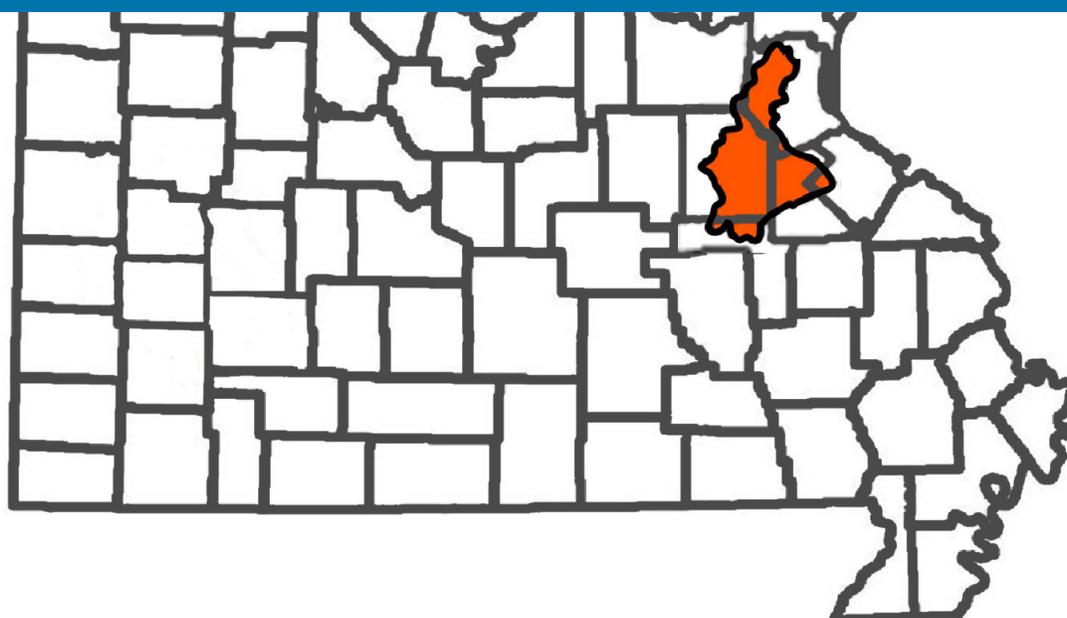


The State of *Our Missouri Waters*

Big River Watershed



The Missouri Department of Natural Resources seeks to improve the availability of water resource information to communities where impact to these water resources is felt most.

The information presented in this summary is intended to increase awareness of how activities on land and in water have an influence on water resource quality and quantity. The department greatly values local input and engagement regarding the mission of ensuring safe and ample water resources, and will continue to seek local guidance to further focus department efforts and funding strategies for the betterment of *Our Missouri Waters*.

Big River Watershed

The State of Our Missouri Waters

Importance of Water Quantity and Quality

Water shortages can have severe and expensive consequences. Adequate water supplies are vital not only to human health and safety, but also to the prosperity of our state. Whether it is for crop irrigation, industrial manufacturing or power generation, water is at the core of human existence and sustainability. A few decades ago, the supply of water in Missouri was considered virtually unlimited. As population and industry have increased, a need for statewide water planning has emerged.

Water quality impairments can also have severe impacts on human health and the environment and be extremely expensive. Unfortunately and more importantly, many water quality impairments are only discovered once the consequences of poor water quality have been realized. For this reason, it is important that locals are involved in the protection of their water quality and quantity so as to prevent irreversible consequences.

Key Points

Streams in the basin exhibit characteristics of typical Ozark Streams with good water quality, fish habitat and Ozark fish species. Nineteen sensitive natural communities, including good examples of Ozark creeks and springs and spring branches are present. However, eroded mine waste and tailings releases into the Big River and its tributaries from past lead and barite mining activities have caused damage to the streams and aquatic habitats. A fish consumption advisory for some fish species is present on Big River due to lead contamination.

In the southern portion of the watershed, there are challenges regarding bacteria levels in water bodies, which can cause serious public health and recreational safety issues. Nonpoint sources of contamination, such as animal waste and contaminants carried by stormwater runoff, can have a serious cumulative impact on surface waters in a largely rural watershed. However, agricultural best management practices can significantly reduce nonpoint source impacts. Pollution prevention is also critical due to connectivity of surface water and groundwater. Point and nonpoint sources of pollution to water bodies or in and around karst features, such as sinkholes, can lead to regional contamination of groundwater wells and springs.

