



Stucky Hall - Home of the NM WRRRI



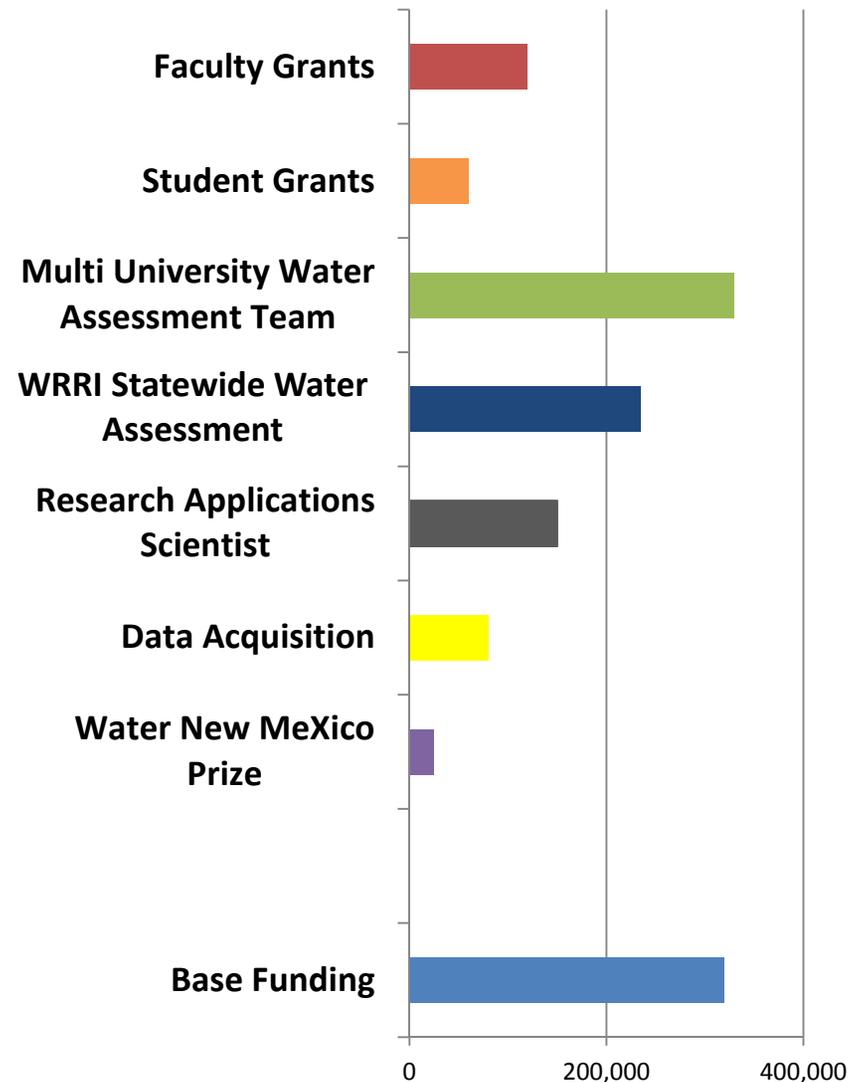
N E W M E X I C O

WATER RESOURCES
RESEARCH INSTITUTE

Executive summary

- 1. NM WRRI overview** - established in response to drought of the 1950s to coordinate water research
- 2. Water scarcity in New Mexico** - negatively impacting livelihoods, environment and communities
- 3. FY 2015 funding** - \$1M one time funds for water initiative that will improve water management for economic development and community health by helping planners, agencies, stakeholders, and policymakers
- 4. FY 2016 request** - \$2M will add water quality to water quantity research for comprehensive improvement in water information for new water sources and improved water planning and policy

NM WRRI FY15 \$1M legislative water initiative and base funding



History of NM WRRRI

Established in response to drought of 1950s in New Mexico

- 1956 First annual New Mexico Water Conference

Long history of supporting statewide water research

- 1963 NM WRRRI established

Special relationship with nationwide network of water institutes

- 1964 Water Resources Research Act set up network of water research institutes
(one in every state plus three territories and the District of Columbia ; PL 88-379.2 introduced by NM Senator Clinton P. Anderson modeled on NM WRRRI)

Statewide mandate

- 1966 Memorandum of Agreement: establishes NM WRRRI statewide cooperation with UNM, NMIMT, NMSU

Purpose of New Mexico Water Resources Research Institute as defined by New Mexico Statute 21-8-40 of 2005

The purposes of the Institute are to:

- **Provide research and training** in water conservation, planning, and management; atmospheric-surface-groundwater relations; and water quality;
- **Transfer water information** through the use of technical and miscellaneous publications, newsletters, conferences, and presentations;
- **Provide expertise, specialized assistance, and information** to address water problems; and
- **Cooperate** with local, state, and federal water agencies.

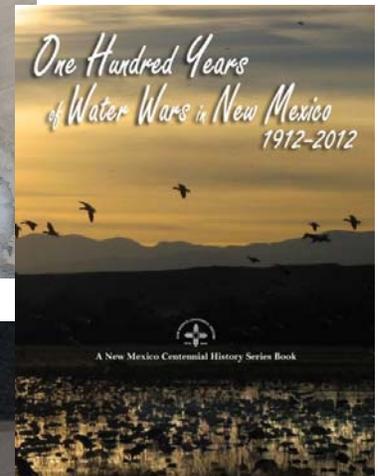
Research



Training



Statewide cooperation

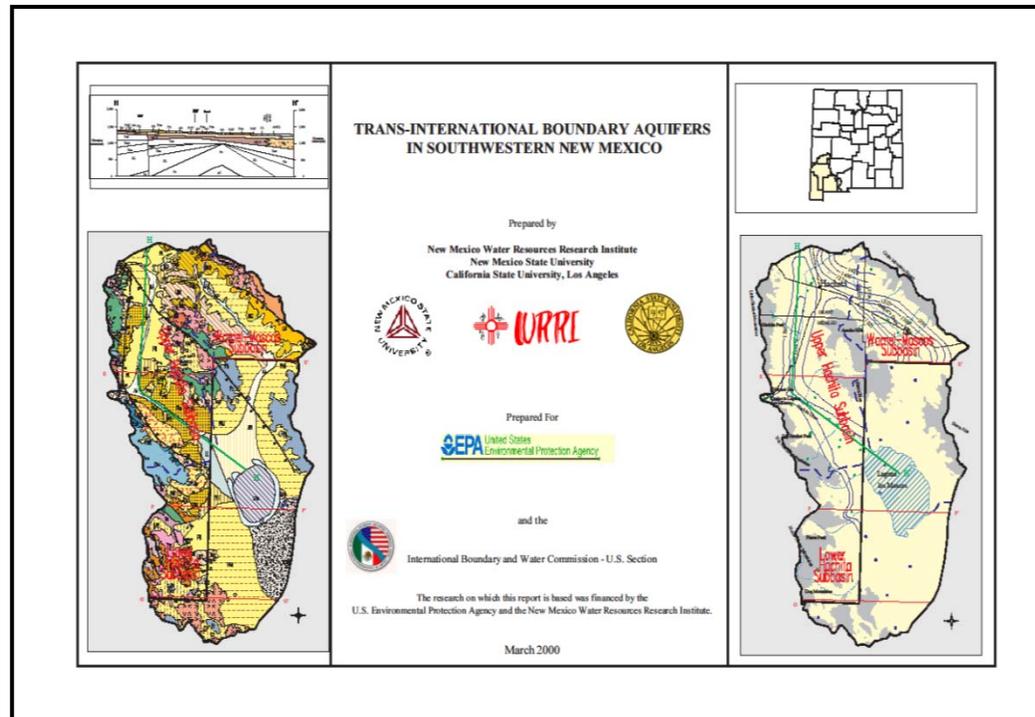


Water Information

Research

NM WRRI promotes research to solve water problems

- Studies supported by NM WRRI led to dropping of a previous Texas lawsuit that would have cost New Mexico untold millions of dollars



- Thirty years of research supported by NM WRRI has revealed 50M acre-feet of Mesilla Valley groundwater – now being studied for desalination suitability

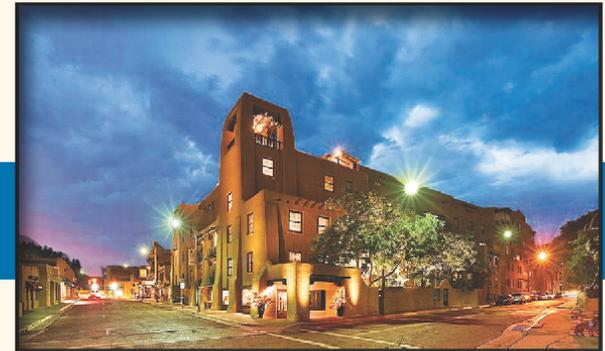
Information Transfer - Annual Water Conference

Premier water meeting every year

2014 Theme:
Statewide water assessment

Attendance:
Over 300 participants including agencies, researchers, stakeholders

SAVE THE DATE



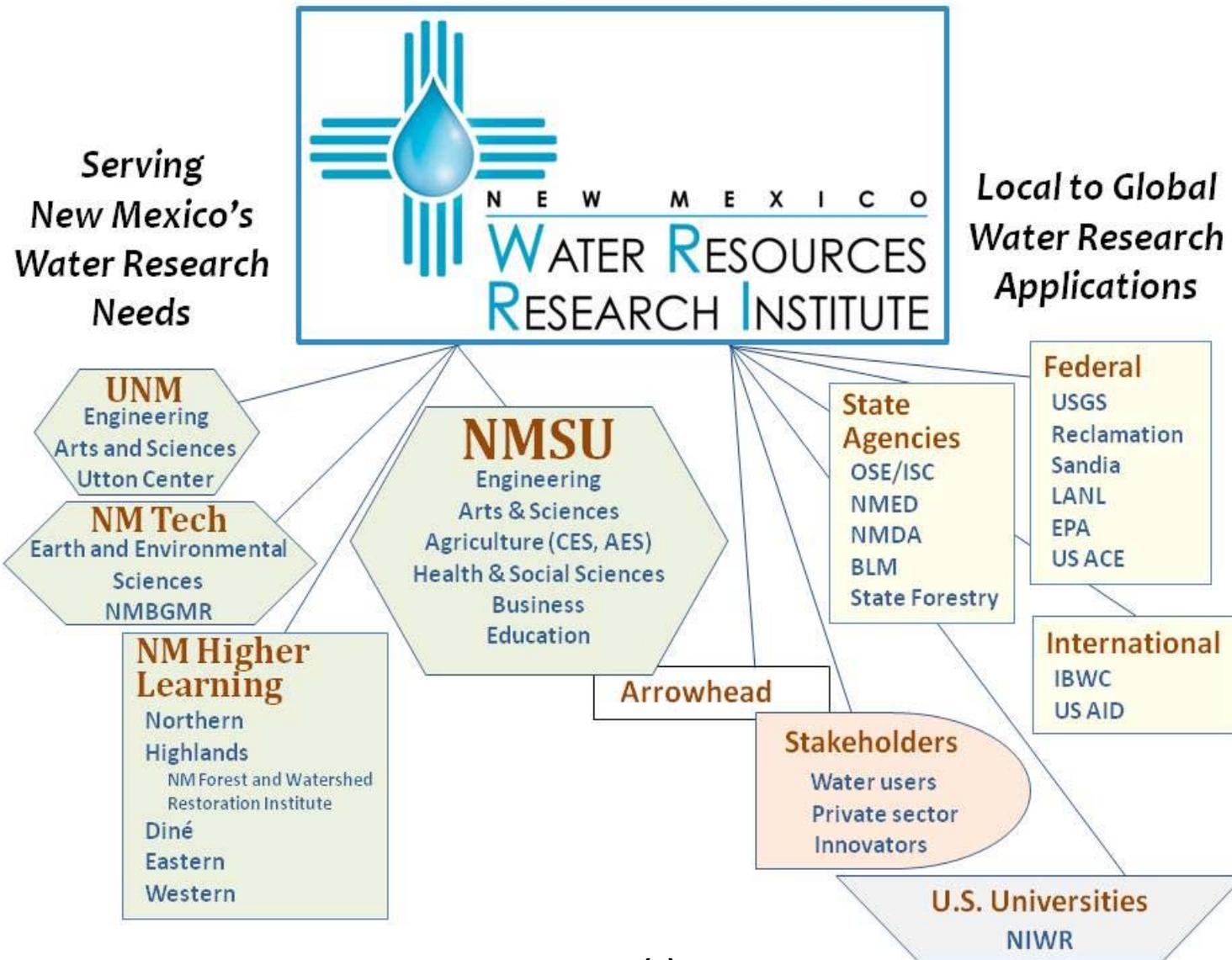
La Fonda, Santa Fe, NM

59th Annual
New Mexico Water Conference
November 18-19, 2014



MSC 3167, PO Box 30001
Las Cruces, NM 88001 575-646-4337
nmwrrri@nmsu.edu
<http://wrrri.nmsu.edu>

