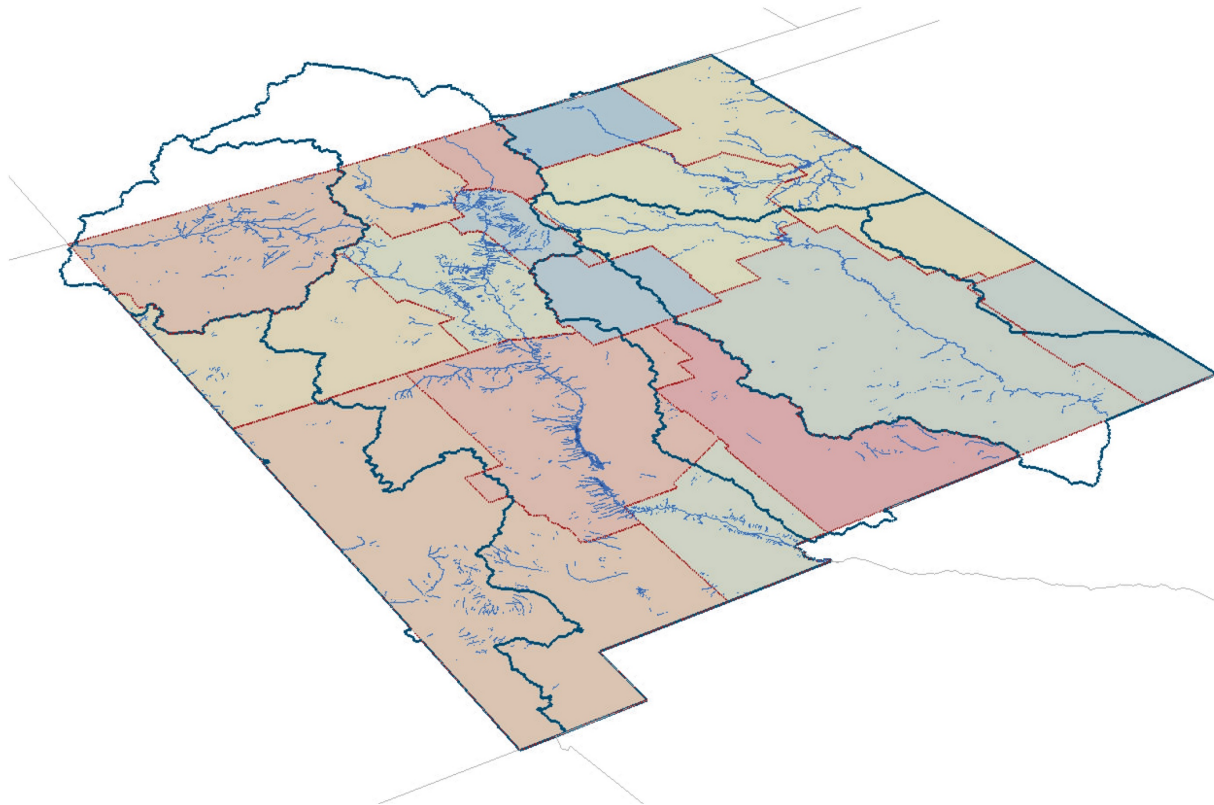


Water Budget Management Scenarios for Regional Resilience in New Mexico – NM WRRI Contributions to the NM ISC 50 yr Water Plan

NM Water Dialogue
13 Jan, 2022



Teams – ISC project, NM WRRI DSWB water
budget and offshoot models

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NM WRRI ISC 50-year water plan contributions and approach

NM WRRI Contributions to 50-Year Water Plan:

- 66th Annual New Mexico Water Conference showcasing 50-Year Water Plan phases 1-3 progress
- During this conference, facilitated discussion of resilience adaptation strategies during Day 3 breakout sessions
- NM DSWB analysis of regional stakeholder resilience strategies and visions utilizing global climate models consistent with Lead Ahead Analysis

NM WRRI ISC project approach:

Assessment

- NM WRRI regional water budget analysis
- Offshoot models integrating socio-economic indicators

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Pivot to resilience adaptation

- Stakeholder conversations
 - Adaptation planning approach for integrated water and community resilience
 - Key question - what are the future scenarios that should be modeled and assessed?
 - Community-driven metrics to define and measure both water and agricultural resilience
- 66th Annual NM Water Conference

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Ongoing work

- Incorporate future predictions and community strategies into water budget scenarios
- Facilitate research, development, and funding of community innovations

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**50 yr
water
plan**

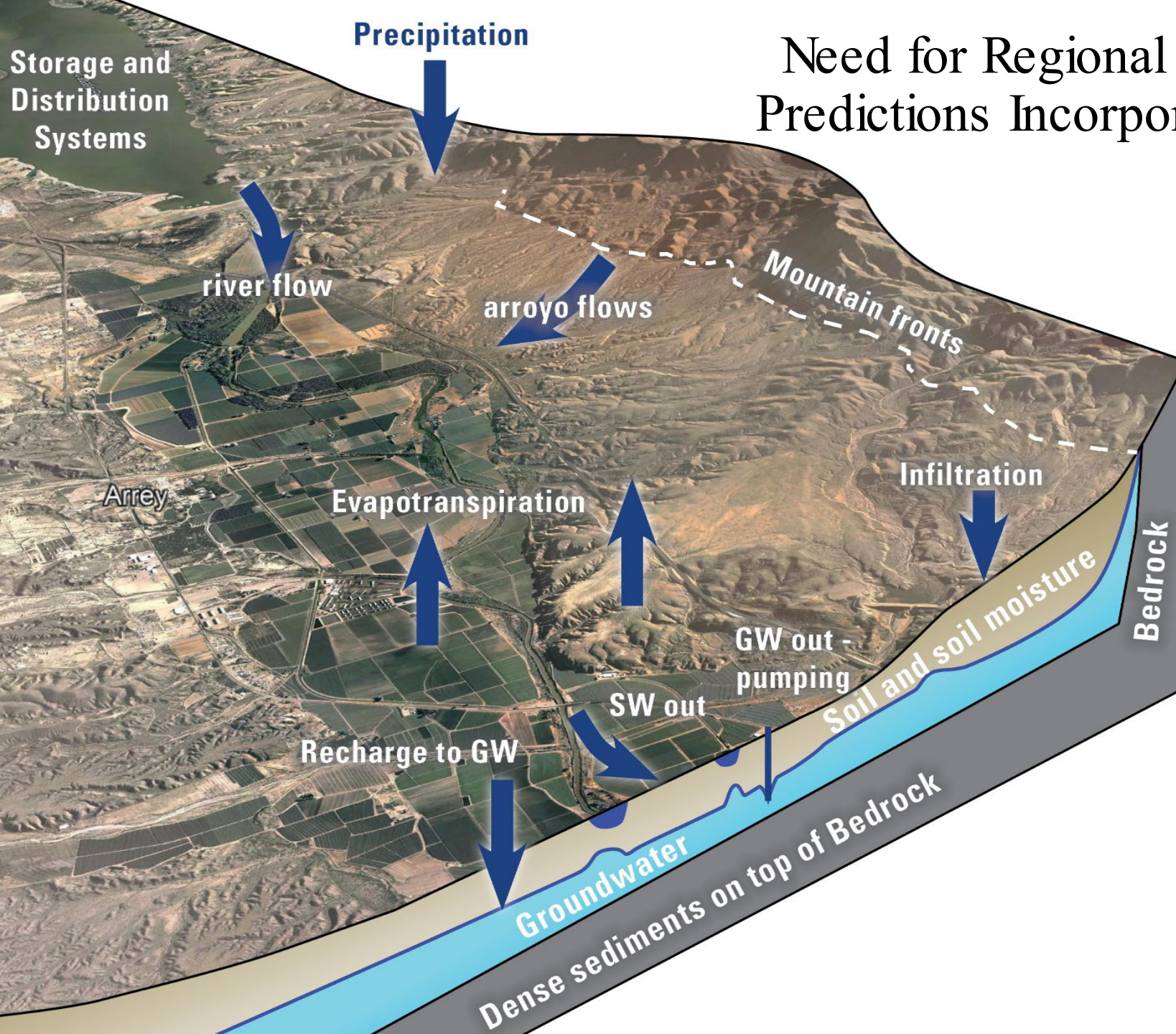


Need for Regional Water Balance Estimates and Predictions Incorporating Climate Change Impacts

