Status and Challenges for USACE Reservoirs

A Product of the National Portfolio Assessment for Water Supply Reallocations (2016-Res-01)
www.iwr.usace.army.mil

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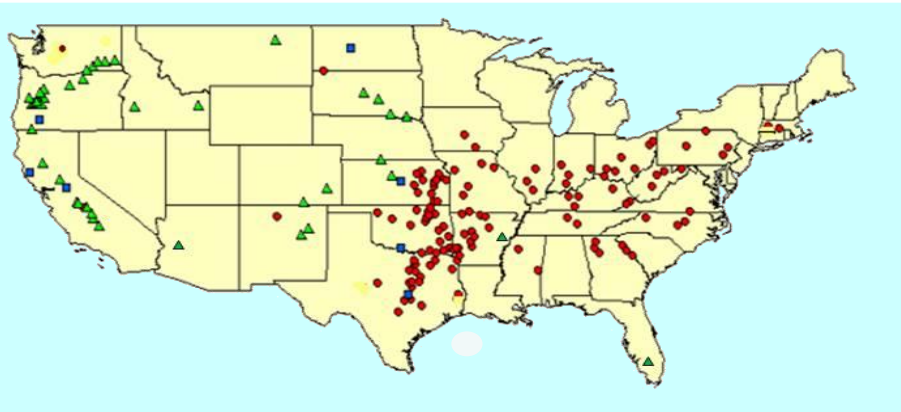
24 May 2019



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Acknowledgments

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Outline

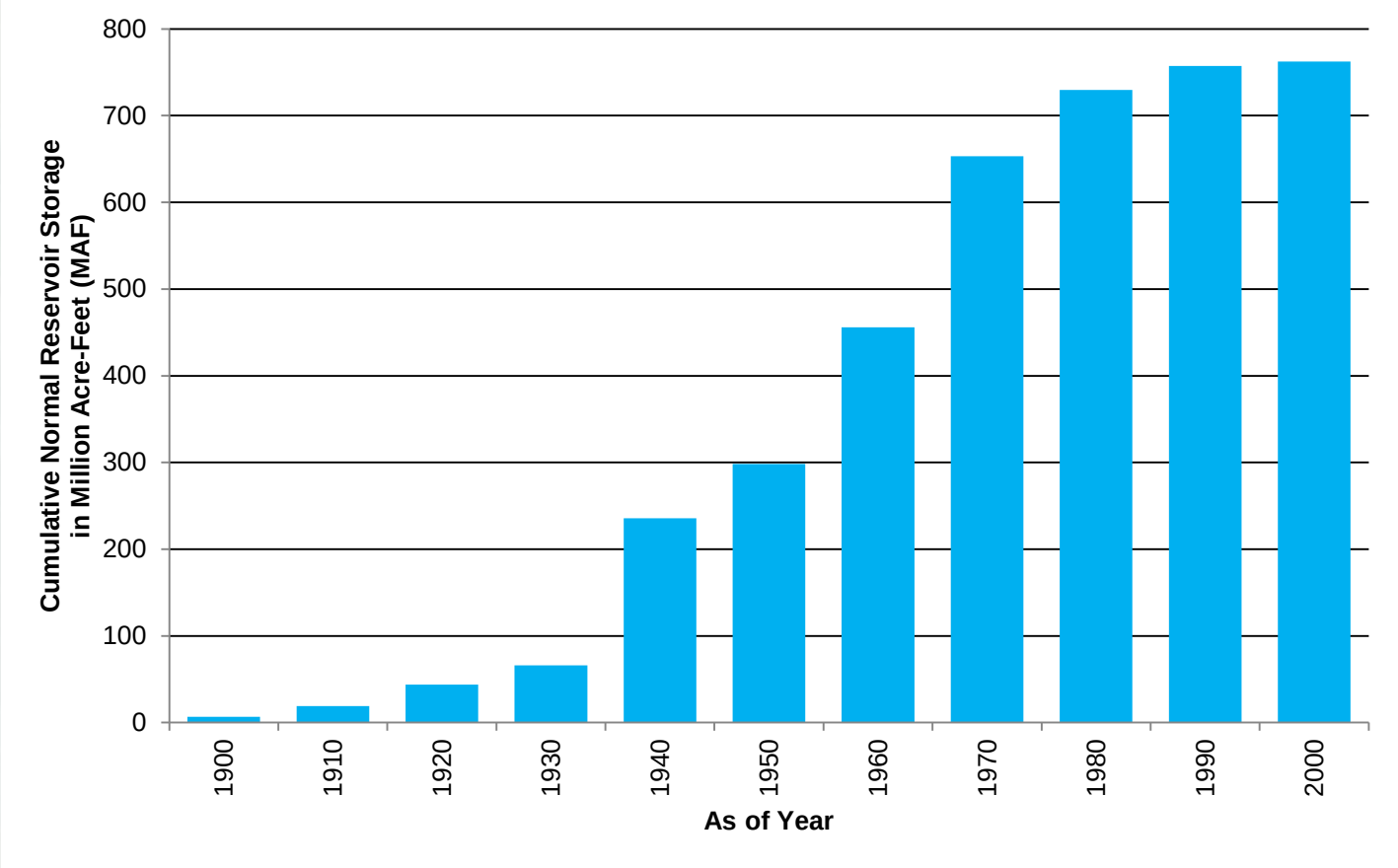
- Why USACE is involved in Water Supply Storage and what is the Dilemma?
- What is the National Portfolio for Water Supply Reallocations?
- How did the Status and Challenges Report evolve?
- How has it benefited the USACE field practitioners?

Why USACE is involved in Water Supply Storage

1958 Water Supply Act: “It is hereby declared to be the policy of the Congress to recognize…

- the **primary responsibilities of the States and local interests in developing water supplies** for domestic, municipal, industrial, and other purposes
- and that the **Federal Government should participate and cooperate** with States and local interests in developing such water supplies **in connection with** the construction, maintenance, and **operation of Federal** navigation, flood control, irrigation, or **multiple purpose projects**.”

