Missouri Water Resources Plan

Statutory Responsibility (640.415 RSMo):

“The department shall 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, including existing and future need for drinking water supplies, agriculture, industry, recreation, environmental protection and related needs.”
When Do We Plan For Water?

Hamilton City Lake, Summer 2018

Lake Elmwood, Milan Summer 2018
Elements of the Water Plan

- Develop estimates of water needs for all sectors of water use
- Assess water supplies
- Assess water quality as it affects water use availability
- Identify infrastructure needs, costs and financing
- Gather public and stakeholder input
### WATER DEMAND SECTORS

#### Consumptive Demand
- Municipally-Provided Public Supply
- Self-Supplied Nonresidential
- Self-Supplied Domestic
- Livestock
- Agriculture Irrigation

#### Non-Consumptive Demand
- Hydroelectric Power Generation
- Commercial Navigation
- Fisheries and Wetlands
- Water-Based Outdoor Recreation
- Thermoelectric Power Generation (small portion consumed)

*Consumptive demand* refers to water that is withdrawn from the source and consumed in a way that makes its use all or partially unavailable for other purposes or uses.
Determining Agriculture Needs

University of Missouri is Leading the Assessment

Overall Objectives:

• Evaluate historical monthly water use of livestock and irrigated crops by county in the State of Missouri

• Project the monthly volume of water needed for irrigation and livestock for each county to 2060
Draft Demands & Projections

Demands

Supply

Infrastructure

Water Quality

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Water Plan Core Elements: Supply
How is Naturalized Streamflow Quantified?

- Representative USGS streamflow gages are selected
- Monthly flow records are unimpaired
- Streamflow represents available flow at the outlet of each basin
Current Consumptive Water Demands by Source – Draft Results

Values in million gallons per day

State Total

2367

533

Groundwater

Surface Water

Missouri-Mishnabotna

15

23

88

96

216

142

Mississippi-Salt

Upper

51

29

Neosho-Verdigris

12

1190

48

12

4

Lower Missouri

216

Upper Mississippi-Kaskaskia-Meramec

105

370

Upper White

14

373

Gasconade-Osage

91

35

35

29

4

Total

2367

533
Determining Challenges in Supply: Analysis at the HUC4

Out-of-State and Major River Supply Average Year

Upper Mississippi-Salt HUC4 Average Year Monthly Surface Water Budget

- Major River Inflow from Out-of-State
- Current Surface Water Withdrawals - Mississippi River
- HUC 4 Streamflow Generated Out of State
Determining Challenges in Supply: Analysis at the HUC4

In-State Supply
Dry Year

Upper Mississippi-Salt HUC4 Dry Year Monthly Surface Water Budget
In-State Supply

Dry Year Streamflow Generated in Missouri
Current Non-Major River Withdrawals
Water Plan Core Elements: Infrastructure

- Infrastructure Analysis
  - EPA 2011 Drinking Water Infrastructure Needs Survey and Assessment (DWINSA)
  - Drinking Water State Revolving Funds (SRF)
  - EPA 2012 Clean Watersheds Needs Survey (CWNS)
  - Missouri Clean Water Information System Database (CWIS)

- Regional Water Supply Studies
Infrastructure Needs

Wastewater and drinking water infrastructure needs in Missouri, over the next twenty years, are estimated to exceed $9.5 billion and $8.4 billion, respectively.

(2017 MoDNR, Financial Assistance Center)
Water Plan Core Elements: Water Quality

- Demands
- Supply
- Infrastructure
- Water Quality
Water Quality Approach

Goals

• Recognize water quality and assess how this affects water supply uses

Elements

• Analyze statewide water quality and the impact on consumptive water supplies
• Evaluate water quality for assessment of wastewater improvements

Considerations

• Not intended as a regulatory plan
• Water quality regulations are authorized under different regulatory statutes than those that authorize the development of the statewide water resources plan
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Primary Sectors Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supply</td>
</tr>
<tr>
<td>Ammonia</td>
<td></td>
</tr>
<tr>
<td>Bacteria (E. coli)</td>
<td>x</td>
</tr>
<tr>
<td>Chloride</td>
<td>x</td>
</tr>
<tr>
<td>Low dissolved oxygen (DO)</td>
<td></td>
</tr>
<tr>
<td>Metals (cadmium, copper, lead, manganese, nickel, zinc)</td>
<td>x</td>
</tr>
<tr>
<td>Nitrates (primarily groundwater)</td>
<td>x</td>
</tr>
<tr>
<td>Nutrients (nitrogen, phosphorus)</td>
<td>x</td>
</tr>
<tr>
<td>Total organic carbon (TOC)</td>
<td>x</td>
</tr>
<tr>
<td>Pesticides (atrazine, others)</td>
<td>x</td>
</tr>
<tr>
<td>Radiologicals (gross alpha)</td>
<td>x</td>
</tr>
<tr>
<td>Sulfates</td>
<td></td>
</tr>
<tr>
<td>Total suspended solids (TSS)</td>
<td>x</td>
</tr>
</tbody>
</table>
Putting It All Together: Scenario Planning

