Summary of Available Water Quality Assessments of the Lower Mississippi River

Lower Mississippi River Conservation Committee
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September 2014

Lower Mississippi River Conservation Committee Member Agencies:
Arkansas Department of Environmental Quality
Arkansas Game and Fish Commission
Kentucky Department for Environmental Protection
Kentucky Department of Fish and Wildlife Resources
Louisiana Department of Environmental Quality
Louisiana Department of Wildlife and Fisheries
Mississippi Department of Environmental Quality
Mississippi Department of Wildlife, Fisheries and Parks
Missouri Department of Conservation
Missouri Department of Natural Resources
Tennessee Department of Environment and Conservation
Tennessee Wildlife Resources Agency

1 - Executive Summary

The Lower Mississippi River Conservation Committee (LMRCC) is a coalition of natural resource and environmental quality agencies from the six lower river states along with federal cooperating agencies and committed non-governmental organizations. The U.S. Fish and Wildlife Service provides a coordinator and support. The LMRCC's mission is to "Promote the restoration and wise use of the natural resources of the Lower Mississippi River through cooperative efforts involving planning, management, information sharing, public education, advocacy and research." Understanding the water quality condition of the river and the support of beneficial uses is fundamental to that mission. Where uses are threatened or not achieved, resource managers need to know the causes so protection and/or restoration measures can be planned and implemented. Critical to protection and restoration efforts is the need to benchmark and track the chemical, biological, bacteriological and physical properties of the river, including sediments, using robust measures of ecosystem health. Documenting the availability of water quality assessment data and information is the focus of this summary report.

Each of the six lower river states has authority to set water quality standards and conduct water quality assessments. Each state has their own water quality standards applicable to the Mississippi River and has included assessments of the river in their assessment reports.

The LMRCC states employ various methods to assess the river's water quality and support of beneficial uses. The bases for assessments include, but are not limited to: the use of water quality monitoring data, fish tissue data and associated advisories, dredging data, and spill data. In general, availability and use of water quality monitoring data is limited.

The LMRCC recommends the dedication of additional resources to the collection of data sets used for water quality assessments of the Mississippi River. Additionally, these assessments must have clear and well-defined objectives. The LMRCC, however, understands the resource challenges of each state and further recommends efforts be focused on leveraging resources. Through production of this Lower Mississippi River water quality assessment summary, the LMRCC has provided a starting point for states to use in understanding data availabilities and gaps.

2 - Introduction

The Mississippi River is this country's defining inland hydrologic feature. It borders on 10 states and drains parts of 31 states and two Canadian provinces. Included in the river's drainage basin are more than 72 million residents, a wide range of industry, and some of the most productive agricultural lands anywhere. Beyond that, the Mississippi region is widely recognized not only for wildlife and outdoor recreation, but also as the inspiration for literature, art and music. The river's importance to our nation cannot be overstated.

The term "Lower Mississippi River" refers most commonly to the free-flowing portion of the river downstream from its confluence with the Ohio River, at Cairo, Illinois, 954 river miles from the Gulf of Mexico. That's how "Lower Mississippi River" and "lower river" are used here.

In 1996, two years after its formation, LMRCC published as its December newsletter a "Water Quality Issue" which included a state-by-state summary of threats facing the river and a discussion of state monitoring programs and results. That document is available upon request from LMRCC.

This project was undertaken to present the condition of the Lower Mississippi River as reported under Title 3 of the Clean Water Act by the six lower river states. State assessments include the Mississippi River itself and major tributaries at their junction with the river. Additionally, information on water quality assessments of other agencies is presented in summary form.

3 - The Processes of Water Quality Assessment

3.1 Water Quality Standards

The Federal Water Pollution Control Act, more commonly referred to as the "Clean Water Act," requires states, subject to EPA oversight, to take the primary role both in setting goals for the nation's waters and in assessing waters to determine the extent to which those goals are achieved. These goals, called "water quality standards," are based on the beneficial uses of the waters to be protected, such as public water supply, protection of fish and aquatic life, navigation and use by wildlife, recreation, agriculture and industry. States vary in how they describe and assign uses to their waters, and no two of the lower river states are exactly alike.