Statewide Coordination



NM WRRI Productivity

Research Grants: 520+ research and educational projects

New Mexico University Faculty: 200+ researchers

Students Trained: 2,500+ university students supported

Published Reports: 400+ technical and miscellaneous reports

Website <http://wrri.nmsu.edu>



Water Scarcity in New Mexico



New Mexico is in Severe Drought

U.S. Drought Monitor New Mexico

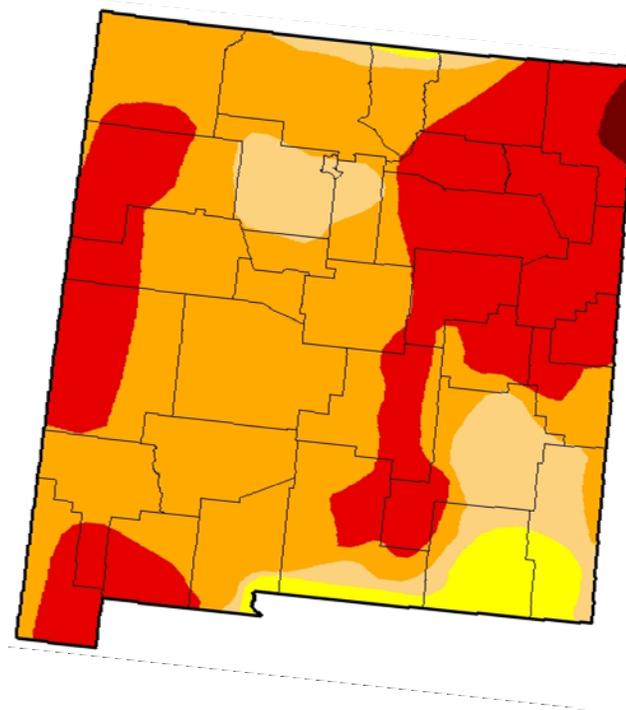
June 5, 2014

Drought Conditions (Percent Area)

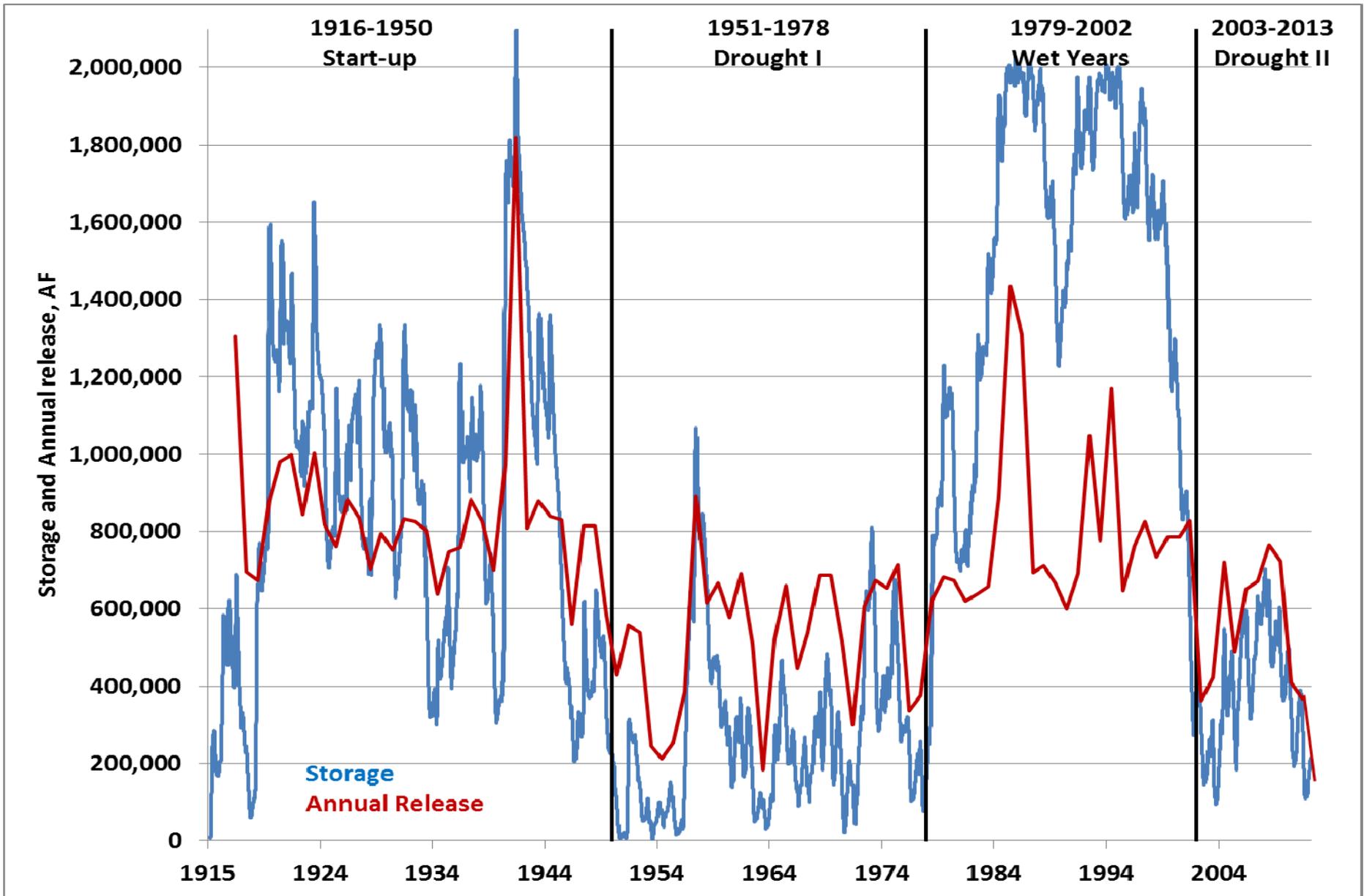
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	98.92	90.91	42.43
Last Week (07/02/2013 map)	0.00	100.00	100.00	98.92	92.58	42.77
3 Months Ago (04/09/2013 map)	0.00	100.00	98.68	93.30	58.73	4.36
Start of Calendar Year (01/01/2013 map)	0.00	100.00	98.83	94.05	31.88	0.97
Start of Water Year (09/25/2012 map)	0.00	100.00	100.00	62.56	12.25	0.66
One Year Ago (07/03/2012 map)	0.00	100.00	99.79	85.70	25.98	0.00

Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

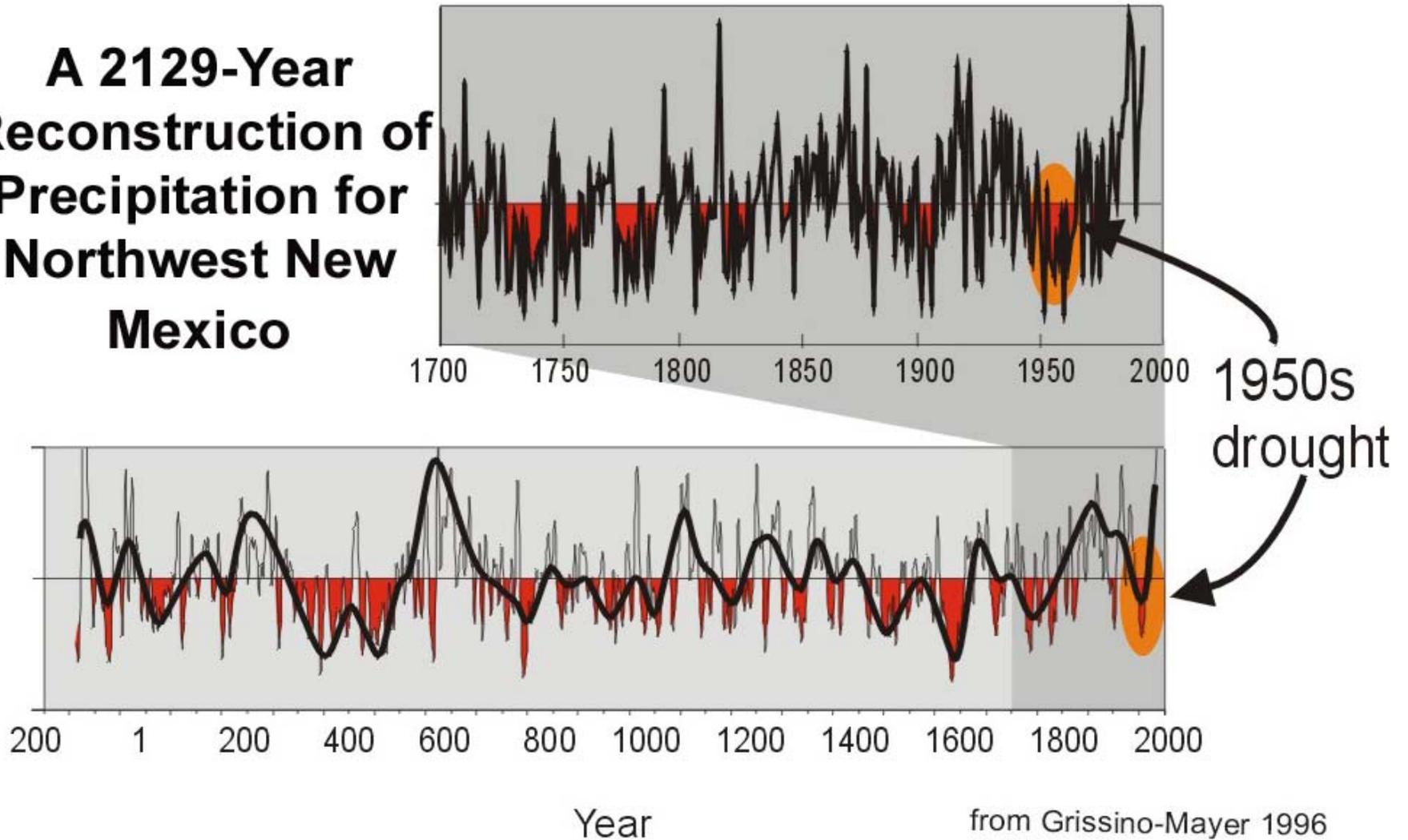


Elephant Butte storage shows wet and dry periods

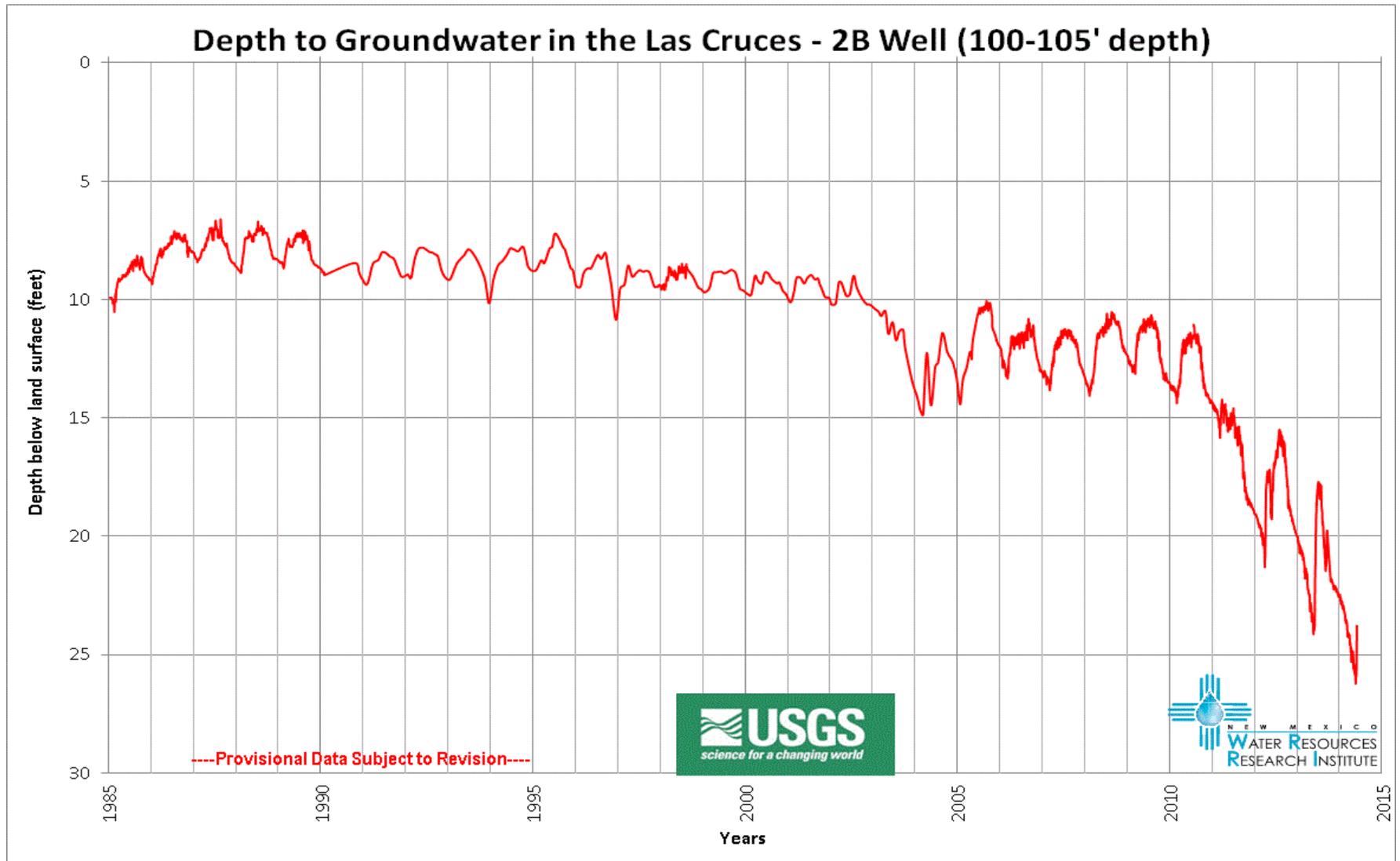


Historic droughts were more severe

A 2129-Year Reconstruction of Precipitation for Northwest New Mexico



With reduced surface water deliveries after 2002, groundwater levels drop



Water scarcity impacts are widespread



Oil and Gas

- Farmers selling water for fracking



Community water supplies

- 290 at risk single well systems
- 4 broken systems in 2013



Surface supply shortages

- Rio Grande Project 2013 smallest release ever



Ranching

- Destocked herds
- Windmills not functioning



Groundwater aquifers

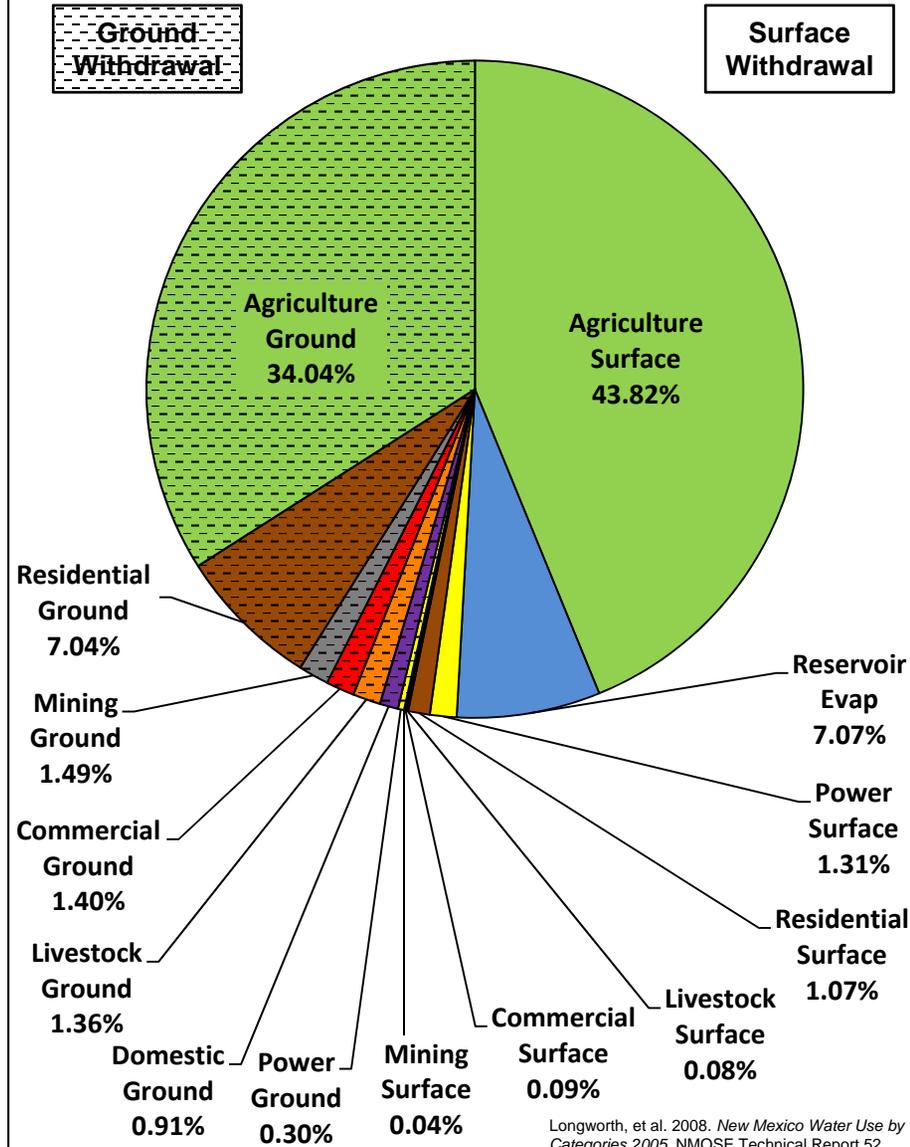
- fossil water aquifers declining
- river connected aquifers not being recharged



