RECLAMATION
Managing Water in the West

USBR Produced Water Research Efforts and Partnering Opportunities

Oklahoma Water Resources Center

OSU Produced Water Research Team

April 9, 2019

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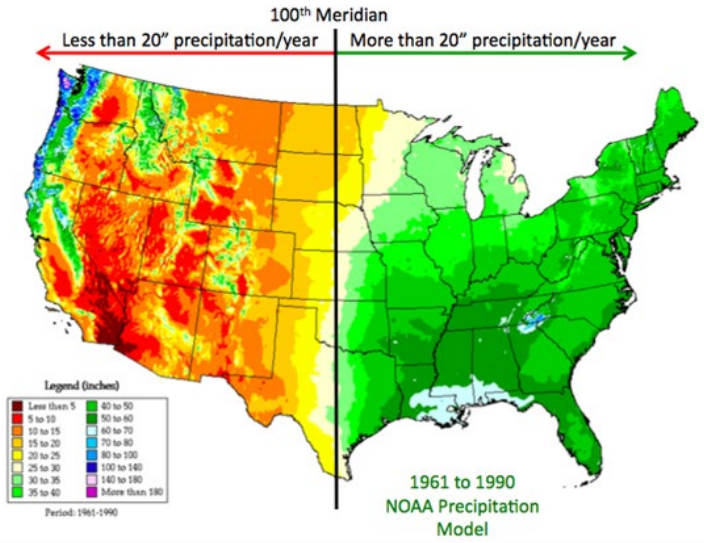
Reclamation Background

- Constructed more than 600 dams & reservoirs
- Deliver 11 million acre-feet of M&I water to 31 million people annually
- Irrigate 10 million acres per year (one out of 5 Western farmers)
  - 60% U.S. vegetables
  - 25% U.S. fruits/nuts
- Recreation
  - 90 million visitor days per year
- Reclamation and power
  - The 2nd largest hydro producer
  - 58 hydropower facilities
  - 41 billion kilowatt hours



Oklahoma-Texas Area Office

Ownership/oversight responsibility for 11 reservoirs with a total capacity of 4.2 million acre-feet.

Total water rights from projects:

- M&I - 571,000 acre-ft/yr to about 2.7 million customers.
- Irrigation - 110,600 acre-ft/yr for about 63,000 acres.

Annual recreation use of over 4 million visitor-days each year.

Ownership/oversight responsibility for 190,000 acres of Federal land

Who Can We Partner With?

- Local Water/Irrigation Districts
- State entities
- Tribes
- Others – cities, rural water districts, etc.
- Academia
- Private entities

Leveraging Partnerships

Successful Grant Applicants in OK (2016-2018)

No.	Grant Recipient	Scope	Award Date (FY)	Federal Share	Grant Type*
1	City of Durant	Installation of smart meters	2018	$75,000	SS
2	City of Tishomingo	Installation of smart meters	2018	$74,580	SS
3	Thomas Public Works Authority	Installation of smart meters	2018	$75,000	SS
4	Grand River Dam Authority	Formation of a Lake O' the Cherokees watershed group	2018	$100,000	CWMP
5	Chickasaw Nation	Water marketing strategy to bank groundwater	2018	$149,228	WM
6	Mountain Park Master Conservancy District	Augmenting reservoir yield through groundwater	2018	$300,000	Drought
7	Thomas Public Works Authority	Upgrading water meters	2017	$75,000	SS
8	Locust Grove Public Works Authority	Improving efficiency of water conveyance pipelines	2017	$74,395	SS
9	City of Purcell	Water System Improvements Purcell Lake Irrigation	2017	$59,480	SS
10	City of Bartlesville	A feasibility study of Caney river water supply augmentation alternatives	2017	$150,000	Title XVI
11	City of Ada	A feasibility study of water recycling alternatives	2017	$136,193	Title XVI
12	OWRB	A feasibility study of produced water reuse alternatives	2017	$150,000	Title XVI
13	City of Bartlesville	Implementation of Caney River water supply augmentation alternative	2017	$750,000	Drought
14	Chickasaw Nation	Formation of a Lake of the Arbuckles Watershed Group	2016	$53,921	CWMP
15	City of Altus	Altus City Reservoir East Basin Improvements	2016	$300,000	Drought
Total				**$2,298,217**	-

