

THE PETROLEUM RECOVERY RESEARCH CENTER

NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

ROBERT BALCH - DIRECTOR

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What Is the Impact of the PRRC?

Created by New Mexico Statute: NMSA 1978, Article 9 as a division of New Mexico Tech: Primary Duty: "to engage in theoretical and practical research into the recovery of petroleum and other energy resources"

Primary Focus today is:

Produced Water and Sustainability
Traditional hydrocarbon research
Other Energy – Geothermal and Nuclear
Carbon Management and Critical Minerals

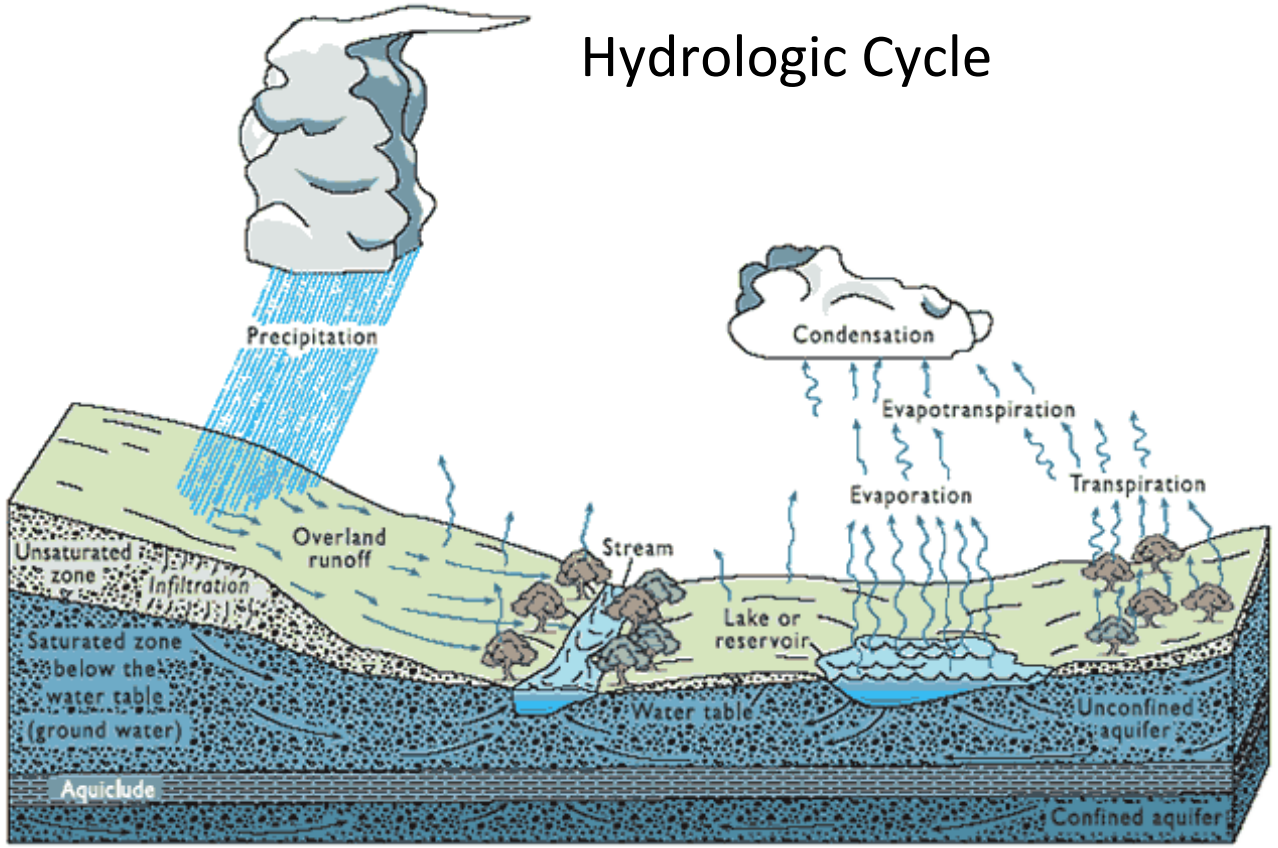
The PRRC has Impact

Jobs: PRRC currently contributes to 106 jobs in the state including 35 staff, 13 supported Faculty at NMT and 58 Students funded on research projects in FY26

