Surface Water and Groundwater System Status Lower Rio Grande

Peggy Barroll, Ph.D.

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Water Leaders Workshop

Outline of Talk

- Intro to LRG Aquifer System
- Surface Water Supply
- Groundwater Level Data
- Water Budget of Aquifer System
- What sectors are using how much water?
- Conclusions

LRG Aquifer System:

Large, deep groundwater basins south of Caballo Dam

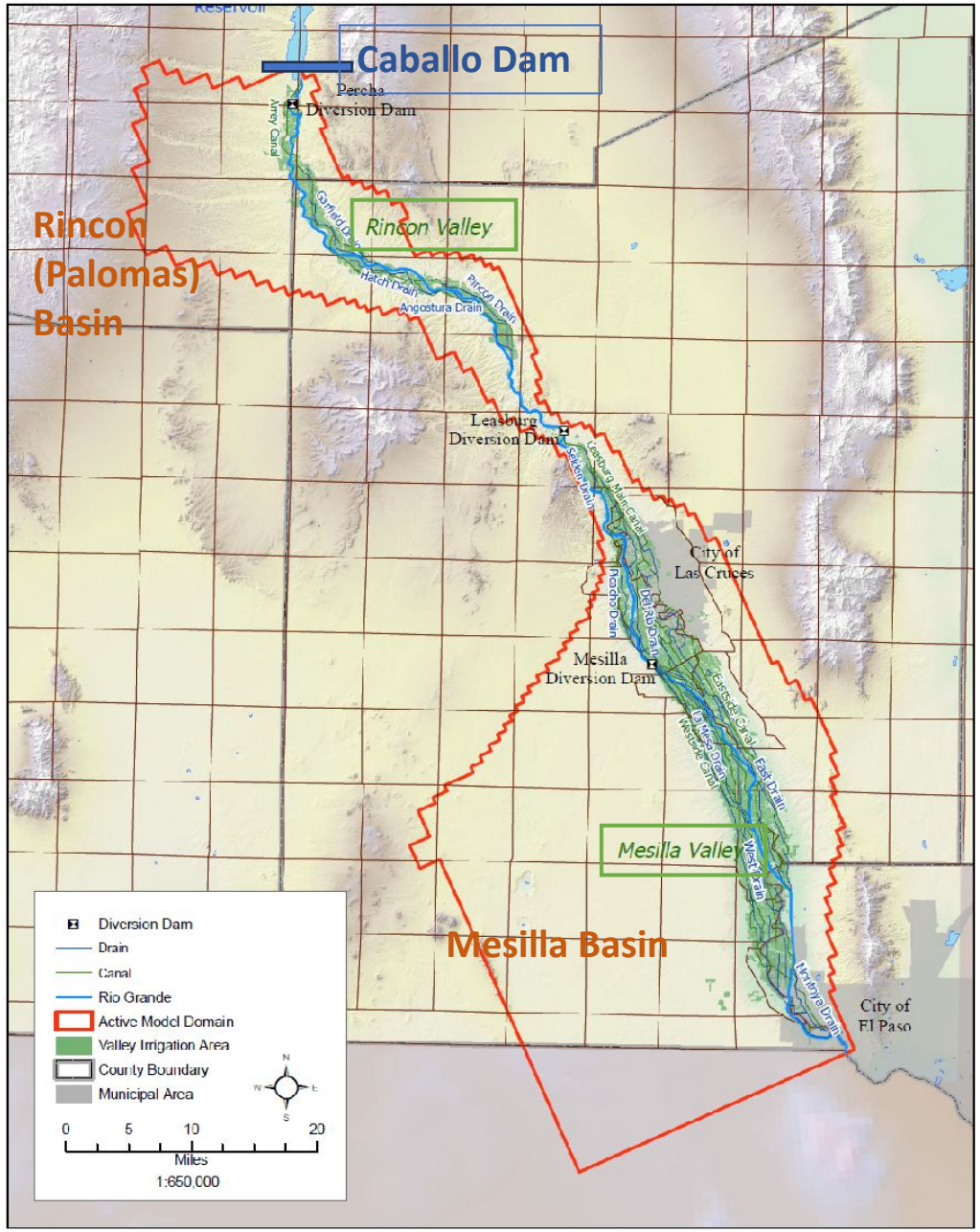
Rincon (Palomas) Basin

Mesilla Basin

Narrow Corridor of thin River Valley Alluvium (Shallow Alluvium)

Rio Grande Valley

- Rincon Valley
- Mesilla Valley



LRG Aquifer System in Cross-section

from the works of Dr. John Hawley

Hawley and Kennedy (2004)

Santa Fe Group (various shades of orange)

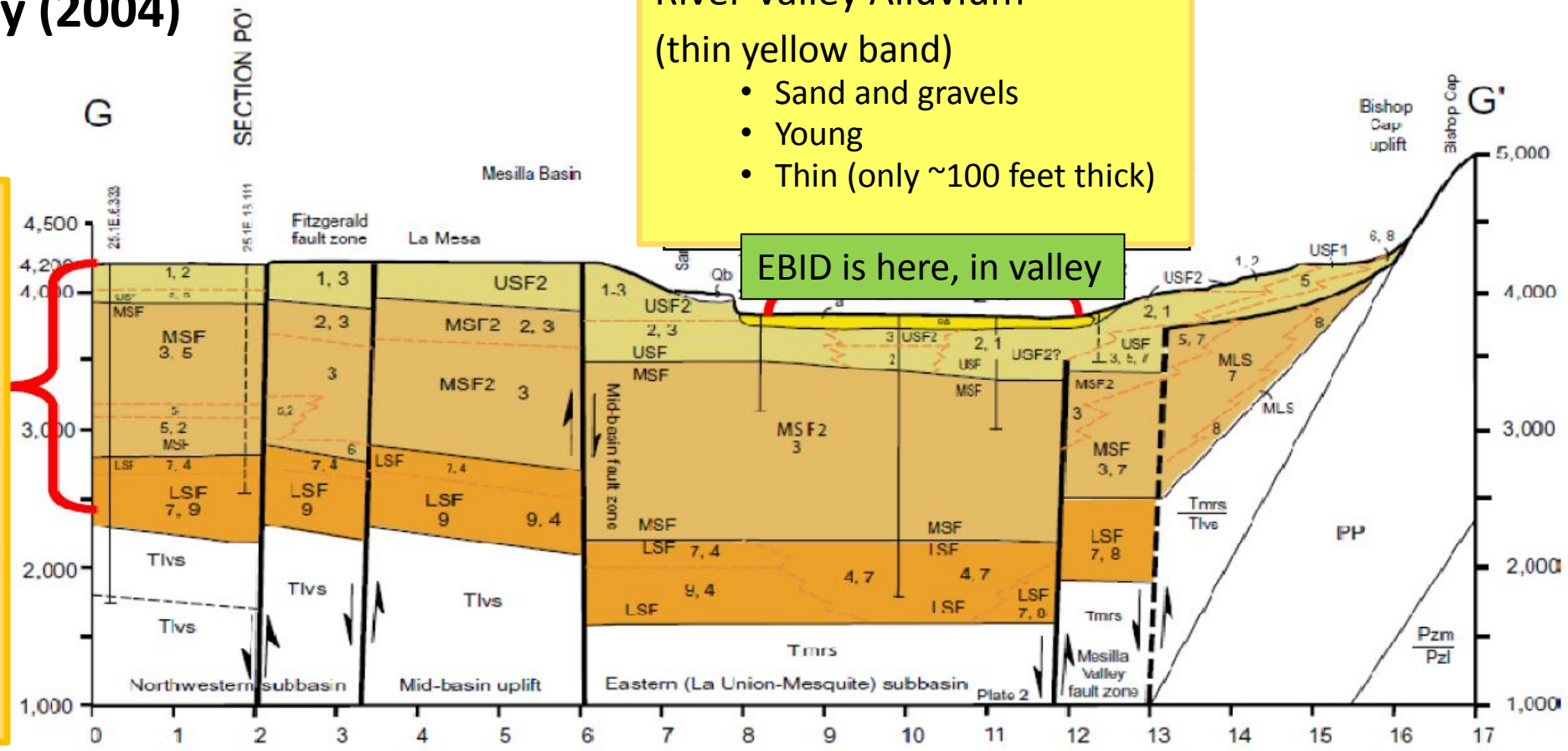
- Clay and silt, some sands and gravels (highly variable)
- Older
- Thick (thousands of feet thick)

River Valley Alluvium

(thin yellow band)

- Sand and gravels
- Young
- Thin (only ~100 feet thick)