* WEEG = Water and Energy Efficiency Grant; SS = Small Scale Water Efficiency Grants; WM = Water Marketing Grants; CWMP = Cooperative Watershed Management Grants

Summary of Programs

FY 19 Announcements ($100 million +)

Planning, Science, Tools, & Research

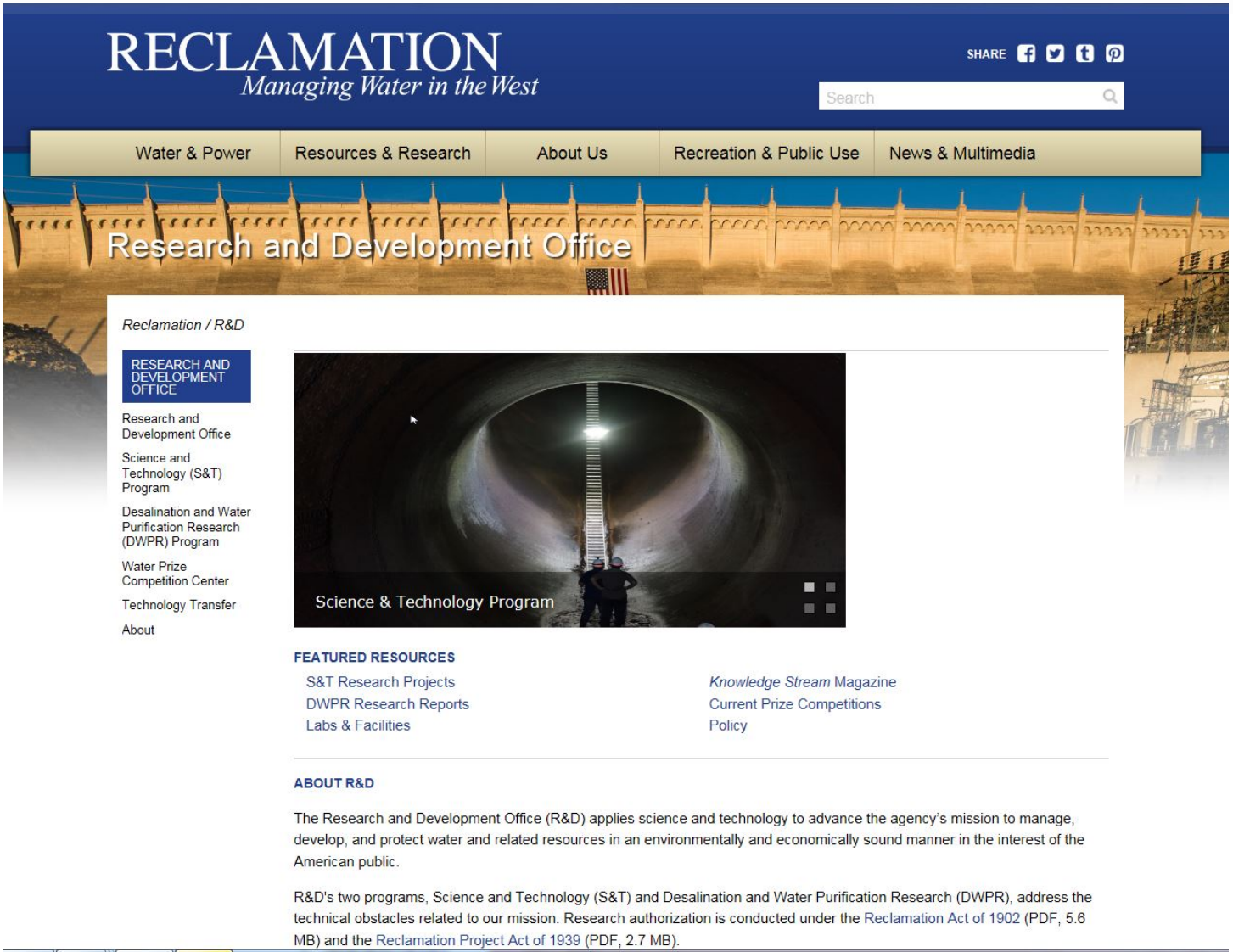
- Drought Contingency Planning Grants
- Desalination Water Purification Research Grants
- Basin Studies Program, Applied Science Tools, Reservoir Operations Pilots
- Cooperative Watershed Management Grants
- Water Marketing Grants
- Native American Affairs Technical Assistance Program
- Title XVI Water Reuse Research Grants