History

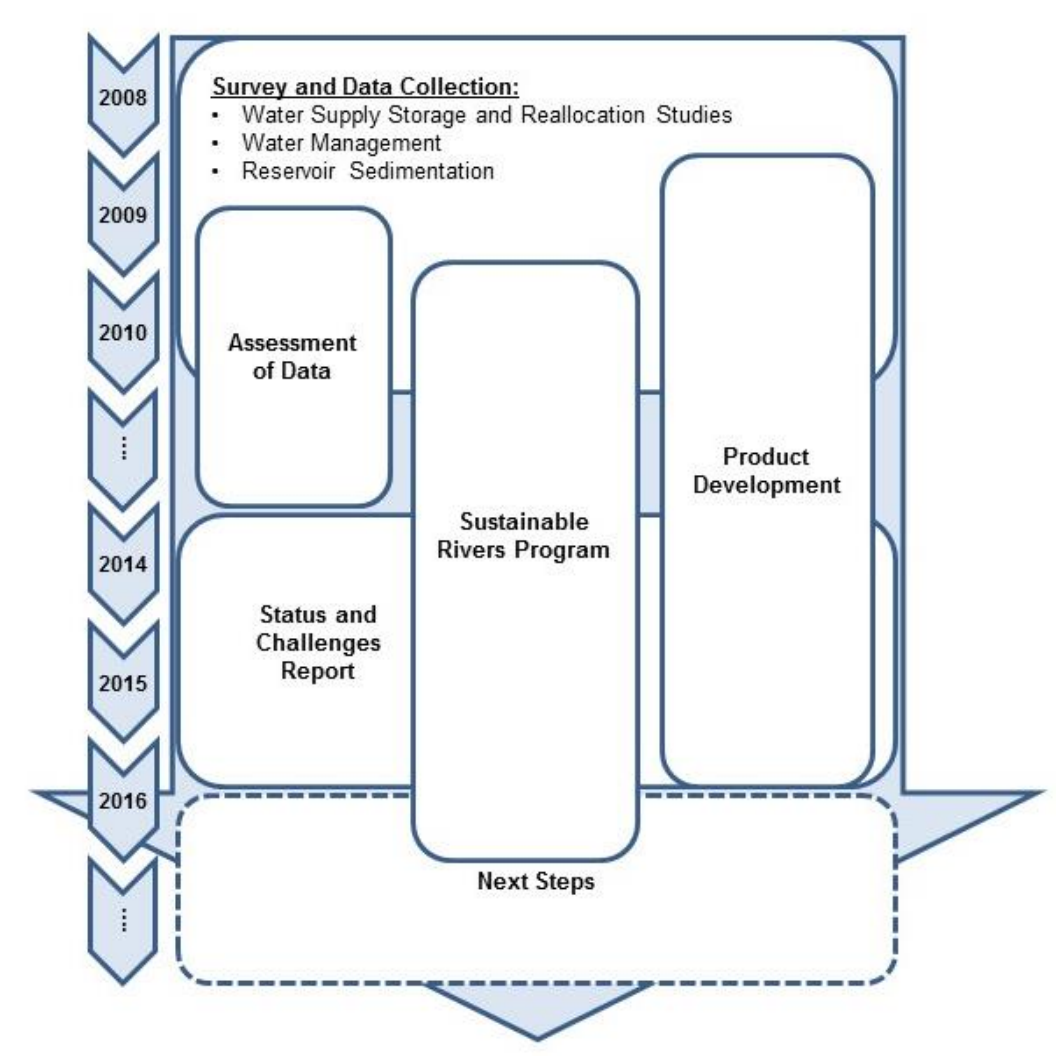


Source: USGS Small-scale Dataset – Major Dams of the United States, 2006

What's the Dilemma

- Water Supply (WS) is not a Primary USACE mission
- Often a cost effective solution for state and local partners
- USACE must budget for it
- Partners repay costs for **water supply storage** to the Treasury
- USACE isn't building new dams

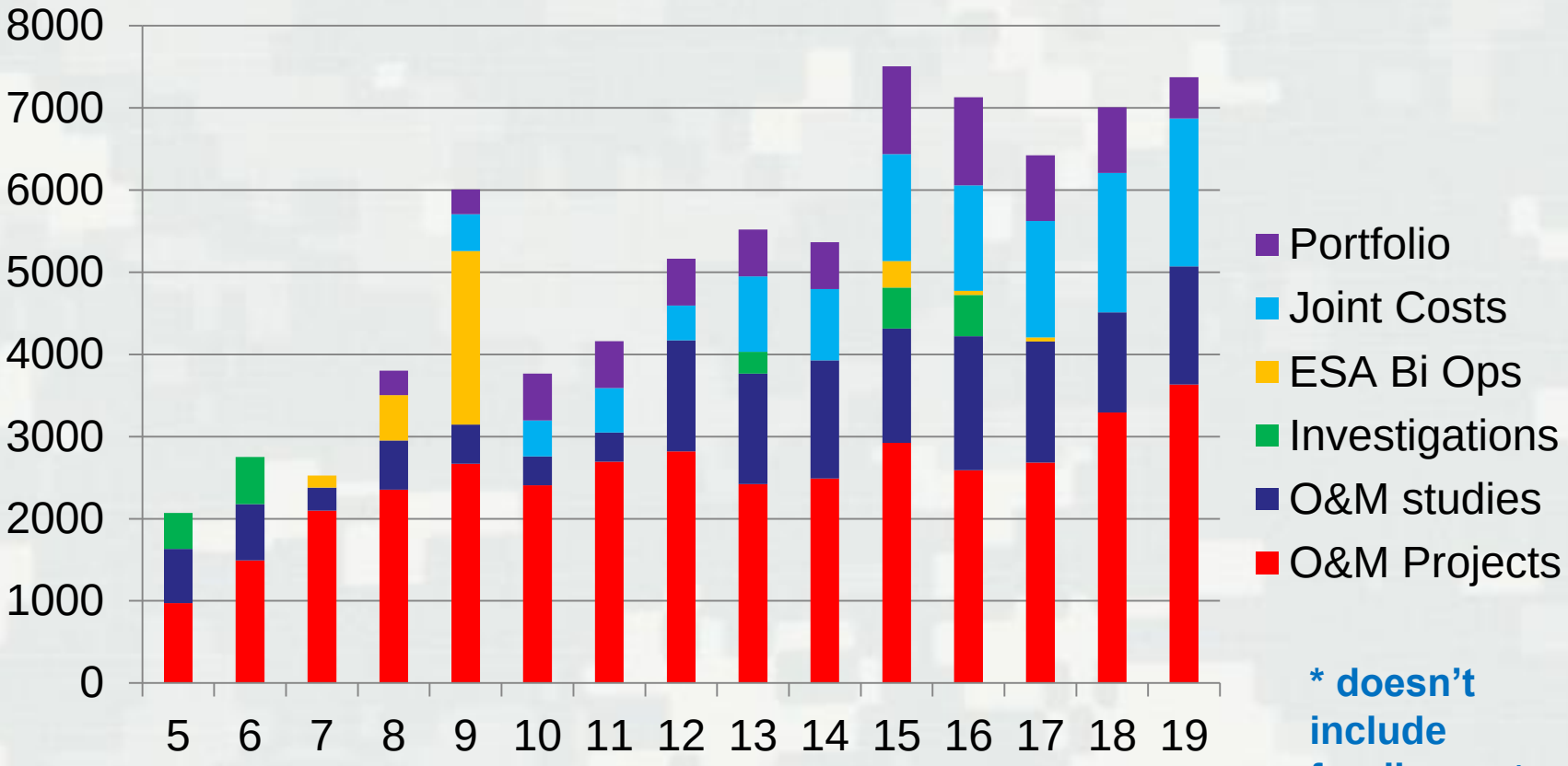
National Portfolio History



Expanded Framework

- Sustainable Rivers Program
- Work by the USACE Committee on water Quality
- Uncertainty in Future Conditions
- Report Structure

Historical WS Funding
Presidential Budget ($000)