EBID is here, in valley



Underneath: "Bedrock" that does not contain much useful groundwater

4a. Section G-G' Santo

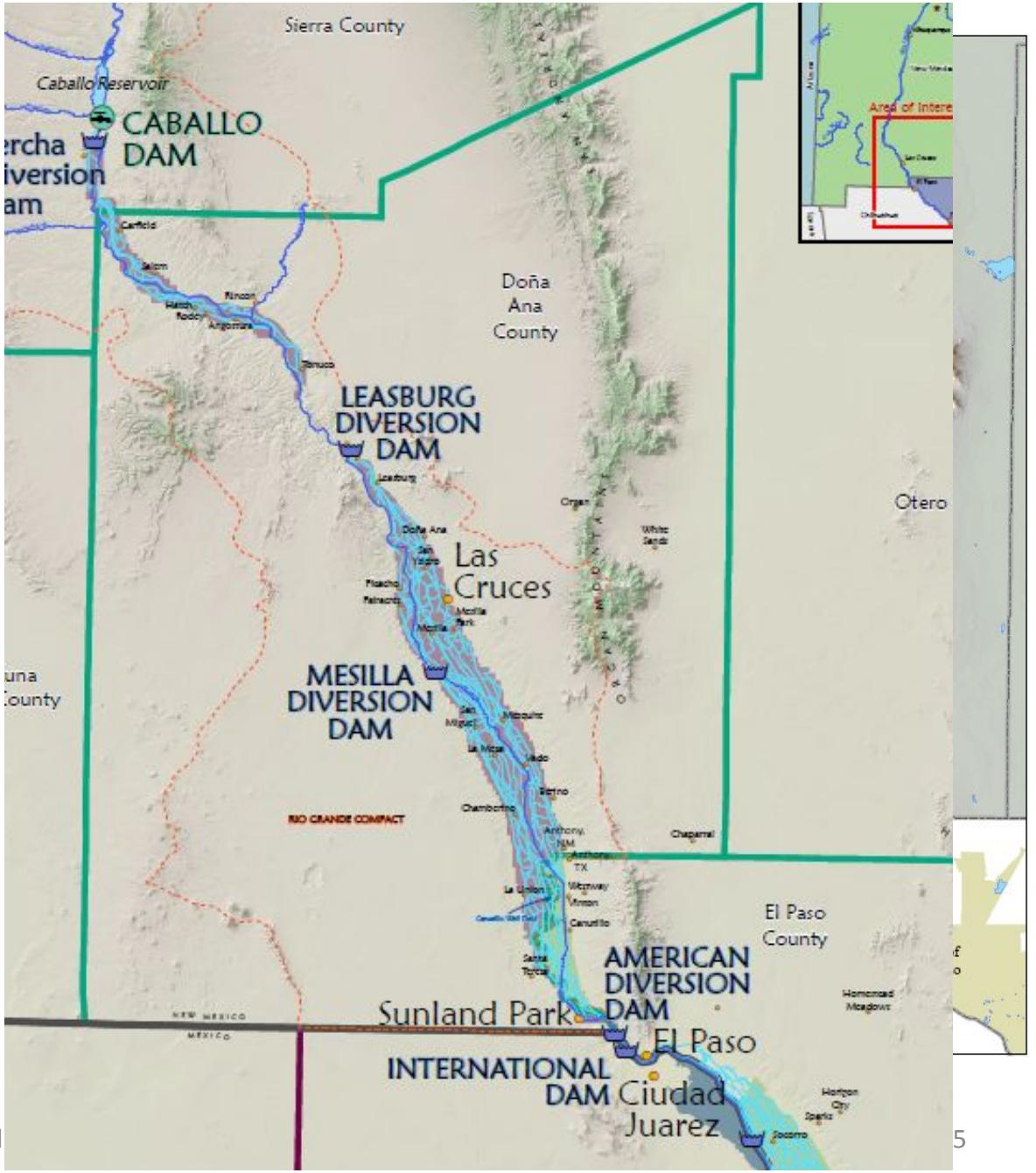
LRG Surface Water System

Rio Grande

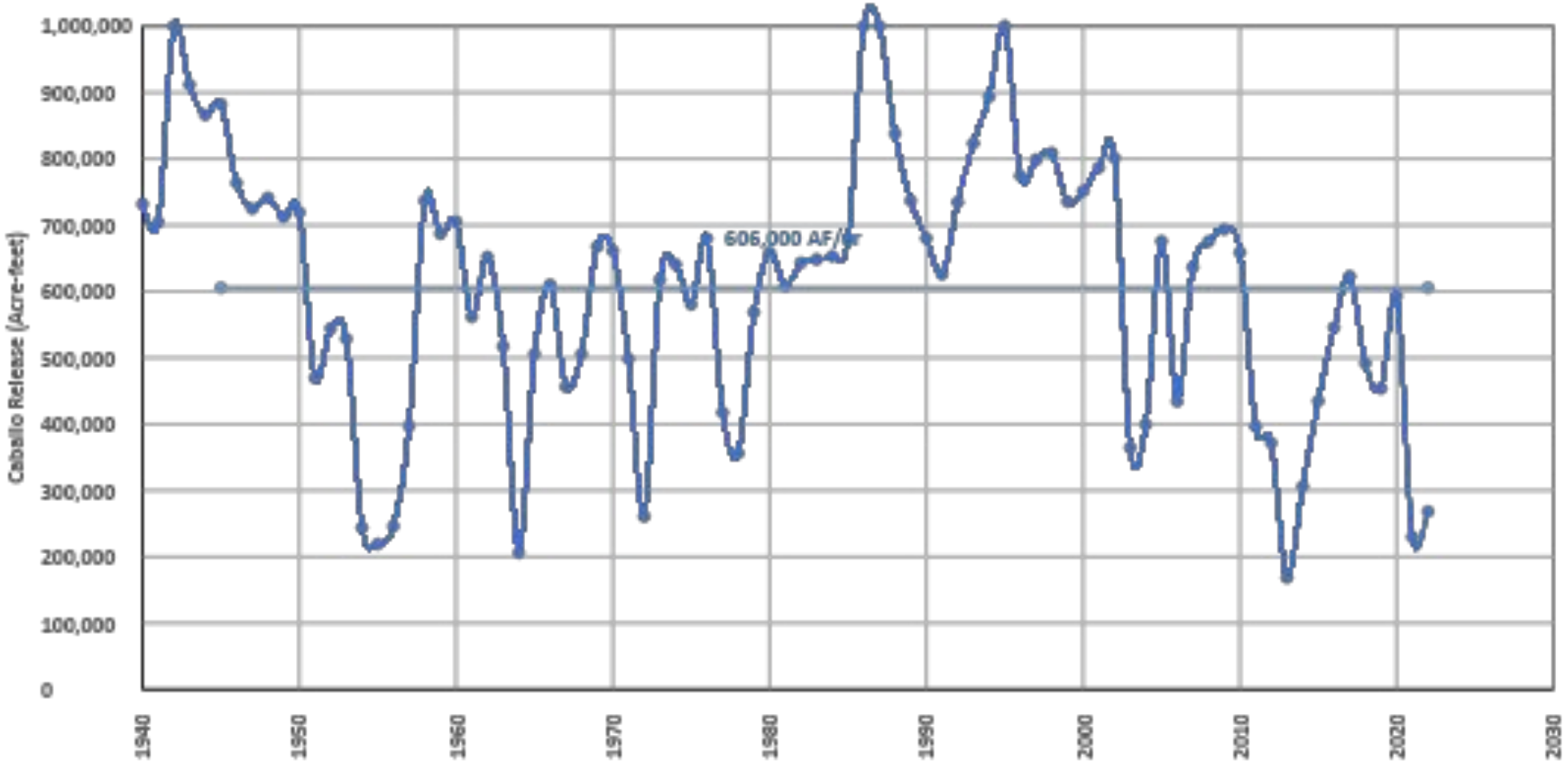
Rio Grande Project
Diversions, Canal and Drains

Source of Supply:

- Releases from Caballo Dam
- Small amounts of side flows from storms



Surface Water Supply:
Annual Release of Water from Caballo Reservoir



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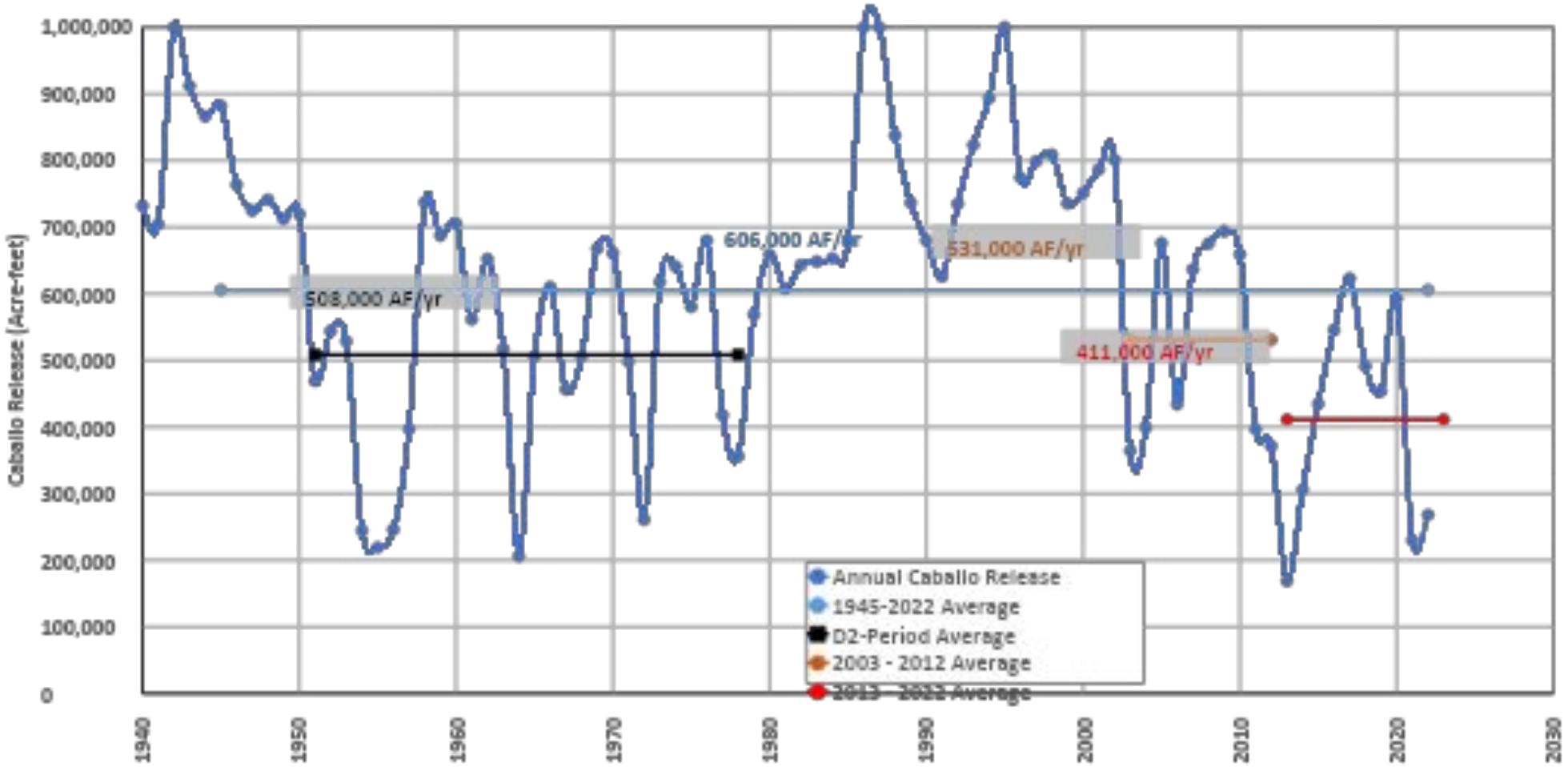
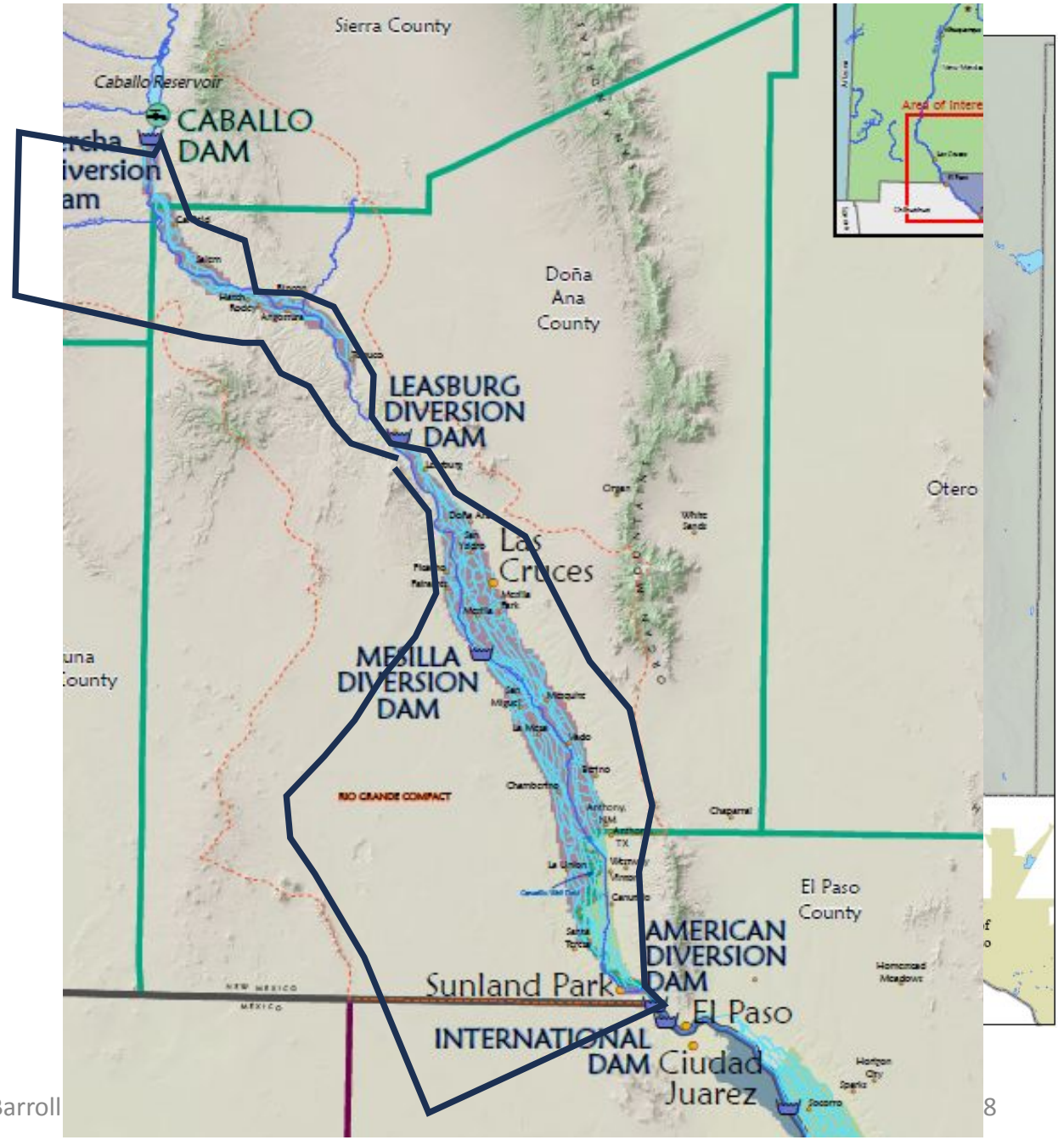


Surface-Water Groundwater Interaction:

- Surface Water release
- Aquifer recharge from river and canals
- Drain discharge from aquifer returned to Rio Grande
- Groundwater pumping

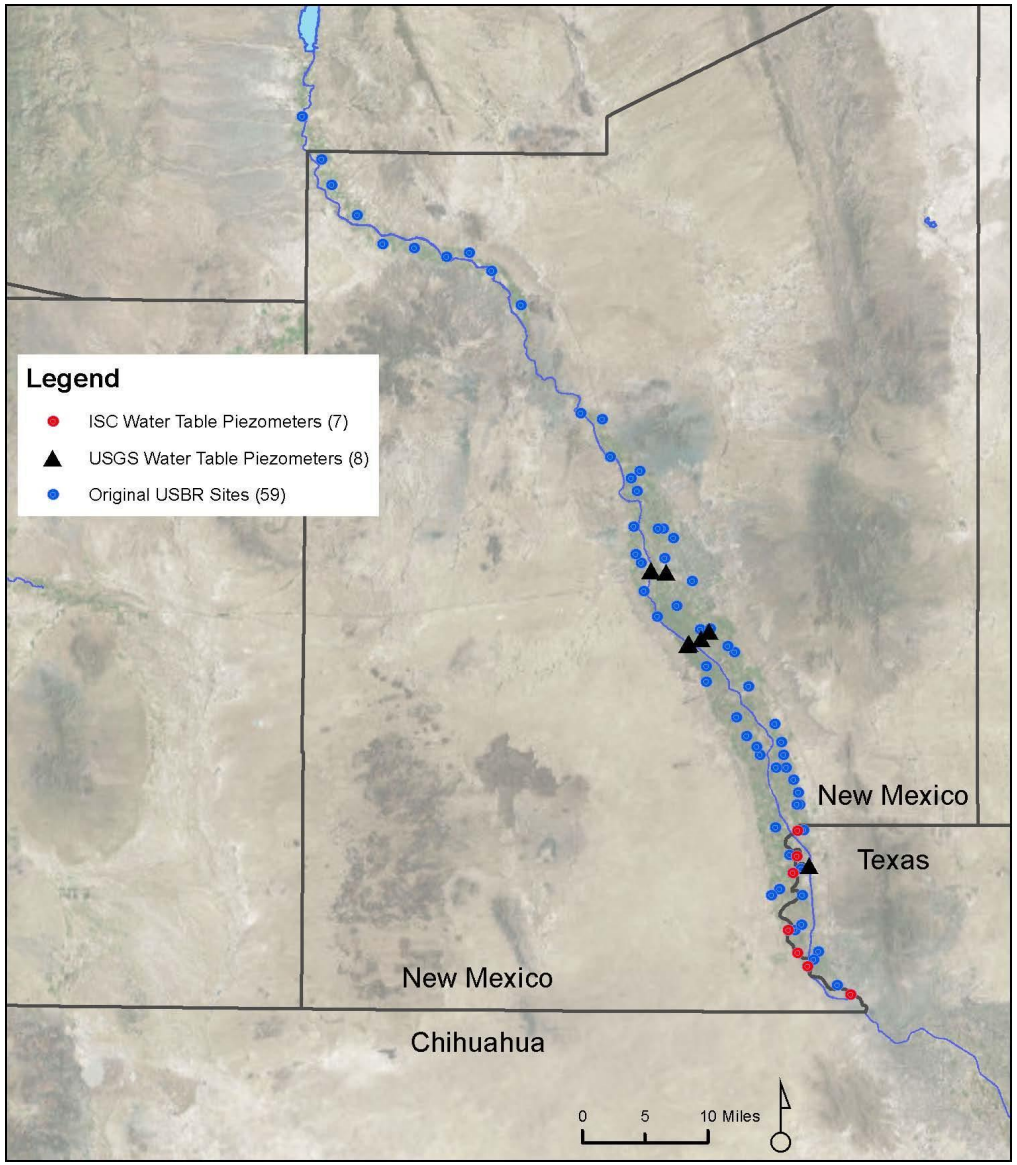
Predominantly in the Rio Grande Valley, within a few miles of the Rio Grande