Design, Construction, & Implementation

- Water & Energy Efficiency Grants
- Small-Scale Construction Grants
- Drought Resiliency Project Grants
- Title XVI and WIIN Water Recycling & Desalination Construction Grants

Research & Development

https://www.usbr.gov/research



WaterSMART

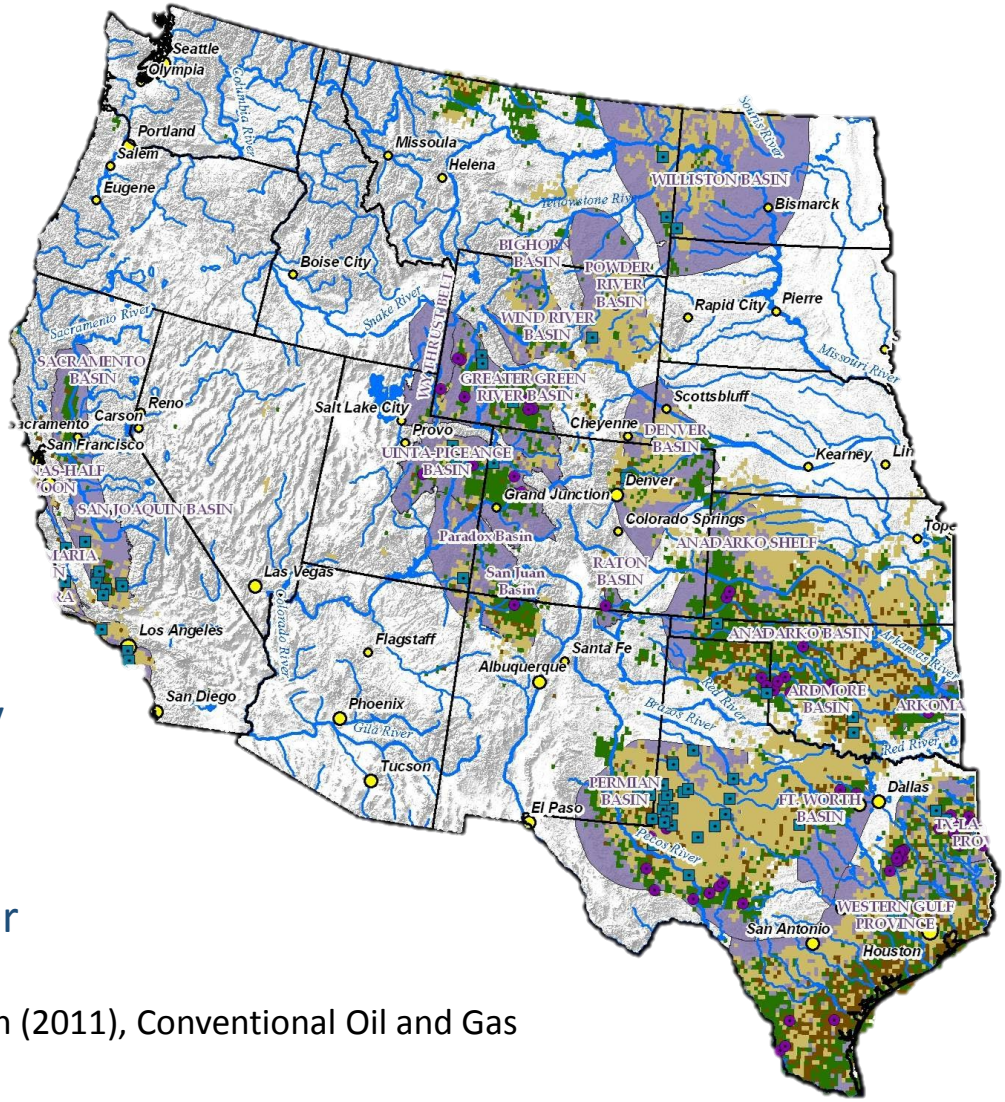
https://www.usbr.gov/watersmart

Oil and Gas in the Western States

Over 80% of on-shore oil and gas production occurs in the Western US

O&G industry water generation and water demand:

- Produced water > 2 billion gal/day (2.2M acre-ft/yr)
- Hydraulic fracturing uses 500,000 gal to >10,000,000 gal of water per fracturing event

