One Water and Produced Water Reuse

ROCKY MOUNTAIN AWWA

ALBUQUERQUE – APRIL 4-5, 2024

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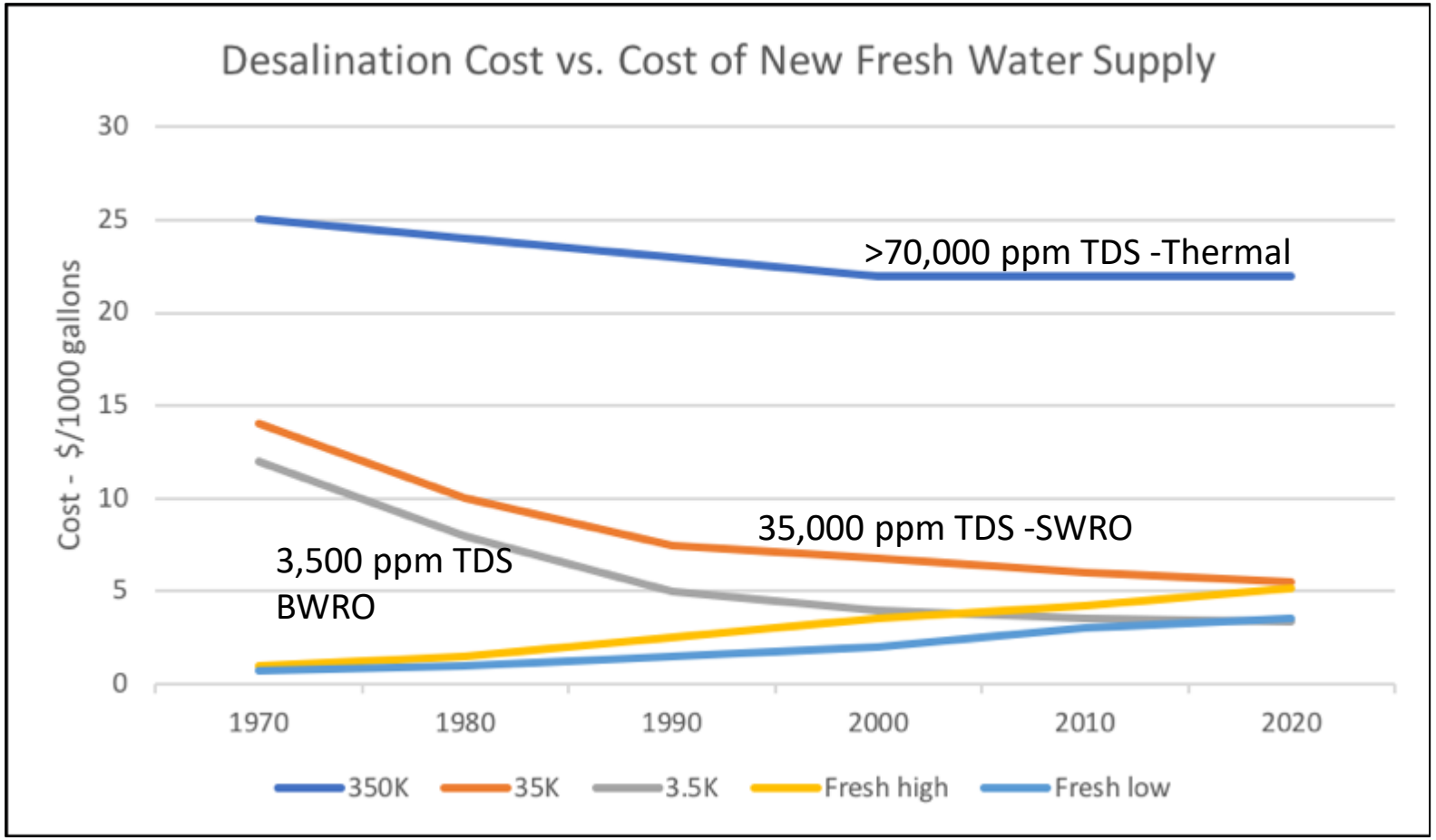
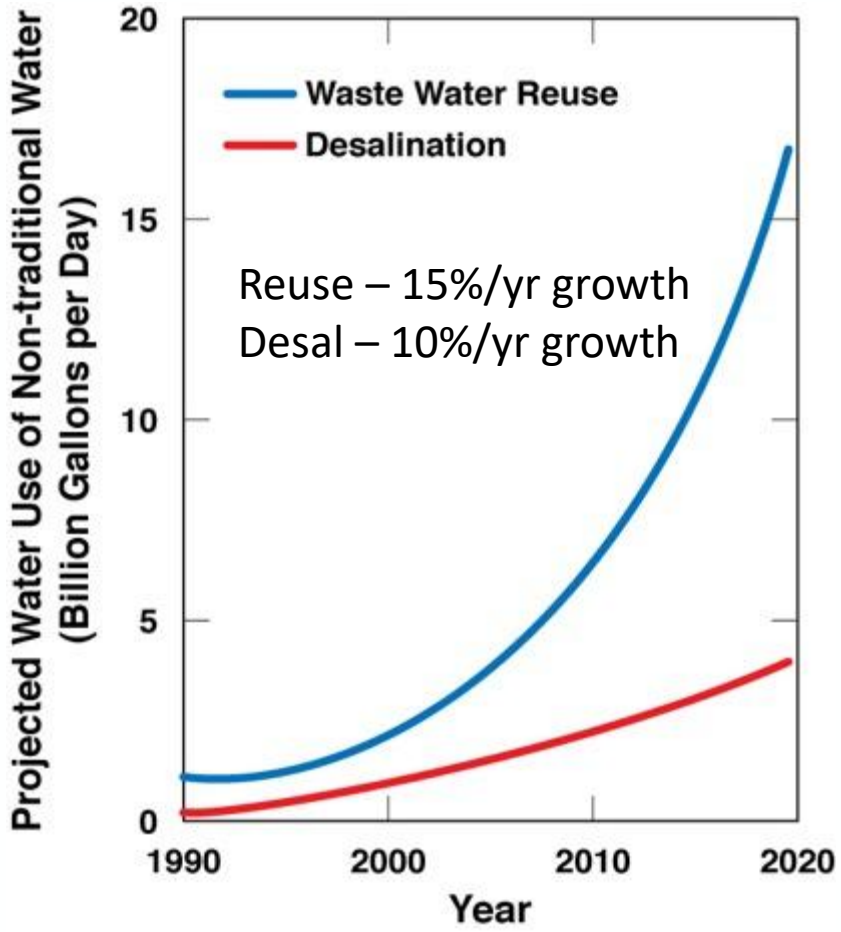
NM STATE NEW MEXICO PRODUCED WATER RESEARCH CONSORTIUM

Treatment vs. Fresh Cost and Use Trends



(EWRI Hightower 2018)

