Summarizing 2014 water quality in the Upper White River Basin using data compiled from volunteer groups and municipal, state and federal agencies. Compiled March 2015

2015 Status of the Watershed

OZARKS WATER WATCH

THE UPPER WHITE RIVER IN ARKANSAS AND MISSOURI

Cover photos, clockwise from top: A volunteer conducts a dissolved oxygen test at Swan Creek. Lynn Lancaster and Don Wilson collect invertebrates in Turkey Creek, Ronna Haxby photo. A Huntsville High School student collects a sample on Holman Creek, Angela Danovi photo.

This is the 7th annual Ozarks Water Watch report aimed at answering the question, "How's the water?" Pristine streams, meandering rivers and blue lakes are the region's most important resources, providing drinking water, endless recreation for local citizens and driving the economy through tourism. It is not a stretch to say that the health of our region is a direct reflection of the health of our waters.

The main goal of this report is to provide the reader with a glimpse of how water quality varies across the Upper White River Basin. To do this, we have gathered data from as many sources as possible to try and provide an answer to the question, "How's the water?" Because the data come from so many sources, there is a challenge in making all that information both comparable and understandable. We have chosen not to describe water quality at individual sites as being "Good" or "Bad", but instead we compared the sites and identified water quality as being High or Low, relative to all the data. In other words, sites rated as Low are not necessarily bad, they just have lower water quality than other sites in the region.

Other goals of the report are to: acknowledge the groups that are monitoring our waters, highlight other activities in the basin that reduce pollution, and educate the reader about some of the threats to water quality.

We hope you find the report informative and that you are motivated to do your part in protecting the region's most important resources, our streams, rivers and lakes. Whether you choose to become a volunteer water quality monitor, help out restoring a stream bank or become more aware of how you as a citizen living in the watershed affect water quality, you can make a difference. It is in everyone's best interest to restore and protect the region's waters. With everyone's help, whenever someone asks, "How's the water?" we can forever answer, "Fine, come on in."

David L. Casaletto

President/Executive Director

Ozarks Water Watch Foundation

Above: David Casaletto at Secchi Day on Beaver Lake. Angela Danovi photo

Right: Bob Matlock, volunteer with the Beaver Lake Volunteer Program. Angela Danovi photo

Overall, water quality in the region is very good. However, some areas need a little help.

What was measured and what it means:

Dissolved Oxygen - Important for aquatic life.

Certain pollutants can reduce Dissolved Oxygen (DO), making water unsuitable for aquatic life. Sometimes, due to excessive algae growth, DO levels are too high. This is also bad for aquatic life.

The DO levels were a concern in about a quarter of the 79 sites where measured. In most cases where DO concentrations are a concern, the actual values were higher than desired, suggesting excess algae are producing the oxygen via photosynthesis.

Phosphorus and Nitrogen - Drive algae growth.

High nutrient levels lead to higher than normal algae growth. Changes in algae growth can alter the natural aquatic communities in our lakes and streams.

Among the 108 sites monitored for Nitrogen, the highest levels were primarily located around the urban areas of the Beaver and James River regions.

Total Phosphorus concentrations at 65 sites in the watershed were generally low. The sites with the highest phosphorus concentrations were typically stream and river sites located near urban areas and lake sites located in the upper portion of tributary arms.

E. coli - Bacteria associated with fecal matter.

While some strains of E. coli can be harmful to humans, these bacteria are used as an indicator of other harmful organisms associated with human fecal contamination. Low background levels are common, due to the presence of natural wildlife in the watershed.

Levels of E. coli in the basin's waterways were low in 2014. Only three sites had E. coli counts of concern.

Invertebrates - Biological indicators of stream health.

Some stream invertebrates are very sensitive to pollution, while others are very tolerant of pollution. The presence of certain invertebrates in the stream provide insight to a stream's health, both short and long-term.

Most of the 36 invertebrate collection sites were in the James River region. The sites with the lowest scores were within the city of Springfield. Urban runoff will usually have a negative effect on invertebrate communities.

Secchi Transparency - Water clarity measurement.

The Secchi disk is a small plate-like device that is lowered into lakes to determine water clarity. Poor water clarity is usually caused by algae or sediment in the water.

Secchi was measured at 70 sites in the watershed. The sites with the least clarity tended to be near the inflowing streams. Because of their proximity to sediment and nutrient sources, it is expected that these sites would have lower water clarity than sites in the main lake channels.

