

A world map with a color gradient overlay representing climate change projections. The colors range from blue (cooler) to red (warmer), with the warmest areas (red) concentrated in the mid-latitude regions of the Northern Hemisphere, particularly over the North Atlantic and parts of Europe and Asia. The map is centered on the Atlantic Ocean.

Adapting to a Changing Climate

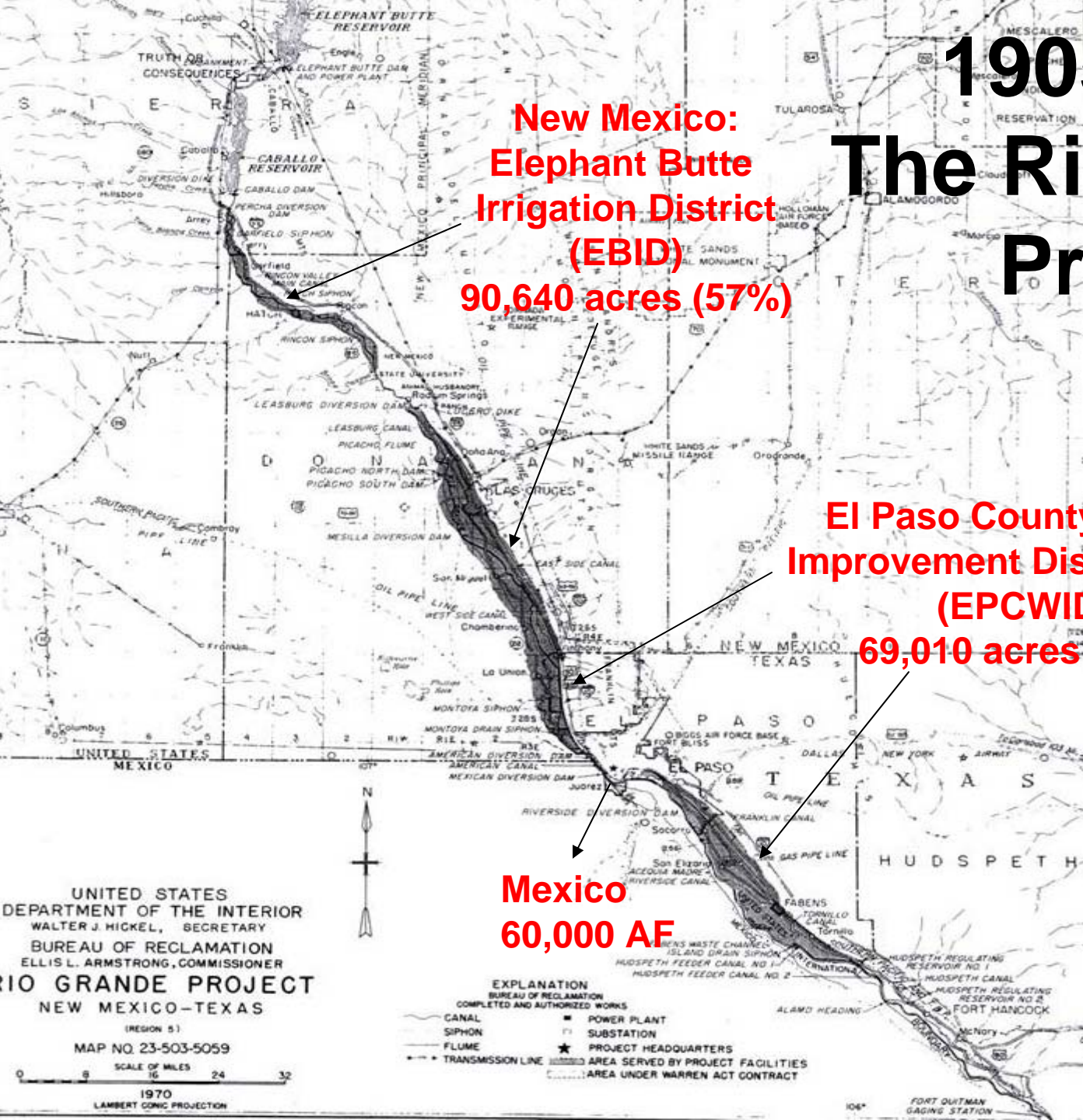
By
Gary Esslinger
Manager, Elephant Butte Irrigation District
New Mexico

