



Produced Water Stewardship and Environmental Stewardship A Changing Landscape

GROUNDWATER PROTECTION COUNCIL
UIC CONFERENCE
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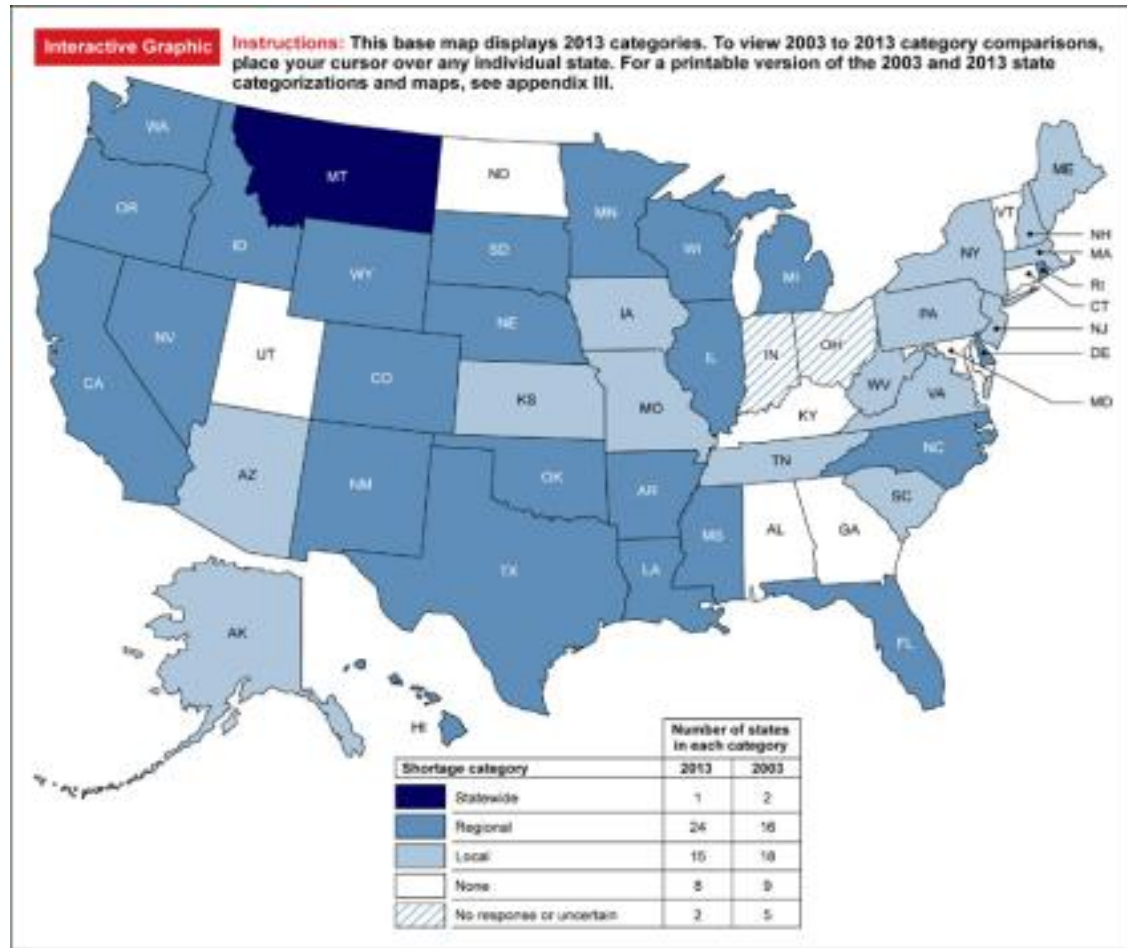
NEW MEXICO
PRODUCED WATER
RESEARCH CONSORTIUM

Presentation Overview

- Review of EPA's National Water Reuse Action Plan efforts for produced water stewardship and reuse.
- What “is not” produced water and environmental stewardship.
- What “ is” produced water and environmental stewardship and why does it matter.
- Opportunities for GWPC/EPA UIC to have a major role in oil and gas environmental and produced water stewardship and regional economic development.