*** doesn't include funding pots**

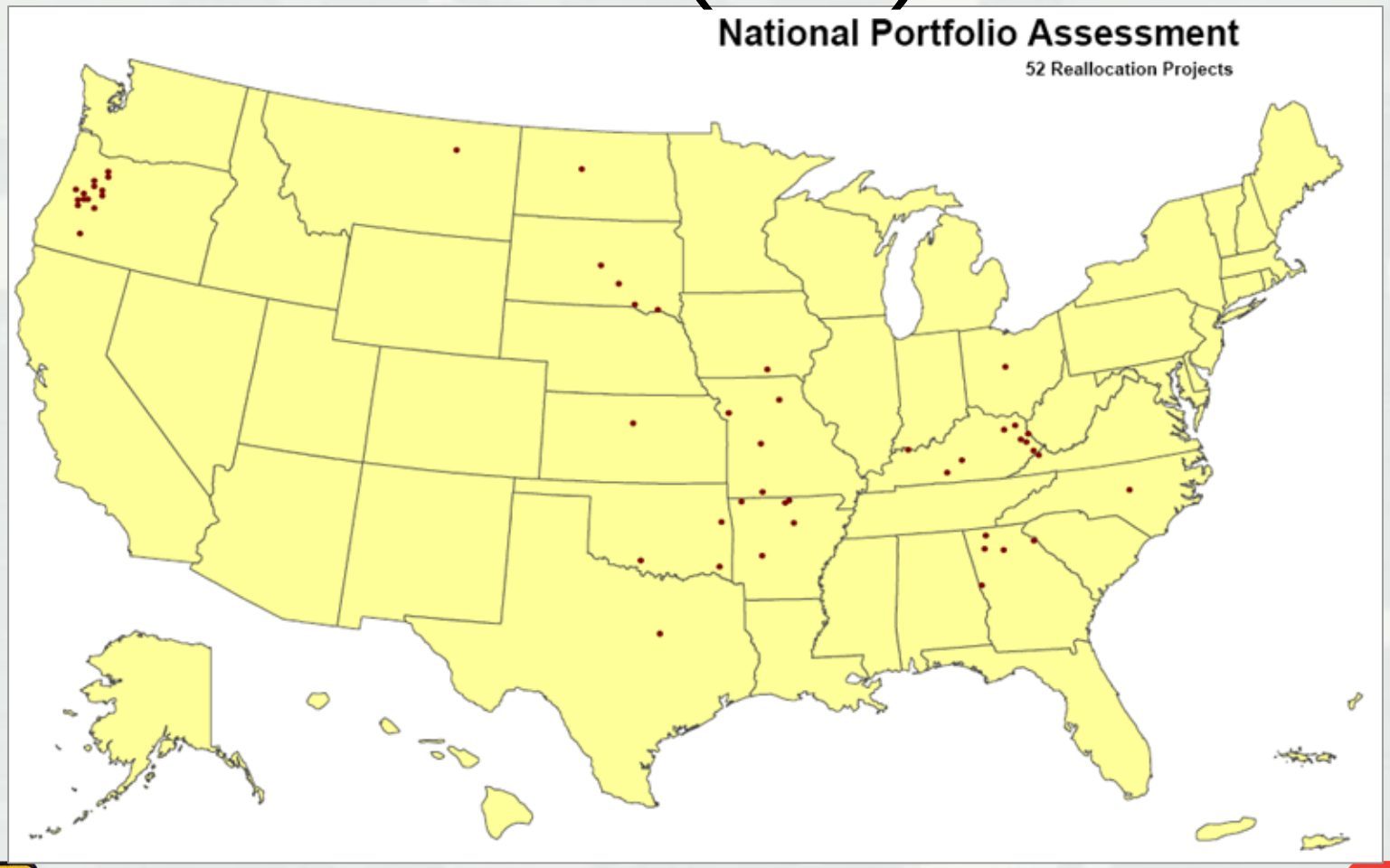
Water Supply Survey

IWR Report # 2015-R-02, available at www.iwr.usace.army.mil

Division	No. of Projects	No. of Agreements / Future Storage Activations	Storage Space (acre-feet)				Principal Cost of Storage ($1,000) [1]		Balance to be Repaid (%)
			Under Contract Present	Under Contract Future	Not Under Contract	Total	Original Cost Owed	Balance to be Repaid	
NAD	7	7 / 0	167,435	0	0	167,435	141,267	58,457	41
SAD	10	25 / 0	209,623	0	0	209,623	35,148	11,947	34
LRD	28	46 / 0	602,653	0	8,460	611,113	79,860	36,764	46
MVD	8	14 / 0	230,597	202,220	13,293	446,110	46,421	21,891	47
NWD	17	35 / 4	498,646	413,630	101,877	1,014,153	124,533	70,469	57
SPD	4	4 / 0	565,000	0	0	565,000	127,706	97,952	77
SWD	62	211 / 76	5,706,942	770,860	310,699	6,788,501	948,873	340,361	36
TOTAL	**136**	**342 / 80**	**7,980,896**	**1,386,710**	**434,329**	**9,801,935**	**1,503,808**	**637,841**	**42**

- About 90% of storage was originally authorized during planning, design and construction
- Remaining 10% has been reallocated after construction
- About 90% of reallocations have occurred since 1980

2010 Information Paper for ASA(CW)

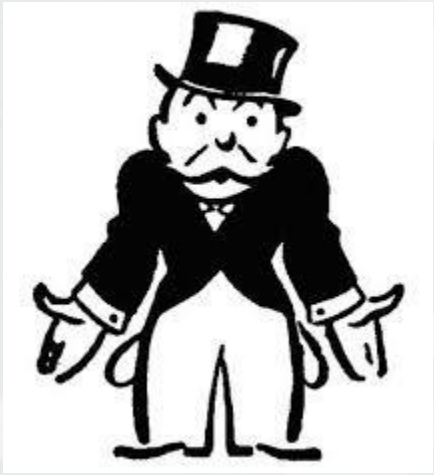


Reallocations

- As requested by OMB, the report identified and prioritized M&I water supply reallocation opportunities.
- As of the 2016 report, 26 of the 52 priority projects identified in 2010 have been studied to some degree, and there have also been study efforts at an additional ten projects.

Potential Alternative Funding Methods for Reallocation Studies

- Acceptance of non-federal (contributed) funds to partially or fully fund the study
- Establishment of a revolving fund, with funding replenished out of overall agreement collections
- Recovery of study costs directly from cost of storage payments



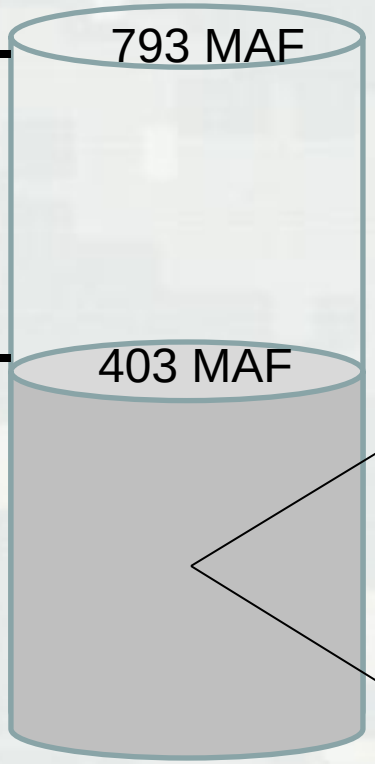
Water Management Survey

Reservoir name	Objective flow locations	Start/end data in any format
Managing office	Objective flow levels	Water control manuals
Year of completion	Max non-damaging flows	Operational changes
Drainage areas (local and total)	Exceedances of objective levels	Motivation for changes
Storage allocations	Fish passage presence	Testing of alternative operations
Authorized purposes	Fish passage effectiveness	Motivation for testing
Ownership	Water temp management	Time series data (daily):
Minimum flow requirements	Infrastructure condition	Inflow
Maximum power release	Dam safety restrictions	Outflow
Max release at min top of con	Start/end electronic database	Storage

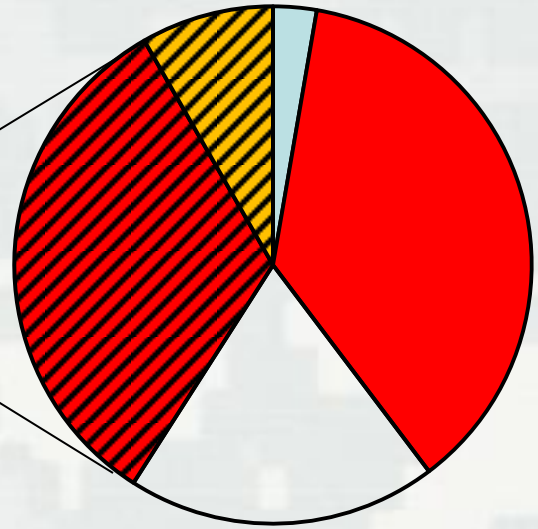
National Reservoir Storage

National Inventory of Dams (83,343 projects)

2008 USACE Survey* (465 projects)



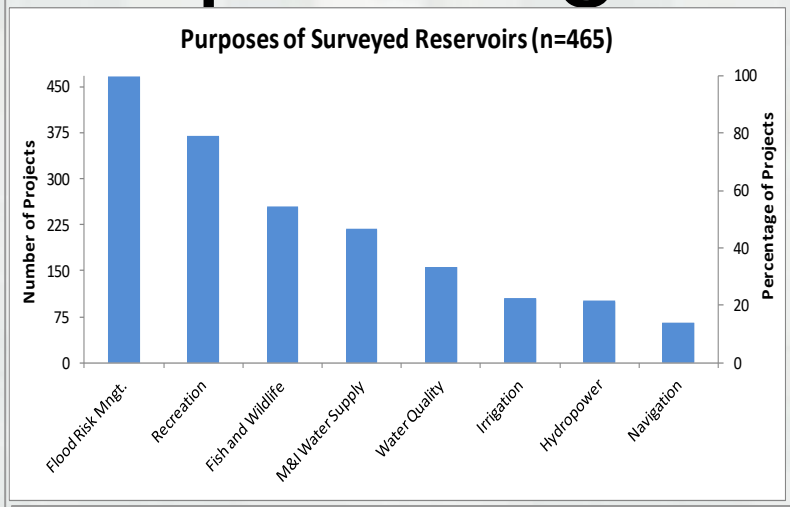
Takeaways:
~ 40% of all reservoir storage under Corps' operations
~ 36% of all reservoir storage is behind Corps dams