- Identify major uncertainties that can impact the future
- Select most important uncertainties as “drivers” of scenarios
- Combine uncertainty drivers into scenarios that represent a different possible futures
- Measure impacts of scenarios and assess strategies to address impacts
- Use an adaptive management framework for continuous re-assessment and implementation of strategies
Major Uncertainties & Drivers

- Population Growth
- Unplanned Outages
- Interstate Diversions
- Regulatory Framework
- Agricultural Output
- Technology Changes
- Municipal Water Use
- Economic Conditions
- Water Treatment Level
- Future Climate
# Proposed Scenarios

## Uncertainty Drivers

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Demands/Economy</th>
<th>Supply Constraints</th>
<th>Future Climate</th>
<th>Water Treatment Level</th>
<th>Regulatory Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business-as-Usual</td>
<td>Baseline Projection</td>
<td>Medium</td>
<td>Historical variability</td>
<td>Existing Water Treatment Level</td>
<td>Current</td>
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<tr>
<td>Weak Economy</td>
<td>Low Projection</td>
<td>Low</td>
<td>Warmer/Wetter</td>
<td>Existing Water Treatment Level</td>
<td>Less Stringent</td>
</tr>
<tr>
<td>Hot Growth</td>
<td>High Projection</td>
<td>High</td>
<td>Hot/Dry</td>
<td>Moderate Increase in Water Treatment Level</td>
<td>More Stringent</td>
</tr>
<tr>
<td>Adaptive Innovation</td>
<td>High Projection</td>
<td>Medium</td>
<td>Hot/Wetter</td>
<td>Moderate Increase in Water Treatment Level</td>
<td>Adaptive</td>
</tr>
</tbody>
</table>
Water Resources Plan Engagement

- Interagency Taskforce
- Technical Workgroups
- Water Resource Plan Presentations
- Missouri Water Resource Plan Brochure
- Water Resources Plan Website
What Does the Future Hold?

Lake Elmwood, Milan
Summer 2018

Hamilton City Lake,
Summer 2018
Drought 2018

October 25, 2018
Historical Record

[Graph showing annual average precipitation with key years and periods indicated.]

Source: NOAA/Missouri Climate Center
Missouri's thousands of miles of rivers, streams and lakes, along with underground aquifers, supply our state's 6 million residents with water to drink and provide a crucial role in supporting outdoor recreation, industry and meeting our agricultural needs.

The Missouri Department of Natural Resources determined through previous water planning that water demands in certain areas of the state cannot be met long term, especially under drought conditions. The Missouri Water Resources Plan will help to identify future shortfalls in water supplies, and explore options to address those water needs. This may include project recommendations such as new infrastructure development, regionalization of water use, integrating water supplies and pursuing financial assistance opportunities.

The department is directed by Missouri statutory law, Section 640.415, RSMo, 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, including existing and future need for drinking water supplies, agriculture, industry, recreation, environmental protection and related needs ..." As such, the department has begun the process of updating the state water plan and anticipates completion of the plan by Fall 2019.

Water Resources Plan Goals & Objectives

Interagency Task Force

Water Plan Technical Workgroups

2003 State Water Resources Plan

Contact Information

Water Resources Plan Information
PO Box 176
Jefferson City, MO 65102
800-361-4627
573-751-2867

Email: Contact Us

Water Resources Plan Brochure
11 x 17 | 6.5 x 11

Report an Environmental Concern

dnr.mo.gov/mowaterplan/
Missouri Water Resources Plan Schedule

- **2016**
  - Oct: Evaluate Demographics, Economics & Trends

- **2017**
  - Jan: Quantify Consumptive & Non-Consumptive Demand
  - Jul: Estimate Agricultural Demands

- **2018**
  - Jul: Evaluate Water Quality
  - Jul: Analyze Surface & Groundwater Hydrology & Availability
  - Oct: Evaluate Infrastructure

- **2019**
  - Jan: Adaptive Management
  - Apr: Stakeholder & Public Involvement
Technical Workgroups Meet Quarterly

- Met last, August 28, in Jefferson City
- Will meet again in November, 2018
Interagency Task Force
Future Meetings

The IATF Meets Twice a Year

• Met last on May 31, 2018

• Will meet again in November 2018
Thank You

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