To the State: Funded research supports entities across the state with a 5-year average budget of $ **$11,950,255** per year including funds allotted to partner universities, national labs, and companies in the state. The PRRC's research portfolio* has projects positively impacting both San Juan and Permian basin communities. PRRC Researchers enjoy a high profile in a wide range of research areas

University Support: The PRRC supports the university and contributed an average of $ **$2,692,872** per year over the last 5 years to NMT including: overhead and direct support and student contracts and faculty Support. We actively train students for careers in sustainable energy development.

Special Focus - Water



Shari Kelly and Peggy Johnson, NM Bureau of Geology

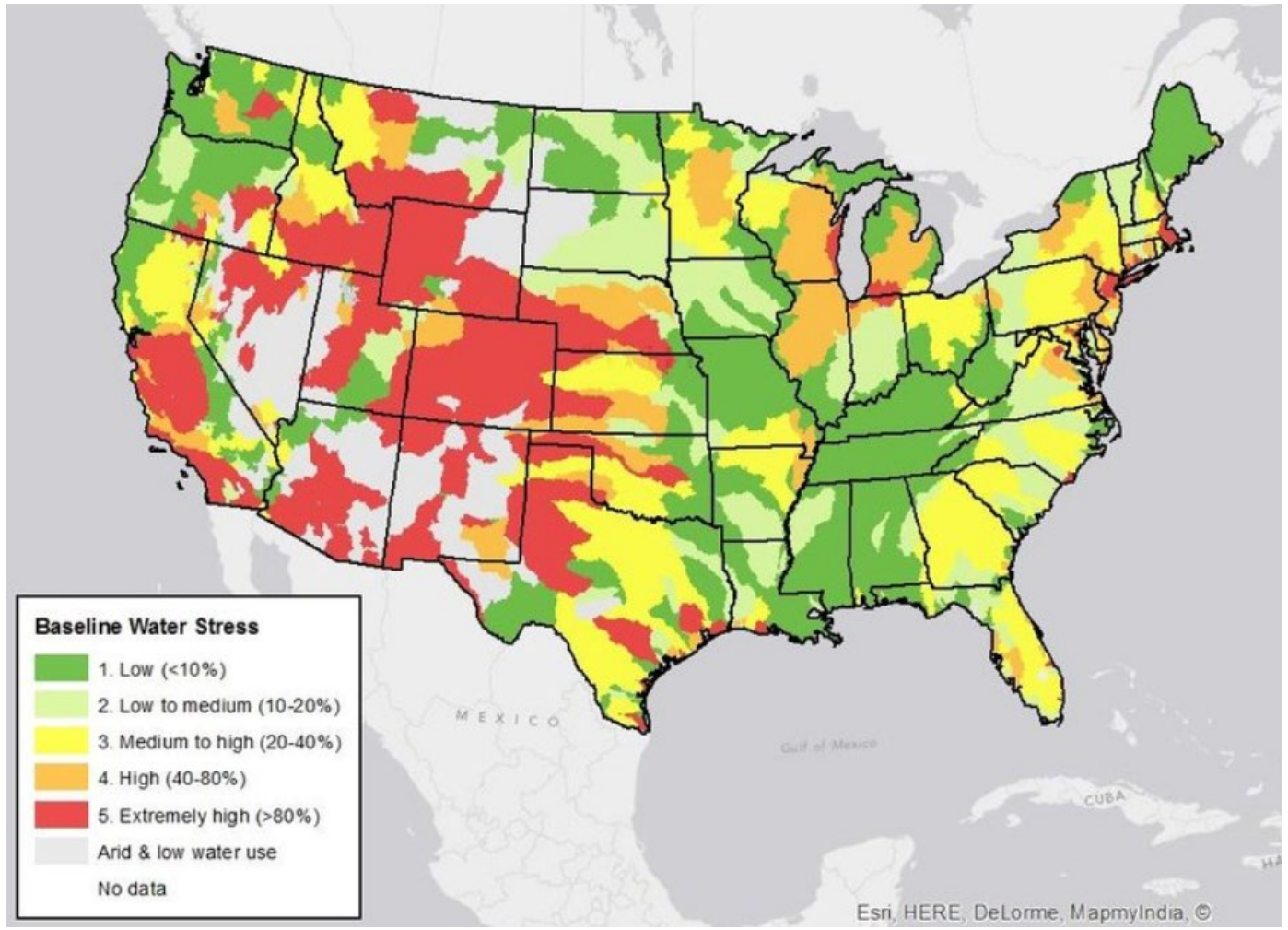
Water shortage and security is a global AND local challenge