Groundwater quality and quantity are very important as there are 77 public drinking water systems in the watershed that rely on groundwater and one surface water system draws directly from the Big River. Groundwater from the watershed comes from the St. Francois and Ozark aquifers. The St. Francois aquifer is generally a poor producer of water due to the igneous rock formations, which are nearly impermeable. Yields of wells drilled in this area typically only produce a few gallons per minute. For many years, mine dewatering in the Old Lead Belt, centered on the Bonne Terre-Park Hills area, drained considerable amounts of water from the St. Francois aquifer. The Ozark aquifer is the most widespread and widely used aquifer in Missouri as it supplies nearly all of the water supply needs in this region. Water conservation efforts by groundwater and surface water users can be implemented to help mitigate impacts of increasing water needs in the area. It is important for Missouri to document its need for water and to protect our right to that water. Registering major water use, annually, establishes a users need for water and helps the department understand the water needs of Missouri citizens.

Opportunities

Community Involvement

- Communities, groups and individuals can be involved in and promote watershed improvement activities through education, advocacy and hands-on projects. Examples include, watershed education for schools, litter control, tree planting, water quality monitoring and storm drain stenciling.

Education and Outreach

- Assistance is available for training and assistance regarding several topics such as source water protection, municipal drinking water loss, water main leak location, asset management, water conservation planning and implementation and I/I onsite assistance.
- Training is also available to livestock operations and landowners regarding the benefits of alternate watering sources for livestock, improvements to land application practices, best management practices and associated cost-share programs.

Financial Assistance

- **Clean Water and Drinking Water State Revolving Funds** are available to build or improve municipal wastewater and drinking water infrastructure and support agricultural and urban projects such as improvements to urban runoff, wet weather flow, stormwater and sewer overflow issues, water reuse and conservation and alternative treatment projects.
- **319 Nonpoint Source Funds** are available to assist organizations with implementation of on-the-ground practices that control, reduce or manage nonpoint source pollution such as riparian buffer strips, detention ponds, limitation of animal waste to stream and sinkholes.
- **Source Water Protection Grants** and **Well Plugging Grants** are available to public water systems to support safe well abandonment procedures and source water protection implementation and planning efforts.
- A full list of department funding sources is available at <http://dnr.mo.gov/financial.htm>

Big River Watershed

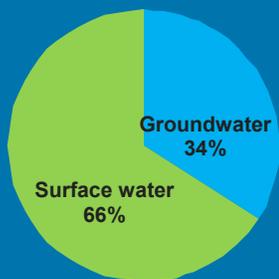
The State of Our Missouri Waters—Current Conditions and Trends

Climate and Water Availability

Water Use by Category (2013)

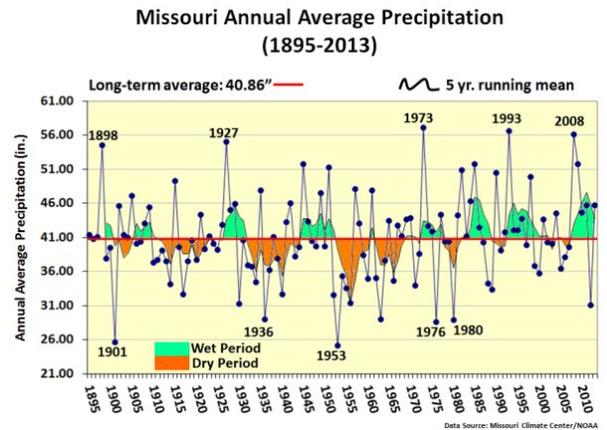


Water Use by Source



Precipitation

The adjacent figure shows annual average statewide precipitation in Missouri from 1895 to 2013. A five-year trend line reveals several wet periods have dominated since the early 1980s, and this wet pattern has also been accompanied by an increasing trend of heavy precipitation events. Severe drought occurred during 2012, but this drought was brief compared to major multi-year droughts that occurred in the 1930s and 1950s. Tree ring analyses conducted in Missouri and historic observation data show periods of multi-year severe droughts in Missouri's history, indicating that extended dry periods are likely to occur in the future.



Groundwater and Surface Water Monitoring

There is one groundwater monitoring well within the watershed as part of the Missouri Observation Well Network. This observation well is located in Potosi. Annual average groundwater levels appear to be fairly stable at these wells, but groundwater levels fluctuate several feet throughout the year, with groundwater lows typically occurring in winter and highest groundwater levels occurring in late spring. There are currently three stream gauges in the watershed that measure average stream flow. These gauges are all on the Big River and are located near Byrnes Mill, Richwoods, and Irondale.

