Desal Dialog

A Regulatory Workshop
On Critical Issues
Of Desalination Permitting

Webcast Outline

Overview

- **Outreach**
- **White Papers**
- **Workshop**
- **Recommendations**

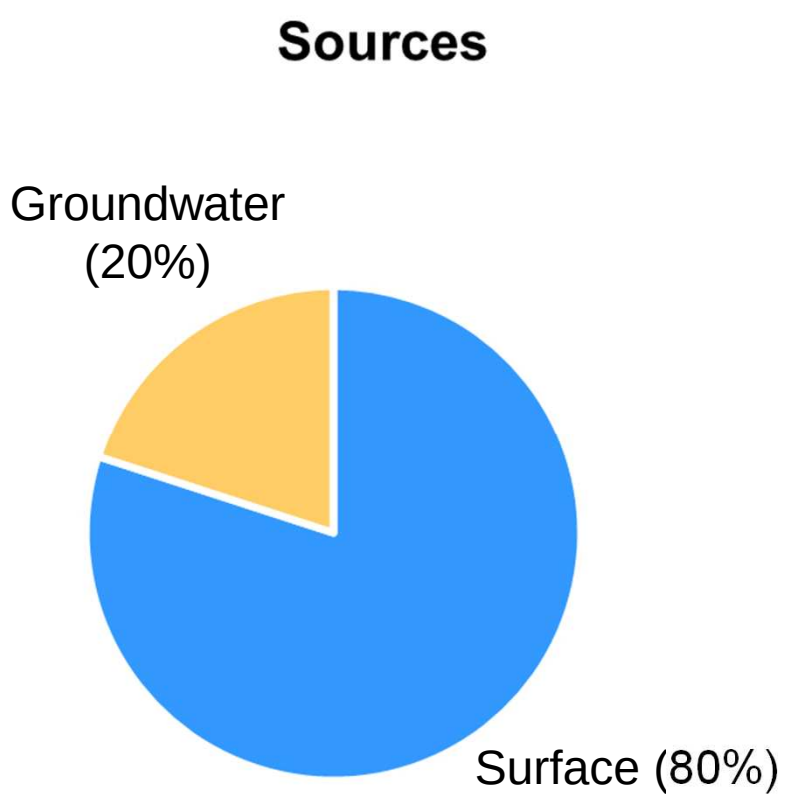
The Path Forward

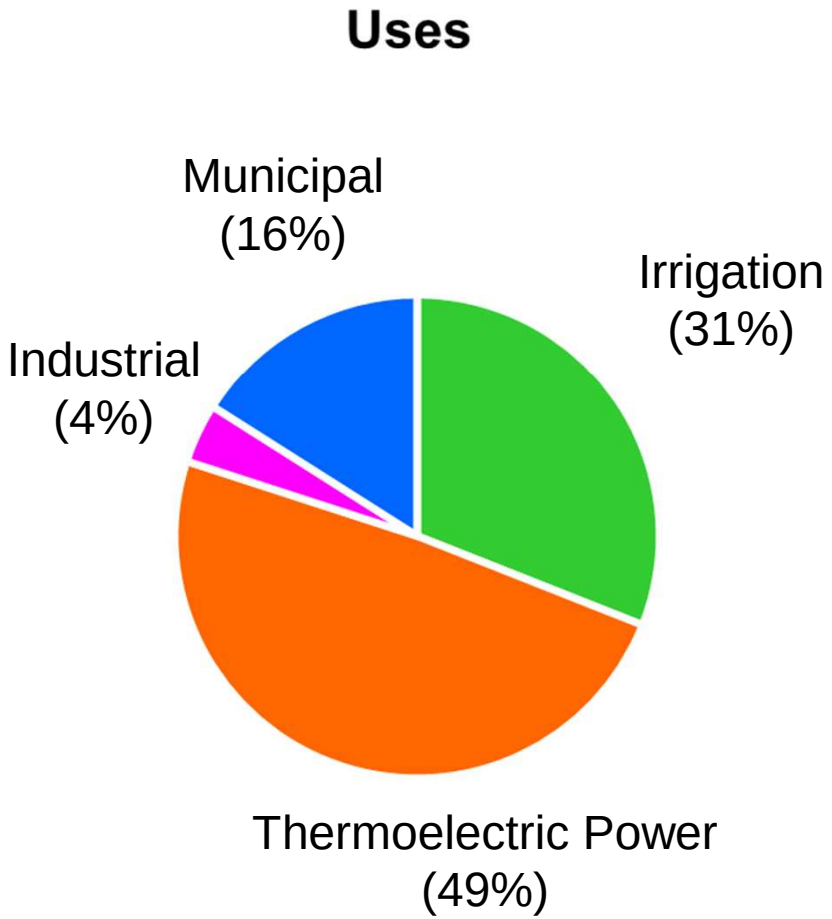
Overview

“Experience is the worst of teachers: she gives the test before presenting the lesson.”

