Missouri’s Two Big Rivers - The “Mighty Mississippi and the “Big Muddy”

As streams receive water from their watersheds, they grow larger. Rivers flow into one-another, creating larger systems of moving water. In North America, the largest river system is primarily composed of Missouri’s two big rivers. The Mississippi and the Missouri rivers together form the fourth-longest river in the world, stretching more than 3,800 miles from Montana to the Gulf of Mexico.

To help maintain this water transit system, the U.S. Army Corps of Engineers works diligently to regulate and stabilize the channels. To accomplish this, the rivers have been altered through dams, levees and channelization. For example, a nine-foot deep channel on the Missouri River from St. Louis to Kansas City is controlled by dredging, leveeing, and use of piers. “Traffic lights,” signs, buoys and markers outline the safely navigable “lanes” up and down the river.

Unusual geologic features are common-place on the Missouri and Mississippi rivers. Oxbow lakes, which are large, crescent-shaped bodies of water that were left in low-lying areas when the river changed course across meander loops, decorate the flat flood plains along either side of both rivers. There are also scenic spots where the rivers left tall pinnacles of rock standing like towers. Castle Rock, on the Mississippi is an example of this unique occurrence. Tavern Rock, on the Missouri, is a typical bluff. It is often noted in the history and folklore of the rivers and was visited by Lewis and Clark.

The two rivers share many similarities: Both have swirling currents that suspend a great deal of silt in their waters. Sand and gravel bars appear and disappear as the rivers constantly change or modify their crooked paths. Both rivers are navigable and serve the entire Midwest with a water route for shipping large quantities of raw materials and products and have become a recreational hub of thousands of people for fishing, sailing, water skiing, swimming and motorboat cruising. Together, these two rivers supply nearly 50% of the public drinking water in Missouri. Both rivers also share their powerful destructiveness as they can jam with ice in winter and swell to flood stage any time of year. The US Army Corps

Visitors walked to Tower Rock during a low-water period in the summer of 2012. (Photo from the Southeast Missouri-ian [http://www.semissourian.com/gallery/12793])
of Engineers tries to manage these dangers through the levees or lock and dam systems that are strategically located along the rivers.

**Water Quality in the Mississippi and Missouri River Basins**

Regrettably, the rivers have also served as dumping grounds for waste in the form of old tires, appliances, bottles, drums and other miscellaneous trash. Water pollution can be divided into two basic categories, the first being **point source pollution**. This is pollution characterized by an obvious entry point or source. Examples of point source pollution are chemical spills, discharge from a specific wastewater treatment plant, and discharge from a production factory or a leaking underground storage tank. The encouraging news is that, following the passage of the Clean Water Act in 1972, a significant amount of point source pollution occurring in the river basins have been reduced or even eliminated.

Today the greatest pollution threat to the rivers occurs from **nonpoint source pollution**. Such pollution does not have an easily defined source and results from a wide variety of sources over a large area.

As a result of nonpoint source pollution, many of the river’s fish species have detectable levels of harmful chemicals in their tissue, and the river’s less pollution tolerant species have been in significant decline. An influx of excess nutrients has had a profound effect on the river’s ecosystems. Excess **phosphates** and **nitrates** routinely enter the rivers from agricultural fields, runoff from suburban lawns, and discharges from waste treatment systems. These nutrients are carried downstream where they accumulate and can cause massive increases in algae populations in the Gulf of Mexico. The algae blooms eventually die, resulting in decomposition that reduces the amount of oxygen available in the water for other forms of aquatic life. The entire river system has been impacted by this effect; however, the impacts have been most dramatic in the delta region at the Mississippi river’s terminal discharge. The overabundance of nutrients has created a **hypoxic zone** (without oxygen) in the Gulf of Mexico. While some level of nutrient load is beneficial to the ecosystems of the river delta, an excess of nutrients have begun to harm these ecosystems, creating large areas that fail to support diversity of life.
Examples of Nonpoint Source Pollution

- Pesticide and fertilizer runoff from both farms and urban homes
- Urban storm water runoff contaminated with road salts, lawn chemicals, paints, oils, grease and gasoline
- Overloaded and faulty septic systems
- Household chemicals carelessly dumped down storm drains
- Soil erosion from inappropriate land use practices associated with forestry, agriculture and livestock operations
- Solid waste, chemicals and erosion resulting from poorly managed construction sites

Missouri River—The “Big Muddy”

The Missouri River is one of America’s most important natural resources. This mighty river runs for 2,300 miles from Three Forks, Montana, to St. Louis, where it joins the Mississippi River. These waters continue on for another 1,500 miles to the Gulf of Mexico, making the Missouri/Mississippi River complex the fourth longest river in the world and the third largest drainage basin.