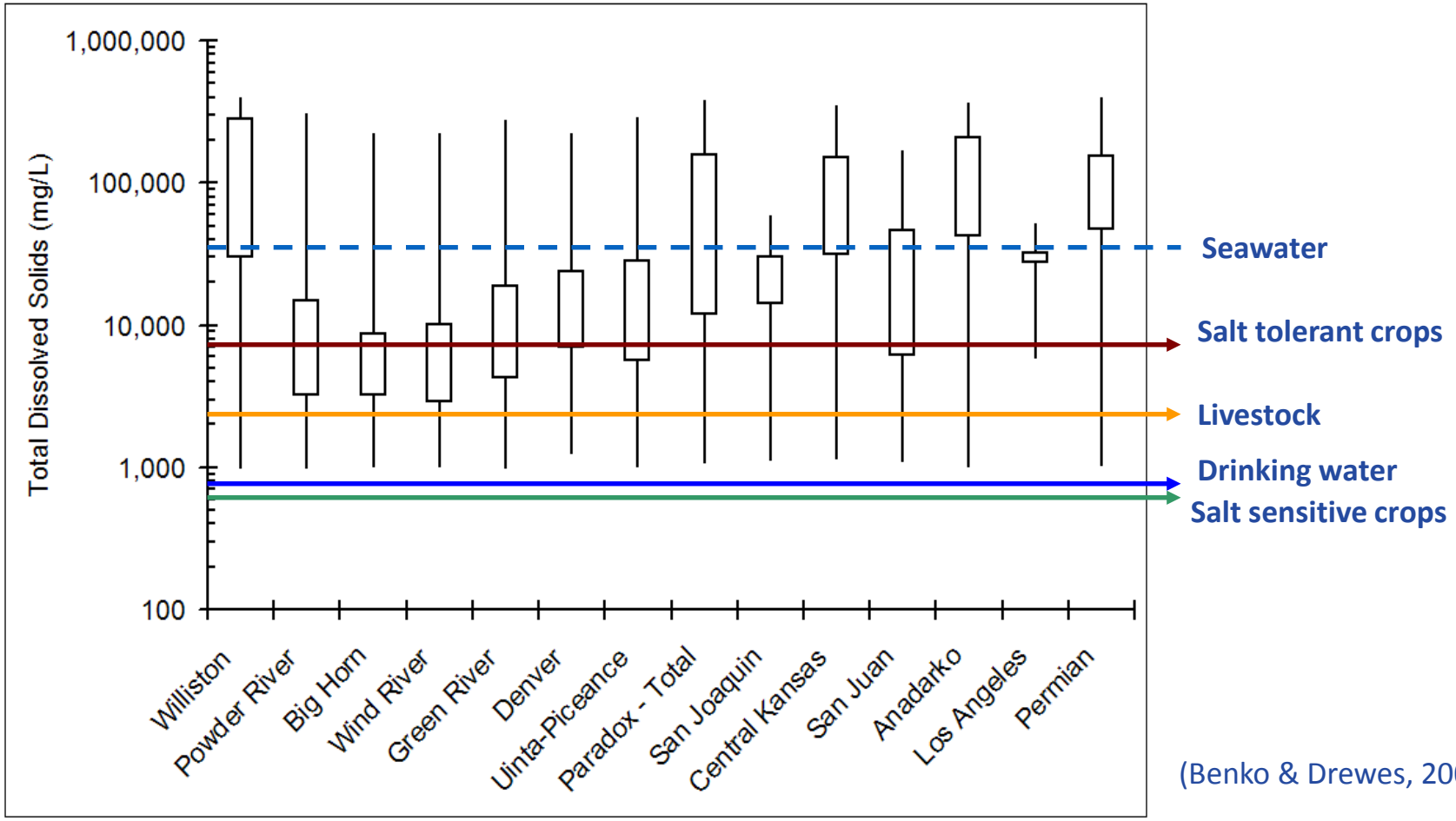


Reclamation (2011), Conventional Oil and Gas

Produced Water as a Water Supply

- Drought-proof supply during emergencies
- Produced water is typical considered a non-tributary water supply and is therefore not subject to water rights limitations
- Potential for variation in flow over time
- Water resource can be mined after oil and gas production stops

Produced Water Requires Treatment for Beneficial Use



(Benko & Drewes, 2008)

S&T Research on Produced Water

- 2006 Workshop
- Background research
- Produced water research summary

2006 Produced Water Workshop

- Fort Collins, Colorado, on April 4-5, 2006
- Goal - explore the potential opportunity and obstacles to beneficial use of produced waters
- The workshop was attended by nearly 200 participants from government, energy companies, water users, water supply planners, government agency staff, researchers, industry representatives, and other interested parties.