- New Mexico is an arid state, **1.1 million** people are affected by the long periods of drought and inconsistent precipitation.
- **87%** of public water supply comes from ground water in NM.
- The remaining water (13%) comes from rivers

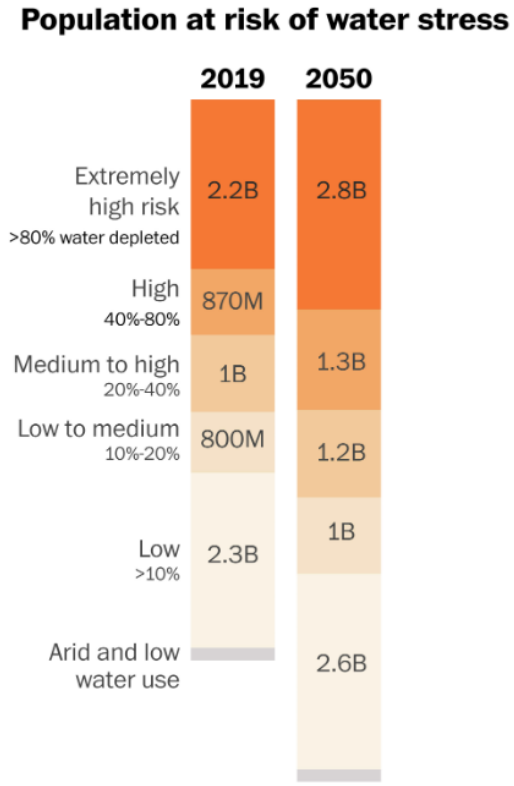
Rapidly depleting aquifers requires exploration of new sustainable water resources…

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Water Stress Map of the United States



Water Stress Map of the United States Source: USGS.



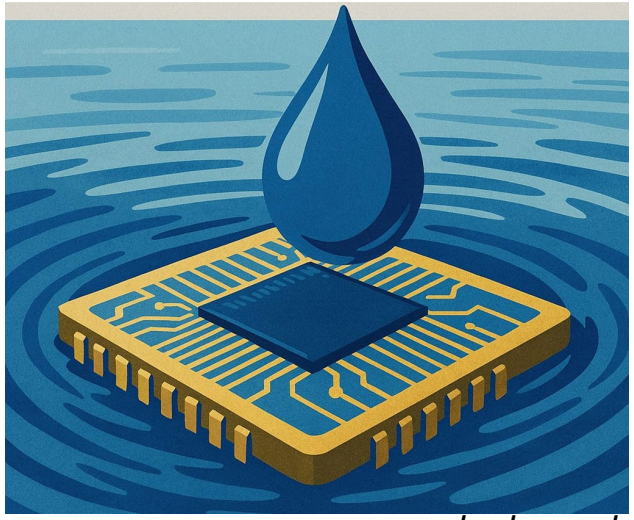
"Over one quarter of the world's population face extremely high water stress".

- World Resources Institute (WRI).

Does New Mexico have enough water?

