Status of the Watershed 2014

THE WHITE RIVER IN ARKANSAS AND MISSOURI

OZARKS WATER WATCH

Summarizing 2013 water quality in the Upper White River Basin using data compiled from volunteer groups, and municipal, state and federal agencies.

Compiled March 2014

The purpose of this report is to answer the question on the minds of those who fish, swim, boat, or simply enjoy the beauty of our streams and lakes; "how's the water?" It's a difficult question to answer directly. People's opinions differ on what is good and what is bad water quality. In this report we hope to highlight some of the complexity surrounding water quality and to address that important question.

To determine how residents view water quality, Ozarks Water Watch recently surveyed 802 people in the region. A full 81% of respondents feel that water quality is good or very good overall. When asked if water quality has improved in the last 25 years, 18% thought it had. 45% thought water quality was the same, and 37% feel it is worse. Those results are more optimistic than our 2008 survey found, when 54% felt that water quality had gotten worse in the past 25 years.

There was an overall trend among those surveyed to hold themselves responsible for water quality. This notion of personal accountability is probably why there is such a strong volunteer presence in the Upper White River Basin.

This report features a great deal of volunteer data. Individuals who feel that they are responsible for water quality tend to put on their boots, roll up their sleeves and jump into the water. Of the more than 4,500 water quality measures used for this report, 37% were collected by volunteers.

Volunteers aren't the only ones gathering water data for this report. The City of Springfield, Taney County, Arkansas Water Resources Center, Beaver Water District, the United States Geological Survey and the Arkansas Department of Environmental Quality are fine water sentinels as well.

Everyone in the watershed has a part to play in protecting our water resources. Judging by the number of volunteer and other organizations monitoring water quality as well as the survey results, the citizens of the Upper White River Basin apparently already know that.

David L. Casaletto
President/Executive Director
Ozarks Water Watch Foundation

Cover photos by Kyle Kosovich, Bob Kipfer, and Mike Kromey

Photo by Bob Kipfer

Water quality in the area is generally very good. However, there are places that need help.

Proper **dissolved oxygen** levels are important for maintaining healthy streams and rivers. Organic and chemical pollutants can reduce oxygen concentrations to the point where the stream is uninhabitable to aquatic life. Extremely high levels of dissolved oxygen are also bad and may occur when the stream has too much algae.

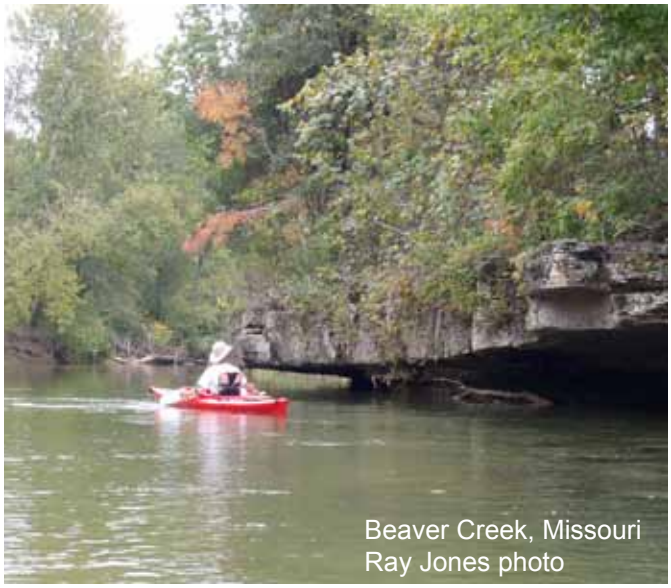
With the exception of a handful of sites, dissolved oxygen levels were quite good across the Upper White River watershed.

Total phosphorus and **total nitrogen** are nutrients that act as fertilizers and promote algal growth in streams, rivers and lakes. While these nutrients occur naturally, human activities in the watershed can increase nutrient inputs into waterways and reduce water quality. Nutrient pollution is common in the nation's waters.

Nitrogen values are particularly high in the James River, Roaring River and War Eagle Creek. The James River and Roaring River were both monitored extensively on a single day in 2013, so most of the values in those waterways represent only a single sample. Future monitoring will determine if these rivers are in trouble or just had a bad day. War Eagle Creek has some exceptionally high nitrogen values. At a couple of locations the values have increased in the last 10 years, while at another War Eagle site they have decreased.