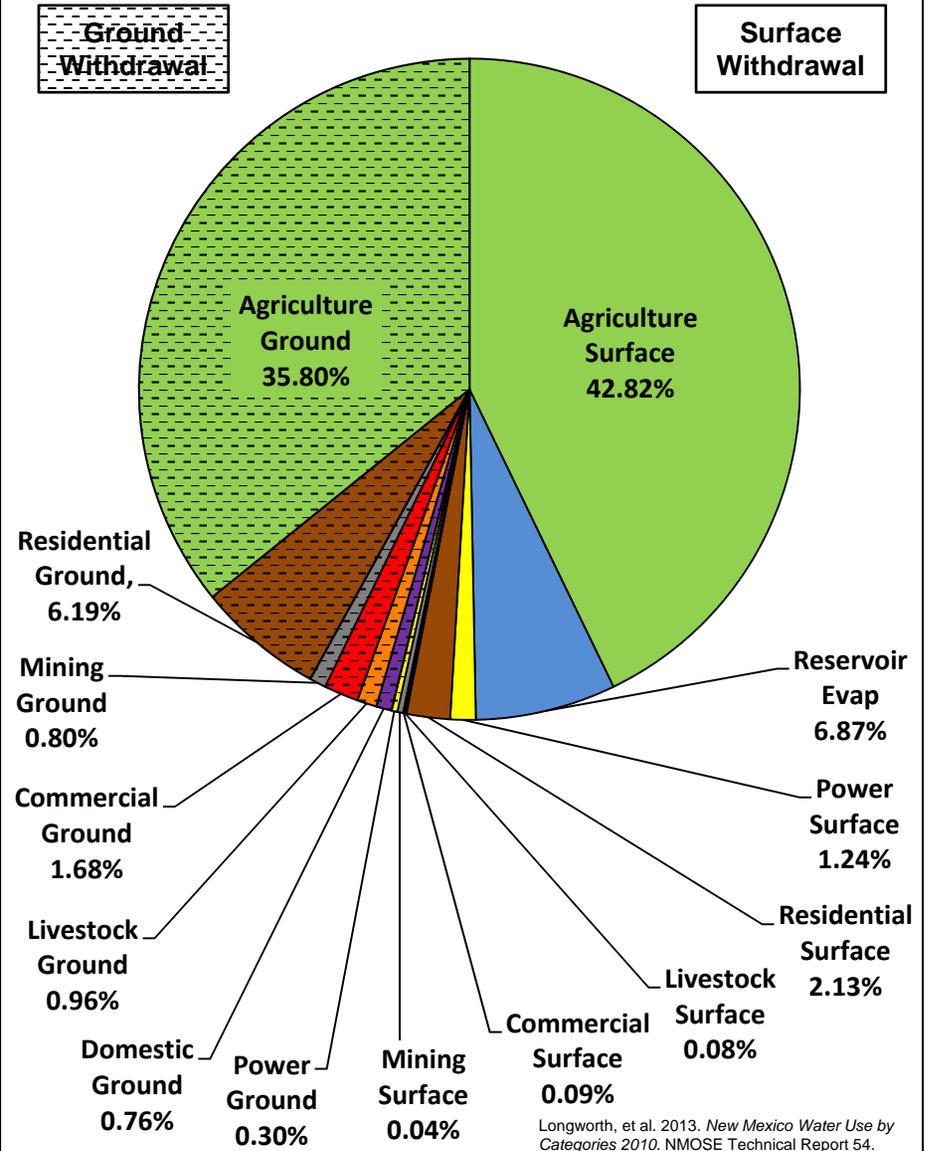
Urban supplies

- Stretched by drought
- Planning under uncertainty

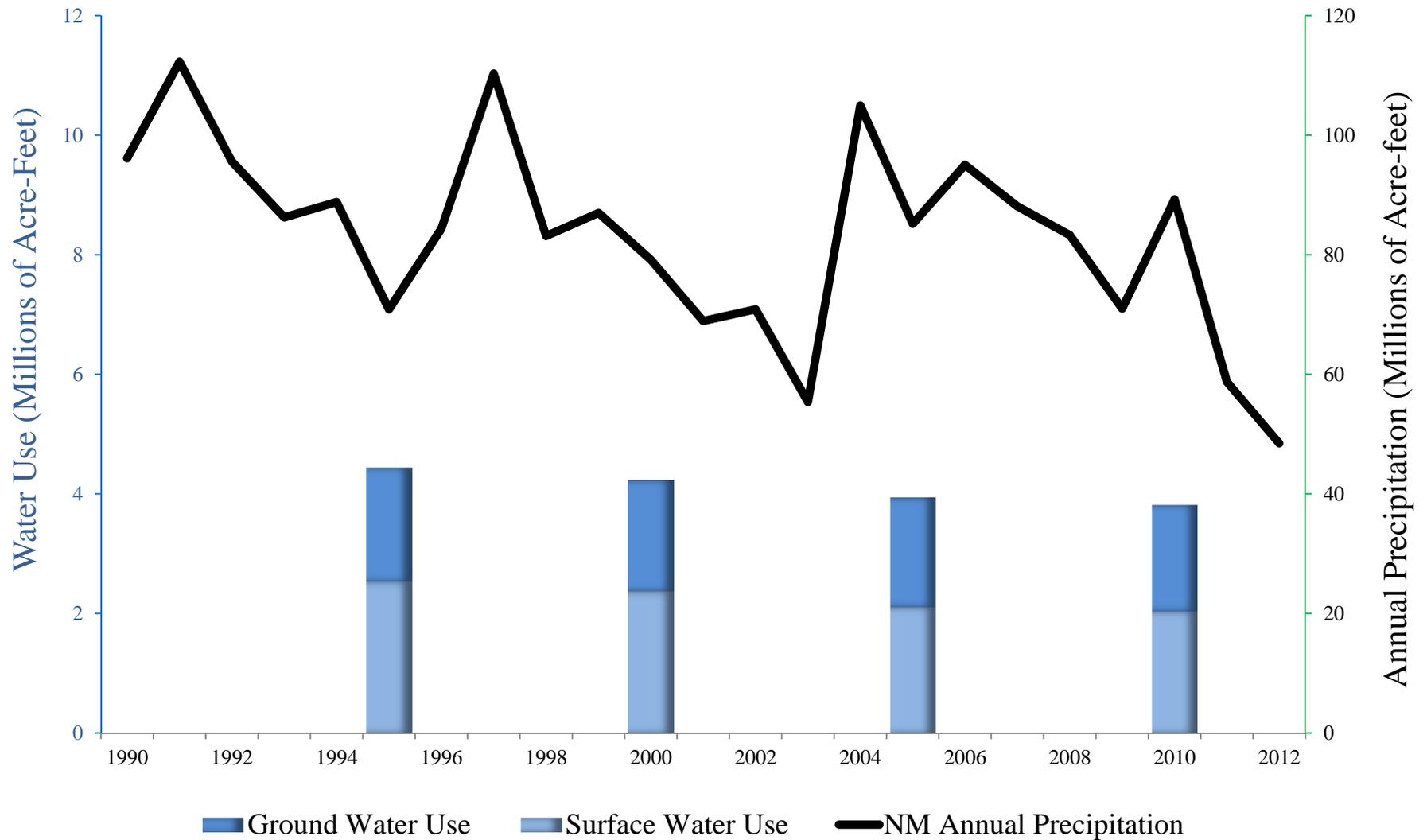
**New Mexico Water Withdrawals –
2005 (percent of 3,950,398 acre/ft total)**



**New Mexico Water Withdrawals –
2010 (percent of 3,815,944 acre/ft total)**



NM Statewide Water Use and Annual Precipitation

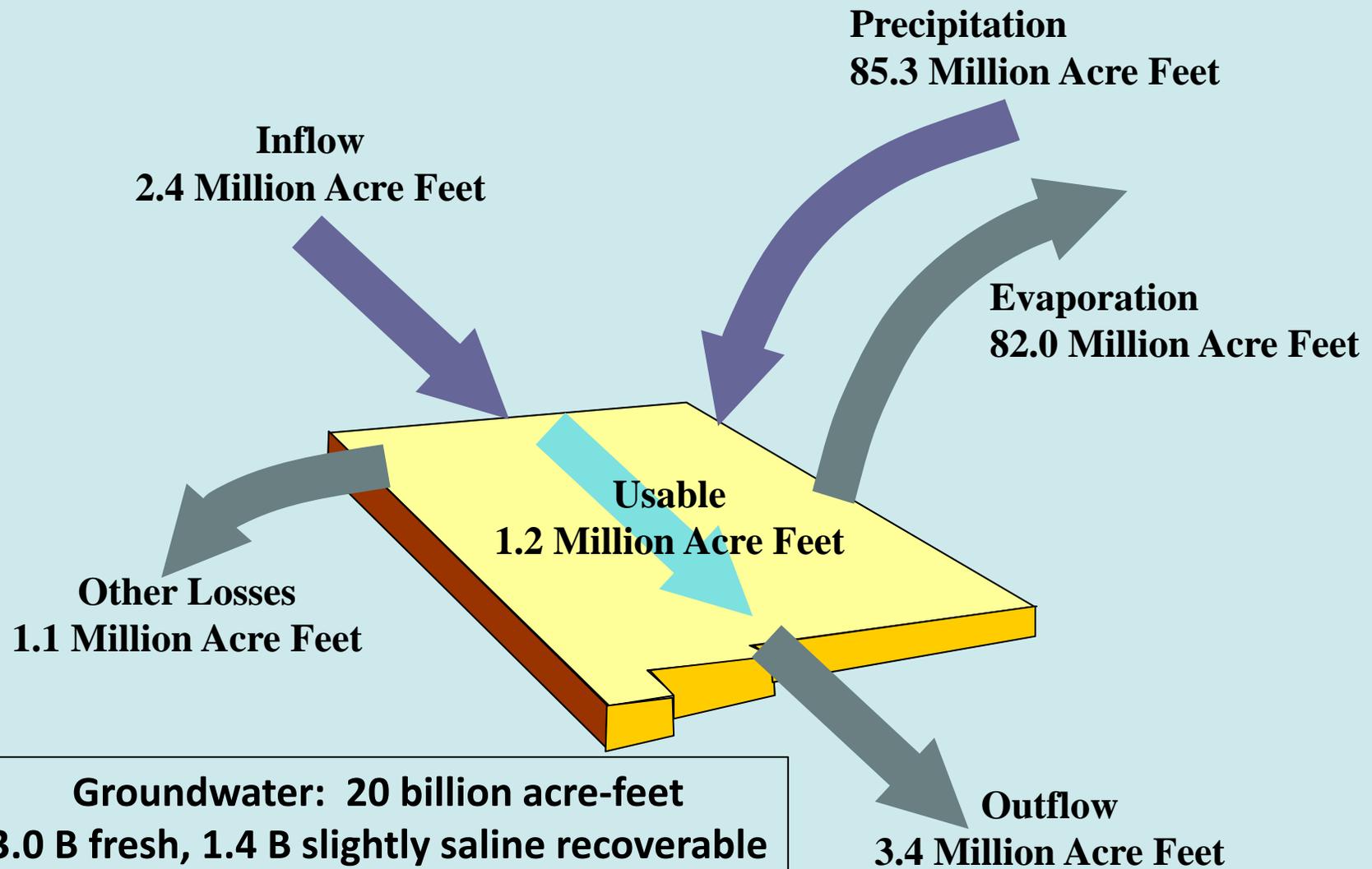


Water use data courtesy of : 95', 00' - Brian C. Wilson (NM OSE), 05', 10' John Longworth et al (NM OSE) accessed from http://www.ose.state.nm.us/publications_technical_reports_wateruse.html accessed on 15 May 2014

Precipitation data courtesy of : PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>, created 5 May 2014

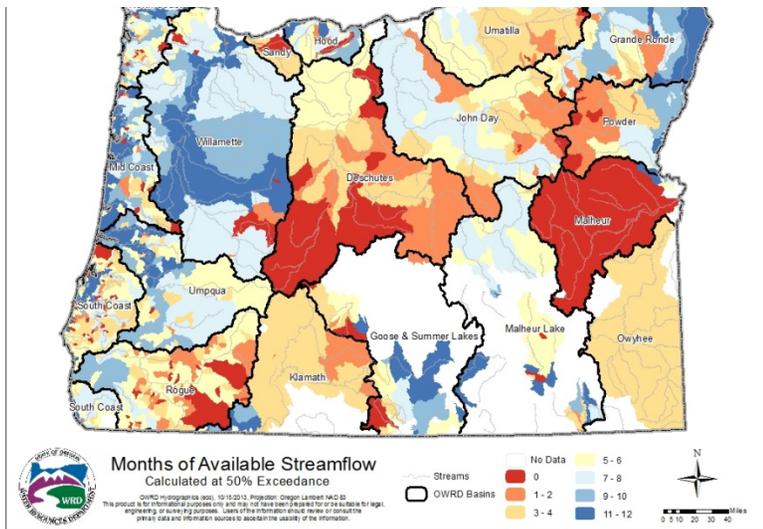
Existing water budgets are static and imprecise

NEW MEXICO MEAN ANNUAL SURFACE WATER BUDGET

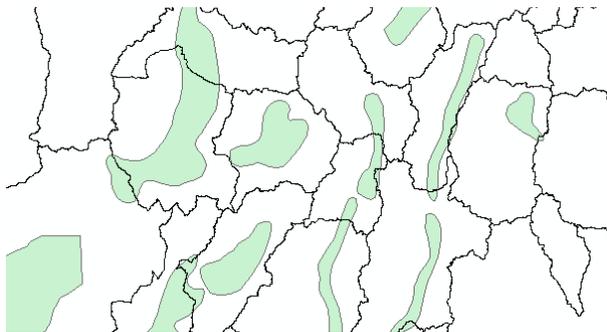


Other western states' water assessments to enhance water administration and planning

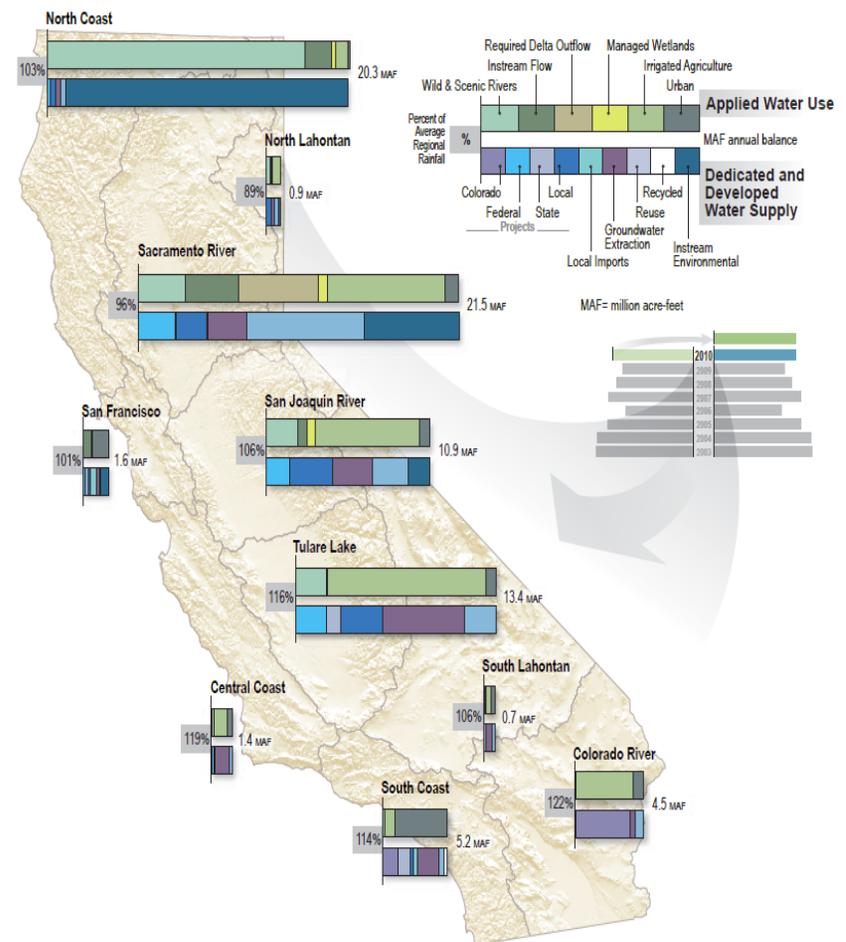
Oregon: Point flow data converted to spatial and temporal flow data



Utah: “Water Rights estimates of diversions per well helped split out annual USGS groundwater area pumping to Water Resources subareas”



California: Water balances with regional water uses and supplies in common platform



Update on FY 2015 Legislative Funding

Funding (NMSU RPSP in SB313)

- \$101K added to recurring \$216K = \$317K recurring base
- \$1M one-time water initiative

Thanks to

Legislators
Governor
NMSU Administration
Stakeholders
NM Universities
NM WRII Supporters

WRII structure for funding projects

- Program Development Review Board
 - Includes representatives from research universities, state agencies, USGS
- Technical Peer Reviewers
 - For objective scientific review of proposals
- Conference Committee
 - To capture information needs of stakeholders throughout New Mexico
- Statewide water assessment team
 - Multi-university multi-agency team with mechanism for stakeholder input

FY 15 NM WRRRI \$1M Water Initiative

- \$ 330,000 Multi University and Agency Water Assessment**
- \$ 235,000 WRRRI Statewide Water Assessment**
- \$ 80,000 Data Acquisition**
- \$ 150,000 Spatial Data Water Research Scientist**
- \$ 120,000 New Mexico Faculty Water Research Seed Grants**
- \$ 60,000 University Student Water Research Grants**
- \$ 25,000 Water New MeXico Prize Business Model**