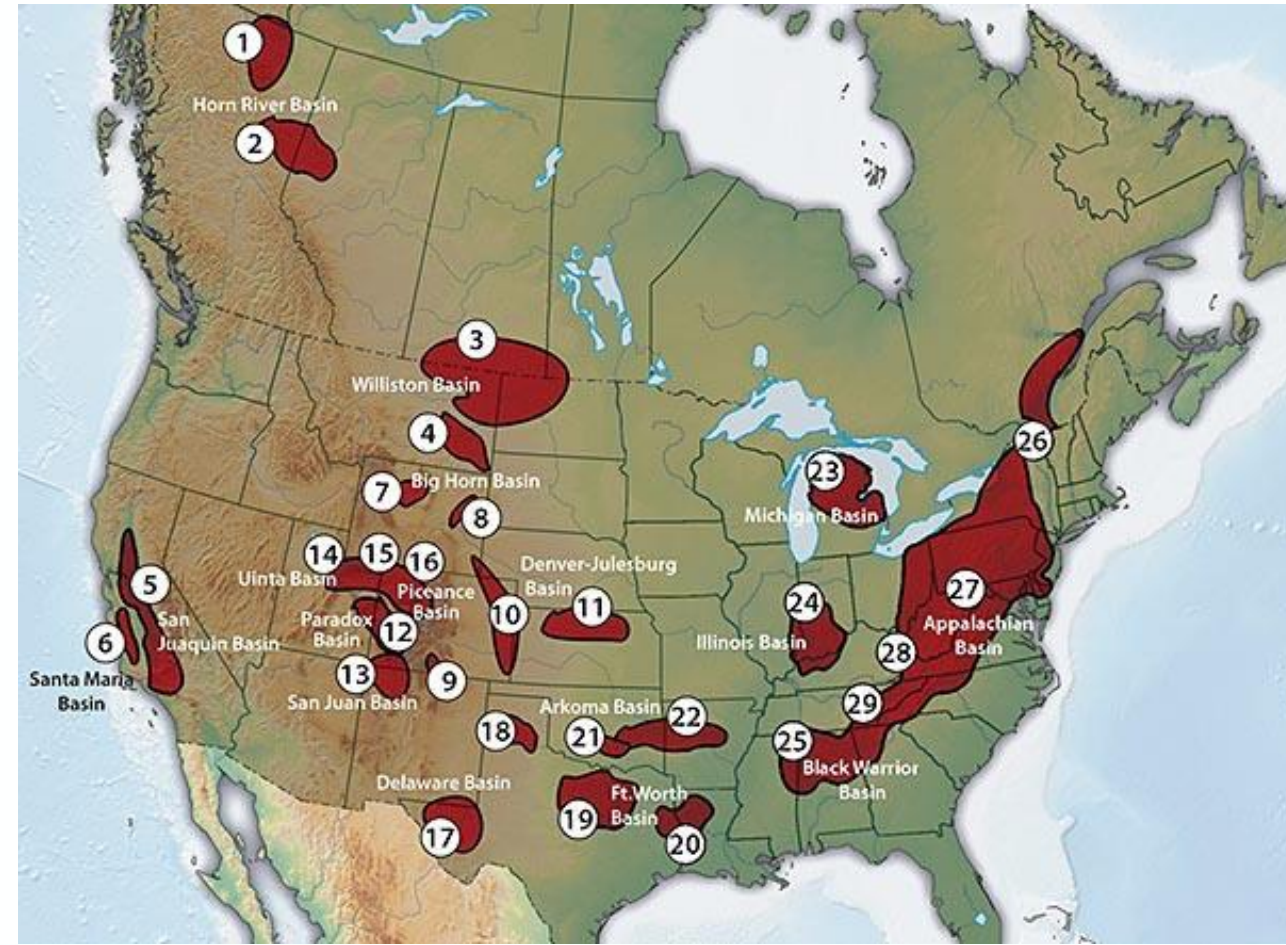


Why Consider Treating and Reusing Produced Water



Sources: GAO analysis of state water managers' responses to GAO survey; Map Resources (map).

State Water Stress

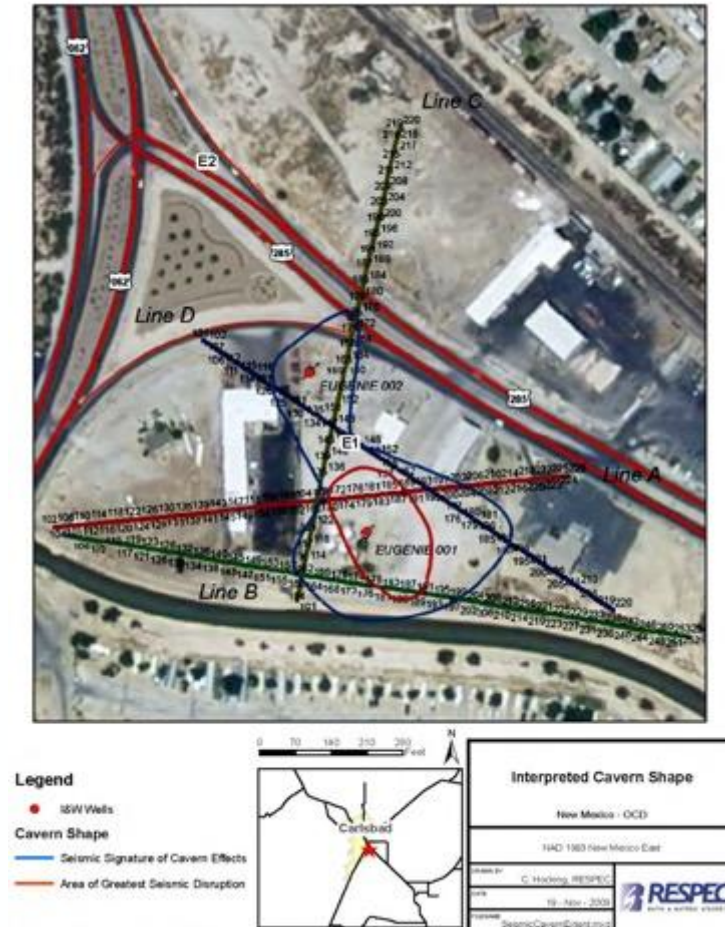


Unconventional Oil and Gas Basins

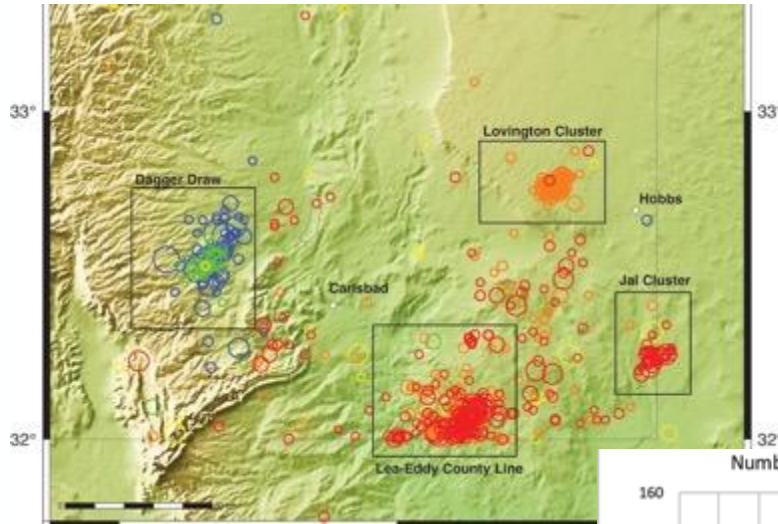
Carlsbad Brine Well – Using Fresh water to make brine for Drilling



