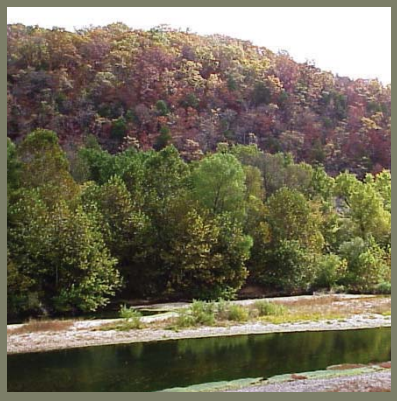
STATUS OF THE WATERSHED

A REPORT FROM THE OZARKS WATER WATCH FOUNDATION



ON WATER QUALITY IN THE OZARKS

OCTOBER 2010

OZARKS WATER WATCH
P.O. BOX 606
KIMBERLING CITY, MO 65686
WWW.OZARKSWATERWATCH.ORG

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WHY THIS STUDY

The rivers, lakes and streams in southwest Missouri and northwest Arkansas establish a foundation for the region's economic prosperity and attractive lifestyle. That's why the quality of these distinctive water resources is so important. If these waters become polluted or spoiled by unconstrained growth and development, they will diminish the vibrant economy, discourage visitors and tourism, and compromise the enjoyment so many in the region now find in these natural assets.

This third annual report is based on a region-wide assessment of the quality of Ozark waters. It is intended to provide a general answer to the question, "How is the water?" As importantly, by raising flags this study can point directions for focused measures to safeguard our rivers, lakes and streams.

The report is based on sound scientific studies of water quality conducted by the U.S. Geological Survey (USGS) and science faculty from the University of Arkansas and Missouri State University. This report contains a brief summary of the study process and the key findings. The full research reports are available on the Foundation's website at www.ozarkswaterwatch.org.

MEASURES OF WATER QUALITY

This year's report includes the results of several assessments of water quality in the upper White River basin. The first assessment is based on the analysis of water quality samples conducted by USGS. The samples drawn were analyzed for chemical, physical and biological parameters. This evaluation is substantially similar to the first two reports and is summarized in a "Water Quality Index" or "WQI" score with a letter grade assigned.

A second assessment has involved stream surveys of macroinvertebrates, the little creatures that live under the rocks in streams and act like canaries in the mine. Their presence or absence is a strong indicator of the ecological health of the stream and constitutes a second dimension of water quality in a "Stream Condition Index" or "SCI." Rather than a letter grade, each site evaluated is rated according to an index scale and characterized as "unimpaired," "impaired" and "very impaired."

WHAT WE FOUND

This year's report again finds that water quality in the region is threatened by development. The biological assessment of stream ecology resulting in the SCI finds every stream site surveyed to be classified as "impaired," with scores ranging from 4 ("very impaired") to a high of 14 ("impaired") out of a possible 20. Scores of 16 and above are considered "unimpaired."

The results of the sample analysis contained in the WQI received index scores ranging from 22.7 to 84.0 on the 100 point scale as in the prior year report. The analysis of longer term trends in water quality showed no statistical change for 75% of the sites, although three parameters showed a significant decrease in trend and four showed a significant increase. The trend analysis overall indicates some stability in water quality but at a low level (see full report on the website for all details).

The map of the upper White River region indicates the location of the sampling sites identified for the study. Following the map is a table listing the survey sites and the assessments applicable to each. Tables summarizing the Water Quality Index (WQI) and the Stream Condition Index (SCI) scores are then shown in tabular form below. A full discussion of the procedures used in developing the indices is contained in the reports available on the Foundation's website at www.ozarkswaterwatch.org.