High phosphorus values were found in the James River below Springfield, MO, the Kings River north of Berryville, AR and portions of the White River east of Fayetteville, AR, reflecting the influence of urban areas on water quality.

E. coli bacteria are associated with the fecal material of warm-blooded animals. Because wildlife is a source of E. coli, low background levels in our waterways are common. While most E. coli are harmless, elevated levels indicate a fecal contamination and the possible presence of other, more dangerous microbes.



Beaver Creek, Missouri
Ray Jones photo

Extensive E. coli monitoring in the James River and around the Springfield area reveals that bacteria numbers are a problem in and around the city, but are low outside Springfield, MO. Monitoring around Fayetteville, AR and Springdale, AR shows bacteria numbers are usually safe for swimming, but one should always exercise caution when choosing a swimming hole. Your local monitoring agencies are the final authority for current E. coli numbers.

Benthic invertebrates are the small creatures that live on the stream bottom. Some invertebrates are very sensitive to pollution, while others are quite tolerant. The invertebrate community at a stream site provides us with a measure of current and long-term water quality.

All 16 of the invertebrate sites monitored reveal that they are doing well. All sites rated either Excellent or Good using the Missouri Stream Team criteria.

Water clarity in lakes is measured using a tool called a Secchi disk, which is lowered with a rope into the water until it is no longer visible. The depth at which the disk disappears in the water is determined by the amount of algae and sediment in the water.

Lake water clarity is very good in the region. Water clarity is lowest in our small lakes and the upper reaches of our big lakes. This is normal. The results from Beaver Lake Secchi Day illustrate this phenomenon perfectly.

Nitrogen Trends in the Upper White River Basin

In short, the water is getting better in some places but getting worse in others. This year we will look at nitrogen trends in the watershed. We will examine other measures of water quality in subsequent years.

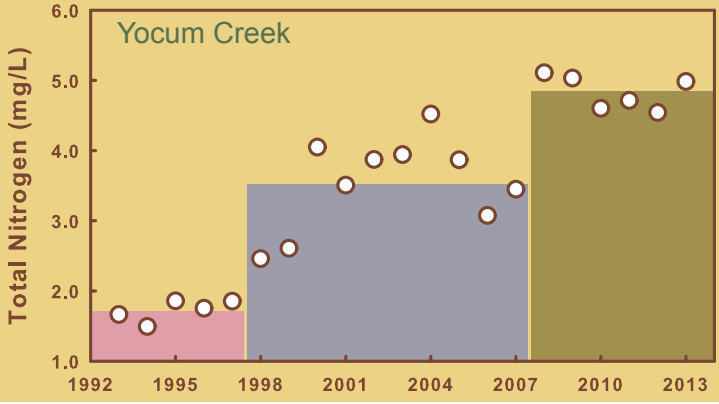
Nitrogen is an important nutrient for algal growth, but too much can be a bad thing. Nitrogen values at two sites, Yocum Creek and War Eagle Creek are too high. The increases we see at Yocum Creek are startling. As of now, there are no total nitrogen limits in place for Arkansas, but the values seen in Yocum Creek far exceed EPA suggested limits (0.38 mg/L). While nitrogen values at War Eagle Creek are not as high as at Yocum Creek, they have been increasing in recent years.

Two other sites in Arkansas show decreasing nitrogen trends. Values measured in Holman Creek have decreased by nearly half in the past 13 years. Nitrogen values are still too high, but they're heading in the right direction. The West Fork of the White River also shows a decrease of nitrogen values over the same time period. This trend is promising.

The graphs that follow show the trends described above. Each dot in the graphs shows the mean value for a year. Colored bars show the average value across a number of years. The data for the graphs were compiled from USGS and ADEQ sources.

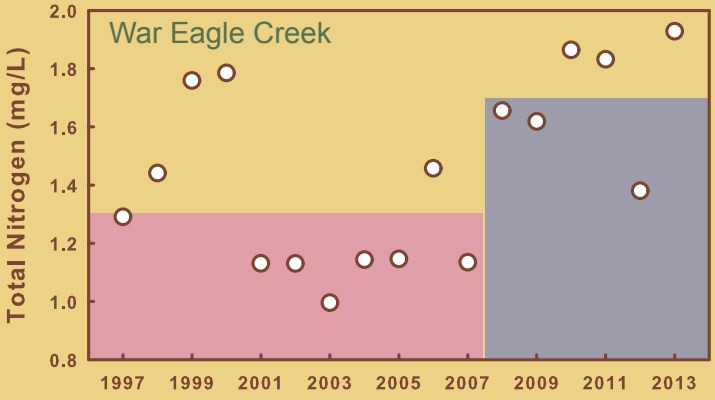
Volunteers collect invertebrates in a Missouri stream
MO DNR photo