For each use, states adopt criteria—numeric or narrative descriptors of the chemical, physical, biological, or bacteriological conditions—that good science finds necessary to protect the waters so classified. "Antidegradation," the third part of water quality standards, describes how uses are to be protected from activities that would lower the quality of waters, with special protection for certain waters.

States are required to review, and revise as needed, their standards through an open process at least every three years, and revisions to those standards are then subject to EPA review. Challenges by EPA or by other interested parties to state water quality standards are not uncommon.

The following identifies for each lower river state the body responsible for adoption of water quality standards and the website where its standards may be found:

3.1.1 Arkansas – The Arkansas Pollution Control and Ecology Commission sets water quality standards. http://www.adeq.state.ar.us/commission/default.htm

3.1.2 Kentucky – Standards are proposed by the Energy and Environment Cabinet, subject to legislative approval. http://www.lrc.ky.gov/kar/401/010/031.htm
Note: Kentucky has designated the Mississippi River as Outstanding State Resource Water (OSRW) from river mile 942.3 to 947.0 and from 957.1 to 959.1 because of the presence of federally listed species, *Scaphirhynchus albus* (Pallid Sturgeon) and *Potamilus capax* (Fat Pocketbook Pearly Mussel).

3.1.3 Louisiana – Standards are adopted by the Louisiana Department of Environmental Quality, subject to legislative approval.
http://www.deq.louisiana.gov/portal/Portals/0/planning/regs/title33/33v09-201211.pdf

3.1.4 Mississippi – Standards are adopted by the Mississippi Commission on Environmental Quality.
http://www.deq.state.ms.us/mdeq.nsf/pdf/legal_11Miss.Admin.CodePt.6Ch.2./$File/11%20Miss.%20Admin.%20Code%20Pt.%206%20Ch.%202..pdf?OpenElement

3.1.5 Missouri - Standards are proposed by the Department of Natural Resources and adopted by the Missouri Clean Water Commission.
http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf

3.1.6 Tennessee – Standards are promulgated by the Board of Water Quality, Oil and Gas.
http://www.tn.gov/sos/rules/1200/1200-04/1200-04-03.20110531.pdf and
http://tn.gov/sos/rules/1200/1200-04/1200-04-04.pdf

3.2 Water Quality Assessment

"Assessment" is the process of monitoring waters and determining their quality based on comparing chemical, physical, bacteriological and/or biological measurements to water quality standards. When the criteria for a particular use are met, that water body is assessed as "supportive" of that classified use. When the criteria are not met for a specified magnitude, duration and/or frequency, the use is said to be "impaired" or "not being supported." Waters can support some uses while being impaired for others; for example, a stream may not have sufficient oxygen for fish, but may be perfectly suitable for swimming.

The Clean Water Act requires that states assess and report the quality of their waters in a document called by its section number in the law: 305(b). A separate part, Section 303(d), requires states to develop, through an open process, a list of all their waters that have been assessed as not fully supporting classified uses. Both reports are required on even-numbered years. Arkansas, Kentucky, Louisiana and Missouri each combine their impaired waters lists, the 303(d) reports, with their 305(b) reports to create "Integrated Reports."

Those state assessment reports can be seen at the following websites:

3.2.1 Arkansas
http://www.adeq.state.ar.us/water/pdfs/draft_2012_integrated_water_quality_monitoring_and_assessment_report.pdf

3.2.2 Kentucky
http://water.ky.gov/waterquality/Pages/IntegratedReport.aspx

3.2.3 Louisiana
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2012IntegratedReport.aspx.

3.2.4 Mississippi
http://www.deq.state.ms.us/mdeq.nsf/page/fs_surfacewaterqualityassessments?opendocument
http://www.deq.state.ms.us/mdeq.nsf/page/twb_total_maximum_daily_load_section?opendocument

3.2.5 Missouri
http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm

3.2.6 Tennessee
http://www.tn.gov/environment/water/docs/wpc/2012_305b.pdf
http://www.tn.gov/environment/water/docs/wpc/2014-draft-303d-list.pdf

3.3 Assessment Units

Water quality data and assessment status are indexed to reaches or sections of waters. On smaller streams it is common for a reach to begin or end at a convergence or a change in grade or riparian land use—anywhere stream conditions might be expected to change. On the Mississippi River, assessment units are typically defined by political boundaries and by hydrology and hydromodification, such as levees. In most instances, these are USGS hydrologic units.