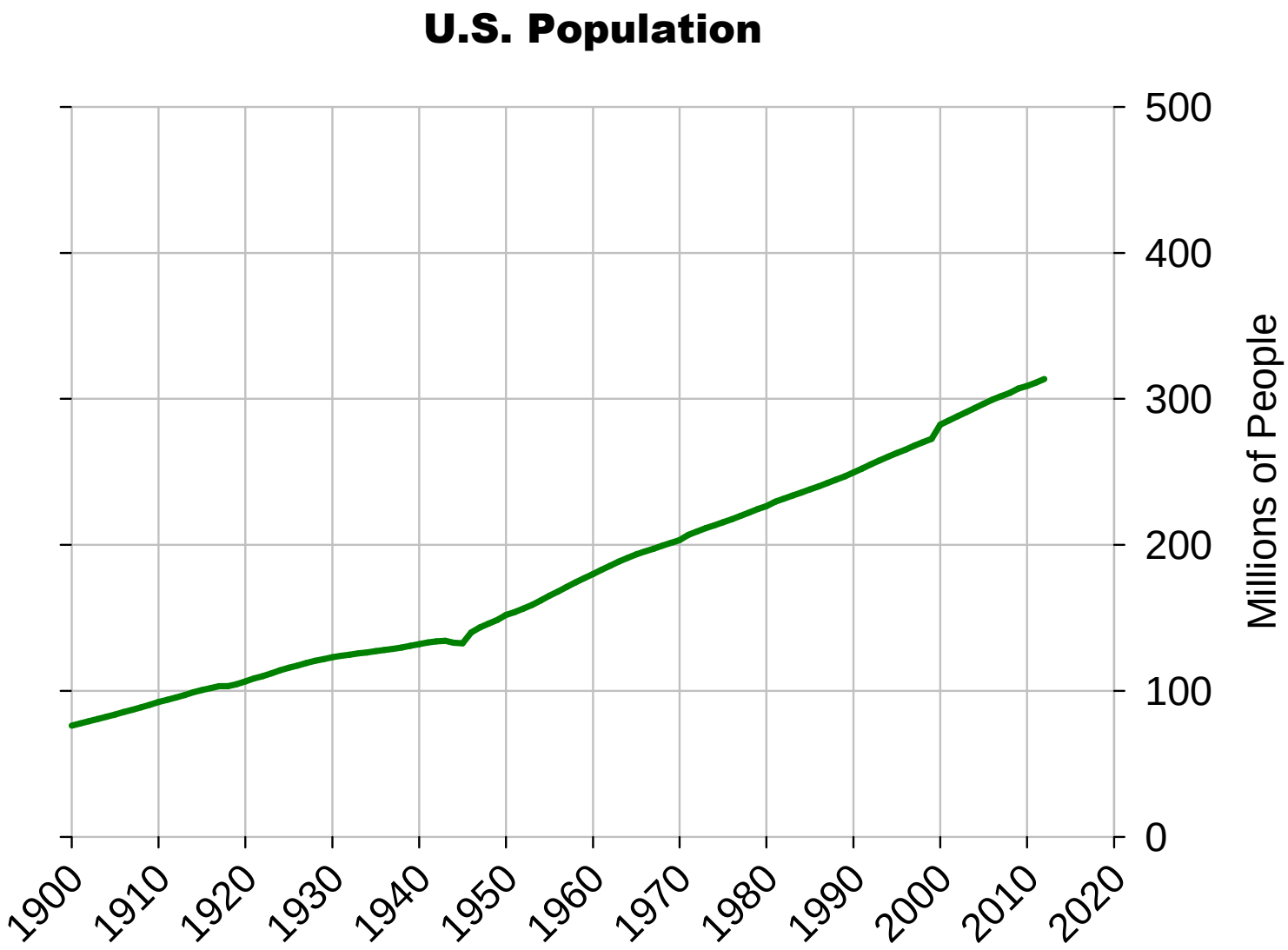
- Vernon Law

U.S. Water 101

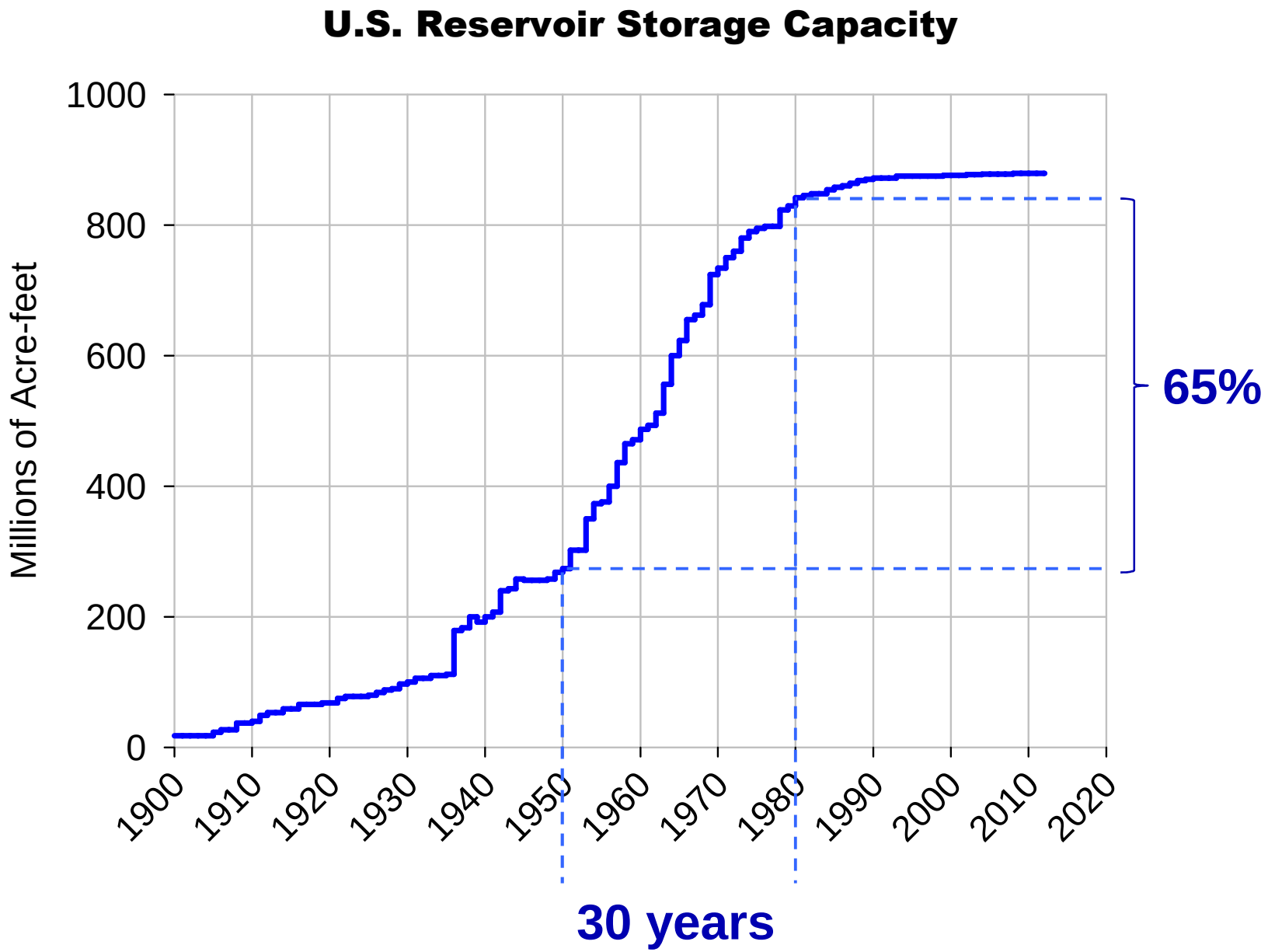




Source: EPA and USGS

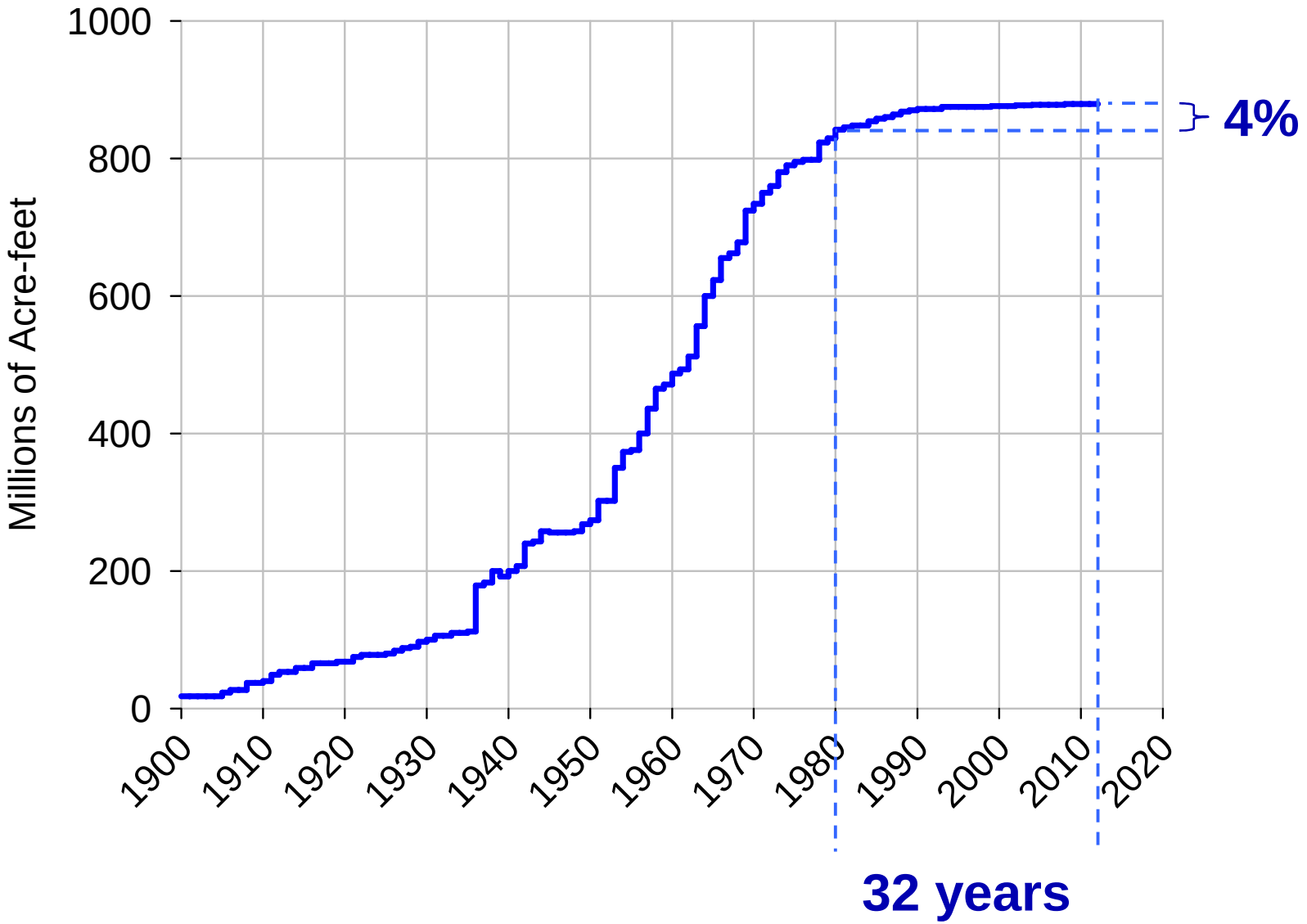


Source: US Census Bureau



