

# **Building Strong Collaborative Relationships for a Sustainable Water Resources Future:**

## **STATE OF MISSOURI**

### **SUMMARY OF STATE WATER PLANNING**

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The findings contained in this report are based on the information collected from the literature search and interviews for this initiative and should not be construed as an official Department of the Army position, policy or decision unless so designated by other official documentation.

# **STATE OF MISSOURI**

## **1. STATE/REGIONAL WATER PLANNING STATUS**

### **Background**

Missouri water planning efforts, as in other states, were initially spawned by drought conditions. Missouri's first state water plan was published in 1938 during the extended drought and "dust bowl" period of the 1930's. More recently, state water planning efforts were the direct result of the authorization and funding of the Missouri Water Resources Law, codified in RSMo 640.400 to 640.435. The Water Resources Law requires the Department of Natural Resources to develop, maintain and periodically update a state water plan for a long-range, comprehensive statewide program for the use of surface water and groundwater resources of the state. The State Water Resources Plan must include an examination of water use, including the current and future need for drinking water supplies, agriculture, industry, recreation, environmental protection and related needs. The Missouri Water Resources Law and State Water Resources Plan mandates were passed by the Missouri legislature and signed into law in 1989.

Initial state water planning efforts (after passage of the Missouri Water Resources Law) included an examination of over 50 water issues. The Department developed the issue list with input from a state interagency task force. Results from recommendations included modification of state laws, policies, and/or additional studies focused on septic systems, abandoned wells, water supply regionalization, public involvement during water issues planning, Missouri River issues, well head protection, wetlands, and pesticide monitoring in groundwater. Policy analysis reports and/or public meetings were held on the Missouri River operation/allocation issues, flood damage prevention, wetlands conservation, water supply regionalization, drought response and mitigation planning.

In the late 1990's a phased approach was implemented to develop the state water plan. Phase I consisted of a descriptive inventory of water resources using existing data. Seven Phase I reports were published that included water resource topics such as surface water, groundwater, water quality, water use, hydrologic extremes (floods and drought), interstate rivers and a summary of water laws. Phase II of the state water plan focused on a regional approach to identifying a broad range of water quantity and quality problems and opportunities. Five Phase II reports were published that covered the entire state. Frequently occurring, statewide concerns identified during Phase II included: drinking water supply infrastructure, localized overuse of groundwater, land application of animal manure, urban/suburban storm water runoff, loss of aquatic species and stream buffer corridors. Phase III was initiated to work toward solutions for regional problems identified during Phase II investigations, but activities were curtailed due to budget and staff reductions and Phase III was never completed.

## **2. RESPONSIBLE STATE AGENCIES/REGIONAL ENTITIES**

Missouri's Department of Natural Resources (MDNR) currently houses several divisions dedicated to the protection and management of the state's water resources. MDNR's Water Resources Center (WRC) is responsible for the development, conservation, and utilization of the

state's water resources as defined in the Missouri Water Resources Law (Missouri Revised Statutes (RSMo) §640.400 to §640.435). Among WRC's responsibilities is the development of the Missouri State Water Plan (SWP).

A State Water Plan Inter-Agency Task Force (IATF) advises WRC on a wide variety of water quantity and quality issues. MDNR's Director chairs the IATF whose membership includes the heads of the Department of Agriculture, Department of Conservation, Department of Economic Development, Department of Health and Senior Services, Department of Public Safety, Department of Transportation, and University of Missouri's College of Agriculture. Previously, SWP staff belonged to DNR's former Geological Survey and Resource Assessment Division.

In addition to developing the SWP, WRC provides technical advice and assistance on water use, planning, groundwater and surface water hydrology; collects, maintains, and analyzes water resources data; makes water quality and quantity determinations; provides drought and flood response; is involved in planning, coordination, and resolution of river basin issues; assesses and prevents groundwater and surface water contamination; and implements provisions of the Dam and Reservoir Safety Laws (RSMo §236.400 to 236.500) (MDNR, 2009).

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### **3. WATER MANAGEMENT VISION AND GOALS**

MDNR's mission is "to preserve, protect and enhance Missouri's natural, cultural and energy resources and to inspire their enjoyment and responsible use for present and future generations (MDNR, 2005)." MDNR envisions "a Missouri where people live and work in harmony with our natural and cultural resources, make decisions that result in a quality environment, and prosper today and in the future (MDNR, 2005)."

