

The LMR SBC's area of focus has been the Missouri Bootheel and all areas south in the Mississippi River Alluvial Valley, running to the mouth of the river. Major tributaries such as the Arkansas, Red, and White Rivers have received some attention to date in the LMR SBC's activities, but have not been major areas of focus because they were envisioned in the *Action Plan* as eventually having their own Sub-basin Committees.

Sub-basin Characteristics: The Lower Mississippi River Sub-basin includes the sections of the Mississippi River Delta in Arkansas, Louisiana, and Mississippi, as well as the active coastal delta, the Missouri "Bootheel," and Western Tennessee. The LMR Sub-basin, which has been described as temporally dynamic and spatially complex, has some significant differences from other parts of the basin.

With generally low, flat topography, high rainfall, alluvial soils, and high water tables, the LMR Sub-basin has undergone a significant alteration of its biogeochemical and hydrological cycles. The ecology of the region was dramatically changed over the past century, with the conversion of millions of acres of bottomland hardwood forests to agriculture and the completion of the Mississippi River and Tributaries Project³. The MR&T Project includes the levee system, the Old River control structure and the Atchafalaya Basin Floodway, and the resulting coastal effects in Louisiana.

The LMR Sub-basin transitions from a tributary-fed to a distributary system south of the Mississippi River's confluence with the Red River. The last tributary stream enters the Mississippi just north of Baton Rouge, while the Atchafalaya River flows southward from the Mississippi-Red River confluence.

Sub-basin Nutrient Load Contributions: The Lower Mississippi River Sub-basin includes the area known as the Mississippi Embayment, where land use is primarily agricultural and streams often have high turbidities, mixtures of nutrients and pesticides, and degraded riparian habitat.⁴ Subsequent studies have found that the LMR's yields of suspended sediments, total phosphorus, total nitrogen, and silicate are disproportionately high for its area.⁵

Estimates of the nutrient load contributed by the Lower Mississippi River Sub-basin have changed somewhat since the original CENR reports that formed the basis for the *Action Plan*.

The 3rd CENR Report (1999) stated that the Lower Mississippi basin contributed less than 8% of the nitrogen loading in the basin, as did the combined Arkansas, Red, and Ouachita basins, and that the Lower Mississippi and Arkansas basins contributed about 12% of the total phosphorus.⁶

Spatial models developed by the U.S. Geological Survey (USGS)⁷ have given the following figures for the Lower Mississippi River's contribution to nitrogen export from interior watersheds delivered to the Gulf:

Point Sources: 21.2%
Fertilizer use: 12.1%
Livestock wastes: 2.6%
Nonagricultural nonpoint sources: 10.3%
Atmosphere: 8.6%

These models also include the Lower Mississippi River in the areas delivering up to 90% of nitrogen exported from their interior watersheds to the Gulf.⁸

The 2006 *Reassessment of Point Source Nutrient Mass Loadings to the Mississippi River Basin* by U.S. EPA stated that facilities in the Lower Mississippi River contributed 22.3% of the annual point source load in the basin for total nitrogen, and 14.7% of the annual load for total phosphorus.⁹

Basin and Sub-basin Assessments

Several assessment efforts are underway that will provide important information about nutrient loading and removal in the lower river and tributary basins.

The U.S. Department of Agriculture's *Conservation Effects Assessment Project (CEAP)* was launched in 2003 as a multi-agency effort to quantify the environmental benefits of USDA conservation programs used by private landowners (www.nrcs.usda.gov/technical/nri/ceap.)

Support increased incentives for CPR, WRP, and related programs that may already target high priority areas in the Lower Mississippi Alluvial Valley.

Allow CRP enrollments on croplands within the levees where the Corps of Engineers has flowage easements.

Identify coastal restoration projects, both planned and currently operating, that can deliver substantial nutrient uptake benefits to the Gulf of Mexico.

Baseline Inventory of Nutrient-Related Activities by State

MISSOURI

The primary area of focus is the southeast Missouri “Bootheel” adjacent to the Mississippi River.

