State Water Planning

Highlights from around the Nation

John Boyer, PE, BCEE

INDIANA WATER SUMMIT 2018

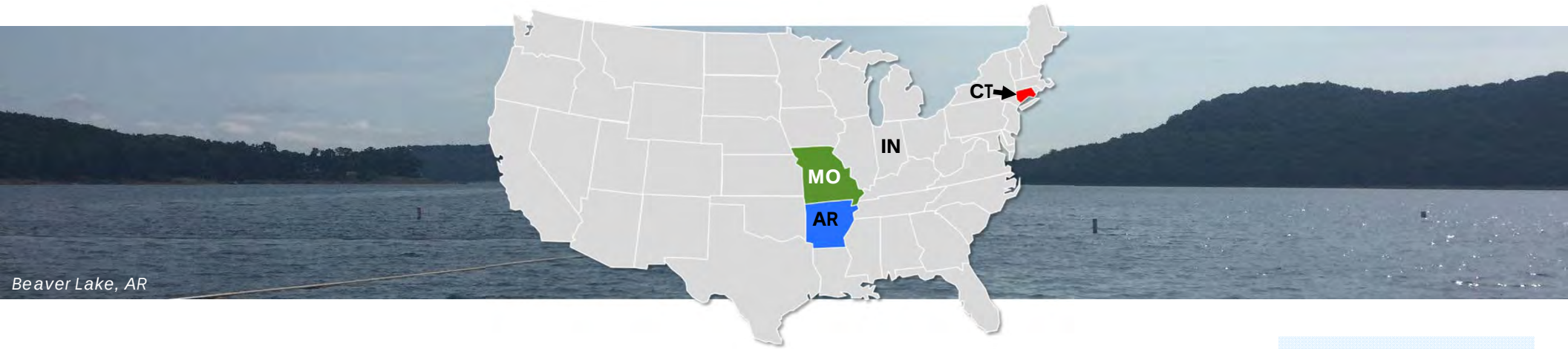
CDM Smith

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?

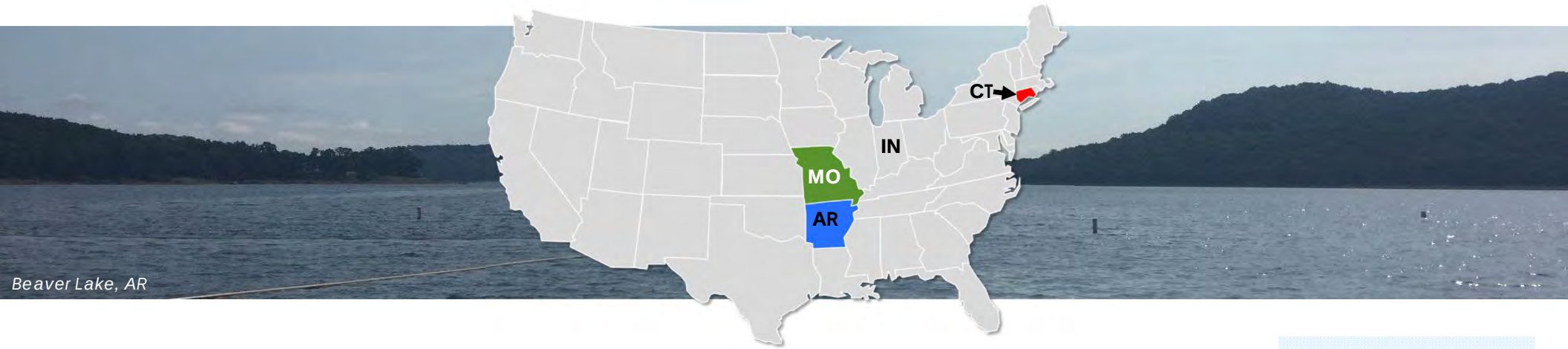
What States are we talking about?



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

Source: USGS, 2017. Estimated use of water in the United States in 2015. Circular 1441

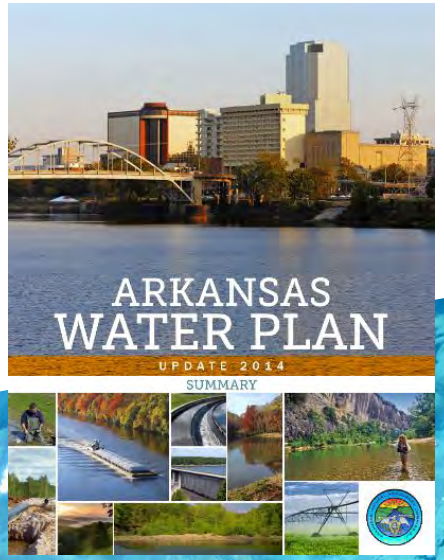
What sectors use the most water?