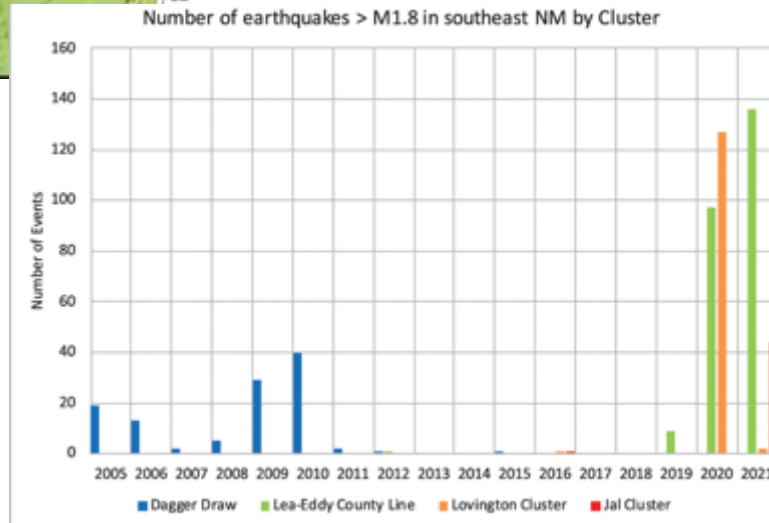
The Carlsbad Brine Well, located at 3005 South Canal Street in Carlsbad, New Mexico, was used to produce brine water for oil and gas drilling from 1978 to 2008. Brine is a salty water that is used in drilling mud and is naturally occurring nonpotable water.



Over Injection of Produced Water Induces Seismic Activity in O&G Regions in NM



Obviously we need better produced water stewardship in NM



State of New Mexico
Energy, Minerals and Natural Resources
Department

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Cabinet Secretary

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Oil Conservation Division



NOTICE TO OPERATORS IMMEDIATE RESPONSE PLAN FOR SEISMIC EVENTS RELATED TO CLASS II UNDERGROUND INJECTION CONTROL WELLS

November 23, 2021

The New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division ("OCD") has the authority under the Oil and Gas Act (Section 70-1-1 *et seq.*, NMSA 1978) and pursuant to delegated authority from the U.S. Environmental Protection Agency under the Safe Drinking Water Act (42 U.S.C. 300f *et seq.*) to regulate all aspects of Underground Injection Control ("UIC") Class II well development and operation, and decommissioning, including their contribution to induced seismic activity. See 19.15.26 NMAC. This Notice sets forth OCD's framework for responding to seismicity related to UIC Class II injection well operations wherever it may occur across New Mexico.