Not for everything we want to do…

- Farming is already limited by available water, this is difficult to address because of very large volumes needed
- New Industries need more water
  - Chip fabrication
  - Data farms (cooling)
  - Grid-scale batteries (cooling, pump hydro)
  - Hydrogen needs 4-8 gallons of water per kg of hydrogen



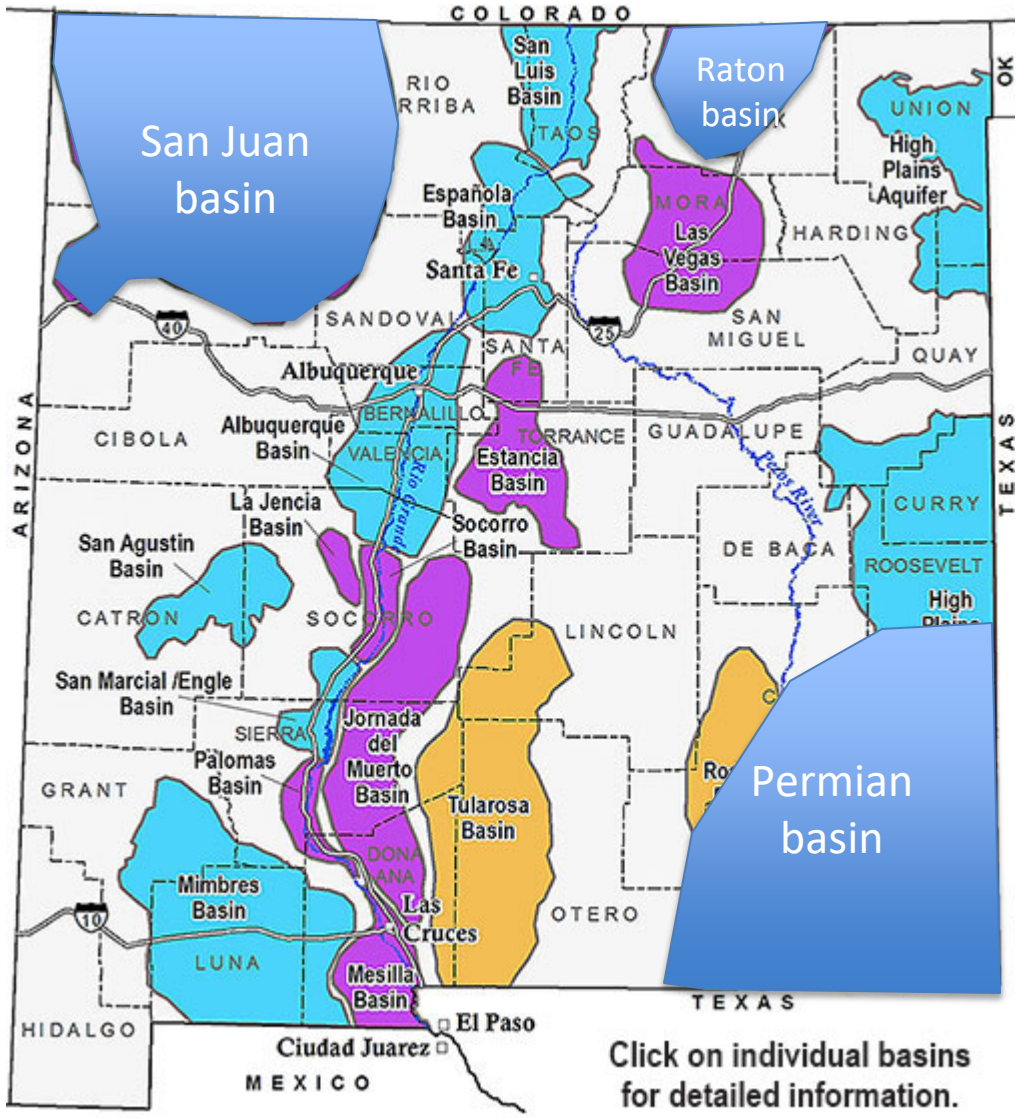
hydrogeek



So How Do We Come Up With "New" Water?