1905-1916 The Rio Grande Project

**New Mexico:
Elephant Butte
Irrigation District
(EBID)
90,640 acres (57%)**

**El Paso County Water
Improvement District No. 1
(EPCWID)
69,010 acres (43%)**

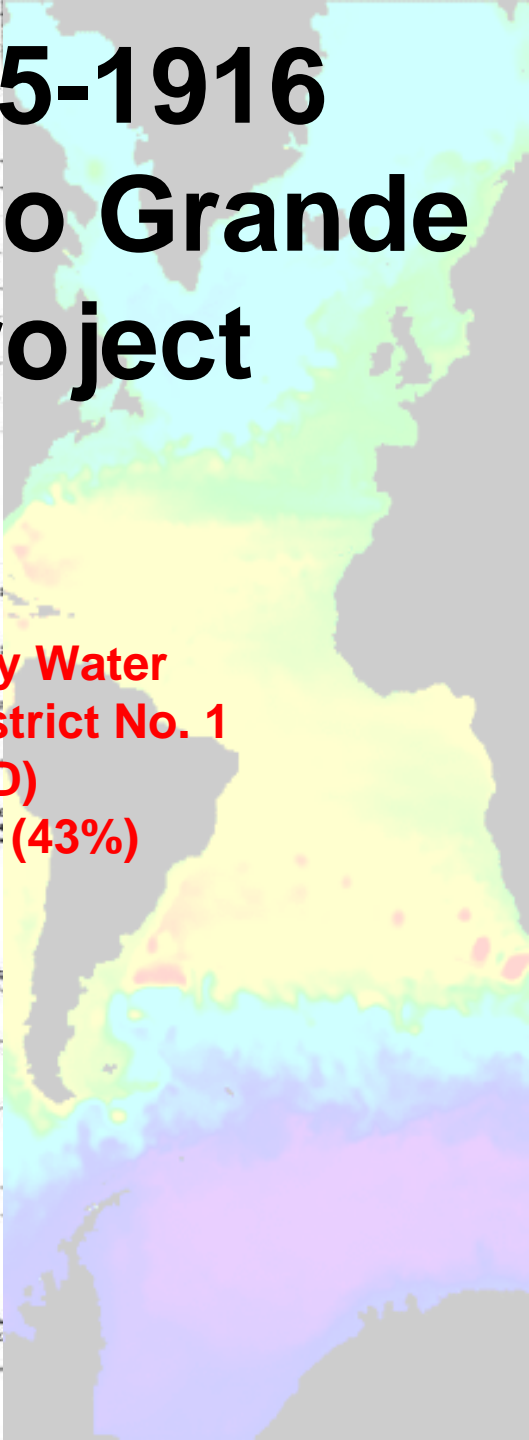
**Mexico
60,000 AF**



UNITED STATES
DEPARTMENT OF THE INTERIOR
WALTER J. HICKEL, SECRETARY
BUREAU OF RECLAMATION
ELLIS L. ARMSTRONG, COMMISSIONER
RIO GRANDE PROJECT
NEW MEXICO-Texas

(REGION 5)
MAP NO. 23-503-5059
SCALE OF MILES
0 8 16 24 32
1970
LAMBERT CONIC PROJECTION

EXPLANATION
BUREAU OF RECLAMATION
COMPLETED AND AUTHORIZED WORKS
CANAL
SIPHON
FLUME
TRANSMISSION LINE
POWER PLANT
SUBSTATION
PROJECT HEADQUARTERS
AREA SERVED BY PROJECT FACILITIES
AREA UNDER WARREN ACT CONTRACT