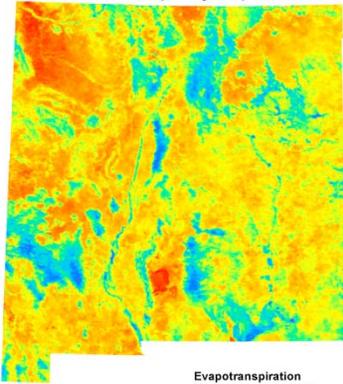
Cutting Edge Aspects of Statewide Water Assessment

- **Dynamic**
includes most up to date and real time data sets
- **Comprehensive**
includes water inputs and outputs
- **Science based**
utilizing latest scientific information including satellite data
- **Synthesized**
complex data streams made readily useful
- **Accessible**
web delivered with automation of data retrieval

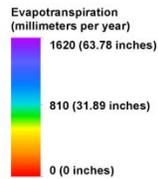
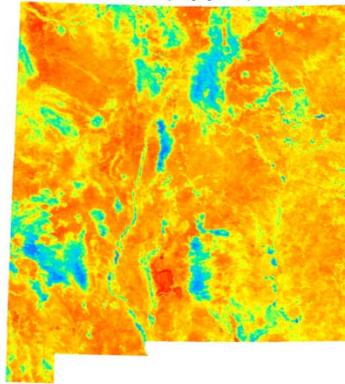
Statewide Water Assessment Research

New Mexico Yearly Evapotranspiration from Senay et al. (2013)

2006 (wet year)

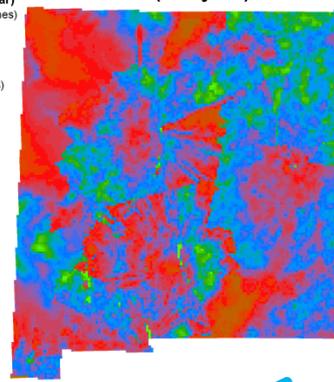


2011 (dry year)

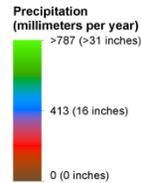
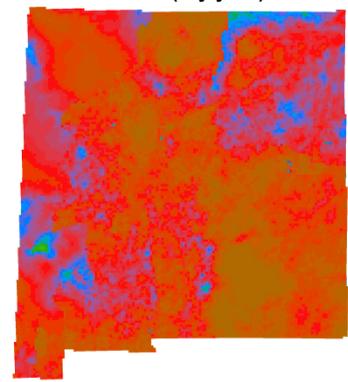


New Mexico Yearly Precipitation from National Weather Service

2006 (wet year)

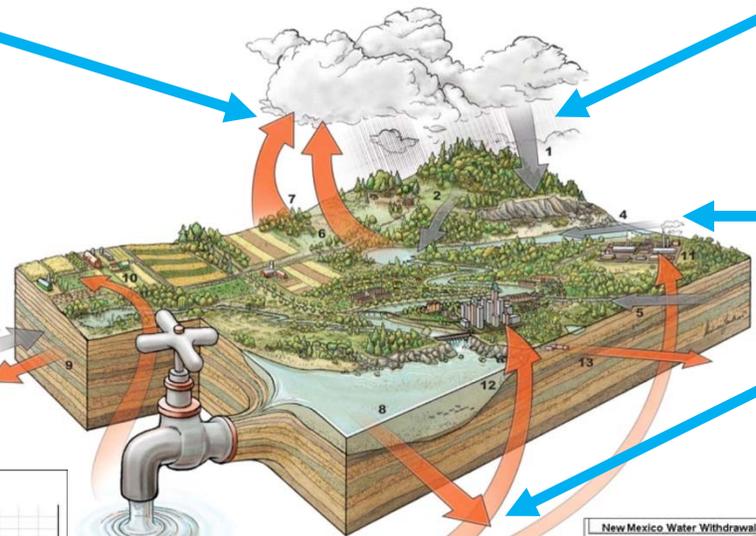


2011 (dry year)

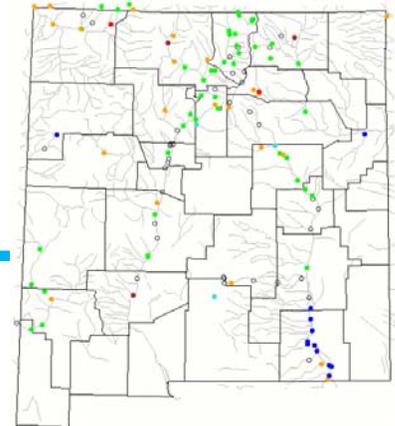


Components of a Water Budget

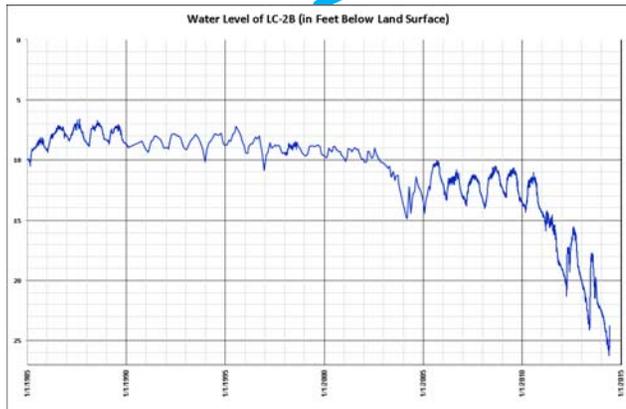
- | | |
|--|---|
| Inputs | Outputs |
| <ul style="list-style-type: none"> 1. Precipitation 2. Runoff 3. Groundwater Inflow 4. Surface Water Inflow 5. Water Diversions | <ul style="list-style-type: none"> 6. Evaporation 7. Transpiration 8. Surface Water Outflow 9. Groundwater Outflow 10. Irrigation 11. Industrial Uses 12. Residential Uses 13. Water Diversions |



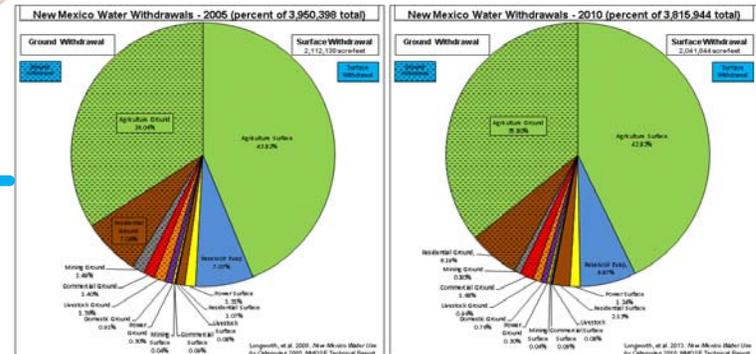
Surface Water Changes from USGS Streamgages



Groundwater Changes from USGS Wells

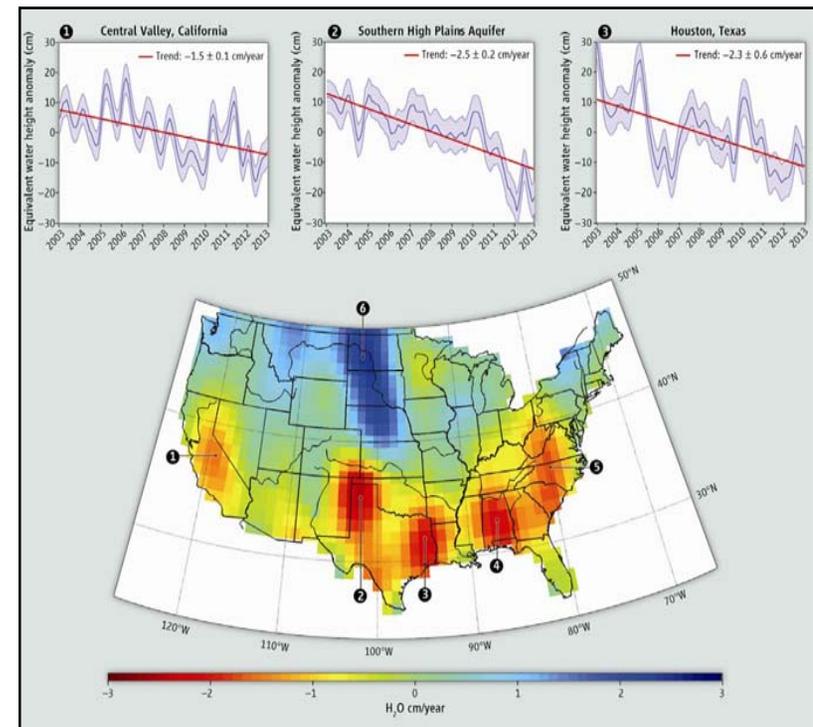


Statewide Water Use from Office of the State Engineer



Implementation of Statewide Water Assessment

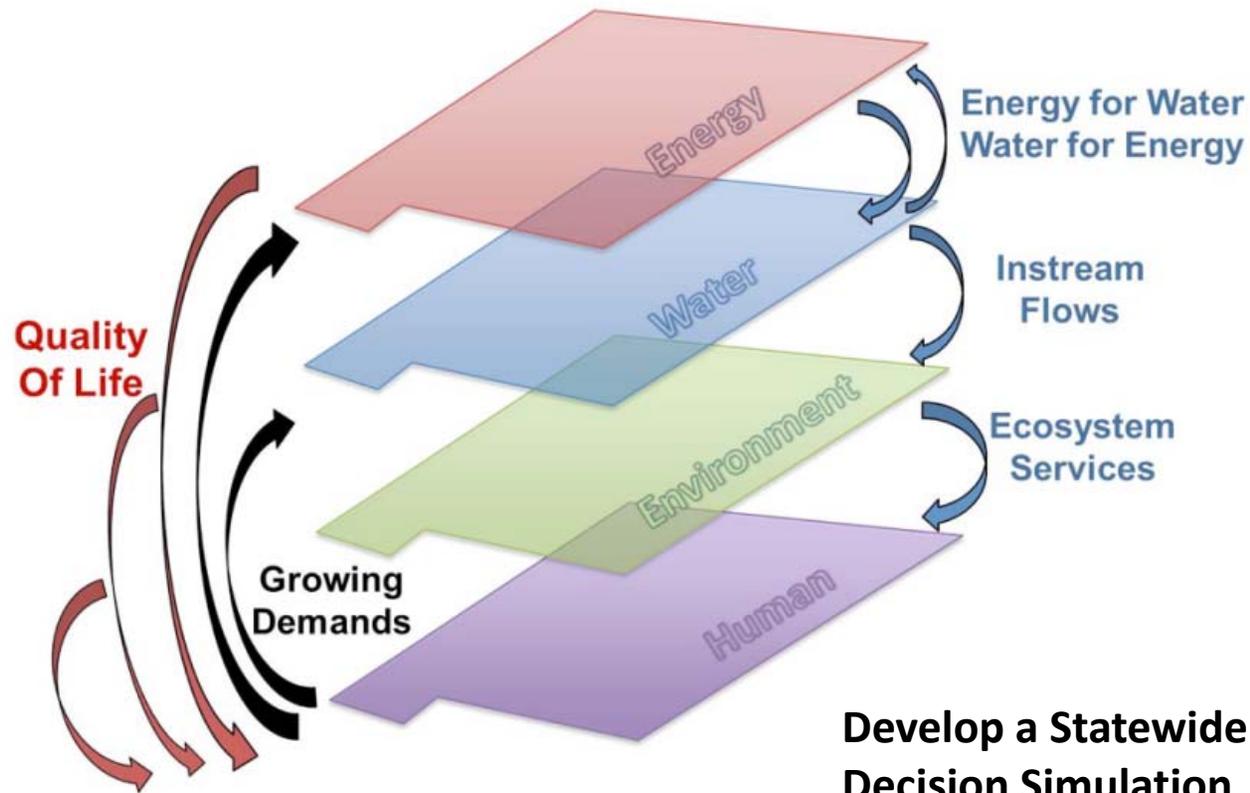
1. Teams of researchers for components that will complement OSE and bring New Mexico up to par with western states like California, Oregon, Utah, Wyoming
2. Statewide water assessment steering committee
3. University and agency collaboration
4. Stakeholder input
5. Concrete deliverables
6. Bring together state-of-the-art information for ready use