Below: Janis Walters, StreamSmart volunteer on the West Fork at Brentwood Park. Angela Danovi photo.

How We Assessed Water Quality

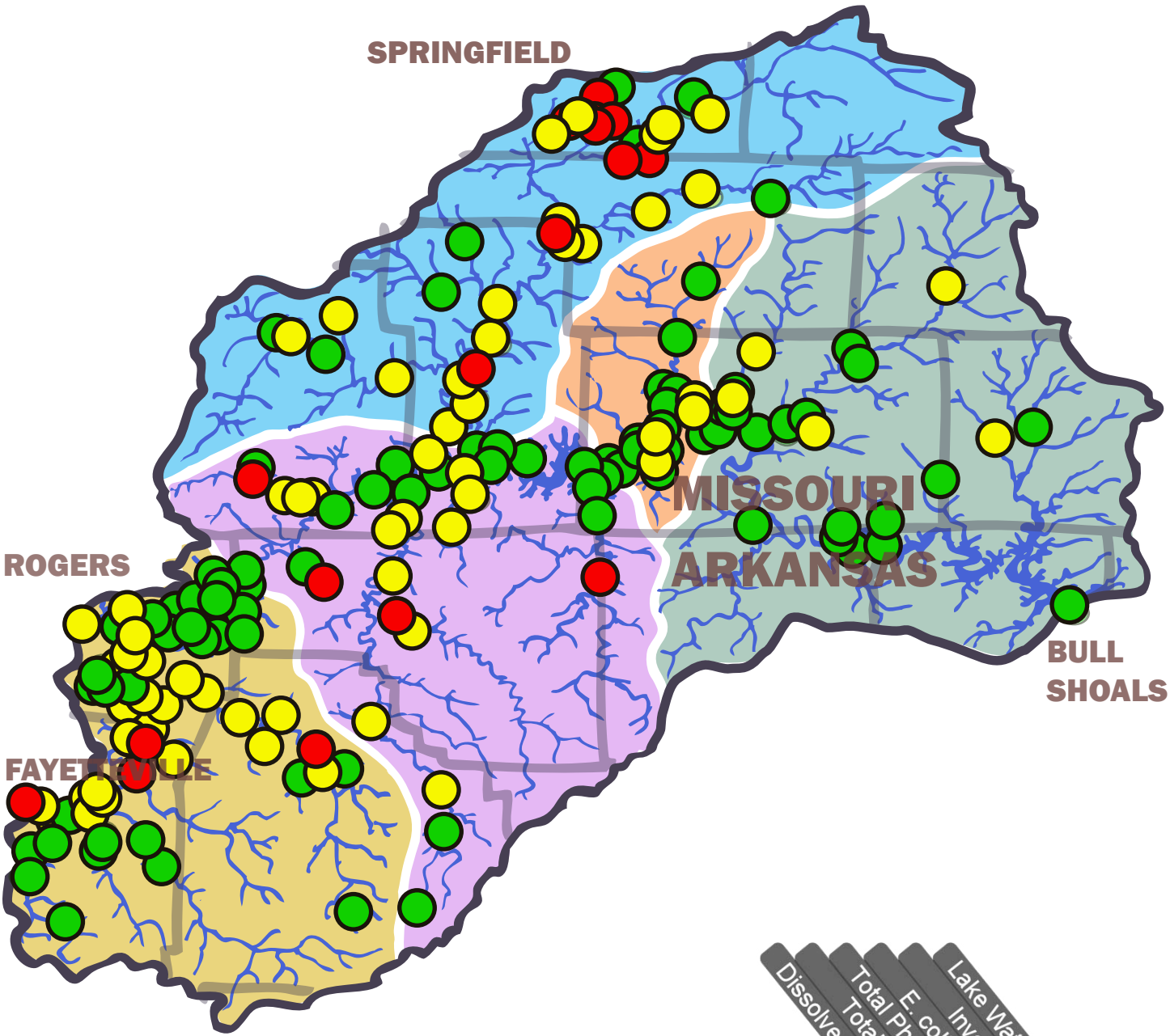
Parameter	Evaluation Method	Water Quality Assessment		
		HIGH	MID	LOW
Dissolved Oxygen	% of samples with >5 mg/L but less than 110% saturation	>75	50 - 74	<50
Total Nitrogen	Geometric mean of all values in mg/L	<0.500	0.501 – 0.900	>0.900
Total Phosphorus	Geometric mean of all values in mg/L	<0.020	0.021 – 0.035	>0.035
E. coli	Geometric mean of colony forming units per 100mL	<70	71 - 126	>126
Invertebrates	Missouri Stream Team Score	>23	18 - 23	<18
Lake Water Clarity	Geometric mean of all values in feet of clarity	>10	5 – 10	<5

What Was Measured In 2014?