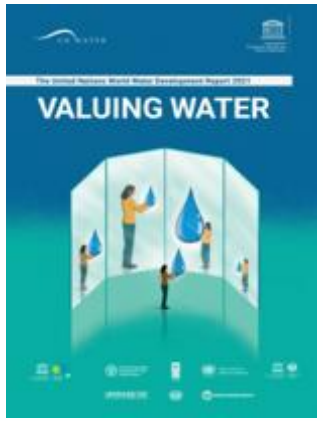


Energy and Technology Drives the 'One Water' Concept

Water Supply Options	Energy Demand (kWhr/kgal)
Fresh Water Importation (100-300 miles)	10-18
Seawater Desalination w/Reverse Osmosis	12-20
Brackish Groundwater Desalination	
Reverse Osmosis Treatment	7-9
Pumping and concentrate management	1-3
Total	8-12
Aquifer Storage and Recovery	
Pre-treatment (as needed)	3-4
Post-treatment (as needed)	3-4
Pumping	2-3
Total	5-11

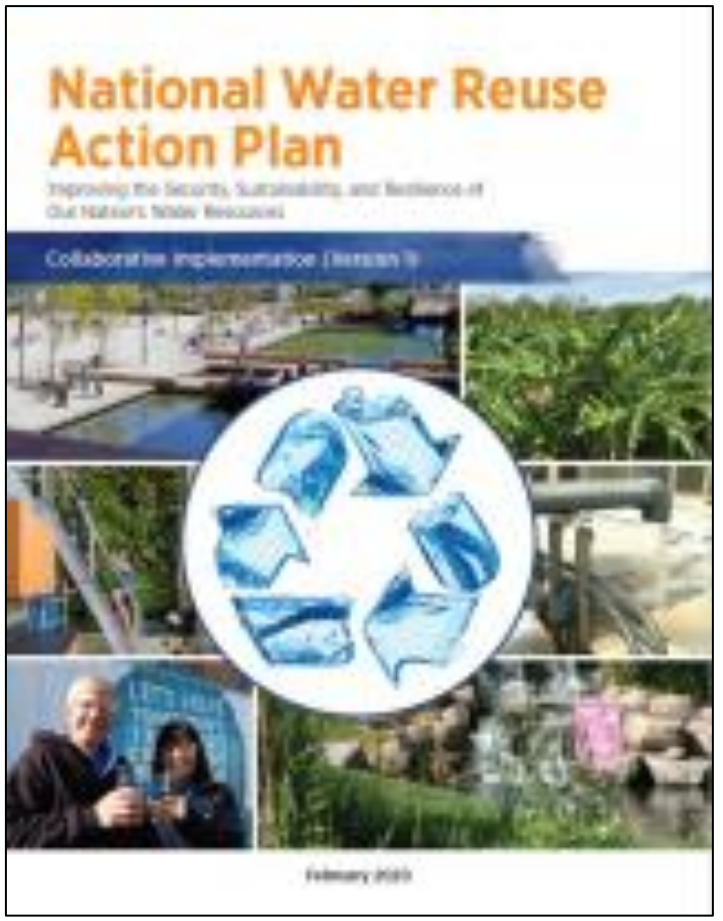
Global “One Water” Concept

- “One Water” is a concept that all water has “**Value**” including waste water if treated for appropriate use
- Two of the United Nations’ Sustainable Development Goals identify **water reuse as key to a more sustainable economic and ecological future.**
- EPA focus is on waste water treatment for fit-for-purpose reuse



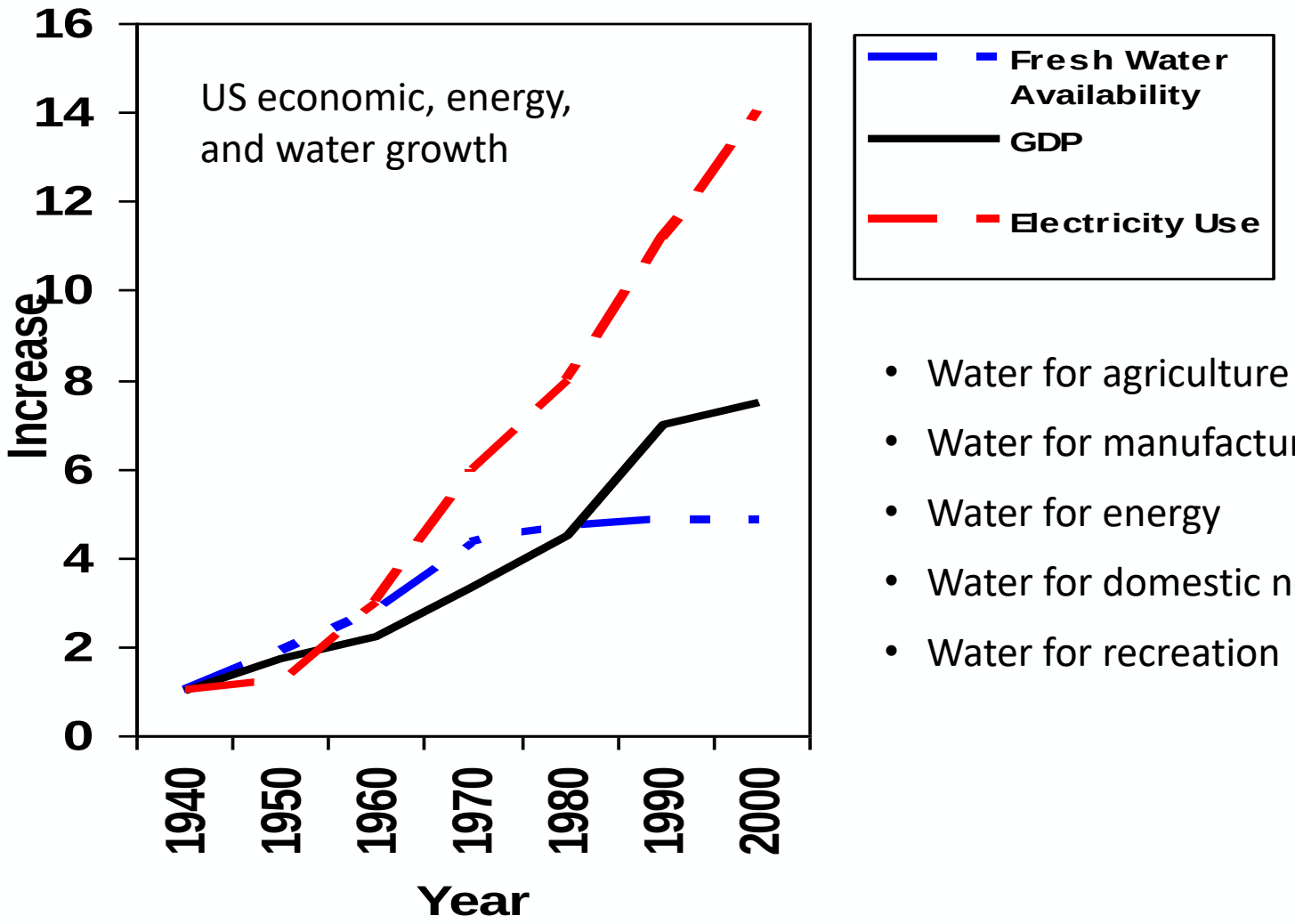
2021 World Water Development Report

EPA Focus includes industrial, municipal, agricultural, oil and gas and electric power, and storm water treatment and reuse



US EPA 2020

Water Availability is a Key Global Economic Driver



- Water for agriculture
- Water for manufacturing
- Water for energy
- Water for domestic needs
- Water for recreation