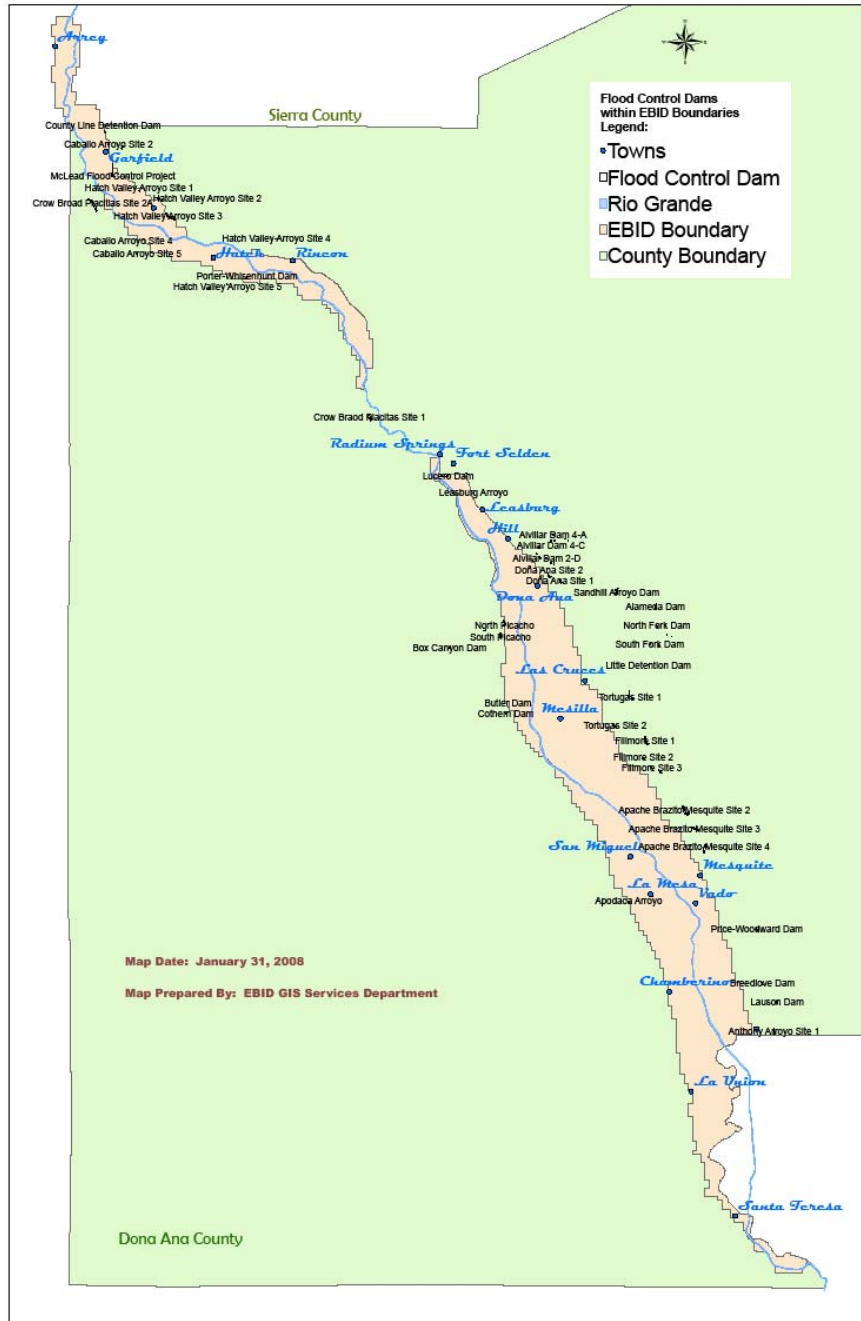
EBID's Planning Scenario

- Long-term decline in average snowpack
 - Historically about 80 percent of Project water supply
- Long-term decline in average local precipitation (primarily monsoonal rainfall)
- Long-term increase in frequency of extreme events (drought, high intensity rainfall/runoff)

EBID Strategies

- Conjunctively manage surface water and groundwater supplies:
 - Surface water as first option – direct use and groundwater recharge
 - Groundwater primarily for drought reserve
- Upgrade flood management infrastructure to provide adequate flood protection
- Further upgrade flood management infrastructure to allow beneficial use of flood water

