State Water Planning
Highlights from around the Nation

John Boyer, PE, BCEE
Outline

• What States are we talking about?
• Why are States preparing water plans?
• How are the plans funded?
• What are the goals of these plans?
• How are stakeholders involved and organized?
• What technical work is performed to support these plans?
• What are some States doing to improve on traditional water planning?
• What are some lessons learned?
What States are we talking about?
## What States are we talking about?

Beaver Lake, AR

<table>
<thead>
<tr>
<th></th>
<th>Arkansas</th>
<th>Connecticut</th>
<th>Missouri</th>
<th>Indiana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (2015)</td>
<td>2,978,204</td>
<td>3,590,886</td>
<td>6,083,672</td>
<td>6,619,680</td>
</tr>
<tr>
<td>Average Rainfall (inches/year)</td>
<td>49</td>
<td>47</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Surface Water Withdrawals (MGD)</td>
<td>4,248</td>
<td>3,000</td>
<td>6,690</td>
<td>6,478</td>
</tr>
<tr>
<td>Groundwater Withdrawals (MGD)</td>
<td>9,585</td>
<td>128</td>
<td>1,737</td>
<td>699</td>
</tr>
<tr>
<td>Per Capita Total Withdrawals (GPD)</td>
<td>4,645</td>
<td>871</td>
<td>1,385</td>
<td>1,084</td>
</tr>
</tbody>
</table>

### Withdrawals by Sector (MGD)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Arkansas</th>
<th>Connecticut</th>
<th>Missouri</th>
<th>Indiana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Supply</td>
<td>363</td>
<td>240</td>
<td>797</td>
<td>628</td>
</tr>
<tr>
<td>Irrigation</td>
<td>11,600</td>
<td>11</td>
<td>1,370</td>
<td>133</td>
</tr>
<tr>
<td>Industrial</td>
<td>157</td>
<td>181</td>
<td>85</td>
<td>2,290</td>
</tr>
<tr>
<td>Thermoelectric</td>
<td>1,440</td>
<td>126</td>
<td>5,860</td>
<td>3,820</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>251</td>
<td>25</td>
<td>164</td>
<td>15</td>
</tr>
</tbody>
</table>

Why are States preparing water plans?
Common Drivers for Statewide Planning

- Current or anticipated water shortages due to population and economic growth
- Competition for water and conflict between different uses
- Lack of supplies when and where the water is needed
- Insufficient or aging infrastructure
- Impaired water quality
- Floods and droughts
- Climate and hydrologic uncertainty/variability
Drivers

**Arkansas** 2014
- Required by law
- First Plan in 1975
- Last updated in 1990
- Groundwater declines
- **Uncertainty** about ability to meet future needs
- Insufficient and *aging* infrastructure

**Connecticut** 2017
- Long discussed by Legislature but no plan was ever developed
- Increased concern regarding competing uses
- Drought and resulting news coverage tipped the scales

**Missouri** 2019
- Required by law
- First Plan in 1938
- Last updated in 2003
- State is required 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”
How are the plans funded?
## Funding and Cost

<table>
<thead>
<tr>
<th>State</th>
<th>Year</th>
<th>Funding Amount</th>
<th>Duration</th>
<th>Funding Source</th>
<th>Funding through Legislature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>2014</td>
<td>$3 Million</td>
<td>2 Years</td>
<td>US Army Corps of Engineers Planning Assistance to States (PAS) funding for initial study</td>
<td>Yes</td>
</tr>
<tr>
<td>Connecticut</td>
<td>2017</td>
<td>$1M</td>
<td>1 year</td>
<td>Funding through legislature</td>
<td>Yes</td>
</tr>
<tr>
<td>Missouri</td>
<td>2019</td>
<td>$2.7M</td>
<td>3 years</td>
<td>PAS funding for all phases</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Planning Assistance to States (PAS)

For preparation of a comprehensive water resources plan for the development, utilization, and conservation of the water resources of drainage basins, watersheds, or ecosystems located within the boundaries of the State, including plans to comprehensively address water resources challenges.