Tributaries of the Mississippi

St. Francis River (Arkansas)

Sub-Tributaries

Black River
Castor River

Agricultural Management Programs

Conservation Security Program
CSP Watersheds 2005

Little River Ditches Watershed (flows into Arkansas)

www.mor.nrcs.usda.gov/programs/CSP/lil_riv_ditches.html

Lower St. Francis Watershed (flows into Arkansas)

www.mo.nrcs.usda.gov/programs/CSP/low_stfran.html

New Madrid-St. Johns Watershed

www.mo.nrcs.usda.gov/programs/CSP/out/mad_stjohn.html

Missouri 319 Program Projects

www.dnr.mo/wpscd/wpcp/nps/319nps-statewide-map.htm

Resources: Partnerships, Programs, Reports, Research

Bootheel Resource Conservation & Development Council, Inc.
www.morcd.org/bhrcd

Delta Research Center
<http://aes.missouri.edu/delta/index.stm>

Middle Mississippi River Partnership
www.swird.org

Missouri Water Quality Report 2004
Missouri Department of Natural Resources, Water Protection Program
http://www.dnr.mo.gov/env/wpp/waterquality/305b/2004_305b.pdf

ARKANSAS

Areas of focus are the Delta eco-region of Arkansas and the Lower Ouachita River Basin.

Tributaries

St. Francis River
White River
Arkansas River

Sub-Tributaries

L'Anguille River
Cache River
Ouachita River

Agricultural Management Programs

The Arkansas Cooperative Extension Service has published guides on Environmental Management and Soil and Water Management geared to the Delta Eco-Region, "Protecting Soil and Water Resources in the Delta,"
http://www.arnatural.org/environmental_management.htm;
www.aragriculture.org/soil_water/soil_water_delta/default.htm

The Arkansas Partners Program initiated by Ducks Unlimited, USDA NRCS and other agencies utilizes winter flooding of agricultural fields for waterfowl habitat, which also benefits water quality.

www.ducks.org/Arkansas/ArkansasconservationProject.htm

Conservation Security Program 2007 – Upper White-Village Watershed

Conservation Security Program 2006

Lower Arkansas Watershed – 94 CSP contracts approved

Conservation Security Program 2005

Lower St. Francis Watershed – 336 CSP contracts approved

Lower White/Bayou Des Arc Watershed – 131 CSP contracts approved

Little River Ditches – 105 CSP contracts approved

www.ar.nrcs.usda.gov/programs/csp.html

319 Programs

Buffalo National River Watershed Partnerships: Swine Waste Management

www.epa.gov/nps/Section319III/AR.htm

Cadron Creek Dairies – Animal Waste Management

Muddy Fork Hydrologic Unit Area: Beatty Branch/Moore's Creek –

Confined Animal Feeding Operations

www.epa.gov/owow/nps/Section319II/AR.html

The International Plant Nutrient Institute (formerly Potash & Phosphate Institute) has published “Fertilizer BMPs for Cotton in the MidSouth”.

<http://www.ipni.net/cottonfertilizerbmp>

A Conservation Tillage Conference held in January 2005 included several presentations focused on cotton production in Arkansas.

www.cottoninc.com/engineering/conservationtillageconference/2005/Pg=4

Cities on the Mississippi River

West Memphis

West Helena

Helena

Cities on Tributaries

Little Rock

TMDLs

Stone Dam Creek Watershed (Arkansas River Valley) – Amonia and Nitrate
November 2003

www.epa.gov/water/tmdl/docs/StoneDamCreekFinalTMDLs.pdf

Sections of the Mississippi River have been included on the state's 303(d) list (http://iaspub.epa.gov/tmdl/huc_rept.control/LowerMississippi.htm).

Arkansas TMDL Documents

www.epa.gov/region6/water/artmdl.htm

Watershed Summaries

Bayou Bartholomew

Bayou Bartholomew has been called the nation's longest bayou, and is one of the last major streams in the LMAV that has not been dredged or channelized. It flows into the Ouachita River in northeast Louisiana, and is thus connected to the Gulf of Mexico through the Atchafalafaya River.

A number of local, state, and federal projects are underway in the Bayou Bartholomew watershed to protect and restore habitat and improve water quality.