Assessment units for the lower river states are as follows:

3.3.1 Arkansas– Arkansas reported 22 separate assessment units, in three hydrologic unit codes or "HUCs" following the hydrologic unit map developed by USGS.
(see http://water.usgs.gov/GIS/huc.html)

All segments have the same classified uses: Primary and Secondary Contact Recreation, Domestic, Industrial and Agricultural Water Supply, and Perennial Delta Fishery.

3.3.2 Kentucky – Kentucky's entire 66.6-mile section of the Mississippi River is in a single assessment segment, GNIS #517524-01. This section is classified for Warmwater Aquatic Habitat, Primary Contact Recreation and Secondary Contact Recreation.

Kentucky has assessment units for its three major tributaries at their junction with the Mississippi River. All are classified for Warmwater Aquatic Habitat, Primary Contact Recreation and Secondary Contact Recreation.

3.3.3 Louisiana - Louisiana has 14 subsegments or assessment units located along and in the Mississippi River basin in the state of Louisiana. All 14 subsegments are classified as Primary Contact Recreation and Secondary Contact Recreation. Thirteen are Fish and Wildlife Propagation Use, while one is Limited Aquatic Life and Wildlife Use. Three subsegments are Drinking Water Supply and one subsegment near the coast is classified as Oyster Propagation.

3.3.4 Mississippi – According to MS water quality standards, the Mississippi River is classified for Fish and Wildlife use and should be suitable for aquatic life use, fish consumption, and secondary contact recreation. The Mississippi Department of Environmental Quality does not have any current assessments on the Mississippi River because water quality data of sufficient quality and quantity do not exist to assess the designated uses. However, where data of sufficient quality and quantity exist, MDEQ does assess waters of the state according to the Clean Water Act Section 305(b) guidance. Waters that do not meet designated uses are added to the active Clean Water Act Section 303(d) List of Impaired Waters. Although MDEQ does not have any current assessments on the Mississippi River, there are available assessments on tributaries to the Mississippi River. These assessments are outlined below:

- Segment 950712: **Yazoo River** from MWS Boundary 9195 to Belzoni, MS. This segment was assessed as impaired for Fish Consumption and a TMDL was completed for DDT/Toxaphene.
- Segment 107811: **Big Black River** from Confluence with Bear Creek to confluence with Clear Creek. This segment was assessed as impaired for Aquatic Life Use. The causes of impairment were identified as Chemical Oxygen Demand, pH and Total Organic Carbon This segment is scheduled for TMDL development.
- Segment 602823: **Bayou Pierre** from Confluence with Storm Creek to Confluence with Unnamed Tributary to Bayou Pierre at MWS 6029 boundary . This segment was assessed as impaired for Aquatic Life Use. The cause of the impairment was identified as pH and this segment is scheduled for TMDL development.
- Segment 607812: **Homochitto River** from MWS 6074 boundary to confluence with Dry Creek. This segment was assessed as attaining Aquatic Life Use Support.

3.3.5 Missouri – Missouri has a single assessment unit of its section of the river, Waterbody Identification Number (WBID) 3152. The designated uses for this segment of the river are Protection of Warm Water Aquatic Life and Human Health – Fish Consumption, Drinking Water Supply, Industrial, Irrigations, Live Stock and Wildlife Watering, Secondary Contact Recreation, and Whole Body Contact Recreation - Level B. This information is located in Appendix H of Missouri's water quality standards (http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf).
It is also available from on-line Water Quality Standards Searchable database (http://www.dnr.mo.gov/mocwis_public/waterQualityStandardsSearch.do).

3.3.6 Tennessee – Tennessee has five assessment units on the river itself as well as the assessment units for major tributaries Obion River, Hatchie River, Loosahatchie River, Wolf River, and McKellar Lake at their junction with the Mississippi. The Mississippi River units are, like Arkansas, based on USGS HUC accounting units.

All of Tennessee's assessment units on the Mississippi are classified for Livestock Watering and Wildlife, Irrigation, Recreation, and Fish and Aquatic Life. In addition, all except one are classified for Domestic Water Supply.

Tennessee has 5 major tributaries at their junction with the Mississippi River. All five of the tributaries at the junction are classified for Livestock Watering and Wildlife, Irrigation,

Recreation, and Fish and Aquatic Life. The Hatchie River is classified for Industrial Water Supply and Domestic Water Supply, in addition to those uses.