Flood Control Dams within EBID Boundaries



EBID Initiatives

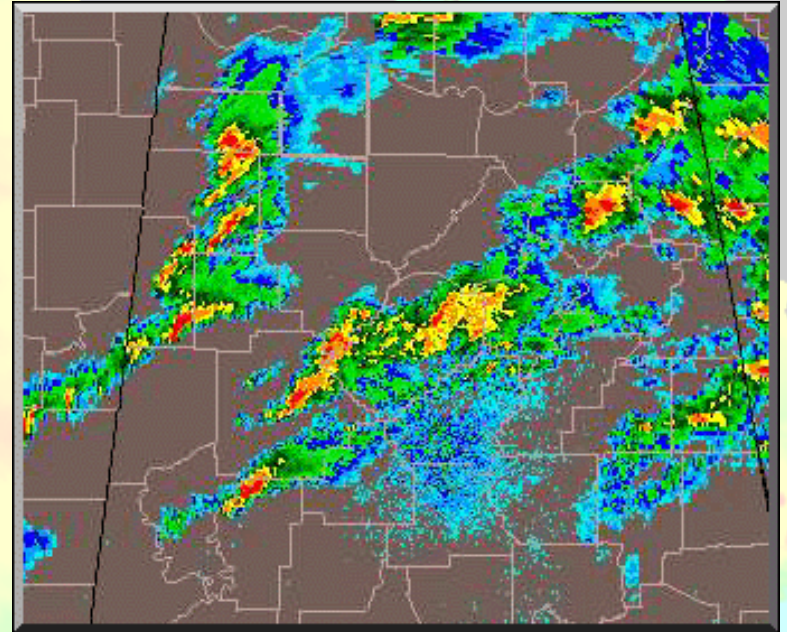
- Advance Warning System
 - NEXRAD Forecasting – NMSU
 - Watershed Weather Instrumentation – ACE
 - Arroyo Flow Measurement - ACE
 - River Flow Monitoring – EBID
- Multifunction Drain Use - NMED
 - Capture, storage, and conveyance of flood flows
 - E. Coli mitigation
 - Habitat establishment

EBID Initiatives

- **Regulating Reservoirs**
 - Burn Lake – City of Las Cruces
 - Below Mesilla Dam – Proposal to BOR 2025
- **NMSU/EBID Dam Safety Center – Legislative funding**
 - Technical services
 - Research
 - Planning
- **Hydropower - NM Energy Commission**
 - Low-head hydropower using existing conveyance facilities
 - Power for drip, sprinkler irrigation, surface water treatment plant
- **Remote Sensing – BOR 2025**
 - Map current and changing ET for water budgeting

Advance Warning - NEXRAD

- Identify preferential storm paths for optimal instrumentation location
- Monitor trajectory and intensity of storms real-time for flood response
- Develop image processing algorithms for short-term forecasting (NMSU)
- Retain or release floodwater based on incoming weather



Watershed Instrumentation

Arroyo Metering (ACE)

- Early Warning from rain gauges in upper watersheds
 - Flood warning
- Flumes for metering flow into Rio Grande
 - Flood warning
 - Diversion management
- Calibrate hydrologic models of watersheds
 - Improve forecasting
 - Improve statistical characterization of flood flows
 - Identify and prioritize areas for stormwater capture