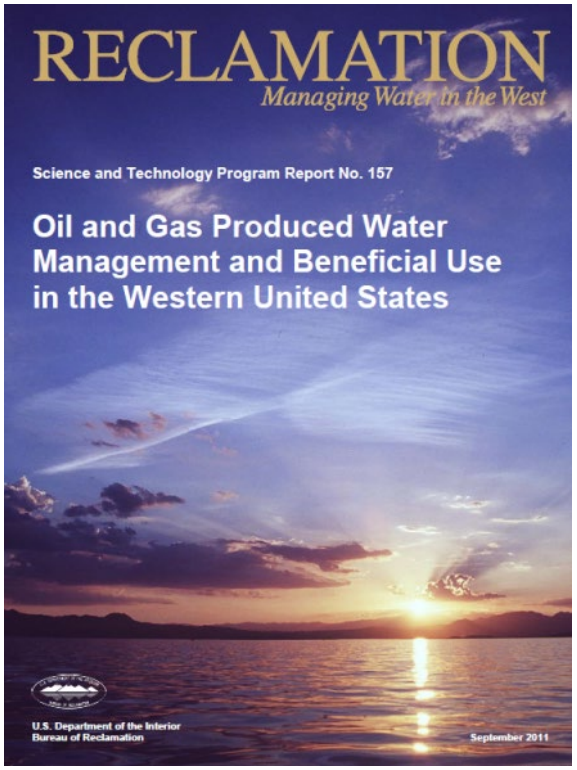
2006 Workshop – Conclusions/Observations

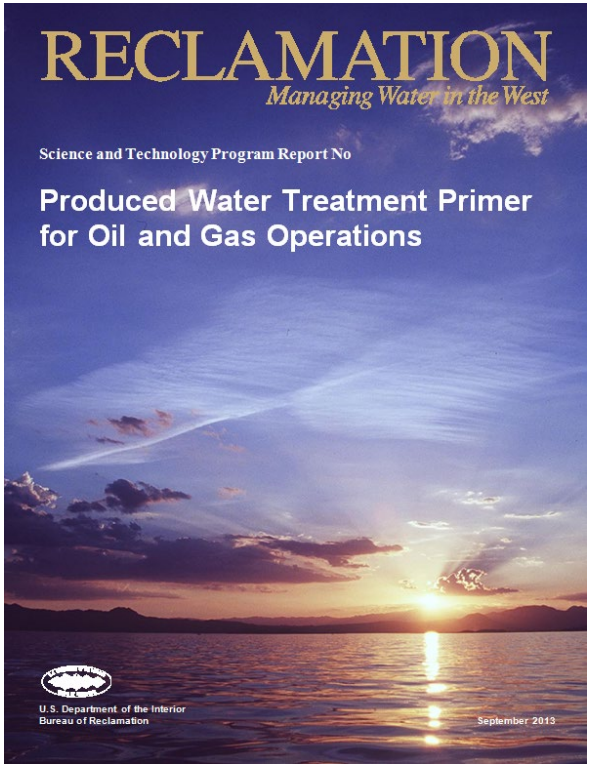
- The most promising opportunities to convert produced waters to beneficial use occur where produced water sources geographically align with markets for water.
- Water markets and the costs of disposal versus treatment will drive the value of produced waters and will be the fundamental factor in determining if produced waters are converted to beneficial use.
- The end users of the produced waters need to be willing to significantly offset the cost of treatment, storage, delivery, and management.

