Engaging the State (of New Mexico) Energy-Water Policy in a Time of Drought

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NEW MEXICO emnrd Energy, Minerals and Natural Resources Department

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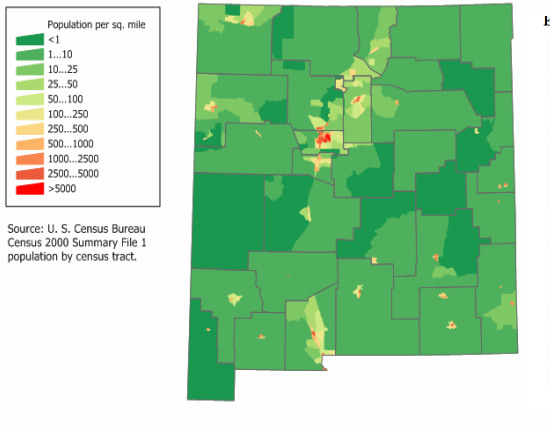
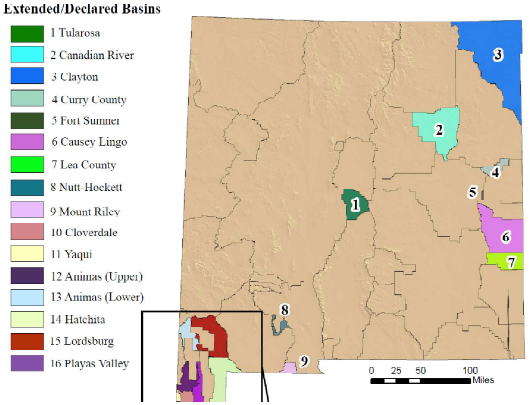
New Mexico Profile

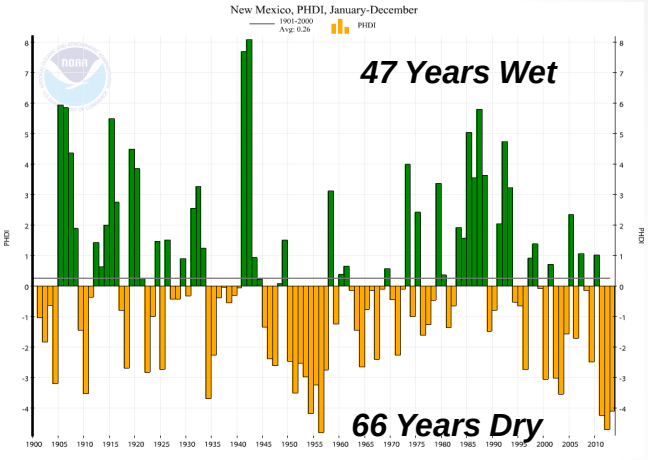


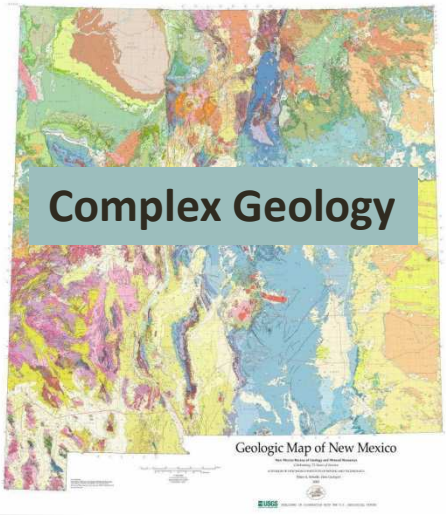
Population ~2M

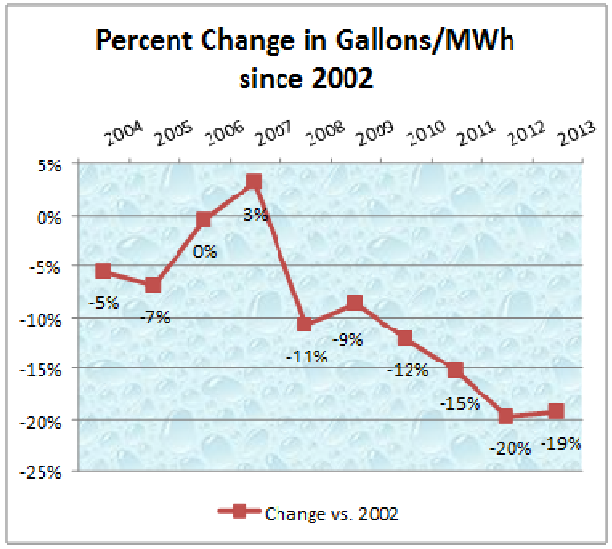


16 Water Planning Regions

Palmer Hydrological Drought Index for New Mexico, 1900-2013







Energy in New Mexico

Energy

40th ranked in electricity generation
2,526 thousand MWh, Jan 2015

Net interstate export of electricity is >120 trillion BTUs

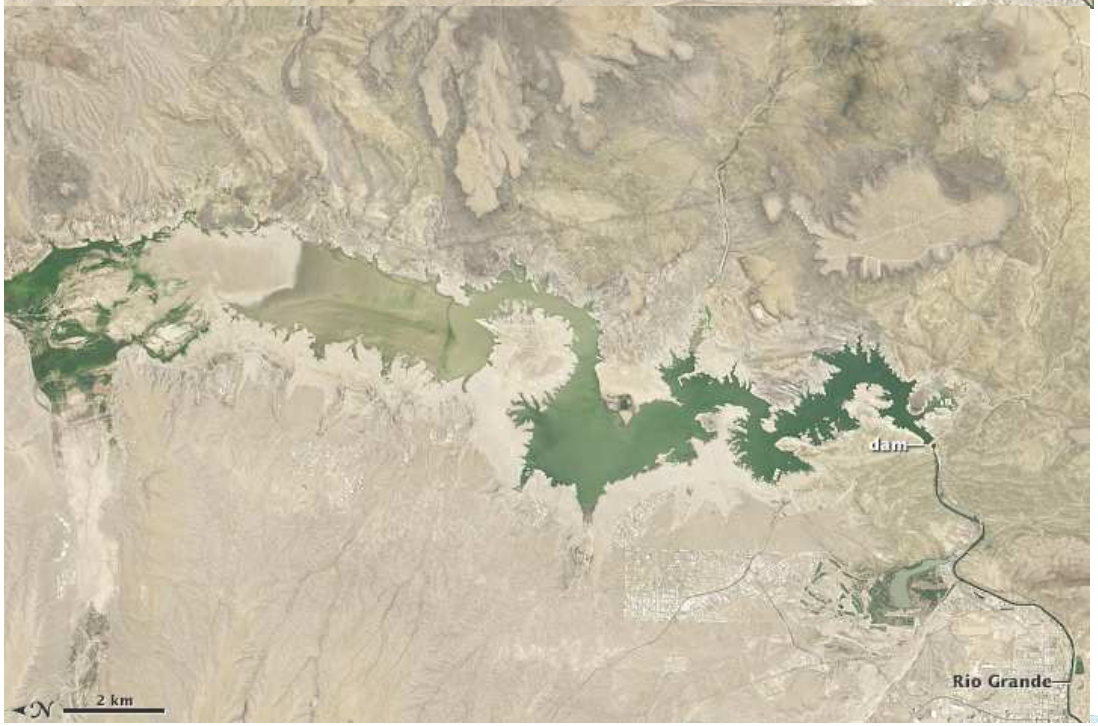
5th Ranked in US for Solar Generation (>300 days of sunshine!)