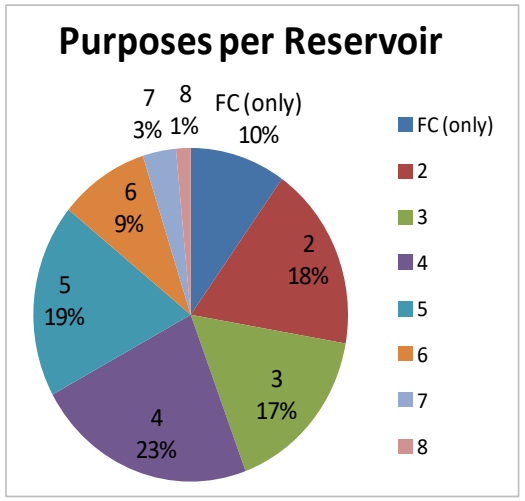


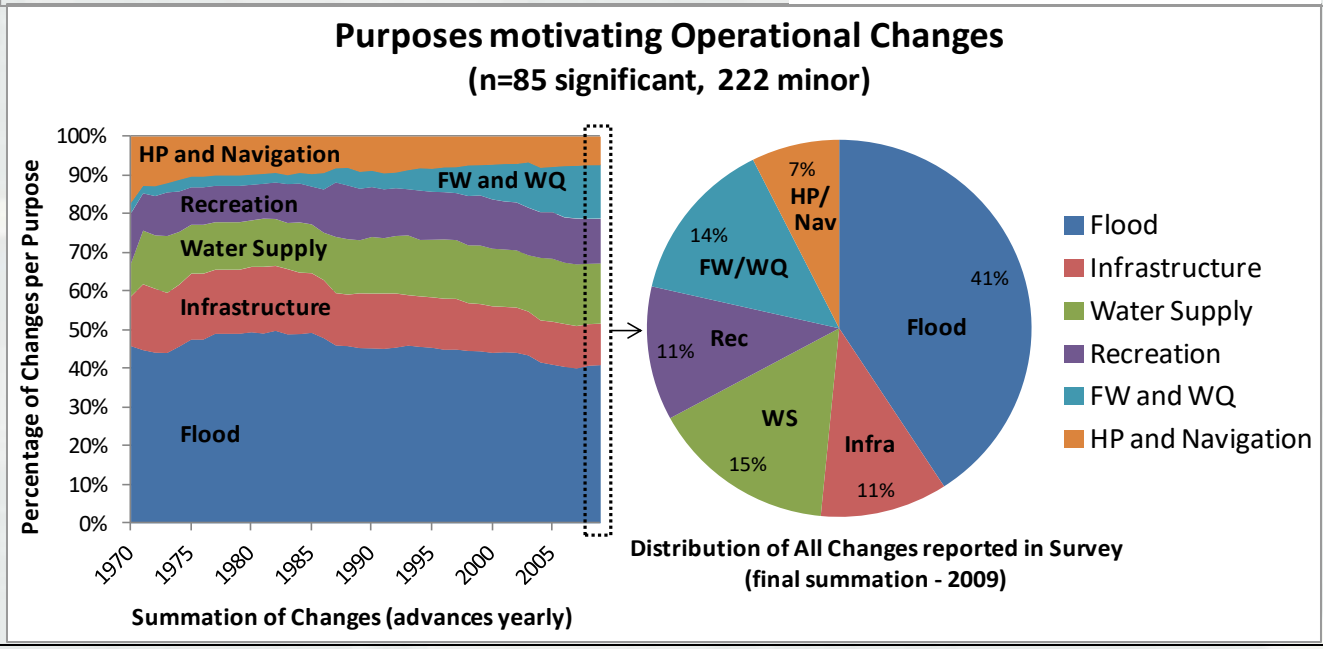
- Water supply storage – Corps projects
- Conservation storage – Corps projects
- Conservation – Non-Corps
- Flood storage – Corps projects
- Flood storage – Section 7

* Total survey storage does not match due to differences in source data

Operating Purposes





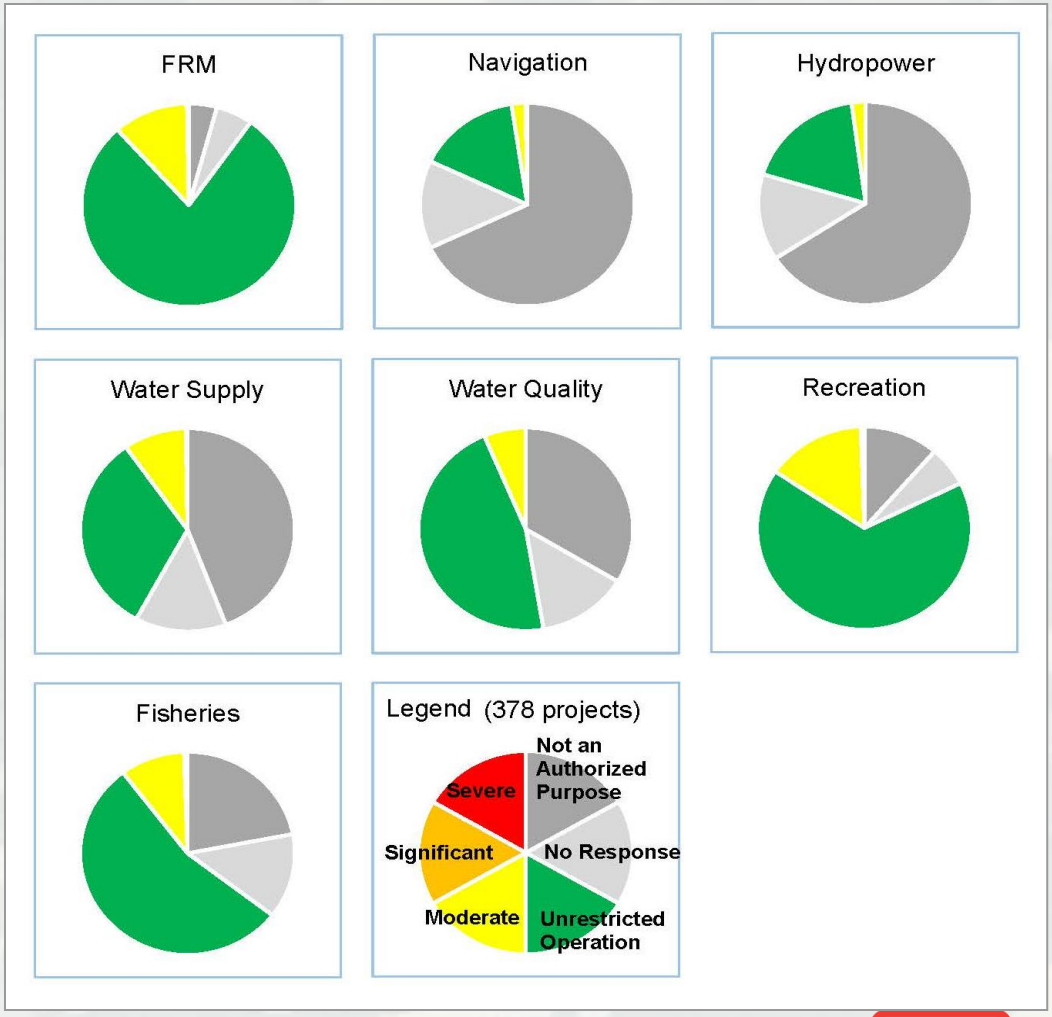


Sediment Surveys

Year Increment	Number of Reservoirs	Percentage of Reservoirs	Survey Age Groups (% of Total)
Never surveyed	3	1	19
1940-1949	4	1	
1950-1959	7	2	
1960-1969	17	5	
1970-1979	32	10	
1980-1984	12	4	28
1985-1989	31	10	
1990-1994	42	14	
1995-1999	75	25	25
2000-2004	46	15	28
2005-2008	25	8	
Not needed	15	5	

Reservoir Sedimentation Survey

MSC	Number of Projects	Number of Purposes Impacted by Severity		
		Moderate	Significant	Severe
LRD	82	22		1
MVD	35	19	1	
NAD	52	10		
NWD	82	47	1	
POD	1			
SAD	15			
SPD	40	7		
SWD	39	105	3	1