UPPER WHITE RIVER BASIN

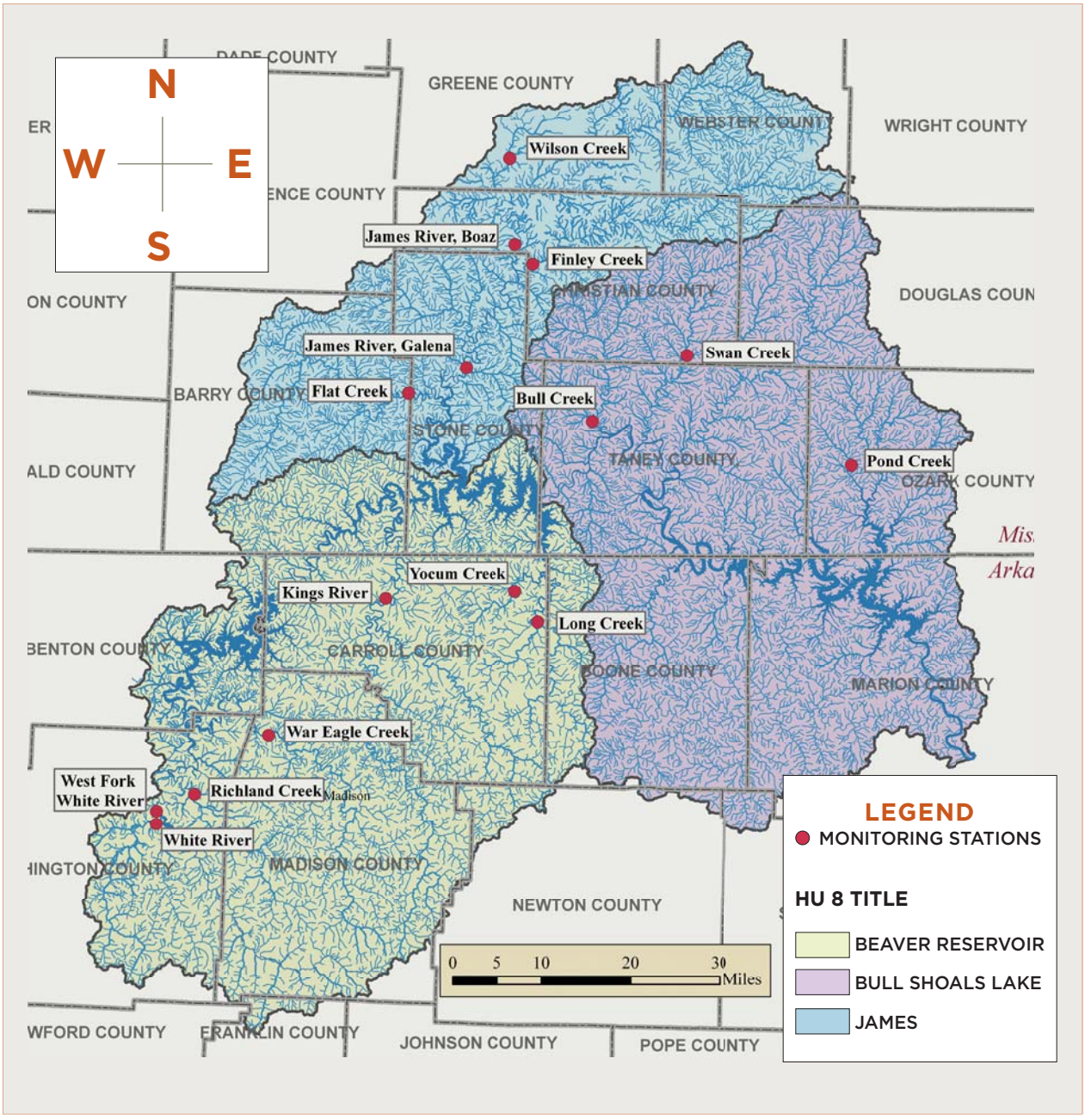


TABLE 1 BELOW SHOWS STREAM WATER QUALITY MONITORING SITES IN THE UPPER WHITE RIVER BASIN AND THE STUDIES THAT WERE CONDUCTED AT EACH SITE. (TABLE FROM BOWLES, 2010)