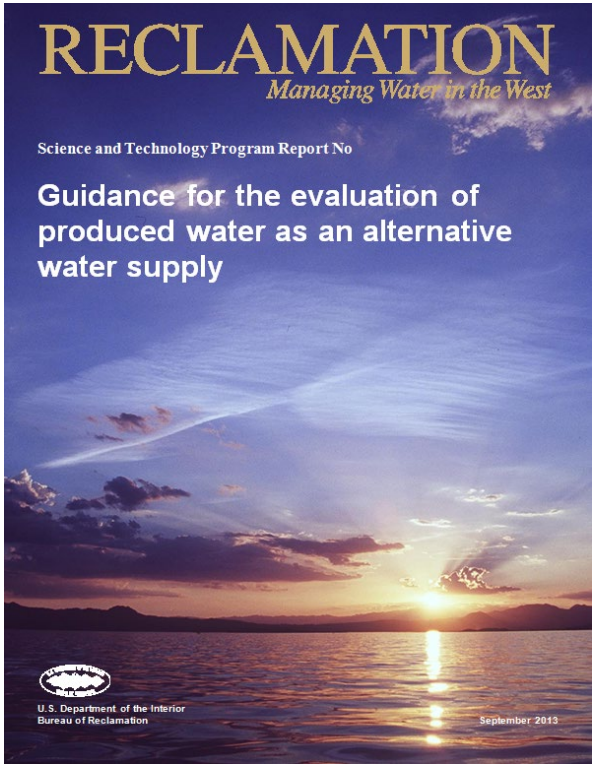
2006 Workshop - Outcomes

- States play the key role in water management and administration and must be in the lead on changing laws and policies to facilitate beneficial uses of produced waters.
- Federal agencies should provide leadership in helping to solve these problems as much of the production occurs on federal lands.

Resources on Treatment Technologies





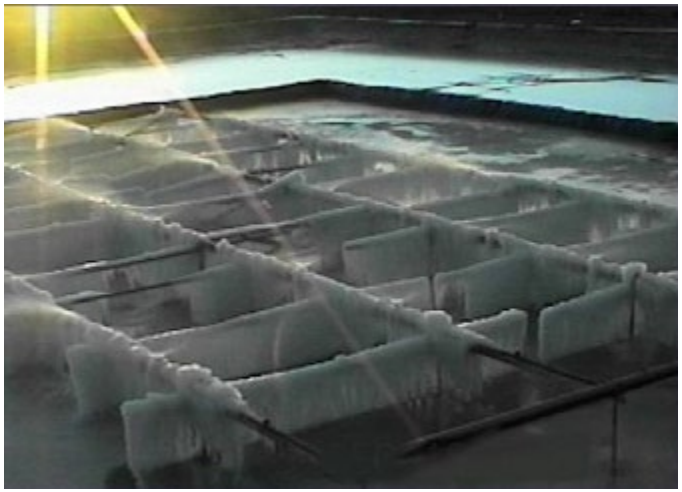


www.usbr.gov/research

project IDs: 3180 (Guerra) and 1617 (Dahm)

Reclamation Funded Projects

- Desalination and Water Purification R&D funded efforts that helped commercialize technologies in use in O&G
  - Altela Rain™
  - Freeze-thaw
- Research areas funded by DWPR of interest to oil and gas
  - Concentrate management
  - Zero liquid discharge
  - Mineral recovery
  - Membrane distillation
  - Forward osmosis
- Title XVI Research/Feasibility
  - Kansas Water Office
  - Oklahoma Water Resources Board



Existing Water Treatment Plants

Case Studies of Existing Hydraulic Fracturing Flowback and Produced Water Treatment Facilities

- Facility Description
- Location
- Feed Water
- Capacity
- Treatment Process
- Treated Water Use
- Concentrate Disposal
- Operational experience
- Performance data
- Permits