3.4 Sources of Data and Information Used in Assessments

In addition to data the states produce through their own monitoring programs, EPA regulations require that states assemble and evaluate existing and readily available data from other sources including federal, state and local government, academic institutions, non-governmental organizations, permittees, citizen groups—anyone who can contribute to what is known about the conditions of the state's waters. States' use of data from outside sources is conditional on documentation of accepted practices in all phases of monitoring (field instrumentation, sample collection, laboratory methods, data management and reporting) that produce the quality of data needed for assessments.

Some external sources of data generally considered by states may include:

- U.S. Army Corps of Engineers
- U.S. Geological Survey
- U.S. Environmental Protection Agency
- U.S. Forest Service
- National Park Service
- Ohio River Sanitation Commission (ORSANCO)
- Local government, sewer districts, utility districts
- NGOs and citizen groups

3.5 Water Quality Assessments and TMDLs

States' lists of impaired and threatened waters, the 303(d) lists, identify the suspected source(s) of impairment, if known, for each listing. For waters impaired by pollutants, such as chemicals, sewage or silt, states must develop recovery plans that allocate the allowable loading of pollutants to all the various sources in the watershed. These plans are called "Total Maximum Daily Loads" and once developed and approved by EPA they are the basis for limits that will apply to regulated discharges, such as wastewater treatment plants. TMDLs also establish targets for unregulated sources, such as agricultural runoff. Waters impaired by sources other than pollutants, such as impoundments or channel modifications, are not required to have TMDLs.

Three TMDLs have been developed for the lower river. In 2006, EPA approved Missouri's TMDL for chlordane and PCBs in the portion of the Mississippi River that borders 16 Missouri counties. This information can be found on Missouri's TMDL website:
http://dnr.mo.gov/env/wpp/tmdl/0001-1707-3152-mississippi-r-record.htm
Tennessee has a TMDL approved for chlordane, dioxin, and PCBs in the Mississippi River Watershed that was approved in 2008. The TMDL is at:
http://www.tn.gov/environment/water/docs/tmdl-epa-approved/mississippi_pcb.pdf
Louisiana has a TMDL for fecal coliform bacteria in several subsegments of the Lower Mississippi River and Passes. It was approved in 2010 and can be found at:
http://www.epa.gov/waters/tmdldocs/ms_riv_3fc_tmdlsfinal_mar28_2011.pdf

3.6 Public Advisories Concerning Recreational Contact or Fish Consumption

It has long been the role of government to protect public health by warning citizens of known risks. Concerning surface waters, public health and environmental protection agencies use information such as bacteriological and chemical monitoring data, fish tissue analysis, overflow and spill reports, and epidemiological studies to warn the public about risk that may be associated with water contact or ingestion, as well as from consumption of contaminated plants or animals from waters.

The lower river states vary considerably in their assignment of authority to issue water advisories. A summary for each of the lower river states follows:

3.6.1 Arkansas - Arkansas Health Department sets fish consumption advisories. There are no such advisories on that states' section of the Mississippi.

3.6.2 Kentucky - Those agencies involved in joint issuance of fish consumption advisories in Kentucky are the Division of Water, the Department for Public Health and the Department for Fish and Wildlife Resources. The Division of Water and the Department for Public Health jointly issue swimming advisories for Public Health. On the basis of mercury contamination, KY has issued a statewide fish consumption advisory (one meal per week for the sensitive group consisting of children and pregnant women or women of child bearing age). Although not based on any direct monitoring from the state's section of the Mississippi River, that water is included.

3.6.3 Louisiana – Louisiana uses a multi-agency group consisting of Agriculture and Forestry, Health and Hospitals, Wildlife and Fisheries, and Environmental Quality to establish advisories concerning fish consumption or primary/secondary contact. There are no advisories for Louisiana's part of the Mississippi.