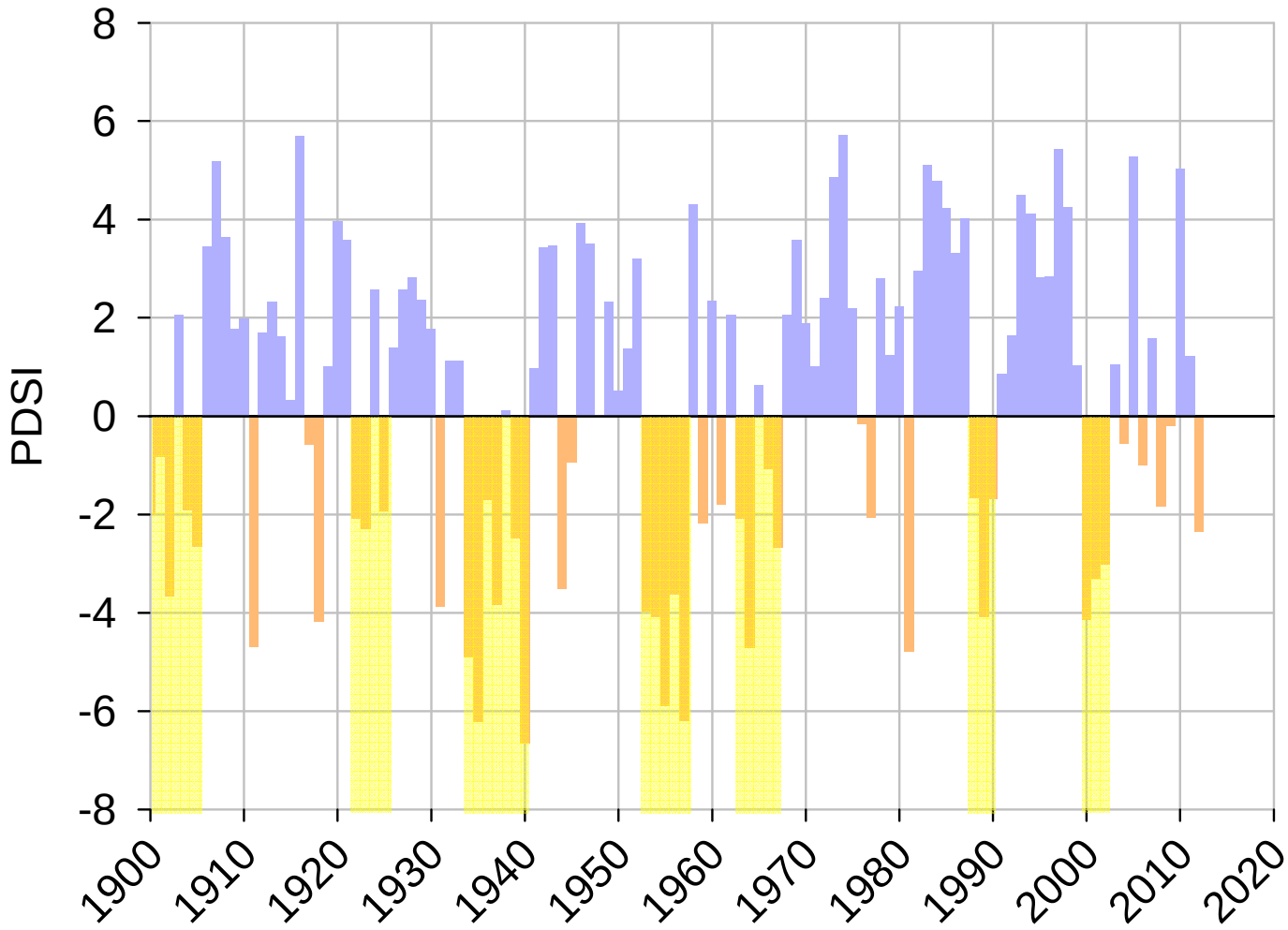
Source: USACE

U.S. Reservoir Storage Capacity



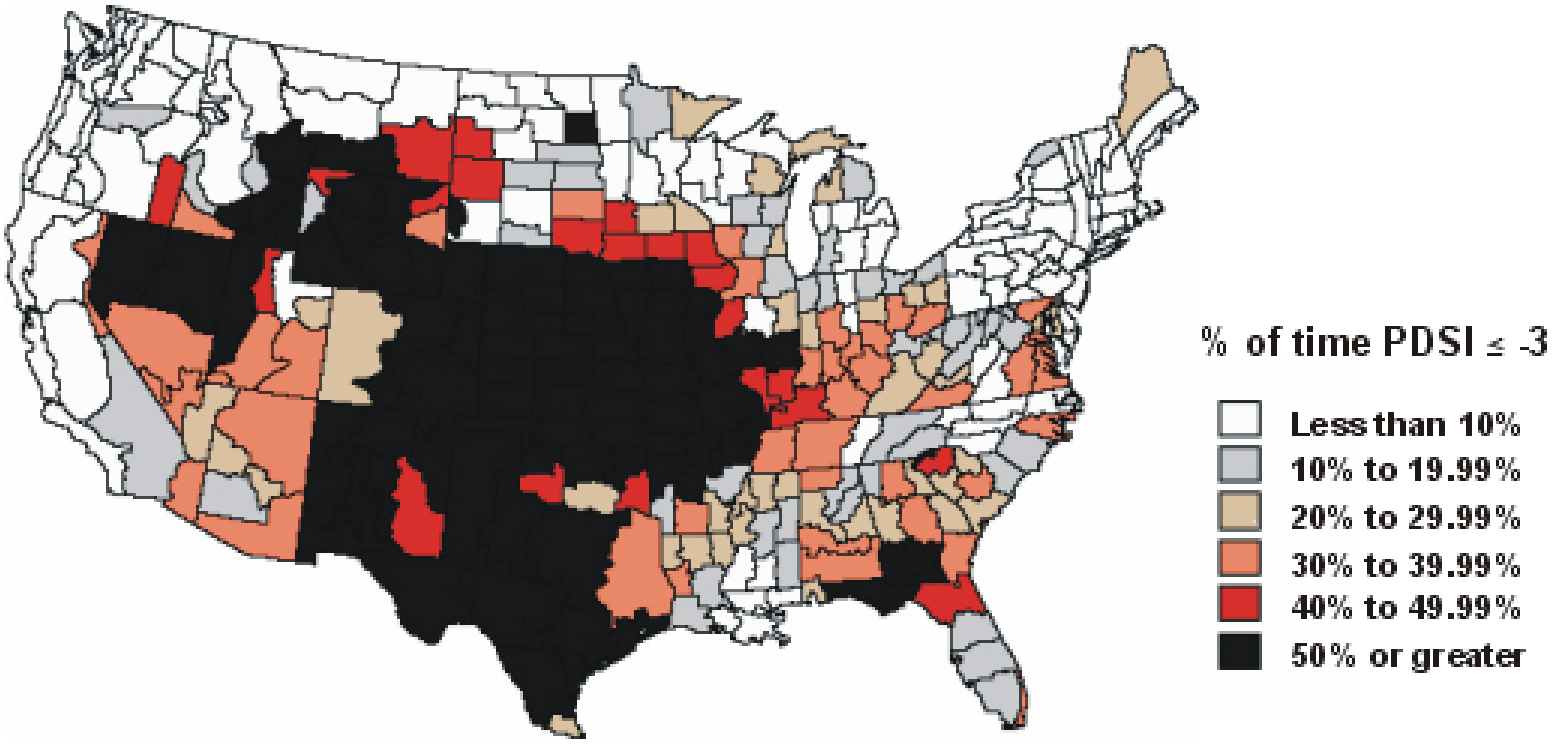
Source: USACE

Palmer Drought Severity Index (U.S.)