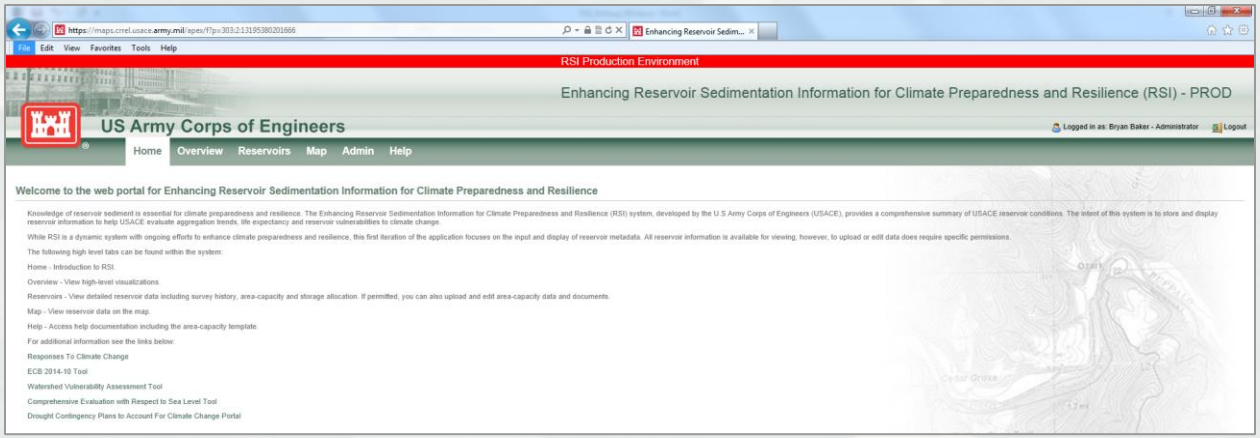


Sediment Management

Sediment Management Practice	Number of Reservoirs Utilizing the Practice	Percent of Reservoirs in the Survey Utilizing the Practice
Minimal Site Specific Sediment Removal	45	12
Periodic Maintenance Dredging	16	4
Periodic Maintenance Dredging with Beneficial Placement of Sediment	8	2
Continual Maintenance Dredging	2	1
Continual Dredging with Beneficial Placement of Sediment	3	1
Sediment Flushing	14	4
Sediment Sluicing	6	2
Other Sediment Management Practices	50	13
Sub-total	144	39
No Sediment Management Practices	73	19
No Response (could imply no other sediment management practices)	161	42
Total	378	100

Sedimentation Data

- Reservoir Sedimentation Database (RESSED)
  - ► http://water.usgs.gov/osw/ressed/
- Enhancing Reservoir Sedimentation Information for Climate Preparedness and Resilience (RSI)
  - ► https://maps.crrel.usace.army.mil/apex/f?p=303:1:



Next Steps

- Develop training and tools to assist study teams in completing increasingly complex water supply storage reallocation studies (Section 2).
- Develop processes to track water withdrawals and forecast water availability in order to better inform project planning and sustainable operations (Section 2).
- Develop a recommended scope and frequency for future water management data collection and assessments (Section 3).
- Track results of case studies on project modifications to enhance water quality and ecosystems (Section 4).
- Develop policy and technical guidance for project modifications to enhance water quality and ecosystems (Section 4).
- Complete the water quality survey initiated by the Corps Committee on Water Quality and use the results to refine and prioritize the challenges and needs assessment presented in Section 4.

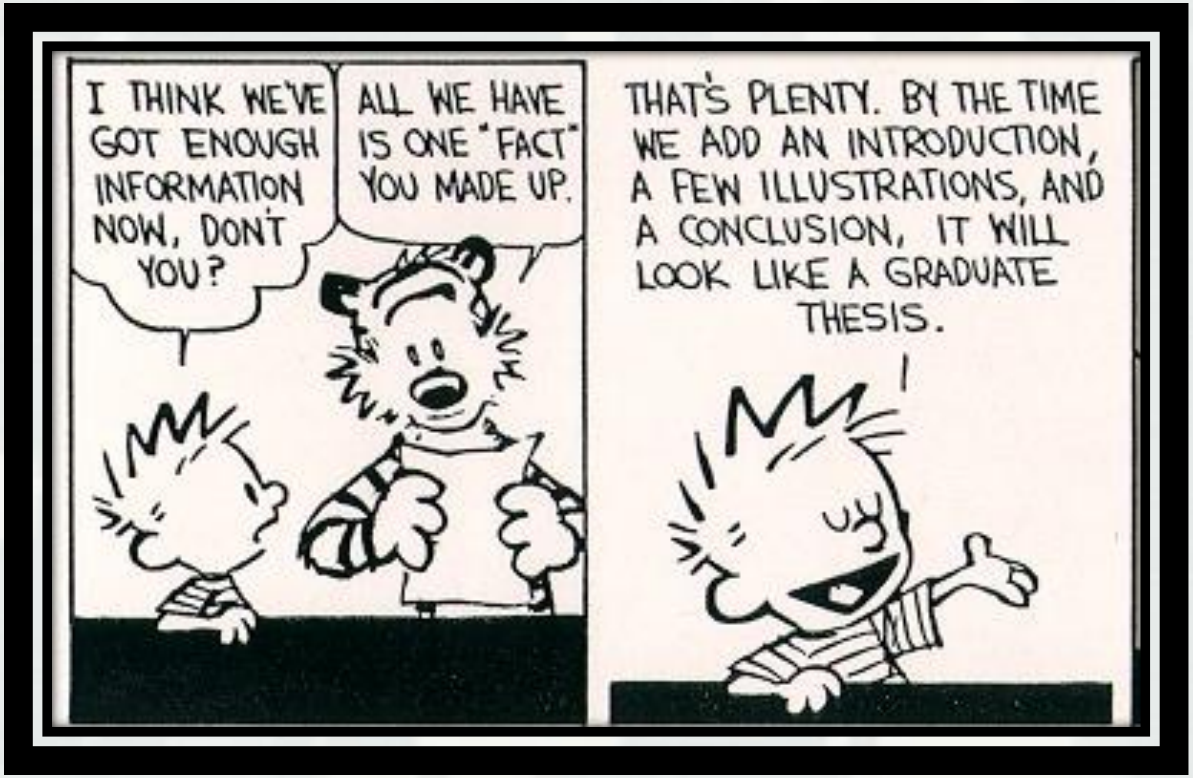
Next Steps

- Continue to identify and prioritize project risks associated with sedimentation, and understand and explore methods for overcoming obstacles to sediment management (Section 5).
- Continue to collaborate with other programs to assess the potential impacts of climate change on multi-purpose reservoir projects (Section 6).
- Develop methods, tools and guidance for the complex tradeoff analyses and decision-making involved in evaluating modifications to existing multi-purpose reservoir projects (Section 7).

How it benefits the field

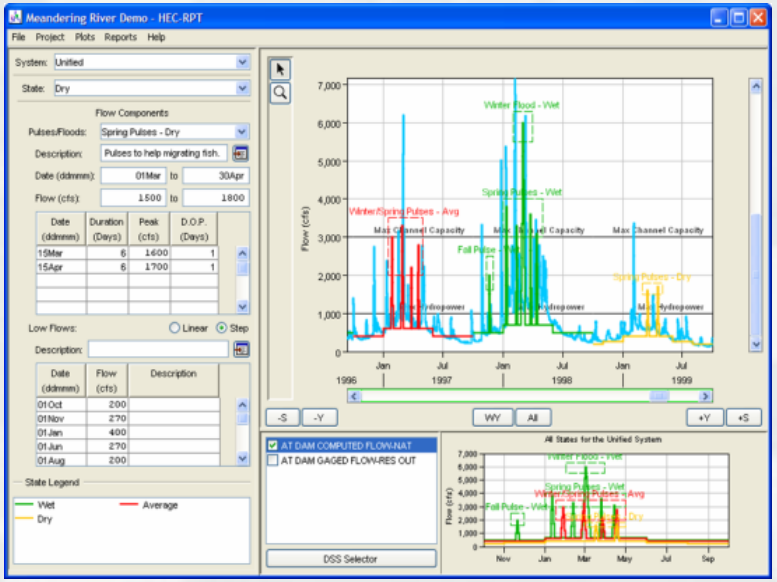
- IWR and the WS PCX have developed reallocation study training modules
- Finishing Trade-off analyses literature review and information paper
- Developing Storage-Yield training module in collaboration with the Hydrologic Engineering Center (HEC)
- We'll be starting to think soon about the next items to tackle

Questions?


I THINK WE'VE GOT ENOUGH INFORMATION NOW, DON'T YOU?
ALL WE HAVE IS ONE "FACT" YOU MADE UP.
THAT'S PLENTY. BY THE TIME WE ADD AN INTRODUCTION, A FEW ILLUSTRATIONS, AND A CONCLUSION, IT WILL LOOK LIKE A GRADUATE THESIS.