A water budget is an accounting of water movement and storage change into and out of a defined region. (Healy et al., 2007)

There is a well-established need for regional water balance estimates, for example, farm scale water “efficiency” may increase regional water consumption

Predictive scenarios are critical to estimate effects of strategies intended to address projected climate challenges, such as in the Leap Ahead analysis



NM WRRI New Mexico Dynamic Statewide Water Budget Model (NM DSWB)

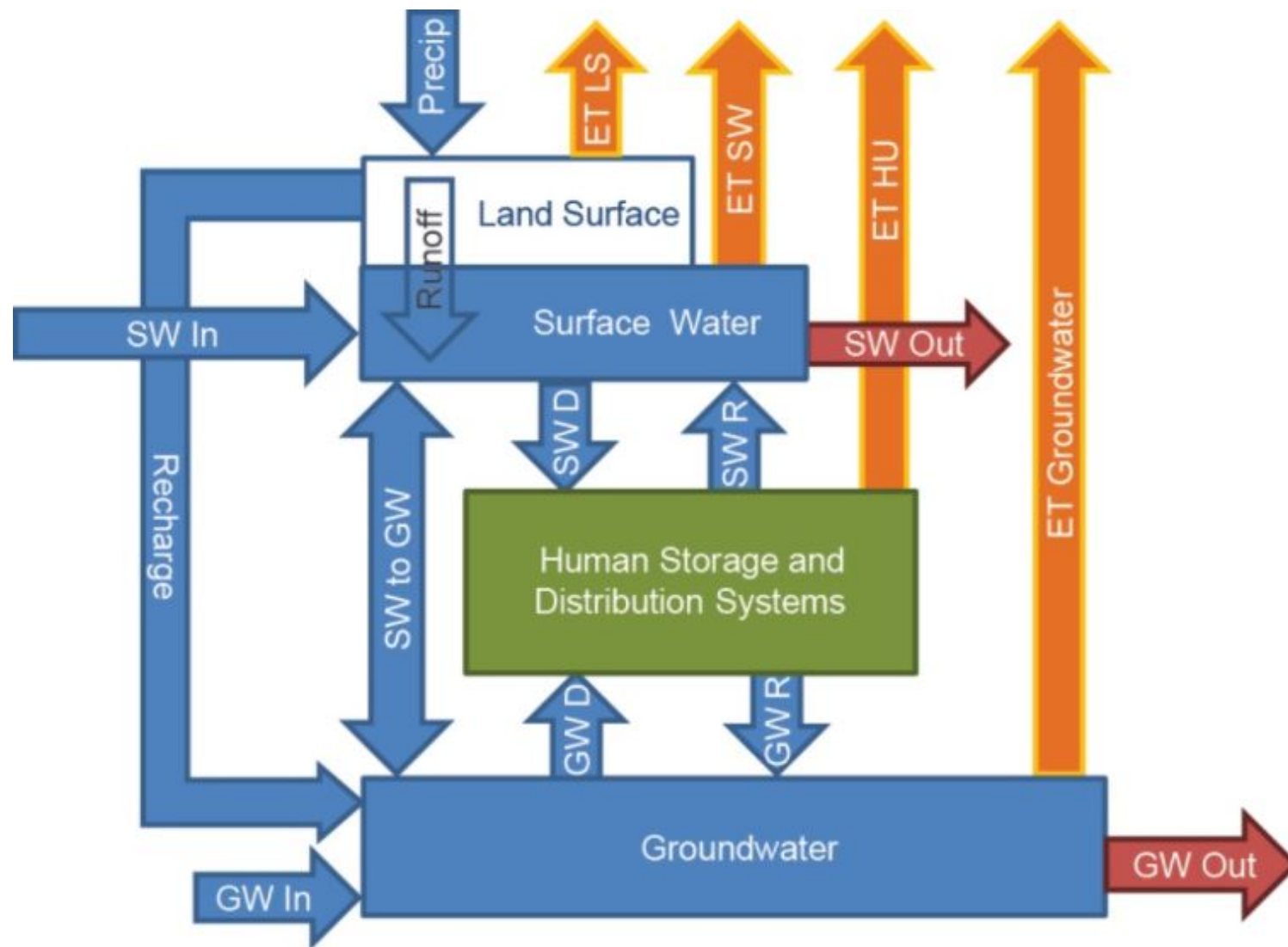
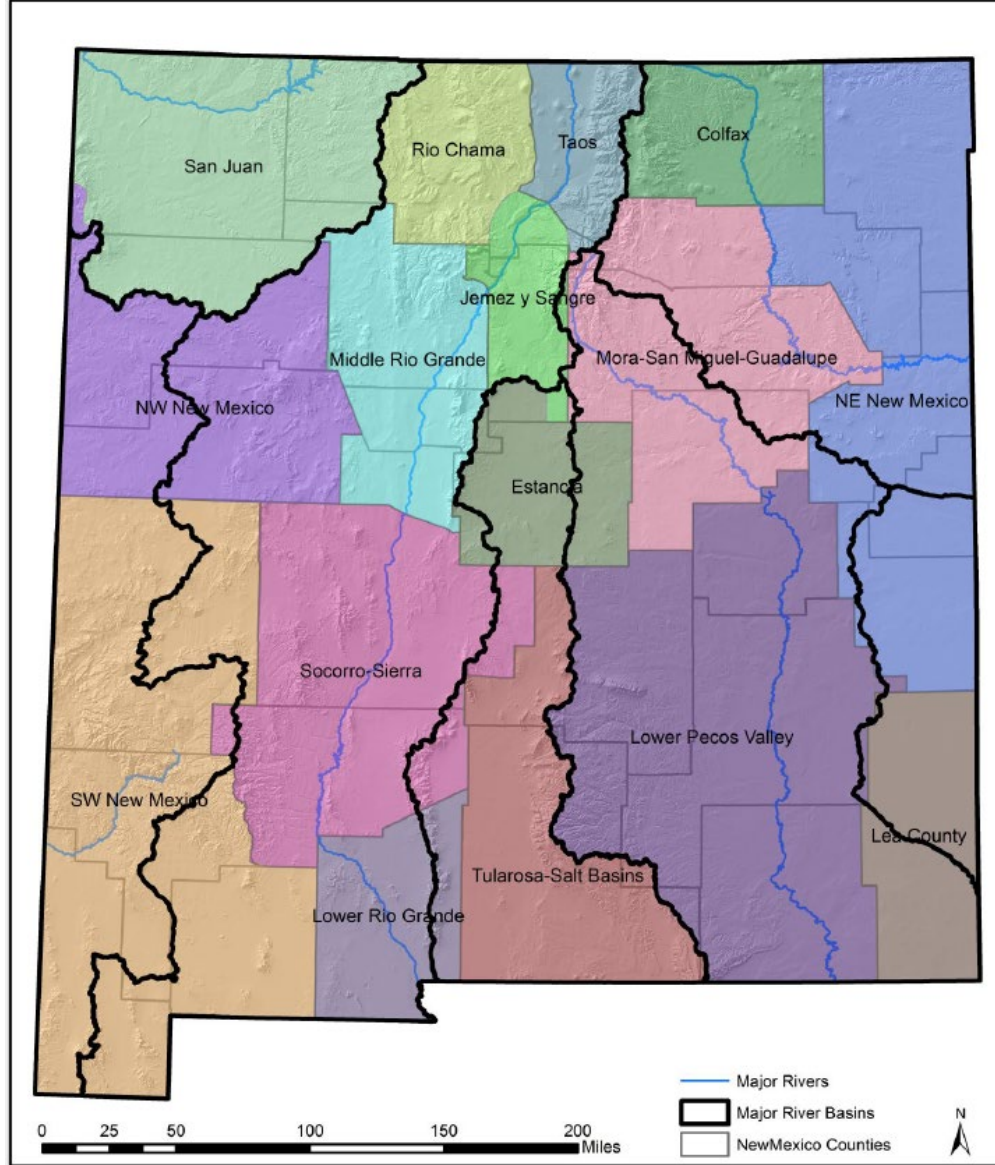


