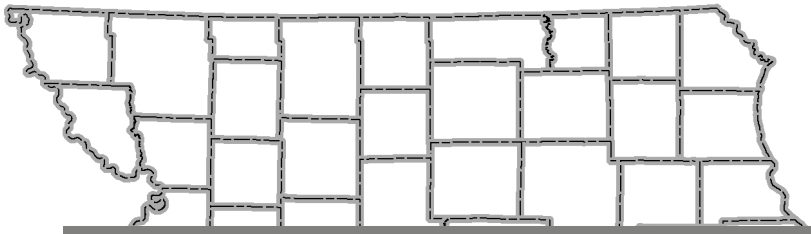
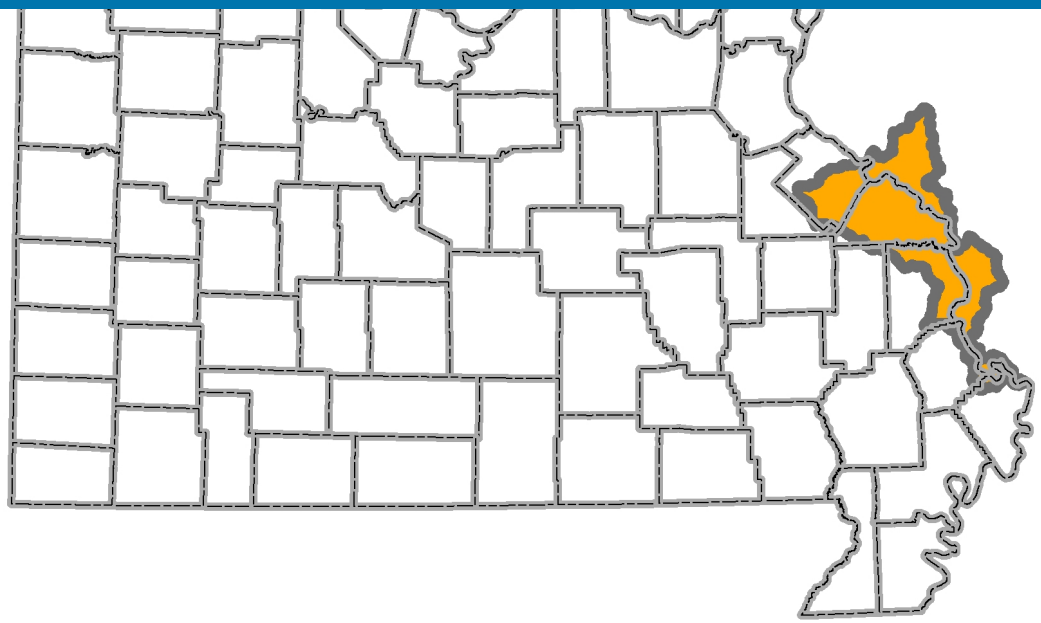


Our Missouri WATERS

The State of *Our Missouri Waters*

Upper Mississippi-Cape 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.*

MISSOURI DEPARTMENT OF NATURAL RESOURCES

HUC-8: 10290106
December 2014

Upper Mississippi-Cape 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

Several streams in the watershed have 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 storm water 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 in this portion of the watershed 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 is also a concern, as most of the watershed is primarily karst and is characterized by sinkholes, caves, and losing streams. These areas are highly susceptible to nonpoint source pollution that can result in ground water contamination. Groundwater quantity is also important to consider as the water levels in the Ozark aquifer, which is the predominant aquifer in the state, are declining in areas of high use. Water conservation efforts by groundwater and surface water users can be implemented to help mitigate impacts of increasing water needs in the area. Missouri shares water resources with many other states, some of which regulate water use and have already established their demand for water. It is important for Missouri to document our need for water and to protect our right to that water. Registering major water use, annually, establishes user needs for water and helps the department understand the water needs of Missouri citizens.