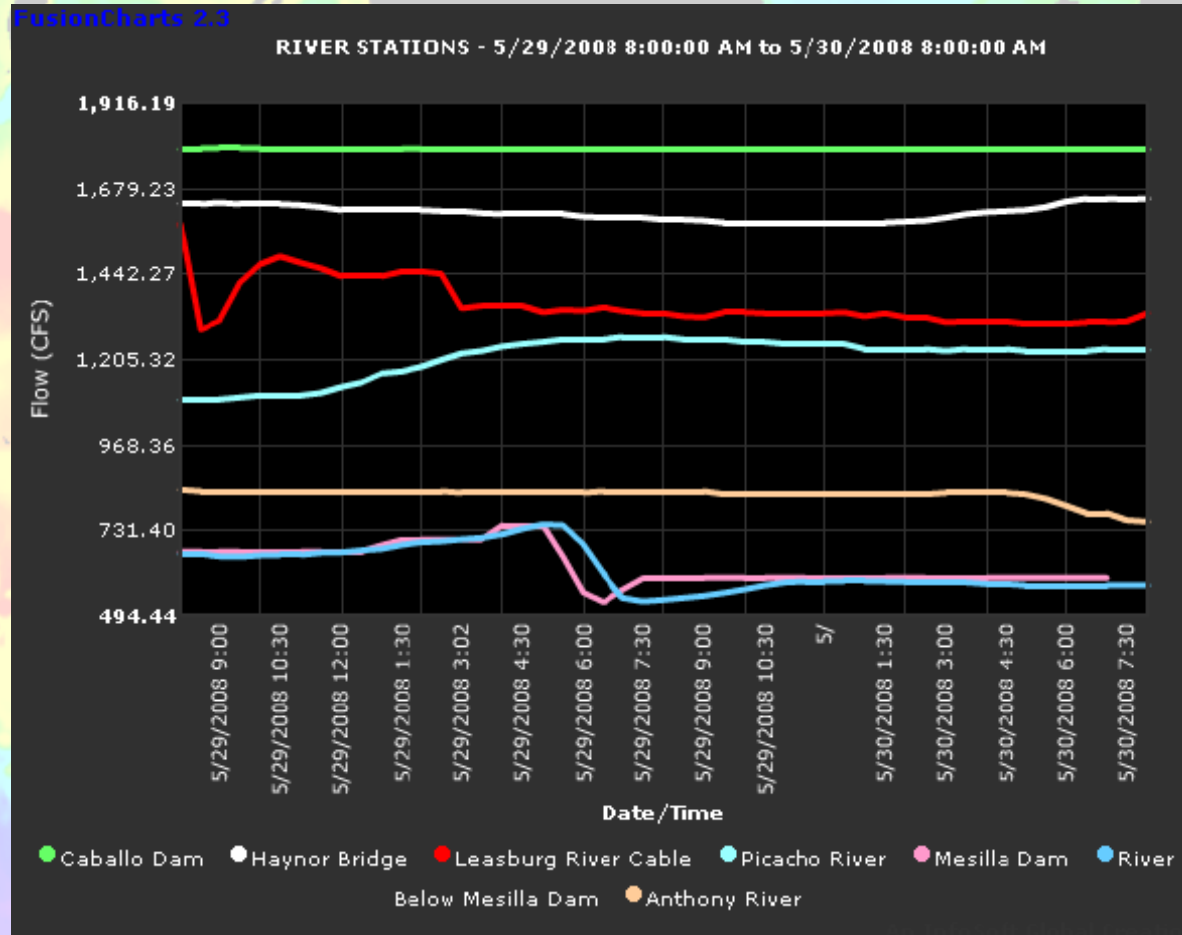
Reservoir Instrumentation

An aerial photograph of a large reservoir, likely a dam, surrounded by a hilly, green landscape. The reservoir is filled with water, and a dam structure is visible in the distance. The background shows a range of mountains under a clear sky.

- Track outlet flow and potential for emergency spillway flow
- Track remaining retention space
- Much safer and more timely than visual confirmation