Diagram of the DSWB model

- Includes flows into region and the effects on the water volumes (stocks)
- Monthly timestep
- Historical (1975–2018)
- Future (2019–2099)
 - 3 Climate change scenarios deemed relevant for SW
- > 30 million data points

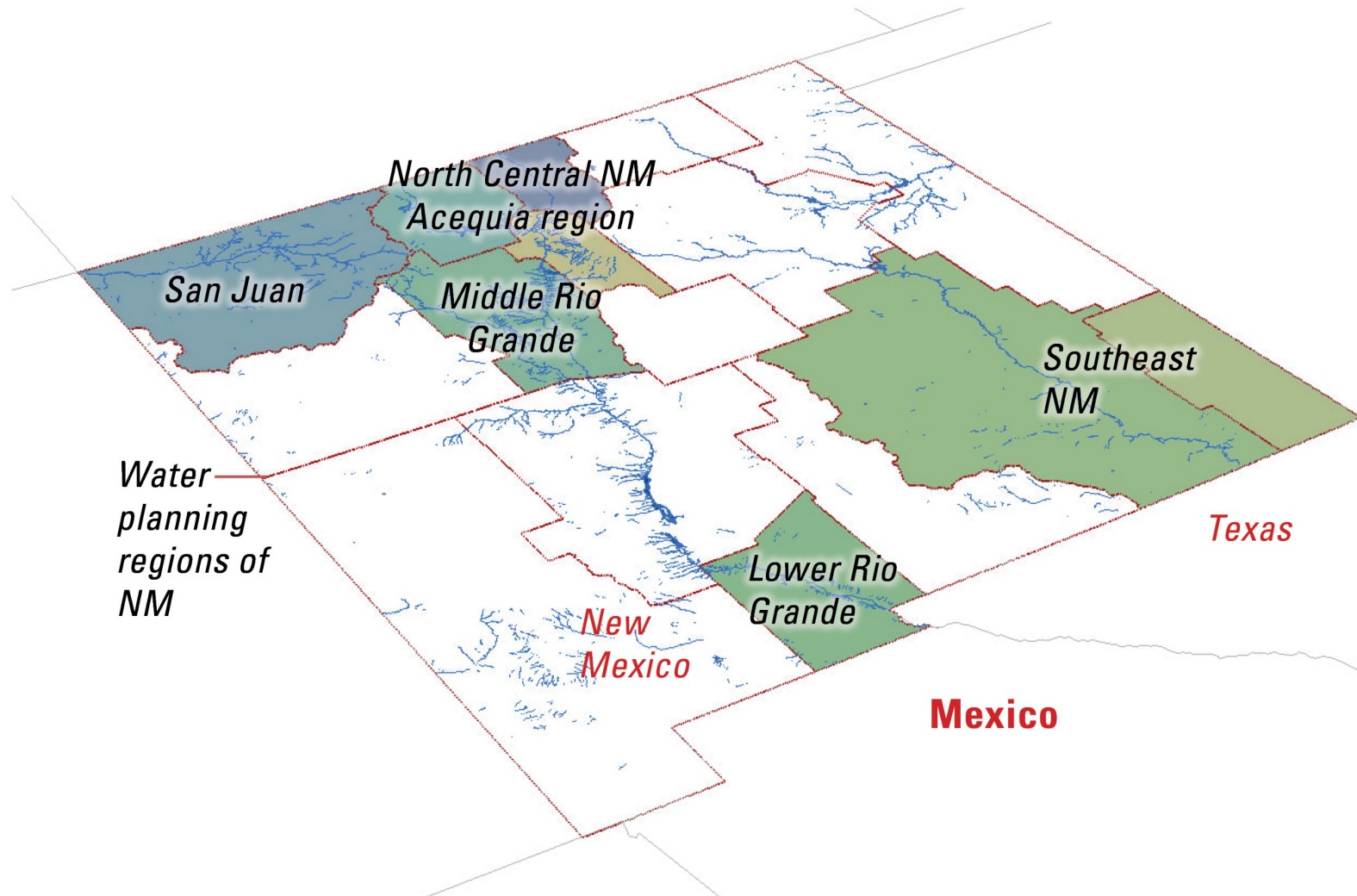
NM DS WB Covers Multiple Spatial Scales



Spatial Scales

- Counties (33)
- Water Planning Regions (16)
- Major river basins (7)
- Statewide (1)

Regional Stakeholder Visions for a Resilient Future



Focus group objectives:

- Collaboratively develop understandings of the regional water dynamics
- Distill clues to resilience
- Use preliminary and follow-up modeling to test what combinations of strategies can achieve the stakeholder resilience visions
- Develop pilot programs of resilient approaches

Focus group questions:

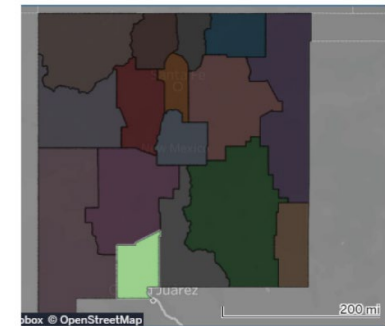
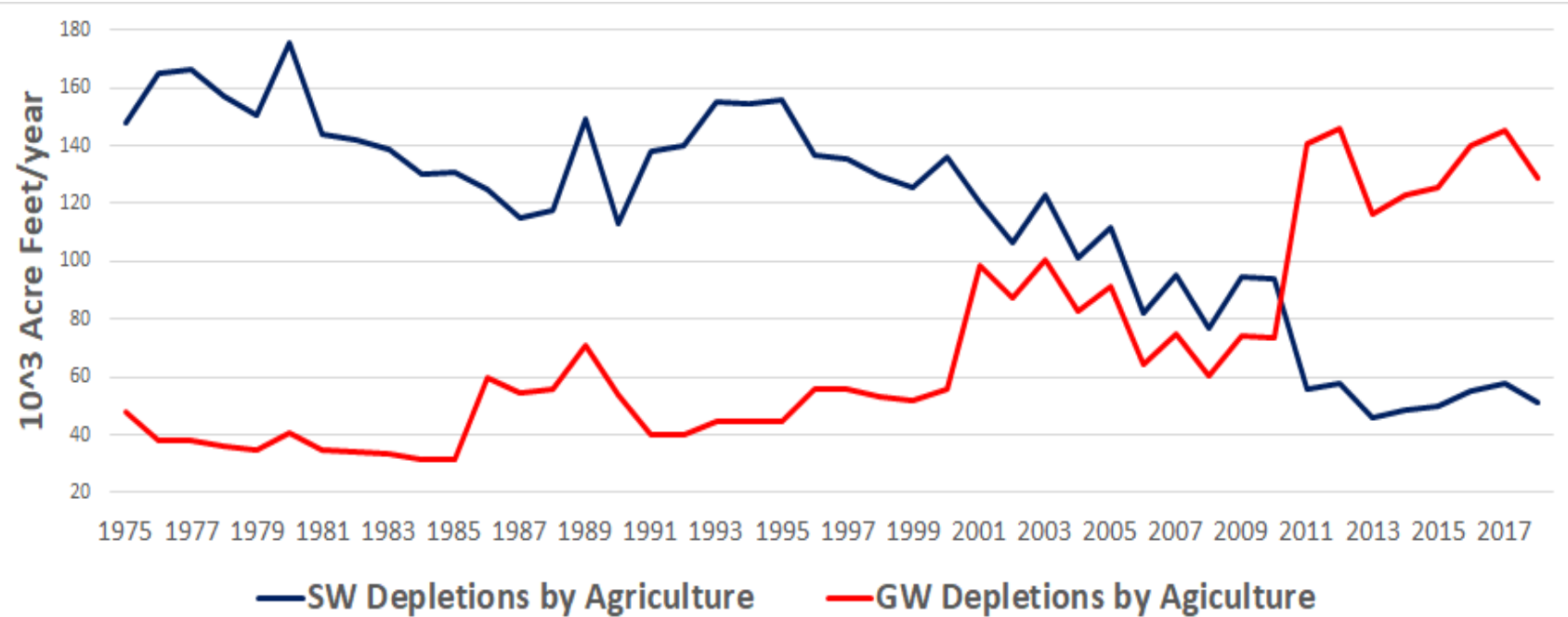
- What is valued about the region
- Issues that affect the region
- Strategies that address issues
- Visions for the future

What follows are preliminary summaries of extensive discussions and contributions

Lower Rio Grande Region WPR (Doña Ana County)

As Surface Water Availability Declines, Groundwater (GW) Pumping Increases

- Exemplifies dynamics of increasing reliance on GW globally



Lower Rio Grande
Water Planning
Region (WPR)
(Doña Ana County)

Lower Rio Grande Stakeholder Visions for a Resilient Future

Values and visions for the future

- Achieve economic and community resilience integrated with ecological resilience, e.g. build healthy watersheds and significantly reduce sediment transport and recurring maintenance issues
- Address challenges of climate change by rethinking the system, how to deal with floods, and restore the Rio Grande with the prospect of more intense storms, plus aging infrastructure
- Retain flood flows with vegetation or aquifer recharge instead of evaporating or flowing downstream
- Build networking and working groups to achieve bigger goals, on the scale of the region

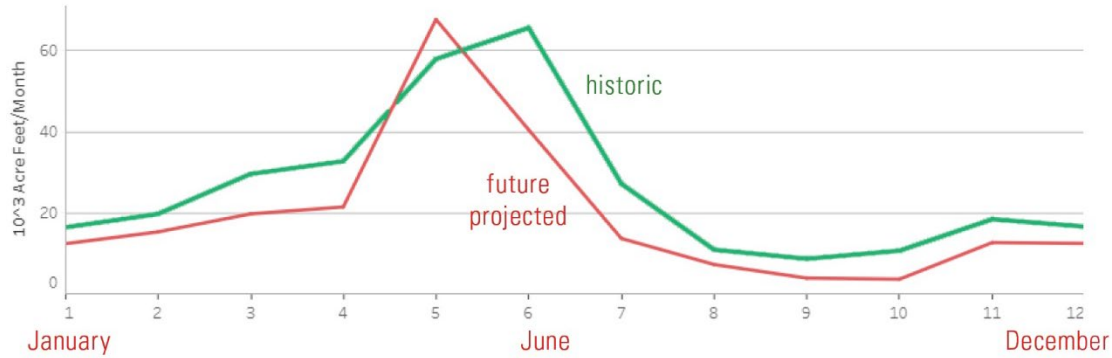
Issues

- Upper watershed/ rangeland health conditions
- Resultant downstream flooding and sediment transport
- Riparian health
- Water supply and quality: increased variability, shortfalls
- Aquifer depletion
- Need for coordinated watershed planning efforts, including in the Organ Peaks National Monument

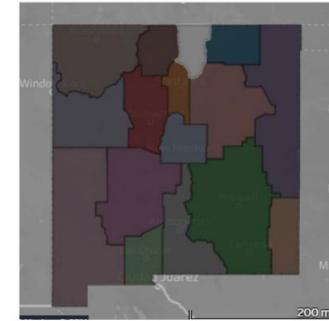
Strategies

- Expand aquifer recharge network
- Expand early warning and water data system
- Watershed planning and restoration
- Develop regional water budget decision-support tool
- Develop watershed educational and technical support programs

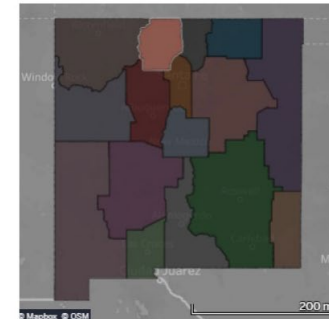
North Central NM Acequia Region



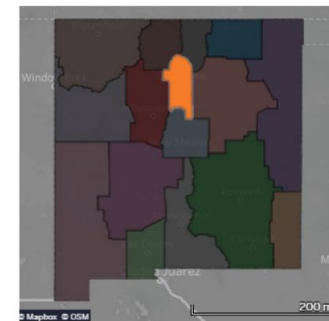
Taos Water Planning Region (WPR)



Rio Chama WPR



Jemez y Sangre WPR



Major surface water dynamic – historic vs. projected

- Earlier and shorter peaks
- Overall less water quantity on average (findings also show significantly less in current period than previous wet years)
- Stakeholders share that they are experiencing these changes

North Central NM Acequia Stakeholder Visions for a Resilient Future

Values

- Querencia – love or sense of place
- Food and water security creating a sense of freedom
- Community involvement and connection
- Maintain the connection between agricultural and cultural traditions
- Provide deep connection to the history and future for current/future generations

Issues & Challenges

- Irrigation and field management
- Water sharing and allocation difficulties/tension, loss of water rights
- Forest, riparian area, and soil health restoration needed
- Increasing temperature, extreme shortages, and extreme climatic variation
- Need for pilot projects, education initiatives, public awareness campaigns, and building standards that prioritize efficiency and conservation
- Lack of funding and labor