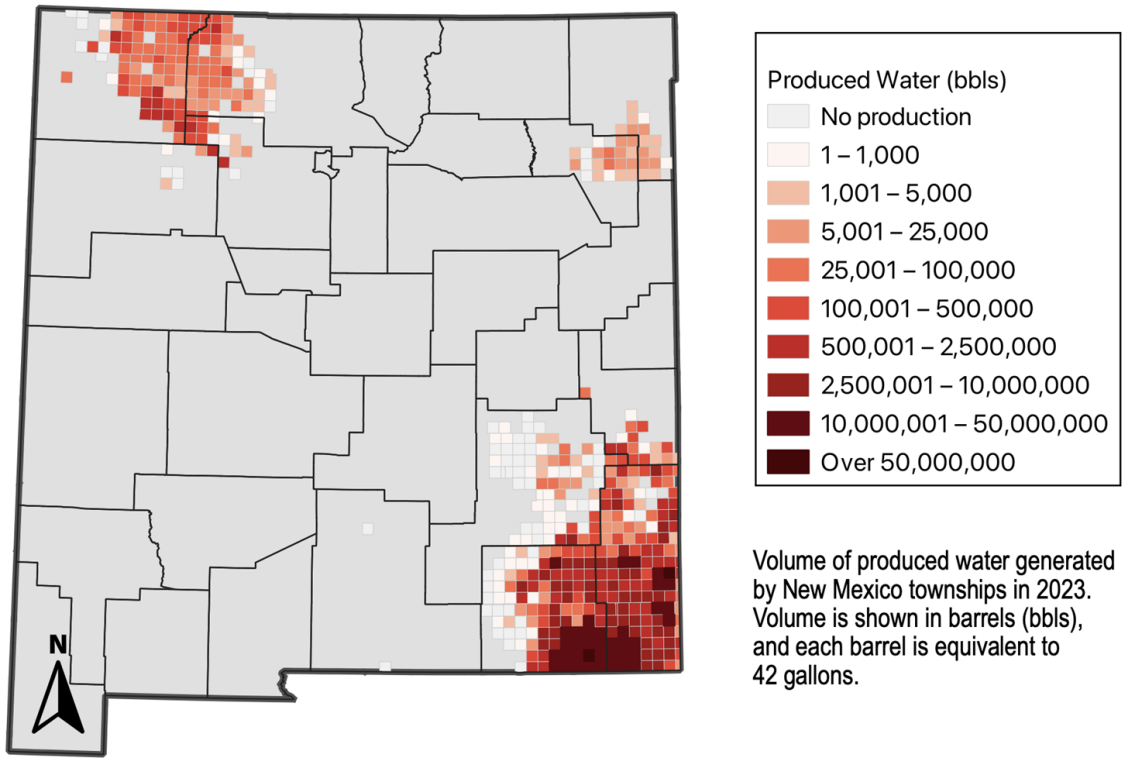
In New Mexico the answer is going to be:

- New groundwater sources…
  - Resources are already strained
- Improve use from non-traditional water sources
  1. Produced Water from oil and gas
  2. Brackish Water
  3. Better reuse/treatment of wastewater



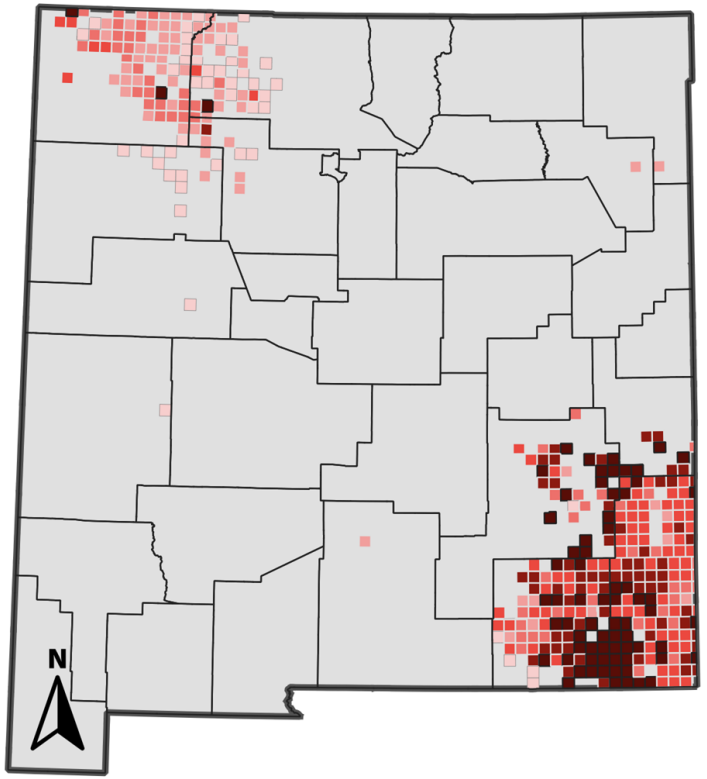
New Mexico Bureau of Geology and Mineral Resources Brackish water assessment