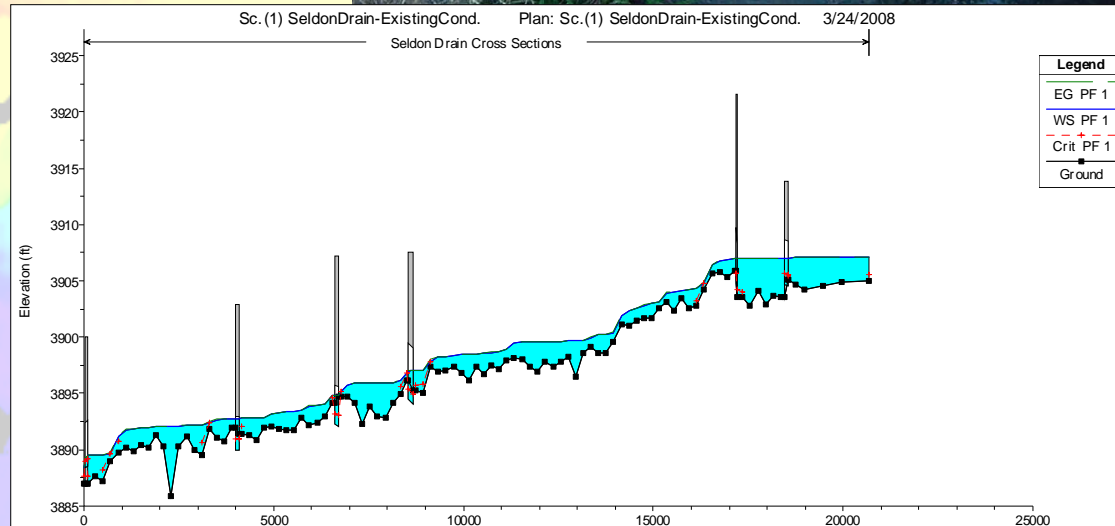
River Metering Stations

- 7 operational stations from Caballo Dam to the Texas State Line
- 20 minute real-time data, radio telemetry
- Operations management
- Flood tracking and warning
- Available on web, used by many local agencies



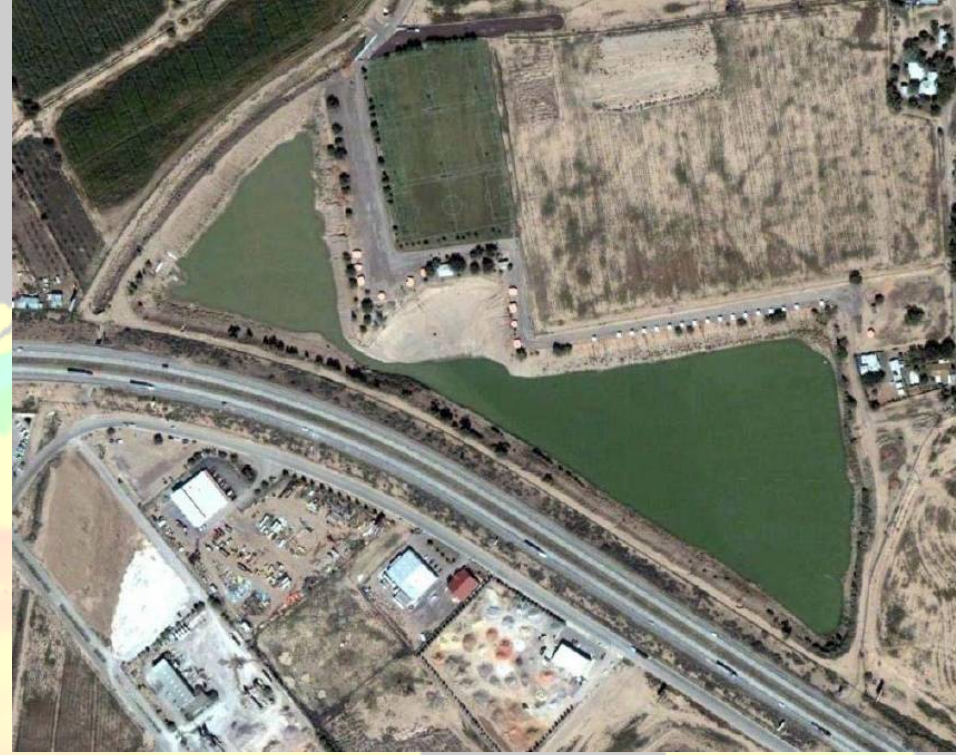
Multi-function Drain Use (NMED)

- Agricultural Drainage
 - Water table control
 - Salt removal
- Habitat Establishment
- Storm water storage and regulation
- E. Coli mitigation from runoff



Regulating Reservoirs

- Burn Lake – Water 2025 grant in partnership with City of Las Cruces
- Westside Canal, Mesilla Dam – 2025 proposal