Lack of Produced Water/Environmental Stewardship In TX Too

Shallow Disposal – Ecological Impacts



Wink Sink #2



Holladay Hole



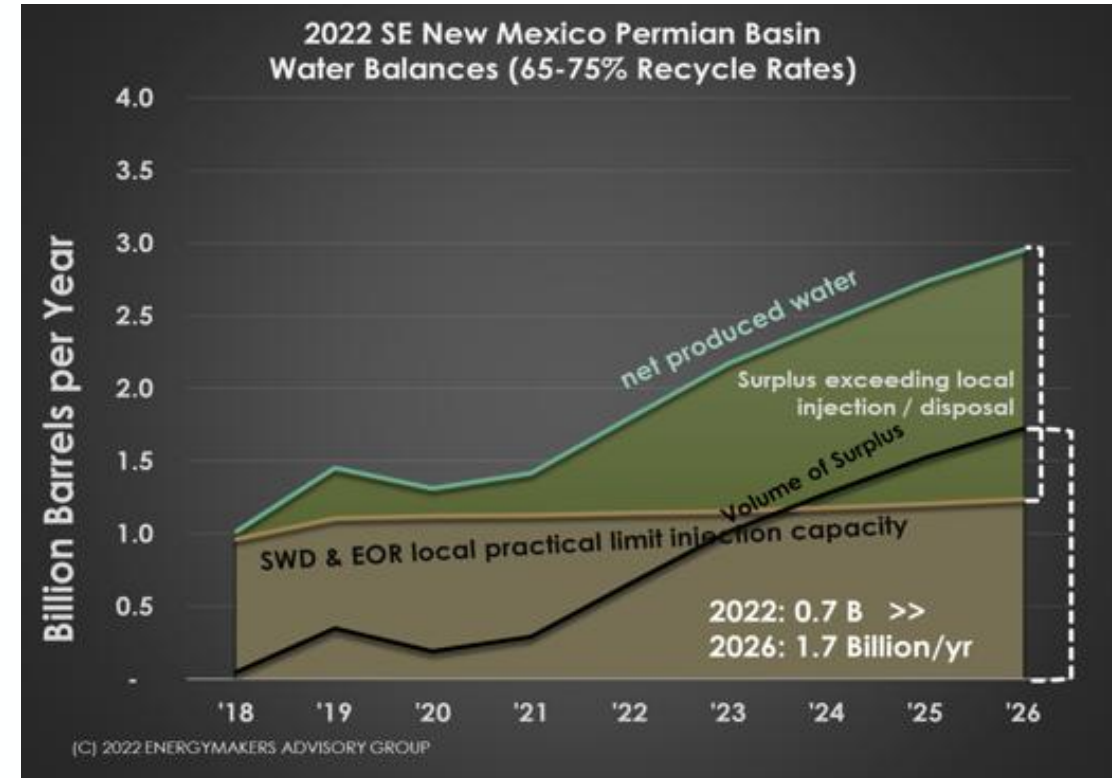
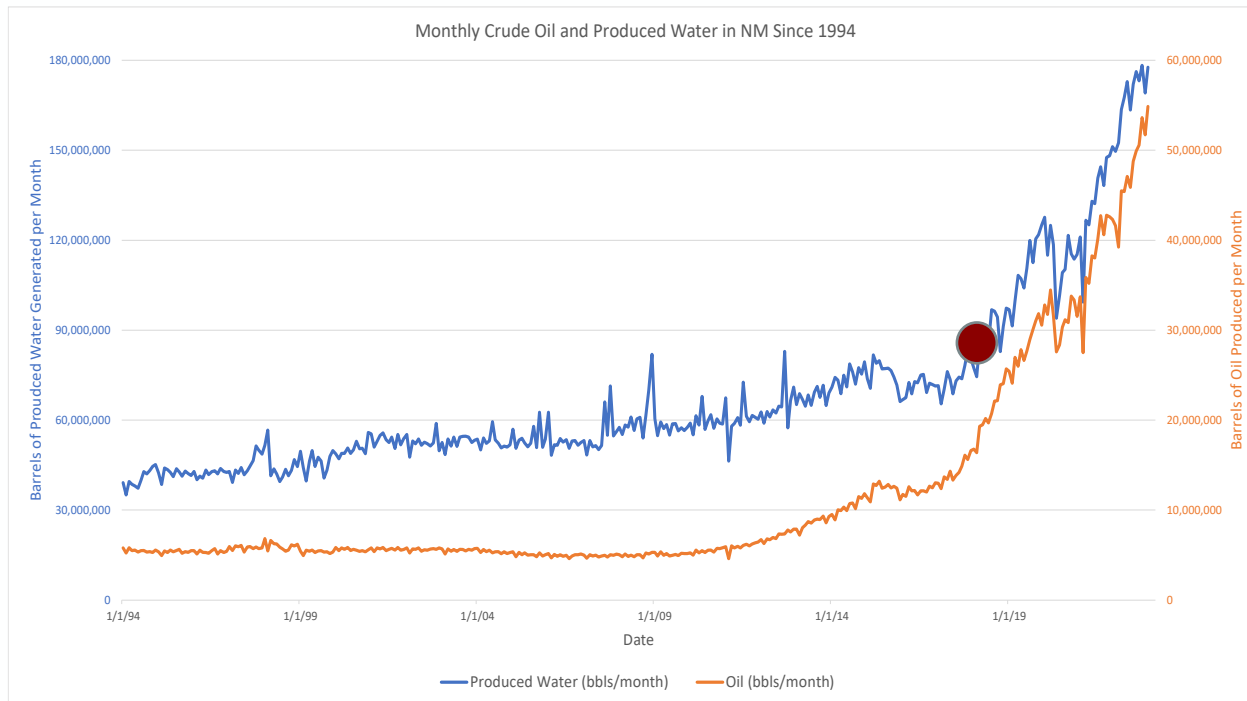
65-acre Lake Boehmer
'Texas Dead Sea'



Deep Disposal - Earthquakes

Alternative to Disposal is Needed in NM Permian Basin

- At 2018 production, OCD estimated New Mexico had 10 years of disposal
- Production has doubled since 2018- oil and gas provides 50% of state revenue
- 200,000 acft/yr of PW



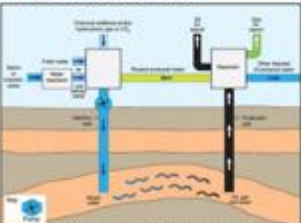
2019 New Mexico Produced Water Act –Driving Stewardship

New Mexico Environment Department

PRODUCED WATER FACTSHEET

What is the "Produced Water Act"? Passed as part of House Bill 546 (HB 546) in the 2019 New Mexico Legislative Session, the Produced Water Act provides jurisdictional and legal clarity over produced water in New Mexico, and encourages the oil and natural gas industry to favor **reuse, recycling** and **treatment** options instead of a reliance on limited fresh water resources.

What is Produced Water?



- "Fluid that is an incidental byproduct from drilling for or the production of oil and gas" (HB 546)
- Comprised primarily of naturally occurring, highly saline water
- May include fluids that were used during drilling, such as hydraulic fracturing fluids
- Traditionally considered a waste product

To date, only about 10% of all produced water generated in New Mexico is reused or recycled in oil and gas operations. No produced water has been permitted for use outside of oil and gas production activities.

Source: <http://www.gwpc.org/producedwater>

Why Encourage Reuse, Recycling, and Treatment of Produced Water Now?

For every barrel (42 gallons) of oil produced, four to seven barrels of produced water may be generated. In 2018, New Mexico became the third largest oil-producing state, generating over one billion barrels of produced water (~60,500 Olympic size swimming pools). New Mexico is considering alternate pathways for produced water management to address growing concerns associated with (1) current underground disposal practices associated with continued oil and gas development, which is not sustainable and has been linked to other environmental challenges, such as earthquakes; and (2) water scarcity and groundwater depletion, which are forecasted to grow more severe due to climate change. Before being reused, produced water must be treated to varying levels to remove oil residues, salts, suspended solids, and other chemicals. Technological advancements are creating new opportunities to treat and reuse water while protecting the environment and human health.



*The level of treatment necessary to protect human health and the environment depends upon the intended use ("fit for purpose").