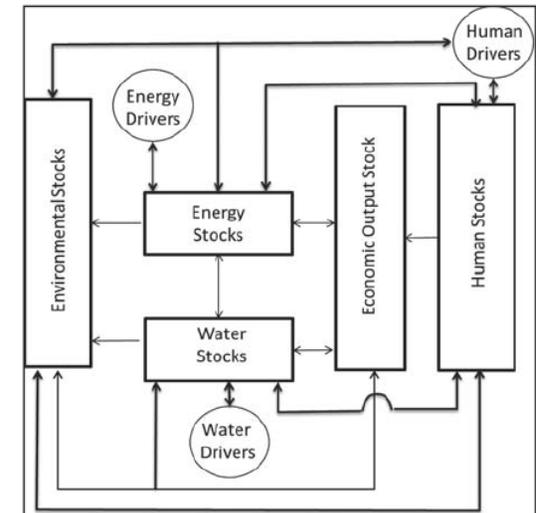
Statewide Water Simulation Tool

New Mexico EPSCoR

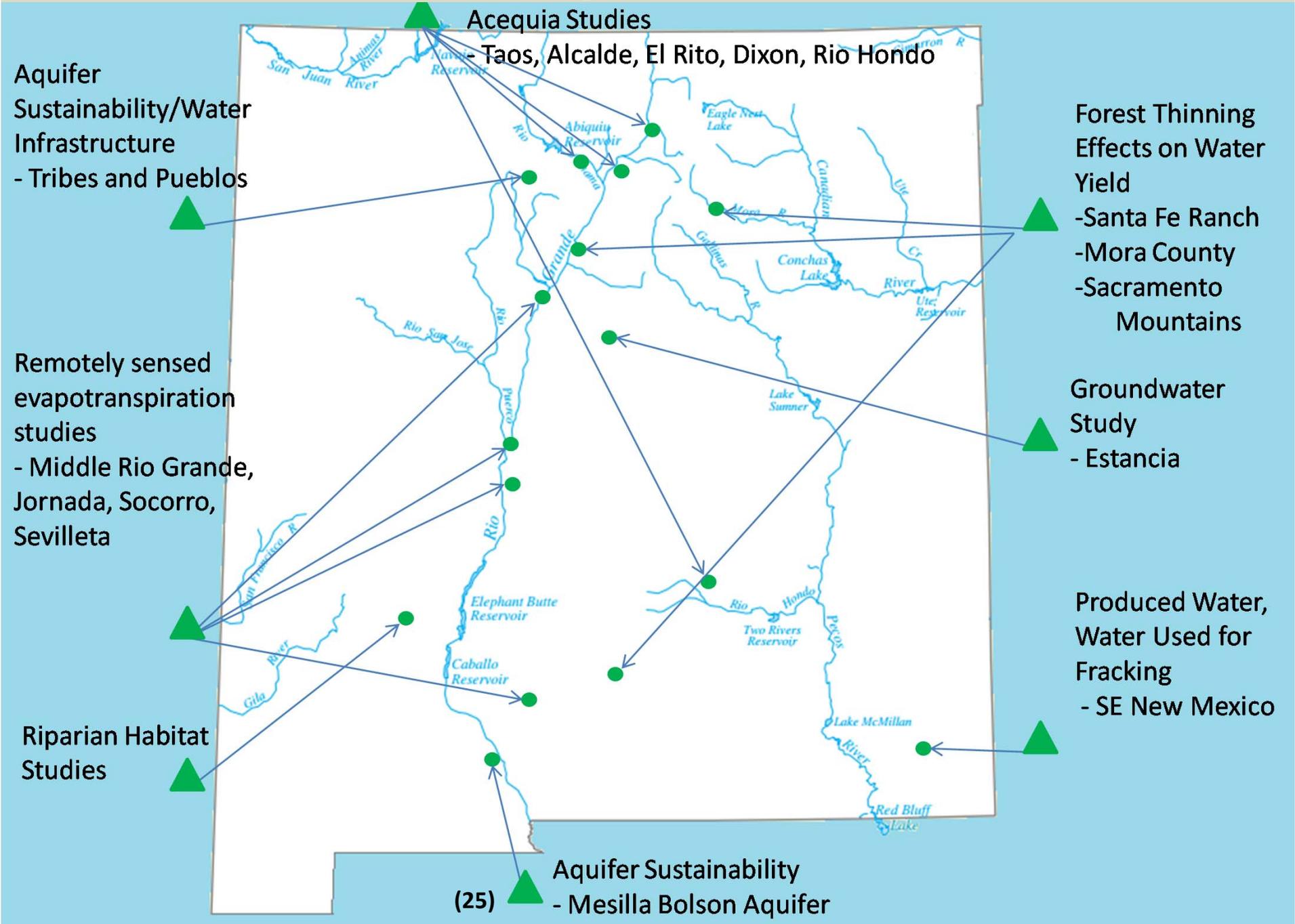
Construct spatial databases and develop dynamic, geospatial budgets for water, human, energy, environment



Develop a Statewide Decision Simulation System



Technical Studies that Complement Statewide Water Assessment



Faculty Water Research Grants

Proposals received in response to NM WRRRI FY15 Faculty Water Research Program

1. Doing hydrology backwards in New Mexico to estimate a statewide water assessment (i.e., Canadian, Rio Grande, Gila, and Pecos Rivers); UNM
2. Soil water sodicity as a standard to predict invasive plant problems in NM; NMSU
3. Policy alternatives for controlling nitrate pollution from NM's dairies; UNM
4. Quantifying the variability and interactions of stream flow, riparian extent and ET; NM Tech
5. Assessment of water table and water quality variations with respect to river flow along Rio Grande between Garfield, NM and Fabens, TX; NMSU
6. Policy options to enhance water supply in support of revision of the Lower Rio Grande Water Users Organization Regional Plan; NMSU
7. Photon-energized forward osmotic system for seawater and brackish water desalination; Highlands/NM Tech
8. Identification of law and policy options for best water management practices; UNM
9. Nanocrystalline cellulose reinforced polyamide thin film as RO membranes; UNM

Student Grant RFP will be released in August for projects to start in October.

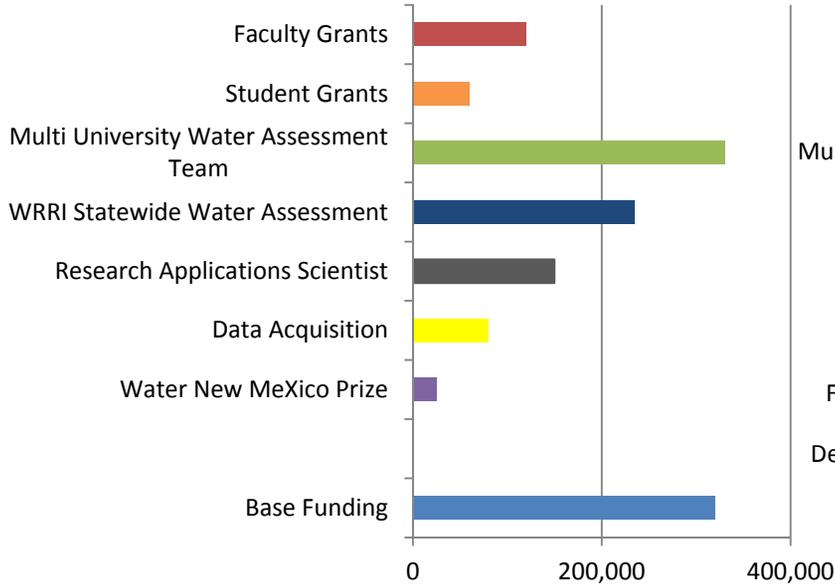
Research Needs Across New Mexico

- Evaluating the Current Coldwater Temperature Standards for New Mexico to Protect Aquatic Life (NMSU, WQCC, NMED; 1 year; \$30,000)
- Where Will the Water Come From? Analyzing Grassroots Political Formations in Mega-energy Development in Mora, Rio Arriba, San Miguel, and Lea counties (UNM; 1 year; \$30,000)
- Well Water Quality Study for the Hatch and Las Cruces Areas – Studying the Interaction Between Surface Water, Irrigation Water Applied to Crops, and Groundwater (NMSU; 1 year; \$30,000)
- Helping Families without Access to Water – Household Water Conservation Workshop & Water Rate Assessment (WRRI; 3 years; \$195,000)
- Improving Access to Potable Water within a Transboundary Regional Aquifer (WRRI; 1 year; \$80,000)
- Estimating a Critical Water Assessment Component: ET in Water Storage Reservoirs and Lakes in the Upper Rio Grande Basin with Satellite Data from 2000 to 2014 (UNM; 1 year; \$30,000)

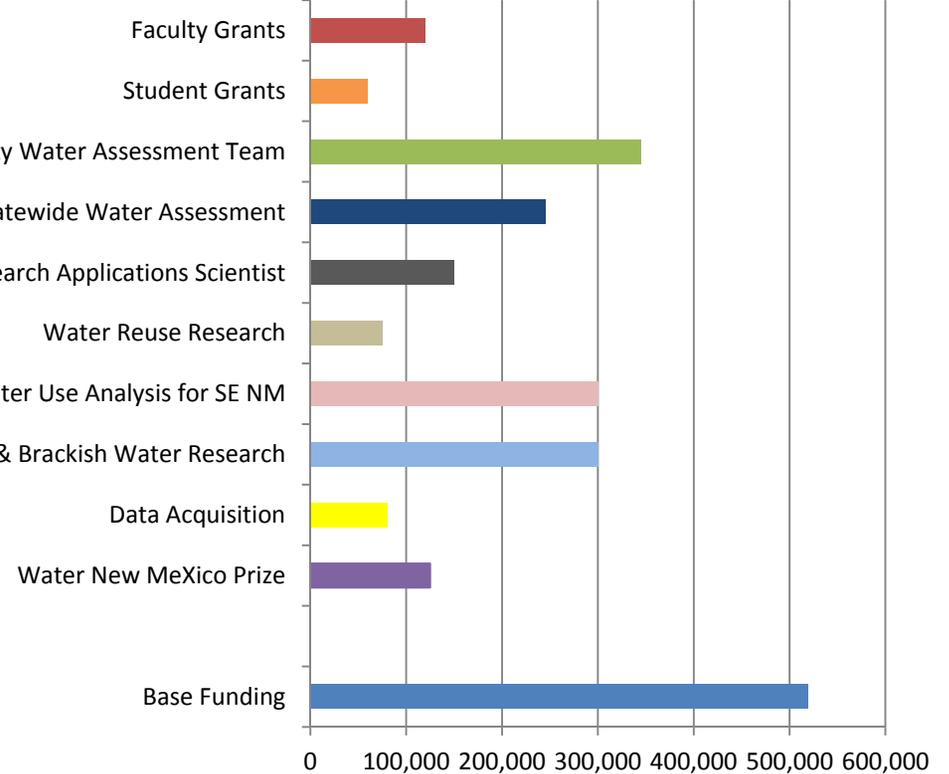
WRRI's Expansion Budget Breakdown

FY15 (\$1M) and FY16 (\$2M)

Year 1 FY15 (1M)



Year 2 FY16 (2M)



	Year 1 (FY15)	Year 2 (FY16)
Faculty Grants	120,000	120,000
Student Grants	60,000	60,000
Multi University Water Assessment Team	330,000	345,000
WRRI Statewide Water Assessment	235,000	245,000
Research Applications Scientist	150,000	150,000
Water Reuse Research		75,000
Fracking Water Use Analysis for SE NM		300,000
Desalination & Brackish Water Research		300,000
Data Acquisition	80,000	80,000
Water New MeXico Prize	25,000	125,000
Total Expansion Fund Request	1,000,000	2,000,000
Base Funding (Includes Policy Analyst)	319,400	519,400
Total Base & Expansion Fund	1,319,400	2,319,400

FY16 NM WRRRI Expansion Request \$2M/year

(contingent on Regents approval as an NMSU legislative priority)

\$200,000 base funding expansion for associate director policy analyst to apply water research policy studies to help solve drought and water scarcity problems in New Mexico leading to new policy directives based on scientific data and core NM WRRRI faculty research support

\$120,000 New Mexico Faculty Water Research Seed Grants

At least four research projects per year that confront water issues will be funded at NMSU, UNM, and NM Tech. Funding is primarily for student training and products include technical reports, peer-reviewed journal articles, and communications to water managers and end-users.