Opportunities

Community Involvement

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

Education and Outreach

- Technical assistance providers are available for training and assistance regarding several topics such as source water protection, municipal drinking water loss, water main leak detection, asset management, water conservation planning and implementation, and I/I (inflow and infiltration) reduction.
- 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

Our Missouri WATERS

Upper Mississippi-Cape Watershed

The State of Our Missouri Waters

What is a Watershed?

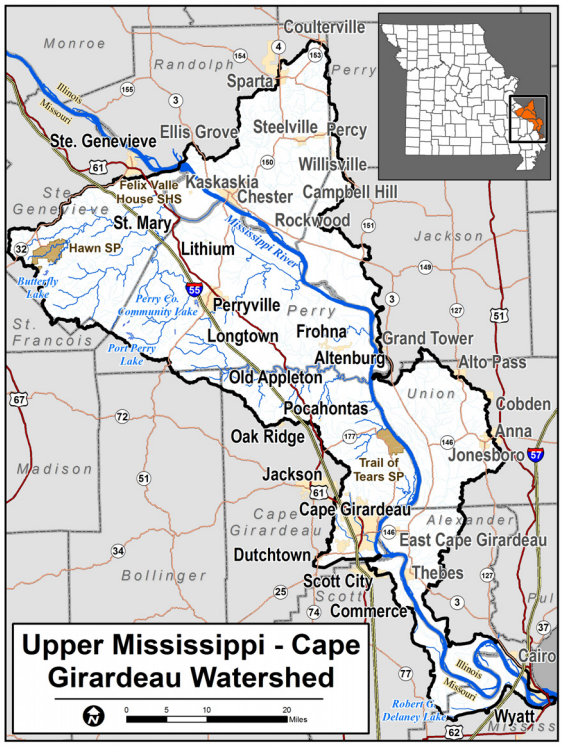
A watershed is an area of land defined by ridges, from which waters flow into a particular lake, river or wetland.

Basin Characteristics

- Drainage area of 1727 mi^2
- Includes portions of seven Missouri counties
- Crosses into Illinois
- Largest population includes Cape Girardeau, Perryville and Scott City.
- Cape Girardeau County has experienced appr.21 percent population growth from 1990 to 2012. Perry County's population has grown by 14 percent since 1990.

Recreational Resources

Hunting for deer, turkey and waterfowl are the top recreational activities. Public areas include: Trail of Tears and Hawn state parks, Middle Mississippi River National Wildlife Refuge, Mark Twain National Forest, Juden Creek, Cape Woods and Red Rock Landing conservation areas, Pickle Springs Natural Area and Perry County Community Lake. These parks and attractions provide habitat for wildlife and migrating waterfowl and various opportunities for people to enjoy the outdoors.



Water Resources

Surface Water

There are 31 lakes ranging in size from 50 to 395 acres covering a total surface area of 4,360 acres (Missouri – 1,062 acres and Illinois – 3,300 acres). There are approximately 2,320 miles of major streams in the Upper Mississippi Cape watershed (Missouri – 1,390 miles and Illinois – 930 miles) Some of the larger streams in Missouri are Apple, Indian, Saline, South Fork Saline and Bois Brule creeks, River aux Vases and the Mississippi River.

Groundwater

There are two major aquifers, the St. Francois aquifer and the Ozark aquifer. The aquifers range in thickness from less than 200 feet to more than 700 feet thick, and averages about 500 feet in thickness. Most wells that are deep enough to produce from the St. Francois aquifer in this region also produce from the shallower and more prolific Ozark aquifer.

