional contributions from agricultural and urban land use (nonpoint sources).

Comparing upstream to downstream changes on Holman Creek demonstrates how point and non-point sources can influence water quality.

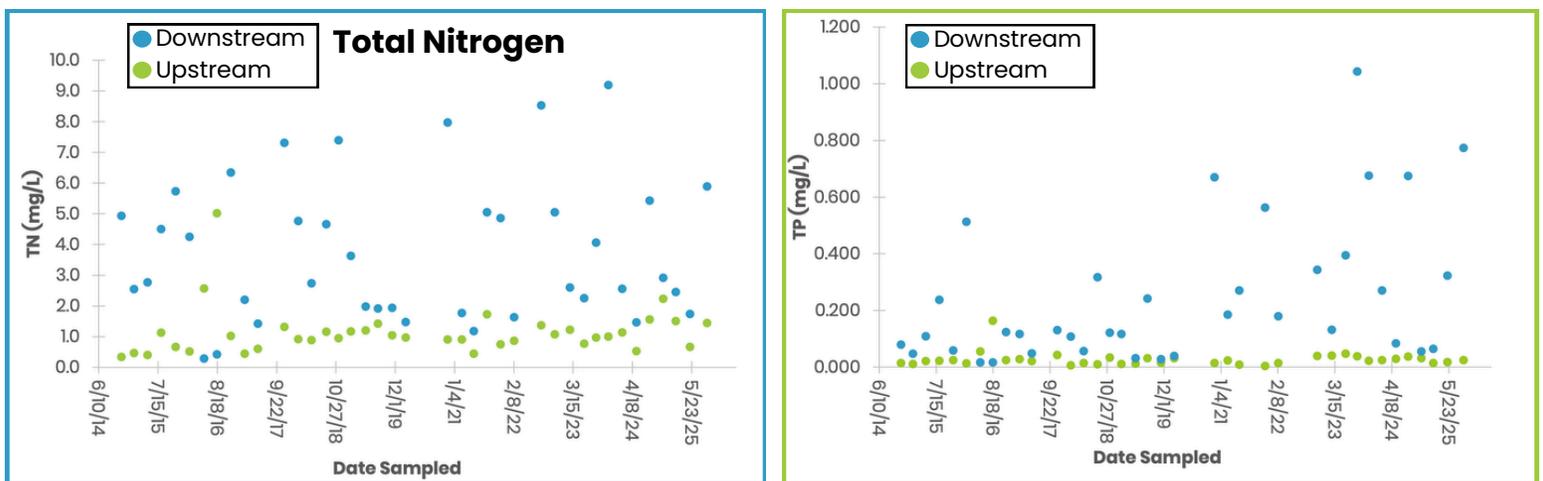


Figure 4. Total nitrogen and total phosphorus concentrations over time at Holman Creek Upstream and Downstream sites.



Patty, Care, Ken, and Charlotte at Holman Creek.

Key Takeaways

- Holman Downstream had total nitrogen as high as **9.20 mg/L** and total phosphorus over **1.0 mg/L**.
- These high nutrient concentrations are likely influenced by land use and the WWTP, which both impact water quality.

Conclusion and Key Findings

StreamSmart Volunteers Provide Critical Data



Chris and Heather at Town Branch Creek

Volunteer citizen scientists, like StreamSmart volunteers, provide a vital service by gathering high-quality data that would otherwise be unavailable. Their dedication and passion fuel monitoring efforts in small creeks and streams, generating granular data beyond the capacity of many other agencies and entities to collect. Through this program, these data directly inform real-world decision making, and amid rapidly changing land use patterns, the contributions and skills of these volunteers are more important than ever.

Nutrients are Increasing in Some Waterways

While nitrogen and phosphorus are necessary fuel for life, like all things in this world, there can be too much of a good thing. Elevated nutrients can lead to water quality problems like excessive algal growth and low DO, negatively affecting stream health and aquatic life. Many of the tributaries to WEC, including Glade Creek, Clear Creek, and Holman Creek Upstream show that nutrients are increasing, reflecting changes on the landscape. By identifying these sources, StreamSmart data help target restoration efforts where they're needed most.



Abbie at Town Branch Creek

Water Quality is Influenced by Land Use

As Northwest Arkansas continues to grow, changes in land use increasingly affect the quality of water flowing through the landscape. Pasture, urban, and even forested landscapes may affect runoff patterns and the pollutants carried to local streams and rivers. These waters support drinking water supplies, recreation, and regional economies. Protecting Beaver Lake through watershed management is imperative to the sustainable growth and long-term well-being of our communities.



Zach at Tanyard Creek

To learn more about how the data from this report was collected, analyzed, and interpreted, scan the QR code on the following page and read the full report. We extend our thanks to our many volunteers for their dedication and service; to Beaver Water District for their funding and support of this program; and to the Arkansas Water Resources Center for their continued partnership.

References

1. H2Ozarks. (2025) Status of the Watershed Report. https://irp.cdn-website.com/03e4eac8/files/uploaded/SS+Status+of+the+Watershed+Report_FINAL.pdf. (Scan QR code to access the full report)
2. ADEQ. Arkansas Division of Environmental Quality. (2022). 2022 impaired waterbodies – 303(d) list. <https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2022/2022-ir.pdf>
3. ANRC. Arkansas Natural Resources Commission. (2018). 2018–2023 non point source pollution management plan (100 pp.).
4. APC&EC. Arkansas Pollution Control and Ecology Commission. (2023). Rule 2: Regulation establishing water quality standards for surface waters of the State of Arkansas. Arkansas Department of Energy and Environment, Division of Environmental Quality. <https://www.adeq.state.ar.us/legal/regulations/pdfs/reg02.pdf>
5. AWRC. Arkansas Water Resources Center. (2024). Water quality laboratory: Certification and quality assurance. University of Arkansas System Division of Agriculture. Retrieved November 4, 2025, from <https://awrc.uada.edu/water-quality-lab/certification-and-quality-assurance>
6. EPA. U.S. Environmental Protection Agency. (2022, July). Restoration projects reduce sediment in the West Fork White River: Arkansas (Success story).
7. Evans-White, M. A., Haggard, B. E., & Scott, J. T. (2013). A review of stream nutrient criteria development in the United States. *Journal of Environmental Quality*, 42(4), 1002–1014. <https://doi.org/10.2134/jeq2012.0491>
8. Grantz, E. M., & Haggard, B. E. (2023, February). Constituent loads and trends in the Upper White River Basin: A nonpoint source management program priority watershed (MSC Publication No. 395). Arkansas Water Resources Center, University of Arkansas Division of Agriculture.
9. Haggard, B. E., Grantz, E., & Scott, J. T. (2022). Defining critical or hydrologic conditions as sampled during the Joint Study (Technical Report MSC 393). Arkansas Water Resources Center.
10. Stroud Water Research Center. (2025). Model My Watershed [Web application]. WikiWatershed. <https://modelmywatershed.org/>
11. RTI International. (2023) Beaver Lake Watershed Protection Strategy



Our mission: to protect and improve water quality in the Ozarks of Arkansas and Missouri. We achieve this through education, outreach, research, public policy, and local solutions.

Contact

Ayla Grace, Program Coordinator

Ayla@H2Ozarks.org

Erin Scott, Senior Policy and Program Director

Erin@H2Ozarks.org

1200 W. Walnut Street

Ste 3405, Rogers, AR 72758

www.H2Ozarks.org



[Read the Full Report](#)