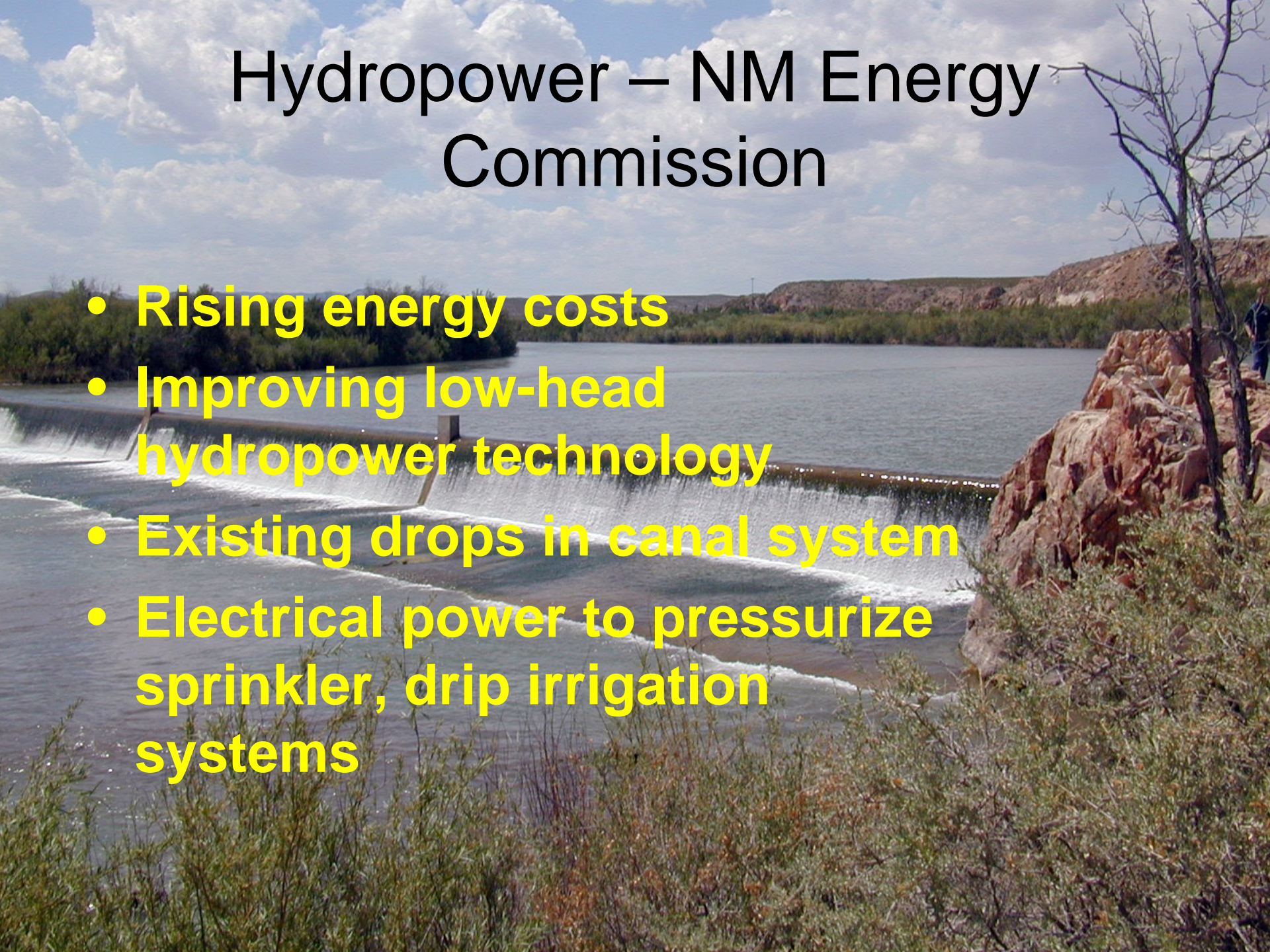


NMSU Dam Safety Center

- NM Legislative funding FY 2009
- Technical services:
 - Hydrology studies
 - Breach analyses
 - Inundation mapping
 - Emergency action planning
- Research
 - “Smart” dams – instrumentation, non-destructive testing
 - Management for flood water use
 - Financial analysis
- Training
 - Dam inspectors