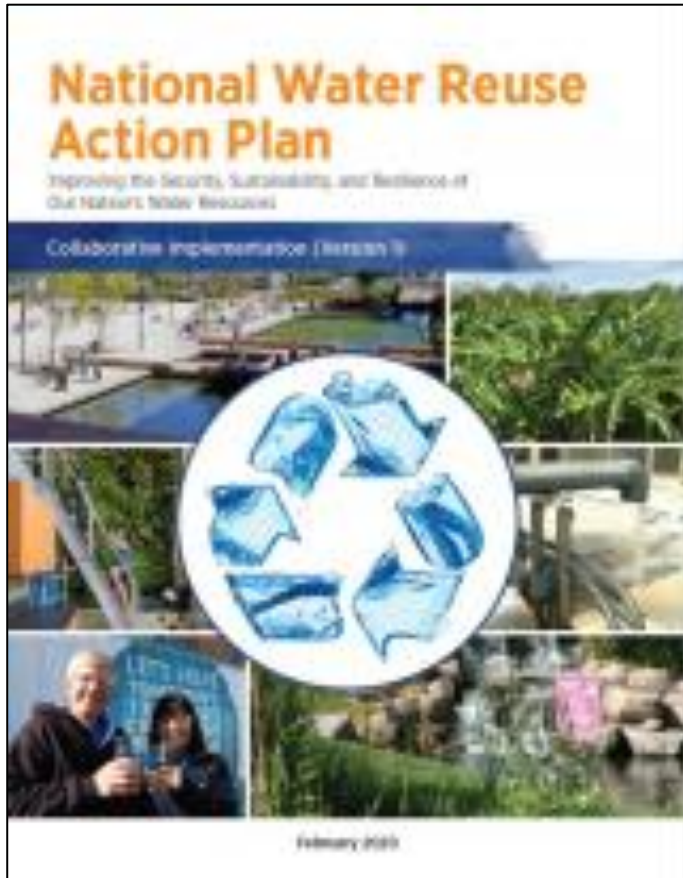
Source: <http://www.gwpc.org/producedwater>

Visit NMED's Produced Water website (<https://www.ems.nm.gov/new-mexico-produced-water/>) for additional information and to sign up for NMED Produced Water updates. To submit input, email gw.environment@state.nm.us

What is the 2019 "Produced Water Act"?

- Passed as part of House Bill 546 (HB 546) in the 2019 New Mexico Legislative Session,
- Provides jurisdictional and legal clarity over produced water management and ownership in New Mexico, and
- Encourages the oil and natural gas industry to favor reuse, recycling and treatment options instead of a reliance on limited fresh water resources for drilling and fracking and deep well injection.

2020 EPA National Water Reuse Action Plan



- Focus on the fit-for-purpose treatment and reuse of waste water
- Five major programmatic areas:
 - Thermo-electric cooling water
 - Agricultural waste water
 - Municipal waste water
 - Produced water
 - Storm water
- Produced water milestones in Section 2.4.2 of the WRAP include collaboration and outreach with WRA and industry

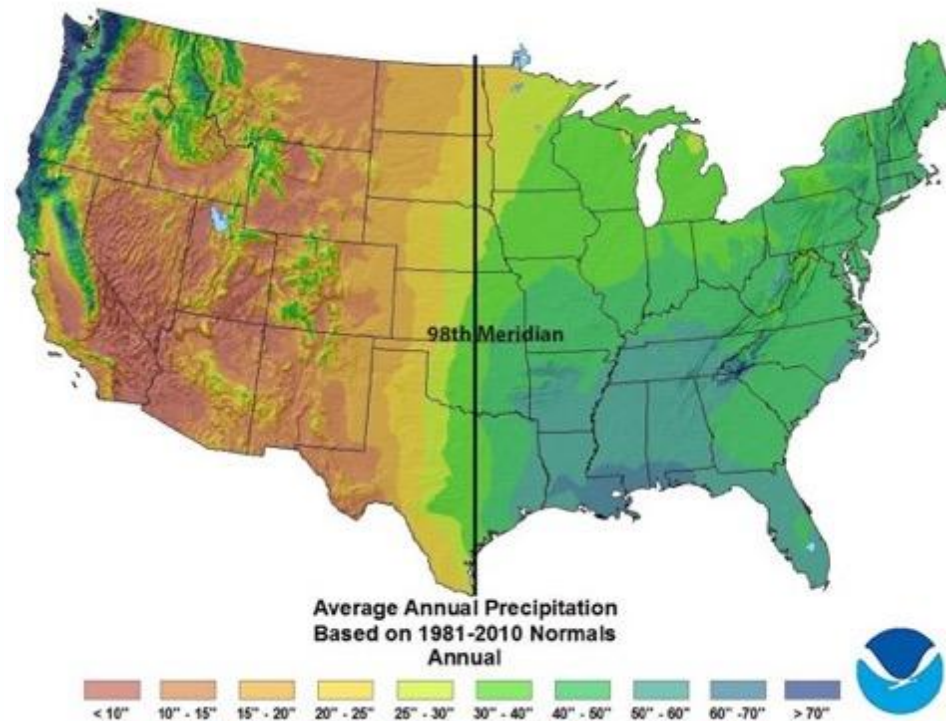
Two of the United Nations' [Sustainable Development Goals](#) are water reuse as key to a more sustainable future.

States with Produced Water Recycling and Reuse Efforts

Recycling – use inside oil and gas, Reuse – use outside oil and gas

- States

- California
- Pennsylvania
- Wyoming
- New Mexico
- Arizona
- Texas
- Colorado
- Oklahoma
- Utah



Two-thirds of voters care about water, conservation

BY CHRIS WOODWARD
THE CENTERSQUARE
CONTRIBUTOR

More than two-thirds of voters in Mountain West states say they are worried about land, water and wildlife in the region, according to a recent poll.

The Conservation in the West Poll, by the State of the Rockies Projects at Colorado College, found 67% of voters expressed worry about "about the future of nature, meaning our land, water, air and wildlife" as opposed to hopeful.