In short, the water is getting better in some places but getting worse in others



Yocum Creek (USGS site at County Road 614, approximately 4.5 miles east of Oak Grove, AR) has displayed the most dramatic increases in nitrogen levels, with the average concentration for the last six years (4.83 mg/L) being two and a half times higher than the average value for the 1993 – 1997 time period (1.72 mg/L). The decade between represents a period of increasing values, with an average of 3.54 mg/L.

The other site to show an increase in nitrogen is War Eagle Creek (monitored by USGS, ADEQ and AWRC at Highway 45 north of Hindsville, AR). Annual values exceeded 1.40 mg/L in the late 1990's, followed by a period when six of seven years had average nitrogen values <1.2 mg/L. In recent years the nitrogen levels have been back up over 1.40 mg/L. Continued monitoring will determine if nitrogen concentrations remain elevated or if they drop back down to levels measured in the early to mid 2000's.



Long-term declines in nitrogen have occurred in Holman Creek (ADEQ site on Highway 23 north of Huntsville, AR). The average nitrogen value for 1990-2000 was 5.32 mg/L and has decreased 45% to 2.92 mg/L for 2001-2013. While the annual values during the last 13 years have varied considerably (1.92 to 4.64 mg/L), the majority have been under 3.00 mg/L.

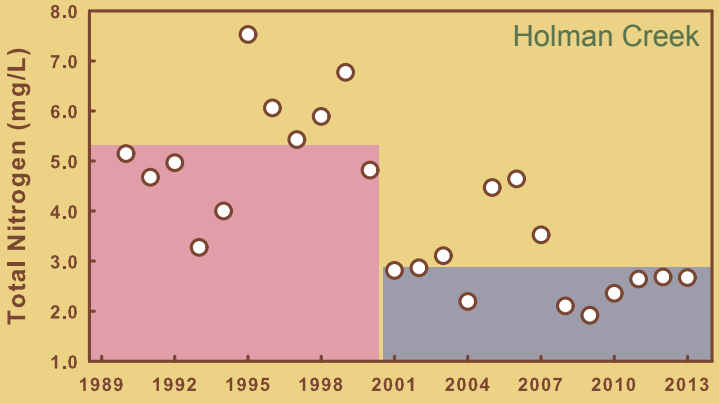
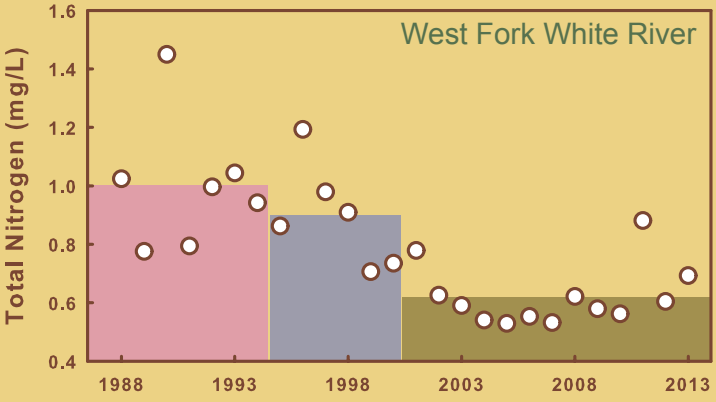



Photo by Bob Kipfer

The other site that has displayed a decrease in nitrogen is located on the West Fork of the White River (USGS and ADEQ monitored site just east of Fayetteville. AR). Nitrogen averaged 1.00 mg/L for 1988-1994, dropped to 0.90 mg/L for 1995-2000, and has averaged 0.62 mg/L for the last 13 years. Not only have values been lower in recent years, they have also generally been less variable from one year to the next.