4th largest energy supplier via petroleum and natural gas

7.8% of generation is renewables; Almost all planned new generation will use natural gas or renewables

Data source: EIA, 2015

Drought in New Mexico



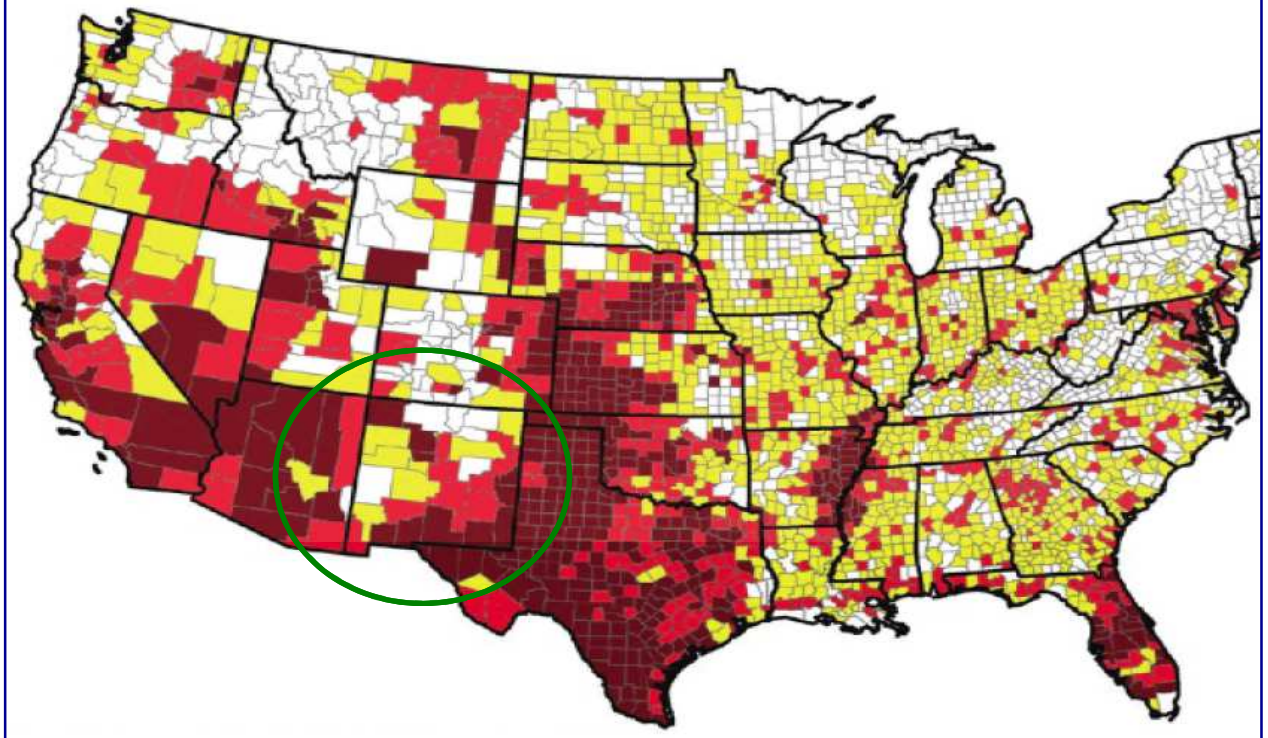
Elephant Butte Reservoir
NASA Earth Observatory
Landsat 8 images

Acquired June 2, 1994
89% of maximum
(2.2 Maf)

Acquired July 8, 2013
3% of maximum

http://earthobservatory.nasa.gov/IOTD/view.php?id=81714

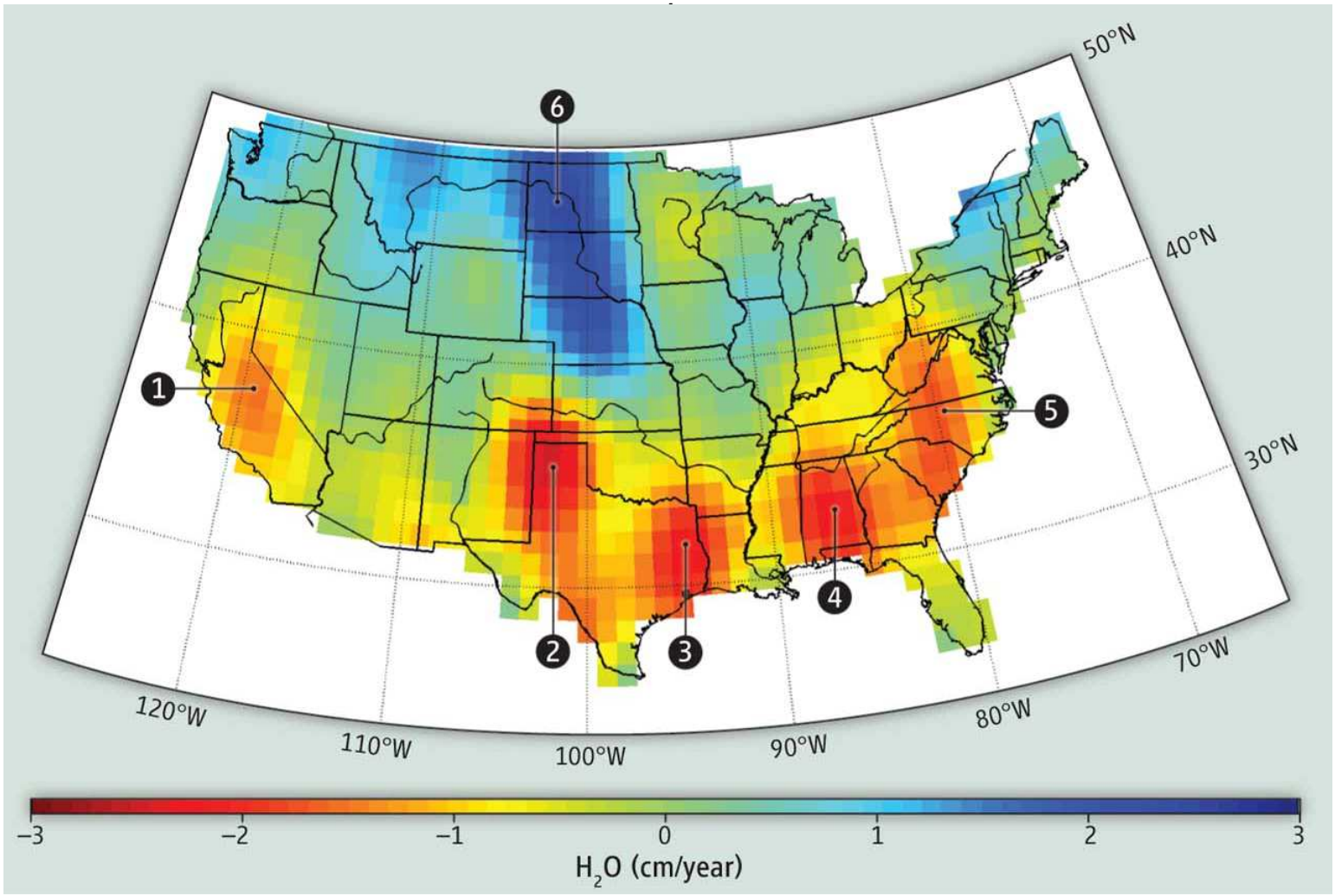
Climate Change Effects



Water Supply Sustainability Risk Index (2050)