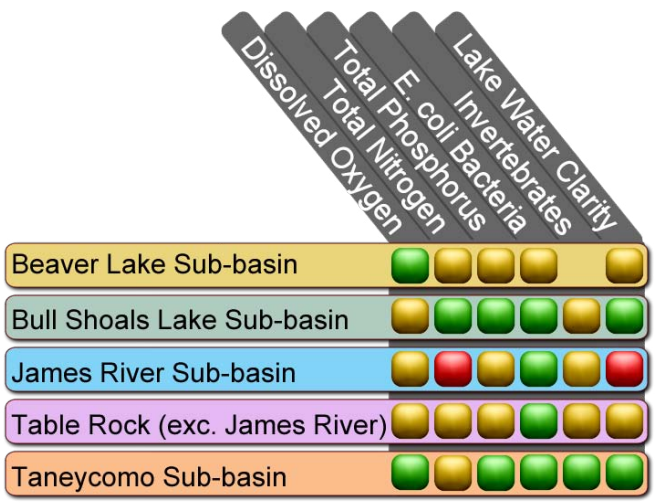
- 700 Dissolved Oxygen values
- 1,145 Total Nitrogen values
- 1,477 Total Phosphorus values
- 265 E. coli values
- 180 Invertebrate scores
- 305 Water Clarity readings

The scores in this report show how the numerous monitoring sites in the region compare to one another and are not intended to define “good” or “bad” water quality. What this report attempts to do is show where the highest and lowest *relative* water quality is. Identifying these sites will help us to focus our efforts where they are needed and let us allocate our limited resources accordingly.

Right: Students from Huntsville High EAST Program monitor water quality on Holman Creek, AR with StreamSmart. Angela Danovi photo.



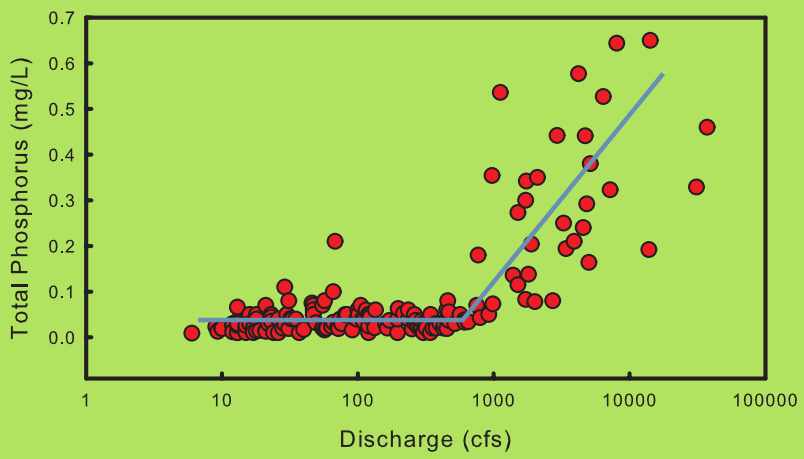
OZARKS WATER WATCH



All Site Scores (Stream and Lake) Combined

Water quality conditions in streams and rivers can vary dramatically. At any site, the maximum levels of nutrients or E. coli may be 10 times (or more) higher than the minimum values during the course of a year. Fluctuations in water quality within a stream are a result of changing flow. During storms, rainfall in the watershed picks up nutrients, sediment and other pollutants, transporting them to the stream.

The volume of water moving through a stream or river during a specific time period is called discharge and is typically measured as cubic feet per second (cfs). The relation between discharge and total phosphorus can be seen in the following graphic showing data from USGS on War Eagle Creek. When discharge is less than 600 cfs the phosphorus concentrations are quite stable at around 0.04 mg/L. As discharge rises above 600 cfs the phosphorus levels increase dramatically.



Managing water quality often means managing runoff.

Pollutants accumulated on the ground are washed into lakes and streams when it rains. The “first flush” at the beginning of a rain storm has the most pollutants. If we can keep pollution off the ground and slow down the runoff we can do a lot to improve water quality.