Springs

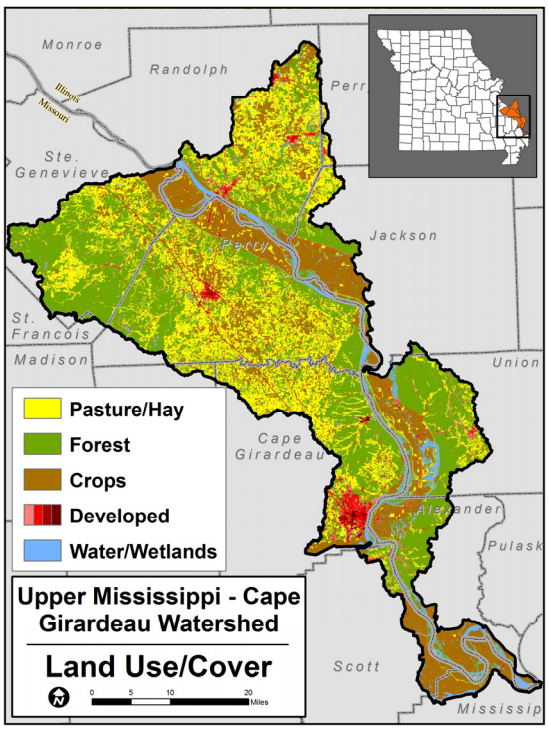
There are 64 springs and resurgences in the Upper Mississippi Cape watershed. 33 named springs or resurgences and 31 unnamed springs or resurgences. There are 18 springs or resurgences that have estimated or measured flow information.

Geology/Hydrology

The basin is primarily karst and the bedrock is composed of permeable carbonates with 25 percent of the streams classified as losing and approximately 3,300 identified sinkholes. There are 650 known caves located in Perry County. These may be sensitive habitat for endangered species. Moderate to severe groundwater contamination potential exists within a majority of the basin. Intense bedrock folding and faulting in localized parts of the basin create additional challenges for water supply, waste disposal and engineered structures. The basin is also located within the New Madrid Seismic Zone and has a potential risk for earthquake-induced soil liquefaction along the Mississippi River flood plain and southeast lowlands at the south end of the basin.

Land Use

Land use in the watershed is split between three main uses; forestland at 39 percent, 25 percent in grassland, and 22 percent in crops. Largely rural, nonpoint source contributors are relevant to the overall health. It should also be noted that the City of Cape Girardeau and the surrounding urban areas did see an increase in growth and development in the past decade.



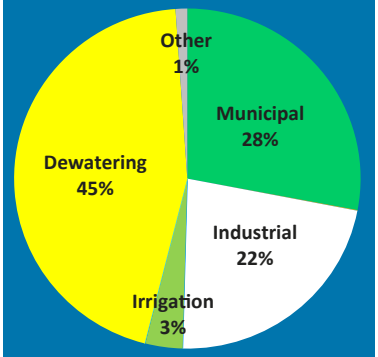
Our Missouri WATERS

Upper Mississippi-Cape Watershed

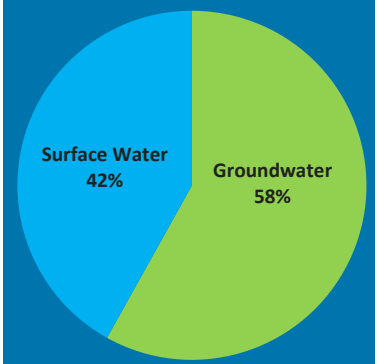
The State of Our Missouri Waters-Current Conditions and Trends

Climate and Water Availability

Water Use by Category (2013)



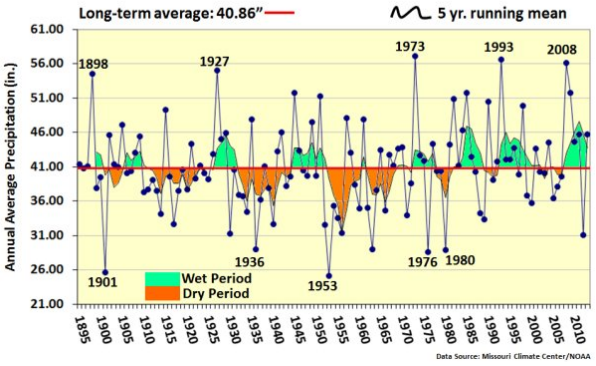
Water Use by Source (2013)



Precipitation

Annual precipitation totals reveals several wet periods have dominated since the early 1980s. 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.