- Extreme (412)
- High (608)
- Moderate (1192)
- Low (929)

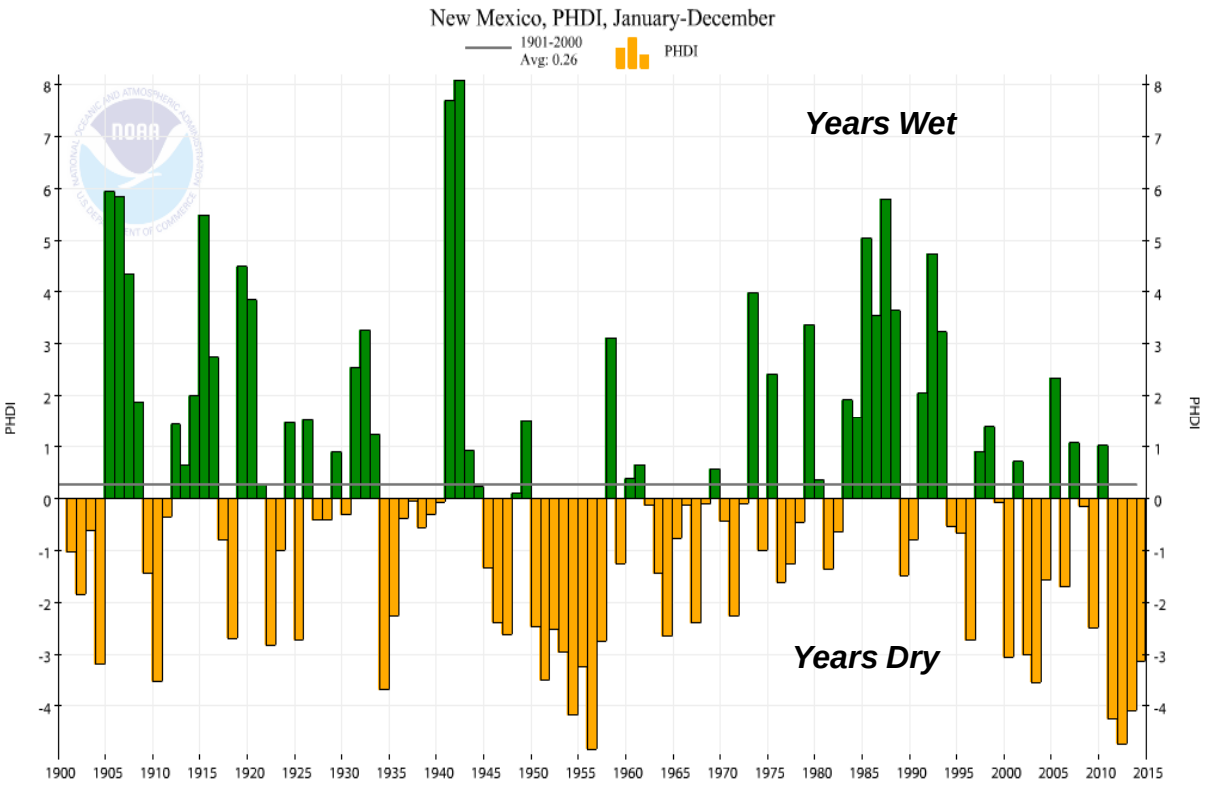
Mixed picture.Between 2003 and 2012, GRACE data show water losses in agricultural regions such as California's Central Valley (1) (−1.5 ± 0.1 cm/year) and the Southern High Plains Aquifer (2) (−2.5 ± 0.2 cm/year), caused by overreliance on groundwater to supply irrigation



James S. Famiglietti, and Matthew Rodell, Science, 2013;340:1300-1301

Drought and Drought Recurrence in NM

- 67 years dry vs. 47 wet since 1900
- Drought recurrence is the norm
- 19 x 2 or more dry year instances in a row, vs 11 x 2 or more wet years



Palmer Hydrological Drought Index for New Mexico, 1900-2015

Source: NCDC-NOAA, accessed 10/19/15

New Mexico Recoverable Water Initiative

Dr. Jeri Sullivan Graham, Work Group Coordinator

Some Drought Task Force Goals

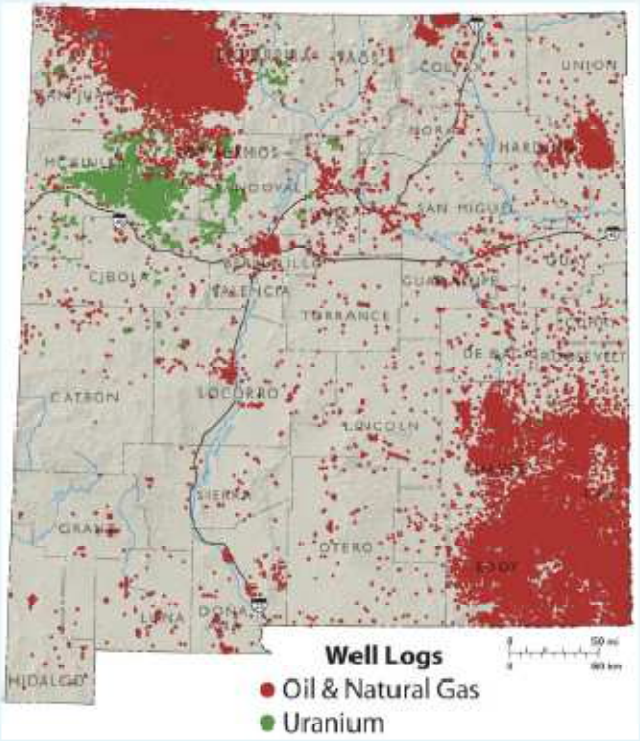
Short Term (6 mo to 2 years)