MDNR's goals for water resources, listed in its Strategic Plan 2005 to 2009, are (MDNR, 2005):

1. Assure needed water flow in the Missouri River
2. Provide an adequate supply of high quality water. Regional water supply issues in Springfield and southwest Missouri affect water quality and quantity. In north central and northwest Missouri water issues center on the quantity of drinking water

3. Concentrate our efforts to upgrade an aging wastewater and drinking water infrastructure, especially in major metropolitan areas, with limited financial resources to correct the problem
4. Implement updated water quality standards to comply with federal law

The strategic plan also highlights goals for the department which include:

- Working with the USACE on the expansion and improvement of the lock system on the Upper Mississippi River.
- Minimizing changes to the Missouri River Master Manual that will be detrimental to agriculture and to the economy.
- Opposing measures that restrict water quantity flowing into the state.
- Encouraging the public and MDNR to work cooperatively on problem solving and to use innovative methods to protect water quality.
- Streamline the process for accessing the Water and Wastewater State Revolving Loan fund.
- Working with Arkansas on water quality issues.

#### **4. SCOPE OF WATER RESOURCES PLANNING AND MANAGEMENT**

Water resources planning initiatives in Missouri have historically been highly event driven. Periods of drought and flooding events have tended to be the primary impetuses for the initiation of funding to bolster planning initiatives. Recent drought events have led to state legislature approval for increased funding for surface and groundwater data collection. In the past flood events in the state of Missouri have spawned policy changes in floodplain management.

Part I of the SWP includes assessments of the state's current water resources and its needs. Surface water quantity and quality are described according to the state's five major river basins (Figure 1): Arkansas, White, Upper Mississippi, Lower Mississippi, and Missouri (divided into north of the river and south of the river sections). Groundwater quantity and quality descriptions are grouped based on groundwater provinces whose boundaries are delineated by geologic and water quality criteria. These provinces are the Springfield Plateau, St. Francois Mountains, Osage Plains, Salem Plateau, Mississippi River Alluvium, Missouri River Alluvium, Southeast Missouri, North East Missouri, and Northwest Missouri. Missouri possesses one of the premier groundwater monitoring systems in the country. Overall, the state has been building its data collection, analysis, and interpretation capabilities in recent years, however because Missouri does not regulate water use, there is a poor understanding of consumptive use statewide, preventing the development of an effective water budget. Drinking water quality and general water quality monitoring is conducted by staff from MDNR's Water Protection Program within the Division of Environmental Quality. WRC provides surface water and groundwater monitoring. Surface and groundwater data collected and analyzed by the MDNR is one aspect of the technical assistance it provides to the active regional water planning initiatives within the state, allowing for more effective planning and management decision making.



**Figure 1. Major River Basins in Missouri (Brookshire, 1997)**

In addition to describing the condition and location of the state's water resources, Part I categorizes and quantifies how water is used (DuCharme and Miller, 1996). Water use categories covered in the report include: water use in thermoelectric and hydroelectric power generation; municipal, domestic and industrial water use; agricultural water use; in-stream water use issues (such as navigation and aquatic habitat preservation); water use in recreation; and water use for fish and wildlife.

As a second objective, the SWP focuses on the identification of the Missouri's statewide and regional water resources issues and needs. In Volume 6, Water Resources Sharing (Vineyard, 1997), one or more current and/or future issues in each of the state's major river basins are identified. These include:

- Water quality in the Arkansas River Basin
- Gulf Hypoxia Zone in the Lower Mississippi River Basin
- Endangered species (e.g., Pallid Sturgeon) in the Lower Mississippi River Basin
- Maintenance of levee system in the Lower Mississippi River Basin
- Revision of the Master Water Control Manual in the Missouri River Basin (the Manual guides the USACE's operation of six major dams along the river)
- Native American water rights in the Missouri River Basin
- Development of a new management vision for the Missouri River Basin
- The Upper Mississippi River Basin Environmental Management Program
- The Upper Mississippi River Navigation Study
- Maintenance of levee system in the Upper Mississippi River Basin
- USACE revised management plan for the White River Lakes
- Low dissolved oxygen in tailwaters of large White River dams threaten fisheries