- Water Resources Development Act of 1974
- $30,000,000 available annually
- $5,000,000 annual per-State limit
- Require 50% match by State
- The Corps may contribute direct technical assistance or States may work with a non-Federal partner
What are the goals of these plans?
Connecticut

Overarching Goal: Balance the use of water to meet all needs

Stakeholder Defined Goals:

- Provide **reliable and resilient supplies** for all uses
- **Promote public health** and quality of life with high quality water
- Protect the **environment**
- **Manage water cost effectively**

- Develop an **implementation plan**
- Prepare for uncertain **future climate**
- **Use science and data** to recommend action
- **Involve CT citizens**
Overarching Goal: Balance the use of water to meet all needs

Other Plan Requirements as Defined by Statute:

- Make recommendations for technology and infrastructure upgrades
- **Recommend land use** and other measures to ensure the desired quality and abundance of water
- **Establish conservation guidelines** and incentives for consumer water conservation
- Develop a water reuse policy with incentives for matching the quality of the water to the use
- Promote intra-regional solutions and sharing of water resources
- Identify modifications to laws and regulations necessary to implement the recommendations of the plan
Goals

- First and foremost, meet the drinking water needs of the State

- Optimize the use of surface and groundwater for the differing economies of the unique regions of the State

- Reliably meet agricultural and industrial water needs

- Manage water resources in a manner that protects the ecological needs of fish and wildlife

- Reliably meet the water quantity and quality needs to help support navigation, recreation and tourism
Goals

- Use **best available science** and **data** to update and implement the Plan
- Employ the latest **supply management** and **water efficiency technologies** among the different sectors of use
- Plan for **changing demographics**
- **Refine criteria for declaring drought**, water shortages and excess water and advance policies and procedures for allocating water during drought
- Improve upon existing methodologies to quantify **instream flow needs**
- Include **recreation** and **tourism** as a non-consumptive water use
Goals

- Gather input from citizens and stakeholders to help identify water resource priorities
- Evaluate current and future groundwater and surface water availability
- Develop projected water supply needs through the year 2060
- Identify gaps in water availability based on water use projections
- Identify water and wastewater infrastructure needs, funding and financing opportunities
- Identify impacts affecting water availability
- Outline a series of strategies to help prepare us to meet our water needs
How are stakeholders involved and organized?
Connecticut

Explore policy options and draft language where consensus is possible

Policy Subcommittee

Review data, analytical processes and technical options for water management

Science/Tech Subcommittee

WPC Steering Committee

Provide recommendations to the WPC

Water Planning Council DEEP, DPH, PURA and OPM

WPC Advisory Group

Advise the WPC and provide updates on other statewide water planning activities

Connecticut Citizens

Express comments, concerns, questions and offer opinions on the process and its decisions

Recommend the Plan to the Legislature

Connecticut Legislature

Recommend the Plan to the Legislature
• 36 public meetings
• 5 Regional Planning Groups formed to represent local interests
• 2 Technical Workgroups with 10 subgroups
• TAC consisted of 9 ANRC Commissioners
• Agency Planning team developed and implemented the AWP
Project & Stakeholder Organization

Interagency Task Force (IATF)
20+ state and non-government representatives
Serves as an advisory group providing overall guidance and direction, and making project recommendations.

Missouri Department of Natural Resources
Responsible for project execution and administration

Technical Workgroups
- Consumptive Needs
- Non-Consumptive Needs
- Infrastructure Needs
- Agricultural Needs
- Water Quality

Provide guidance on technical analyses, give feedback to the development of technical products, identify and prioritize water resource issues, and provide recommendations on how to address those issues.
What technical work is performed to support these plans?
Technical Work

• What you can accomplish depends on:
  • Budget
  • Schedule
  • Data availability
  • Project goals
  • Resources to complete the work
  • Availability of existing tools and models
Comparison of Technical Approaches

• Calculation of “excess surface water” within 9 regional basins
  • Demands projected to 2050
  • Use of existing groundwater model

• 44 subregional water budgets
  • Demands projected to 2040 (less rigorous)
  • Comparison of average annual and peak month supply and demand
  • Basic assessment of future climate variability and increased conservation impacts

• 9 regional water budgets
  • 6 subregional surface water budgets focusing in areas of higher stress
  • Demands projected to 2060 (more rigorous)
  • Use of existing groundwater models
  • In-depth scenario planning, including assessment of future climate variability
**Technical Work Example**