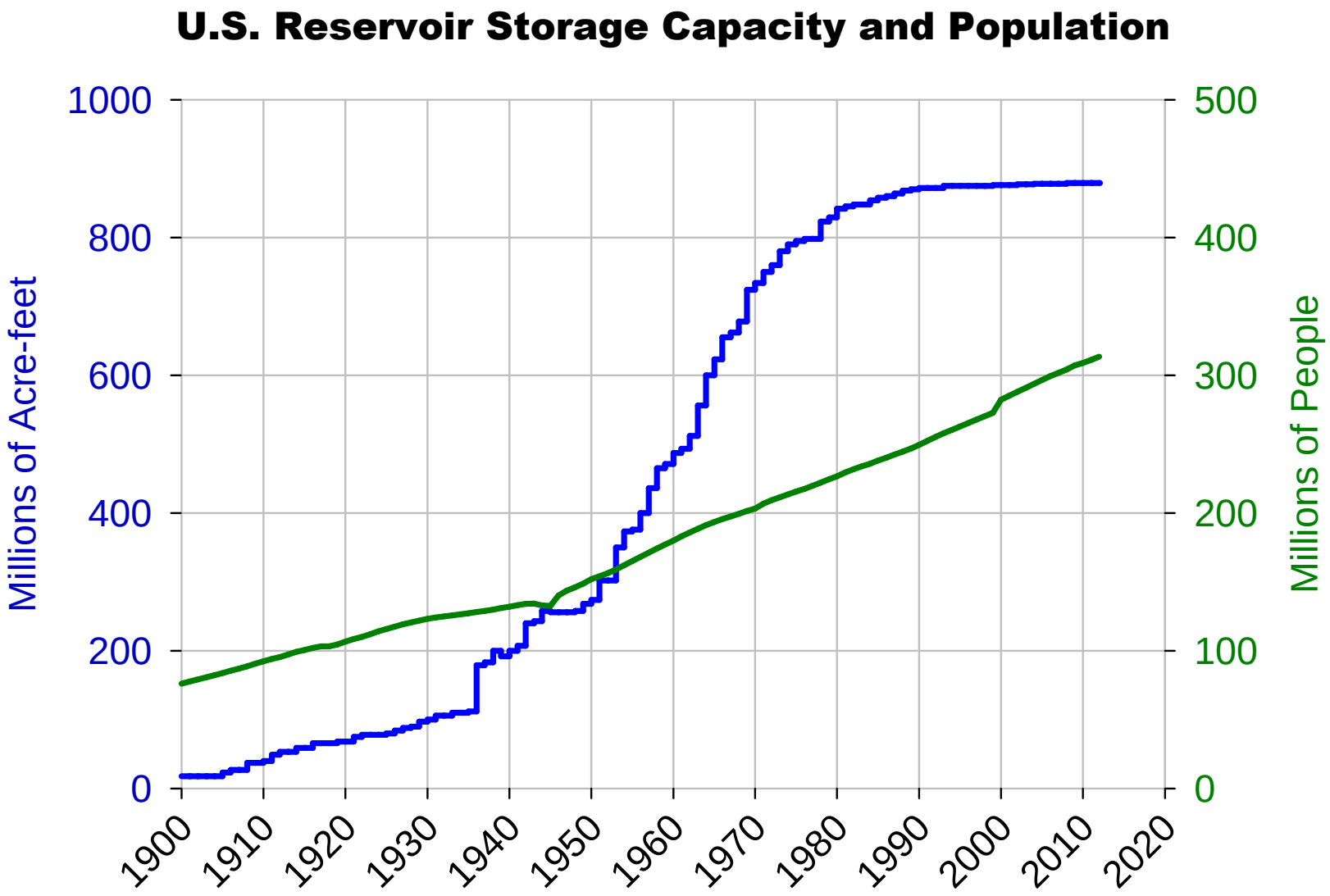


Source: NOAA

1954 to 1956
Palmer Drought Severity Index

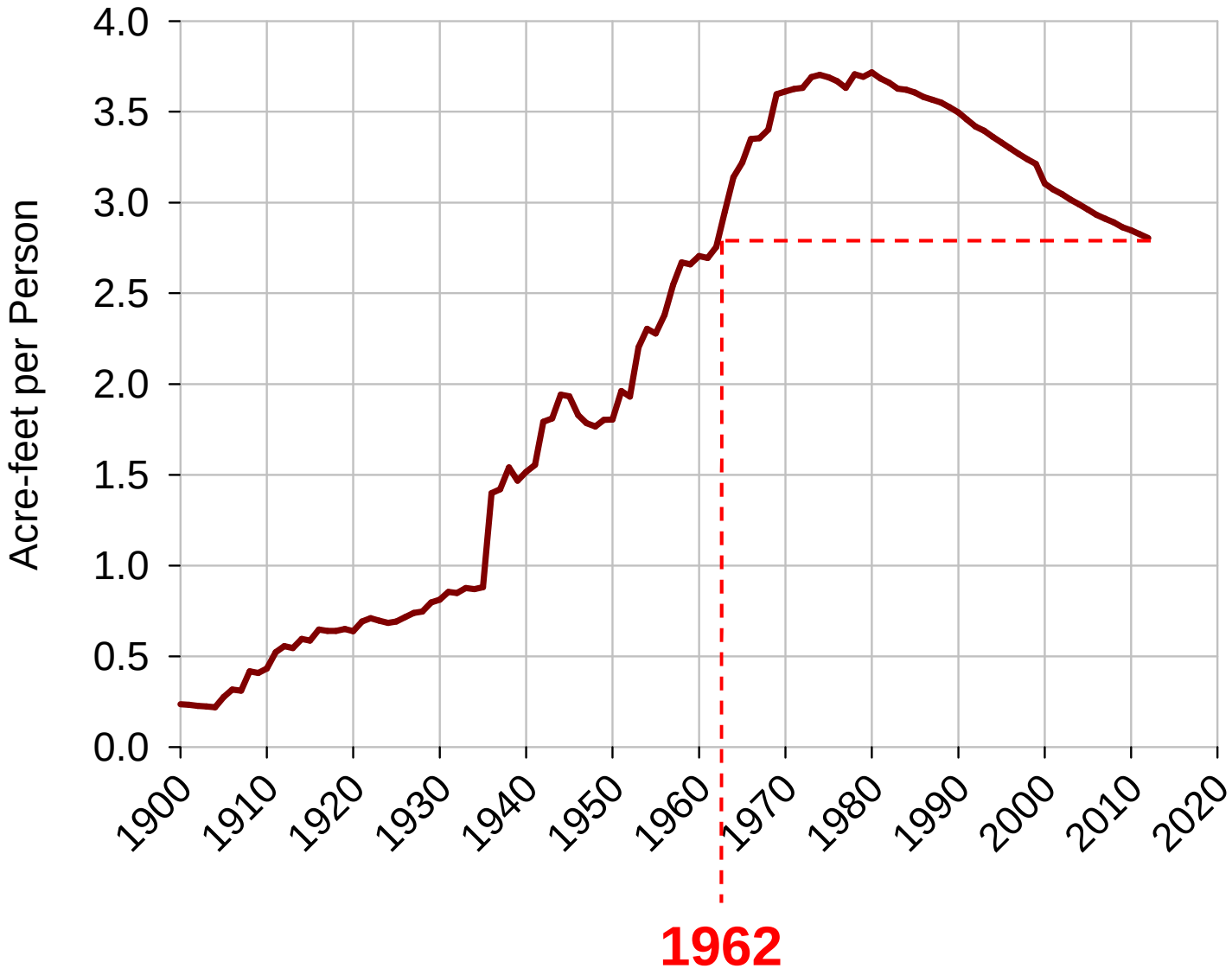


Source: National Drought Mitigation Center



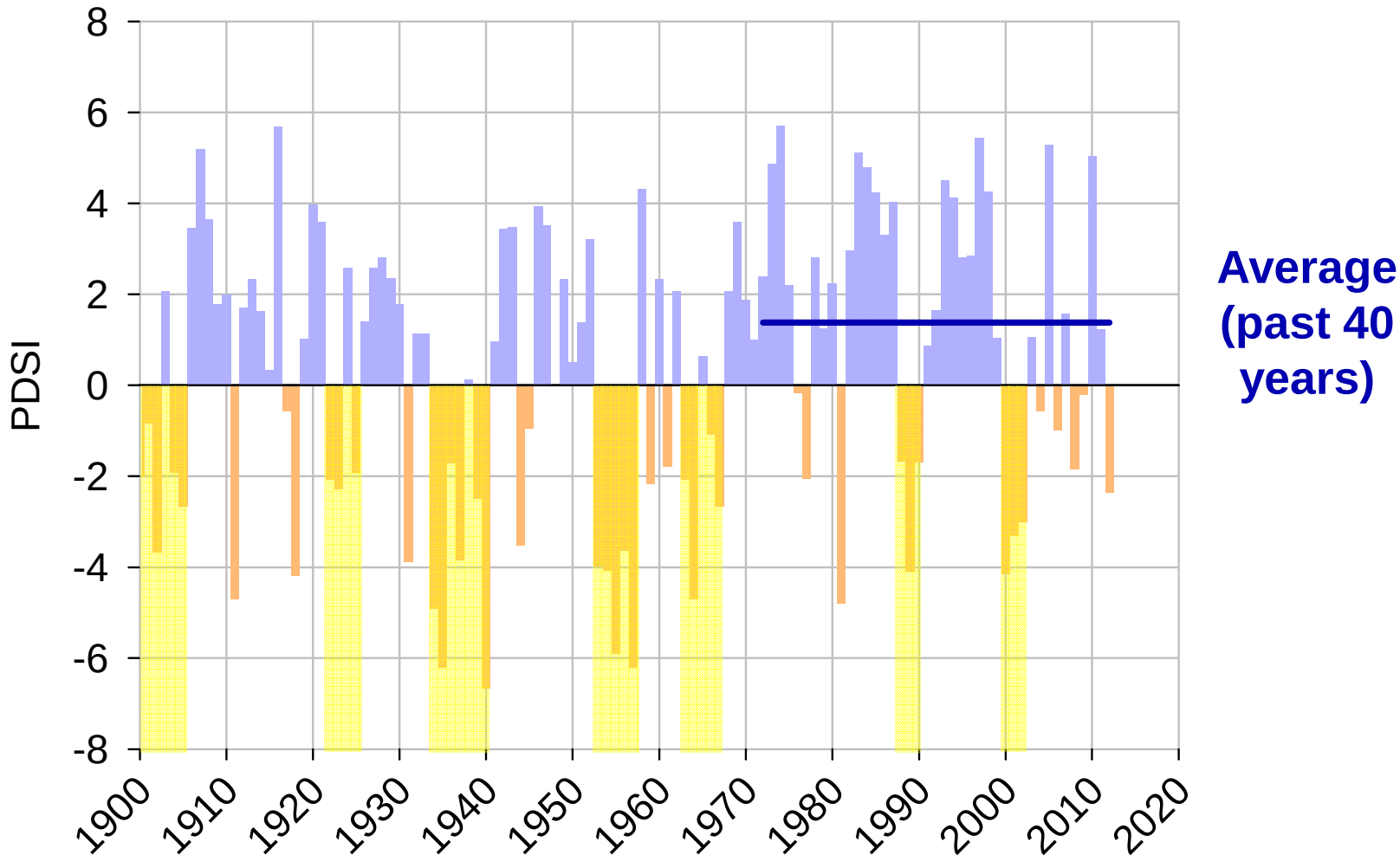
Source: US Census Bureau and USACE

U.S. Ratio of Reservoir Storage Capacity per Capita



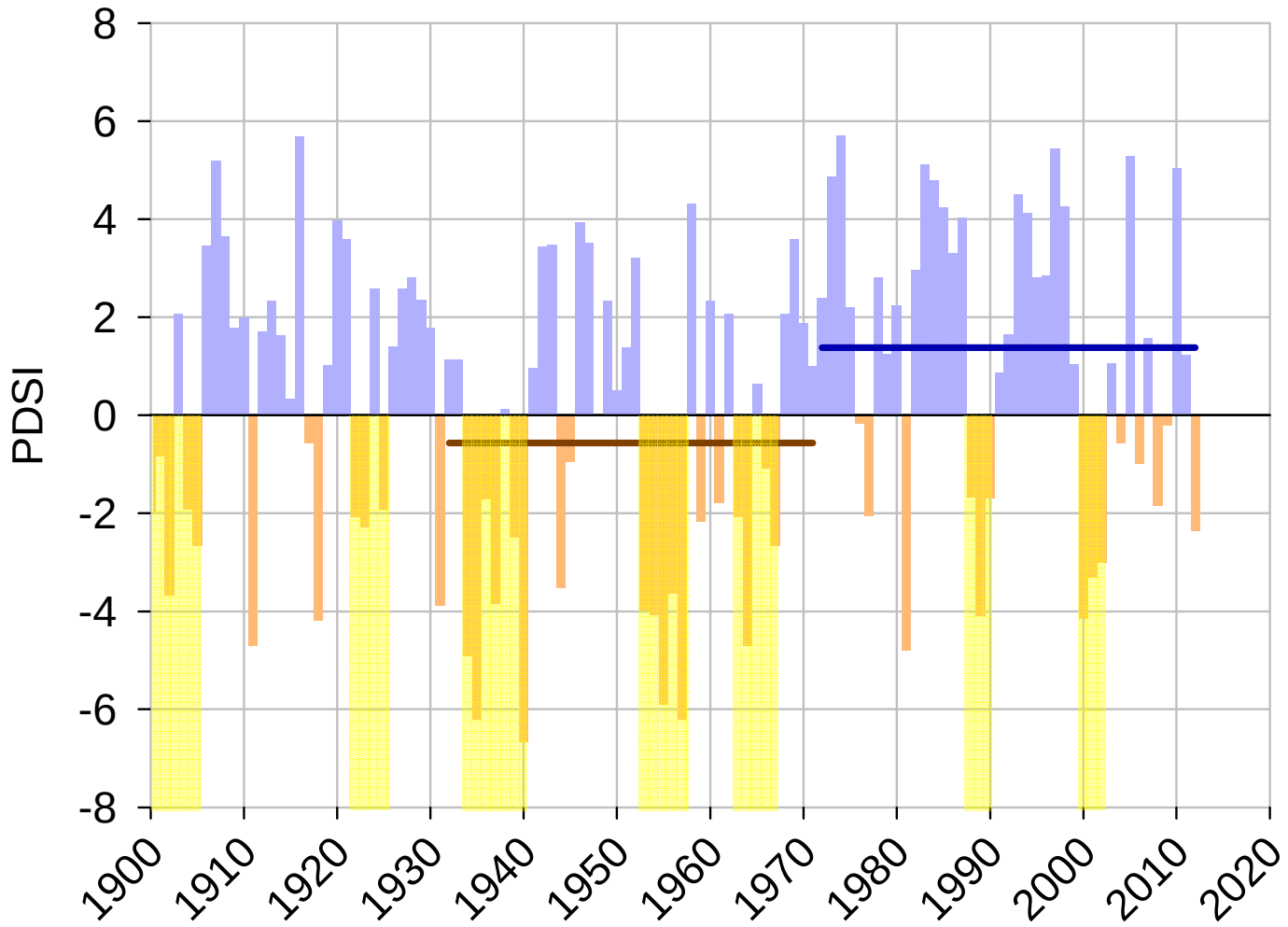
Source: US Census Bureau and USACE

Palmer Drought Severity Index (U.S.)



Source: NOAA

Palmer Drought Severity Index (U.S.)