- Water quality and water supply in the White River Basin

Missouri is especially vulnerable to droughts and flooding. The last decade has produced both phenomena and, consequently, there have been associated changes in water resources planning and management. Because Missouri does not regulate water use, there exists the potential for conflicts among water users during times of drought. This has led to several focused efforts for regionalized study and planning for long-term water supply. In Volume 5, *Hydrologic Extremes in Missouri: Flood and Drought* (Drew and Chen, 1997), several major needs for effectively management related to floods and drought are described:

- Development of basic climatic and hydrological databases
- Creation of rainfall, evaporation, runoff and streamflow maps, especially those related to hydrologic extremes
- Development of better methods for estimating streamflow for areas that have no streamflow stations
- Collection of more information on extreme events necessary to conduct hydrologic extreme analysis for many purposes such as irrigation management, in-stream flow requirements, and municipal water system design
- Development of drought indices for different regions of the state and better indices for different applications or types of drought, such as agricultural or water supply
- Development of objective drought definitions and collection of explicit information about what factors trigger different types of droughts
- Initiation of long-term planning for flood and drought programs that focus on the reduction of society's vulnerability to future floods and droughts

Droughts are also considered in the state Drought Response Plan (1995). As a result of the 1999 to 2000 drought, MDNR made extensive revisions to the plan and released an updated version in 2002. According to the 2002 Drought Plan, droughts primarily affect citizens in rural areas where water shortages have reduced agricultural crop production, increased costs to supply water to crops and livestock, and threaten water quality. The Drought Plan identifies major federal, state and local organizations and delegates response and mitigation responsibilities to these various entities.

Another issue in Missouri is sharing the resources of the Missouri River. This trans-boundary waterway is important to the state to support navigation, drinking water supplies, and power generation among other needs. Missouri does not participate in any compacts or agreements with other states regarding the shared resources of the Missouri River.

Future concerns over water resources in the state focus on the water-energy nexus and interstate management of groundwater. It is possible that large quantities of water will be required for the production of ethanol and additional energy sources. As a result there is a concern over the intensified use and potential impact on local groundwater supplies. In addition, the management of groundwater supplies in conjunction with bordering states may become a prevalent issue. Missouri operates under the riparian system of water law, whereas the bordering states to the west operate under the prior appropriation doctrine.

MDNR's role in addressing regional water resources issues is to provide data, technical assistance and guidance to regional groups to aid in decision making and the establishment of long-term strategies. Regional issues and needs are identified in Part II of the SWP. These issues and needs are grouped into five use categories: drinking water, agricultural water, industrial, environmental, and recreational. Issues and needs for the five regions are:

### **Southern Missouri**

- Drinking water Use
  - An in-depth, comprehensive, county-by-county groundwater assessment is needed (must be more detailed than the Groundwater Resources of Missouri)
  - Overuse of groundwater in site-specific areas
  - Unplugged, abandoned wells
  - Private water well construction and water quality
  - Seismic activity
  - Aging infrastructure of public water supply systems
  - Payment for true cost of water
  - Inefficient water use
  - Lack of water rights laws
- Agricultural water use
  - Improper land application of poultry litter
  - Fish farming
- Industrial Use
  - Metallic mineral mining and exploration drilling can cause water quality and quantity problems
  - Industrial pollution
  - Construction in flood plains
  - Dam operations
- Recreational Water Use
  - Water conditions can affect tourism
  - Commercial development changing hydrology and topography
  - Pathogenic coliform in streams
  - Environmental concerns in the National Scenic Rivers of southeastern Missouri
  - Problems associated with recreational use
- Environmental Water Use
  - Human population dispersion
  - Stormwater runoff
  - Introduction of new chemicals into water bodies
  - Endocrine disrupters and water pollution
  - Coal
  - Landfills and dumps
  - Gravel mining
  - Deforestation
  - Altered watercourses in the Bootheel
  - Coordination of government agencies