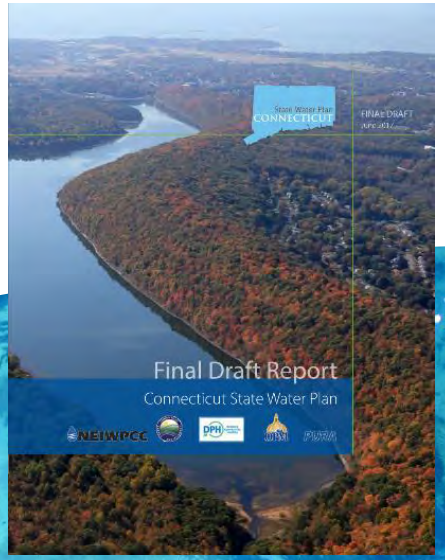


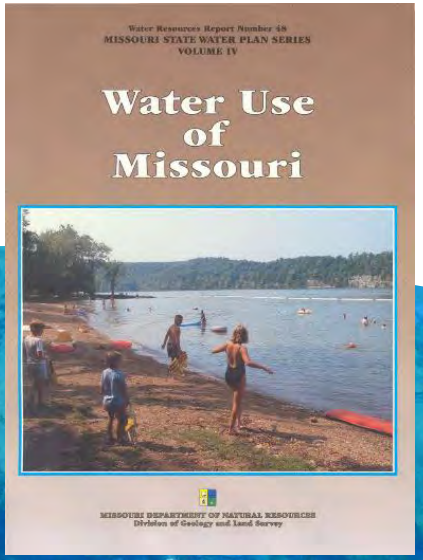
Withdrawals by Sector (MGD)	Arkansas	Connecticut	Missouri	Indiana
Public Supply	363	240	797	628
Irrigation	11,600	11	1,370	133
Industrial	157	181	85	2,290
Thermoelectric	1,440	126	5,860	3,820
Aquaculture	251	25	164	15

Source: USGS, 2017. Estimated use of water in the United States in 2015. Circular 1441

Why are States preparing water plans?

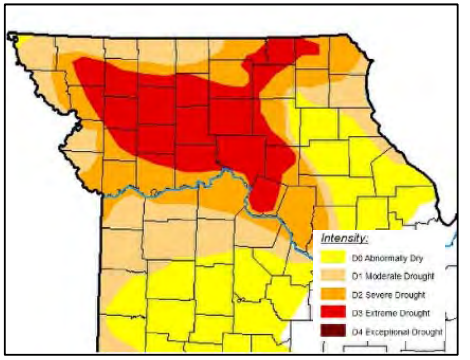






Common Drivers for Statewide Planning

- 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

Arkansas
2014

- **$3 Million** (2 Years)
- US Army Corps of Engineers Planning Assistance to States (PAS) funding for initial study
- Funding through legislature

Connecticut
2017

- **$1M** (1 year)
- Funding through legislature

Missouri
2019

- **$2.7M** (3 years)
- PAS funding for all phases
- Funding through legislature

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

US Army Corps of Engineers®

What are the goals of these plans?