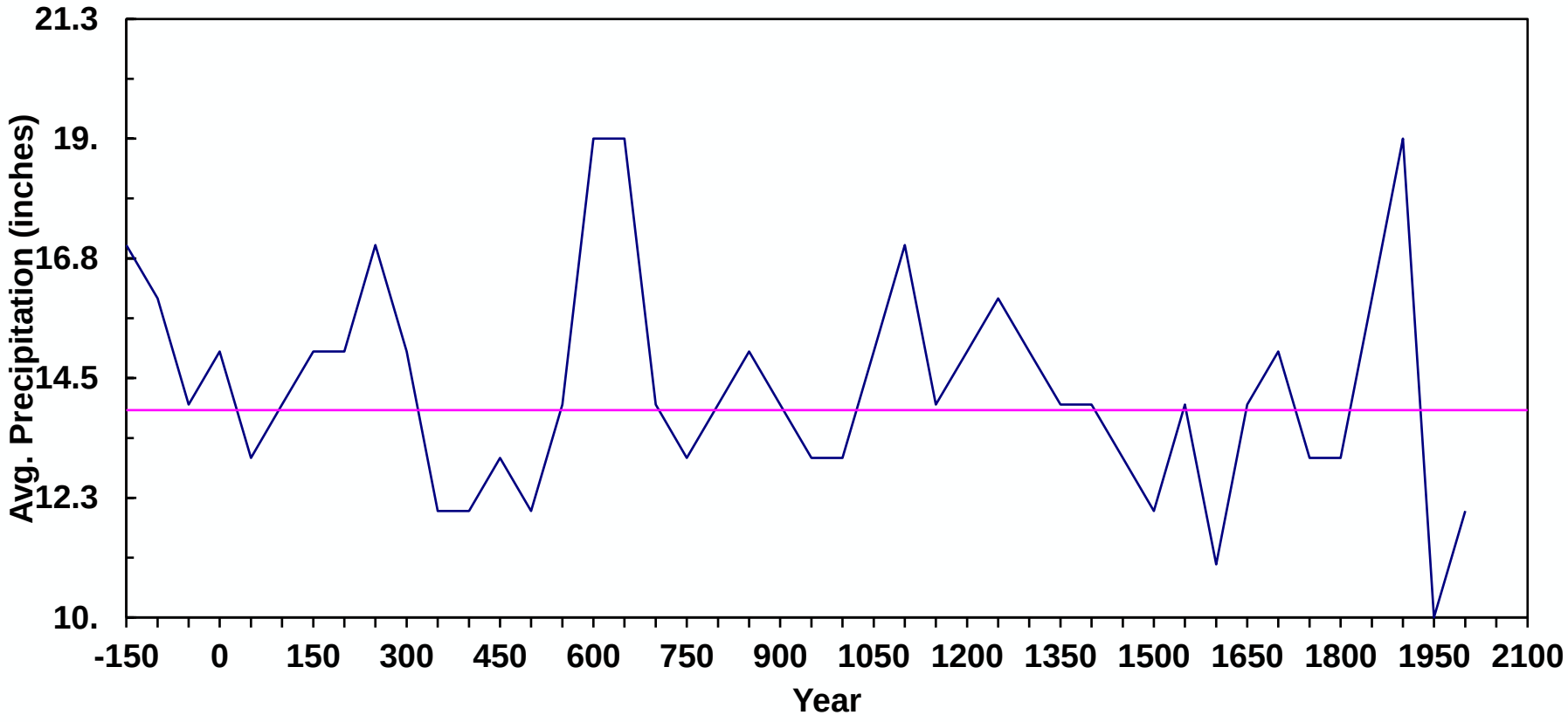
NM ranks 49th in fresh water availability

	AZ	NM
Water supply:	7 M acft/yr	2 M acft/yr
GDP:	$300 B/yr	$100 B/yr
Ag use:	~72%	~78%
M&I use:	~28%	~22%
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

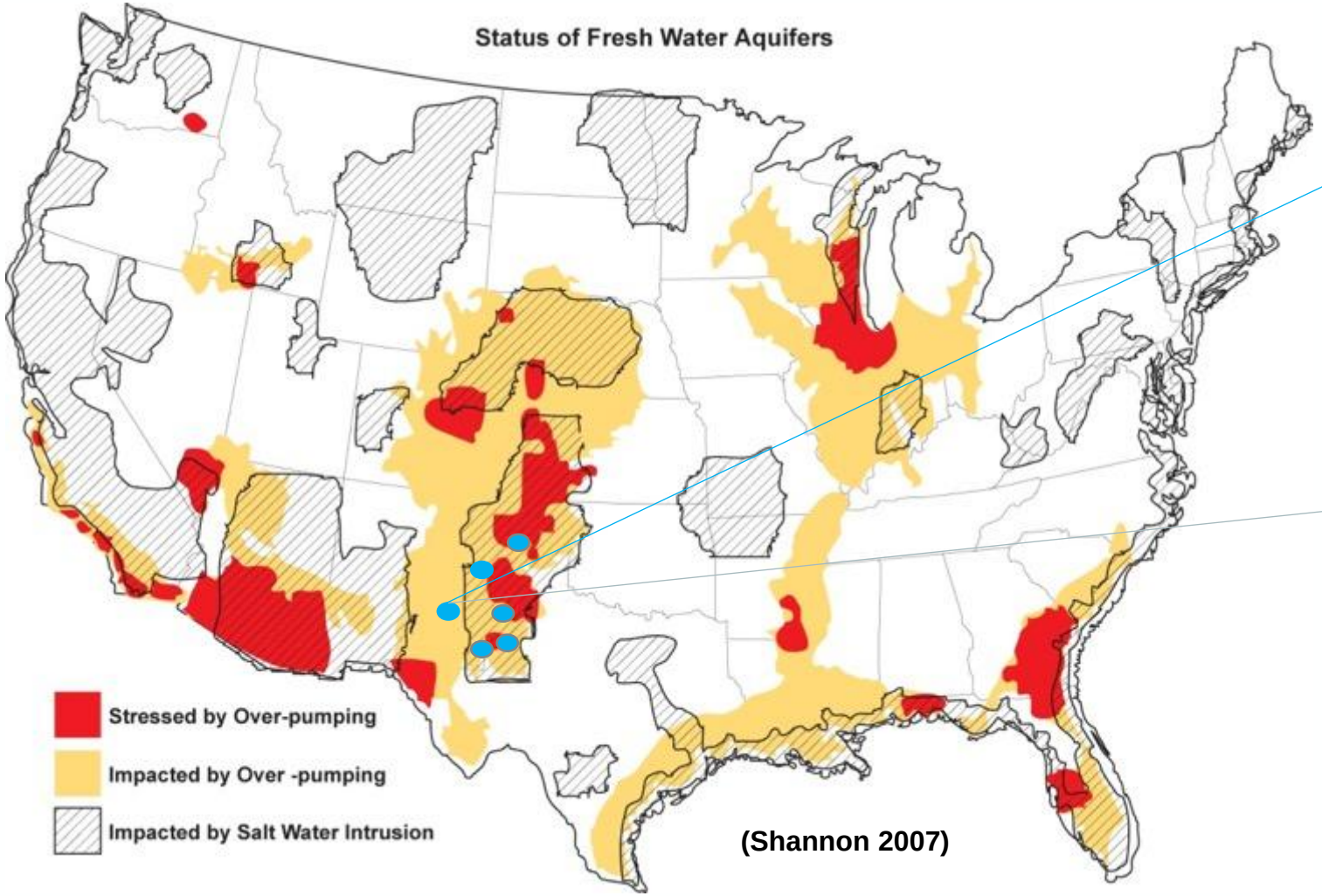
Surface Water Challenge – Mid-latitude Climate Cycle Impacts