3.6.4 Missouri – The Missouri Department of Health and Senior Services (MDHSS) has issued fish consumption advisories for the Mississippi River. The DHSS has issued a general statewide fish consumption advisory for mercury, stating consumption should be limited to one meal per month for largemouth bass, spotted bass, small mouth bass and walleye for sensitive populations (e.g. pregnant women, women of childbearing age, nursing mothers, and children younger than age 13). Additional MDHSS fish consumption advisories for both Mississippi and Missouri Rivers due to PCB's, chlordane, and mercury contamination are as follows:

- shovelnose sturgeon (all sizes, excluding eggs) should be limited to one meal per month
- sturgeon eggs should not be eaten at any time.
- Flathead, channel, and blue catfish (greater than 17 inches) should be limited to one meal per week.
- Common carp (greater than 21 inches) should be limited to one meal per week

There are no recreational advisories issued for Missouri's section of the river.

Annually, the DHSS, Missouri Department of Conservation, Missouri Department of Natural Resources, along with other agencies coordinate monitoring activities to evaluate the amount of

contaminants in Missouri sport-caught fish. The current fish consumption advisories for Mississippi River can be found at http://health.mo.gov/living/environment/fishadvisory/index.php.

3.6.5 Mississippi – Fish Consumption advisories are issued by the Mississippi Fish Advisory Task Force, made up of the Mississippi Department of Environmental Quality, the Mississippi Department of Health, the Mississippi Department of Wildlife Fisheries and Parks, and other stakeholders within the state. The Task Force has issued a regional consumption advisory for the Yazoo River Basin in the area known as the Delta, for legacy pesticides DDT and Toxaphene. There are no advisories issued by the task force on the Mississippi River in Mississippi. For more information on Mississippi Fish Consumption advisories, please refer to the website: Mississippi Fish Advisories (http://www.deq.state.ms.us/Mdeq.nsf/page/FS_Mississippi_Fish_Advisories?OpenDocument).

3.6.6 Tennessee – The Tennessee Department of Environment and Conservation has authority to issue advisories regarding recreational use, including non-commercial fishing, in the state's waters. There is an advisory for fish consumption from the Mississippi state line up to a point just below Meeman-Shelby State Park. This is based on chlordane, other organics and mercury. The Tennessee Wildlife Resources Agency regulates commercial fishing, and there is a ban on commercial fishing in this same water. The TDEC advisory also applies to the lower portion of the Memphis-area tributaries to the Mississippi: Loosahatchie River, Wolf River and McKellar Lake.

3.7 Limitations of Water Quality Assessments

This document uses the term "assessment" in referring to the finding by states of support or non-support of classified uses in their waters. As stated above, those are threshold determinations, meaning states report support, partial support or non-support based on water quality standards. The states vary in how they report the degree to which conditions are better or worse than the standard in the Clean Water Act assessments. Those interested in the condition of the river should consider not only the assessment status as reported but also the information underlying those assessments, as well as other available information in discussing the condition of the Lower Mississippi River.

4 - Summary of State Assessments

4.1 Arkansas – The Arkansas Department of Environmental Quality does not presently monitor the Mississippi River and no portion of the river in that state is considered to be assessed. Four stations were monitored years ago by the predecessor agency, the Arkansas Department of Pollution Control and Ecology, but the last of those sites was discontinued in April 1992.

The state does regular monitoring on major tributaries, Arkansas River (ARK0020), the St. Francis River (FRA0013), and the L'Anguille River, (FRA0010).

4.2 Kentucky – Kentucky has not monitored the Mississippi River in the past. Efforts are being made to establish an ambient station on the Mississippi River at Columbus-Belmont State Park in Hickman County.

Kentucky has assessed Mayfield Creek at its junction with the Mississippi River. Biological, bacteriological and water chemistry data at the station indicate that Mayfield Creek does not support the Warmwater Aquatic Habitat use because of other flow regime alterations and habitat conditions. Fish tissue has been collected in the lower portion of Bayou de Chien and it has been assessed as partially supporting the Fish Consumption use because of mercury levels in the collected fish. The lower portion of Obion Creek has been assessed as not supporting Warmwater Aquatic Habitat and Primary Contact Recreation uses because of sedimentation, habitat conditions, other flow regime alterations and *Escherichia coli*.