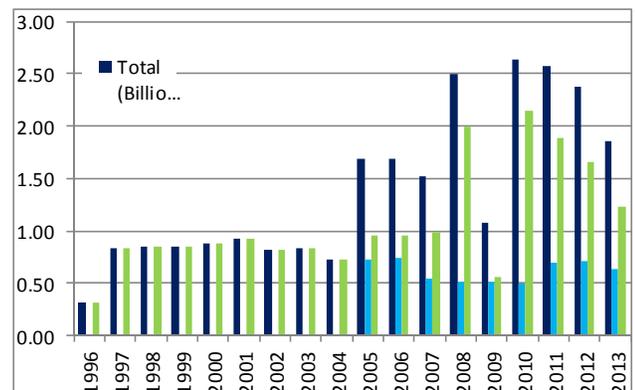
USGS Potosi, MO Groundwater Monitoring Well



Water Use Characteristics

The estimated annual water use is 1.86 billion gallons, of which 34 percent is surface water and 66 percent is groundwater. There are 77 public drinking water systems in the watershed that rely on groundwater and one surface water system that draws directly from the Big River. Major water use categories for this watershed are predominately municipal (97 percent), commercial (2 percent) and irrigation with less than (1 percent).

Big River Watershed Major Water Use



Big River Watershed

The State of Our Missouri Waters—Current Conditions and Trends

Watershed Protection

Protection of Our Natural Resources

The department exercises authority under Missouri's Clean Water Law to regulate point sources of pollution. When point sources are known or discovered, the department issues permits for these sources to limit the amount of certain water contaminants that may be discharged into the water body.

The department also has resources to help people proactively plan to protect water resources, such as:

- Source Water Protection Plans for drinking water sources
- Section 319 funding for watershed planning and projects
- Funding to plan for source water protection
- Soil and Water Conservation funding
- State Revolving Fund grants and loans for community drinking water and wastewater improvements

A full list of department funding sources is available at dnr.mo.gov/financial.htm

It is important to note that resources are limited and local involvement, in determining most critical and effective focus areas, is invaluable.

Water Quality Impairments

Section 303(d) of the federal Clean Water Act requires each state identify waters that do not meet water quality standards and for which adequate water pollution controls are not in place. These identified waters are considered impaired. Water quality standards protect beneficial uses of water including whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife.

The following lakes and streams within the watershed are listed on the state's 2014 List of impaired waterways and are presented on the adjacent map: Big River (Cadmium and Lead), Coonville Creek (Lead), Eaton Branch (Cadmium, Lead and Zinc), Flat River Creek (Cadmium), Salt Pine Creek (Unknown), Shibboleth Branch (Lead and Zinc), Terre Du Lac Lakes (Nitrogen and Chlorophyll), Tributary to Old Mines Creek (Sedimentation), Tributary to Flat River (Zinc), Turkey Creek (Cadmium, Lead and Zinc).