Today, the “Big Muddy” is used by people in many ways ranging from recreational activities such as fishing and boating to more commercial applications such as transportation, drinking water, crop irrigation and receiving waters for municipal and industrial effluents. About half of Missourians, representing more than 3 million residents, get their drinking water from the Missouri River. The economic impact of the Missouri River is estimated at $541 million, with about 15% of that total amount benefiting Missouri in the form of power generation, municipal water supply, navigation and irrigation.

Prior to settlement, the Missouri River contained a diverse ecosystem dependent on abundant braided channels, riparian lands, chutes, islands, sandbars and backwater areas. Today, more than half of the Missouri River has been impounded or channelized. Substantial portions of the river are now largely separated from the flood plain and millions of acres (about 87%) of Missouri’s wetlands have been lost. Such changes have reduced the populations of many fish and bird species, placing some of them on the endangered species list.
Mississippi River - The “Mighty Mississippi”

The first Europeans to see the Mississippi were probably Hernando De Soto and his men in 1541. The Mississippi River’s name is said to derive from the American Indian expression “Mee-see-sea-bee” which means “Father of Waters.” For thousands of years the river and its tributaries have been central to human societies. Like the Missouri River, the Mississippi River is one of America’s most important natural and cultural resources. From its headwaters at Lake Itasca in Minnesota, this great river runs for 2,350 miles to the Gulf of Mexico, representing the third largest drainage basin in the world. The waters of more than 30 states contribute to the river’s flow, draining 40 percent of the United States. These waters provide a wide range of unique aquatic habitats for hundreds of different fish and mussel species. The river and its floodplain also create unique habitats for a diverse range of biological systems. The river’s flood plain is home to an immense variety of wildlife and serves as the primary flyway for more than 40 percent of the nation’s migratory waterfowl.

More than 12 million people live in communities that border the river. The river offers a rich and varied history that is often tied to its role as a primary route for commerce. The river has witnessed the rise and fall of the great mound building societies of early American Indian cultures as witnessed at the Cahokia Mounds on the Illinois side of the Mississippi River [http://cahokiamounds.org/](http://cahokiamounds.org/). The river played a critical role in the settlement of early America as pioneers pushed towards the west and trade routes were established. During the Civil War control of the river was often fought over between the North and South, reflecting its strategic importance. The steamboat era arose on her waters as goods and people were transported up and down the river, promoting the development of many of America’s great cities along the river’s edge.

In the present day the river is as important as ever, as a transportation route for various raw materials and goods with close to 500 hundred million tons of cargo shipped on the river each year. Almost half the grain exported from the United States moves down the river. The river serves as a drinking water source for more than 18 million people living in the Mississippi River basin. The river generates close to $2 million dollars in commercial fishing activity and more than $1.2 billion in recreational activities. The river’s water is also used for crop irrigation and receiving waters for municipal and industrial effluents.

However, human progress has come with consequences. The river we know at present is significantly altered from the river of just a hundred years ago. The river has been impacted by the continued development of its waterway and surrounding lands. The lower river is primarily contained to a set channel, in order to facilitate transportation. The upper river is affected by a series of 27 locks and dams installed along its length. The river faces pollution from a variety of sources, and a significant amount of the river’s wetlands have been lost as a result of both development within the floodplain and the containment of the river to a channel. The river’s terminal delta in the Gulf of Mexico is increasingly impaired by many of the alterations of the river. Invasive species have begun to change the river’s ecosystems with yet to be determined results. As a result of such changes many of the river’s native species are threatened.
More than 120 fish species live in the upper Mississippi River, and more than 20 of those species are listed as threatened or endangered by one or more states. Twenty of the river’s mussel species have become extinct and several more have now been listed as threatened or endangered by state and federal agencies. Historically, as many as 50 mussel species lived in the upper Mississippi River, representing one of the most diverse mussel populations in the world. Sedimentation, pollution and invasive species have severely impacted the river’s mussels. River mussels are indicators of water quality and key links in the river’s food chains. The loss of these native fish and mussels represents a loss of biological diversity and productivity across the entire river basin.