\$60,000 University Student Water Research Grants

Approximately twelve grants per year will fund student research at NMSU, NM Tech, UNM, ENMU, NMHU, WNMU, Diné College and Northern NMC and provide leverage for securing additional funding.

\$300,000 Desalination and Brackish Water Research

In-house research will leverage Brackish Groundwater National Desalination Research Facility (BGNDRF) federal research installation and NMSU programs with Reclamation.

\$300,000 Fracking Water Use Analysis for SE New Mexico

Critical analysis of water level change, water quality, water use in hydraulic fracturing areas

FY16 NM WRRI Expansion Request \$2M/year (cont.)

\$590,000 Statewide Water Assessment

This ongoing funding supports a yearly statewide water assessment that addresses water scarcity challenges and improves water planning with synthesis of cutting edge scientific data and involves key water people.

\$75,000 Research on Water Reuse

Complete water quality component with water reuse research

\$80,000 Hydrologic Data Acquisition and Synthesis

Funds will be used to acquire, process, synthesize, and deliver data to assist in making sound management and policy decisions.

\$150,000 Research Applications Scientist

All water use sectors from agriculture to urban, environmental, and industry will benefit from a regional water scientist who will use the most advanced science to understand New Mexico's complex water systems.

\$125,000 Water New Mexico Prize

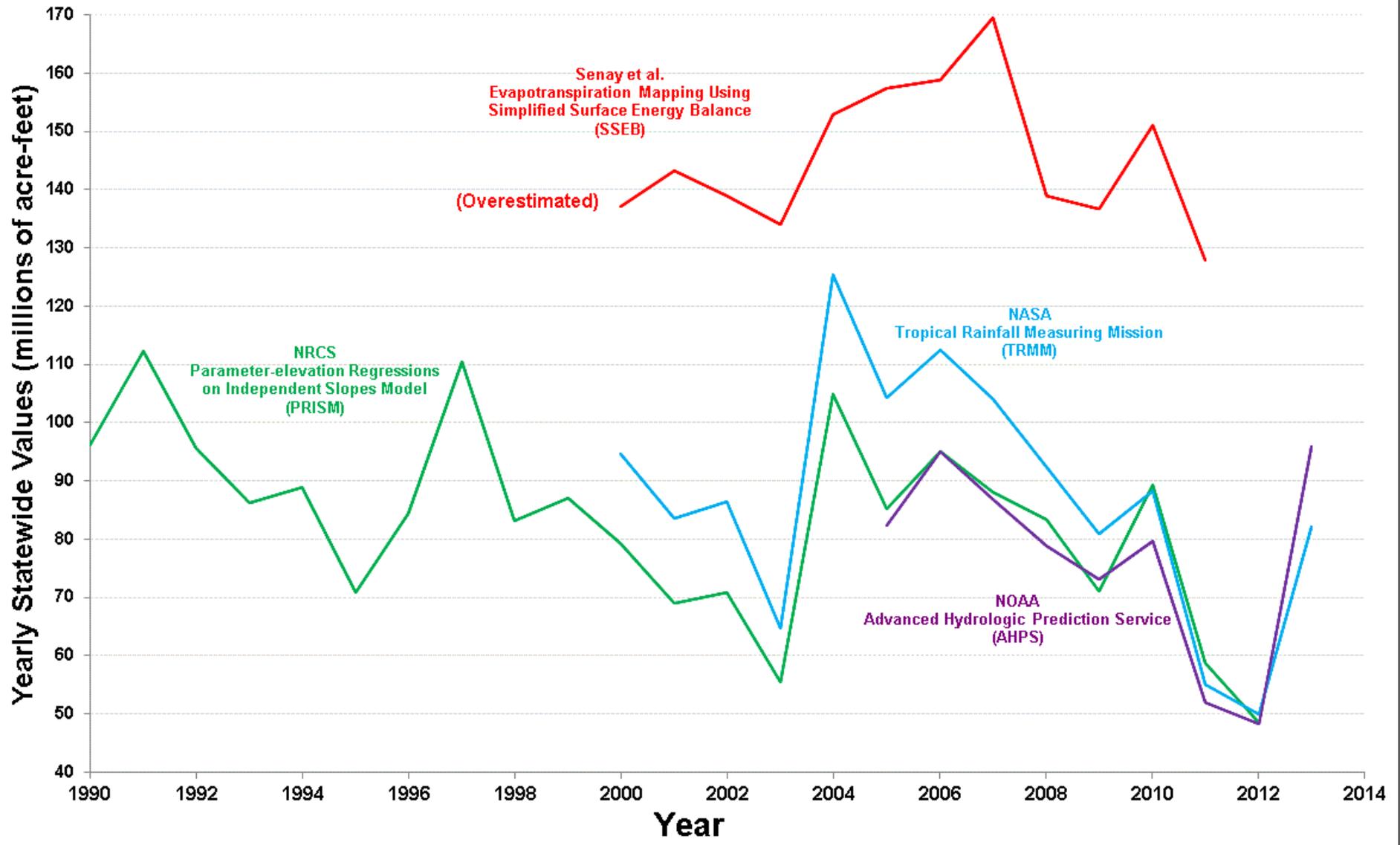
This award recognizes excellence in water research and application.

THANK YOU

THANK YOU



New Mexico Water Assessment Component Models

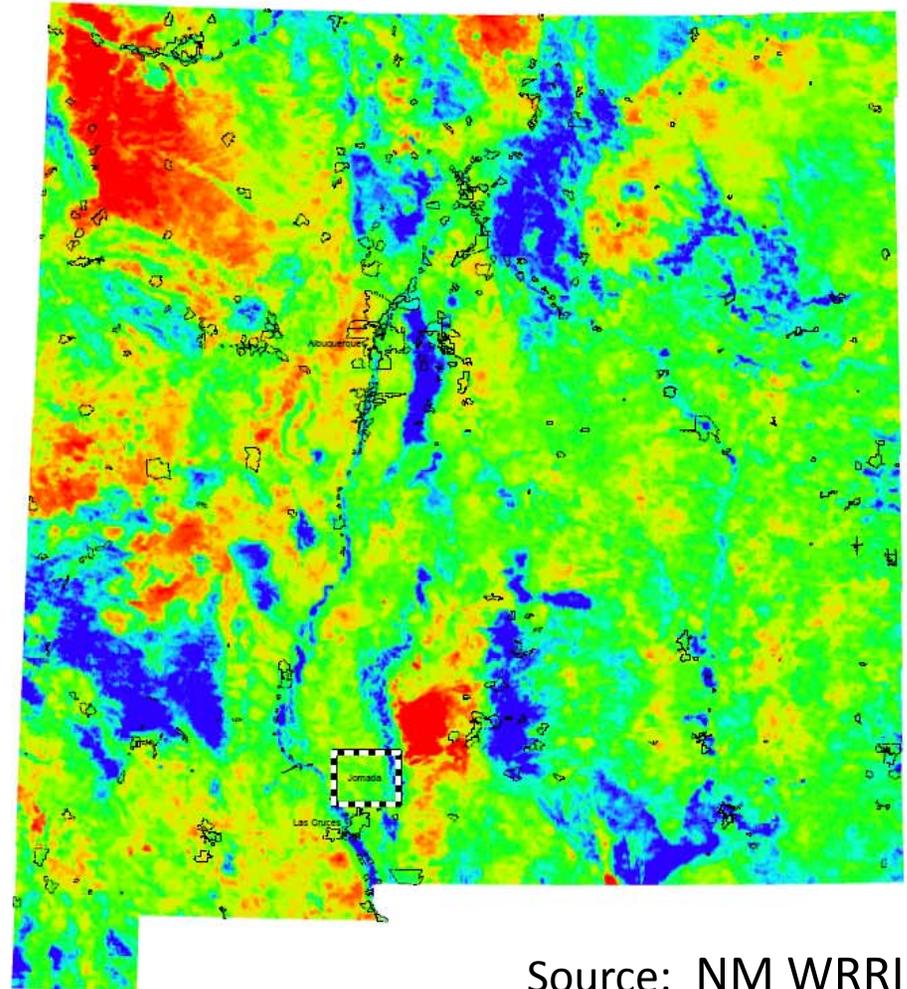
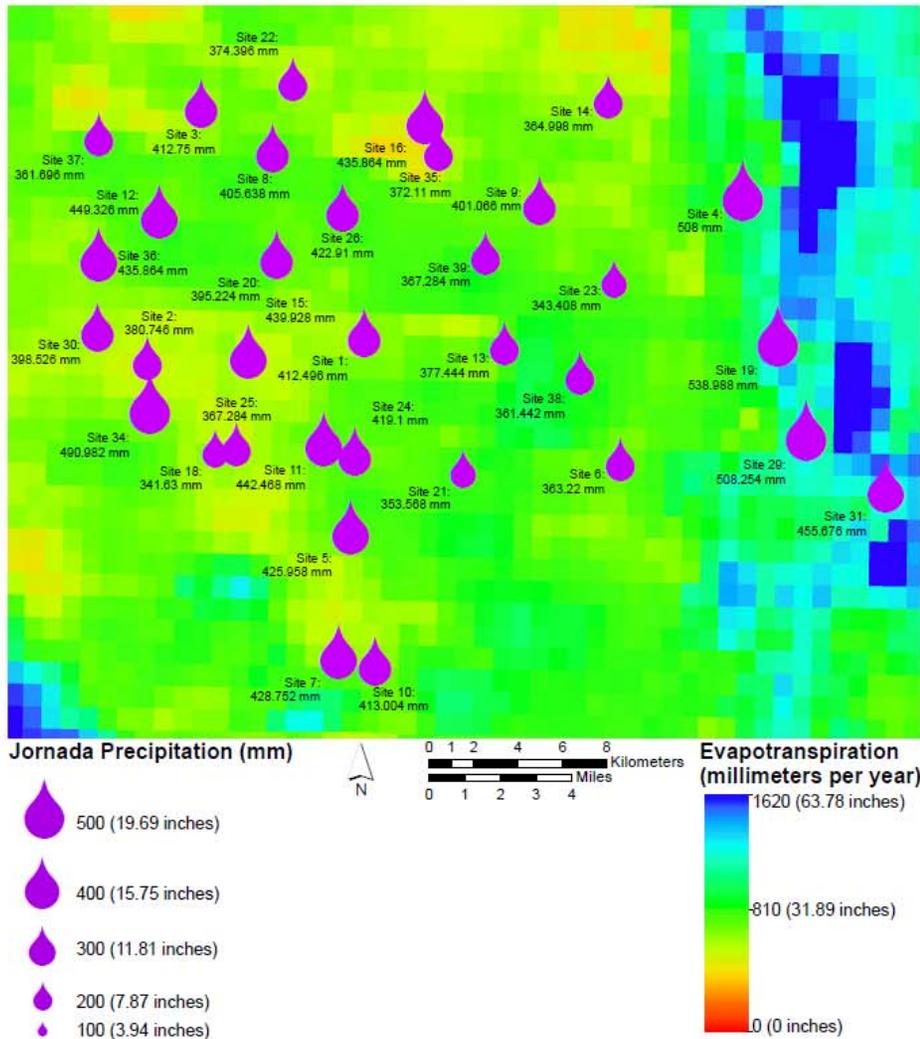


(i)

Correlation Between Jornada Precipitation and Statewide Evapotranspiration

We are attempting to correlate precipitation within the Jornada Experimental Range (a closed basin) with evapotranspiration data obtained from a model using MODIS satellite imagery (Senay et al., 2013). We hope to verify the model's ability to provide precise data as a component for a statewide water budget.