4.3 Louisiana – Louisiana has three routine active ambient water quality monitoring sites on the lower river and has historical data for other lower river ambient sites and special project monitoring sites. The Louisiana 303(d) list in the 2012 Integrated Report listed five subsegments within the Mississippi River Basin in Louisiana as impaired. These subsegments include 1) 070401 Mississippi River Passes-Head of Passes to Mouth of Passes, includes all passes in the birdfoot delta (Estuarine) for turbidity; 2) 070503 Capitol Lake for dissolved oxygen; 3) 070504 Monte Sano Bayou for lead, dissolved oxygen and fecal coliform; 4) 070505 Tunica Bayou for fecal coliform; and 5) 070601 Mississippi River coastal bays and gulf to 3-mile limit for fecal coliform.

4.4 Missouri –
The lower Mississippi River is not actively monitored nor included in Missouri's ambient water quality monitoring network. The ambient monitoring network does collect water quality data from St. Johns Ditch (a tributary of the Mississippi River) at Henderson Mound. Water quality data is collected from St. Johns Ditch for field measurements (including bacteria), nutrients (9 times per year), trace metals and major ions (3 times per year), total residue (6 times per year), and pesticides (6 times per year). In 2006, St. Johns Ditch was listed as impaired for bacteria due to rural nonpoint sources and urban runoff/storm sewers, and mercury in fish tissue due to atmospheric deposition.

Overall, there is a limited amount of water quality data for the mainstem of the Mississippi River for this lower reach. In 2002, Missouri listed the Mississippi River as impaired for PCBs and Chlordane in fish tissue. A TMDL was written and approved for this impairment in 2006. Since the 2002 listing, Missouri's assessment criteria have been updated. During the more recent assessment cycles, fish tissue data was obtained from the Tennessee Department of Environment and Conservation, Missouri Department of Conservation, and United States Environmental Protection Agency, Region 7. Chlordane (sum of isomers) and PCBs in fish tissue in the lower section of the lower Mississippi River were less than the "no consumption" advisory level that has been established by the MDHSS. Although the Missouri Department of Natural Resources has assessed the lower section of the Mississippi River as unimpaired by chlordane and PCB's in fish fillets, Missouri anglers should still follow the fish consumption advisories recommended by MDHSS.

4.5 Mississippi – The Mississippi Department of Environmental Quality assesses major tributaries, but not the river itself.~~.~~ Prior to 2006, limited assessments on the river were provided in Section 305(b) reports; however, MDEQ's 2006 Section 303(d) list explained that the agency considers the Mississippi River, and decisions concerning listing, delisting and TMDLs, to be at national scale, properly belonging to EPA Regions 4 and 6.

4.6 Tennessee – Historically, Tennessee conducted semiannual chemical and bacteriological monitoring near Memphis at River Mile 724.6. That monitoring ended in the late 1990s and water column chemistry was not the basis for a determination of impairment. The state's 2012 assessment reports its Recreation use to be impaired for all five units along the Mississippi based on fish tissue data. The state considers consumption of fish tissue to be part of the Recreation use, and in the past found some species contaminated by chlordane, dioxin (including 2,3,7,8 – TCDD), and PCBs in all sections of the river. The state attributes this condition to contaminated sediments. Additionally, in TN0801010001_1000, the state identified mercury from atmospheric deposition as a contaminant of fish tissue. Dredging impacts to habitat were listed as the cause of the Fish and Aquatic Life use being impaired in all five Mississippi River assessment units.

Tennessee's major tributaries are identified as having a number of impairments. At its junction with the Mississippi, the Obion River is impaired for Recreation by unknown sources of bacteria and for Fish and Aquatic Life due to habitat alteration and siltation from channelization and non-irrigated crop production. The Hatchie River is found fully supporting all uses. The Recreation use of each of the Memphis-area tributaries to the Mississippi (Loosahatchie River, Wolf River and McKellar Lake) was impaired by chlordane, dioxin (including 2,3,7,8-TCDD) and PCBs from contaminated sediments and mercury from atmospheric deposition. Recreation in the Wolf River and McKellar Lake was further impaired by bacteria from urban stormwater runoff plus sanitary sewer overflows in the case of McKellar Lake. The Fish and Aquatic Life use is impaired in the Loosahatchie River by phosphorous in urban stormwater and habitat alteration and siltation from channelization. In the Wolf River, that use is also impaired by those causes plus lead from historic hazardous waste sites. In McKellar Lake, the Fish and Aquatic Life use is impaired by nitrogen and oxygen deficit caused by urban stormwater runoff and by siltation from dredging.