The Bayou Bartholomew Alliance was formed in 1995, and the Bayou Bartholomew Foundation in 2005. <http://www.arkansas.gov/bba/>;
<http://www.arkansas.gov/bba/foundation.htm>.

The Alliance and partners received an EPA Targeted Watershed Grant in 2003 to address impairments and habitat loss in the watershed.
<http://www.epa.gov/owow/watershed/initiative/2003/summaries/bayou.pdf>

The newsletter "On the Bayou" identified BMPs and conservation programs for landowners and stakeholders that can improve the watershed's health.

www.aragriculture.org/soil_water/soil_water_delta/OnBayou/on_bayou_99.htm.

Bayou Bartholomew was selected as a Focus Watershed by the Lower Mississippi River Sub-basin Committee.

(www.epa.gov/gmpo/specialactivities/index.htm)

Fourche Creek Watershed

The Fourche Creek Watershed drains and filters over 90% of the Little Rock metropolitan area, which includes stormwater and other non-point source runoff, and eventually flows into the Arkansas River. The watershed is also impacted by nutrients from agricultural and domestic faces challenges from floodplain development and sedimentation. An EPA Targeted Watershed grant was awarded in 2004 to address these challenges.

<http://www.epa.gov/twg/2005annualreport/2004fourche.pdf>

Audubon Arkansas and other partners collaborated on the Fourche Creek Watershed Initiative with funding from EPA.

<http://www.epa.gov/twg/2004/2004proposals/04fourchecreek.pdf>

White River Watershed

The White River flows from northwest Arkansas into Missouri and enters Arkansas to join the Mississippi River. The lower White River basin has been described as one of the most important bottomland hardwood wetlands in the world, and includes the Cache River, which joins the White before it empties into the Mississippi.

A major ecosystem study of the White River Basin has been undertaken by EPA – “An Ecological and Habitat Vulnerability Assessment of Arkansas’ White River Basin” (2002). This study included habitat and water quality vulnerability assessments, and their relation to landscape change. Loss of riparian vegetation was cited as a potential factor contributing to the overall load of nutrients being delivered to the Mississippi River and Gulf of Mexico. <http://www.epa.gov/esd/land-sci/whiteriver.htm>

[A Landscape Atlas of Ecological Vulnerability: Arkansas' White River Watershed and the Mississippi Alluvial Valley Ecoregion](http://www.epa.gov/esd/land-sci/pdf/EPA600R03057_Aug03.pdf) was completed in 2003 (http://www.epa.gov/esd/land-sci/pdf/EPA600R03057_Aug03.pdf).

The White River flows 90 miles through White River National Wildlife Refuge, with many streams, bayous, and sloughs across the refuge flowing into the river (<http://www.fws.gov/whiteriver/habitatpage.htm>.)

The Raft Creek Bottoms along the White River were once extensive bottomland hardwood forests, which were converted to cropland in the 1960s-1970s. Under the WRP program, most of the tract has been reforested, with extensive restoration of waterfowl habitat.
www.nrcs.gov/programs/wrp/states/success_ar.html

Cache River

The Cache River, together with White River, has been called the largest remaining tract of contiguous bottomland hardwood forest in North America. Recent sightings of the Ivory-billed woodpecker have expanded protection efforts in those watersheds.

Cache River National Wildlife Refuge www.fws.gov/cacheriver

Cache River Natural Area, Rex Hancock/Black Swamp Wildlife Management Area. www.agfc.com/data-facts-maps/maps/wildlife-mgt-areas/rex-hancock-black-swamp.aspx

Wetland and Habitat Protection and Restoration

The Arkansas Wetland Conservation Plan is a multi-agency effort that identifies priority areas for restoration and protection, ranking them within a watershed. Lands close to existing waterways, riparian corridors, and fragmented forest areas are high priorities. Regional reports have been done for several watersheds in the Delta eco-region – Bayou Meto, Bayou Bartholomew, and the St. Francis River
www.mawpt.org/plan/area_reports.asp

Arkansas Wetlands Reserve Program
www.nrcs.usda.gov/programs/wrp/states/ar.html

Ducks Unlimited has worked with private and public partners to create and restore over 300,000 acres of waterfowl habitat in Arkansas, including projects on the White River and Overflow National Wildlife Refuges, and the Raft Creek, St. Francis Sunken Lands, Seven Devils Swamp, and Bayou Meto Wildlife Management Areas.