**Central Missouri**

- Drinking Water Use
  - Overuse of groundwater in site specific areas
  - Lack of spring protection
  - Surface water quality threats from pollutants
  - Unplugged, abandoned wells serve as vector for groundwater contamination from surface water
  - Inadequate private water well construction and water quality (for wells constructed prior to adoption of the 1987 Missouri Well Construction Rules)
  - Aging infrastructure of small public water supply systems
  - Untreated residuals (solids) from the production of drinking water are returned to Missouri River
- Agricultural Water Use
  - Land application of animal manure
  - Lack of coordination of non-federal levee construction
  - Loss of riparian corridor
  - Pesticides in runoff
  - Excessive in-stream sedimentation
- Industrial Water Use
  - Low flow in the Missouri River cannot meet power generation and thermal dissipation needs
  - Low levels of dissolved oxygen below dams
  - No comprehensive basin-wide agreement to assure future uses of the lower Missouri River
  - Lack of a master plan to address best/future uses of the Missouri River
  - Dam discharges need to be better regulated to maintain in-stream flows for environmental uses and to minimize stream bank erosion
- Recreational Water Use
  - Wastewater releases from septic systems threaten water quality in Lake of the Ozarks
  - Economic development in Missouri River marinas are hindered by location of railroads, supply of basic utilities, and fluctuation of the reservoir levels
  - Competition for water between recreational and hydropower uses at Lake of the Ozarks
  - Pollution and recreational dangers at Anderson Cove in Lake of the Ozarks
- Environmental Water Use
  - Need balance between natural resource development and environmental protection for endangered and threatened aquatic species
  - Loss of sensitive aquatic species
  - Exotic species infestation
  - Stream bank erosion
  - Stream channelization, incision and sedimentation of streams in the Blackwater River watershed
  - Sand and gravel mining
  - Stream sedimentation
  - Urbanization and roadway construction causing stormwater concerns
  - Habitat loss in the Missouri River

- Habitat loss in the Osage and Blackwater River systems

### **Northwestern Missouri**

- Drinking Water Use
  - Public drinking water suppliers may supply water that does not meet standards
  - Missouri Water Law does not include a statutory water quantity provision that would define the entitlement of each water user
  - Drought effects can be problematic due to a combination of water supply and water use factors
  - Lack of model contracts for public water supply system cooperation
  - Some small water districts may not adequately supply water
  - Communities may not be able to afford upgrades to their aging public water supply system infrastructure
- Agricultural Water Use
  - Improper land application of animal manure from confined animal feeding operations
  - Atrazine (a herbicide) threatens both surface and ground water and water becomes costly to treat
- Industrial Water Use
  - Problems associated with strip mining and runoff—erosion, sedimentation, acid mine drainage, high sulfate concentrations and iron manganese deposits
- Environmental Water Use
  - Stream channel incision is widespread in NW Missouri due to channelization and increased runoff
  - Soil erosion and sedimentation in streams and lakes due to land use
  - Lack of oversight in levee construction and flood plain management
  - Loss of sensitive aquatic species
  - Lack of riparian corridor
  - Unauthorized discharges of raw or poorly treated sewage from wastewater treatment facilities
  - Pharmaceutical/chemical contamination of water
  - Combined sewer overflows and associated costs of wastewater treatment and system rehabilitation
  - Water quantity and quality problems associated with urban sprawl around Kansas City
  - Aging USDA-NRCS water impoundments
  - Structural bridge deficiencies due to aging and streambed scouring
  - Competing uses of the Missouri River
  - Missouri does not have agreements with Iowa and Kansas over streams flowing into Missouri from these states
  - Biological contamination of water

### **Northeastern Missouri**

- Lack of regional water planning and system consolidations
- Lack of model contracts for public water supply systems
- Outdated public water supply district laws

- High costs associated with developing, expanding, and replacing public water supplies
- Aging infrastructure of public water supply systems
- Changing water requirements stemming from reversal of long-term regional population trends
- Water quality threats in watersheds
- Water requirements associated with industrial growth
- Industrial water use rights
- Abandoned pre-law coal mines
- Wastewater assimilation in stream
- Impacts of concentrated animal feeding operations
- Livestock watering in drought conditions
- Aquifer depletions in Audrain County
- Lack of hydrologic data
- Impacts of stream channelization
- Sedimentation in streams
- Aquatic ecosystem health concerns
- Loss of riparian corridors/streambank vegetation
- Loss of aquatic species
- Environmental water interests vs landowner water rights
- Interstate water issues between Missouri and Iowa
- Lack of emergency service access points on lakes and rivers