Rio Grande Valley Aquifer Conditions: Groundwater Levels

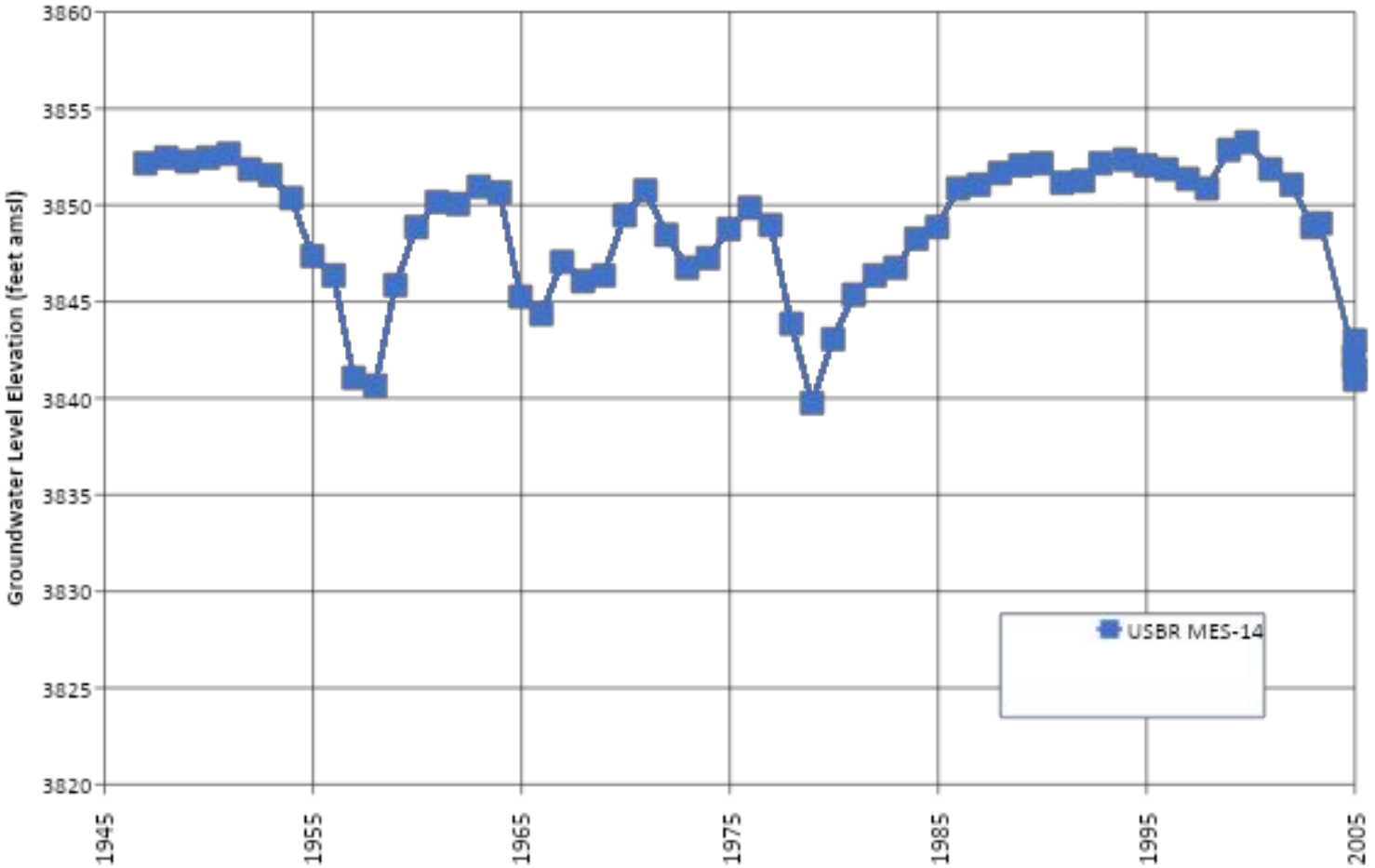
Numerous observation wells

- Drilled by US Bureau of Reclamation, USGS and New Mexico OSE/ISC,
- Maintained and monitored by EBID and USGS



Groundwater Level Records from Observation Wells

Annual (winter) data from a well south of Las Cruces

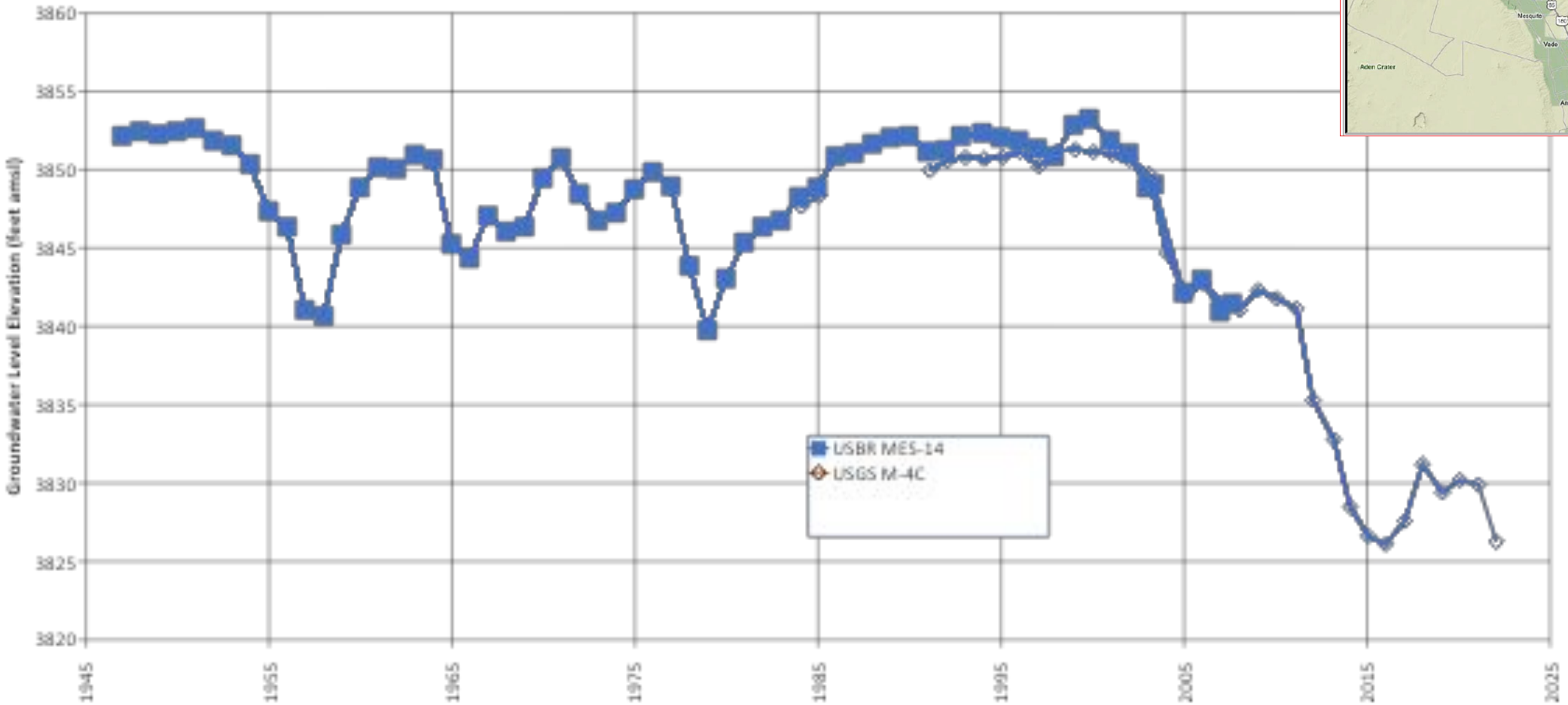


Up until about 2000, water levels fluctuated, declining during drought, recovering thereafter

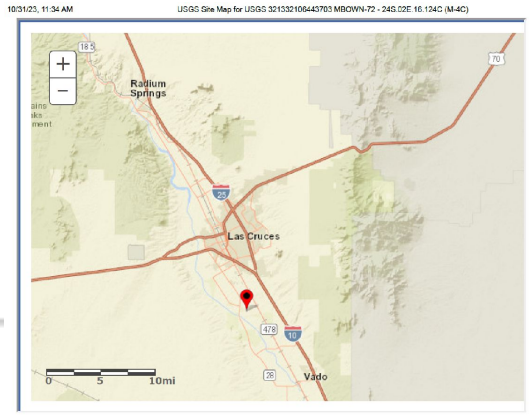
Recent Annual Data south of Las Cruces:

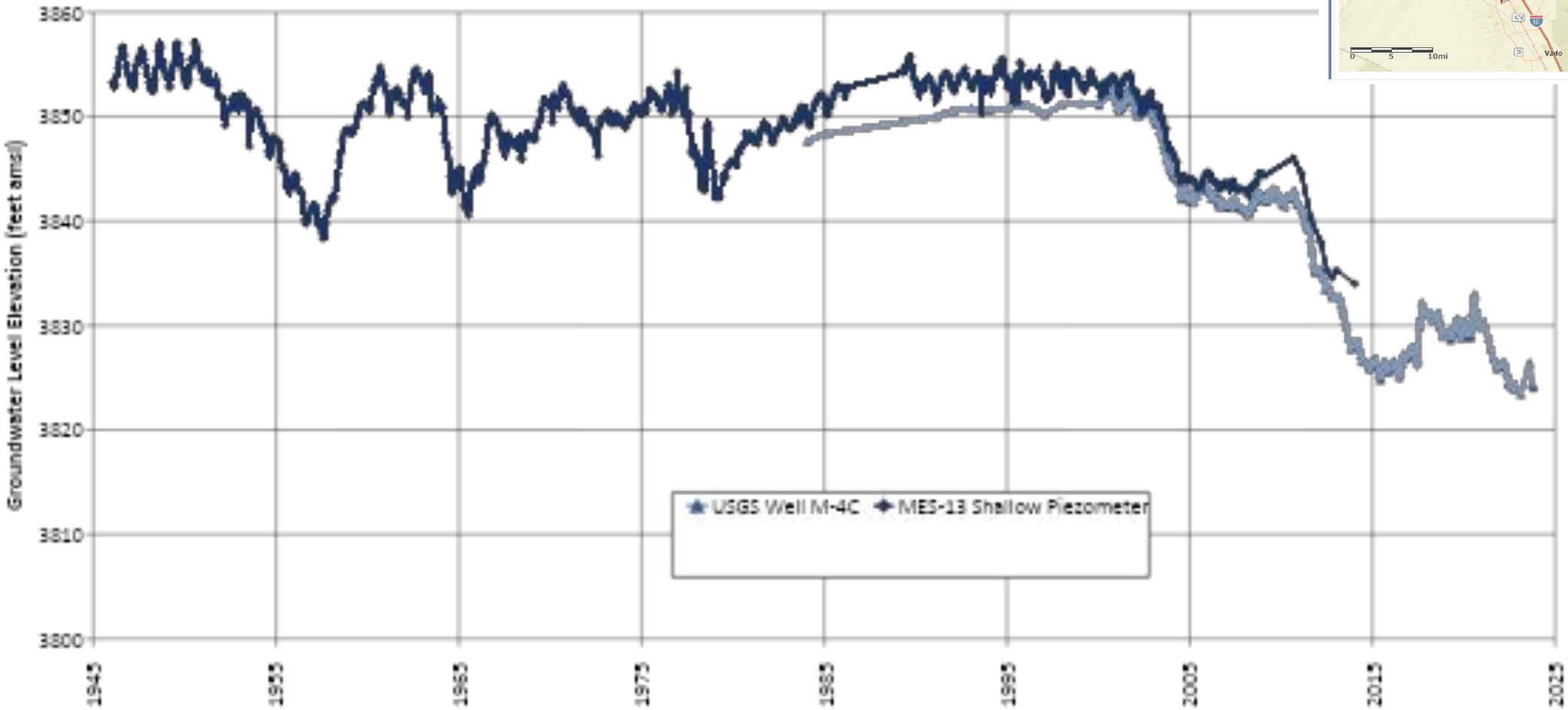
Dropping, and not recovering

Are we now in a mined-aquifer regime?

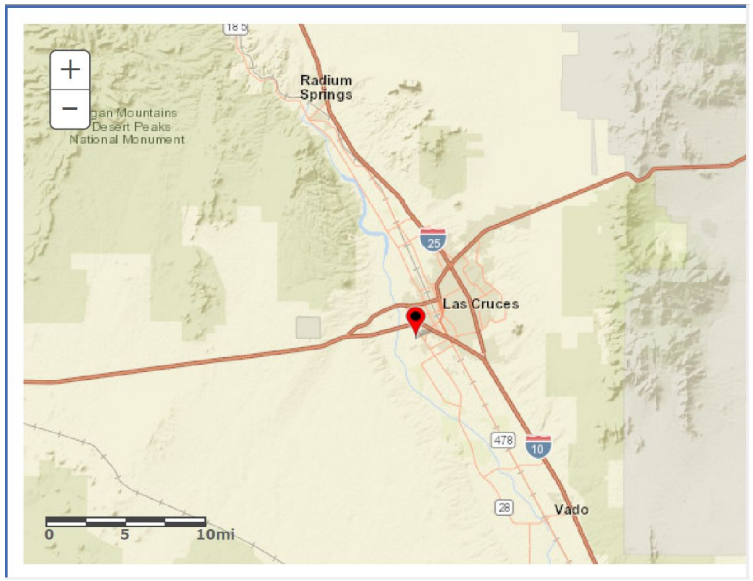


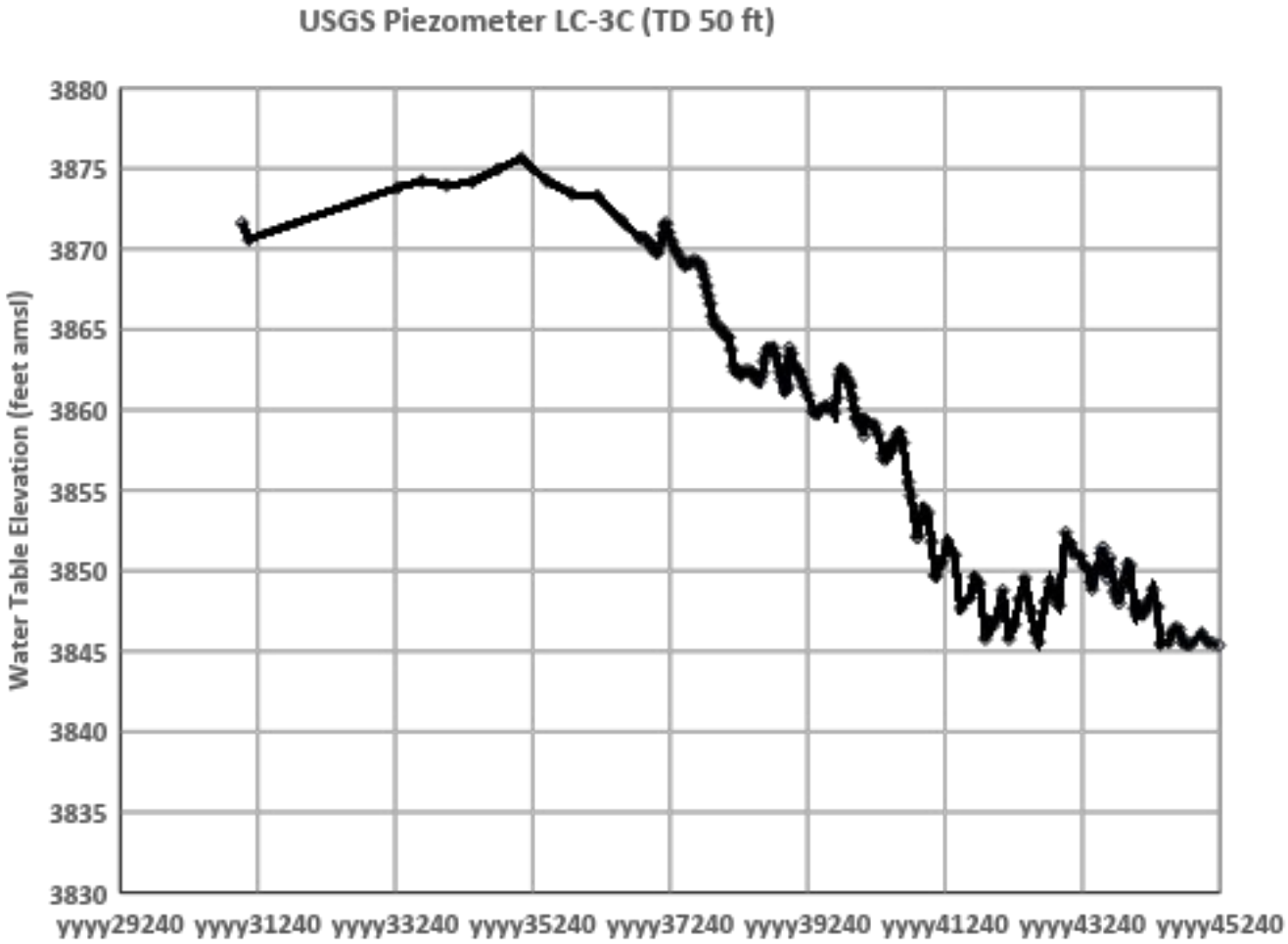
Latest Data (south of Las Cruces)