Connecticut Goals

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**

Connecticut Goals

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

Arkansas

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**

Photo courtesy AR State Water Plan

Arkansas

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

Missouri

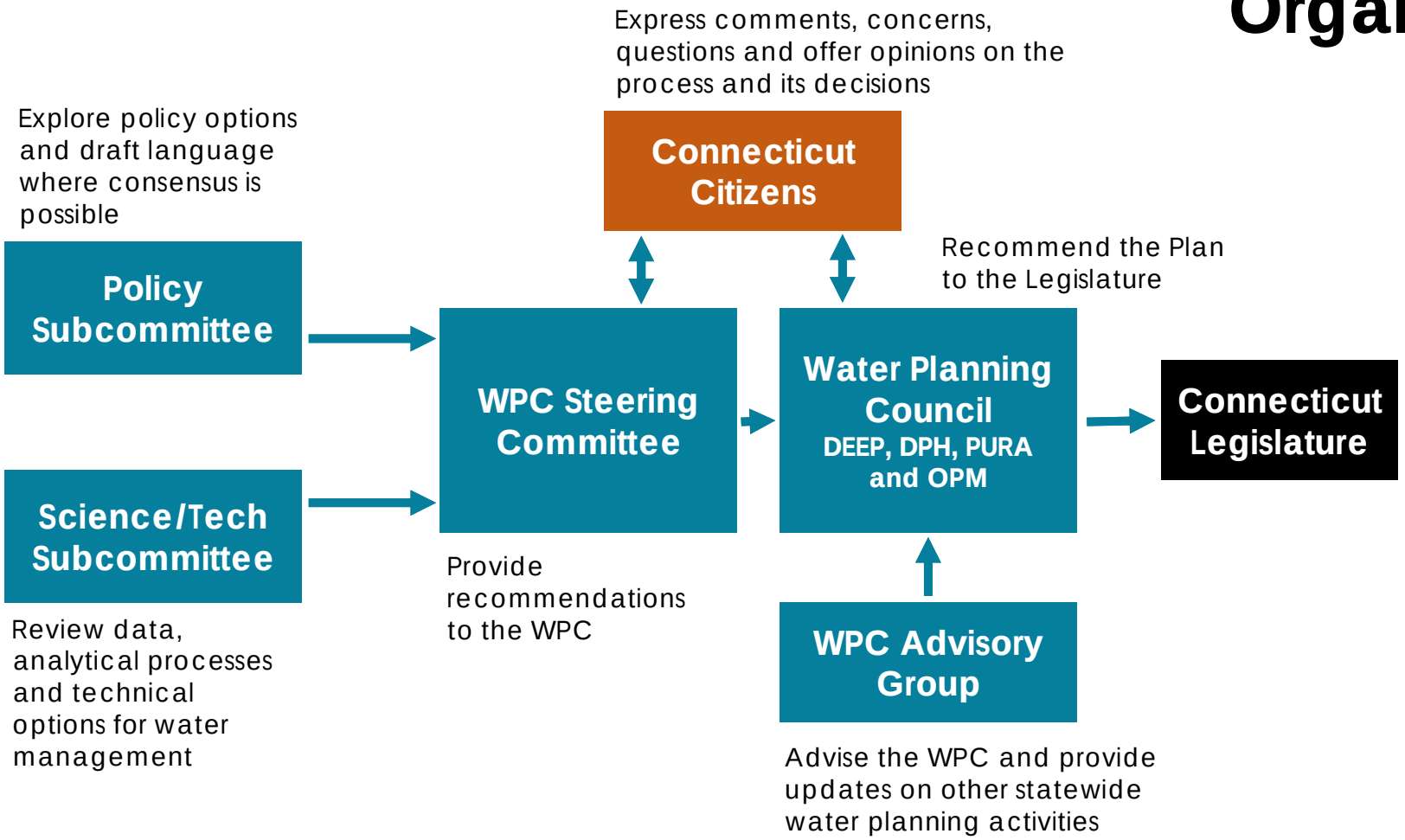
Goals

- 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?

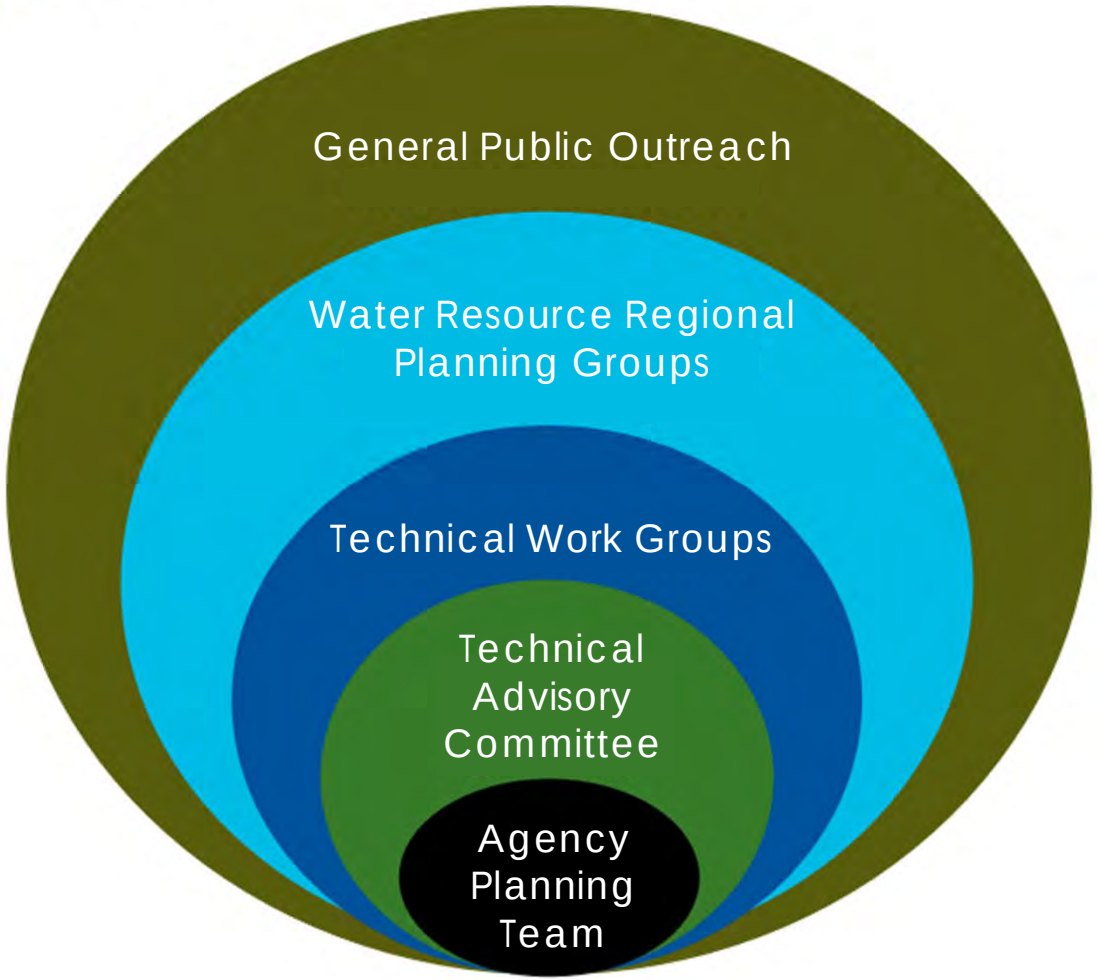
Connecticut

Project & Stakeholder Organization



Arkansas

Project & Stakeholder Organization



- 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

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.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