Permeable surfaces, like this parking lot in Kimberling City, MO allow water to penetrate and soak into the ground. More water soaking into the ground means less water and pollutants entering our streams after a rain event.

Structures such as these reduce the amount of nutrients, metals and sediment in runoff and reduce erosion in the watershed. It is estimated that each year this parking lot will retain enough phosphorus to grow over 1,000 pounds of algae!

Rain washes loose sediment and pollutants into streams and lakes. Sediment can choke out streambeds, eliminating habitat for insects. Fish communities suffer without this important food source. Because phosphorus binds particularly well to sediment particles, excess sediment in our waterways usually means excess phosphorus is present, too.

Phosphorus encourages excessive algae growth that covers rocks in streams and makes lake water green. Though algae is important as a food source for the smaller creatures near the bottom of the food chain, too much algae will ultimately hurt the aquatic community.

Man-made lakes can benefit by having another lake upstream to catch some of the sediment, nutrients and other pollutants. Water quality will differ among lakes in a series, with the downstream lake usually having better water quality.

Home owners can install rain barrels and rain gardens to slow the rate at which water is delivered to streams. This reduces erosion and stormwater run off.

New, permeable pavement allows water to soak into the ground, removing pollutants and reducing erosion downstream.

The roots of trees and other plants keep sediment on the ground and out of the water.

Aquatic plants keep sediment on the bottom of the lake and reduce the erosive power of wave action.

Sediment will eventually fill in our man-made lakes. By controlling the rate at which the sediment enters the water, we can prolong the life of our lakes.

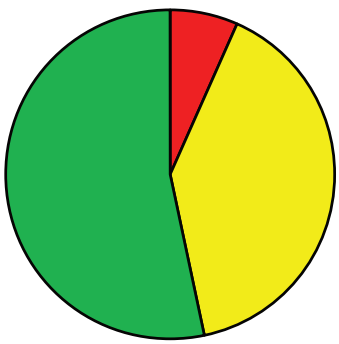
The Upper White River Basin can be divided into 5 regions or sub-basins. Water quality differs in each of the sub-basins. The following pages summarize water quality in each region.

- Beaver Lake Region - 75 Sites
- Table Rock Region - 32 Sites
- Bull Shoals Region - 23 Sites
- Taneycomo Region - 21 Sites
- James River Region - 38 Sites

For specific information by site, visit the interactive map at: www.ozarkswaterwatch.org

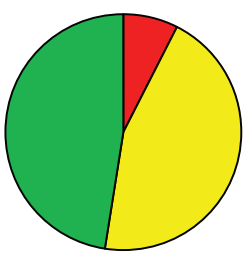
Above: Ken Leonard and Angela Danovi monitor water quality with StreamSmart on War Eagle Creek, Arkansas. Sabrina Bowman photo.

BEAVER LAKE



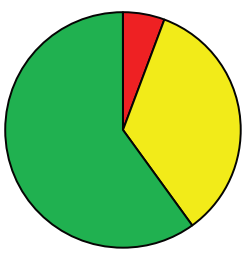
75 Sites Total
- 53% HIGH
- 40% MID
- 7% LOW

STREAMS



40 Stream Sites
- 48% HIGH
- 45% MID
- 8% LOW

LAKES

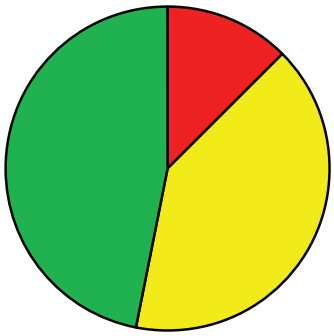


35 Lake Sites
- 60% HIGH
- 34% MID
- 6% LOW

Nutrients led to the most LOW scores in the stream sites of the Beaver Lake region.

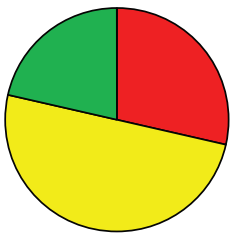
Lake sites nearer the inflowing streams had more nutrients and less water clarity than down-lake sites.

TABLE ROCK



32 Sites Total
- 47% HIGH
- 41% MID
- 12% LOW

STREAMS

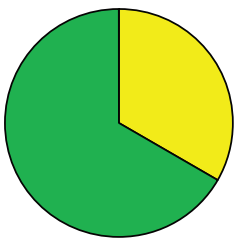


14 Stream Sites
- 21% HIGH
- 50% MID
- 29% LOW

Stream conditions in the Table Rock region were average for the Upper White River basin.