**Connecticut Water Budget**

### Basin Water Summary

<table>
<thead>
<tr>
<th>Regional Basin</th>
<th>No.</th>
<th>Major Basin</th>
<th>Size of Basin in CT (m^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southeast</td>
<td>22</td>
<td>Coasts</td>
<td>58</td>
</tr>
<tr>
<td>Western</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Water Availability and Demand (MGD)

- **Average Conditions (MGD)**
- **July Conditions (MGD)**

### Comparisons of available water, current and future demand, and registration amounts

<table>
<thead>
<tr>
<th>Water in Basin</th>
<th>Net Groundwater Demands</th>
<th>Surface Water Demands</th>
<th>Unused Groundwater</th>
<th>Unused Surface Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Conditions, A03</td>
<td>82</td>
<td>1.36</td>
<td>9.40</td>
<td>0.48</td>
</tr>
<tr>
<td>Future (2040) Conditions, A03</td>
<td>25</td>
<td>4.38</td>
<td>15.99</td>
<td>1.32</td>
</tr>
<tr>
<td>Current Conditions, MMA03</td>
<td>82</td>
<td>1.36</td>
<td>9.40</td>
<td>0.48</td>
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**State and basin map**
Technical Work Example

Missouri

Comparison of availability and demand by month
Flow duration curve
Basin features

Reservoir storage analysis
Notes
Sub-regional demand summary

water budget
Summary of demands by sector

Missouri Water Budget

Summary of Surface Water Demands by IUCC

What are some States doing to improve on traditional water planning?
Scenario Planning

- Given the time and expense to plan for critical infrastructure, it is essential to account for uncertainty.
Scenario Planning and Adaptive Management

- Current water planning paradigm includes only a **narrow range** of forecasted conditions.

![Diagram showing actual conditions and a major 'Disruption Point' causing stress beyond planned conditions.](image)

- **Actual conditions** vs. **Narrow range of forecasted conditions**

  - Major ‘Disruption Point’ causing stress beyond planned conditions.
Scenario Planning and Adaptive Management

- Scenario expands the plausible range of forecasted conditions based on various scenarios.
## Scenario Planning Example

<table>
<thead>
<tr>
<th>Scenario</th>
<th>M&amp;I Demands</th>
<th>Ag Demands</th>
<th>Future Climate</th>
<th>Supply Constraints</th>
<th>Regulatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business-as-Usual</td>
<td>Baseline</td>
<td>Medium</td>
<td>Historical variability</td>
<td>No supply constraints</td>
<td>No USACE reservoir reallocations</td>
</tr>
<tr>
<td>Strong Economy/High Water Stress</td>
<td>Low</td>
<td>High</td>
<td>Hot and dry</td>
<td>Interstate diversions on Missouri River</td>
<td>Limited USACE reservoir reallocations</td>
</tr>
<tr>
<td>Substantial Ag Expansion</td>
<td>High</td>
<td>Highest</td>
<td>Warm and wet</td>
<td>Interstate diversions on Missouri River</td>
<td>Limited USACE reservoir reallocations</td>
</tr>
<tr>
<td>Weak Economy/Low Water Stress</td>
<td>High</td>
<td>Medium</td>
<td>Warm and wet</td>
<td>No supply constraints</td>
<td>No USACE reservoir reallocations</td>
</tr>
</tbody>
</table>

Draft and simplified for demonstration only
What are some lessons learned?
Observations, Outcomes and Lessons Learned

• All State plans are different. The focus varies between policy, programs or projects.

• Very few states get to project implementation, but instead hope to harness power of water utilities and others for project implementation.
Observations, Outcomes and Lessons Learned

• A **reliable funding source** reinforces the commitment to plan for the future

• **Creating funding mechanisms** is a good incentive to cooperate – new authorities and partners

• Decentralized (bottom-up) planning can sometimes lead to a focus on **differences** rather than **common goals**

• Abandoning **positions** and focusing on **interests** helps reduce conflicts
Observations, Outcomes and Lessons Learned

- Poor **data quality** and **availability** may limit the technical analysis.

- **Multiple lead agencies** can be **hard to navigate** and may have trouble reaching agreement.

- Stakeholder engagement early and often is critical – **but still may not be enough!**

- The **process is as important as the result** - make sure people are heard and input is considered.
THANK YOU