2006 Jornada Experimental Range Precipitation and Evapotranspiration



Source: NM WRRRI

Updated groundwater assessment

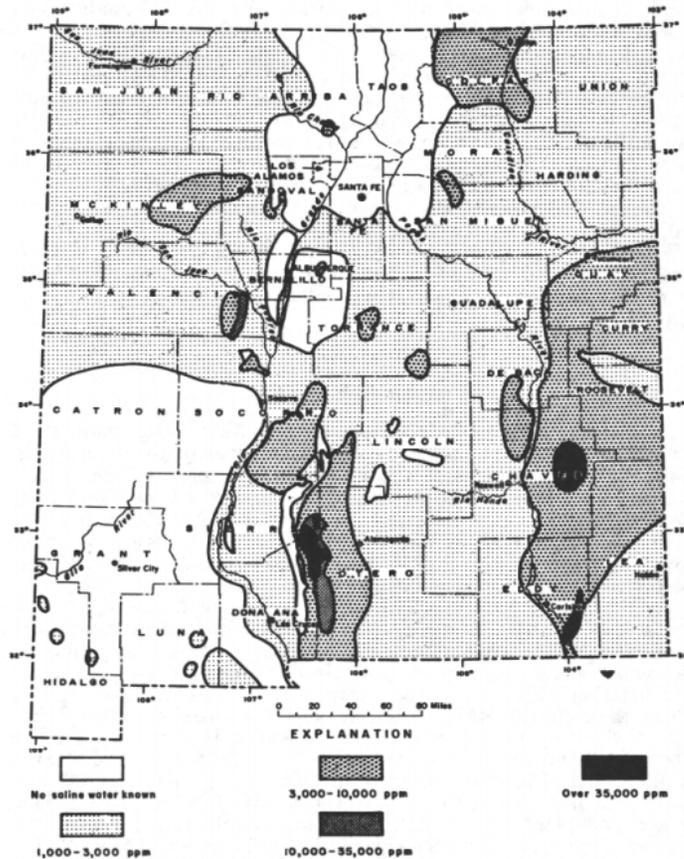
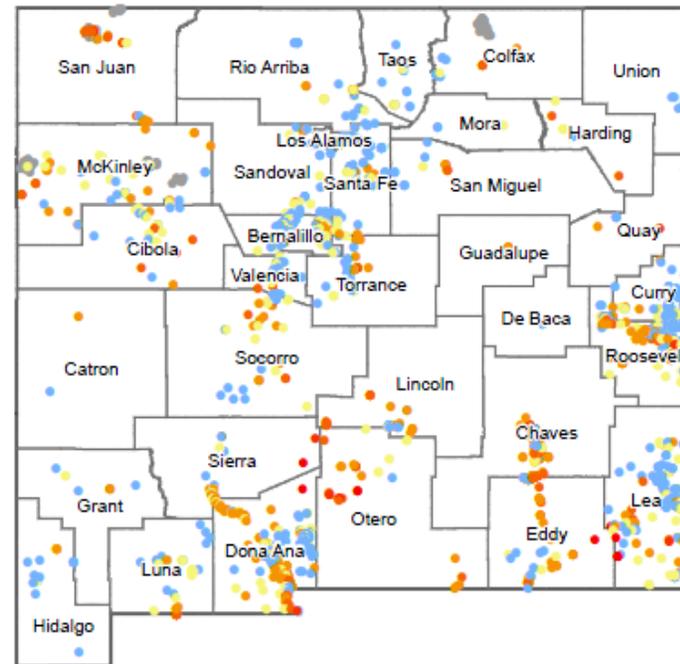


Figure 1. Map of the general occurrence of saline groundwater in New Mexico (Hale et al. 1965).

Concentration of total dissolved solids in sampled wells

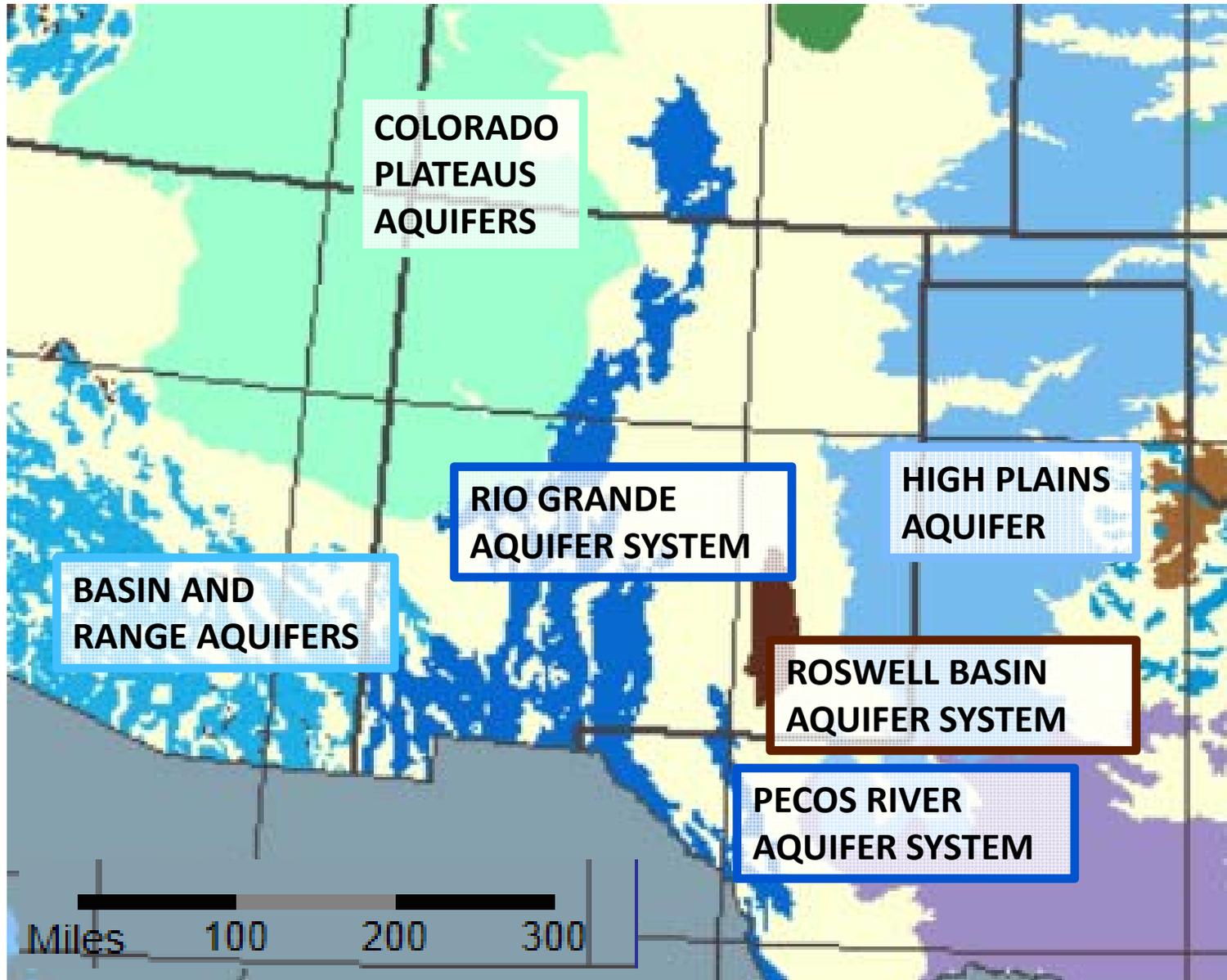


Total dissolved solids (milligrams per liter)

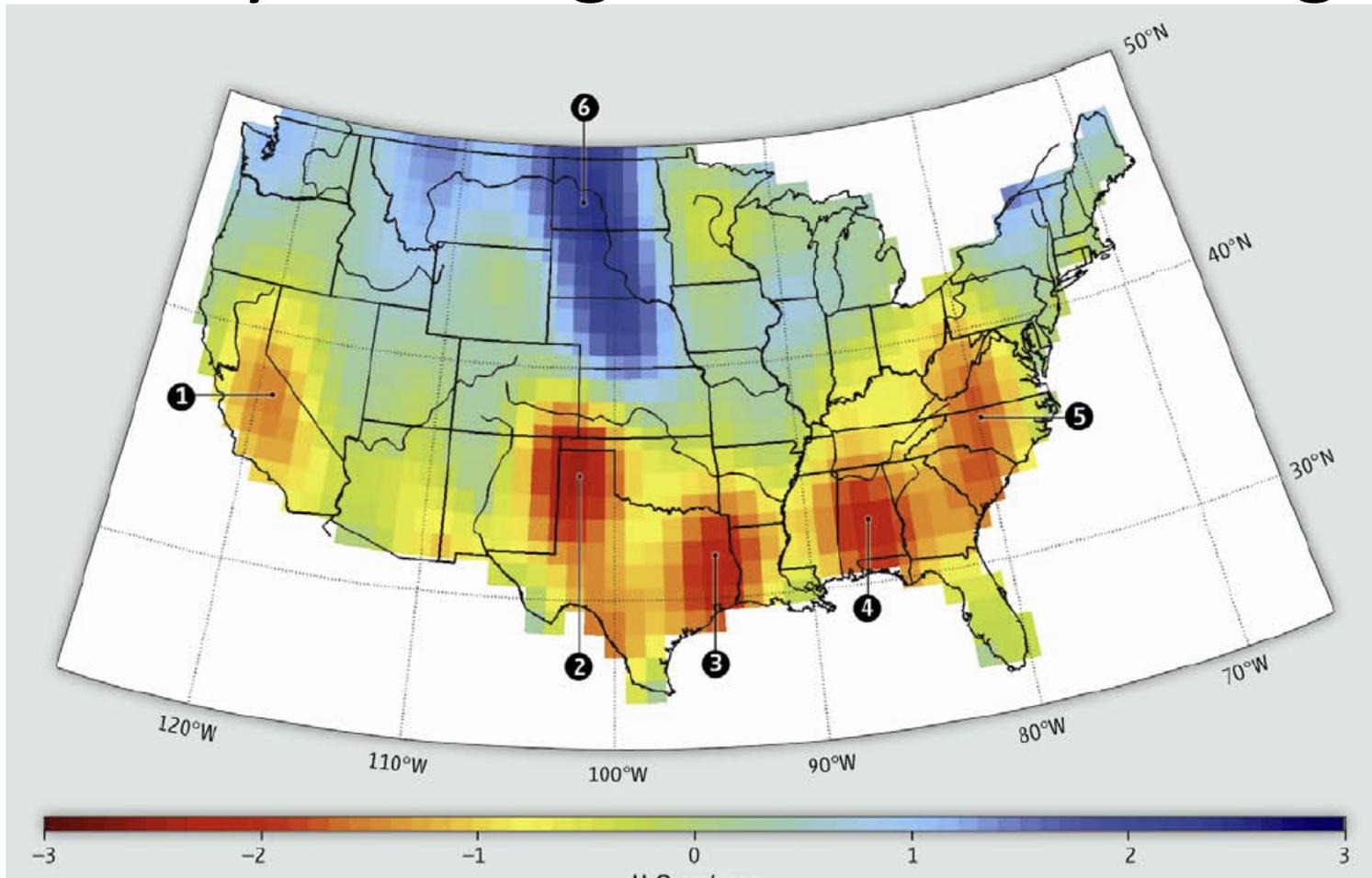
- < 500
- 500 - 1000
- 1,000 - 3,000
- 3,000 - 10,000
- 10,000 - 20,000
- > 20,000
- TDS data not entered

Up to date well data provided by EMNRD, EPA, NMED, and USGS

Aquifers of New Mexico – Hydrologic Diversity



Gravity-based groundwater change



ENVIRONMENTAL SCIENCE

Water in the Balance

14 JUNE 2013 VOL 340 SCIENCE www.sciencemag.org

Published by AAAS

James S. Famiglietti^{1,2,3} and Matthew Rodell⁴

Satellite data may enable improved management of regional groundwater reserves.

(v)

Source: NM WRI