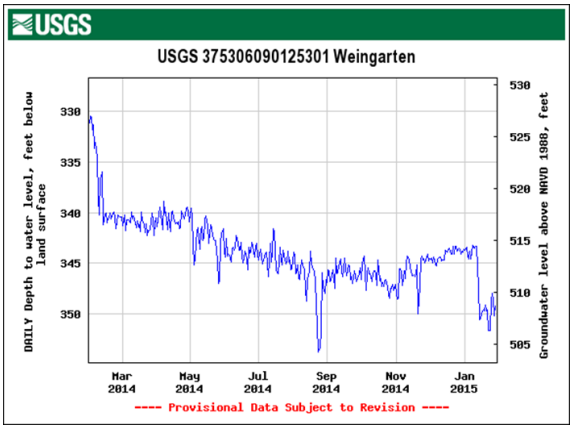
Missouri Annual Average Precipitation (1895-2013)



Groundwater and Stream Monitoring

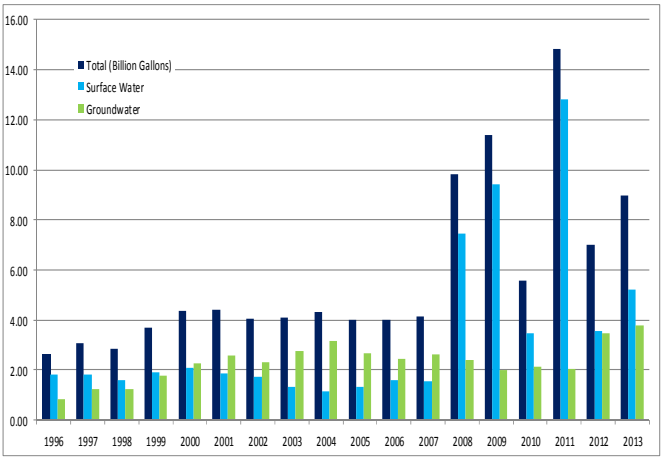
There is one groundwater monitoring well within the watershed as part of the Missouri Observation Well Network. This observation wells is located at Weingarten. Annual average groundwater levels appear to be fairly stable at these wells, but groundwater levels fluctuate several feet throughout the year, with groundwater lows typically occurring in winter and highest groundwater levels occurring in late spring. There are currently four stream gauges in the watershed that measure average stream flow that varies from 29.0 to 86,600 million gallons per day.

USGS Weingarten, MO Groundwater Monitoring Well



Major Water Use Characteristics

A major water user is defined as the capacity to withdraw more than 70 GPM (gallons per minute) or 100,000 GPD (gallons per day). The estimated annual water use is 8.9 billion gallons, of which 95 percent is surface water and 5 percent is groundwater. There are 15 registered major water users present in the basin. Major water use categories for this watershed are predominately dewatering (see the chart on the left). There are 11 public drinking water systems in the watershed and 9 of these systems rely solely on ground water, two systems buy from both surface and groundwater sources. The estimated domestic water use is 620,661 gallons per day.



Our Missouri WATERS

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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:

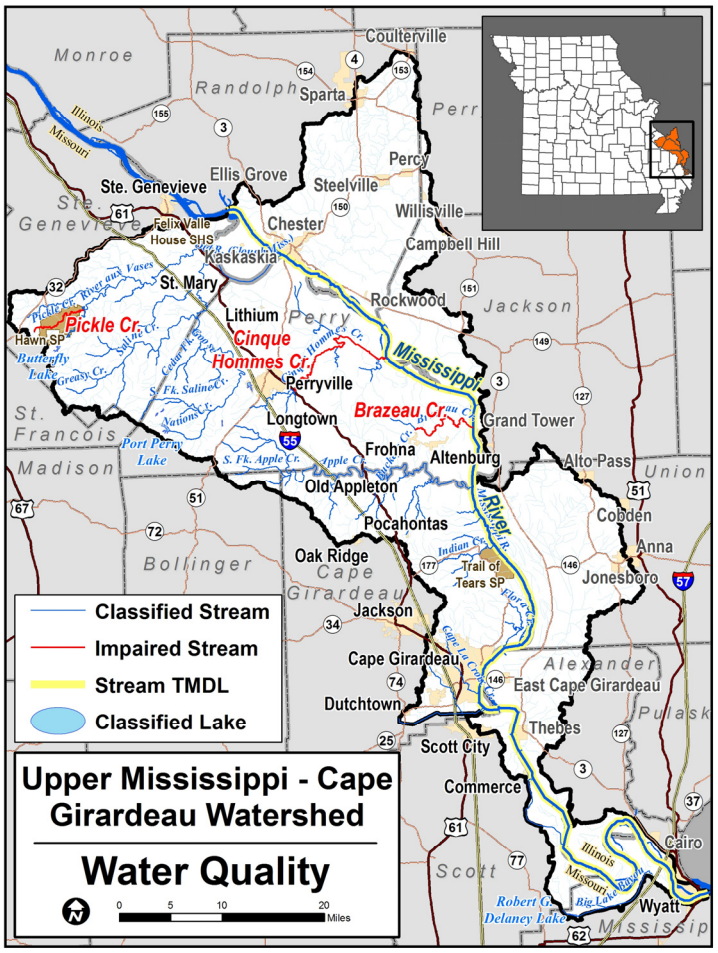
- Source Water Protection Plans for drinking water sources
- Section 319 funding for watershed planning and projects
- Funding to plan for source water protection
- Soil and Water Conservation funding
- State Revolving Fund grants and loans for community drinking water and wastewater improvements

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 such as whole body contact (e.g. swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife.



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.

Our Missouri WATERS

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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

- Monitoring – Lakes and Streams
- Assessment of Data
- Identification of Impaired Waters
- Corrective Plans (TMDLs) – MDNR Developed/ EPA Approved

NPDES:

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

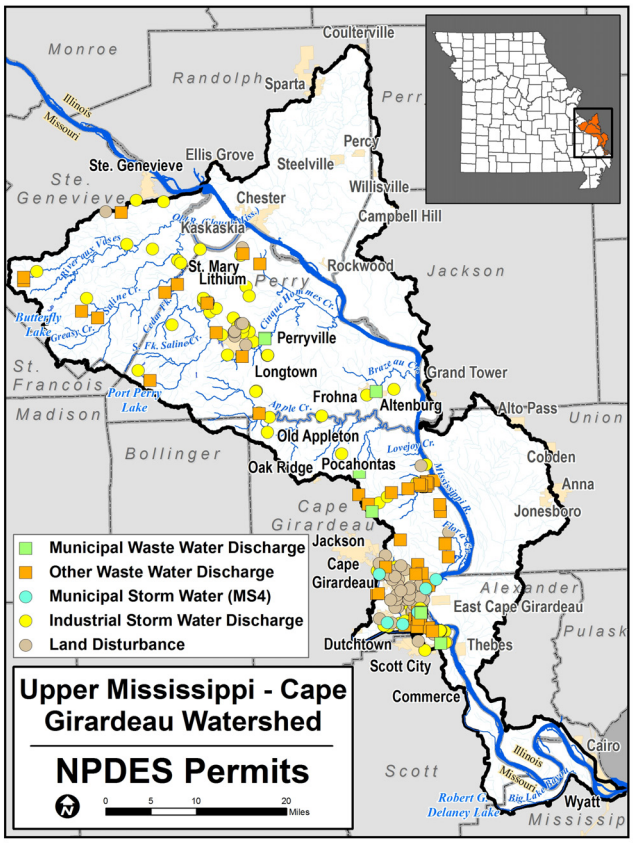
Total Maximum Daily Loads (TMDL)