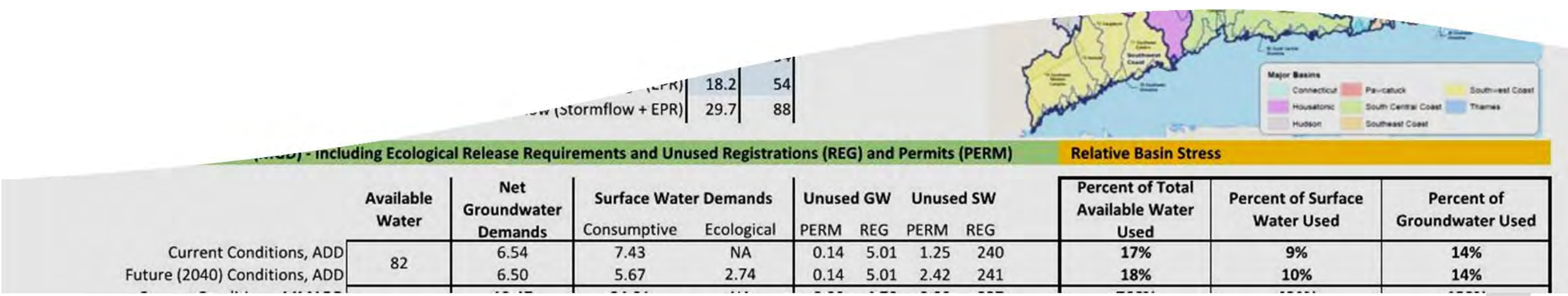
Responsible for project execution and administration

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 Legislature

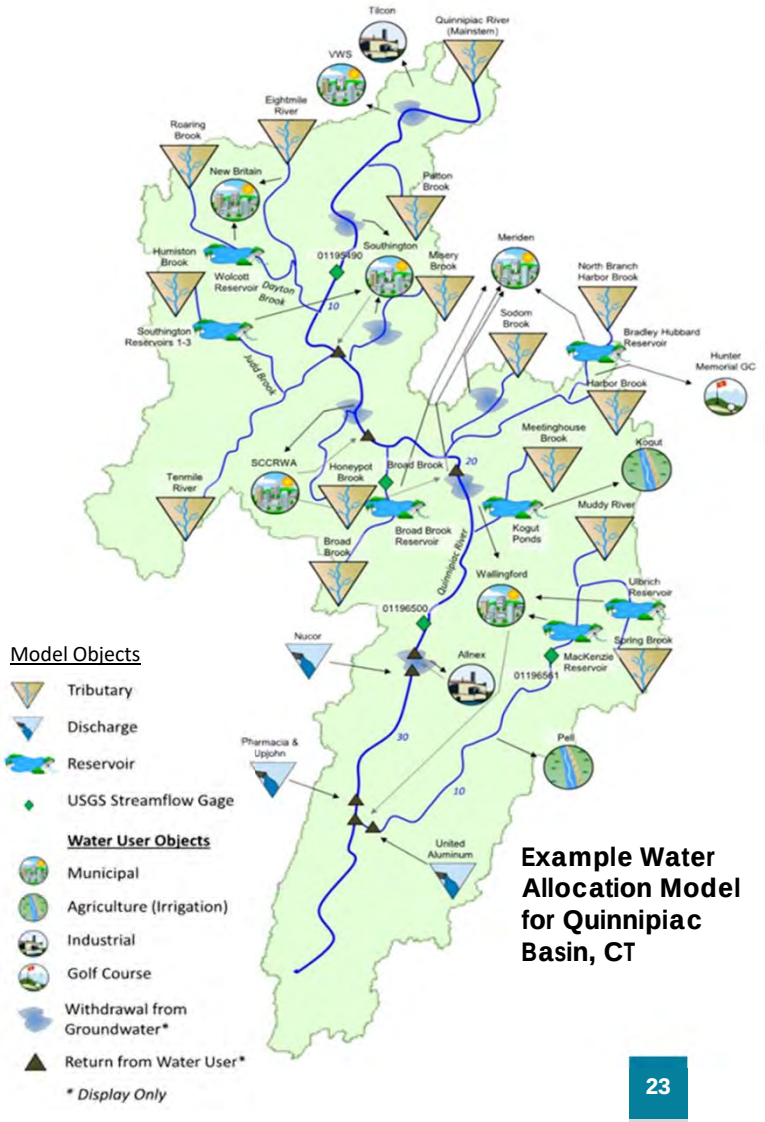
What technical work is performed to support these plans?