Average (40 years prior)

Source: NOAA

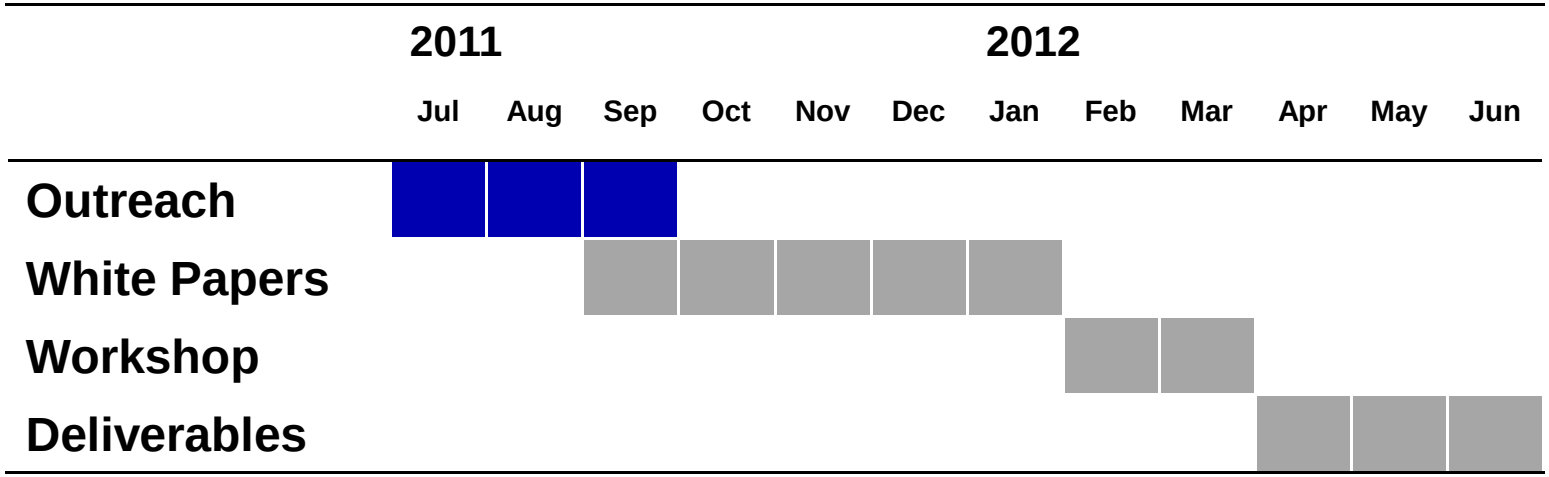
"…uncertainties regarding environmental impacts and ways to mitigate these impacts are some of the largest hurdles to implementation of desalination in the United States."

- National Academies of Science, 2008, *Desalination: A National Perspective*

Desal Dialog Purpose

- Facilitate a discussion about desalination permitting.
- Identify common ground.
- Define needed data and/or research.