How We Assessed Water Quality

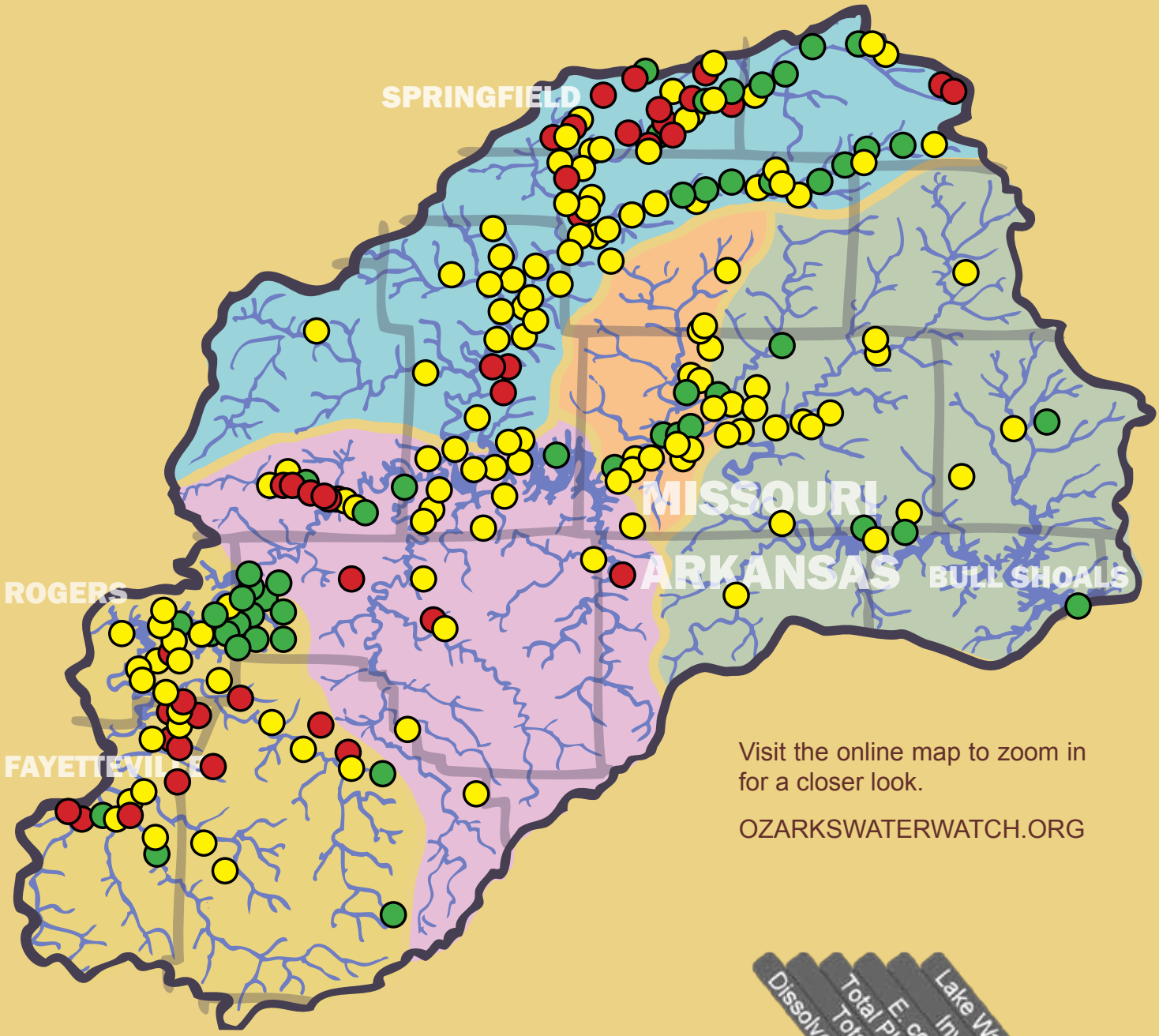
Parameter	Evaluation Method	Water Quality Assessment		
		HIGH	MID	LOW
Dissolved Oxygen	% of samples with >5 mg/L but less than 110% saturation	>75	50 - 74	<50
Total Nitrogen	Geometric mean of all values in mg/L	<0.500	0.501 – 0.900	>0.900
Total Phosphorus	Geometric mean of all values in mg/L	<0.020	0.021 – 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 2013?

- 685 dissolved oxygen values
- 1504 total nitrogen values
- 1469 total phosphorus values
- 614 E. coli counts
- 30 Invertebrate scores
- 224 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.

Photo by Bob Kipfer



Visit the online map to zoom in for a closer look.