	Available Water	Net Groundwater Demands	Surface Water Demands		Unused GW		Unused SW		Percent of Total Available Water Used	Percent of Surface Water Used	Percent of Groundwater Used
			Consumptive	Ecological	PERM	REG	PERM	REG			
Current Conditions, ADD	82	6.54	7.43	NA	0.14	5.01	1.25	240	**17%**	**9%**	**14%**
Future (2040) Conditions, ADD		6.50	5.67	2.74	0.14	5.01	2.42	241	**18%**	**10%**	**14%**

Technical Work

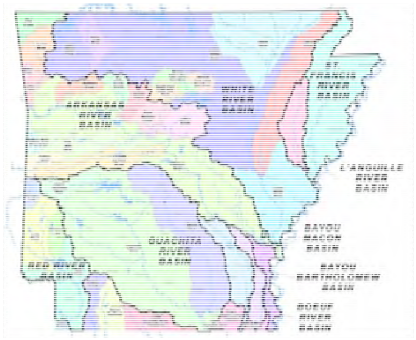
- What you can accomplish depends on:
  - Budget
  - Schedule
  - Data availability
  - Project goals
  - Resources to complete the work
  - Availability of existing tools and models



Example Water Allocation Model for Quinnipiac Basin, CT

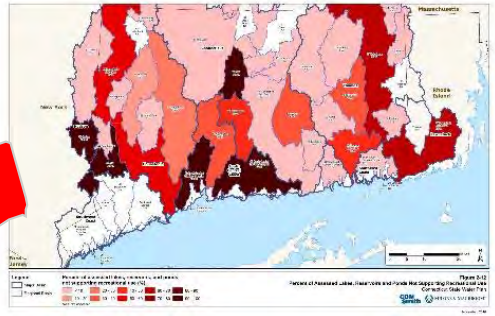
Comparison of Technical Approaches

AR



- Calculation of "**excess surface water**" within 9 regional basins
- **Demands** projected to **2050**
- Use of **existing groundwater model**

CT



- 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

MO

- 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**

Connecticut

Technical Work Example

Water budget

State and basin map

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

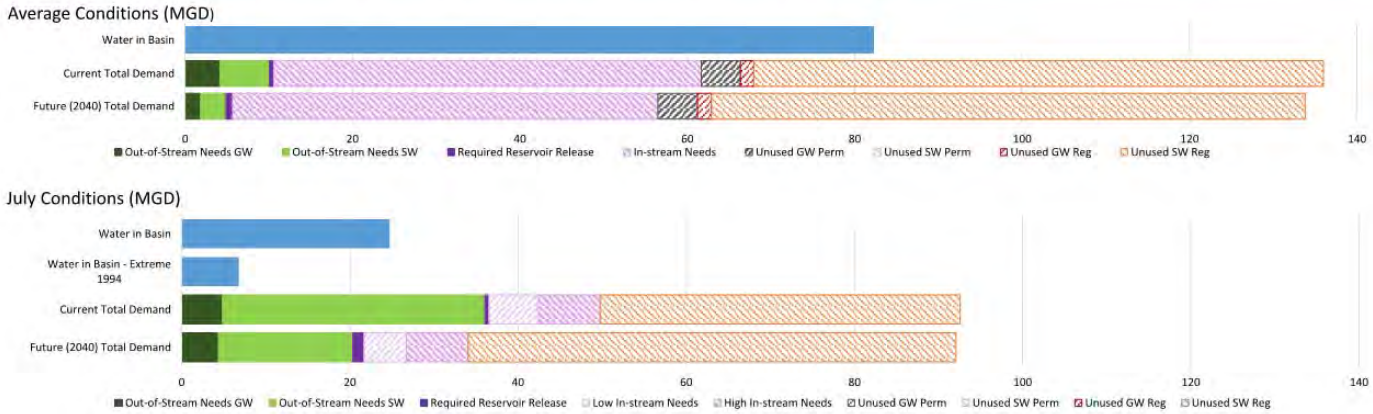
Basin Water Summary

Regional Basin	Southeast Western
Regional Basin No.	22
Major Basin	Southeast Coast
Size of Basin in CT (mi^2)	58

Catalog of Internal and External Flows in Basin

	IN/YR	MGD	
Precipitation	48.0	133	Water In
Wastewater Discharge	0.0	0.0	
Estimated Domestic Recharge	0.2	0.5	
Evapotranspiration	22.9	63	Water Out
Groundwater Withdrawals	1.7	4.7	
Surface Water Withdrawals	2.1	5.9	
Stormflow	14.5	40	Internal
Estimated Potential Recharge (EPR)	15.2	42	
Total Streamflow (Stormflow + EPR)	29.7	82	