Produced Water Distribution in New Mexico



Produced Water (bbls)
- No production
- 1 – 1,000
- 1,001 – 5,000
- 5,001 – 25,000
- 25,001 – 100,000
- 100,001 – 500,000
- 500,001 – 2,500,000
- 2,500,001 – 10,000,000
- 10,000,001 – 50,000,000
- Over 50,000,000

Volume of produced water generated by New Mexico townships in 2023. Volume is shown in barrels (bbls), and each barrel is equivalent to 42 gallons.



TDS (ppm)
- 1 - 10,000
- 10,000 - 25,000
- 25,000 - 50,000
- 50,000 - 100,000
- 100,000 - 150,000
- >150,000

Average quality of produced water generated by New Mexico townships based on total dissolved solids (TDS, in parts per million, ppm).

Figure 2. (Left) Volume of produced water generated by New Mexico townships in 2023; (Right) Average quality of produced water generated based on total dissolved solids (TDS, in parts per million, ppm).

Source: Cather/PRRC

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Produced Water in New Mexico

2,748 MM bbl*

Produced water reported for New Mexico in 2025

128,641 mg/L*

Mean TDS in 46 Permian Basin produced-water samples

NM WaterSTAR

Interactive produced-water quantity and quality mapping portal

Produced water is a big issue

- In 2025, over **113 billion** gallons of produced water was generated in NM, over **310 million** gallons per day, equal to **TWICE the total daily municipal water consumption** in NM;
- Produced water is currently reinjected underground for use or disposal (the cost can exceed **$0.11/gallon**);
- Cost of water management can make profitable operations uneconomic for small producers.

Produced water desalination is challenging

- **High salinity** (as high as 201,474 mg/L), volatiles, **organics** (as high as 248.1 mg/L), etc.;
- Most commercial desalination processes focus on **brackish water** (<10,000 mg/L) **and sea water** (35,000 mg/L).

Source: * NMOCD.

**Hightower, Permian Basin Produced Water Quality Drivers, Produced Water Society Permian Basin Summit, 2023.

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Produced Water Purification

Challenges and Opportunities:

- New Mexico is the **second-largest** oil-producing state and among top natural-gas producers.
- Produced water can be up to **6 times saltier than seawater**, can also carry:
  - TDS often reaching 200,000 mg/L,
  - hydrocarbons such as oil and grease (2-565 mg/L),
  - suspended solids (1.2-1,000 mg/L),
  - dissolved organic compounds up to 1,500 mg/L,
  - and metals or major ions including Ba, Fe, Ca, Mg, and Li across basin-specific concentration ranges.

Reuse discussions: **disposal-only** >>>>> **fit-for-purpose treatment, oilfield recycling, and potential closed loop new industrial water supplies**.

Current Produced Water Management

In New Mexico:

59.9%

Deep-well disposal / SWD

40.1%

Enhanced oil recovery injection/Pressure maintenance injection

0%

Beneficial reuse outside oil and gas

PRRC Research Goal: develop **affordable, portable and scalable robust membrane**-based desalination technologies to convert produced water as a sustainable water resource.

Sources: NMOCD
https://wwwapps.emnrd.nm.gov/ocd/ocdpermitting/Reporting/Production/ExpandedProductionInjectionSummaryReport

Water Filtration – Hollow Fiber Membranes

30 years of produced water research with dozens of funded projects

- Polymeric hollow fiber membranes have been fabricated at PRRC for produced water treatment. The removal efficiency for organics salt removal is greater than 95% in a single pass, under a relatively low pressure (less than 30 psi).
- Working with PESCO to manufacture and distribute systems for domestic and industrial uses
  - **PESCO has licensed our technology and is preparing to mass produce units**
- Committed to building six 500 gpd systems for rural Native American communities
  - Partnership with Navajo Technical University
- Have projects to extract critical minerals from produced water
  - Successfully isolating and extracting Lithium from Permian basin water