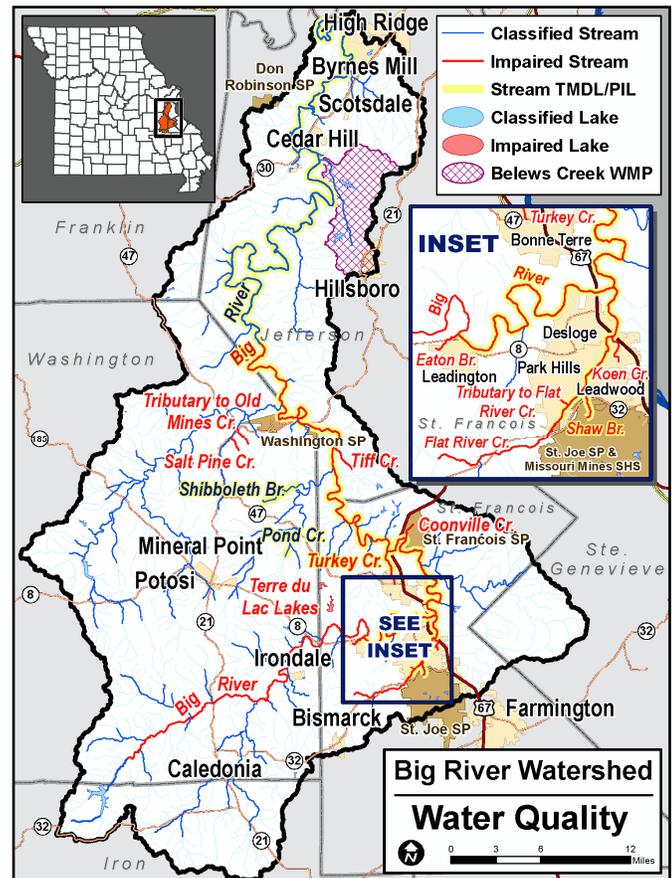
Impairments can be caused by

known sources like point or nonpoint source pollution, or may be unknown; however, identifying activities near impaired water bodies can provide key information in determining the sources of contamination as well as developing solutions for impaired waters.

Examples of **point sources** of pollution include municipal wastewater treatment plants, land disturbance sites, large confined animal operations, and treated industrial wastewater discharges. Common challenges for wastewater treatment include the limited contaminant removal capacity of certain types of treatment. When facilities experiences difficulty in providing the proper level of treatment and contaminant removal, the department often works with them to improve the treatment process and quality of the discharge. In the case that point source emitters are unwilling to improve the quality of their discharge, the department has regulatory authority to ensure that inappropriate discharges are discontinued in a timely manner.

Nonpoint pollution sources refer to contaminants that do not come from specific conveyances and may come from multiple sources, such as failing septic systems and contaminants carried in stormwater runoff from rural, urban and agriculture lands.

Other causes of water body impairments include natural causes like precipitation, climate and drought which can alter stream flow and channel characteristics leading to changes in water quality.



Big River Watershed

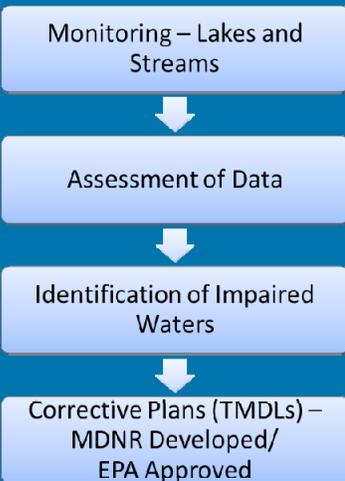
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Watershed Protection

General Water Quality Criteria

A water body is considered impaired if it does not meet water quality standards that specifically protect its beneficial uses, such as drinking water, recreational uses and fish or other aquatic life health.

Missouri's Process to Improve Water Quality



NPDES:

National Pollutant Discharge Elimination System. In Missouri, NPDES permits are also known as Missouri State Operating (MSOP) permits.

Total Maximum Daily Loads (TMDL)