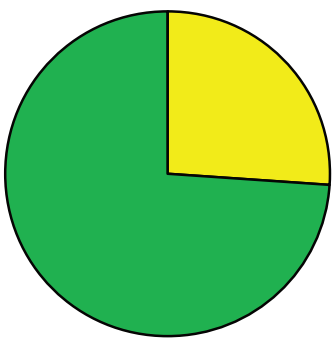
Lake sites were above average, with no sites in the LOW category.

LAKES

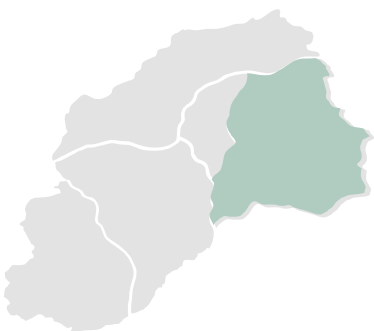


18 Lake Sites
- 67% HIGH
- 33% MID
- 0% LOW

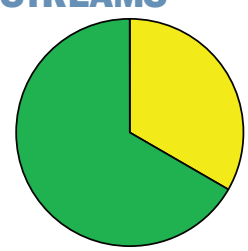
BULL SHOALS



23 Sites Total
- 74% HIGH
- 26% MID
- 0% LOW



STREAMS



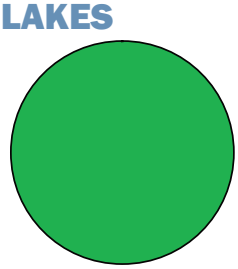
18 Stream Sites
- 67% HIGH
- 33% MID
- 0% LOW

Most of the monitoring in this region occurred on streams. No sites, stream or lake, scored LOW overall.

Very few E. coli bacteria were found in the 12 stream sites where it was measured.

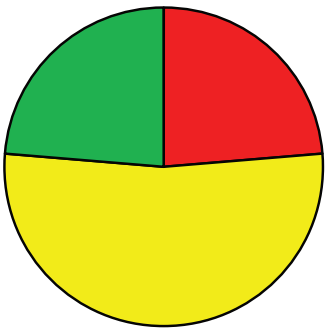
All five lake sites scored in the HIGH category.

LAKES



5 Lake Sites
- 100% HIGH
- 0% MID
- 0% LOW

JAMES RIVER



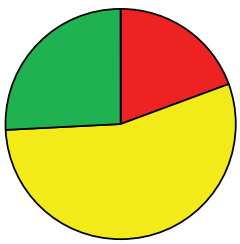
38 Sites Total
- 24% HIGH
- 53% MID
- 24% LOW

This received the lowest scores of all regions in the Upper White River Basin.

Nutrients, particularly nitrogen, led to the most LOW scores for streams in this region.

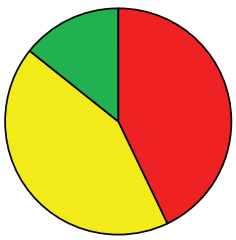
Lake sites in the James River region typically had lower water clarity than other lake sites in the Upper White River watershed.

STREAMS



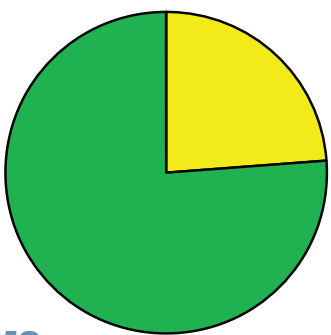
31 Stream Sites
- 26% HIGH
- 55% MID
- 19% LOW

LAKES



7 Lake Sites
- 14% HIGH
- 43% MID
- 43% LOW

LAKE TANEYCOMO

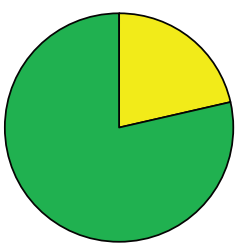


21 Sites Total
- 76% HIGH
- 24% MID
- 0% LOW

This region had the fewest monitoring sites in the Upper White River Basin.

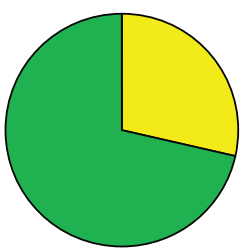
No site received a LOW overall score, though some sites had a single parameter with a LOW score. Site scores are derived by averaging scores for all parameters.