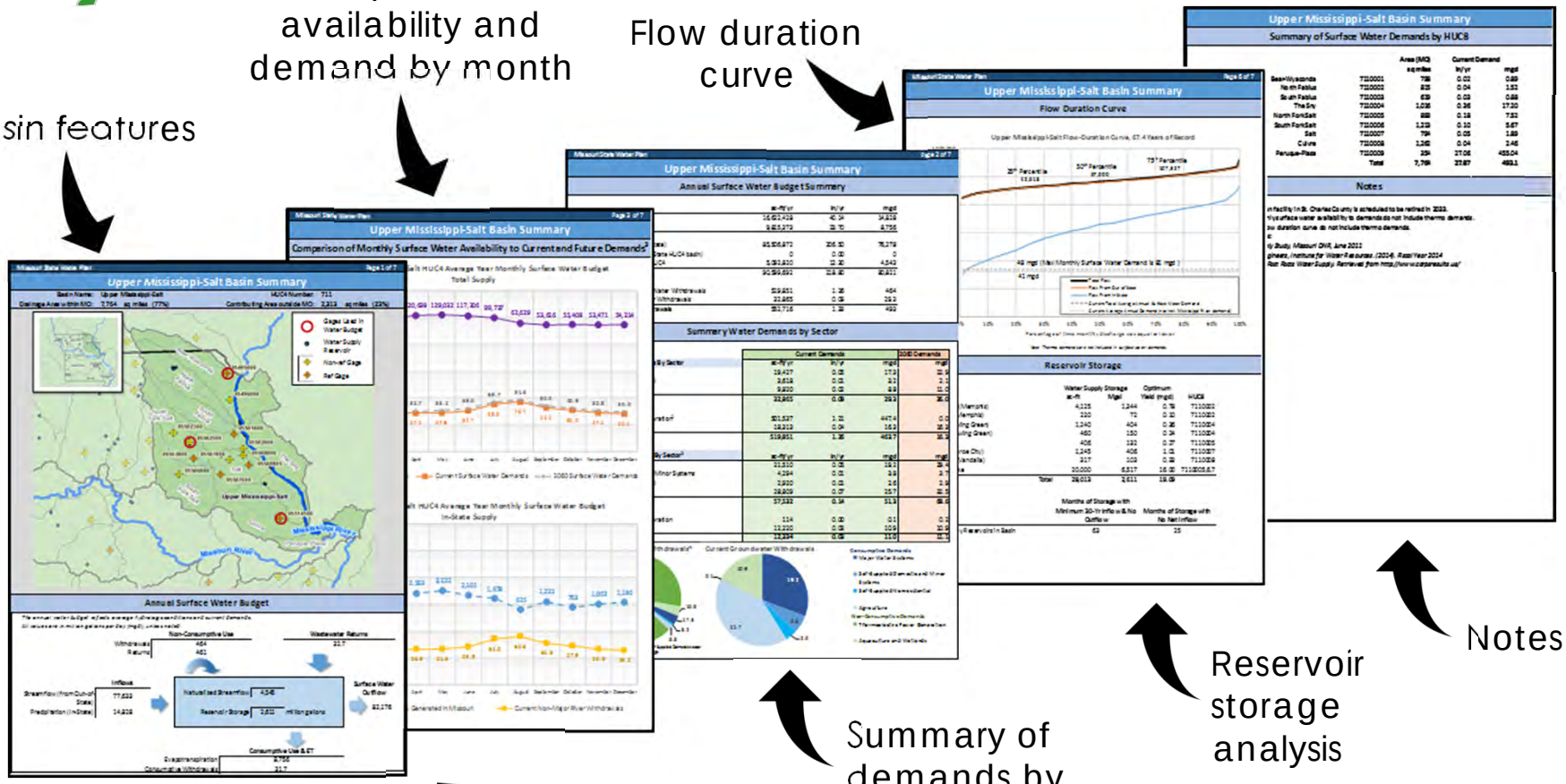
Water Availability and Demand (MGD) - Including Estimated Ecological Flows, Regulatory Reservoir Releases, and Unused Registrations (Reg) and Permits (Perm)



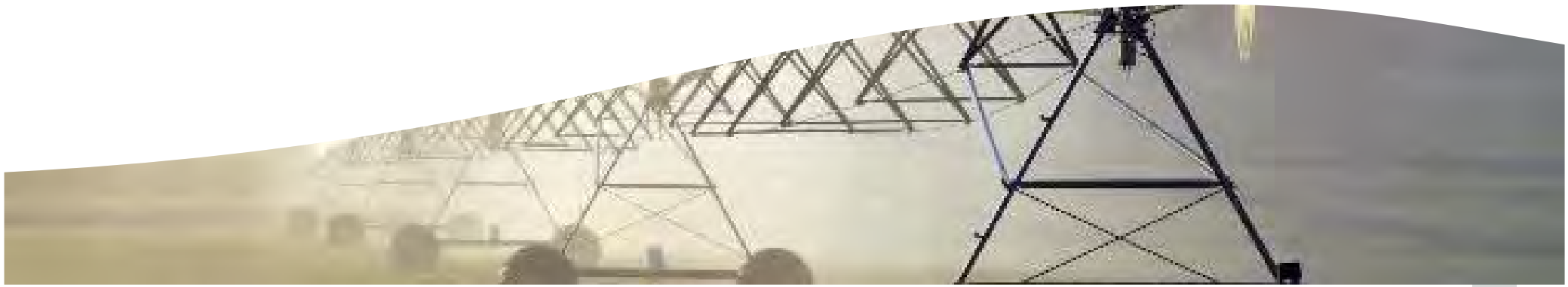
	Water in Basin	Net Groundwater Demands	Surface Water Demands: Out-of-stream Needs	Surface Water Demands: Reservoir Release	Surface Water Demands: In-stream Needs		Unused Groundwater: Perm	Unused Groundwater: Reg	Unused Surface Water: Perm	Unused Surface Water: Reg
Current Conditions, ADD	82	4.15	5.94	0.48	51.6		4.67	1.60	0.00	68.06
Future (2040) Conditions, ADD		1.86	3.05	0.76	51.6		4.75	1.67	0.00	70.96
Current Conditions, MMADD	25	4.86	31.20	0.48	6.4	13.7	-0.57	-3.07	0.00	42.82
Future (2040) Conditions, MMADD		4.38	15.99	1.32	6.4	13.7	-0.29	-2.82	0.00	58.02