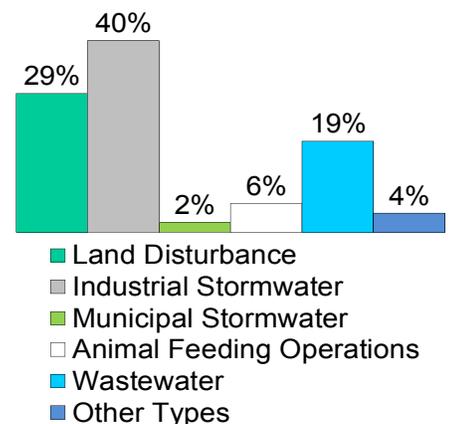
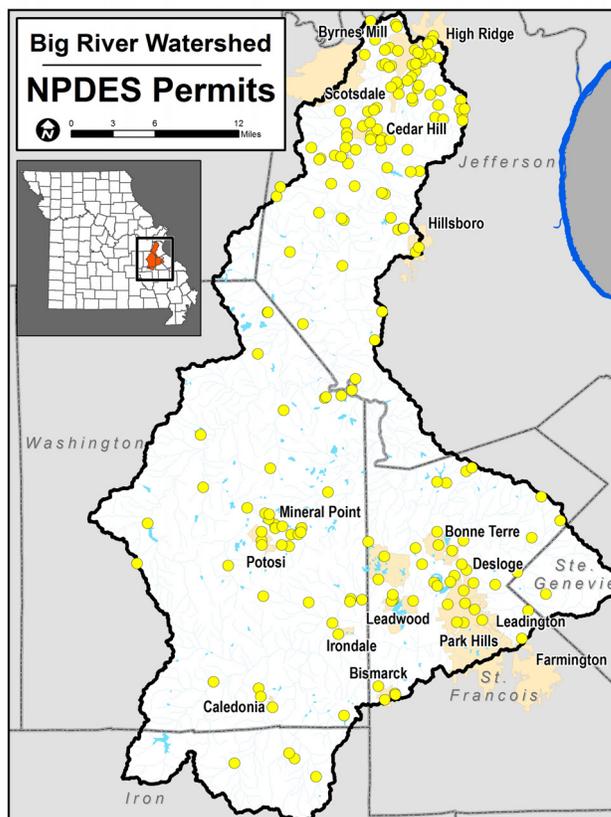
A TMDL is a mathematical calculation of the maximum amount of a pollutant that a water body can absorb and still meet water quality standards. A TMDL study identifies the potential or suspected pollutant sources in the watershed and allocates the allowable pollutant load among these sources. It also includes an implementation plan to identify how the load will be reduced to a level that will protect water quality. In this watershed, TMDLs have been developed for the Big River, Flat River Creek, Pond Creek, Shaw Branch and Shibboleth Creek to address impairments to the protection of aquatic life caused by sediments and heavy metals in the stream attributed to past mining activities. A TMDL was also written for Turkey Creek in St. Francois County to address aquatic life impairments caused by excessive biochemical oxygen demand and organic sediment. Pollutant reductions and implementation plans for the metals and sediment TMDLs target former mining and milling activities, while the Turkey Creek TMDL assigns pollutant allocations and load reductions to a specific wastewater treatment facility. Implementation of these TMDLs is intended to restore these waters to a level that attains water quality standards and protects beneficial uses.

More information regarding these TMDLs can be found online at dnr.mo.gov/env/wpp/tmdl/wpc-tmdl-EPA-Appr.htm.

Regulated Point Sources

The department regulates point sources by issuing permits that prescribe conditions of operating the point discharge and limit the discharge of water contaminants. In addition, the department inspects regulated facilities and analyzes water samples to ensure the facilities are not polluting waters. It's also important that communities look to the future for watershed planning in order to maintain awareness of wastewater treatment types (e.g. septic tanks, lagoons, gravity systems, filtration, etc.), their impacts and upcoming regulations.

The following graphics illustrate the type and distribution of permitted sites in the watershed.



Big River Watershed

The State of Our Missouri Waters—Current Conditions and Trends

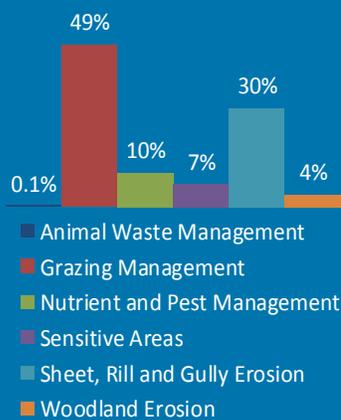
Local Watershed Improvements

Local Awareness

Is it safe to fish or swim in the nearby stream? Does the stream provide habitat suitable for fish? What does it cost to make this water potable? Will I have enough water during a drought?

Impacts to water quality and quantity are most critical to local communities; however, impacts are often not realized until a dire situation arises as a result of poor water quality or quantity. Local awareness and involvement can lead to pollution prevention and reduction, water supply sustainability, and can give communities the upper hand in protecting, preserving and enhancing local water supplies for generations to come.

2009 - 2014 Conservation Practices



Missouri Stream Team and Volunteer Water Quality Monitoring

Missouri Stream Teams strive to gain and share knowledge regarding the state's stream systems and the problems and opportunities they face. The Missouri Stream Team Program is a partnership between the departments of Natural Resources and Conservation as well as the Conservation Federation of Missouri and the citizens of Missouri. Besides improving stream conditions, Stream Teams often provide useful data in targeting areas that should be monitored more closely for impairments. The Missouri Stream Team Watershed Coalition has compiled and reported monitoring data which demonstrates the importance of watershed protection, preservation and enhancement by local communities. (image from <http://mstwc.org/who-we-are/vision-mission-goals/>)

The Volunteer Water Quality Monitoring Program is one of the most popular activities of the Missouri Stream Team Program. There are 54 sites throughout the watershed that provide the department with valuable water quality data.