Loosahatchie River Watershed

A Water Quality Management Plan was presented for the watershed in 2003. (www.state.tn.us/environment/wpc/watershed/wsmplans/loosahatchie/).

The watershed includes agricultural and urban areas, with 16 NPDES-permitted facilities, 8 of which discharge into streams listed on the 1998 303(d) list. The Water Quality Management Plan includes USDA-NRCS data on conservation practices in the watershed from the Performance & Results Measurement System (<http://prms.nrcs.usda.gov/prms>), and a map of BMPs installed from 1999-2002 through the TN Department of Agriculture's non-point source and conservation fund grant programs.

The U.S. Army Corps of Engineers' "Millington and Vicinity" Project involves the Big Creek drainage basin, a tributary of the Loosahatchie (www.mvn.usace.army.mil/projects/pdf/tennessee.pdf).

An innovative project was launched in 2004 by six smaller municipalities in the watershed whose growth had prompted construction of new wastewater treatment plants, working in conjunction with the University of Memphis and other partners to reduce dissolved oxygen and nutrient impacts (www.tetrattech-ffx.com/lower_miss/pdf/thursday/moore.pdf).

Wolf River

The Wolf River enters the Mississippi just north of downtown Memphis, and drains a mixed rural/urban watershed, with extensive protection and restoration efforts as well as major growth challenges occurring.

The Wolf River Watershed has received a Water Quality Management Plan (www.state.tn.us/environmental/wpc/watershed/wsmplans/wolf/).

The Ghost River Land Acquisition Project involves protection and restoration of a section of the Wolf River drainage, undertaken through the 319 Program (www.epa.gov/owow/nps/Section319III/TN.htm).

The Nature Conservancy's William B. Clark Conservation Area preserves 500 acres of bottomland hardwood forest in the Wolf River floodplain (www.nature.org/wherewework/northamerica/states/tennessee/).

The Wolf River Conservancy has succeeded in getting a Greenways Plan for the watershed passed in Memphis/Shelby County. www.wolfriver.org

Nonconnah Creek

Nonconnah Creek received a Water Quality Management Plan in April 2002 (<http://state.tn.us/environment/wpc/watershed/wsmplans/nonconnah/>)

Wetland and Habitat Protection and Restoration

The Tennessee Wildlife Resources Agency (TWRA) has identified extensive “areas of conservation interest” in West Tennessee, including sections of the Hatchie River, the Lower and Upper Obion River, the Middle and South Forks of the Forked Deer River, and the Wolf River, as well as the Mid-Mississippi Alluvial Valley and Eagle Lake Refuge, both areas north of Memphis (www.state.tn.us/twra/thcp/west%20tenn%2011-20-06.pdf).

Ducks Unlimited has projects on federal and state refuges and management areas located in the Mississippi Alluvial Valley in Tennessee: Chickasaw and Lower Hatchie National Wildlife Refuges, Eagle Lake and White Lake Refuges, and the Bogota and Ernest Rice Wildlife Management Areas (www.southern.ducks.org/Tennessee/TennesseeProjects/). DU’s Eagle Lake Refuge Project involves restoration of over 1000 acres of wetlands, along with flooded agricultural fields, adjacent to the Mississippi River north of Memphis (www.southern.ducks.org/EagleLakeRefuge.php).

In discussions about the LMRCC’s Lower Mississippi River Conservation Initiative held at the Tennessee Wildlife Resources Agency in 2001, several opportunities to reconnect the river to its floodplain were recognized, including Open Lake in the Lower Forked Deer River watershed, where water quality would also be benefitted (www.lmrcc.org/TNmtpdf.pdf).