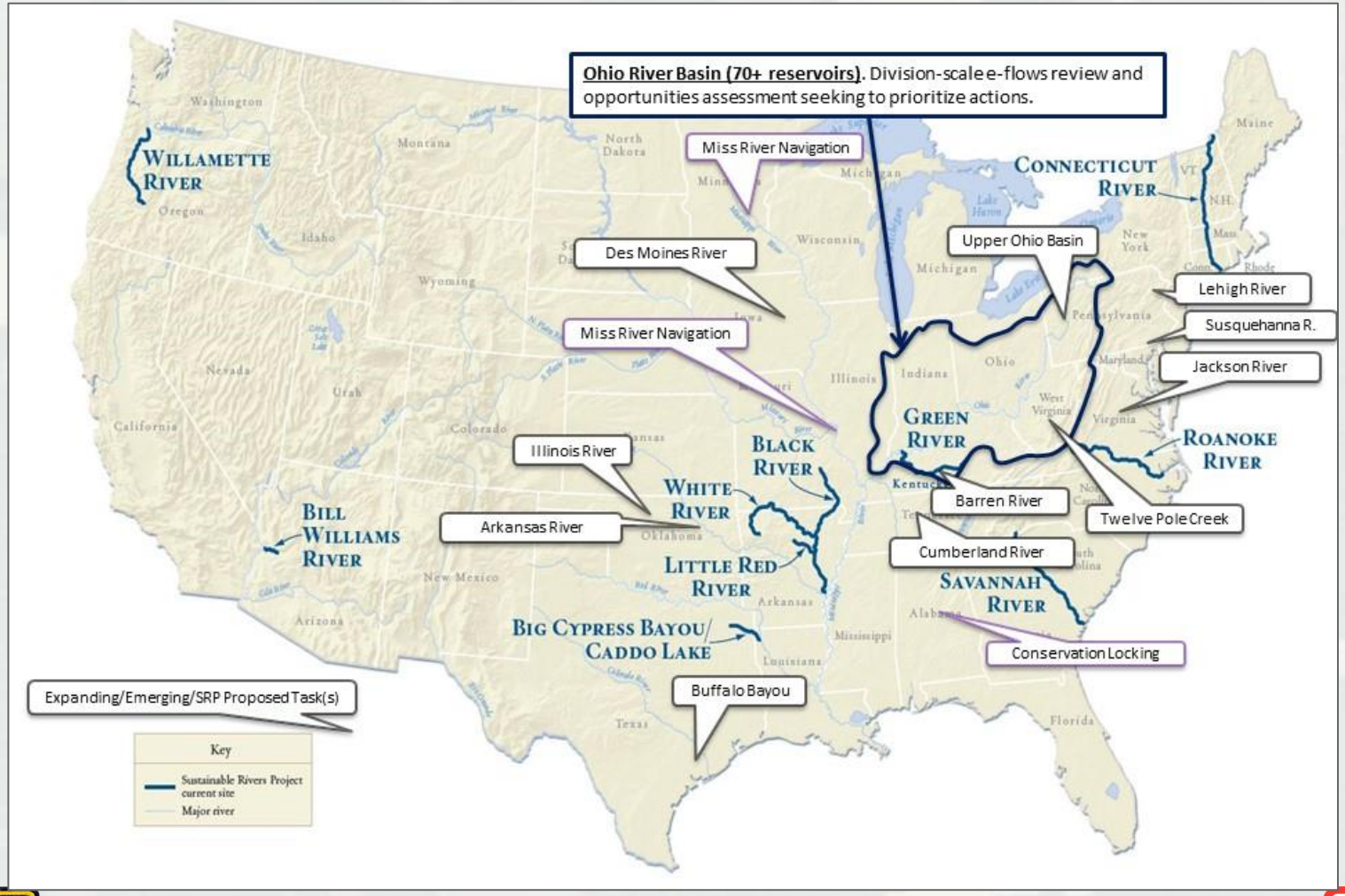
Sustainable Rivers Program

- Funded as part of the National Portfolio in 2010
- Science
- Technology
- Outreach
- Implementation
- Policy



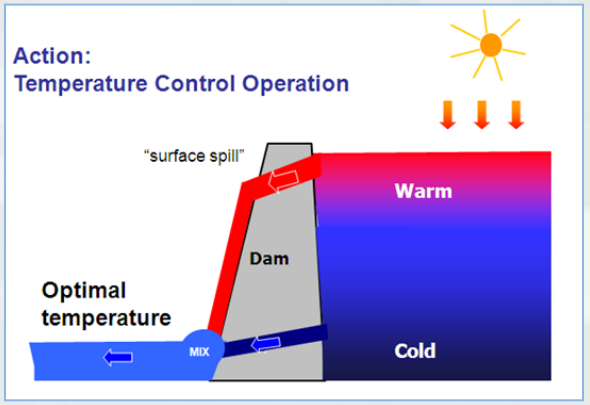
https://www.conservationgateway.org/ConservationPractices/Freshwater/EnvironmentalFlows/Pages/environmental-flows.aspx.

SRP Project Sites as of 2016



Committee on Water Quality Case Studies

- Dworshak Reservoir, Idaho: Lower Snake River Water Temperatures.
- Fall Creek Reservoir, Oregon: Modified Operations for Fish Passage.
- Detroit Reservoir, Oregon: Operation for Downstream Water Temperature.



- Tappan Lake, Ohio: Outlet Modifications for Improved Water Quality.
- Huntington District: Flexible Winter Drawdown for Improved Water Quality.
- Sutton Lake, West Virginia: Operational and Structural Modifications for Improved Downstream Conditions.
- Kanawha River, West Virginia: Operational Changes in Low Flow Augmentation

Committee on Water Quality Challenges

- Uncertainty over frequency and severity of future droughts in changing climate conditions
- Increasing incidence of harmful algal blooms
- Increasing pressure from mineral extraction activities
- Non-federal hydropower retrofits