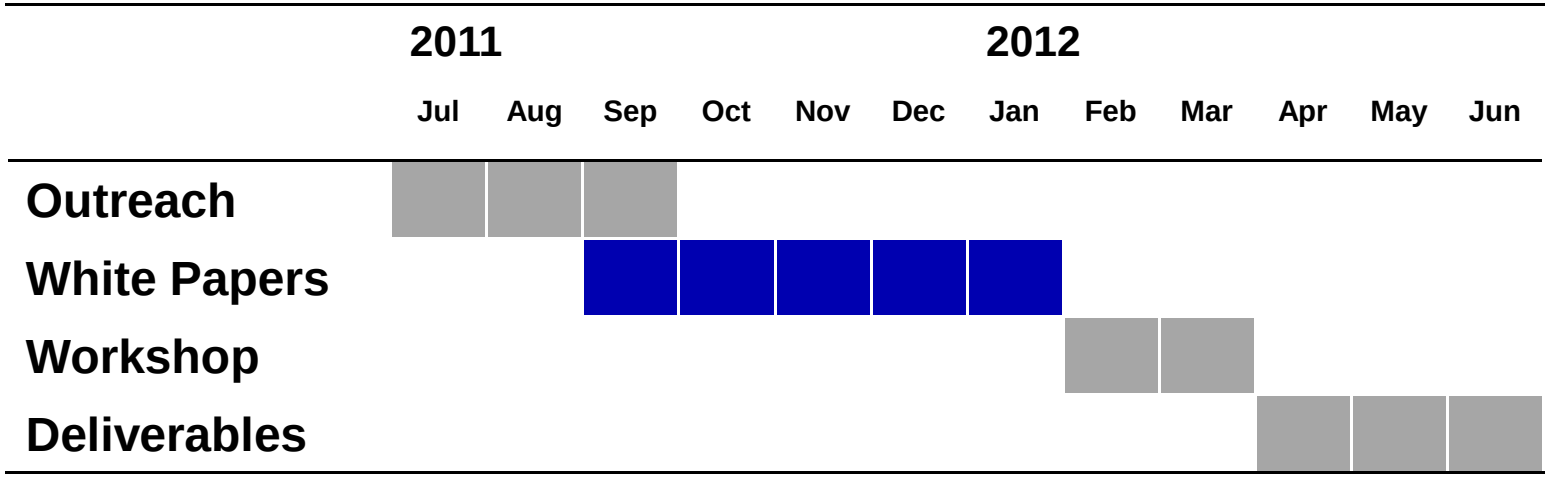
Process



1. Outreach

- Identify key stakeholders
- Gather existing information

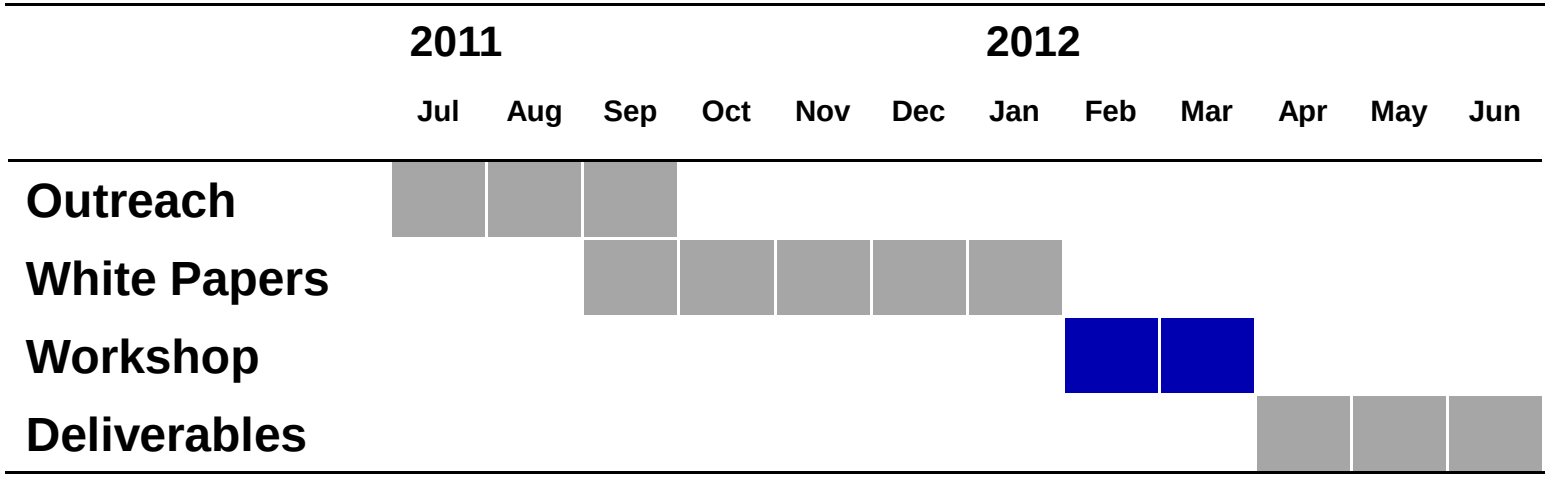
Process



2. White Papers

- Identify and organize permitting issues
- Solicit input from participants

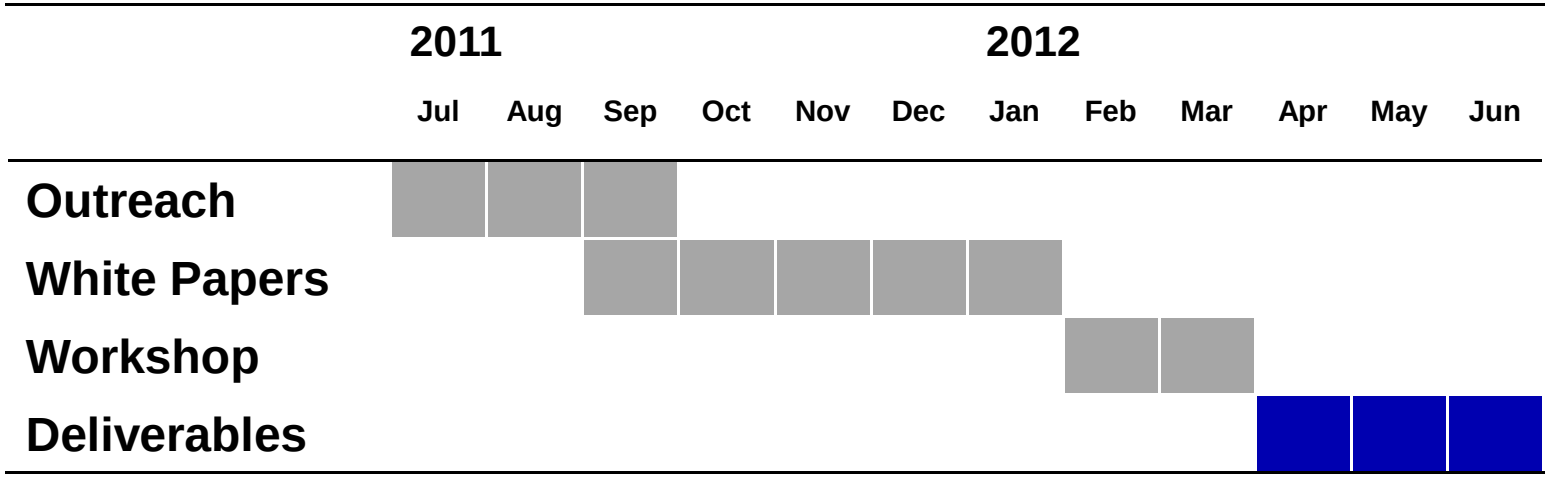
Process



3. Workshop

- Experiences abroad and domestic
- Breakout discussions of topics

Process



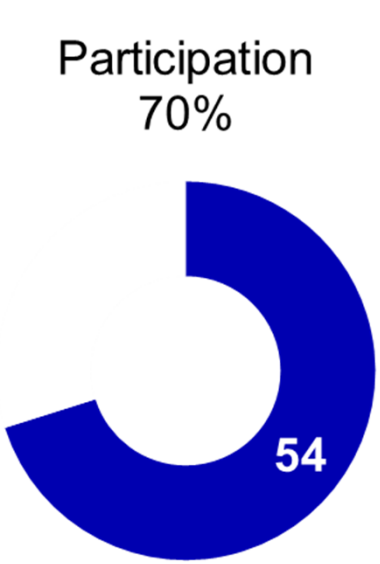
4. Deliverables

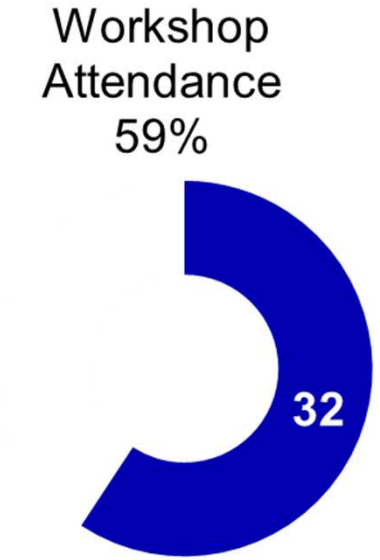
- Recommendations for further study
- Recommendations for national guidelines