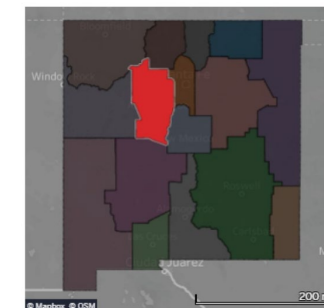
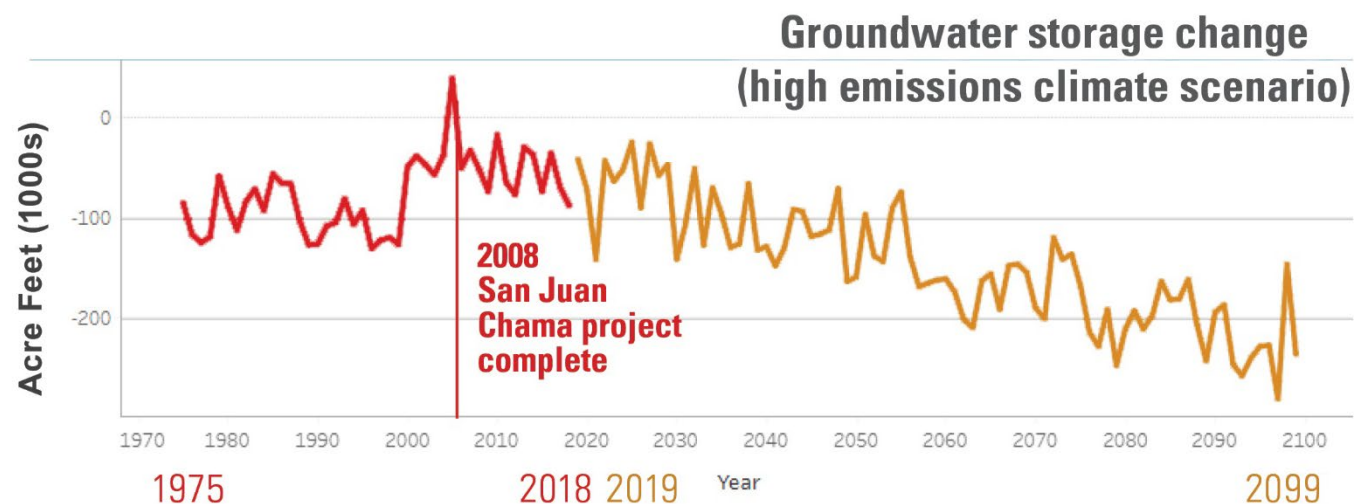
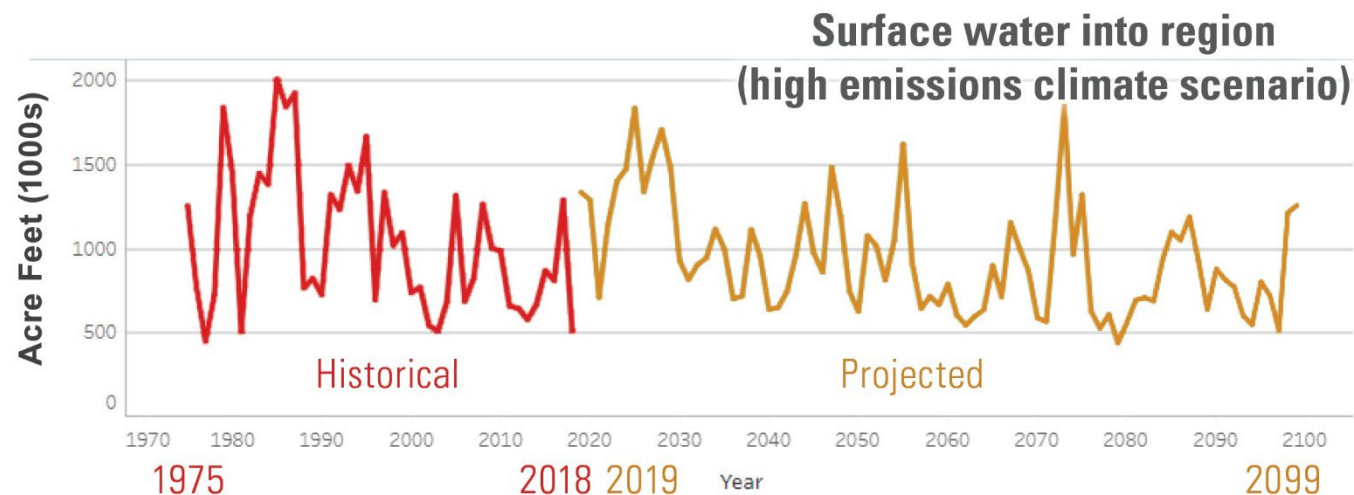
Strategies & Solutions

- Restoring watersheds for intact ecosystems and planting polyculture and perennial crops
- Protective covers for crops to withstand unpredictable/extreme weather
- More processing facilities
- Invest in the youth with culturally relevant strategies that
- Business incentives (restore water supplies, offset water use)
- Fully fund community/regional science centers to support strong, foresightful community planning

Middle Rio Grande Region

Surface and groundwater change trends

- Surface water - significant variability and increased periods of low supply
- Groundwater (GW) storage changes - San Juan Chama water has decreased GW declines, however, the average change is still negative
- Projected GW trends - with a high emissions scenario, we see GW declines predicted in the future



**Middle Rio Grande
Water Planning
Region (WPR)**

Middle Rio Grande Stakeholder Visions for a Resilient Future

Values and visions for the future

- Farming, the Bosque, and water within all.
- The agro-ecosystem, the intertwining of farm fields and the river, and the culture that is attached to the land.
- Working with the water budget we have towards a scaled down river with key functions to keep it alive
- Equitably sharing the resources of the community.
- Thinking forward and across agencies, across communities, to make all of our plans happen
- Maintain multiple values of river flows through Albuquerque that could be lost with loss of viable water supply

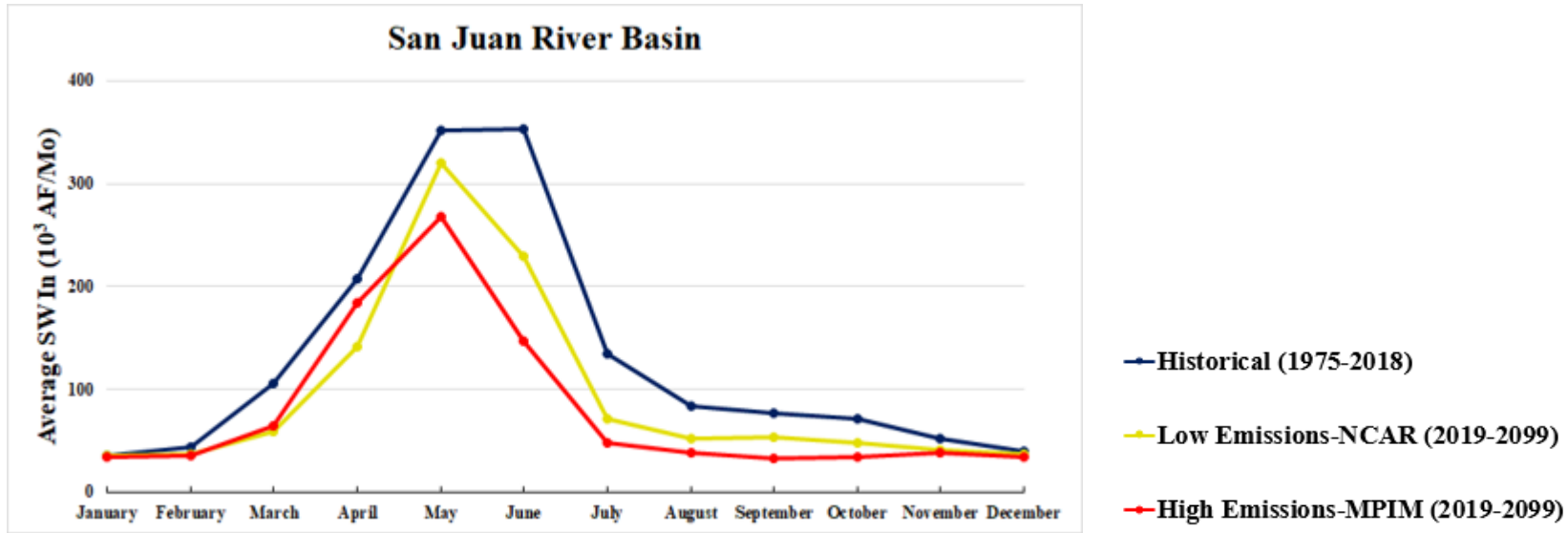
Issues

- Climate change and limited surface water in the future, and future declines in the aquifer
- If farming goes, the river will go, because there will be less return flows to the river.
- Water for agriculture is also critical for wildlife, 62% of the wetlands in the Intermountain West states are flood irrigated pastures.
- New marijuana growing
Implications of water use