The poll marks the 14th time the project has surveyed voters in Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. It was conducted from January 4 to 21 and involved at least 400 registered voters in each of the eight states for a total 3,376 voters.

Among those worried about the future of nature in the west includes 72% in Arizona, 68% in Colorado, 63% in Idaho, 67% in Montana, 63% in Nevada, 64% in New Mexico, 65% in Utah, and 58% in Wyoming.

While 96% of Democrats surveyed deem water, air,

wildlife, and public land issues important, so do 87% of Independents, and 74% of Republicans, according to the survey.

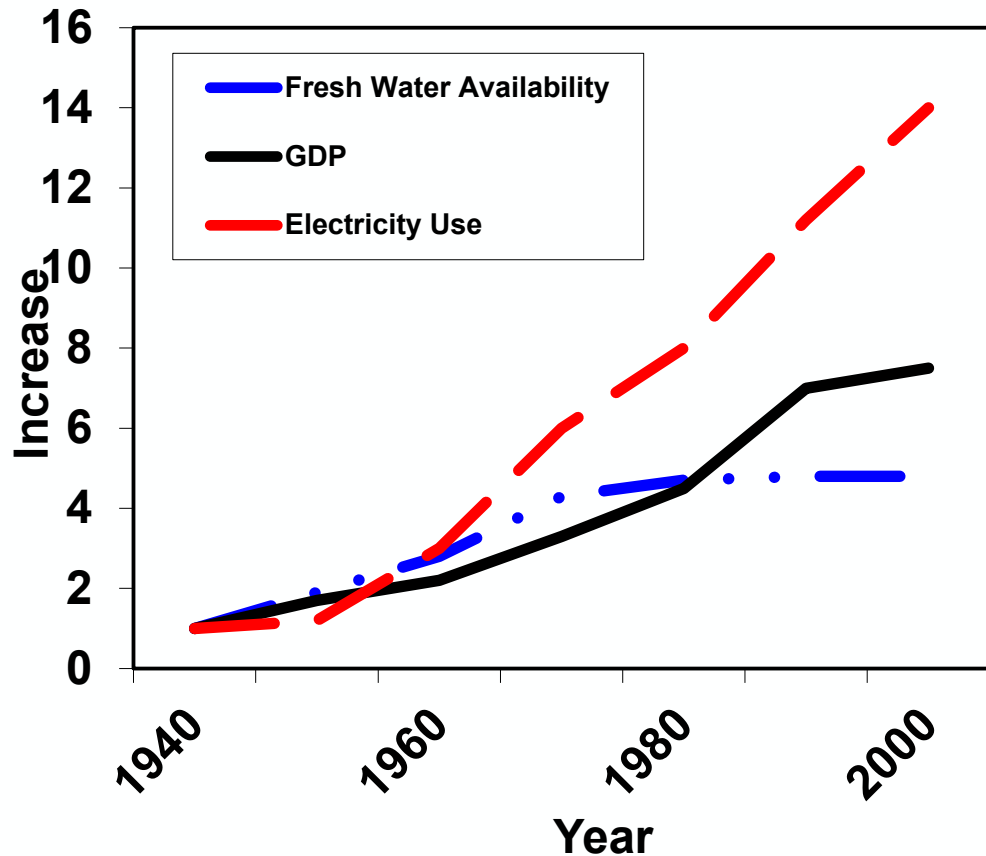
"There may be a lot that divides voters across the country, but in the West, there is nearly universal consensus in favor of conservation," Katrina Miller-Stevens, the project's director and an associate professor at Colorado College, said in a statement. "Not only do voters prefer conservation when asked how public lands and water should be utilized, but issues involving water, air, land and wildlife are top of mind when they make their voting decisions."

The survey also marks the first time in the poll that Republicans and Independents favor "prioritizing conservation over maximizing energy production," the project said in a news release.

Among all voters, 70% said they prefer their representatives focus more on ensuring protection of resources and public lands, while 26% said they would rather they pursue more domestic energy production on public lands.

Significant Environmental, Social, and Economic Stewardship Benefits

Water Supply Growth Drives Economic Growth



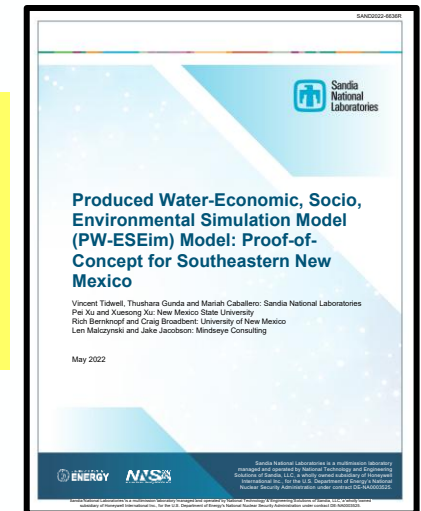
US GDP Growth vs Energy and Water Growth