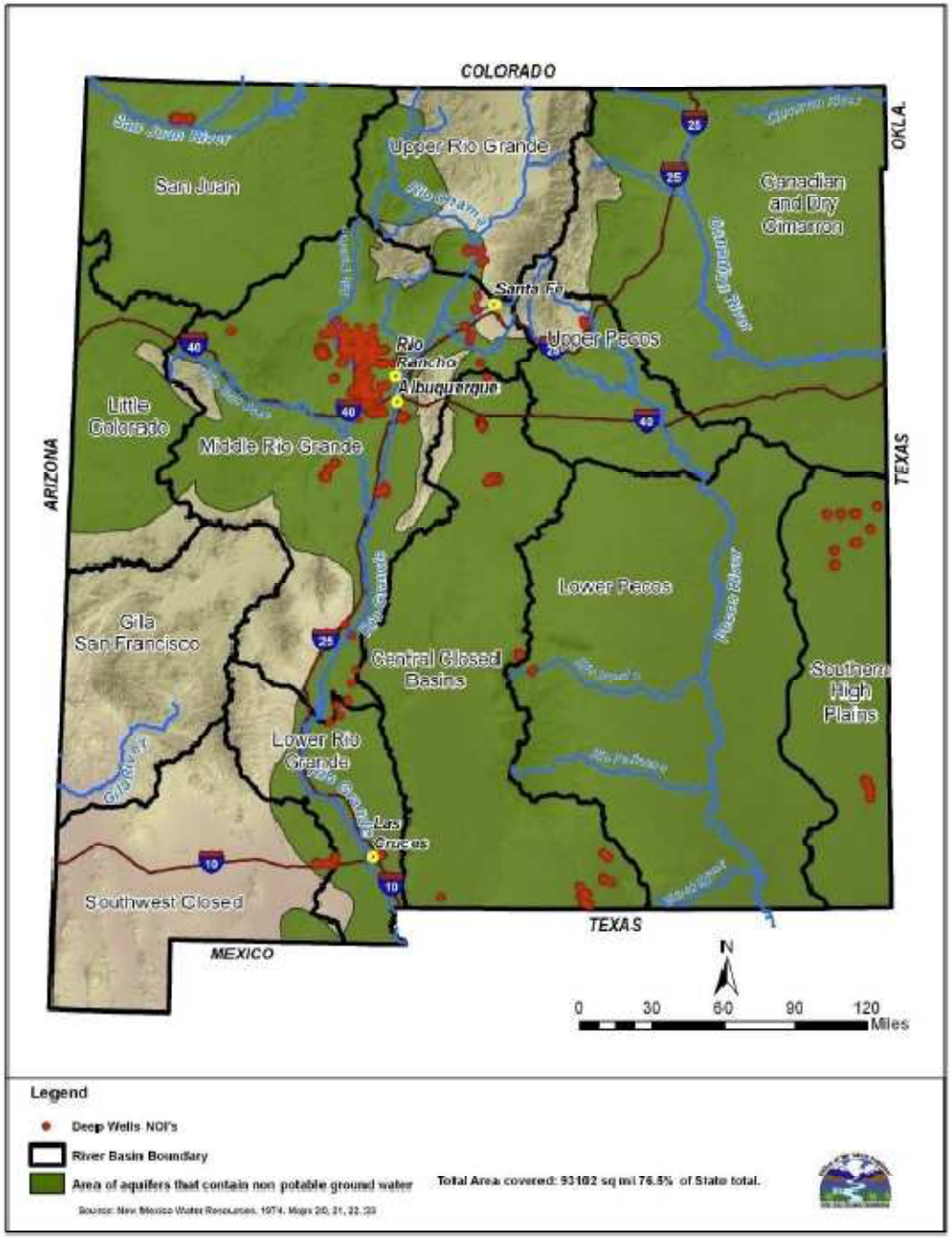
- **establish a Brackish Water Task Force** to expand understanding and expertise in the area of brackish water resource development, ensure communication among the state's experts, and provide a forum for review and evaluation of proposed projects and aquifer prioritization.
- **establish a decision matrix that prioritizes saline aquifers and communities or groups of communities in need of water supply.**
- **compile and review existing data and identify data needs for characterizing and evaluating suitability of potential aquifers**.
- **develop a saline aquifer web page** as a clearinghouse for public information
- **prepare a summary report of saline aquifer resources**.
- **develop a hydrogeologic characterization and computer model to support an impact assessment and feasibility study.**

Long Term (2 to 5 years):

- **collect any additional data needed for proper evaluation of potential aquifers.**
- **develop a hydrogeologic characterization and computer model to support an impact assessment and feasibility study.**
- **pursue plant design and pilot projects.**

Occurrence of Nonpotable Groundwater in New Mexico





2014-15: Brackish Water Work Group

NMBGMR recent work

- Major water quality data digitizing and compilation efforts underway

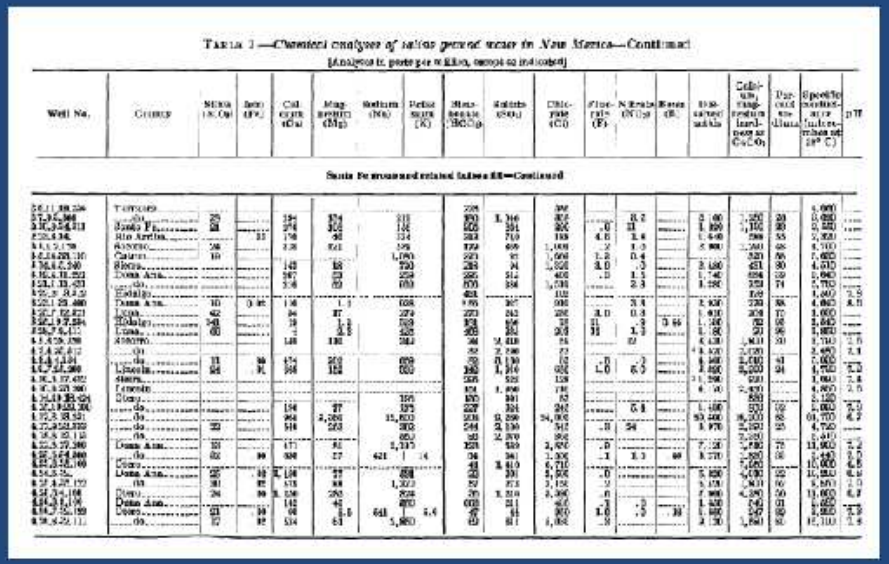
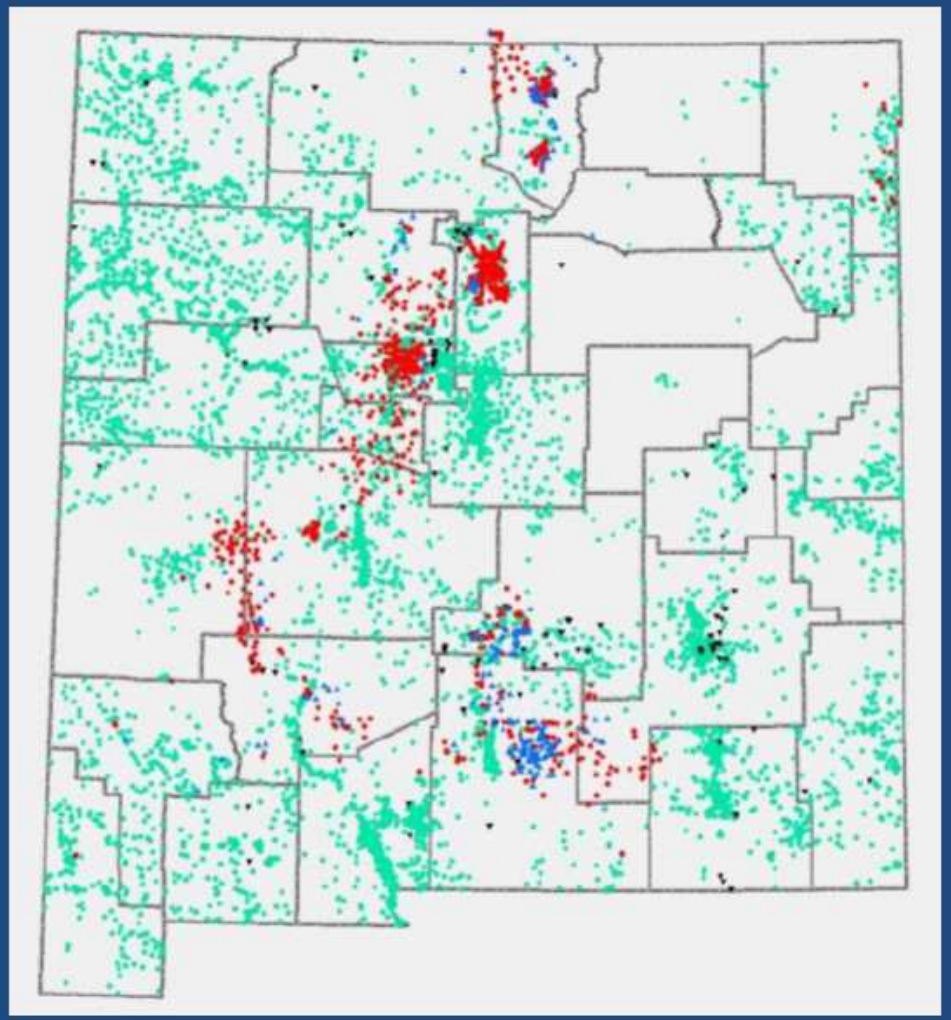