Missouri

Technical Work Example



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

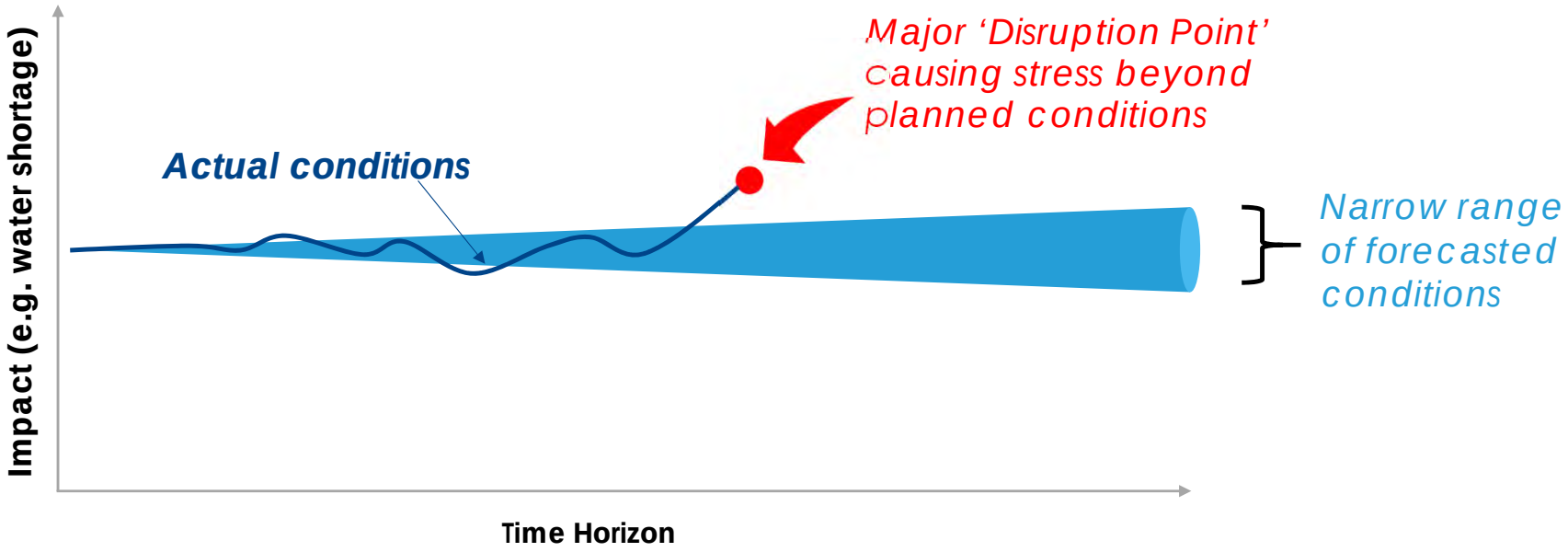


Scenario Planning

- Given the time and expense to plan for critical infrastructure, it is essential to account for **uncertainty**

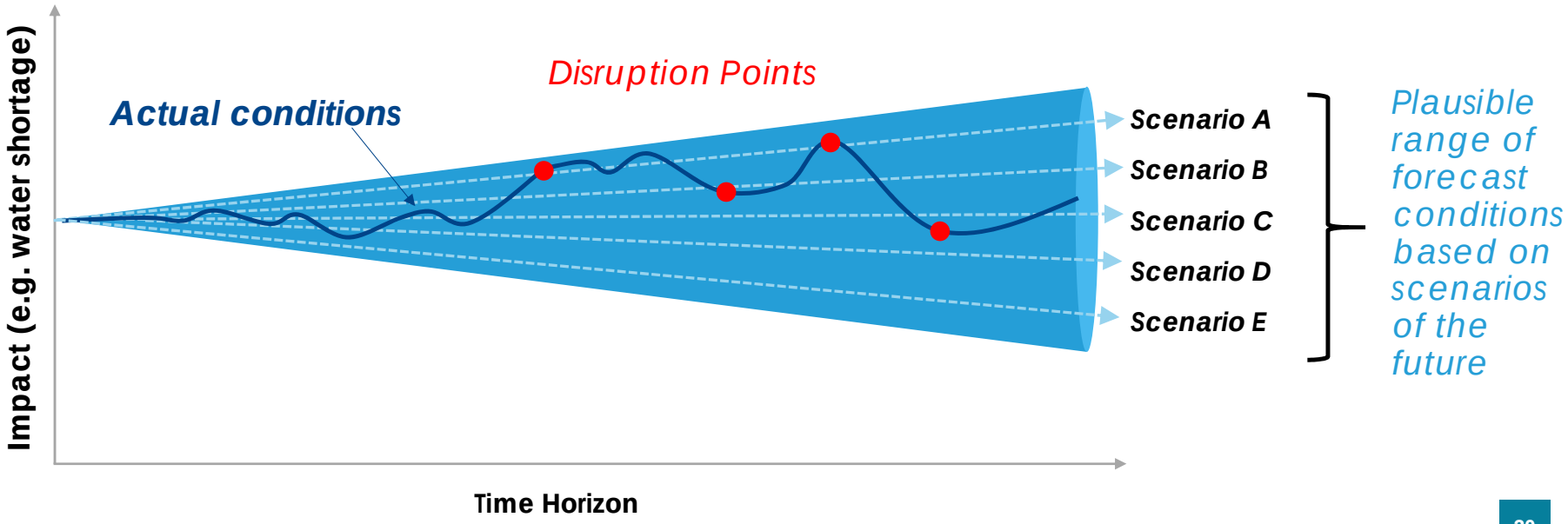
Scenario Planning and Adaptive Management