Strategies

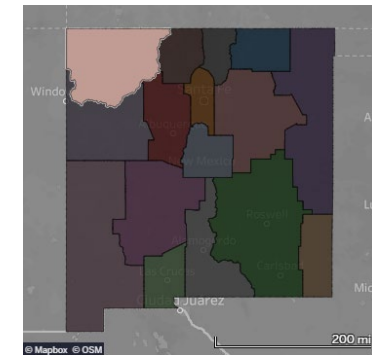
- Need regional teams working on these complex issues, because there are no silver bullets
- Expand our management of water past snowpack to include management of monsoonal flows when they come
- More implementation of aquifer storage and recovery
- More inclusion of the agricultural community in water discussions
- Ensuring water quality to also ensure water quantity

San Juan Water Planning Region (WPR)

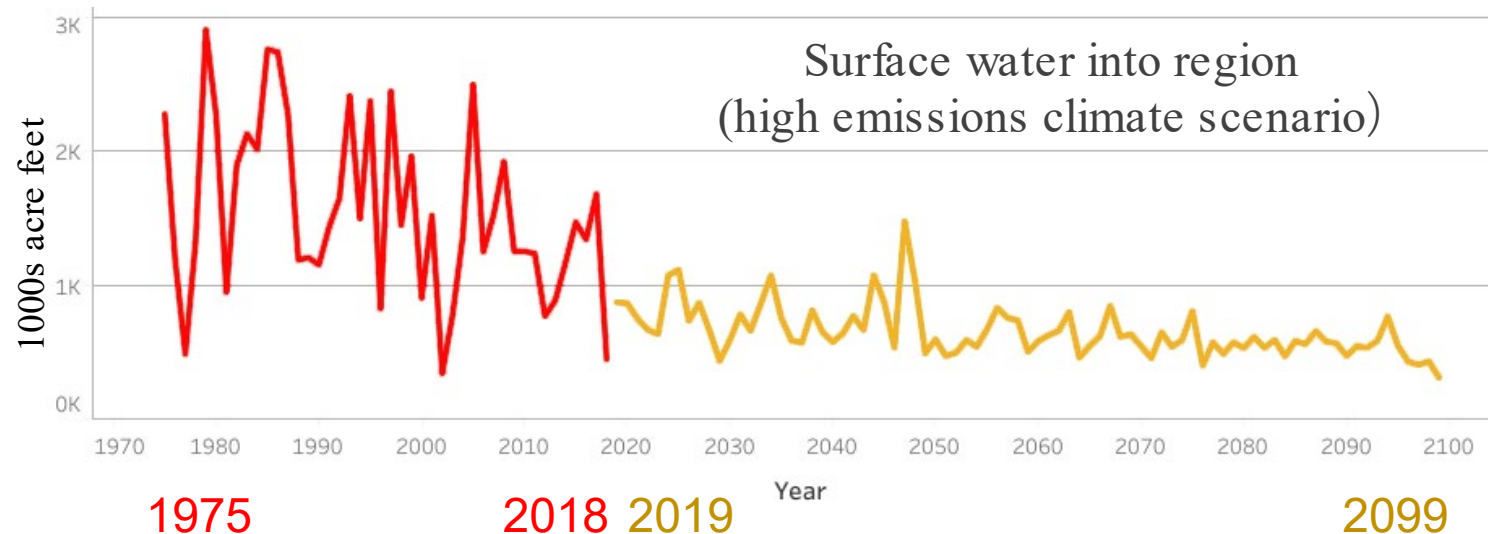


Seasonal and Annual Surface Water Inflows

- The model shows a possible future earlier and diminished peak runoff
- An overall reduction in average annual streamflow into the region is projected



San Juan Water Planning Region (WPR)



San Juan WPR Stakeholder Visions for a Resilient Future

Values and visions for the future

- Keep water affordable and available to make maximum use for all users: municipal, agriculture, fisheries/habitat, recreation, etc.
- Integrated watershed approach amongst land owners along the river to coordinate active stewardship, and look for win-win restoration strategies that protect soil and water health
- Making water deliveries from Navajo Dam that maintain compliance with contract obligations while balancing competing values of different water users: e.g. system users vs. endangered species
- Shifting from economic reliance on oil/gas industry to outdoor recreation

Issues

- Diminished water quality as temperature warms and precipitation variability increases
- There is no “hard” administration of the Colorado River. Compact agreements were created during a wetter period in history
- Commercial viability and diminishing value of farmland as irrigation diminishes
- Increased surface runoff from channelization created by oil and gas road networks
- Forecast changes in precipitation not captured with current infrastructure

Strategies

- Upland and arroyo restoration through slow and spread strategies that increase groundwater recharge
- Continue to build coalitions and partnerships that have the capacity to pursue funding for soil and water restoration projects
- Implement water shortage sharing agreements
- Reopen compact negotiations
- Develop more water storage options
- Increased outreach and education to the public on possible water conservation measures