McKean County, PA

San Ardo, CA

Clarion County, PA

Wellington, CO

Pinedale, WY

Powder River Basin, WY

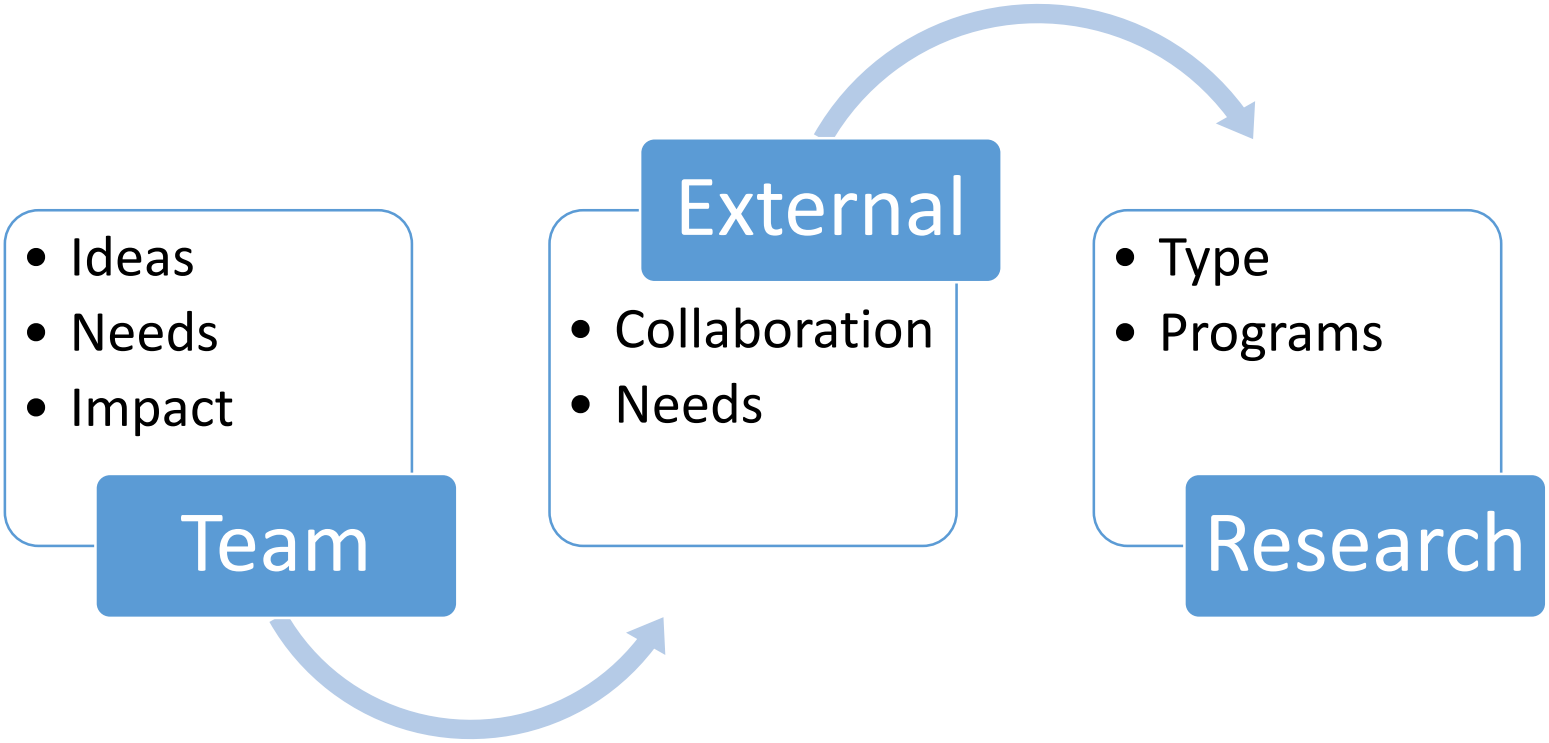
Applicable Reclamation Programs

Office	Program	Purpose
Research and Development	Science and Technology (S&T)	Funding for internal research projects
	Desalination and Water Purification Research (DWPR)	Funding of grants for research by non-federal applicants
Policy and Administration	Title XVI Water Reclamation and Reuse	Funding for planning, design, and construction of water recycling and reuse projects
	WIIN Act Desalination Construction Projects	Funding for planning, design, and construction of facilities to desalinate ocean or brackish water
Native American and International Affairs	Native American Affairs Technical Assistance	Funding available to federally recognized Indian tribes to provide technical assistance for drought, wetlands, and water recycling programs

Desalination & Water Purification Research

- External grants – funding research
- Operation and Maintenance of the Brackish Groundwater National Desalination Research Facility (BGNDRF)
- Supports collaboration across federal government – Water Treatment Interagency Working Group (WaTr)
- Network and collaborate with non-profits, public entities, and private sector

Roadmap Effort



First Step

- An internal workshop in February was held to determine what research is needed for beneficial use of produced water to expand water supplies
- Established a Reclamation team
- Develop the next steps

Questions? To Learn More……

https://www.usbr.gov

- All WaterSMART, Title XVI, Drought Grants and R&D projects on website
- Project examples
- Winning proposals available online
- We are here to help

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