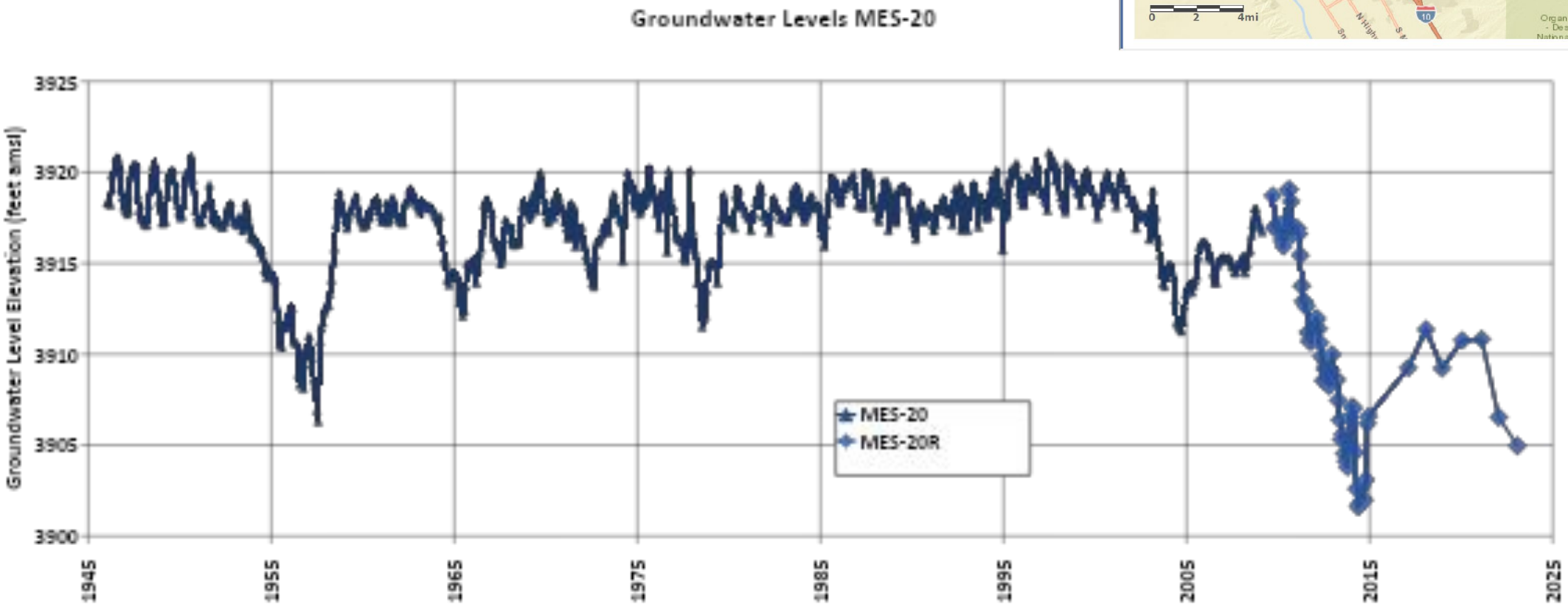


Shallow Groundwater Levels in Las Cruces



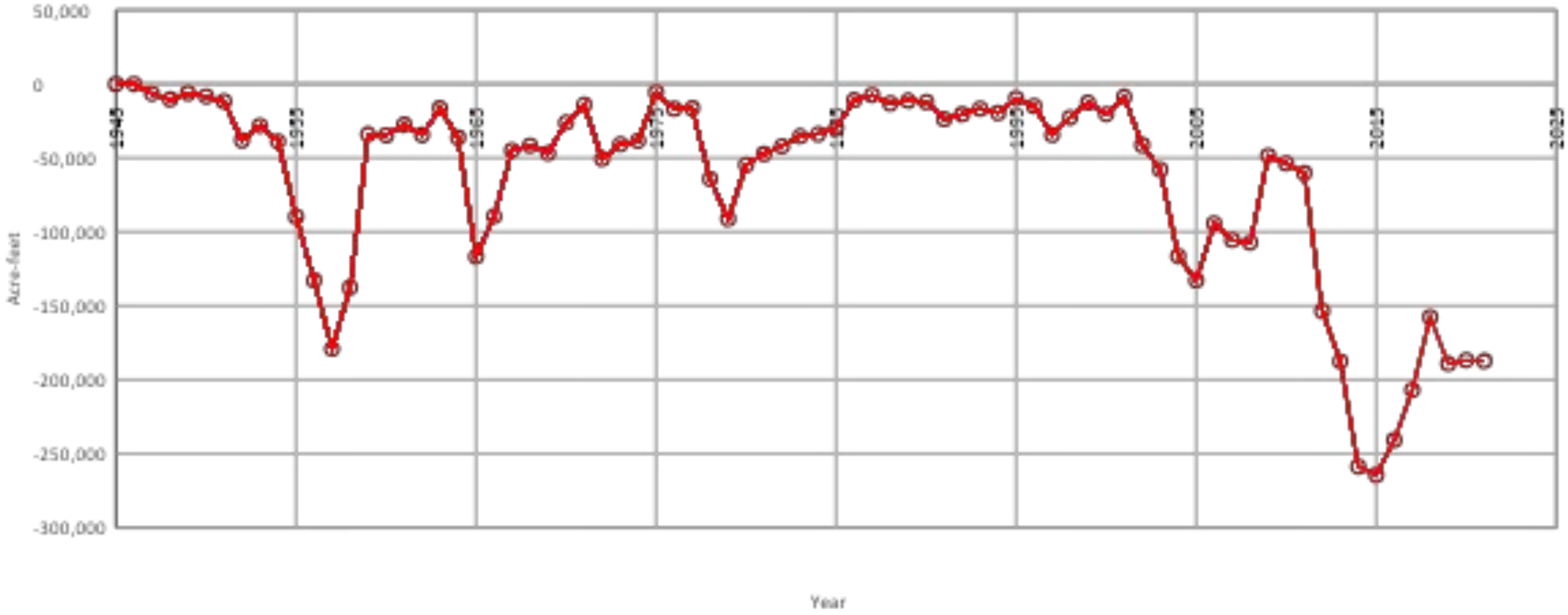


Shallow Groundwater Levels North of Las Cruces



Reduction of the Amount of Groundwater In Storage in the Shallow Aquifer Rincon and Mesilla Valleys

Balleau Groundwater and Dr. Erek Fuchs from measured groundwater level data.
Calculated relative to 1945 baseline condition.



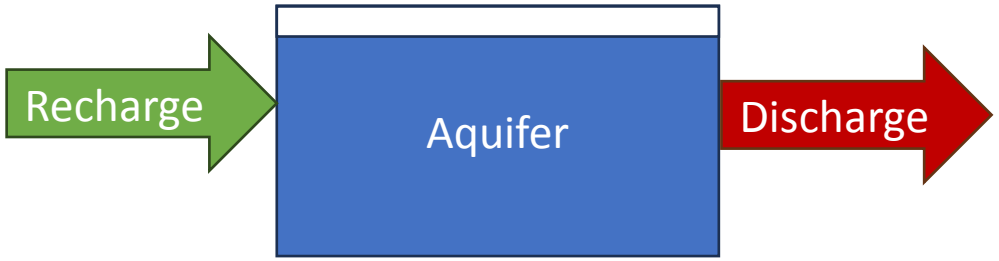
Aquifer Water Budget Components:

Inflow to the Aquifer (Recharge)

Most of the inflow to aquifer comes from

- Seepage of irrigation water from canals and farms (Rio Grande water)
- Seepage directly from Rio Grande

Small amounts of recharge from local precipitation and side inflows



Key Anthropogenic (Human) Components

Withdrawal of Water from LRG Aquifer System (Discharge)

Well pumping: irrigation and municipal users

Discharge from drains

Other: Small amounts of groundwater are lost to evaporation from phreatophyte plants, and subsurface groundwater outflow

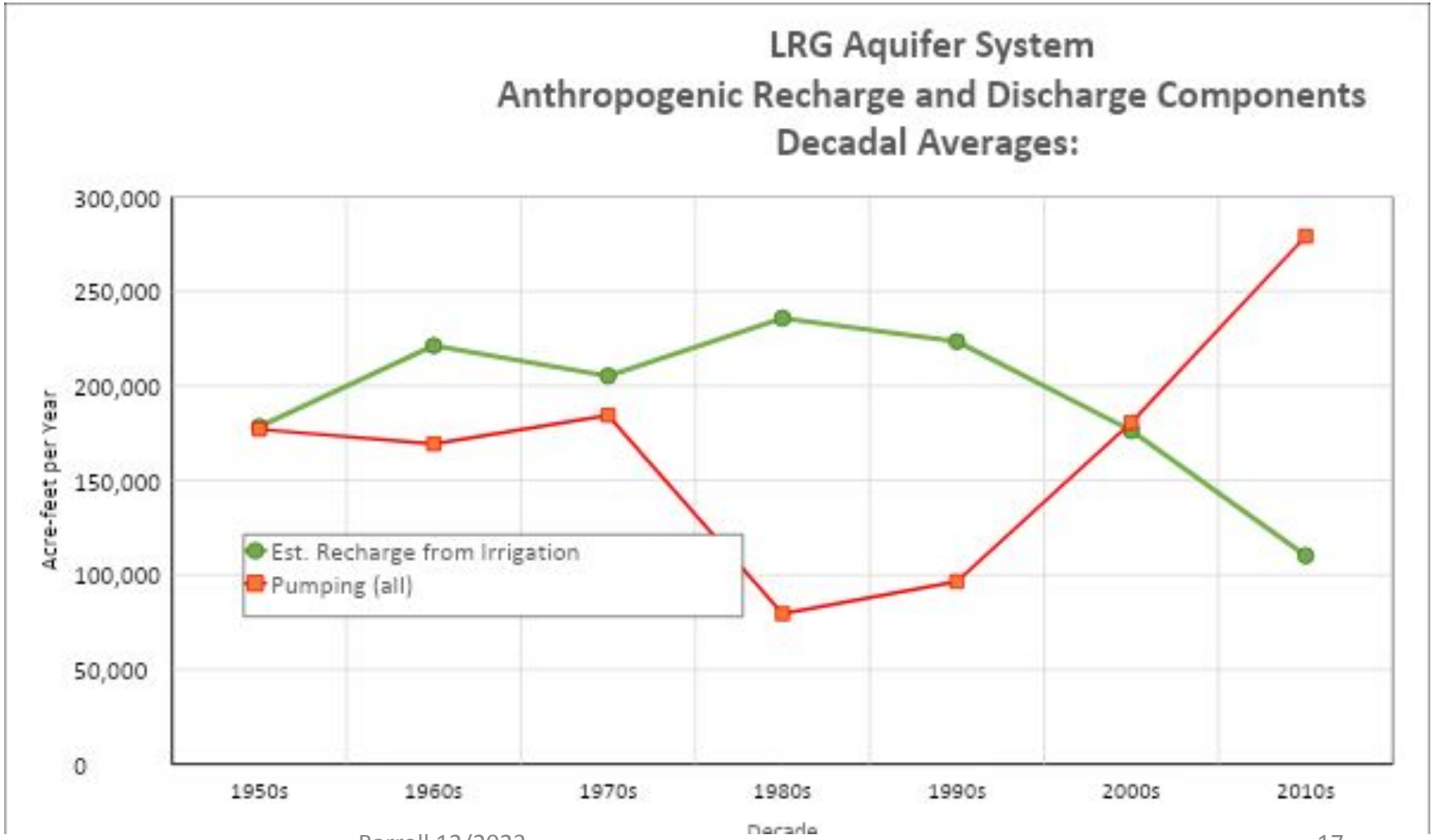
How Have Anthropogenic Water Budget Components Changed with Time in the LRG Aquifers?