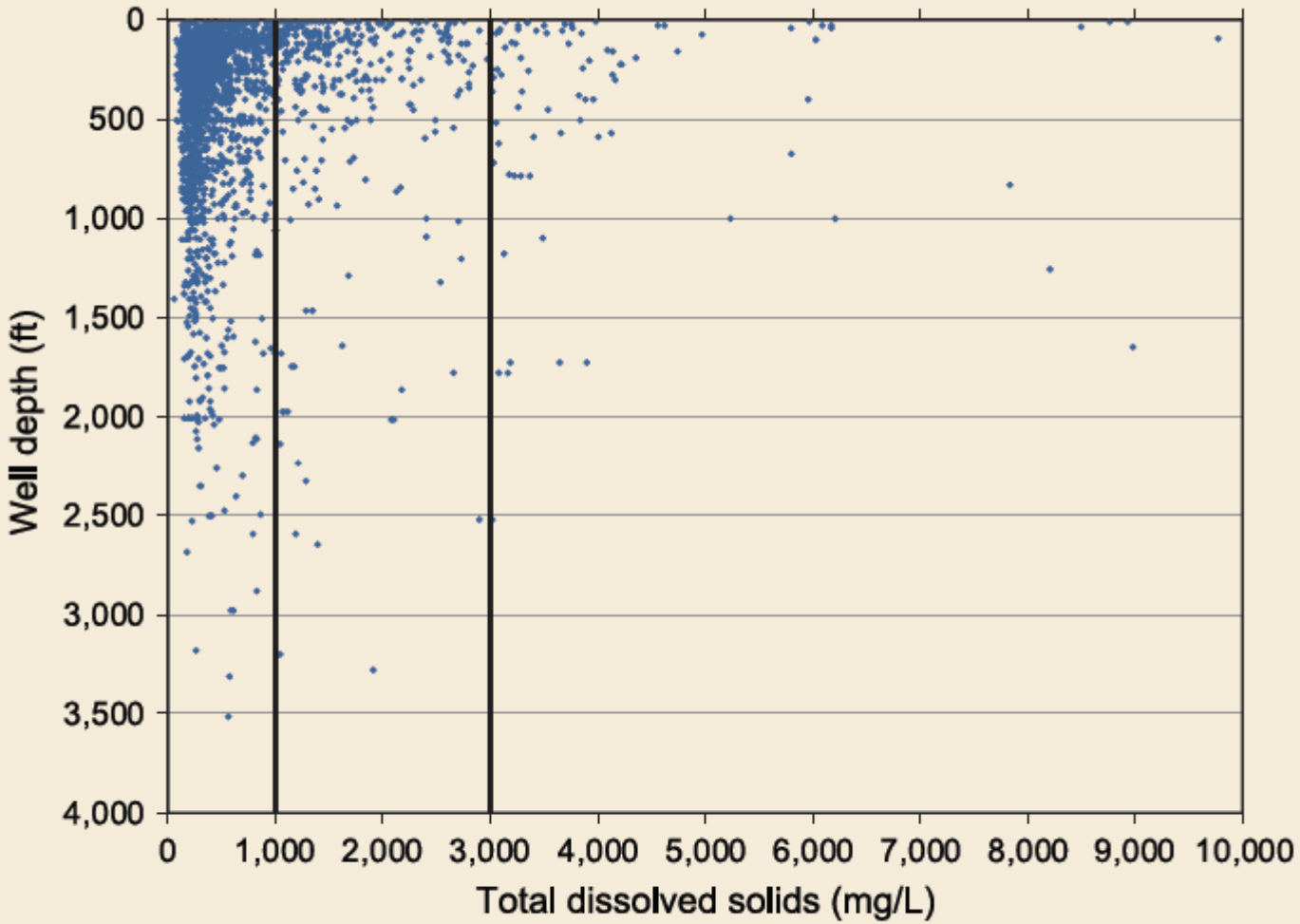
TABLE 1.—*Chemical analyses of saline ground water in New Mexico*—Continued

Santa Fe ground-water basin—Continued



Source: S. Timmons, AGWT 04, 2015

More information on less saline waters



Graph of salinity and depth in New Mexico wells. More data exist for freshwater and shallow locations. (Sources: NMBGMR, USGS, NMED).

Key Aspects of Implementing BW Use

- **Community and Industry Needs**-Prioritization
- **Availability**
  - Right place, right time, right volume
- **Safe extraction, use, and the environment**
  - Handling, concentrate disposal, spills, sustainable sources
- **Policies and Regulations**
  - Water rights, inter-basin transfers, quality, environment
- **Treatment**
  - Salinity, Metals, TSS, scale-forming minerals
- **Costs**
- **Market Analysis**
  - Which customer will buy the water? At what price?
- **Infrastructure Investment**
- **Risk perception and use acceptance**
- **Financing-Public or Private?**
- **Partnerships with Industry and Localities**

New Mexico Brackish Groundwater Assessment Program Workshop

January 15, 2004
Albuquerque, New Mexico

Report of Findings and Recommendations

Sponsored by:

New Mexico Office of the State Engineer New Mexico Water Resources Research Institute
U. S. Bureau of Reclamation