5 - The Condition of the Lower Mississippi River

5.1 State Assessments

As the summaries above illustrate, the lower river states, when they assess the river, use a variety of mechanisms. While all states monitor and assess tributaries, five of the six states have no active ambient monitoring on the river itself. The sixth state, Louisiana, monitors the very lowest portion of the river.

Arkansas, Kentucky and Mississippi do not assess their portions of the river. Missouri's assessment document currently reports no impairment for the Lower Mississippi River. Louisiana's 303(d) list outlines impairments to passes, bayous and coastal areas. Tennessee reports its criteria for Recreation to be violated over its entire length by organics in fish tissue, with mercury adding to that in one assessment unit. Criteria for Fish and Aquatic Life are reported to be violated by dredging impacts on habitat.

5.2 National Research Council

The National Research Council (NRC) prepared a report in 2008 titled MISSISSIPPI RIVER WATER QUALITY AND THE CLEAN WATER ACT: Progress, Challenges and Opportunities, available at http://www.nap.edu/catalog.php?record_id=12051. The NRC report provides a comprehensive, including historical, review of river water quality, factors that affect water quality, and the evolution of the Clean Water Act and its impact on water quality programs affecting the river.

The NRC report suggests that data sets are lacking across the states to allow for a coordinated, comprehensive assessment of the river:

> "Although there are some important federally sponsored efforts in monitoring Mississippi River water quality—such as those conducted by the U.S. Army Corps of Engineers and the U.S. Geological Survey, especially on the upper river—there is no single water quality monitoring program or central water quality database for the entire length of the Mississippi. Thus, there are limited amounts of water quality and related biological and ecological data for the full length of the Mississippi River, especially the lower river. This limited amount of data inhibits evaluations of water quality problems along the river and into the Gulf of Mexico, which in turn inhibits efforts to develop, assess, and adjust water quality restoration activities. Moreover, the limited attention devoted to monitoring the river's water quality is not commensurate with the Mississippi River's exceptional socioeconomic, cultural, ecological, and historical value. The lack of a centralized Mississippi River water quality information system and data gathering program hinders effective implementation of the Clean Water Act and acts as a barrier to maintaining and improving water quality along the Mississippi River and into the northern Gulf of Mexico (p. 5)."

5.3 U. S. Environmental Protection Agency (EPA)

EPA does not collect any water quality samples on the Lower Mississippi River on a regular basis, but the EPA through the National Rivers and Stream Assessment Program (NRSA) funded limited monitoring activities, including some state participation, along the lower river to conduct a chemical, biological and ecological assessment in 2008. This sampling effort was the first multi-state monitoring along the lower river and was similar to an earlier assessment of the Upper Mississippi River (the area of the Mississippi River north of its junction with the Ohio River). The U.S. Geological Survey state water science centers (Arkansas and Louisiana), state departments of environmental quality and state wildlife and fisheries agencies collected the environmental samples and shipped them to EPA-approved laboratories. A draft report is available at: http://water.epa.gov/type/watersheds/monitoring/aquaticsurvey_index.cfm

5.4 U.S. Army Corps of Engineers

The Corps has limited historical water quality chemistry data for the Mississippi River. However, the Corps collects extensive suspended-sediment and water-discharge data for the Lower

Mississippi River. Primary suspended-sediment collection sites include the Mississippi River at Memphis, Vicksburg, and Tarbert Landing, the latter which has been monitored for more than 60 years. Suspended-sediment data is important for water quality assessments in that many of the chemicals of interest such as trace metals, phosphorus, organochlorine pesticides, and other hydrophobic organic compounds are concentrated on sediments. Suspended sediment also plays a key role in remediation of coastal land loss in Louisiana.

5.5 U.S. Geological Survey

The U.S. Geological Survey (USGS) has conducted numerous studies along the Lower Mississippi River and has operated a water-quality monitoring network along the Lower Mississippi River since 1973 as part of the National Stream Quality Accounting Network (NASQAN) Program. NASQAN operates twenty-six stations throughout the Mississippi drainage basin but only four stations along the Lower Mississippi River. One site is located in Mississippi and the other three are located in Louisiana. The four stations are the Lower Mississippi River at Vicksburg, MS River Mile 437 [(RM) Above Head of Passes (AHP)]; at St. Francisville, LA (RM 265 AHP); at Baton Rouge, LA (RM 230 AHP); and at Belle Chasse, LA (RM 74AHP). St. Francisville is the oldest site, being in continuous operation since 1973; Belle Chasse is the second-oldest site, dating back to 1977. Vicksburg and Baton Rouge are relatively new sites, established in 2000.