U of A Tree Ring Data

NM 50-year water plan - climate analysis shows NM cannot continue to operate under current water planning and stewardship approaches

U.S. Ground Water Stewardship – Towns are Dying

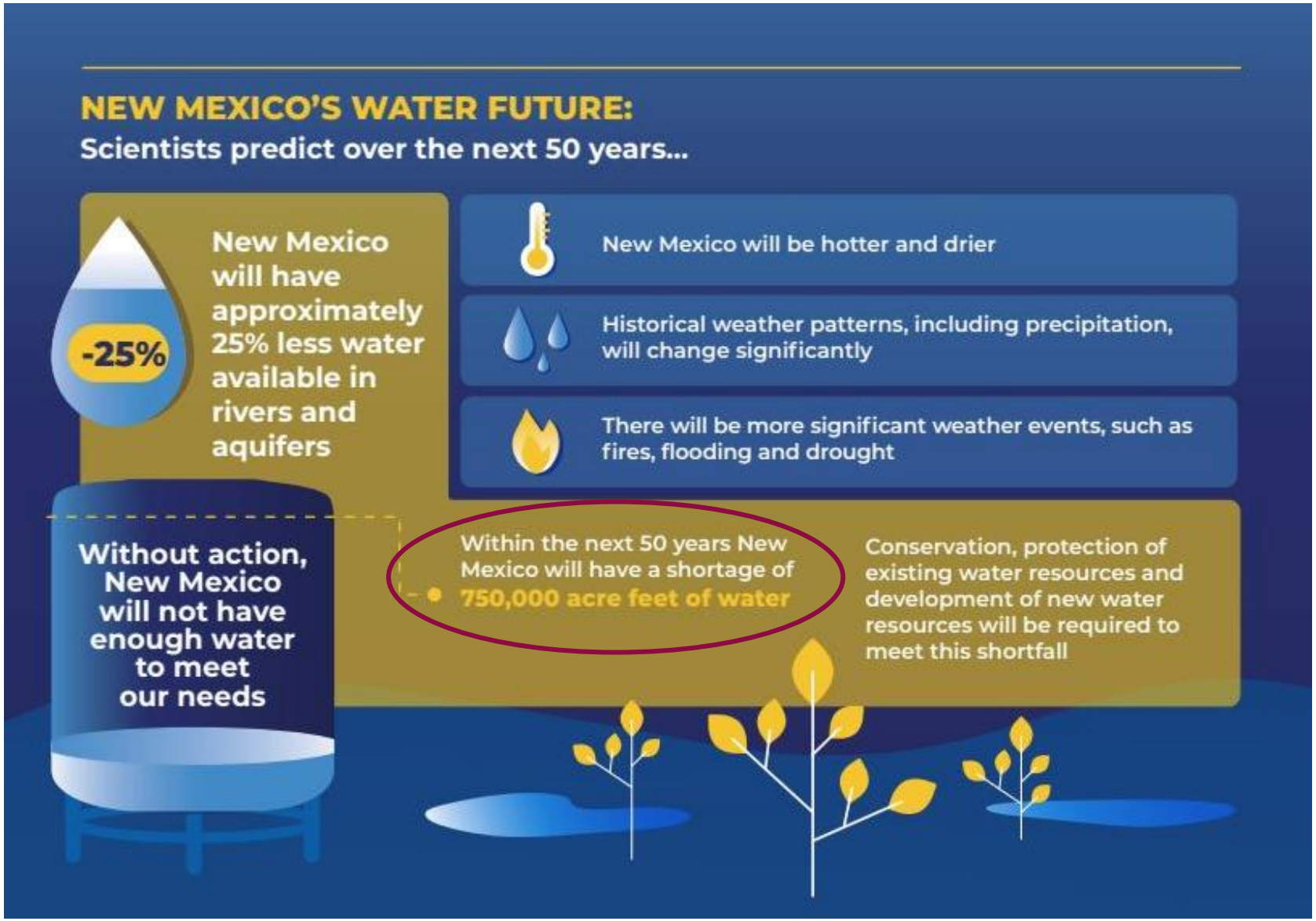


(Shannon 2007)