January 2004

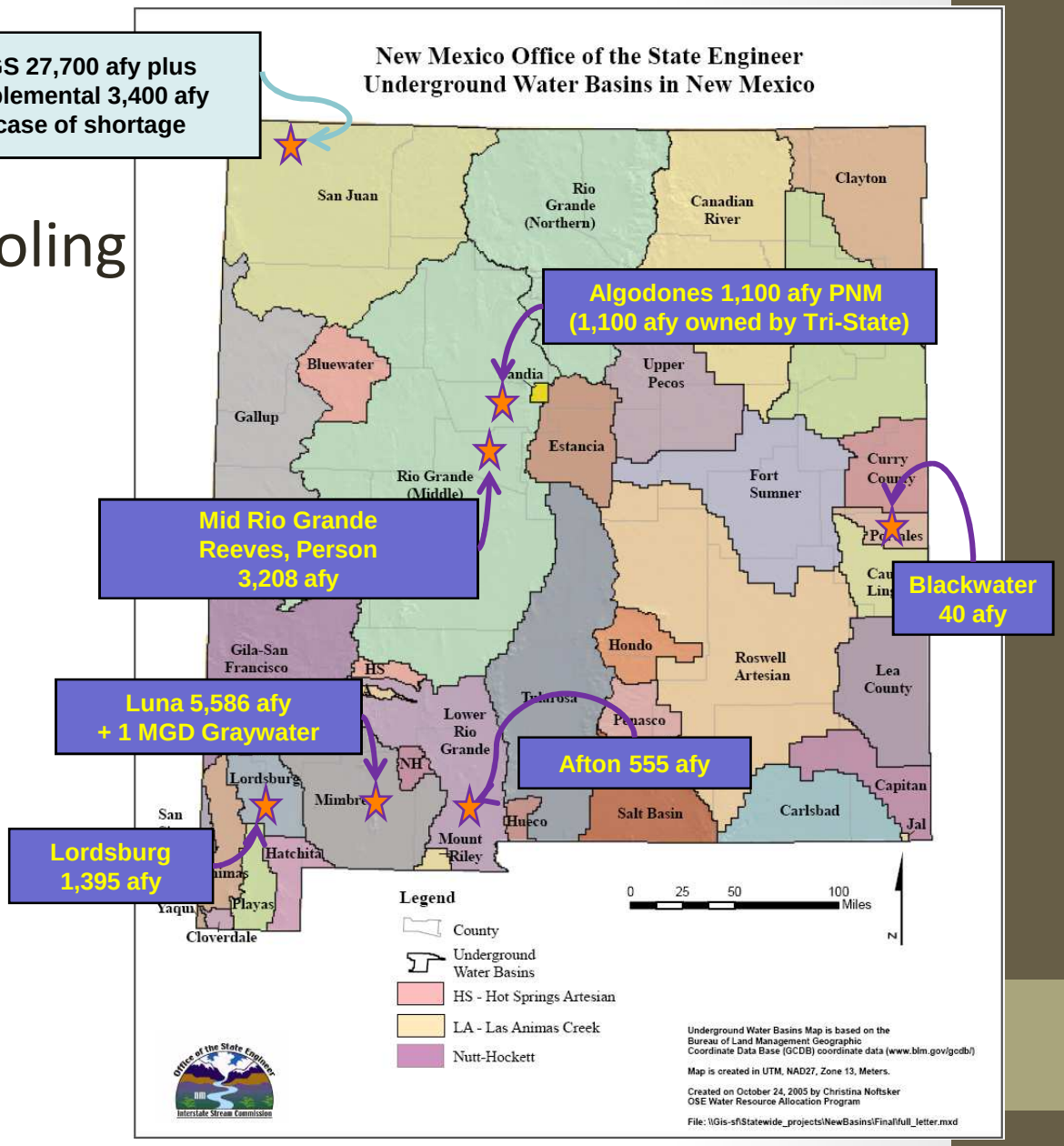
PNM Water resources

- 90+ % is used for cooling

Who Owns It?

Except for SJGS, where water is supplied through surface rights leased from BHP and Jicarilla Apache Nation, all of PNM's other facilities own groundwater rights.

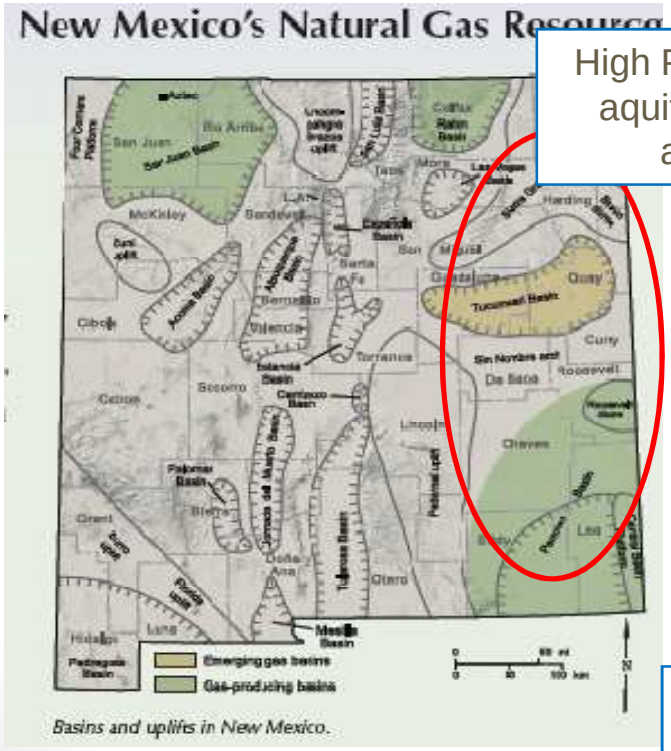
(Luna also has rights to one-million gallons per day of Deming graywater)