- NM is 49th in fresh water availability

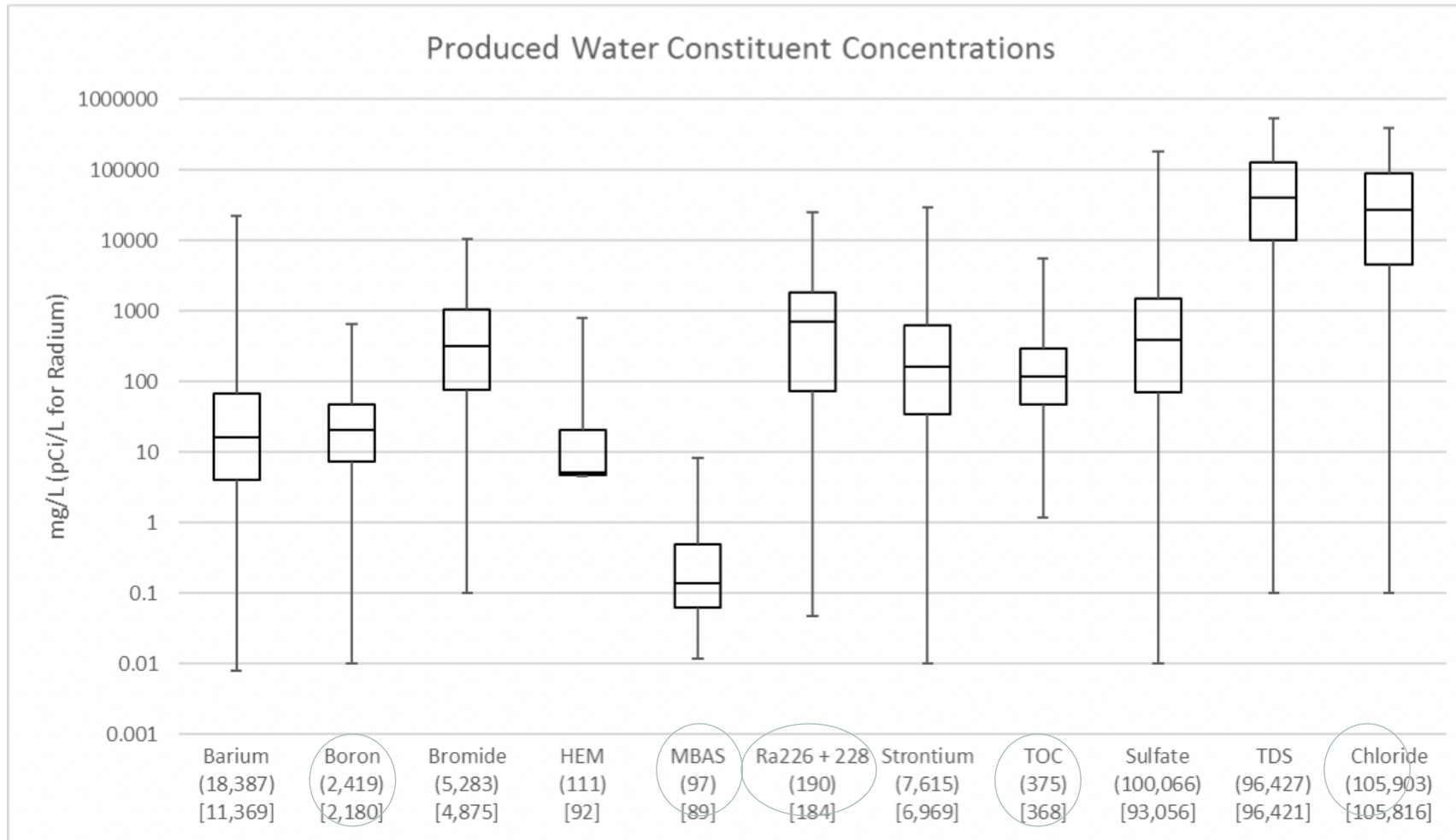
	AZ	NM
Water supply:	7 M acft/yr	2 M acft/yr
GDP:	\$300 B/yr	\$100 B/yr
Ag use:	~72%	~75%
M&I use:	~28%	~25%
Population:	7 M	2 M

“Water promises to be to the 21st century what oil was to the 20th century: the precious commodity that determines the wealth of nations.”

Fortune Magazine, May 15, 2000

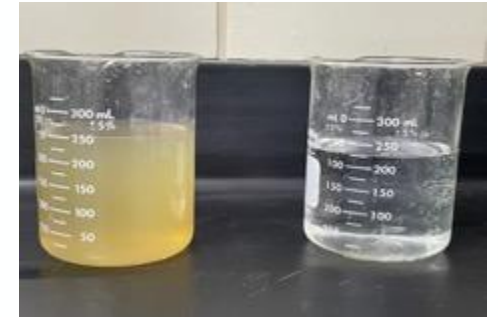


Produced Water Treatment Needed for Recycling and Reuse



[EPA-821-S19-001]