Key Recharge Component:
Recharge from Irrigation

- **Canal Seepage**
- **On-Farm deep percolation**

Key Discharge Component:
Groundwater Pumping

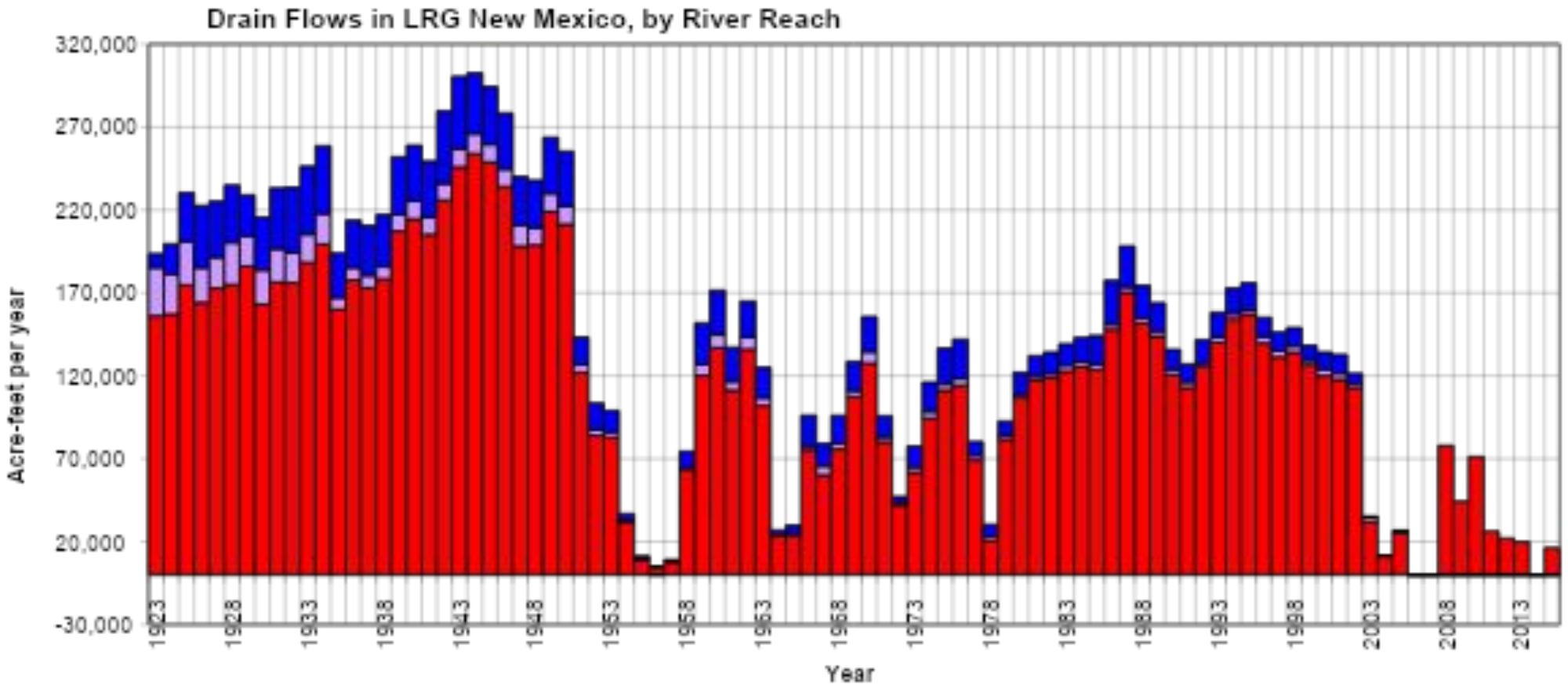
- **Irrigation**
- **Municipal etc. (DCMI)**



Drain Discharge into Rio Grande

Variable:

- High in high-supply years,
- Low during drought, very low in recent years

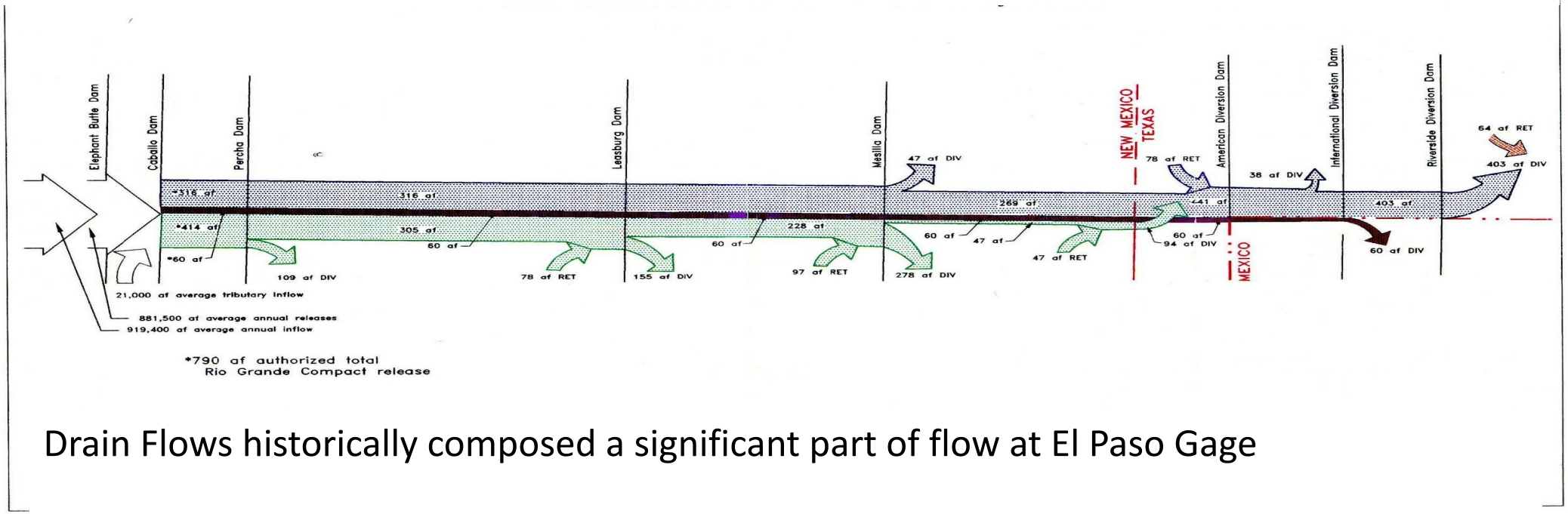


Importance of Drain Flows

Drain Flows are part of Project Supply

If drains don't flow:

- Project Supply is reduced
- Project efficiency is reduced



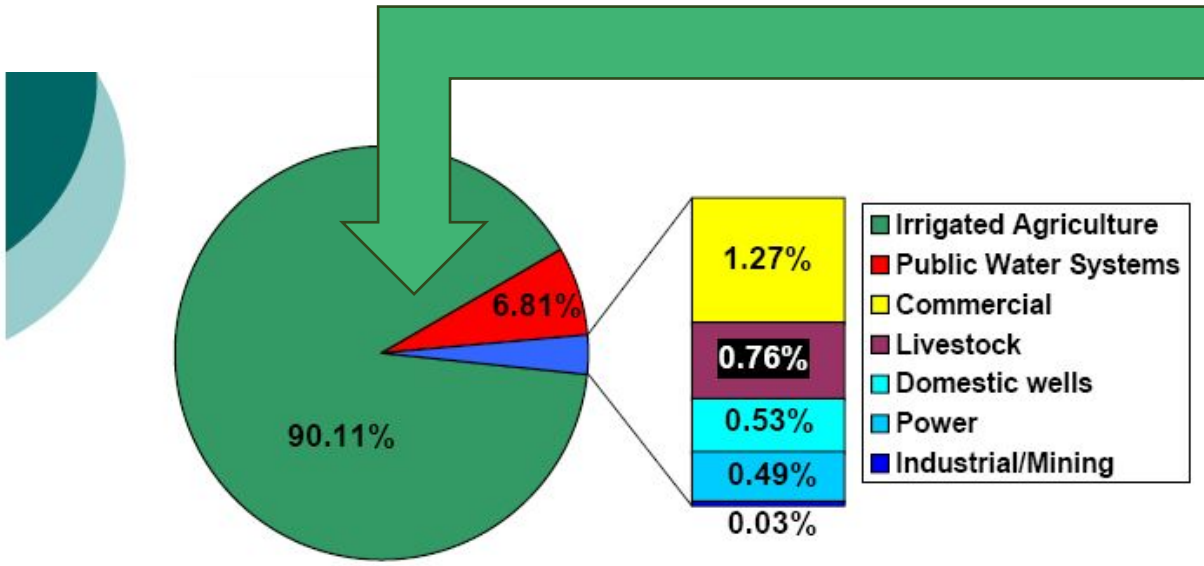
Drain Flows historically composed a significant part of flow at El Paso Gage

How is Water in the LRG being Used? By Whom? How has this use changed?