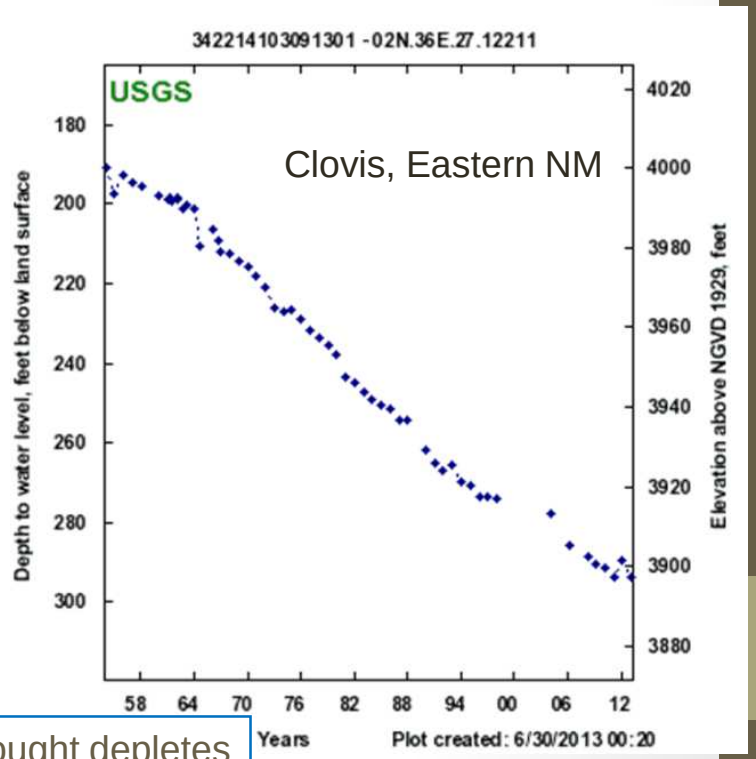
Source: PNM

Water for Oil and Gas Production in New Mexico

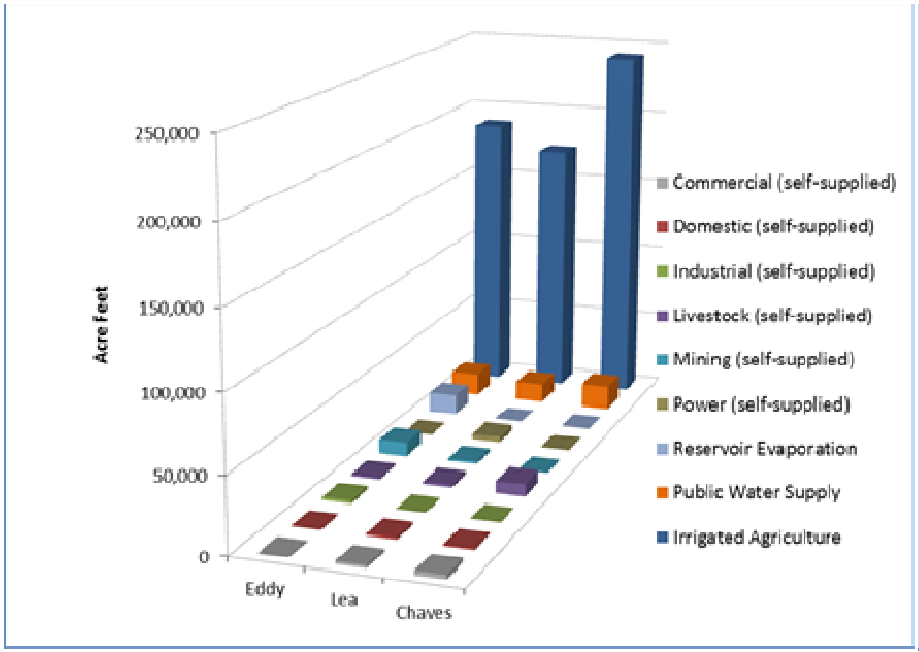
- Ground-water depletion in the Southwest has reached record proportions
- Increased electricity demand (brackish treatment, transport) and reduced oil and gas production (drilling and frac fluid limits) may result.
- Brackish ground water and produced water could be used for drilling and completions.

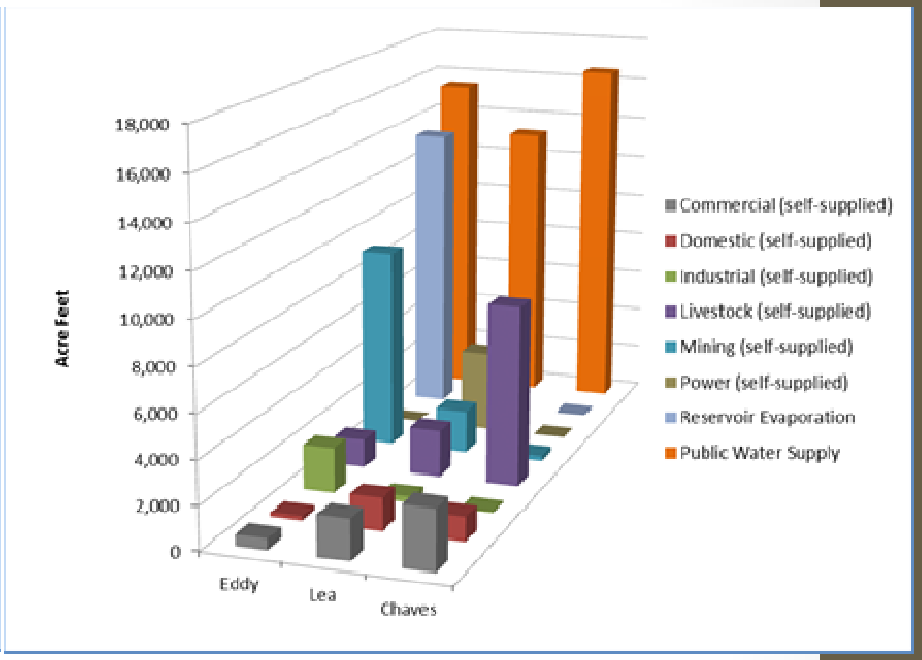


High Plains/Ogallala aquifer overlaps oil and gas basins



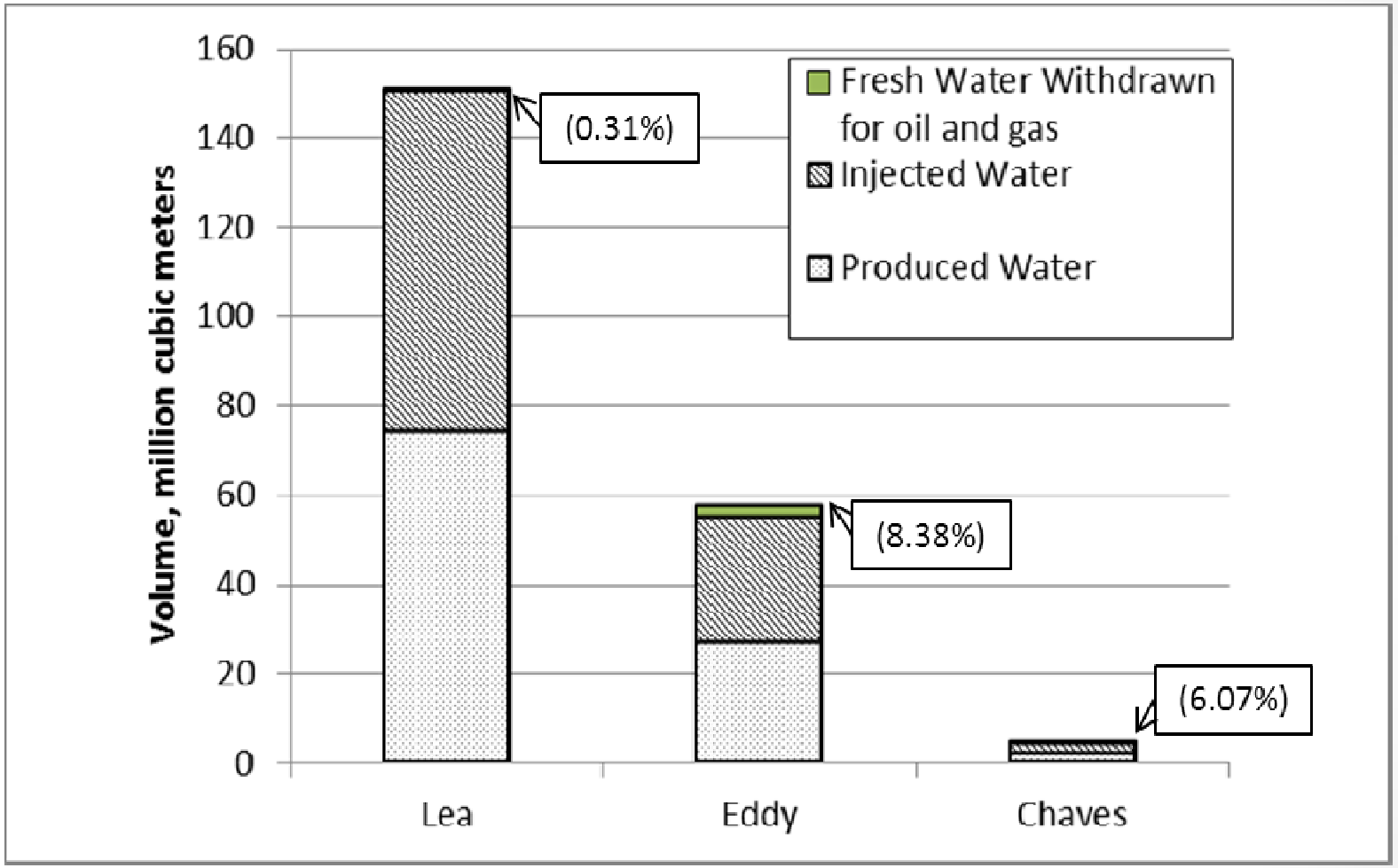
Cumulative drought depletes fresh ground water