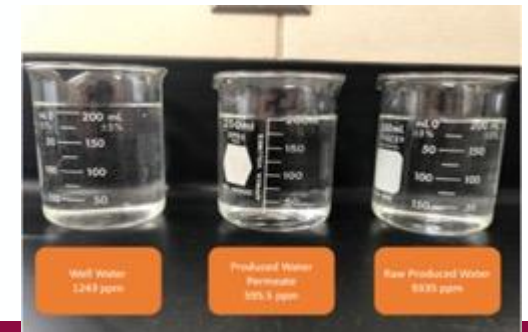
San Juan Basin



Permian Basin

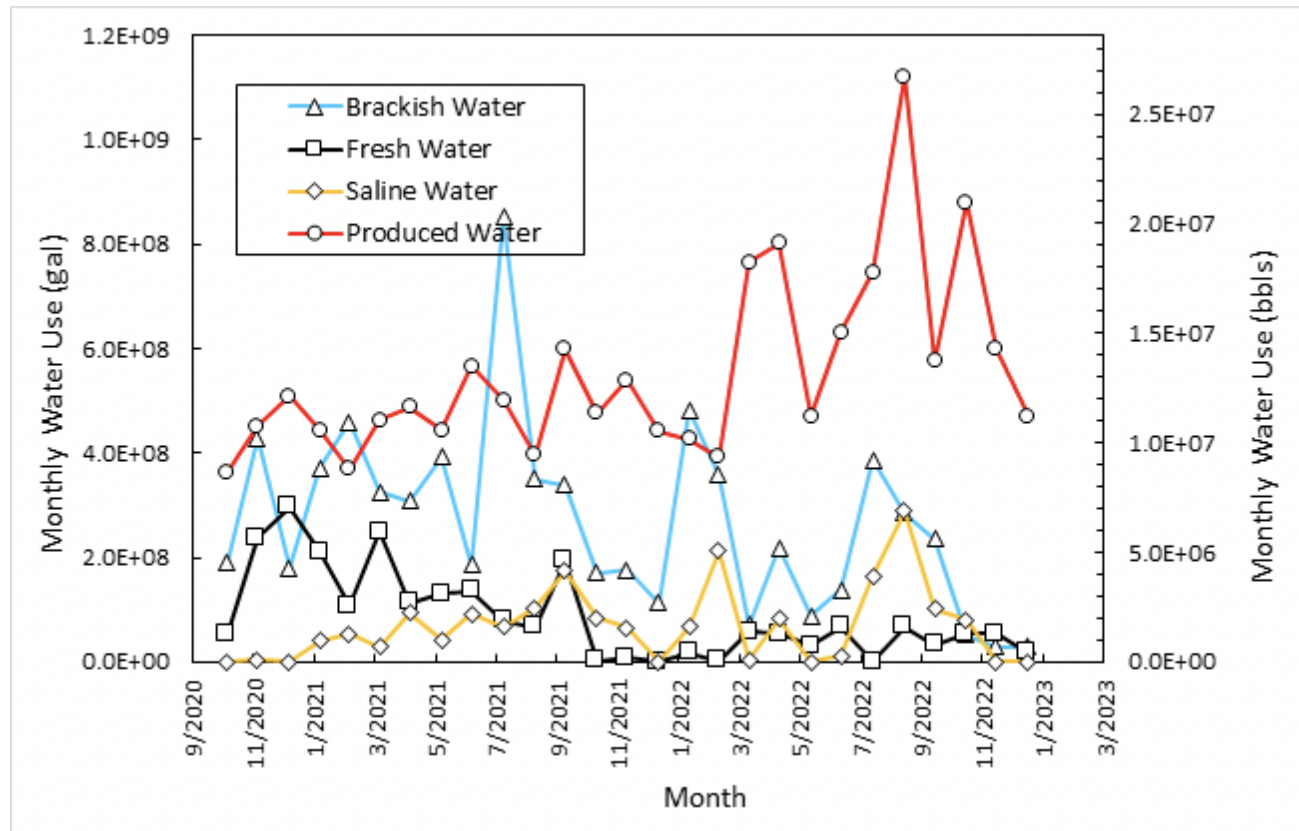


Permian Basin



Affect of Produced Water Recycling Regulations on Fresh Water Use

Current Water Use in Drilling and Fracking

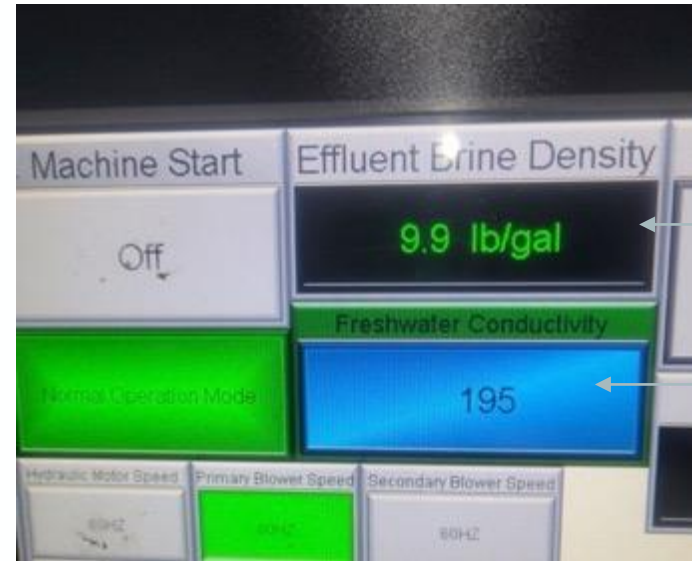


State	Fresh Water Use	Produced Water Reuse
New* Mexico	5%	80%
Texas	50%	50%

* Fresh water use regulation change in 2019, more restrictions proposed in 2024

Produced Water Treatment for Recycling in Oil and Gas

- More recycling inside oil and gas
 - Treatment and reuse of produced water in plugging and abandoning orphan wells
 - Similar use in repurposing abandoned oil and gas wells for brackish water wells
 - Get more oil recovery and lower SWD operational costs with 'clean brine'



Brine Recovery

Distillate

NMPWRC Thermal Technology Testing

Produced water thermal treatment - fresh water for cementing and 10# brine for re-drilling before cementing

- \$2/bbl for fresh water and \$3/bbl for 10# brine
- \$25 M in federal funding



Western States Treated Produced Water Reuse for Land and Agriculture in TX, CA, and WY

State	TDS mg/L	Total Constituents Evaluated	Date Developed	Application
California*	1000	~100	1995	Full-scale irrigation
Wyoming	500	~100	2020	Full-scale rangeland
Texas RRC	1000	~50	2024	Pilot-scale rangeland or irrigation

* Conventional produced water only



GWPC Opportunities to Support Improved Produced Water and Environmental Stewardship

- Establish Water Star as the Produced Water Data Information Platform
 - Both water quantity and quality (~15 major constituents per EPA report)
 - Some aggregation by $\frac{1}{4}$ township or equivalent lat/long
- Consider improvements to FracFocus
 - Require MSDS information for ‘proprietary chemicals’
 - Consider working with industry to endorsing ACS “Green Fracking” like-approach
- Consider weighing-in on establishing standards for repurposing plugged and abandoned wells and the associated re-drilling, re-plugging, and re-perforating to access shallow or deep brackish and saline aquifers for use for potential agricultural or industrial applications.