Commercial Prototype (PESCO) in Field Tests





5000 gallons per day

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N⁴WPP Brackish water Desal



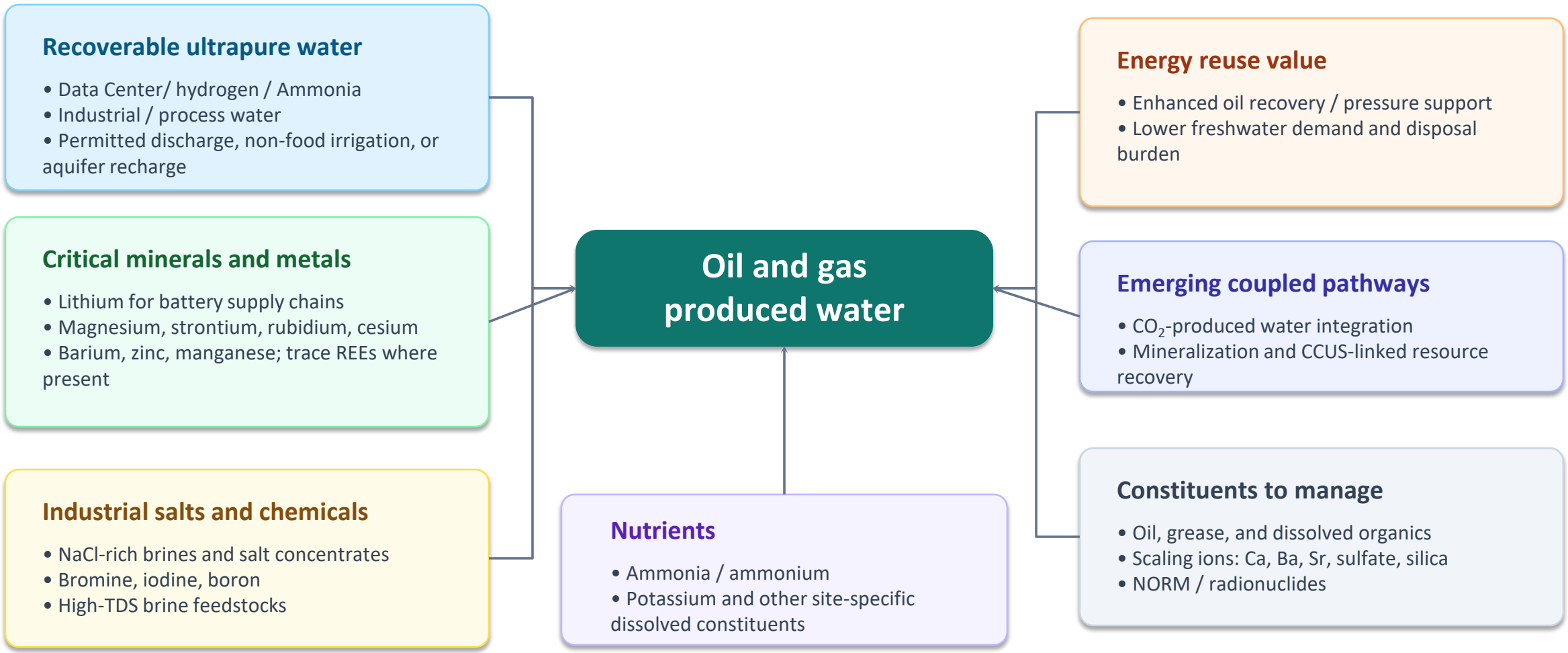


Navajo Tech-NMT-Navajo Nation Water Purification Project – Working to Desalinate brackish water wells on the Navajo Nation

500 gallons per day

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Available Resources in Produced Water



Sources: Scanlon et al., *Science of the Total Environment*, 2020; Gerardo and Song, *Environmental Science: Water Research & Technology*, 2025; Yelatontsev et al., *Desalination*, 2026; Biswas et al., *ACS Omega*, 2025; *Water Research*, 2026, 294, 125546.