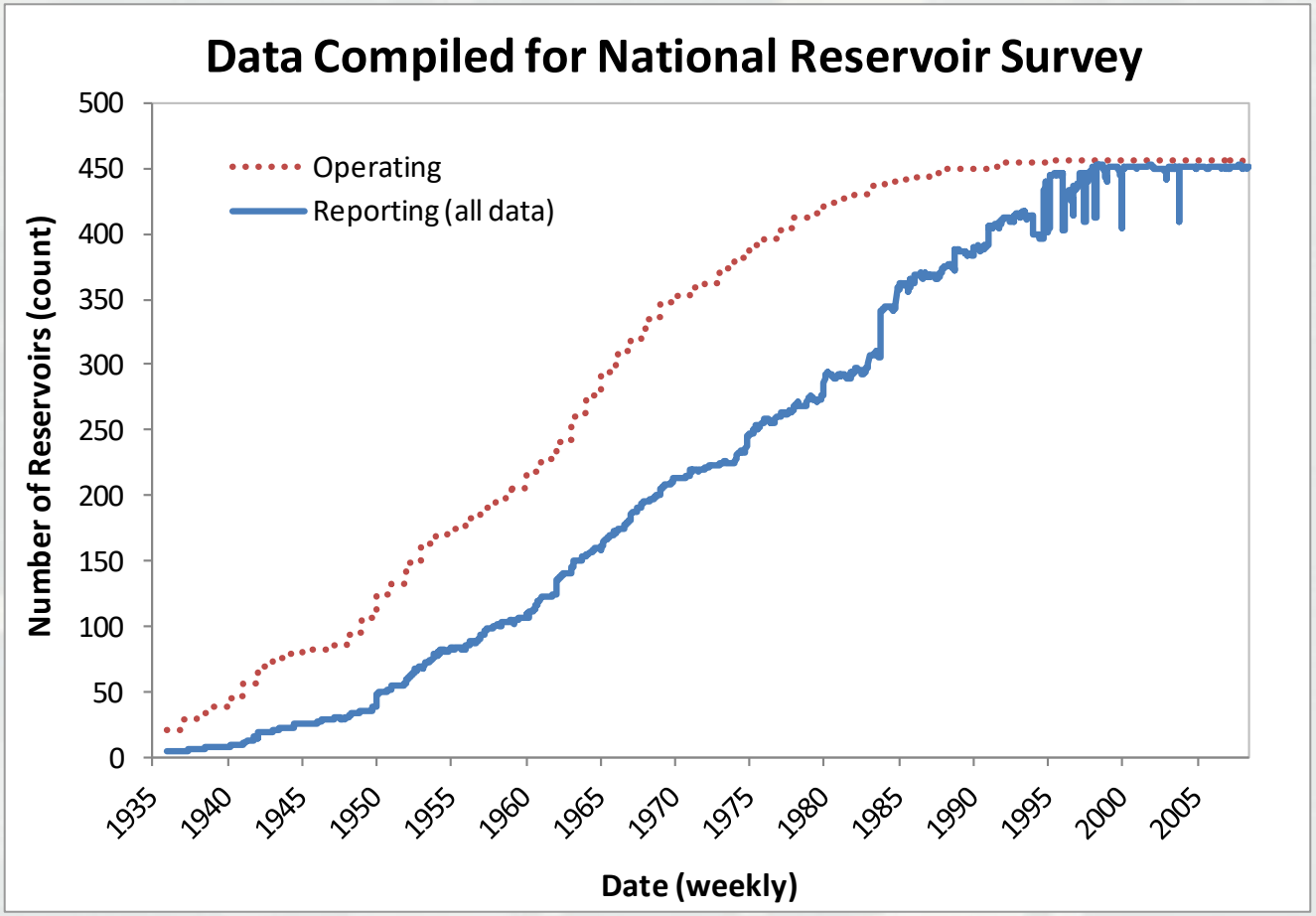
Environmental Flows Policy

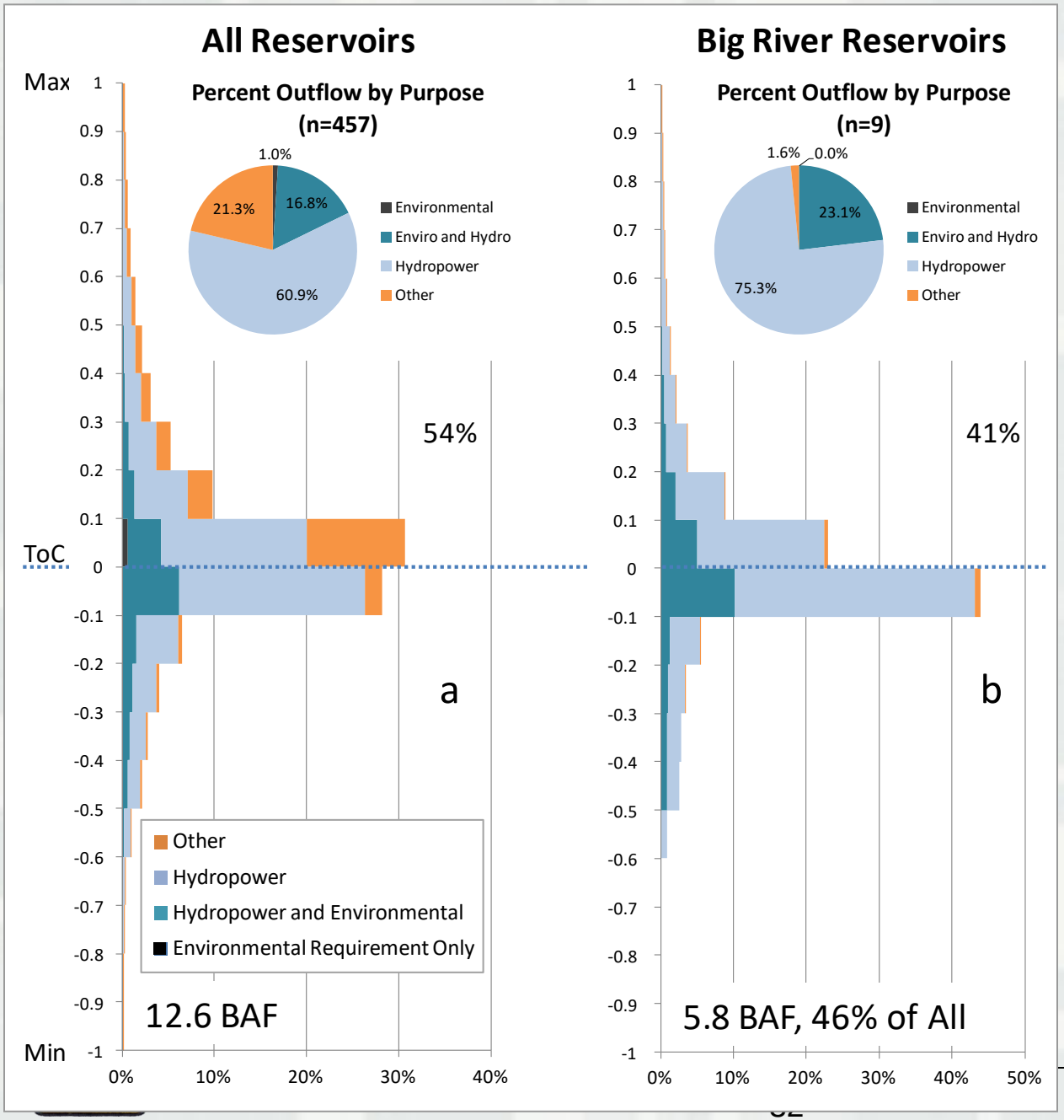
- 2012 TNC Guide:
  - Flow regimes mimic natural inter- and intra-annual flow variability
  - Co-development of flow criteria and implementation policy
  - Structured, transparent, inclusive process to develop criteria; understand and negotiate tradeoffs
  - Criteria link to health of entire aquatic / riparian ecosystem; not limited to specific species
  - Regionalized criteria apply to all water bodies for which site-specific criteria haven't been developed
- 2014 USACE EAB Recommendations:
  - Expand support for SRP with goal of 20 project sites by 2020
  - Districts include assessments of potential for environmental flow operations in periodic reviews of reservoir operations
  - Include instruction on potential role of dam operations in aquatic ecosystem restoration in classes for new district leaders

Uncertainty in Future Conditions

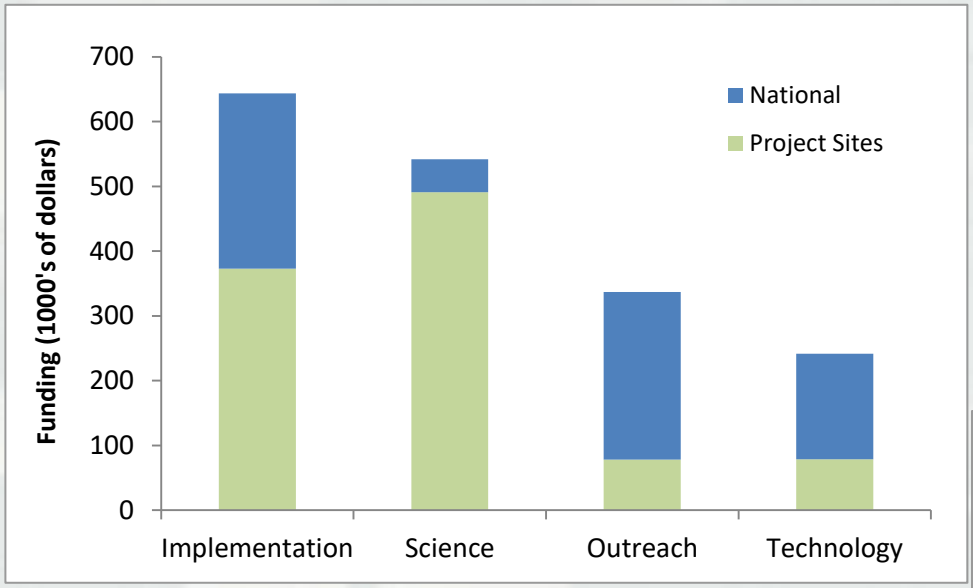
- Responses to Climate Change Program
  - ▸ RSI
  - ▸ Drought Contingency Plan Updates
- Pilot Studies
  - ▸ Oologah Lake, OK
  - ▸ Marion Lake, KS
    - Incorporating down-scaled climate model projections into reservoir yield modeling
    - Development of adaptation approaches