Southeast New Mexico

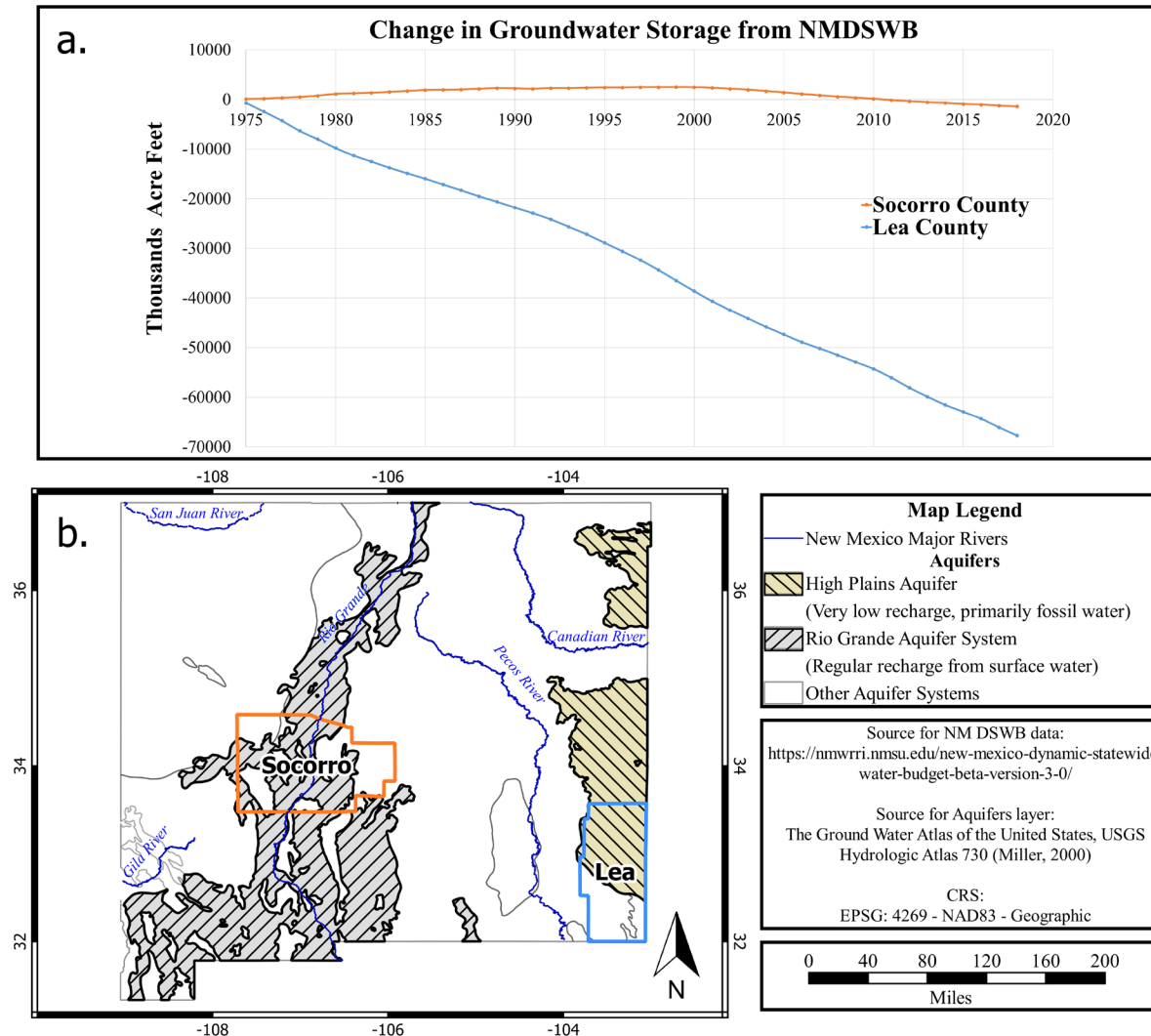


Figure 1. Comparison of groundwater storage in two different aquifer types: a. Annual change in groundwater storage for two different counties from the NM DSWB, b. Location of example NM aquifers with different recharge rates.

Fossil Groundwater Dynamics

- In Lea County, the groundwater storage has been steadily declining
- Most groundwater used is fossil groundwater from aquifers that receive very little to no recharge from the surface

Southeast New Mexico Stakeholder Visions for a Resilient Future

Values and visions for the future

- Maximize the period of having fresh groundwater resources in the region through the use and reuse of non-traditional water resources. “Soften the landing” of diminishing fresh groundwater
- Long term, transition to industries that can take advantage of brackish water resources
- Local water governance mechanisms: Allow growers to take a more active role in the aquifer management by being able to pull water from production during wet periods, and then putting that water back to use during a dry period

Issues

- Dwindling freshwater supplies from the Ogallala Aquifer
- Concern about conservation efforts that take farmland out of production permanently by growers in Pecos River Valley
- Getting oil/gas companies to adopt recycling of produced water over disposal
- Limited agency resources for enforcement and implementation
- Capacity challenges for small water systems
- Texas right-of-capture groundwater law

Strategies

- Local governance mechanisms such as groundwater conservation districts that have more flexibility: not simply taking land out of production permanently
- Increase reuse of municipal and industrial wastewater, as well as produced/brackish water in a way that protects public health and the environment.
- Take advantage of flood events through watershed management.
- Promoting crop changes that work for the growers’ livelihoods, and increase water conservation

Pivoting from Assessment to Development of Resilience Adaptation Strategies



66TH ANNUAL
**NEW MEXICO
WATER CONFERENCE**
OCTOBER 26-28, 2021

REALITY AND RESILIENCE:
PLANNING FOR NEW MEXICO'S
WATER FUTURE
FREE REGISTRATION

 
VIRTUAL CONFERENCE

October 28 Resilience Breakout Sessions

Breakout Categories:

Agriculture

3 breakout groups
38 total responses

Watershed & Habitat Health

4 breakout groups
90 total responses

Commercial & Energy Water Use

2 breakout groups
52 total responses

Public Water Systems

3 breakout groups
38 total responses

Outdoor Recreation

1 breakout group
10 total responses

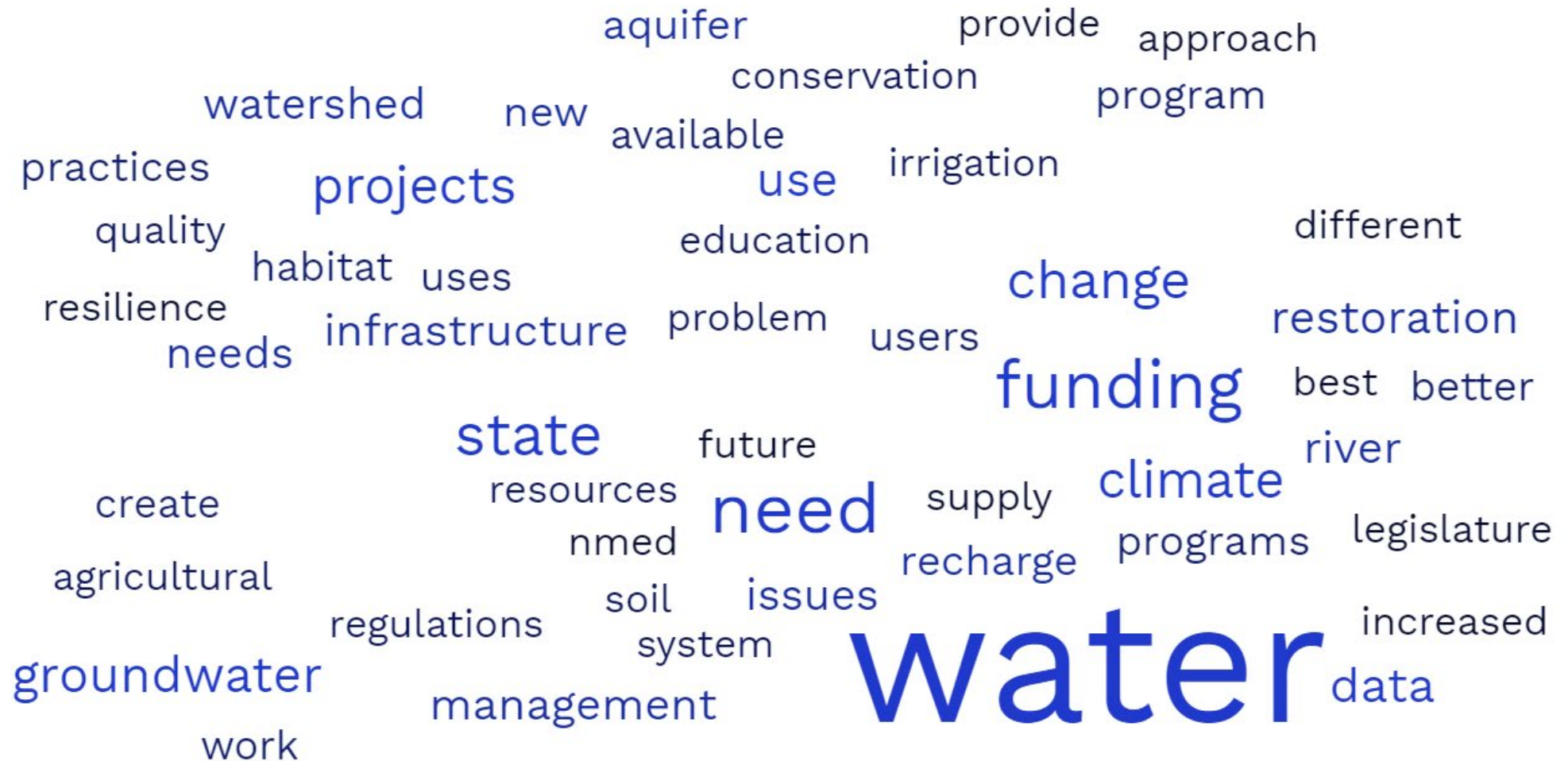
Facilitated Questions:

What are the group's greatest concerns related to 10-25% less water supply by 2070?