USGS SITE #	SUB-BASIN	SITE NAME	WATER QUALITY INDEX	WATER QUALITY TREND ANALYSIS	BIOLOGICAL INDEX
07052152	JAMES	WILSON CREEK NEAR BROOKLINE, MO	●	●	
07052250	JAMES	JAMES RIVER NEAR BOAZ, MO	●	●	
07052345	JAMES	FINLEY CREEK BELOW RIVERDALE, MO	●	●	
07052500	JAMES	JAMES RIVER AT GALENA, MO	●	●	
07052820	JAMES	FLAT CREEK BELOW JENKINS, MO	●		
N/A*	JAMES	CRANE CREEK AT HWY. AA, MO			●
07053810*	BULL SHOALS	BULL CREEK NEAR WALNUT SHADE, MO			●
07053900	BULL SHOALS	SWAN CREEK NEAR SWAN, MO	●		
07054080*	BULL SHOALS	BEAVER CREEK AT BRADLEYVILLE, MO			●
07054285*	BULL SHOALS	POND CREEK NEAR LONGRUN, MO			●
N/A*	BULL SHOALS	TURKEY CREEK NEAR THEODOSIA, MO			●
07054410*	BULL SHOALS	BEAR CREEK NEAR OMAHA, AR			●
07048600	BEAVER	WHITE RIVER NEAR FAYETTEVILLE, AR	●	●	
07048800**	BEAVER	RICHLAND CREEK AT GOSHEN, AR			
N/A*	BEAVER	RICHLAND CREEK AT CR 79, AR			●
07049000	BEAVER	WAR EAGLE CREEK NEAR HINDSVILLE, AR	●	●	
07048960*	BEAVER	WAR EAGLE CREEK NEAR HUNTSVILLE, AR			●
07048550	BEAVER	WEST FORK WHITE RIVER EAST OF FAYETTEVILLE, AR	●	●	
07053250**	BEAVER	YOCUM CREEK NEAR OAK GROVE, AR			
07050500	BEAVER	KINGS RIVER NEAR BERRYVILLE, AR		●	
07050225*	BEAVER	KINGS RIVER NEAR KINGSTON, AR			●
07053207*	BEAVER	LONG CREEK AT DENVER, AR			●

* NOT CURRENTLY MONITORED BY THE USGS

TABLE 2 BELOW SHOWS FLOW-ADJUSTED PARAMETER SCORES AND THE OVERALL WATER QUALITY INDEX (WQI) SCORES FOR SITES IN THE UPPER WHITE RIVER BASIN. MAXIMUM SCORE IS 100. PREPONDERANCE OF SCORES IS IN THE 40'S AND 50'S. (WQI FROM BOWLES, 2010)

SITE	SITE NUMBER	DISSOLVED OXYGEN	*E. COLI*	TN	TP	WQI SCORE	ASSIGNED GRADE
WEST FORK WHITE RIVER FAYETTEVILLE, AR	07048550	95.5	30.0	27.1	27.9	45.1	C
WHITE RIVER FAYETTEVILLE, AR	07048600	91.7	75.0	31.7	0	49.6	C
WAR EAGLE CREEK HINDSVILLE, AR	07049000	83.8	72.2	0	0	39.0	C-
WILSON CREEK BROOKLINE, MO	07052152	3.3	87.3	0	0	22.7	D
JAMES RIVER BOAZ, MO	07052250	87.5	91.7	0	6.3	46.3	C
FINLEY CREEK RIVERDALE, MO	07052345	67.2	89.6	0	27.9	46.2	C
JAMES RIVER GALENA, MO	07052500	55.1	100	0	25.3	45.1	C
FLAT CREEK JENKINS, MO	07052820	44.0	83.0	0	50.0	44.3	C
SWAN CREEK - SWAN, MO	07053900	88.1	68.0	80.0	100	84.0	A-

TABLE 3 BELOW SHOWS METRIC SCORES AND THE STREAM CONDITION INDEX (SCI) SCORES CALCULATED FROM THE BENTHIC INVERTEBRATE SAMPLES. THE METRIC SCORES ARE PRESENTED WITH STANDARD ERRORS. SCORES OF 16 AND ABOVE ARE CONSIDERED "UNIMPAIRED," 10-14 "IMPAIRED," AND BELOW 10 "VERY IMPAIRED." (TABLE FROM BOWLES, 2010)