Soil and Water Conservation and Nonpoint Source Grants (319 Grants)

Over the last five years, the department has provided several watershed project grants to local communities to improve water quality through reduction of nutrient and sediment loads and deposition, rehabilitation and removal of failing or neglected septic systems, watershed management planning, water quality monitoring, incentivized soil conservation practices, education/outreach efforts and other activities. These grant projects have included: Upper Big River Corridor, Belews Creek Watershed Management Plan, St. Louis Metro Clean Water Education and Resource, Upper Big River Corridor Water Quality Project, and Belews Creek WMP Implementation.

Source Water Protection Projects and Grants

This voluntary program is designed to assist public water systems and the communities they serve with developing local voluntary source water protection plans to protect their source of drinking water from existing or additional contamination sources. Contamination of drinking water sources (or those areas that recharge drinking water sources) often require a water system to increase the level of treatment that must be applied to raw drinking water to remove harmful pathogens, chemicals or other agents. More information on the Source Water Protection Program and grants can be found on our website: <http://dnr.mo.gov/env/wpp/pdwb/swpp.htm>.

Well Plugging Grants

As part of source water protection, the department offers grants to plug abandoned wells. Inactive wells can act as a direct conduit for pollutants to enter our water sources. Safely closing these wells is another layer of protection for pollution prevention.

Soil and Water Conservation Cost Share Programs

Soil and Water Conservation Districts set goals for conservation issue concerns. These practices are funded and implemented to help districts meet their resource conservation goals, which conserves soil and improves water quality by reducing sedimentation in our rivers and streams. The chart to the left illustrates the number of practices implemented for each concern in the watershed from 2009 to 2014, relative to the total number of practices for this watershed. No irrigation management practices were implemented during this time. District funding requests for FY15 show that woodland erosion, grazing management, and sheet, rill and gully practices are most prevalent.

Big River Watershed

The State of Our Missouri Waters—Current Conditions and Trends

For More Information

Missouri Department of Natural Resources
St. Louis Region
Watershed Coordinator
Tracy Haag
7545 S. Lindbergh,
Ste 210
St. Louis, MO 63125
314-416-2960

Or visit the Web at
dnr.mo.gov/omw

Resources

Education and Outreach Resources include:

Missouri Department of Natural Resources' Our Missouri Waters dnr.mo.gov/omw

Missouri Department of Natural Resources Financial Assistance Opportunities
<http://dnr.mo.gov/pubs/financial-asst-brochure-2014.pdf>)

Natural Resources Conservation Service (NRCS) <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/>

Missouri Rural Water Association (MRWA) <http://www.moruralwater.org/training.php>;
<http://www.moruralwater.org/tools.php>; <http://www.moruralwater.org/dlcenter/>

Missouri Public Utilities Alliance (MPUA) <http://www.mpu.org/Training.php>; http://www.mpu.org/Untitled_Page_4.php

EPA Region 7 Environmental Finance Center (EFC) http://webs.wichita.edu/?u=HUGOWALL&p=/Centers_Research/Environmental_Finance_Center/

Funding Resources include:

Natural Resources Conservation Service (NRCS) <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/>

United States Department of Agriculture Rural Development (USDA-RD) <http://www.rurdev.usda.gov/ProgramsAndOpportunities.html>

Missouri Department of Economic Development (DED) <http://www.ded.mo.gov/BCS%20Programs/BCSProgramDetails.aspx?BCSProgramID=10>; <http://www.ded.mo.gov/Community/InfrastructureAssistance.aspx>

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Center for Applied Research and Environmental Systems (<http://www.cares.missouri.edu/>)

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Department of Natural Resources' Missouri State Water Plan Series, Surface Water Resources of Missouri, 1995, Groundwater Resources of Missouri, 1996. (<http://dnr.mo.gov/env/wrc/statewaterplanMain.htm>)

Department of Natural Resources' Source Water Protection Program Page (<http://dnr.mo.gov/env/wpp/pdwb/swpp.htm>)

Department of Natural Resources' Major Water Users Page (<http://dnr.mo.gov/env/wrc/mwu-forms.htm>)

Missouri Stream Team Program Website, (<http://www.mostreamteam.org/aboutTeams.asp>)

Missouri Stream Team Watershed Coalition Website, (<http://mstwc.org/>)

Multi-Resolution Land Characteristics Consortium, 2011 and 2001 National Land Cover Database, (<http://www.mrlc.gov>)

Missouri Climate Center, (<http://climate.missouri.edu/modata.php>)

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