STREAMS



14 Stream Sites
- 79% HIGH
- 21% MID
- 0% LOW

LAKES



7 Lake Sites
- 71% HIGH
- 29% MID
- 0% LOW

Beyond monitoring water quality

Groups in the White River Basin are doing a lot to clean up our waterways, prevent pollution, restore stream banks and educate people about water quality issues. When you add up the efforts made by the groups listed on the right, you find an amazing amount of time and energy has been put forth to protect the region's most valuable resources…its streams and lakes.

Association for Beaver Lake Environment (ABLE)
Beaver Water District
Beaver Watershed Alliance
The City of Branson
Friends of the North Fork and White Rivers
James River Basin Partnership
Kings River Watershed Partnership
Missouri Stream Team Program
Ozarks Water Watch
Table Rock Lake Water Quality
University of Arkansas Cooperative Extension Service
Watershed Committee of the Ozarks

Right: Angela Danovi sorts trash collected during the 2014 West Fork Watershed Cleanup. Photo by Amy Wilson of Beaver Water District.

Far right: Watershed professionals and volunteers create water management plans during the 2014 Blue Pathways workshop.

Clean-Up

In 2014, groups in the basin conducted more than a dozen events to clean up local water bodies. During these clean-ups around 30 tons of trash (including 400 tires) were removed from our streams, rivers and lakes; leaving them looking much more pristine.

Pollution Reduction

There was a lot of work done in the basin to protect the region's waters from being polluted in 2014. These efforts included: replacing over 40 failing septic systems, pumping out over 570 septic systems to help keep them functioning properly, and the collection of 2,000 pounds of unwanted prescription drugs that could have eventually polluted local waters if disposed of improperly.

Restoration

Dozens of miles of stream banks were stabilized in 2014, helping protect our streams. These efforts included the planting of 800 trees which stabilize soil.

Runoff Reduction

Many efforts focused on reducing runoff that delivers pollutants to local streams. These included installation of 200,000 square feet of permeable pavement and the collection of 25,000 gallons of rainwater in rain gardens, rain barrels, and detention structures. There were also 19 Nutrient Management Plans developed to help homeowners reduce nutrient pollution, a stormwater plan developed for the City of Springfield, and a comprehensive plan to manage stormwater developed for Northwest Arkansas.

Education

Over 200 educational programs were held within the basin during 2014. Events ranged from small presentations for local groups to large scale events, such as Secchi Day on Beaver Lake. There were even musical events focused on water quality. Perhaps the most impressive and beneficial out-reach was the education of close to 13,000 students throughout the basin concerning water quality.

On behalf of everyone, we say

THANK YOU

for helping protect our water.

White River Valley Electric Cooperative

A Touchstone Energy® Cooperative

Ozarks Water Watch would like to thank White River Valley Electric Cooperative for their generous support of this report.

Ozarks Water Watch volunteers collected total nitrogen and total phosphorus samples at 20 Missouri stream sites.

Missouri Stream Team volunteers monitored 36 sites in the Upper White River Basin (UWRB). This report features their dissolved oxygen and invertebrate data.

The Lakes of Missouri Volunteer Program volunteers monitored 31 lake and 2 stream sites in the UWRB. Their total nitrogen, total phosphorus and water clarity data are featured in this report.

Stream Smart volunteers monitored 24 stream sites in the UWRB. Included in this report are their total nitrogen and total phosphorus data.

Secchi Day on Beaver Lake volunteers sampled at 35 Beaver Lake sites. This report features their total phosphorus and water clarity data.

Beaver LakeSmart volunteers sampled at 5 sites on Beaver Lake. This report features their Secchi, total phosphorus and total nitrogen data.

United States Geologic Survey (USGS) monitored 11 sites for total nitrogen, total phosphorus, dissolved oxygen and E. coli bacteria.

Watershed Committee of the Ozarks' Adopt a Spring measured E. coli at 5 spring sites.

Arkansas Water Resources Center measured total nitrogen and total phosphorus at 8 sites.

Arkansas Department of Environmental Quality (ADEQ) measured total nitrogen, total phosphorus and dissolved oxygen at 25 sites.

Taney County monitored 24 sites for concentrations of total nitrogen, total phosphorus and dissolved oxygen.

Beaver Water District measured total nitrogen, total phosphorus, dissolved oxygen and E. coli bacteria at 7 locations.