What are the greatest challenges to addressing those concerns?

What are your suggestions for action to achieve long-term resiliency?

Breakout Session Word Cloud



Key Points from Breakout Discussion Resilience Scenarios

Visions

- Through capture and aquifer recharge practices, stop groundwater decline or even increase groundwater levels
- Through shortage sharing agreements, reduce need to overexploit groundwater resources during periods of lower precipitation
- Using treated wastewater to restore rangelands increases carbon uptake and protect soil (reduces erosion, sediment discharge and increases infiltration)
- Treatment technologies for water resources such brackish/produced water or wastewater reuse can reduce demand on groundwater resources
- Increased municipal/commercial water conservation measures can reduce overall water demand

Issues

- Diminishing surface water availability impairing different water uses: agriculture, spiritual practices, recreation
- Diminished groundwater supply due to pumping
- Impacts on watershed ecosystems: fire risk, loss of habitat, Drier soils, increased erosion, sediment transport,
- Viability of producing certain crops and livestock, farmland moving out of production
- Lack of funding and resources
- Outdated or lack of infrastructure
- Quality threats to source waters

Strategies

- Expand aquifer recharge practices
- Create ecosystem service payment programs
- Implement infrastructure and management for capture and release of snowmelt and storm waters
- Promote agreements to allow better shortage sharing in each basin between agricultural users and public water systems
- Use treated wastewater for rangeland restoration and increase carbon uptake
- Update conservation measures in building codes and incentive programs
- Utilize advanced water treatment and reuse: brackish/produced water, wastewater

Emerging Themes

Policy/Regulatory

- Reconcile discrepancy between allocated/promised water and actual water resources
- Ecosystem service payment programs
- Aquifer recharge and stormwater capture
- Source water protection
- Settlement of tribal water rights
- Shortage sharing agreements
- Policy to promote reuse and use of alternative water resources: brackish, produced water, wastewater

Data/Research Needs

- Improved tools for modeling and forecasting: aquifer mapping, forecasting,
- Greater accessibility to data/tools

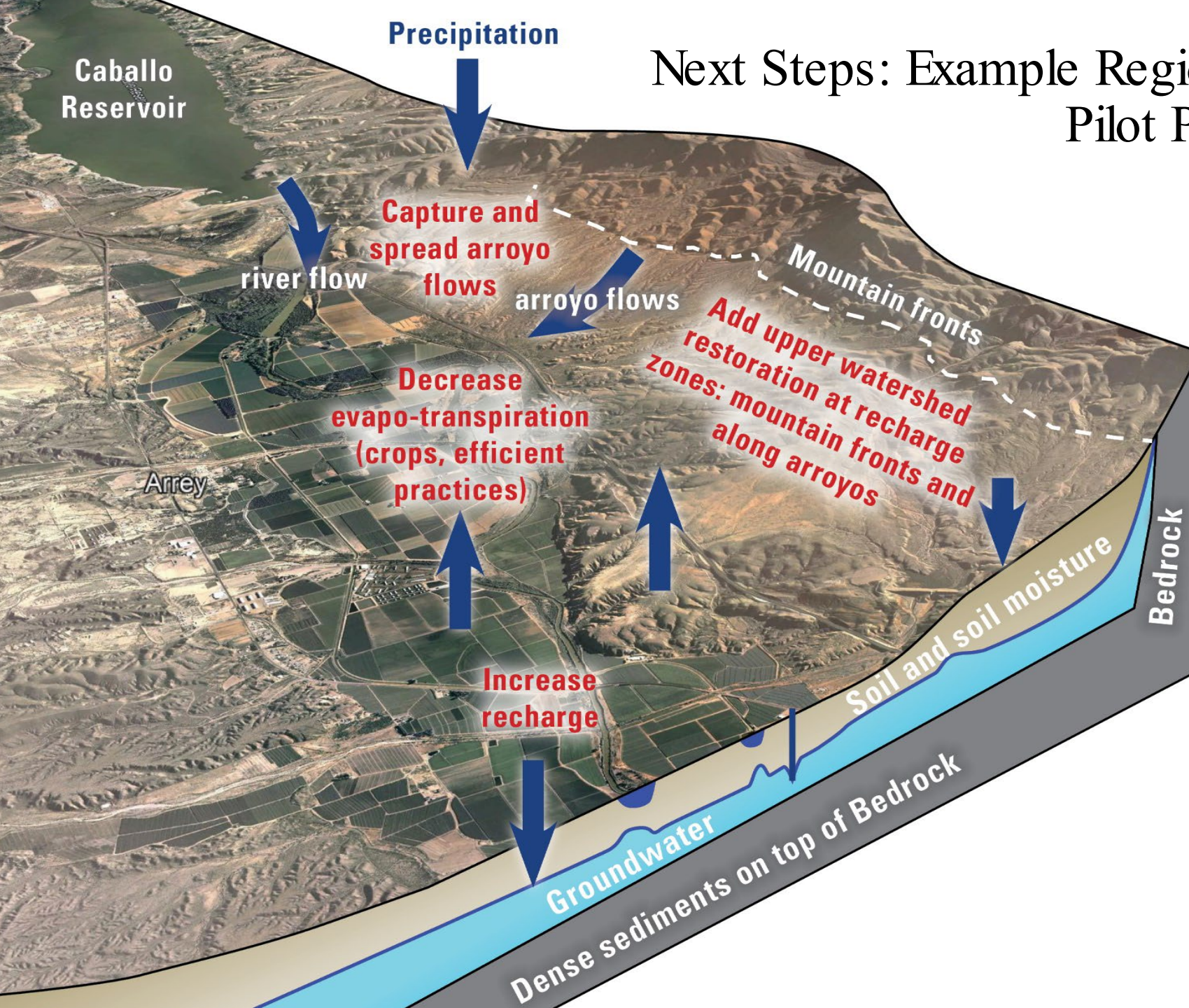
Funding Prioritization

- Investment in infrastructure
- Increase engagement of State/Federal policymakers on climate mitigation and adaptation programs
- More resources are needed to carry out enforcement implementation and enforcement of legislative mandates

Education and Engagement

- Greater interdisciplinary collaboration
- Improved communication with public and elected officials
- Youth engagement in projects such as restoration programs

Next Steps: Example Regional Integrated Models and Pilot Projects



Testing and gaining evidence of effects of strategies for resilience

- Developing integrated water budget models to assess what is needed for regional resilience
- Community pilot projects that test, measure, and fit practices to local conditions:
 - Increase groundwater recharge
 - Support transitions to extreme drought tolerant high value crops
 - Water conservation practices that support regional resilience



THANK YOU!