### **Eastern Missouri**

- Drinking Water Use
  - Lack of residential water metering in the City of St Louis
  - Water wastage
  - Aging infrastructure of public water supply systems
  - Methyl tertiary butyl ether (MTBE) contamination of wells
  - Petroleum contamination of alluvial groundwater in St Charles County
  - Groundwater is not potable in certain areas along freshwater-saline water interface near St Louis
- Industrial Water Use
  - Competition with interstate interests for Missouri River water may reduce future beneficial uses
- Recreational Water Use
  - Most streams and rivers in the Mississippi River Basin fail to meet designated uses due to health and safety concerns, and contaminated runoff
  - Pollution of waterways from bilge water and barge cleaning operations
- Environmental Water Use
  - Costs associated with treating water from combined sewer systems or upgrading systems in the St Louis Metropolitan Sewer District
  - Many streams and lakes are on the 303(d) list; need to develop and implement TMDLs
  - Need funding and cost-effective solutions to manage and upgrade stormwater infrastructure to meet National Pollution Discharge Elimination System (NPDES) Phase II Storm Water Rule

In order to address the water resources issues mentioned above and effectively move beyond project scoping into advanced planning, design, and completion, funding and political will are two primary needs for the state. A sustainable funding source for statewide planning, drought mitigation, flood control, and water management is an important component in addressing the state's water resources needs. Funding for water and wastewater infrastructure is available through DNR's Water Protection and Financial Assistance Center (DNR, 2009). The State Revolving Fund is a federally capitalized, low-interest loan program that is available to municipalities, counties, public water and sewer districts, and political subdivisions for new construction or renovation of existing wastewater or drinking water facilities. Establishing political support for water resources projects is another priority tactic in addressing water resources issues. Engagement from the Governor, Missouri General Assembly and Missouri's congressional delegation has the potential to enhance the state's ability to tackle priority water resources needs. The establishment of both a sustainable source of funding and supportive political action has the potential to enhance water resources initiatives within Missouri.

## **5. PARTNERSHIPS, STAKEHOLDER, AND PUBLIC INVOLVEMENT**

Missouri seeks the involvement of numerous federal, state, regional, and local entities for water resources planning, management and development. Major federal partners are the USEPA and USACE. Missouri partially relies on federal government to offer funding and expertise in select phases of planning. Information gathered during the interview conducted to support and confirm data in this summary indicates that the MDNR has a positive relationship with the federal entities it has worked with, noting good service and products. Also noted during the interview was the logistical impediments encountered when working with the U.S. Corps of Engineers as a result of seven districts and two divisions having jurisdictional operations in the state. MDNR works closely with the Department of Agriculture, Department of Conservation, Department of Economic Development, Department of Health and Senior Services, Department of Public Safety, Department of Transportation, and the University of Missouri's College of Agriculture. Missouri also partners with many of its neighboring states through its membership in regional organizations including the Missouri River Basin Association, Arkansas-White-Red Basins Inter-Agency Committee, Lower Mississippi River Conservation Committee, Upper Mississippi River Basin Association, and Mississippi River Parkway Commission.

MDNR actively encourages stakeholders, communities, businesses and the public to be involved in water resources planning. Under the state's Sunshine Law, all government meetings are announced and open to the public. The Water Resources Center's State Water Plan website is one of several avenues for public involvement in the development of the SWP. Questions and comments on the SWP are solicited through this webpage.

## **6. PLAN IMPLEMENTATION STRATEGY**

Water resources goals and an implementation strategy will most likely be established in Part III of the SWP where the public will be highly involved in the prioritization of watershed issues and development of a watershed strategy. Parts I and II of the SWP are primarily planning tools that

identify important issues and needs on a regional and watershed basis, and provide a foundation for decision and policy making.