“Present and Proposed Conservation Efforts in the Active Floodplain of the Lower Mississippi River: Tennessee” – Summary Map
Lower Mississippi River Conservation Committee
<http://www.lmrcc.org/MRCI.htm>

“Tennessee’s Wetland Conservation Strategy;” “An Assessment of Wetland Mitigation in Tennessee,” www.state.tn.us/environment/wetlands/

Resources: Partnerships, Programs, Reports, Research

Tennessee Department of Agriculture Water Resources Program

<http://state.tn.us/agriculture/nps/index.html>

Tennessee Heritage Conservation Trust Fund

<http://state.tn.us/twra/tchp.html>

Tennessee Water Sentinels

Memphis, TN

<http://www.sierraclub.org/watersentinels/tennessee/>

Tennessee Watershed Management Groups

www.state.tn.us/environment/wpc/watershed/

West Tennessee River Basin Authority

www.state.tn.us/environment/boards/wtn_river_board.shtml

2006 305(b) Report: Status of Water Quality in Tennessee

Tennessee Department of Environment & Conservation (TDEC)

Division of Water Pollution Control

www.state.tn.us/environment/wpc/publications/2006305b.pdf

Tennessee Rivers Assessment Project – Summary Report – 1998

Mississippi River; TDEC, Division of Water Pollution Control

www.state.tn.us/environment/wpc/publications/riv/misisipi.shtml

“Regional Characterization of Streams in Tennessee with Emphasis on Diurnal Dissolved Oxygen, Nutrients, Habitat, Geomorphology and Macroinvertebrates,” TDEC, Division of Water Pollution Control

USDA Agricultural Conservation and Management Programs in Tennessee:

Tennessee Wetlands Reserve Program

www.tn.nrcs.usda.gov/programs/WRP/wrp-index.html

Tennessee EQIP

www.tn.nrcs.usda.gov/programs/eqip2007/index.html

EQIP Riparian Forest Buffer Incentive

www.tn.nrcs.usda.gov/programs/eqip2007/riparian_for_buff.html

Comprehensive Nutrient Management Plan Initiative 2007

www.tn.nrcs.usda.gov/programs/CNMP/CNMP-index.html

Watershed Summaries

Yazoo River Basin

The Yazoo River Basin is the largest in Mississippi, and drains one of the most intensively farmed parts of the Mississippi River Alluvial Plain. The Yazoo River, which enters the Mississippi north of Vicksburg, is fed by numerous streams in the Bluff Hills and Delta portions of the basin, and its flow is divided by four large flood control reservoirs. The Yazoo Basin is largely separated from the Mississippi River by an extensive levee system that runs the entire length of the western side of the basin. The northwestern part of the basin is experiencing sub-urban expansion from Memphis and growth from the casino industry along the Mississippi River.

The Yazoo River drainage area accounts for about 1.7% of the Mississippi River's drainage, and on average about 2.8% of the Mississippi's flow. Backflow from the Mississippi River is a major influence on the Yazoo's discharge and functioning. Measured nutrient loadings show the Yazoo River accounts for 1.4% of the total nitrogen, 0.7% of the nitrate, 3.4% of the total phosphorus, and 1.6% of the orthophosphorus delivered to the Mississippi River.

http://www.tetrattech-ffx.com/lower_miss/pdf/thursday/coupe.pdf

The Yazoo Mississippi Delta Joint Water Management District (YMD), a multi-county water resource agency is involved with a number of projects and collaborative efforts, including periodic conferences that summarize conservation and water quality projects (www.ymd.org).

The "Lower Yazoo River Basin Economic and Environmental Restoration Initiative" proposed a strategy that includes water and sewer infrastructure and floodplain restoration, explicitly mentioning the goal of improving water quality locally and downstream in the Gulf of Mexico. The plan also calls for conservation easements on the most frequently-flooded lands through the NRCS Emergency Wetland Reserve Program and Section 319 of the Clean Water Act.

www.epa.gov/region04/water/specialprojects/yazoo/investment.htm

A Hydrologic Observatory has been proposed for the Yazoo River Basin that would study erosion, nutrient transport, and other processes.

www.olemiss.edu/sciencenet/Yazoo/poster/

Big Black River Basin

The Big Black River enters the Mississippi River 25 miles south of Vicksburg. It is one of the last undammed rivers east of the Mississippi, and most of its tributaries are undeveloped. It is affected by backflow from the Mississippi under high water conditions.