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



Scenario Planning and Adaptive Management

- Scenario **expands the plausible range** of forecasted conditions based on various scenarios



Missouri

Scenario Planning Example

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

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.



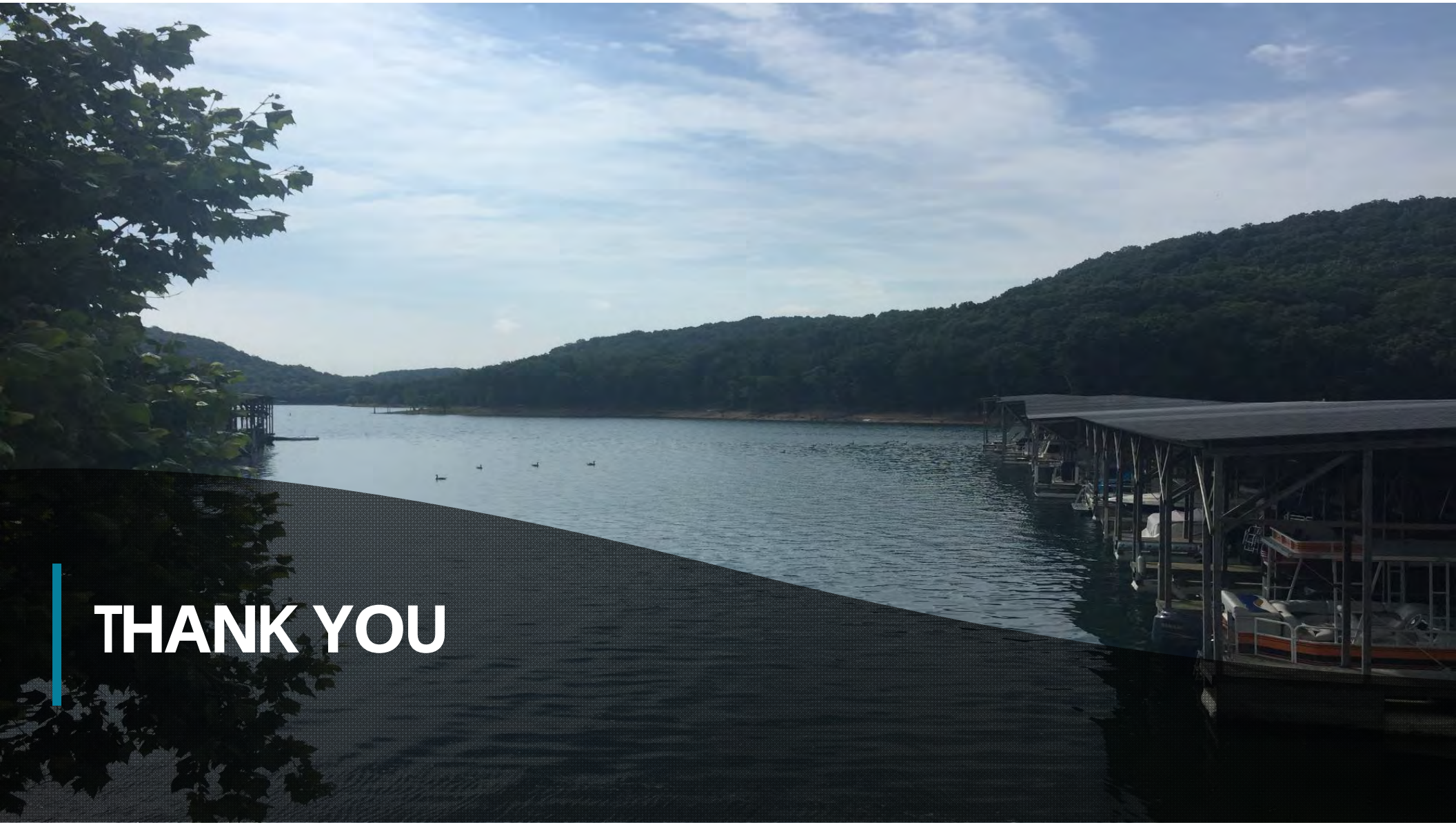


Observations, Outcomes and Lessons Learned

- 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