NM Example

Hope, New Mexico 88540,
1920 population – 2100
20 sq. miles of orchards

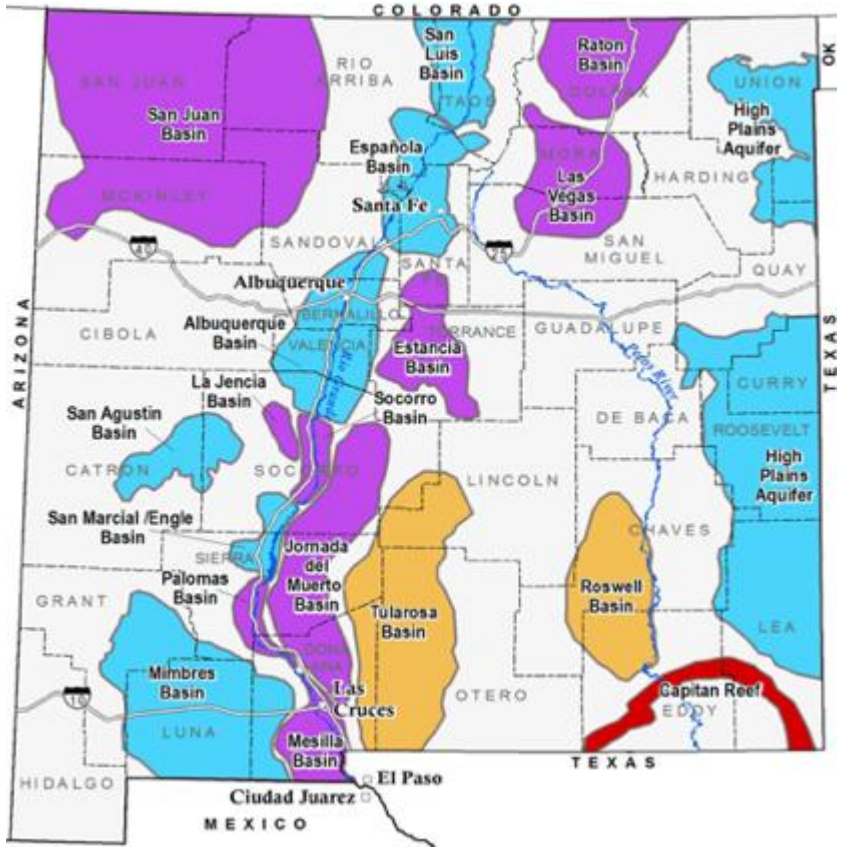
2020 Population - 100



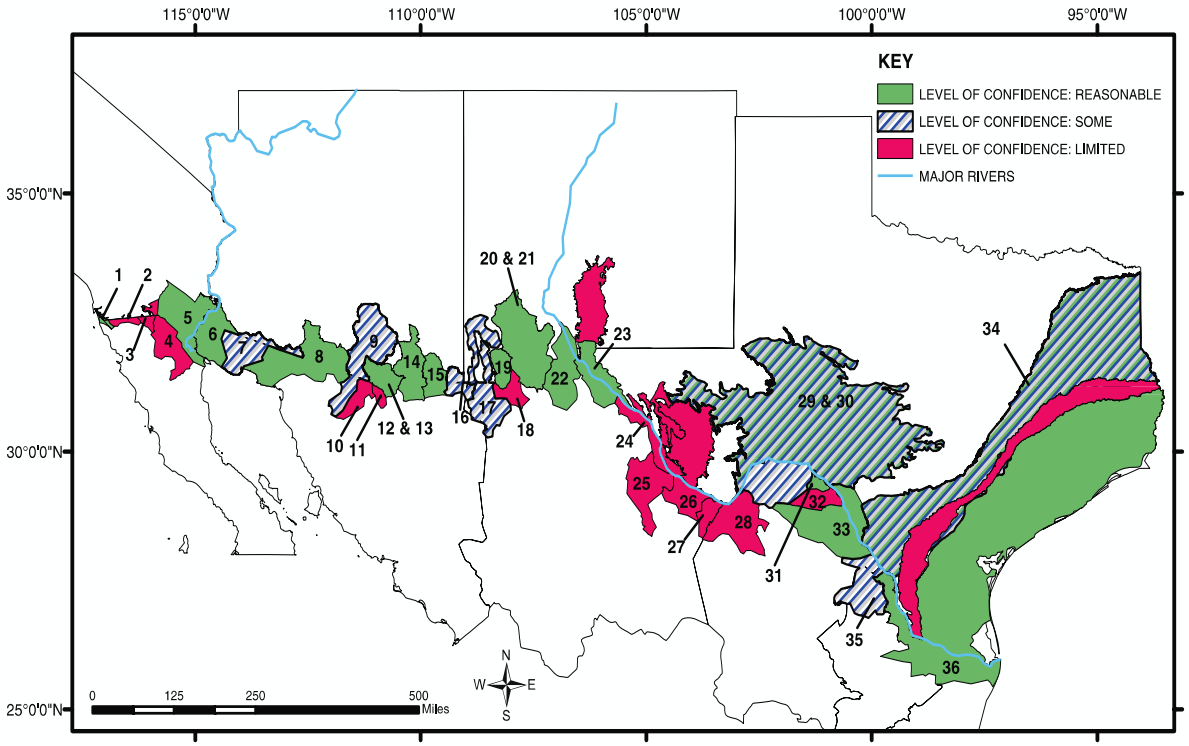
OSE Water Policy and Infrastructure Task Force - December 2022

"…need to augment supply regionally, through such tools as brackish groundwater desalination, wastewater reuse, and treated or recycled produced water. "

Why Use Brackish Ground Water – >2 billion ac ft in NM



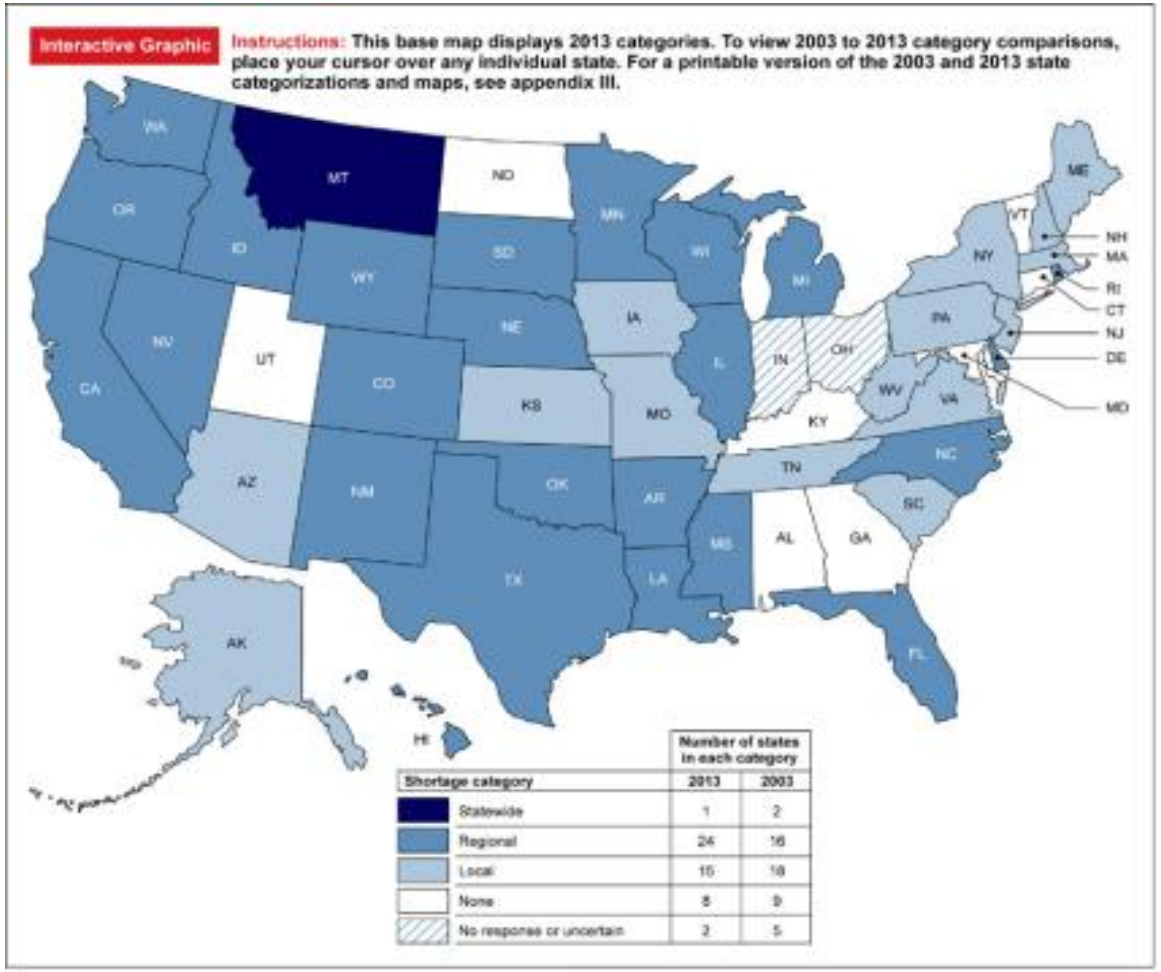
Overview of Fresh and Brackish Water Quality in New Mexico. *New Mexico Bureau of Geology and Mineral Resources, OFR-583, New Mexico Tech, Socorro, NM, June 2016.*