Outreach

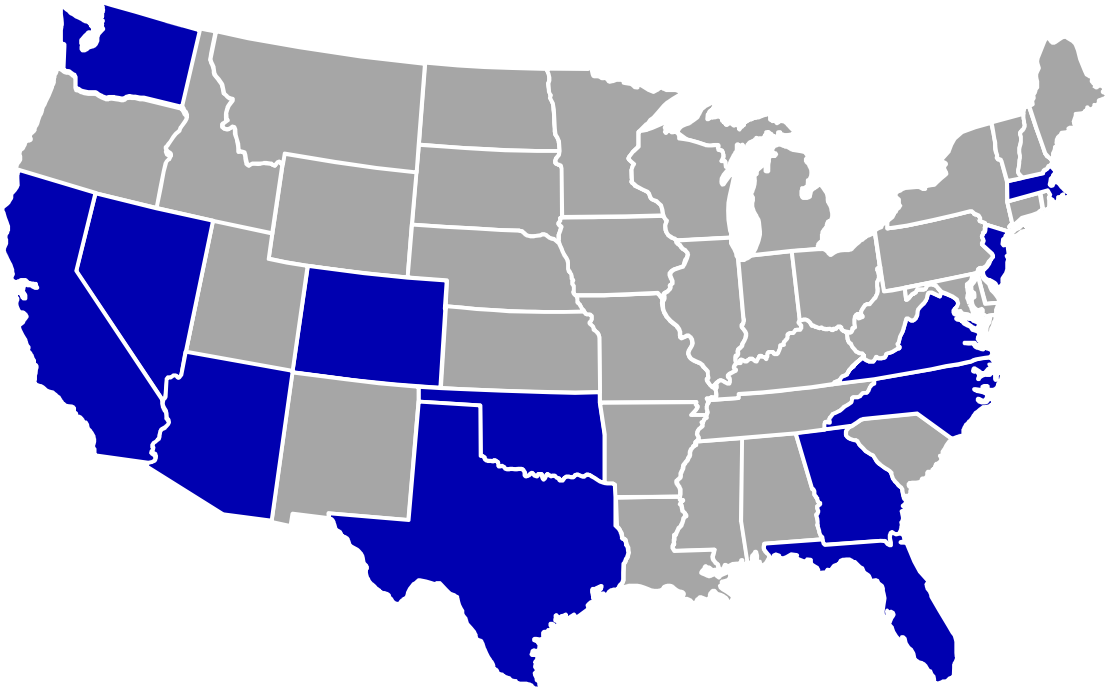
Participation

	Organizations
Regulators	16
Utilities	24
Associations	14
Total	**54**





Participation



Arizona

California

Colorado

Florida

Georgia

Oklahoma

Massachusetts

Nevada

New Jersey

North Carolina

Texas

Virginia

Washington

Australia

Oman

Philippines

Spain

White Papers

Scope

1.0 Source Water Issues

2.0 Product Water Quality Challenges

3.0 Desalination Plant Discharge Impacts

4.0 Reverse Osmosis Membrane Technology Performance and Reliability

Scope

1.0 Source Water Issues

- 1.1 Impingement and Entrainment (I&E) of Aquatic Organisms by Open Intakes
- 1.2 Source Water Quality Characterization

2.0 Product Water Quality Challenges

- 2.1 Product Water Quality and Public Health
- 2.2 Product Water Quality and Non-consumptive Use
- 2.3 Blending of Source and Desalinated Waters

Scope

3.0 Desalination Plant Discharge Impacts

- 3.1 Characterization of Discharges
- 3.2 Seawater Concentrate Water Quality
- 3.3 Alternative Seawater Desalination Concentrate Disposal Methods
- 3.4 Alternative Brackish Desalination Concentrate Disposal Methods

Scope

4.0 Reverse Osmosis Membrane Technology Performance and Reliability

- 4.1 Reverse Osmosis Integrity Testing and Pathogen Removal Credits
- 4.2 Removal of Algal Toxins by Reverse Osmosis Membranes
- 4.3 NSF Certification of Equipment, Chemicals, and Membranes for Potable Use

Purpose

- Identify key permitting challenges associated with desalination.
- Provide participants with a technical background on each issue.
- Define needed data and/or research.

Workshop

Logistics

- Time and Place
  - March 28-29, 2012
  - Sacramento, CA

- Participation
  - 43 individuals representing 32 organizations (60% of participating entities)

Workshop Objectives

- Provide participants with an overview of the purpose and need for the Desal Dialog

- Facilitate feedback from participants:
  - Identify areas of common ground relating to permitting issue
  - For the areas where there is disagreement, identify potential research projects that could be implemented to better inform the issue
  - Determine level of support for developing national guidelines for the permitting issue

Recommendations

Proposed Research Projects

White Paper Topic	Proposed Research Project
1.1: I&E of Aquatic Organisms by Open Intakes	1A: Methodology for Quantification of I&E of Desalination Plant Intakes
	1B: Methodology for Determination of the Biological Significance of I&E
	1C: Methodology for Assignment of I&E Reduction Credits to Intake Technologies
	1D: Methodology for Development of I&E Mitigation Program
1.2: Source Water Quality Characterization	1E: Study of Survivability of Regulated Human Pathogens in Saline Waters
	1F: Methodology for Performing Sanitary Surveys and Applying Drinking Water Standards to Desalination Projects
	1G: Methodology for Assigning Pathogen Removal Credits to Desalination Intake Wells

Proposed Research Projects

White Paper Topic	Proposed Research Project
2.1: Product Water Quality and Public Health	2A: Guidelines for Integrating Desalinated Water into the Water Distribution System
2.2: Product Water Quality and Non-Consumptive Use	
2.3: Blending of Source and Brackish Desalinated Waters	2B: Survey of Existing Brackish Groundwater–Source Water Blending Practices

Proposed Research Projects

White Paper Topic	Proposed Research Project
3.1: Characterization of Discharges	3A: Information and Decision Tree for Characterization of Desalination Plant Discharges
	3B: Characterization of Toxicity Impacts of Plant Discharges
	C: Development of Standard Methods for Laboratory Analysis of Concentrate
3.2: Seawater Concentrate Water Quality	3D: Survey of Existing Desalination Plant Discharge Permitting Practices
	3E: Development, Verification, and Certification of Salinity Dispersion Models Tailored for Seawater Discharges
3.3: Alternative SWRO Concentrate Disposal Methods	3F: Study of Salinity Tolerance of Target Sensitive Marine Species
	3G: Mapping of U.S. Ocean Shorelines (“Near-shore Outfall Zone”)
3.4: Alternative BWRO Concentrate Disposal Methods	3H: Database of Permitting Practices for Brackish Concentrate Disposal

Proposed Research Projects

White Paper Topic	Proposed Research Project
4.1: RO Membrane Pathogen Removal Credits and Integrity Testing	4A: Standard Method for Online Nanofiltration and Reverse Osmosis Integrity Testing
4.2: Removal of Algal Toxins by SWRO Membranes	4B: Surrogate-based Method for Assessment of Algal Toxin Removal
4.3: NSF Certification of Equipment, Chemicals, and Membranes for Potable Use	4C: Methodology for Implementing NSF/ANSI 61 Standard for Desalination Project

Proposed Research Projects

- For each proposed research project, a draft scope of work was developed describing:
  - Need
  - Objectives
  - Approach
  - Benefit

National Desalination Guidelines

- Participant Feedback

No.	White Paper Topic Question	Yes	No	Not Sure
1.1a	Do you think that the development of national guidelines for environmental review, evaluation, and selection of saline water intakes will simplify desalination project permitting?	17	2	-
1.2a	If a comprehensive study of the survival rate of viruses, E. coli, Giardia, and Cryptosporidium in saline waters of various TDS concentrations establishes a threshold below which such organisms cannot survive 24 hours, would this be a suitable basis to relax, eliminate, or remove the second barrier of pathogen removal and inactivation requirements for desalination plants (for SWRO)?	10	4	1
1.2b	In your opinion, would the initial Cryptosporidium monitoring of 1 year (rather than 2 years as per LT2ESWTR) be adequate for desalination project permitting if no Cryptosporidium is detected over the 12 months of testing (for surface source water)?	12	3	1

National Desalination Guidelines

- Participant Feedback

No.	White Paper Topic Question	Yes	No	Not Sure
2.1a	Do you think that the development of Federal desalinated water quality guidelines will simplify desalination project permitting?	11	2	-
2.2a	Do you think that the development of Federal water quality guidelines for non-consumptive uses of desalinated water will simplify desalination project permitting?	10	3	-

National Desalination Guidelines

- Participant Feedback

No.	White Paper Topic Question	Yes	No	Not Sure
3.1a	Do you think that the development of nationwide guidelines for characterization of desalination plant discharges will simplify desalination project permitting?	12	3	3
3.1b	Based on your experience, do you think that simplified characterization of concentrate and spent membrane cleaning solutions will be acceptable?	4	8	2
3.2a	Do you think that the development of nationwide regulations for seawater desalination plant concentrate discharge will simplify desalination project permitting?	11	2	-
3.3a	Do you think that the development of nationwide regulations for seawater desalination plant concentrate discharge will simplify desalination project permitting?	14	4	-

National Desalination Guidelines

- Participant Feedback

No.	White Paper Topic Question	Yes	No	Not Sure
3.4a	Do you think that a change in concentrate classification (name change only) away from industrial waste will benefit permitting and regulation of concentrate through changed perceptions of concentrate?	11	6	1
3.4b	Do you think that Federal Guidelines specific for municipal membrane concentrate would lead to more appropriate and more uniform regulation of concentrate disposal and provide a means for states and regulators new or relatively new in dealing with concentrate to more efficiently regulate concentrate disposal?	15	-	1
3.4c	While not sacrificing important environmental and health concerns and their translation into permitting/regulatory requirements, how might the regulatory process change to reduce the time and effort spend on dealing with permit issues?	n/a	n/a	n/a