How much fresh water does oil and gas use?
Not much compared to agriculture.

Produced water volumes



Oil and Gas producers are reducing fresh water consumption

- Treatment goal: 100% PW reuse; retain cross-link gel efficiency

	FW Job	PW w/ EC	PW w/o Treatment
Water Cost	$250,000	$0	$0
Water Treatment	$0	$65,000	$22,500
Water Transport	$75,000	$285,000	$285,000
Pumping Cost	$1,300,000	$1,500,000	$1,500,000
Total Cost	$1,625,000	$1,850,000	$1,807,500

Information courtesy of Kent Adams, VP, Bopco LP

Brackish Water Rules in NM

- Less than 1,000 mg/L

or

- Above 2,500 feet below ground surface

Then normal water permit applications and jurisdiction apply. Water rights are assigned for beneficial use.

- Greater than 1,000 mg/L,

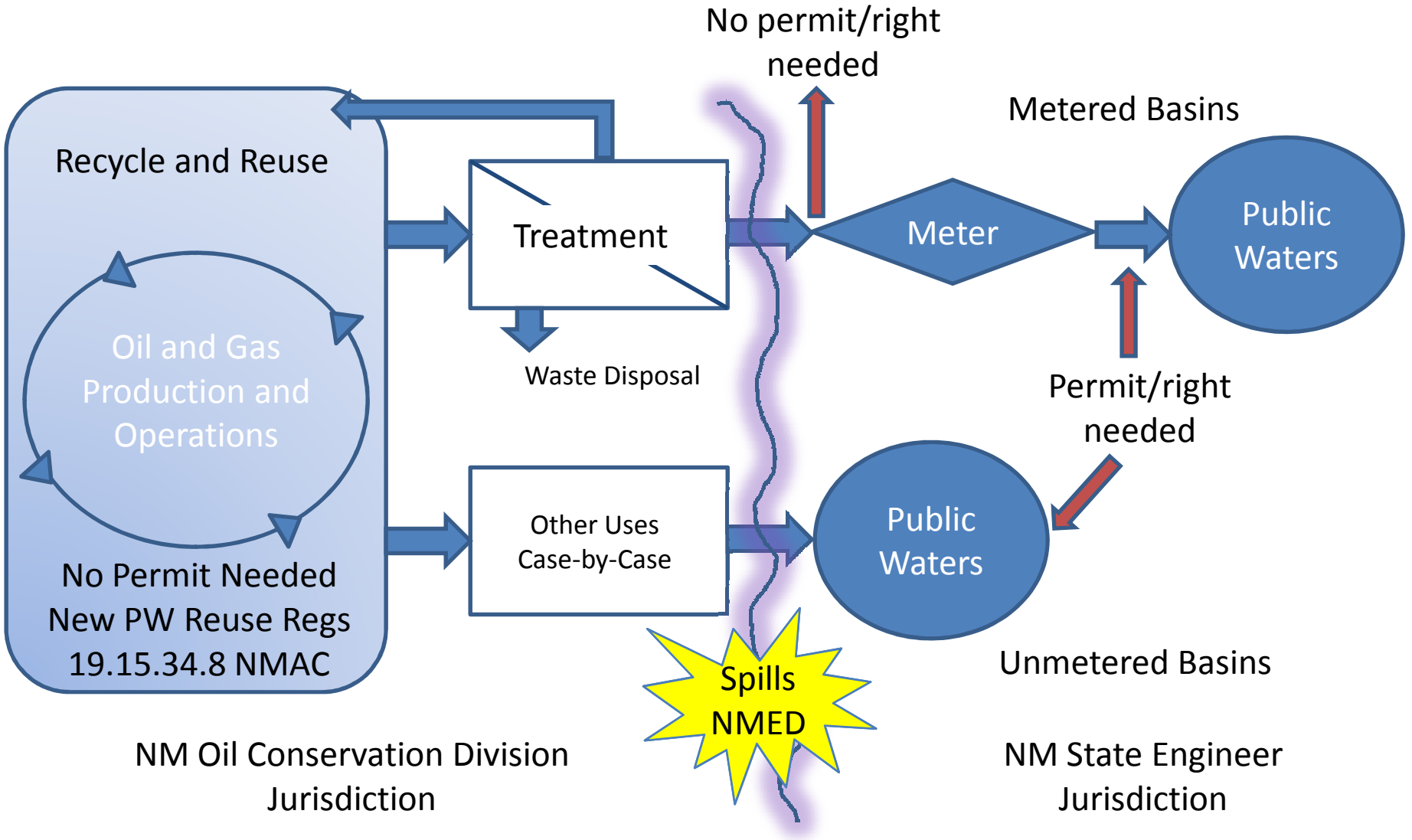
and

- Below 2,500 feet bgs

Then a permit is required, but no beneficial use assignment is needed.

Additionally, no impairment of fresh water may occur by extraction of the BW

New Mexico Produced Water Regulatory Framework for Reuse-*a fuzzy dividing line…..*



Key issues for Water and Energy in New Mexico

- We are fully allocated and so future generation and production must adapt
- Options to explore: alternative water resources for oil and gas and improved reuse of fresh water for power generation.
- Balance multiple outside issues and regulatory pressures to keep the sales price of electricity low and still use less water; keep the cost of oil and gas production low and better manage water
- Incorporating the cost of infrastructure adaptation into the price of electricity and into oil and gas production is an ongoing process.
- *Research, tools, and public outreach to help manage and explain the interlinkage of natural systems, water, and energy production will be important in the future for NM.*

Recent Policy Changes and Process Adaptations

- State Energy Policy-Includes Energy-Water Nexus
- Hybrid cooling implementation
- Settlement to replace coal-fired with gas-fired and solar (SJGS)
- New regulations - recycling of Produced Water
- Brackish Water and Waste Water resources
- Renewables on the upswing (geothermal, solar, wind, waste biomass, small-scale hydropower)
- Power Storage using modular pumped hydro (local)
- EWN collaborations-public and private entities

PNM Afton Gas-fired, Hybrid-cooled Generation