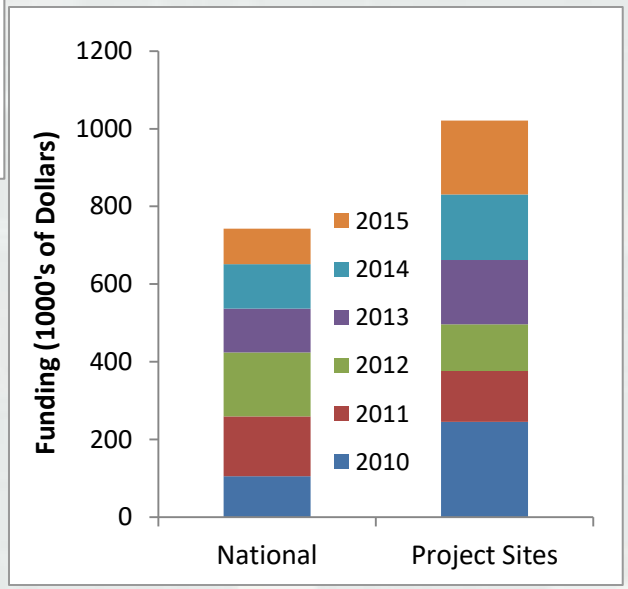
Operational Data



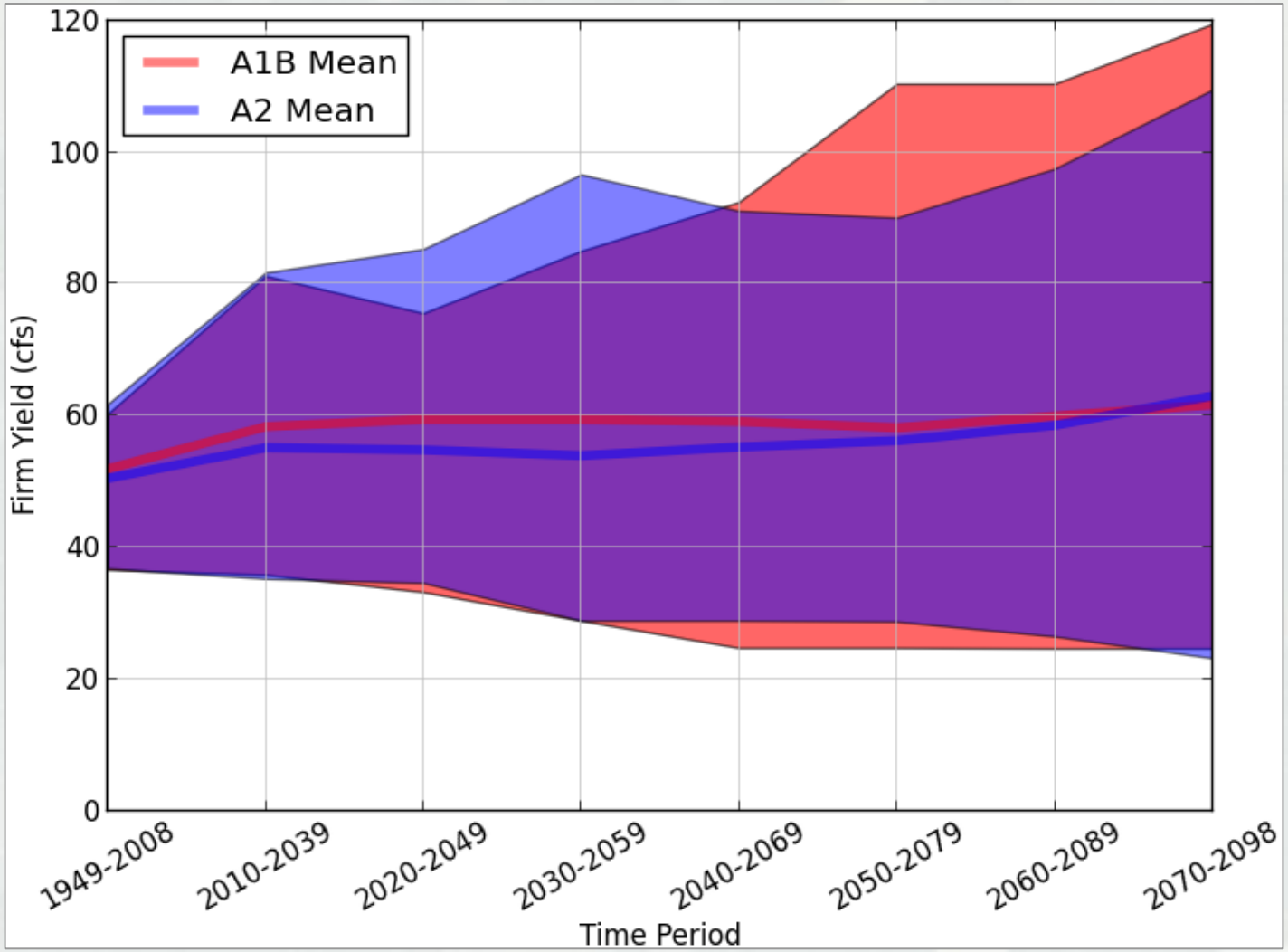

All Reservoirs
Max
ToC
Min
Percent Outflow by Purpose
(n=457)
1.0%
16.8%
21.3%
60.9%
Environmental
Enviro and Hydro
Hydropower
Other
54%
a
Other
Hydropower
Hydropower and Environmental
Environmental Requirement Only
12.6 BAF
Big River Reservoirs
Percent Outflow by Purpose
(n=9)
1.6%
0.0%
23.1%
75.3%
Environmental
Enviro and Hydro
Hydropower
Other
41%
b
5.8 BAF, 46% of All
General Reservoirs
Percent Outflow by Purpose
(n=404)
1.8%
11.7%
36.7%
49.8%
Environmental
Enviro and Hydro
Hydropower
Other
65%
d
6.7 BAF, 53% of All

SRP Funding

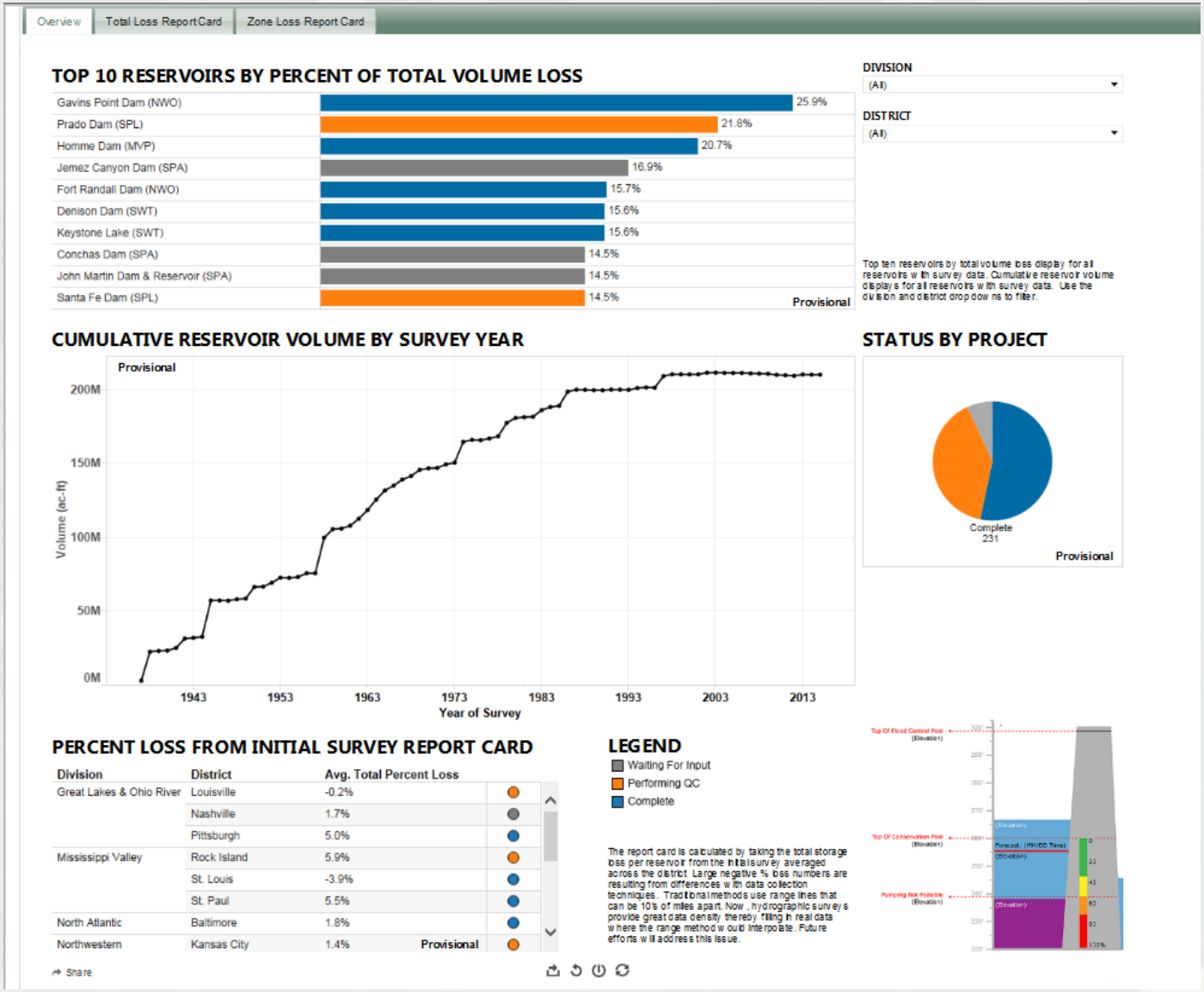




Marion Lake, KS, Pilot Study



RSI



Reservoir Storage