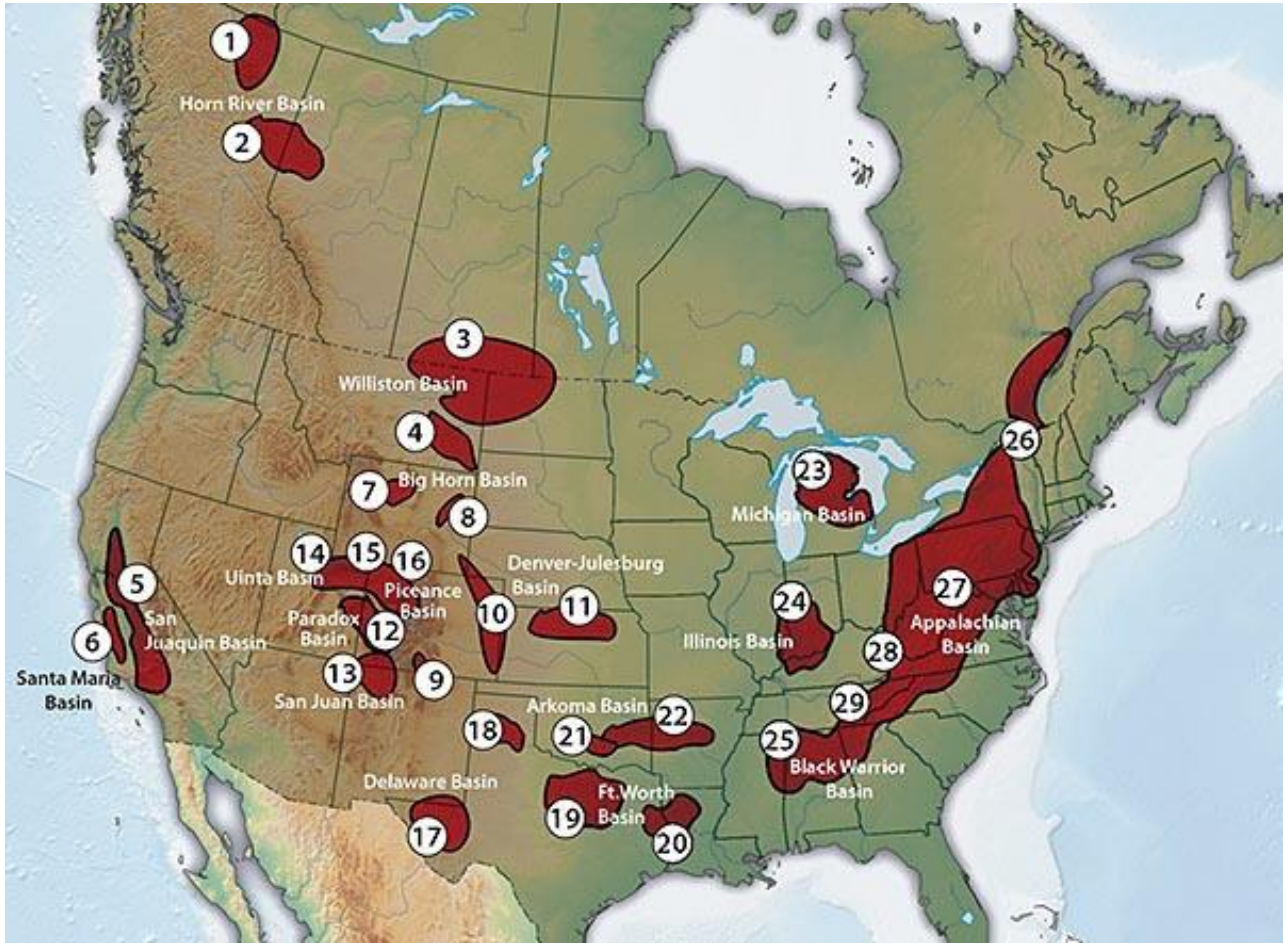
The 1983 La Paz Agreement between the United States and Mexico is a pact to protect, conserve, and improve the environment of the border region of both countries.

NEW MEXICO PRODUCED WATER RESEARCH CONSORTIUM

EPA Interest in Produced Water – Huge Opportunities Nationally



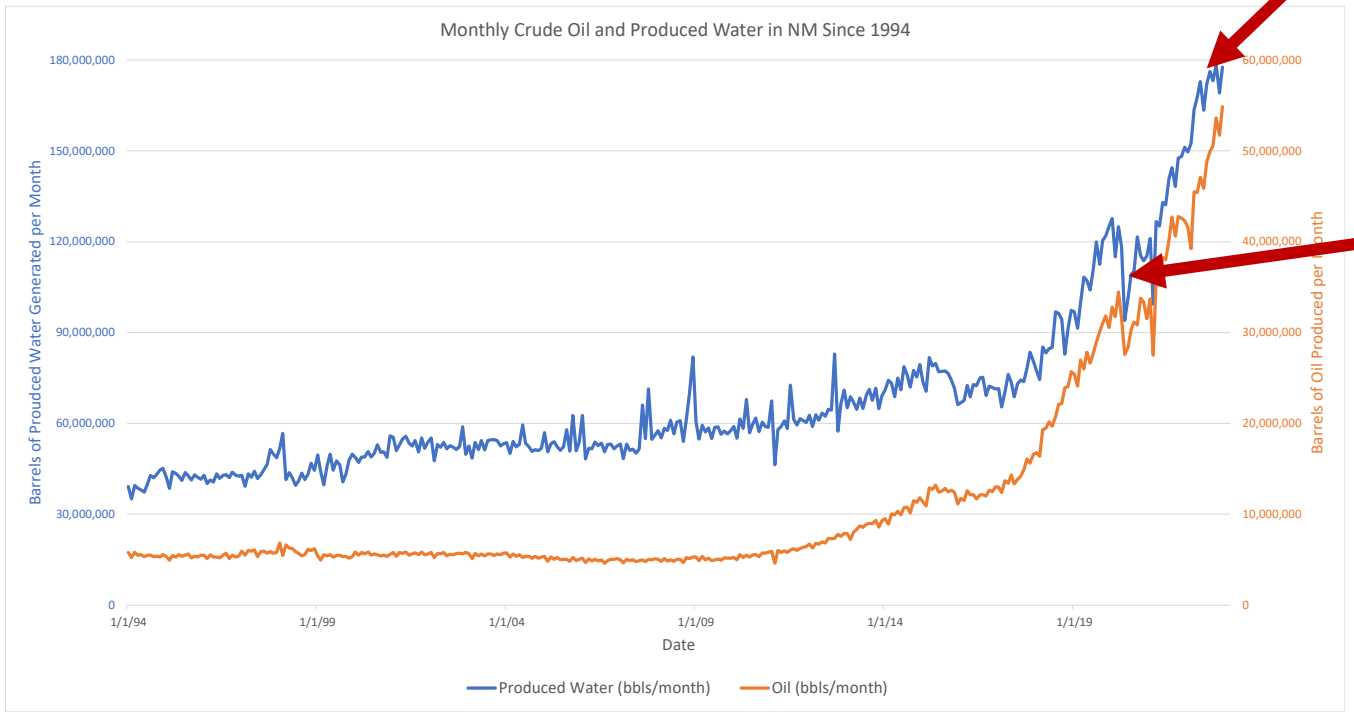
Sources: GAO analysis of state water managers' responses to GAO survey; Map Resources (map).