OZARKSWATERWATCH.ORG

OZARKS WATER WATCH

	Dissolved Oxygen	Total Nitrogen	Total Phosphorus	E. coli Bacteria	Invertebrates	Lake Water Clarity
Beaver Lake Sub-basin						
Bull Shoals Lake Sub-basin						
James River Sub-basin						
Table Rock (exc. James River)						
Taneycomo Sub-basin						

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: 60 Sites
- Table Rock: 44 Sites
- Bull Shoals: 19 Sites
- James River: 95 Sites
- Taneycomo: 24 Sites

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


James River, Missouri
Ray Jones photo

BEAVER LAKE

- 60 sites total; 35 on Beaver Lake
- Lake sites and stream sites scored MID overall in this region
- Most Beaver Lake sites were monitored just once for Beaver Lake Secchi Day
- Most lake sites scored HIGH (46%) or MID (34%)
- HIGH scoring lake sites were nearest the dam
- Most stream sites scored HIGH (20%) or MID (48%)

	LAKE			STREAM		
	HIGH	MID	LOW	HIGH	MID	LOW
Phosphorus	25	4	6	10	5	10
Nitrogen	2	0	0	4	6	15
E. Coli	-	-	-	7	3	0
Inverts	-	-	-	-	-	-
D. Oxygen	-	-	-	14	1	0
Secchi	17	10	8	-	-	-

Table shows the number of sites scoring in each category (HIGH, MID, LOW) for each parameter. Sites are divided into lakes (left) and streams (right).

TABLE SUMMARY

- Most lake sites scored HIGH for phosphorus
- Nitrogen values scored LOW at most stream sites (60%)
- Dissolved oxygen levels were very healthy at stream sites
- HIGH lake water clarity scores near dam; LOW near lake inflows

TABLE ROCK

- 44 sites total; 20 on Table Rock, 24 on streams and springs
- Lake sites scored MID overall; stream sites scored LOW
- Most lake sites scored MID (75%)
- Most stream data are from a single day snapshot sampling event on the Roaring River
- Nutrients may be a problem in the Roaring River

	LAKE			STREAM/SPRING		
	HIGH	MID	LOW	HIGH	MID	LOW
Phosphorus	16	3	1	4	6	13
Nitrogen	3	16	0	1	1	21
E. Coli	-	-	-	1	0	0
Inverts	-	-	-	1	1	0
D. Oxygen	1	0	0	5	3	2
Secchi	1	11	3	-	-	-

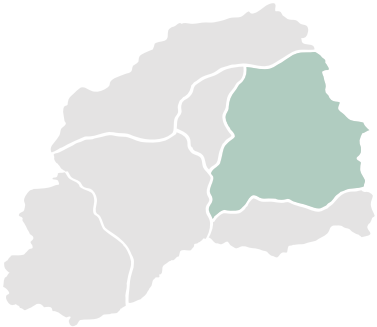
Table shows the number of sites scoring in each category (HIGH, MID, LOW) for each parameter. Sites are divided into lakes (left) and streams (right).

TABLE SUMMARY

- Phosphorus: Most lake sites scored HIGH (80%); most stream sites scored LOW (56%)
- Nitrogen: 81% of lake sites scored MID; 91% of stream sites scored LOW

BULL SHOALS

- 19 sites; 4 on Bulls Shoals Lake, 15 on streams
- 75% of lakes sites scored HIGH
- 87% of streams scored MID



	LAKE			STREAM		
	HIGH	MID	LOW	HIGH	MID	LOW
Phosphorus	2	3	0	4	7	3
Nitrogen	3	1	0	2	3	0
E. Coli	-	-	-	1	0	0
Inverts	-	-	-	2	3	0
D. Oxygen	2	0	0	13	1	1
Secchi	2	2	0	-	-	-

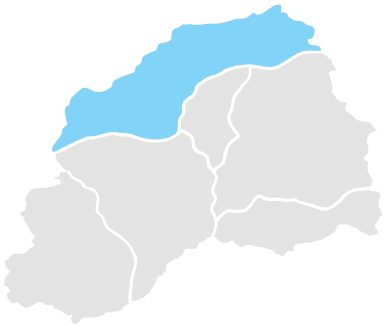
Table shows the number of sites scoring in each category (HIGH, MID, LOW) for each parameter. Sites are divided into lakes (left) and streams (right).