The floodplain forests are another important component of the Mississippi River system. Forests have thrived in the rich soils deposited by the river for thousands of years. **Riparian zones** are areas of lush growth of water tolerant plants such as sycamore, willow, cottonwood and sedges that grow along the river’s edge. Such floodplain forests were utilized heavily in the 1800s for lumber and firewood. Steamboats required huge quantities of split wood to fuel the boilers of the boats’ engines. As a result, most of the trees were cut from the river’s islands and banks. Sections of the river basin were also cleared of forest to support development. These actions resulted in changes to the forest’s **diversity** and density.

Intact riparian zones provide a buffer zone around waterways. Riparian areas can reduce the effects of poor watershed practices by slowing down the flow of water and helping reduce erosion. The floodplain forests help to filter out sediments, chemicals and nutrients associated with surface water runoff. The forest production of leaf litter yields organically rich soils that support active microbial populations of bacteria and fungi that are capable of naturally treating many of the contaminants that find their way into surface waters. The soils of intact riparian zones also hold water and release it slowly, aiding substantially in flood control. Floodplain forests shade waterways reducing water temperatures and in turn increasing dissolved oxygen levels. Riparian zones also offer substantial plant and animal habitat.

Overall, the floodplain forests of the Mississippi River are still in decline as a result of continued agricultural and urban development. Many of the islands that were once associated with the river prior to channelization have disappeared and the forests they contained eliminated. Efforts to mitigate some of these changes and restore the floodplain forests are increasing as the benefits of these systems are realized.

**Glossary of Terms**

**Big Muddy:** Nickname for the Missouri River because of its heavy load of silt.

**Channelization:** The reconstruction of a natural waterway so it flows in a different path, generally narrowing the river and making it deeper.

**Chutes:** On rivers and streams, a secondary channel around an obstacle like an island.
**Clean Water Act:** Primary federal law in the United States governing water pollution passed by Congress in 1972.

**Dam:** A barrier constructed across a waterway to control the flow or raise the level of water.

**Diversity:** The number and variety of species found within a specified geographic region.

**Flood plain:** A relatively level area on both sides of the stream channel that carries excess water the channel cannot handle during a flood. Allowing excess water to spread out reduces the floodwater’s speed, reducing damage downstream.

**Hypoxic Zone:** Areas in the ocean of such low oxygen concentration that animal life suffocates and dies and as a result are sometimes called "dead zones."

**Levee:** An embankment built to prevent the overflow of a river.

**Lock and Dam Systems:** The system that enables water vessels to move from one section or body of water at one elevation to another section of water at another elevation through a series of steps in which water is forced in or drained out of a contained area to raise or lower the vessel.

**Mighty Mississippi:** One of the nicknames for the Mississippi River, also known as Muddy Mississippi and Old Man River.

**Nitrates:** A chemical compound that contains oxygen and nitrogen that is used in fertilizer to increase plant productivity.

**Nonpoint source pollution:** A source of contamination that cannot be traced to a distinct place of origin.

**Nutrient load:** The quantity of nutrients in an ecosystem in a given period of time.

**Oxbow lake:** A crescent-shaped lake formed when a bend of a stream is cut off from the main channel.

**Phosphates:** A compound that has phosphorus in it that is used in fertilizer products that help plants grow.

**Point source pollution:** A source of contamination that can be traced to a distinct place of origin, like a pipe or ditch or drain.

**Riparian zone/corridor:** The land bordering a stream channel that begins at the top of the stream banks. A riparian corridor at least 100 feet wide and full of plants helps protect the stream ecosystem.

**Silt:** Sand, soil, mud, etc., carried by flowing water before settling to the bottom of a river, pond, lake or ocean.

**Three Forks, Montana:** The town at the headwaters of the Missouri River.

**Wetland:** Land or areas (marshes or swamps) that are often covered intermittently with shallow water or have water saturated soil.

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**For more information:**
DNR Youth Education and Interpretation
P.O. Box 176
Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 522-2656 office
e-mail: naturalresources.ed@dnr.mo.gov
http://dnr.mo.gov/education

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