MDNR's strategies for water resources management are influenced by the findings of the Parts I and II of the SWP and are designed fulfill its departmental goals and goals of the Governor. These strategies include (MDNR, 2005):

- Continue opposition to changes to the Missouri River Master Manual or other policies that negatively impact of restrict the state's economy or multiple uses of the Missouri River, or where changes are not scientifically justified in interstate discussions, negotiations and resolutions of legal issues.
- Continue to serve as a lead agency in interstate river issues and continue membership in regional organizations.
- Continue to monitor groundwater-level declines in the southwestern part of the state and propose possible solutions to groundwater shortages to local decision makers.
- Facilitate options and solutions for drinking water supply problems in northwest Missouri.
- Pursue opportunities to resolve water quality problems with a variety of stakeholders including use of innovative technology.
- Offer initial assistance to newly permitted facilities, or those that have never had an inspection, to enhance compliance and to help them develop an understanding of permit requirements and adhere to environmental requirements.
- Work with stakeholders, state, local and federal partners to promulgate water quality standards that meet federal requirements.
- Continue efforts with Arkansas and Oklahoma to resolve water quality issues to ensure clean water for Missourians.
- Increase the technical assistance provided to cities, counties and permittees to enhance understanding of effective and efficient erosion control practices.
- Increase inspection of land disturbance permittees to ensure protection of both land and water resources.
- Focus efforts on mercury pollution from power plants, medical and hazardous waste incineration; cement kilns and dental waste that pose a particularly significant threat to Missouri's rivers and streams.
- Establish TMDLs for bodies of water to determine the most effective course of action to increase compliance with Missouri's Clean Water Law.
- Seek needed financial resources and implement a full stormwater protection effort.
- Conduct Use Attainability Analyses to determine where waters can support whole body contact recreation so that appropriate standards on those waters are set.
- Work with local entities to encourage the development of locally led voluntary watershed management plans.
- Provide technical assistance to communities in Northwest Missouri seeking to develop additional surface water resources to meet drinking water needs.
- Identify surface water use trends to evaluate needs in an effort to ensure adequate surface water resources for industrial, agricultural, municipal and domestic use.
- Make participation in the State Revolving Fund more feasible by simplifying and streamlining application requirements.

- Seek resources to increase the staff to provide direct assistance to communities in comprehensive water and wastewater site evaluations, design capacity of existing facilities and to inspect facilities under construction.
- Seek to develop and implement areas of the Drinking Water State Revolving Fund that would extend eligibility of the Fund to privately owned public water systems as allowed under the federal Safe Drinking Water Act.
- Seek resources for the rural water grant program that provide assistance to publicly owned community water systems in small rural communities.
- Investigate the use of the State Revolving Fund to assist with security vulnerability.
- assessment and emergency planning efforts.
- Establish field positions to increase awareness of the State Revolving Fund and to facilitate assistance to eligible entities.

## **7. OUTCOMES ASSESSMENT PROCESS**

The Water Resources Law directs MDNR to prepare an annual report that describes the progress the department has made in fulfilling the objectives of the law. The last available annual report was issued in 2004. According to the report, Phase III of the SWP was initiated in 2004; starting with a pilot project using a watershed-based approach in the James River Basin. [Further information regarding Phase III and additional progress toward the development and implementation of the SWP could not be found online.]

## **8. NEEDS, CHALLENGES AND CRITICAL PRIORITIES – INTERVIEW INSIGHTS**

The key water resources issues/needs in the state of Missouri are:

- Maintenance of an adequate flow of the Missouri River
- Regional and localized water quantity and quality issues
- Aging wastewater and drinking water infrastructure
- Vulnerability to flooding and droughts
- Lack of authority to regulate floodplains or levee construction
- Competition among water users during times of drought
- Lack of adequate and sustainable funding
- Lack of staff to effectively carry out planning goals

Meeting the water resources needs of the state of Missouri will require alterations to the current system of funding and political intervention. Budget constraints and decreased human resources have impacted the progress of the statewide water planning effort. Representatives from the MDNR have questioned the broad approach previously adopted in planning for water resources in the state. Currently the department is not equipped to effectively carry out all requirements of the state water plan.

Collaboration with federal entities is one way the state of Missouri feels it can move forward in its state water planning efforts. The state has benefited from the expertise of federal agencies in planning, data collection, and monitoring. Maintaining and improving the collaboration between

the state of Missouri and the federal government will create substantial opportunities for improved water resources planning and management statewide.

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