National Desalination Guidelines

- Participant Feedback

No.	White Paper Topic Question	Yes	No	Not Sure
3.4d	Would analysis of state regulatory websites and the development of guidelines for the type, detail, availability, and clarity of information facilitate more efficient interaction with the agencies? Is this a worthwhile area of consideration?	18	-	-
3.4e	Do you think that the possibility of injecting concentrate into Class II and V wells would facilitate increased application of deep well injection yet maintain an appropriate level of environmental risk?	7	5	1
3.4f	Do you think that the use of natural earthen liner materials meeting environmental risks and decreasing costs associated with expensive synthetic pond liners would lead to increased application of evaporation ponds?	6	5	3

National Desalination Guidelines

- Participant Feedback

No.	White Paper Topic Question	Yes	No	Not Sure
4.1a	Would the development of an online RO integrity monitoring method simplify the permitting process and avoid case-by-case testing for each new RO membrane element that enters the desalination market?	9	1	-
4.3a	Do you believe that raw water intake and pipeline equipment should be NSF certified?	5	7	2
4.3b	Do you believe that the pretreatment system equipment should be NSF certified?	5	7	2

National Desalination Guidelines

- Key Components
  - Intake Issues
  - Discharge Issues
  - Product Water Quality Issues

National Desalination Guidelines

- **Intake Issues**
  - Intake types and environmental impacts
  - Overview of existing intake regulations and guidelines
  - I&E of aquatic organisms
  - Methodology for I&E assessment
  - Methodology for determining entrainment impacts for new and existing intakes
  - Methodology for assessment for cumulative I&E impacts
  - Methodology for determining biological significance of I&E
  - Best available practices for reducing I&E impacts
  - Guidelines for development of I&E impact mitigation program

National Desalination Guidelines

- **Discharge Issues**
  - Discharge types and environmental impacts
  - Overview of existing discharge regulations and guidelines
  - Discharge to sanitary sewer
  - Deep well injection
  - Evaporation ponds
  - Land application
  - Volume minimization
  - Zero-liquid discharge
  - Concentrate characterization
  - Overview of current discharge permitting practices

National Desalination Guidelines

- **Product Water Quality Issues**
  - Overview of existing product water regulations and guidelines
  - Source water quality characterization
  - Guidelines for completing sanitary surveys for SWRO intakes
  - Guidelines for completing sanitary surveys for BWRO intakes
  - Survey of existing brackish groundwater – source water blending practices
  - Reverse osmosis membrane integrity monitoring
  - Algal toxin monitoring and removal by desalination plants
  - Methodology for implementing NSF/ANSI61 standards for desalination plants

National Desalination Guidelines

- Proposed Document Outline
  - *Introduction*
  - *Overview of Desalination Permitting Issues*
  - *Intake-Related Issues*
  - *Discharge-Related Issues*
  - *Product Water Quality–Related Issues*
  - *Legal and Institutional Issues*
  - *Public Involvement Programs*
  - *Desalination Experience Outside the United States*

The Path Forward

Desal Guidelines – Next Steps

- Identify most appropriate path to develop national desalination permitting guidelines
- Search for a primary sponsoring agency
- Identify funding sources (estimated ~$800,000 needed)

Desal Guidelines – Next Steps

- Determine EPA's level of interest and appropriate program.
- Determine the scope and content of guidelines.
- Approach potential funding sources with the EPA-approved outline in hand.
- Finalize scope, funding and instructional logistics (through WateReuse 12-01 – desal guidelines scoping study).
- Solicit contractor for guidelines development.

Desal Dialog

Water Globe Consulting

Final Report available at:
www.watereuse.org/product/10-03-1

Desal Dialog Participants

Technical Advisors

- Fermin López Unzu
- Susan Trousdale,
- Jorge Arroyo
- Dr. Jack Schwartz
- Mike Mickley
- Scott Jenkins

Principal Investigators

- Michael J. Irlbeck, *NRS Consulting Engineers, Inc.*
- Nikolay Voutchkov, *Water Globe Consulting, Inc.*

Project Team

- Christopher Norris, *NRS Consulting Engineers, Inc.*
- Sharon Mineo, *WaterPR*

Desal Dialog Participants

Participating Agencies

- Fermin Lopez Unzu, *Acuamed* (Spain)
- Timothy Hogan, *Alden Research Laboratory, Inc.*
- Ian Watson, *American Membrane Technology Association*
- Mark LeChevallier, Ph.D., *American Water*
- Debra Daniel, *Arizona Department of Environmental Quality*
- Darrell Osterhoudt, *Association of State Drinking Water Administrators*
- Judy Adams, *Brownsville Public Utilities Board*
- John Bruciak, *Brownsville Public Utilities Board*
- Genoveva Gomez, *Brownsville Public Utilities Board*
- Ron Davis, *CalDesal*
- Paul Schoenberger, *CalDesal*
- Thomas Luster, *California Coastal Commission*
- Bruce Burton, *California Department of Public Health*

Desal Dialog Participants

Participating Agencies (continued)

- Kim Wilhelm, *California Department of Public Health*
- Charles Cullom, *Central Arizona Project*
- Lynn Stevens, *City of Daytona Beach*
- Brian Matthews, *City of Palm Coast*
- Heidi Luckenbach, *City of Santa Cruz*
- Ray Allen, *Coastal Bend Bay and Estuaries Program*
- Hasan Abdullah, *East Bay Municipal Utility District*
- Ed Archuleta, *El Paso Water Utilities*
- Elsa Potts, *Florida Department of Environmental Protection*
- Philip Roberts, *Georgia Institute of Technology*
- Jim Murphy, *Guadalupe-Blanco River Authority*
- Gavino Sotelo, *Laguna Madre Water District*
- Jack Schwartz, Ph.D., *Massachusetts Division of Marine Fisheries*

Desal Dialog Participants

Participating Agencies (continued)

- Anne Slugg, *Massachusetts Office of Coastal Zone Management*
- Warren Teitz, *Metropolitan Water District of Southern California*
- Heather Collins, *Metropolitan Water District of Southern California*
- Shannon McCarthy, *Middle East Desalination Research Center* (Oman)
- Brad Hagemann, *Monterey Regional Water Pollution Control Agency*
- Bob Holden, *Monterey Regional Water Pollution Control Agency*
- Richard Bell, *Municipal Water District of Orange County*
- Jeff Mosher, *National Water Research Institute*
- Dyk Luben, *North Carolina Department of Environment and Natural Resources*
- Carl Parrott, PE, *Oklahoma Department of Environmental Quality*
- Philip Rolchigo, *Pentair*
- Harry Seah, *Public Utilities Board of Singapore* (Singapore)

Desal Dialog Participants

Participating Agencies (continued)

- Mike Dixon, *SA Water* (Australia)
- Julia Velez, *San Antonio River Authority*
- Cesar Lopez, *San Diego County Water Authority*
- Michael Dunbar, *South Coast Water District*
- Mark Elsner, *South Florida Water Management District*
- Bruce Moore, *Southern Nevada Water Authority*
- Eric Dickenson, *Southern Nevada Water Authority*
- Kenneth Herd, *Southwest Florida Water Management District*
- Catherine Walker, PE, MBA, *St. Johns River Water Management District*
- Mariela Carpio-Obeso, *State Water Resources Control Board*
- Dominic Gregorio, *State Water Resources Control Board*
- Susan Trousdale, *Sydney Water* (Australia)
- Christine Owen, *Tampa Bay Water*

Desal Dialog Participants

Participating Agencies (continued)

- David Galindo, *Texas Commission on Environmental Quality*
- Pat Radloff, *Texas Parks & Wildlife Department*
- Jorge Arroyo, *Texas Water Development Board*
- Yuliana Porras, *U.S. Bureau of Reclamation*
- Kevin Price, *U.S. Bureau of Reclamation*
- Bob Bastian, *U.S. Environmental Protection Agency*
- Jeffrey Lape, *U.S. Environmental Protection Agency*
- Scott Kudlas, *Virginia Department of Environmental Quality*
- Mark Sauer, *Virginia Department of Environmental Quality*
- Dan Horne, *Virginia Department of Health*
- Deana Bollaci, *WateReuse Research Foundation*
- Barry Liner, *Water Environment Federation*
- Jennifer Warner, *Water Research Foundation*
- Phil Lauri, *West Basin Municipal Water District*

Desal Dialog Participants

Project Advisory Committee

- Andy Shea, *HDR, Inc.*
- Kenneth Herd, *Southwest Florida Water Management District*
- Frank Leitz, *U.S. Bureau of Reclamation*
- Jennifer Warner, *Water Research Foundation*