The NASQAN program samples from Minnesota to Louisiana, studying the impacts of different hydrologic events, such as floods and droughts, on water quality. Currently, NASQAN monitors major ions, nutrients, trace metals, dissolved organic carbon, mercury, herbicides, bacteria, discharge and suspended sediment. The USGS also operates real-time continuous monitoring gages at Vicksburg and Baton Rouge that include nitrate, dissolved oxygen, pH, specific conductance and water temperature measurements. Nutrients, especially nitrate and phosphorus, have been detected at elevated levels in the Lower Mississippi River NASQAN samples. Atrazine, a herbicide used extensively in corn production and lawn care, is one of the most commonly detected organic compounds in the Lower Mississippi River. Although atrazine is rarely detected above drinking water standards (an annual average of 3.0 ug/l based on quarterly samples), it occurs in a majority of the samples collected at the Lower Mississippi River NASQAN stations. Information about the NASQAN program is available at: http://water.usgs.gov/nasqan/.

The USGS also has conducted several water-quality studies of the entire Mississippi River, starting in Minnesota and extending south all the way to near its confluence with the Gulf of Mexico. Water chemistry and suspended sediment were collected using a Lagrangian sampling scheme (sampling the same slug of water from the beginning to the end of the sampling trip). This sampling approach allowed for the comparison of water quality conditions along the course of the river. The study was one of the first to identify caffeine concentrations in Mississippi River downstream of major metropolitan areas and atrazine as one of the most commonly detected organic compounds in the river. The report, U.S. Geological Survey Circular 1133, Contaminants in the Mississippi River, 1987-1992 is available online at: http://pubs.usgs.gov/circ/circ1133/. An additional study by the USGS Toxics substances in water program looked at pharmaceutical compounds in selected water bodies across the United States, including some on the Lower

Mississippi River (Mississippi River at St. Francisville: http://toxics.usgs.gov/pubs/FS-027-02/index.html and Water-quality data for pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000 USGS Open-File Report 02-94). These and other reports, data and maps can be accessed on the Internet at http://toxics.usgs.gov. Additional data collection efforts would be beneficial to understanding changes in water chemistry.

6 – Discussion and Recommendations

The above information outlines the processes states use for conducting water quality assessments including adopting standards, monitoring waters to determine quality based on those standards and developing and implementing TMDLs or other remedial actions, as necessary. It also provides a synopsis of water quality monitoring conducted by USGS, EPA, and the Corps and summarizes the NRC report on the condition of the Lower Mississippi River. It is clear from this information there is much variation in the degree to which water quality is monitored on the lower river. Resources are limited and therefore an effort to increase monitoring efforts must be developed collaboratively to best leverage those resources.

In summary, the LMRCC recommends additional resources be dedicated to the collection of data sets used for water quality assessments of the Mississippi River. However, due to limited resources, it is critical to identify key data sets that will provide a quality basis for further evaluation of the river including its tributaries, distributaries and the Gulf of Mexico. The matter of excess nutrients being delivered to the Gulf is one of national importance, receiving attention from federal and state agencies, tribes, academia, industry, non-governmental organizations and the public in general. Improved water quality monitoring of the Mississippi River will assist the Gulf Hypoxia Task Force in addition to the many other assessment and restoration efforts.

To lay the groundwork for planning additional data collection efforts, the LMRCC recommends initial efforts be focused on identifying core and essential data that will allow comprehensive and meaningful water quality evaluations of the river. The LMRCC recommends intensive literature reviews on large river water quality studies to provide a starting point for what data is most beneficial to large river evaluations.

Once beneficial data sets have been identified, a thorough data-gap analysis can be conducted. Based on the data-gap analysis, plans can be developed for data collection efforts. These plans should take the form of work plans that can be used to either request funding, or be modified as needed for submittal when funding requests-for-proposals become available. Plans should be written with chronologically logical tasks that have discernible deliverables, data quality objectives and estimated costs; these plans can be broken down as needed if available funding amounts cannot cover the entire cost of the data collection project.