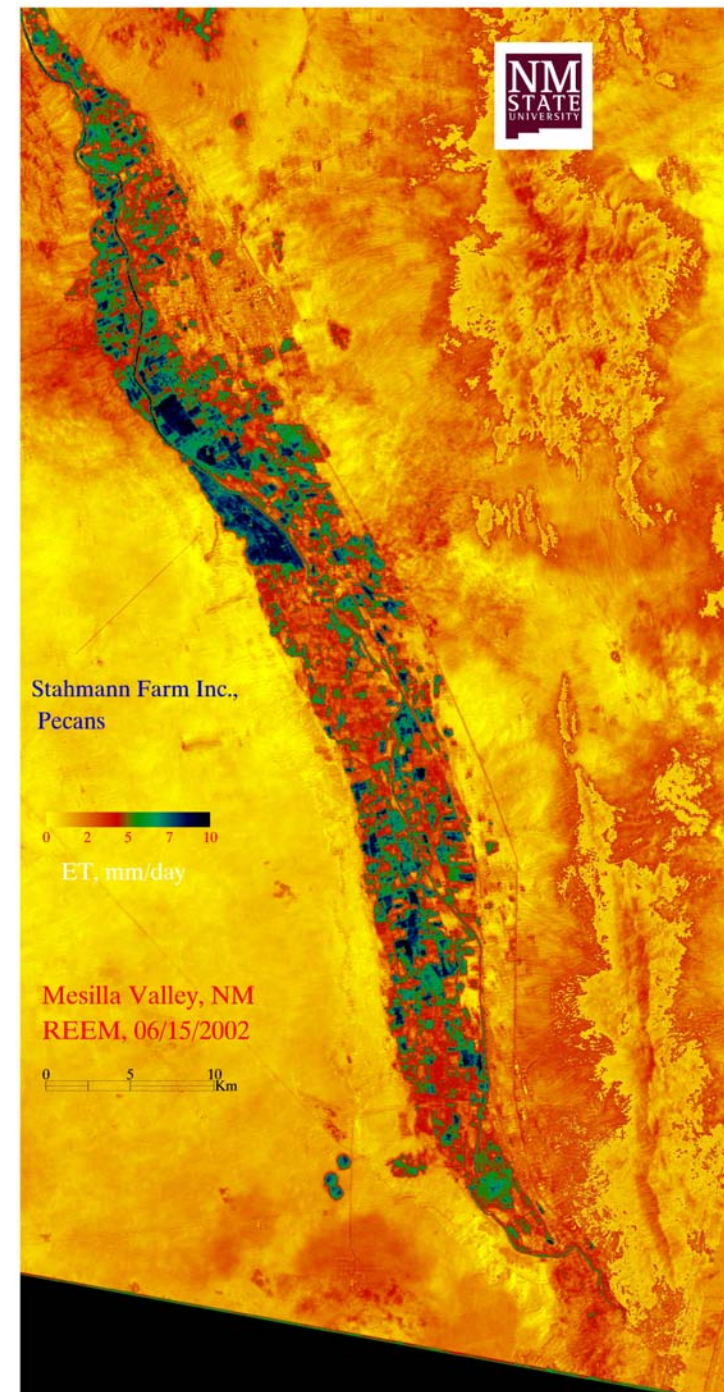
Hydropower – NM Energy Commission

- **Rising energy costs**
- **Improving low-head hydropower technology**
- **Existing drops in canal system**
- **Electrical power to pressurize sprinkler, drip irrigation systems**



Remote Sensing

- Evapotranspiration mapping
- Depletion changes with:
 - Changing crops
 - Drought cycles
 - Climate change
- Key to interstate, international water management



Management Strategies

- Reduce upstream release, use storm water in river to make diversions and downstream delivery
- Infiltrate captured water in reservoirs
- Release from reservoirs into canal system
 - Irrigation, surface water treatment plants
 - Infiltration
- Store in drains
- Regulating reservoirs
- Infiltrate by delivering to land that does not require irrigation

Needs

- Adaptive Research – Dam Safety Center, New Mexico State University
- Local, state, and federal investment in infrastructure
 - Rehabilitate existing dams
 - Additional storage/retention capacity
 - Data collection infrastructure
- Financial mechanisms that provide for adequate O&M, upgrades
- Cooperation among water users and water use sectors



Thank You!

Questions?