A TMDL is the mathematical calculation of the amount of a specific 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 water 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, TMDL's have been developed for Cinque Hommes Creek and Brazeau Creek located in Perry County. They are listed as impaired on the 303d list for bacteria (E. coli) from nonpoint sources. Pickle Creek located in Ste. Genevieve County is listed as impaired on the 303d list for low pH caused by atmospheric deposition (acid rain). Impaired uses for these TMDL's include whole body contact and protection of warm water aquatic life. The department has developed pollutant reduction recommendations and measures for all TMDL's. These recommendations are plans, for which actions still can and need to be taken to protect, preserve and enhance these watersheds.

For more information regarding these TMDLs, please visit the links provided:
Cinque Hommes CreekTMDL: http://www.dnr.mo.gov/env/wpp/docs/1781-cinque-hommes-cr-info.pdf
Brazeau Creek TMDL: http://www.dnr.mo.gov/env/wpp/docs/1781-cinque-hommes-cr-info.pdf
Pickel Creek TMDL: http://www.dnr.mo.gov/env/wpp/tmdl/info/1755-pickle-ck-info.pdf

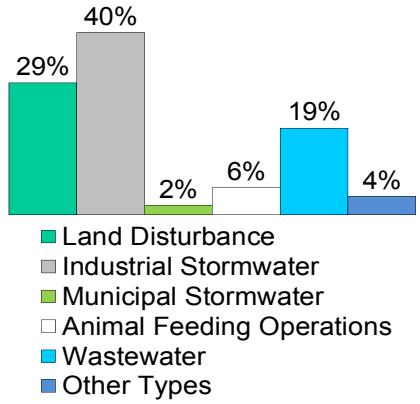
Regulated Point Sources

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, their impacts and upcoming regulations.



There are 176 permitted facilities with a majority being wastewater discharges at 135. There are 75 facilities with general industrial stormwater permits and 50 permitted land disturbances sites. Most of the permitted facilities are located in the Cape Girardeau area. The following graphics illustrate the type and distribution of permitted sites in the Upper Mississippi - Cape Girardeau Watershed.

NPDES Permit Types



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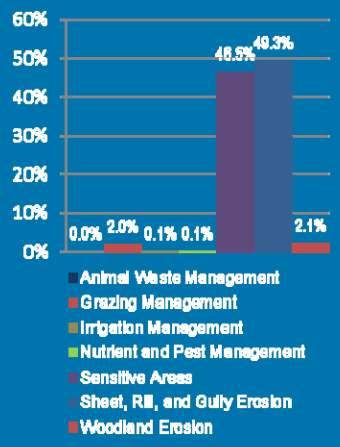
The State of Our Missouri Waters-Current Conditions and Trends

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.

2014 Conservation Practices



Our Missouri WATERS

Local Watershed Improvements

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/)

Stream Team volunteer monitors have provided the department with valuable water quality data from 32 sites throughout the watershed.

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: Perry County Shallow Groundwater Assessment, Perry County Karst Protection, and the Perry County Karst Water Quality Education projects.

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. 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 on 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 grazing management and sheet, rill and gully practices are most prevalent.

Upper Mississippi-Cape Watershed

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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.mpua.org/Training.php; http://www.mpua.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

References

2010 Census data (http://www.census.gov/)

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

Department of Natural Resources' Groundwater Level Observation Well Network Page (http://dnr.mo.gov/env/wrc/groundwater/gwnetwork.htm)

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)

U.S. Army Corps of Engineers, Southwest Missouri Water Resource Study—Phase I. Sept. 2012 (http://tristatewater.org/?page_id=12)

Guinan, Pat, State Climatologist, MU Extension, Missouri Climate Center, (http://climate.missouri.edu/modata.php)

Contact Information for this Watershed

Missouri Department of Natural Resources
Southeast Region
Watershed Coordinator - Paden Grant
2155 N. Westwood Blvd.
Popular Bluff, MO 63901
573-840-9750

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

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