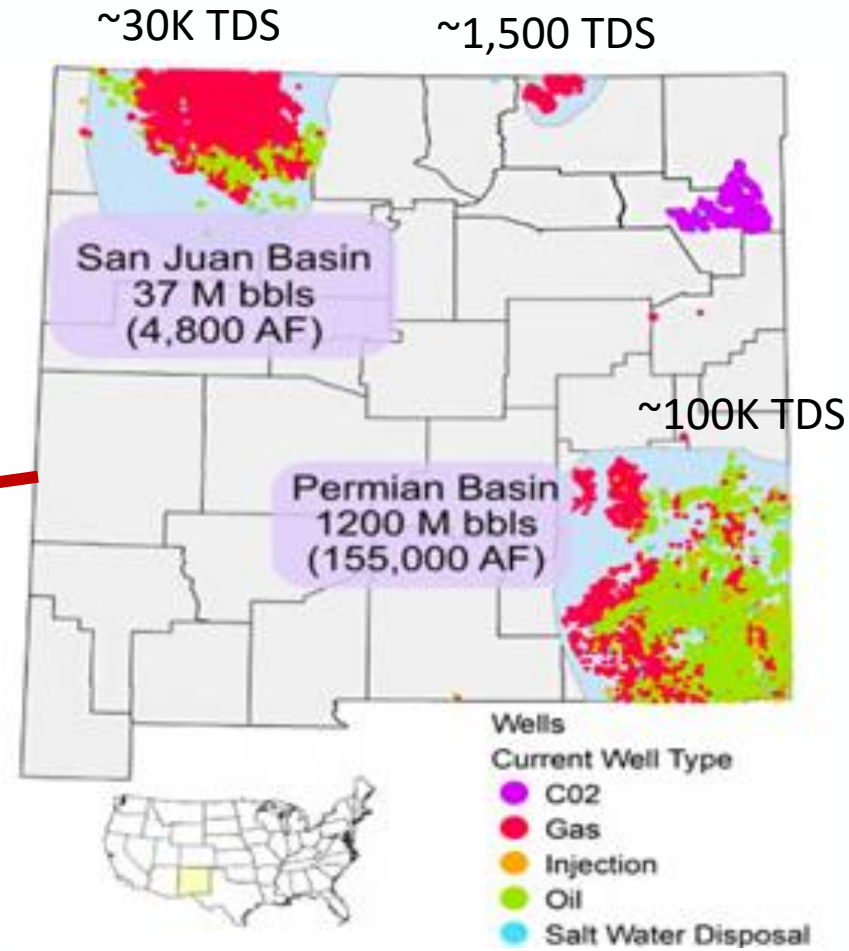
NEW MEXICO PRODUCED WATER RESEARCH CONSORTIUM

OSE Interest in Produced Water – Huge Opportunities in NM

- Protects 50% of NM state revenues
- 150,000 - 200,000 ac ft of 'new' water
- O&G is the only 'water positive' industry

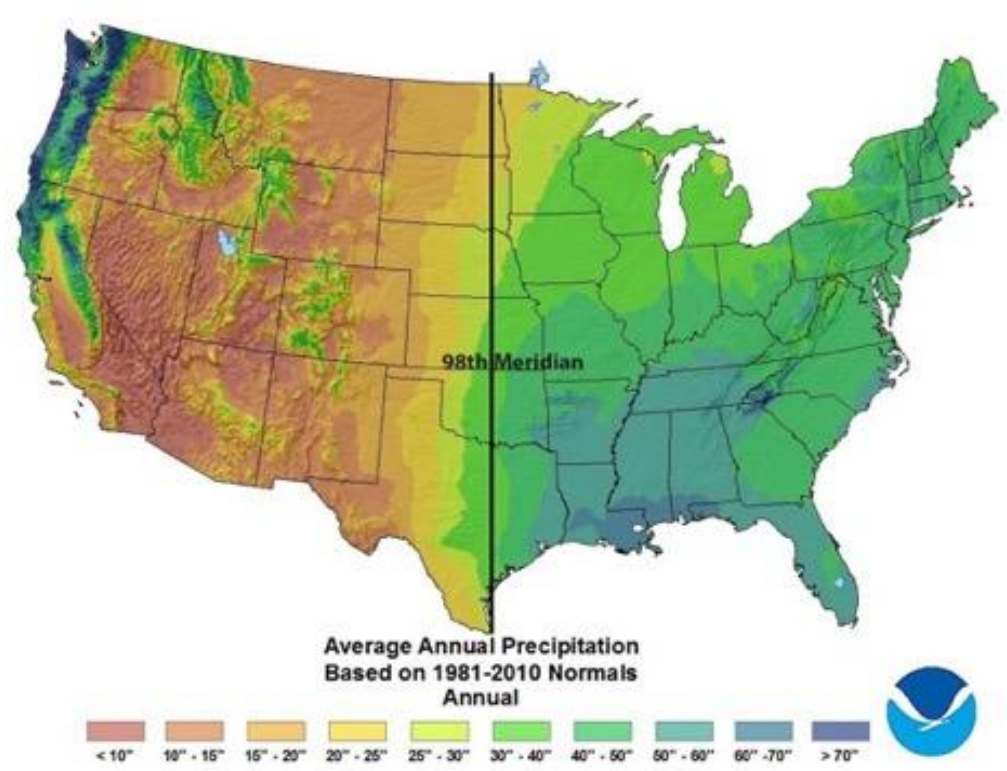


250,000 AF



NMWRRI - 2020

Federal Regulations Allow Produced Water Use In the West



Produced water reuse allowed if quality is such that it can be used via surface water discharge for irrigation

Current Ag Discharge Criteria

NM - 20-25 Constituents

CO, WY, OK, CA, BoR– 30-40 Constituents

Generally 1000 ppm TDS

Current Pecos River Discharge Criteria

NM – 41 aquatic impact constituents

110 - human impact constituents

Artesia target quality – 2600 ppm TDS

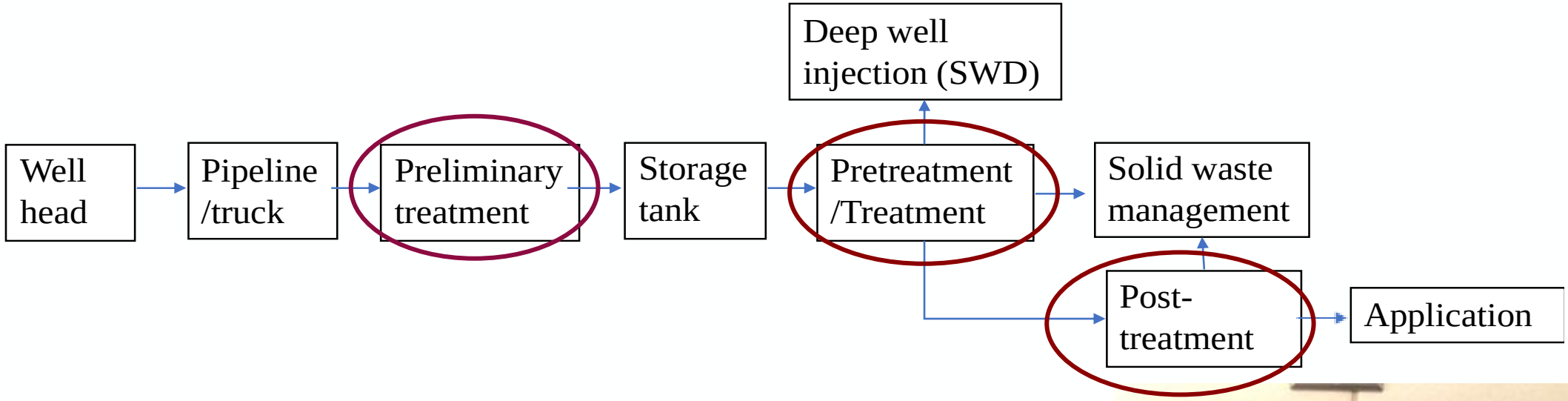
State line target quality – 3600 ppm TDS