TABLE SUMMARY

- Very few LOW scores
- No LOW nitrogen scores
- Dissolved oxygen levels are healthy

JAMES RIVER

- 95 sites; 87 stream sites, 6 in Table Rock Lake's James River Arm, 2 in Lake Springfield
- Many sites sampled once as part of James River watershed Snapshot
- Most MID and LOW scores were near the City of Springfield



	LAKE			STREAM/SPRING		
	HIGH	MID	LOW	HIGH	MID	LOW
Phosphorus	2	2	4	30	25	21
Nitrogen	0	2	6	15	4	58
E. Coli	-	-	-	55	11	13
Inverts	-	-	-	3	3	0
D. Oxygen	-	-	-	3	2	5
Secchi	0	3	5	-	-	-

Table shows the number of sites scoring in each category (HIGH, MID, LOW) for each parameter. Sites are divided into lakes (left) and streams (right).

TABLE SUMMARY

- Phosphorus scores evenly split across sites
- Nitrogen scores LOW for 75% of sites
- E. coli scores HIGH at 70% of sites

LAKE TANEYCOMO

- 24 sites; 17 stream sites and 7 at Lake Taneycomo
- Nutrient levels score well
- While phosphorus scored LOW at 2 sites and dissolved oxgyen scored LOW at another, no site received an *overall* LOW score

	LAKE			STREAM		
	HIGH	MID	LOW	HIGH	MID	LOW
Phosphorus	6	1	0	8	7	2
Nitrogen	0	6	0	2	1	0
E. Coli	-	-	-	-	-	-
Inverts	-	-	-	2	1	0
D. Oxygen	1	0	0	14	2	1
Secchi	2	2	1	-	-	-

Table shows the number of sites scoring in each category (HIGH, MID, LOW) for each parameter. Sites are divided into lakes (left) and streams (right).

TABLE SUMMARY

- Most sites (58%) received HIGH phosphorus scores
- Nitrogen levels scored MID at most sites (78%)
- Dissolved oxygen levels are healthy, HIGH scores at 82% of sites.

Dedicated volunteers and water quality groups are not only monitoring streams and lakes in the watershed, they are also working on other projects that benefit water quality in our area. These groups (listed below) accomplished much in Missouri and Arkansas during 2013.

Association for Beaver Lake Environment (ABLE)
Beaver Water District
Beaver Watershed Alliance
Friends of the North Fork and White Rivers
James River Basin Partnership
Kings River Watershed Partnership
Missouri Stream Team Watershed Coalition
Northwest Arkansas Land Trust
Ozark Greenways
Ozarks Water Watch
Roaring River Parks Alliance
Springs Committee of Eureka Springs
Table Rock Lake Water Quality
Watershed Committee of the Ozarks
Watershed Conservation Resource Center

Volunteers removed tons of trash and hundreds of tires from our lakes and streams. A grant helped property owners replace over 40 failing septic systems, keeping nutrients and bacteria from fouling our waters.

Storm drain artwork in Springfield, MO - Artist:Taylor Bolls

Volunteers prepare to plant trees along Wilson Creek
Photo supplied by James River Basin Partnership

Storm water detention features and rain gardens were constructed, and rain barrels were installed to slow down rainwater and allow it to soak into the ground rather than wash pollutants directly into streams. In Branson, 600 metal decals were affixed to storm drains, letting residents and visitors know that what goes down the drain ends up in our waterways. Artists painted storm drains in a partnership with the City of Springfield to raise awareness of storm water issues among citizens. Local water quality groups reached thousands of children and taught them about water quality issues and watersheds.

Roughly 8000 trees were planted along Springfield streams to hold valuable soil on the ground where we need it, and keep it out of our streams where it robs aquatic invertebrates of valuable habitat. Cattle were fenced out of Wilson Creek and provided with an alternate watering source to protect the stream banks and reduce bacteria loading.

Concerned citizens working together with local water quality groups certainly can get a lot of things done!

2013 DATA CONTRIBUTORS

Ozarks Water Watch volunteers collected total nitrogen and total phosphorus samples at 19 Missouri stream sites.

Missouri Stream Team volunteers monitored 19 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 8 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.

James River, Missouri
James River Basin Partnership photo

The James River Snapshot was conducted by volunteers and coordinated by Missouri State University. This report features 70 total nitrogen, total phosphorus and E. coli measurements collected on July 13, 2013.

The Roaring River Snapshot was conducted by volunteers for the Lakes of Missouri Volunteer Program. Featured in this report are 21 total nitrogen and total phosphorus measurements collected on June 15, 2013.

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

Watershed Committee of the Ozarks measured E. coli at 20 spring and stream 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 17 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 10 locations.