Agriculture and forest are the largest land use types. Sections of the Big Black River and its tributaries are impaired by nutrients and sediments.
www.deq.state.ms.us/mdeq.nsf/page/WMB_Big_Black_River_Basin

Bayou Pierre

EPA Watershed Profile

http://cfpub.epa.gov/surf/huc.cfm/huc_code=0800203

Homochitto River

The Homochitto River flows through the Homochitto National Forest and enters the Mississippi River through two channels, one about 17 miles south-southwest of Natchez, and the other 25 miles south-southwest of Natchez, through Old River Lake.

Homochitto National Forest: www.fs.fed.us/r8/mississippi/homochitto

St. Catherine Creek

St. Catherine Creek flows into the Mississippi River south of Natchez. The St. Catherine National Wildlife Refuge borders the Mississippi River's eastern side, with the Homochitto River forming a southern boundary. The Refuge encompasses nearly 26,000 acres, with over 11,000 acres of reforested agricultural land.

www.fws.gov/saintcatherinecreek/

Wetland and Habitat Protection and Restoration

The Delta National Forest contains over 60,000 acres of bottomland hardwood forests, seasonally flooded areas, and small sloughs draining into the Big and Little Sunflower Rivers in the Yazoo Basin.

www.fs.fed.us/r8/mississippi/delta

Ducks Unlimited has projects providing winter waterfowl habitat and restoring wetlands on federal and state refuges and management areas, as well as the Delta National Forest (www.ducks.org/Page1666.aspx)

DU is also a major participant in the Wetlands Reserve Program in Mississippi, with restoration of bottomland hardwood forests in the Delta a major focus.

(www.ducks.org/Mississippi/MississippiConservation/1455/WetlandsReserveProgramMississippi.htm)

“Present and Proposed Conservation Efforts in the Active Floodplain of the Lower Mississippi River: Mississippi” – Summary Map
Lower Mississippi River Conservation Committee
<http://www.lmrcc.org/MRCI.htm>

Resources: Partnerships, Programs, Reports, Research

Delta Land Trust
www.deltalandtrust.org

Lower Delta Partnership
<http://www.fws.gov/southeast/grants/LDP-9-02.pdf>

Lower Mississippi Valley Natural Resources Partnership
www.nbc.gov/accomplishments/printacc.cfm?states=MS

Mississippi Land Trust
www.misslandtust.org

Mississippi River Trust
www.mississippirivertrust.org

Mississippi Soil and Water Conservation Commission
<http://www.mswcc.state.ms.us/wqproj.html>

Mississippi Water Resources Research Institute
<http://www.wrri.msstate.edu/>

Bayou Manchac (closed)
Blind River (closed)

Agricultural Management Programs

Conservation Security Program
CSP Watershed 2006
Tensas River Watershed
www.la.nrcs.usda.gov/programs/csp.html

319 Program Projects
Bayou Queue de Tortue Watershed – BMPs and Pollution Prevention
Bayou Plaquemine Brule – Watershed Planning and Management
www.epa.gov/owow/nps/Section319II/LA.html

Coulee Baton Microwatershed Plan
www.la.nrcs.usda.gov/final

Conservation of Louisiana Private Lands 2007
Louisiana Natural Resources Conservation Service (USDA)
www.la.nrcs.gov/

Cities on the River

Lake Providence
Ferriday
Vidalia
Baton Rouge
Port Allen
Plaquemine
Donaldsonville
Kenner
Metairie
New Orleans
Belle Chasse

Baton Rouge Sewer Wastewater Improvement Program
<http://brsewer.com/WIP/sec2present.asp>

Ouachita River Foundation
www.ouachitariver.org

USGS Studies and Reports

Atchafalaya and Mississippi river Deltas Study – Sediment-Hosted
Contaminants
<http://gulfsi.usgs.gov/missriv/reports/ofrshelf/index.html>