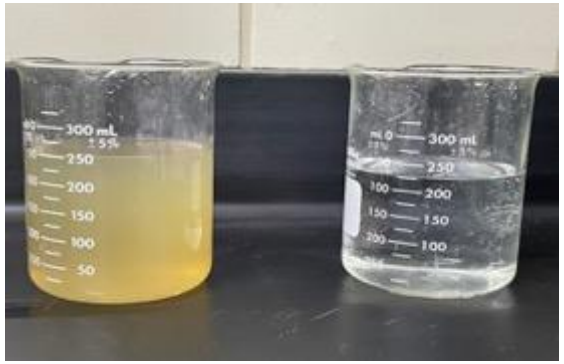
TX – 45 aquatic impact constituents

110 – human impact constituents

Red Bluff target quality – 4000 ppm TDS

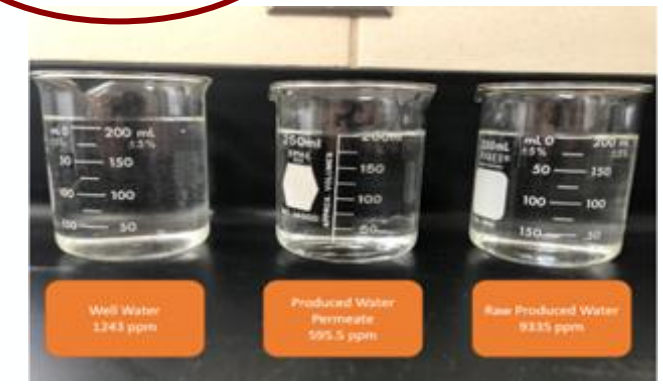
Common Treatment Train Approach for Safe Water





Permian Basin -100,000 TDS Raw PW (left) pre-treatment (right)

Permian Basin -100,000 TDS Raw PW (left) pre-treatment (center)



San Juan Basin -10,000 TDS Raw PW (right) w/RO treatment (center)

Quality of Thermal Treatment of Permian Produced Water

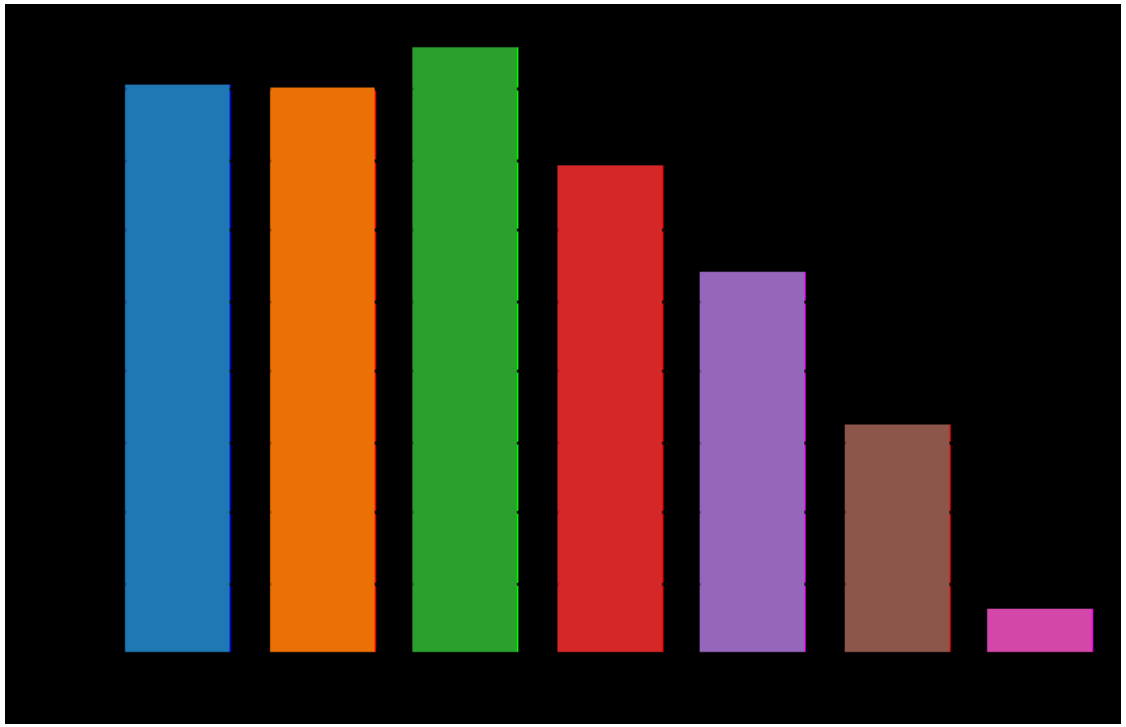
Constituent	Feed (ppm)	Distillate (ppm)
TDS	126,000	350 +/-150
TPH	75 +/-70	11 +/-3
Ammonia	~400	46
Fe	1	0
Mn	0.36	0.004
Na	38162	102
Ca	4554	7
Mg	751	1.5
K	647	0.9
Ba	6.6	0.9

Constituent	Feed (ppm)	Distillate (ppm)
Sr	1348	3.3
Al	0,14	0.006
Li	32	0.005
Zn	0.04	0.02
Pb	0	0.006
HCO3	120	200
SO4	270	10
Cl	72300	160
Si	17	0.10
PO4	3.7	2.90

Average of a example real-time hourly data during a one-month test series

Public Acceptance of Produced Water Treatment and Reuse

Identify all potential reuse applications that you would support for the use of treated produced water to conserve the use of New Mexico's freshwater supplies, if the water is treated and regulated to standards that prove it to be safe to use and protect human health and the environment?



- Uses inside the oil field - such as construction, drilling and fracking, concrete mixing, and dust suppression **(61%)**
- Industrial uses outside the oil field - such as construction, power generation, manufacturing, etc. **(61%)**
- Agricultural uses, such as irrigation for non-edible crops (e.g., cotton) **(65%)**
- Multiple agricultural uses, e.g., irrigation, rangeland restoration, livestock watering, etc. **(53%)**
- Supplemental drinking water supplies **(41%)**
- I need more information to support the reuse of treated produced water **(25%)**
- No, I would not support the reuse of treated produced water for any use outside of the oil field **(5%)**