SITE	USGS SITE NUMBER	TAXA RICHNESS	EPT RICHNESS	SHANNON'S DIVERSITY	WQI SCORE	ASSIGNED GRADE
BULL CREEK NEAR WALNUT SHADE, MO	07053810	27.3 ± 2.9	15.3 ± .7	1.8 ± 0.3	5.6 ± 0.1	12 IMPAIRED
BEAVER CREEK AT BRADLEYVILLE, MO	07054080	16 ± 2.1	12 ± 1.5	1.1 ± 0.3	5.4 ± 0.2	12 IMPAIRED
POND CREEK NEAR LONGRUN, MO	07054285	23 ± 3.2	16.7 ± .9	1.7 ± 0.1	4.0 ± 0.4	12 IMPAIRED
CRANE CREEK AT HWY. AA, MO	N/A	23.7 ± 2.8	16 ± 2.2	1.8 ± 0.1	4.6 ± 0.1	12 IMPAIRED
TURKEY CREEK NEAR THEODOSIA, MO	N/A	20.7 ± 1.5	12 ± 0	1.7 ± 0.1	5.2 ± 0.6	12 IMPAIRED
LONG CREEK AT DENVER, AR	07053207	8.7 ± 2.2	5.3 ± 2.4	1.1 ± 0.5	3.5 ± 1.7	8 VERY IMPAIRED
WAR EAGLE CREEK NEAR HUNTSVILLE, AR	07048960	20 ± 1.2	13 ± 0.7	2.1 ± 0.2	5.2 ± 0.2	14 IMPAIRED
KINGS RIVER NEAR KINGSTON, AR	07050225	23.3 ± 2.7	16 ± 1.5	1.5 ± 0.2	4.8 ± 0.3	12 IMPAIRED
BEAR CREEK NEAR OMAHA, AR	07054410	9.7 ± 1.2	4 ± 1	0.5 ± 0.1	5.9 ± 0.1	4 VERY IMPAIRED
RICHLAND CREEK AT CR 79, AR	N/A	17 ± 0.6	13 ± 1.2	1.2 ± 0.2	5.1 ± 0.4	12 IMPAIRED

WHAT DO THESE SCORES MEAN?

The overall assessment of water quality during the past year again earns what in our judgment is a middling "C" grade. Our waters generally are neither very bad nor very good.

For the most part our rivers, lakes and streams are adequate for their general intended uses for swimming, fishing, boating and with proper treatment, human consumption. From an aesthetic perspective our rivers and lakes continue to be attractive to the many people who use and enjoy them.

At the same time, these water resources continue to be far from pristine. They suffer from threats indicated in the WQI and SCI ratings. According to the measures we have employed in evaluating water quality, our waters are degraded although the tests indicate some degree of stability, albeit at a mediocre level, in long term trends.

This report is something like the evaluation of a patient with a persistent fever. Taking the person's temperature, essentially what we've done in this study, reveals the symptom but not the cause of the problem. A good physician will usually have some insight into the cause of a patient's problem. And in the case of our rivers and lakes we know what most of the causes are and what can be done to assure better water quality.

People's developments and activities lie at the root of water quality problems in most places. The elevated levels of nutrients and sediment caused by runoff are at the bottom of many current problems. Storm water from developed areas, sediment from unpaved roads and plowed fields, leaking septic tanks and improperly fertilized yards, fields, and golf courses all contribute to excessive nutrients and sediment in the watersheds. These "non-point" sources today cause much of the mischief in degraded water quality.

WHAT CAN AND SHOULD BE DONE?

It's not enough to give a grade of "C" to our rivers and lakes and to worry about their long-term health. There are a number of measures that can be taken to address the causes of the fever affecting this environmental patient. The following recommendations can help treat the underlying problems:

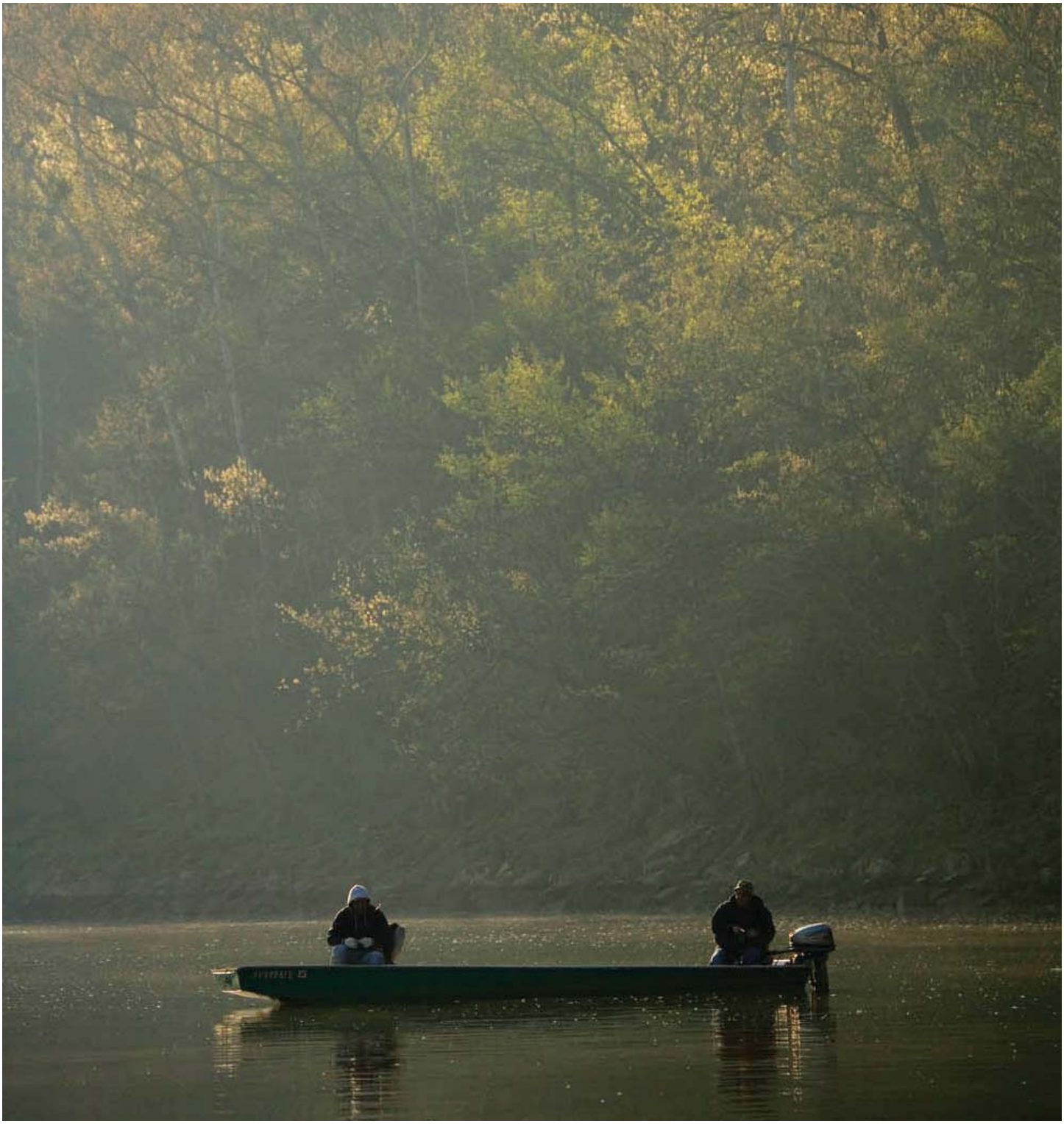
• The results contained in this report need to be publicized. They need to be discussed in public meetings and forums. Groups with a direct stake in water quality—groups like chambers of commerce, city and county governing bodies, farm, watershed and civic organizations—can help raise red flags, make the public aware of the problem and support measures to keep our rivers, lakes and streams clean.

• Public bodies like health departments, city and county councils, commissions, quorum courts, and state agencies can review their regulatory responsibilities to the extent this may be relevant. These bodies can consider how effective their efforts are to assure compliance with regulatory standards for matters like development, storm water, septic systems, nutrient management and road maintenance. Regulations are not much good if they are not clearly communicated and enforced.

• Ways can and should be found to support watershed organizations in the region working, generally without sustainable funding, to educate and involve citizens in efforts to sustain clean rivers and lakes. Individuals and organizations should join and support the organization working on their local watershed.

• Citizens, once informed, can take measures on their property as well as support good public policy intended to keep rivers, lakes and streams wholesome. A publication from this Foundation and the watershed groups working in the region offers practical, hands-on advice for landowners about being good stewards. Entitled "Living with Land and Water in the Ozarks: A Landowner's Guide to Streamside Living," this attractive publication is available without charge through any of the watershed organizations in the region or on the Foundation's website at www.ozarkswaterwatch.org.

• A new publication "LID: Low Impact Development, A Design Manual for Urban Areas" from the University of Arkansas Community Design Center with support from Ozarks Water Watch is a resource for planners, developers, architects and engineers as well as for municipal and county regulatory officials. Low Impact Development (LID) is an ecologically-based stormwater management approach favoring soft engineering to manage rainfall on site through a vegetated treatment network. The goal of LID is to sustain a site's pre-development hydrologic regime by using techniques that infiltrate, filter, store, and evaporate stormwater runoff close to its source. Contact Ozarks Water Watch for information on obtaining a LID Manual.



Water quality is a continuing challenge and with population growth and economic development in the Ozarks it will not go away. Heightened awareness and sensitivity to this issue may be the most essential prerequisites to long-term solutions. This annual report is intended to help provide these essential things.

RESEARCH FOR THIS REPORT SUPPORTED BY THE WATER WATCH ALLIANCE

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IN MEMORY OF CHUCK BACHUS