Total water use (including surface water) by Sector:

90% agriculture, 7% municipal, 3% other

Agricultural Water Use:
- Application of Irrigation Water
- Consumption of Irrigation Water

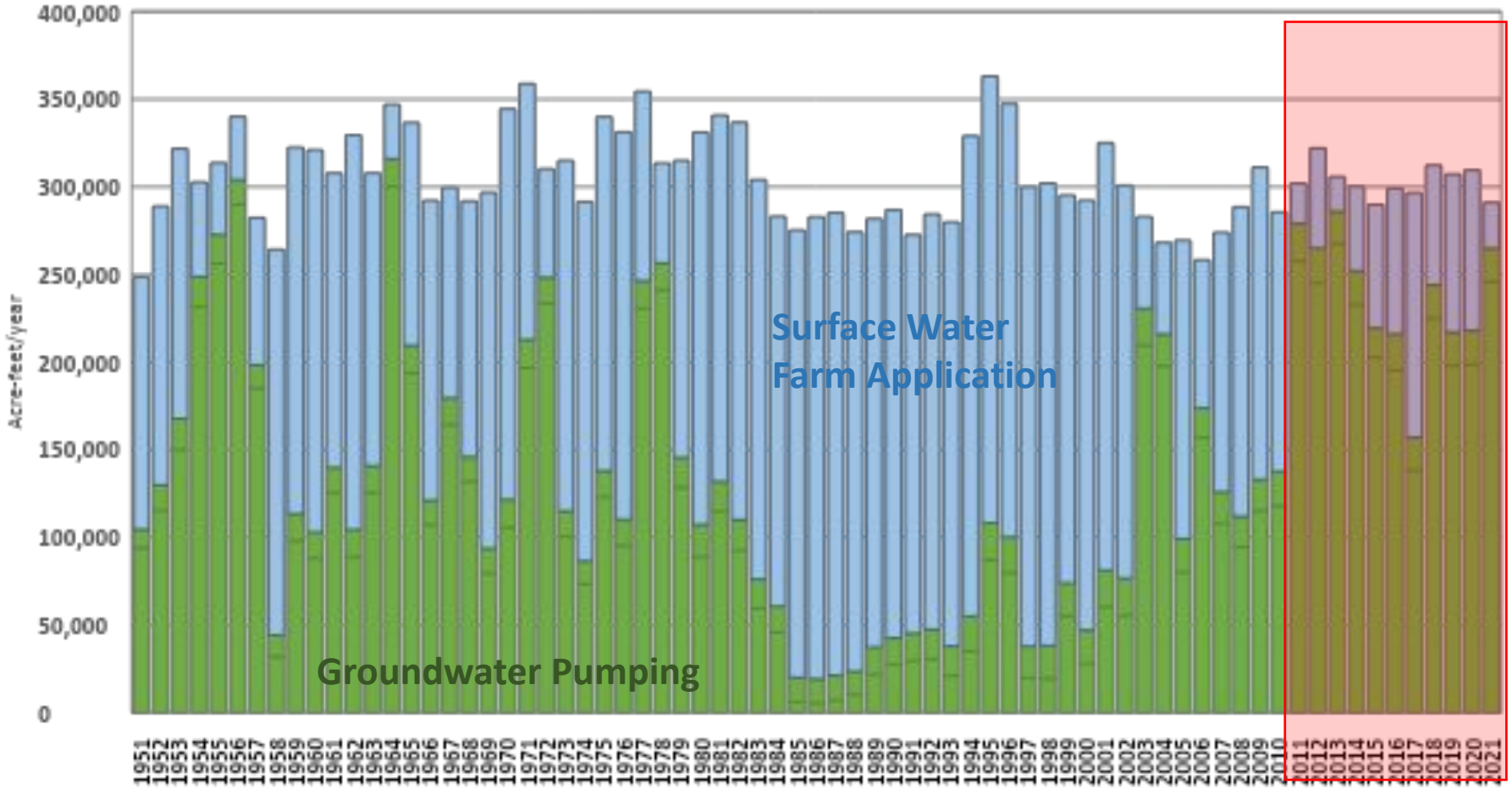


From LRGWUO Regional Water Plan 2003

97 percent of LRG water use is irrigation or public water systems

EBID

Irrigation Water Use: Water Application



Irrigation Water Applied to Crops

<u>Total</u> application of irrigation water is also pretty flat.

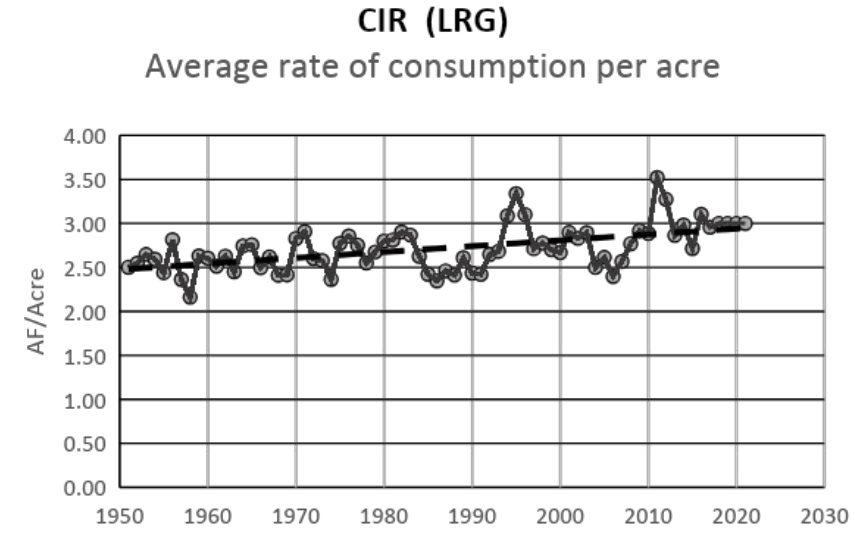
<u>But:</u> In recent years, very little surface water, so a large proportion of irrigation is from groundwater pumping

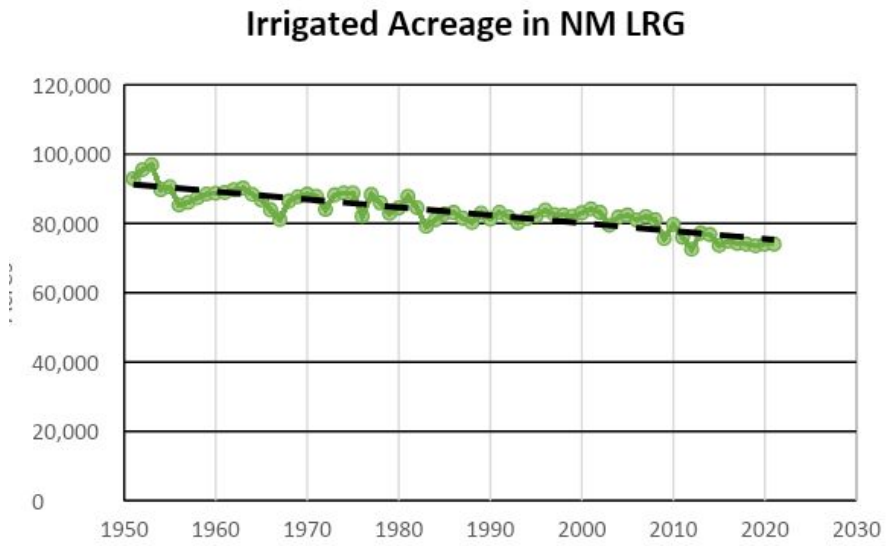
Irrigation Water Use: Consumption

High consumptive use crops have increased in importance,

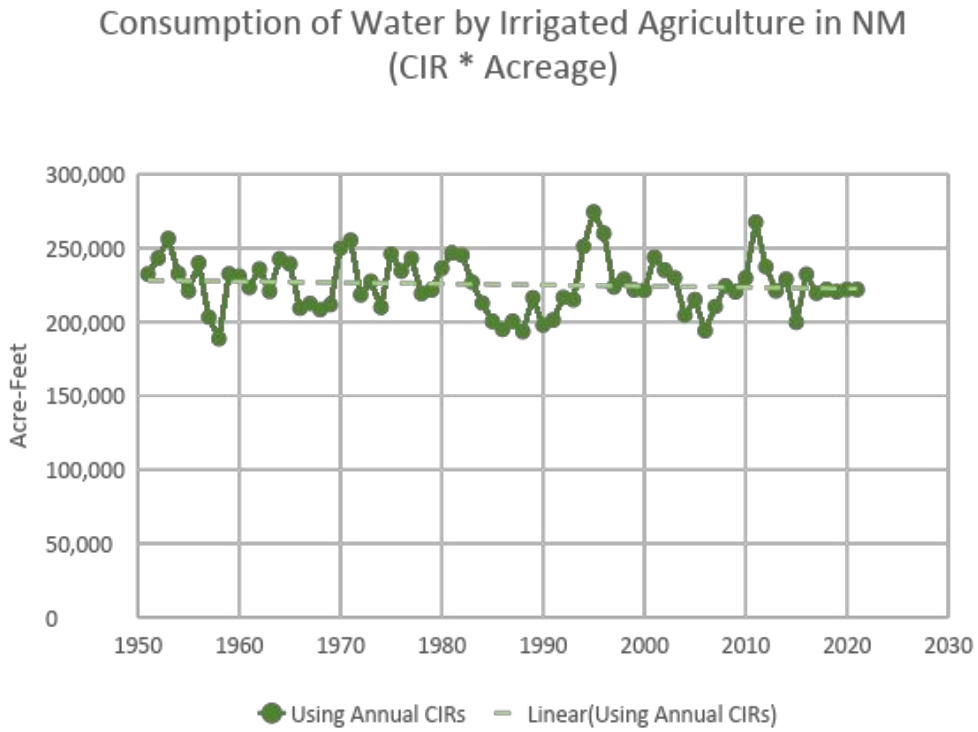
but

The total acreage irrigated has gone down.





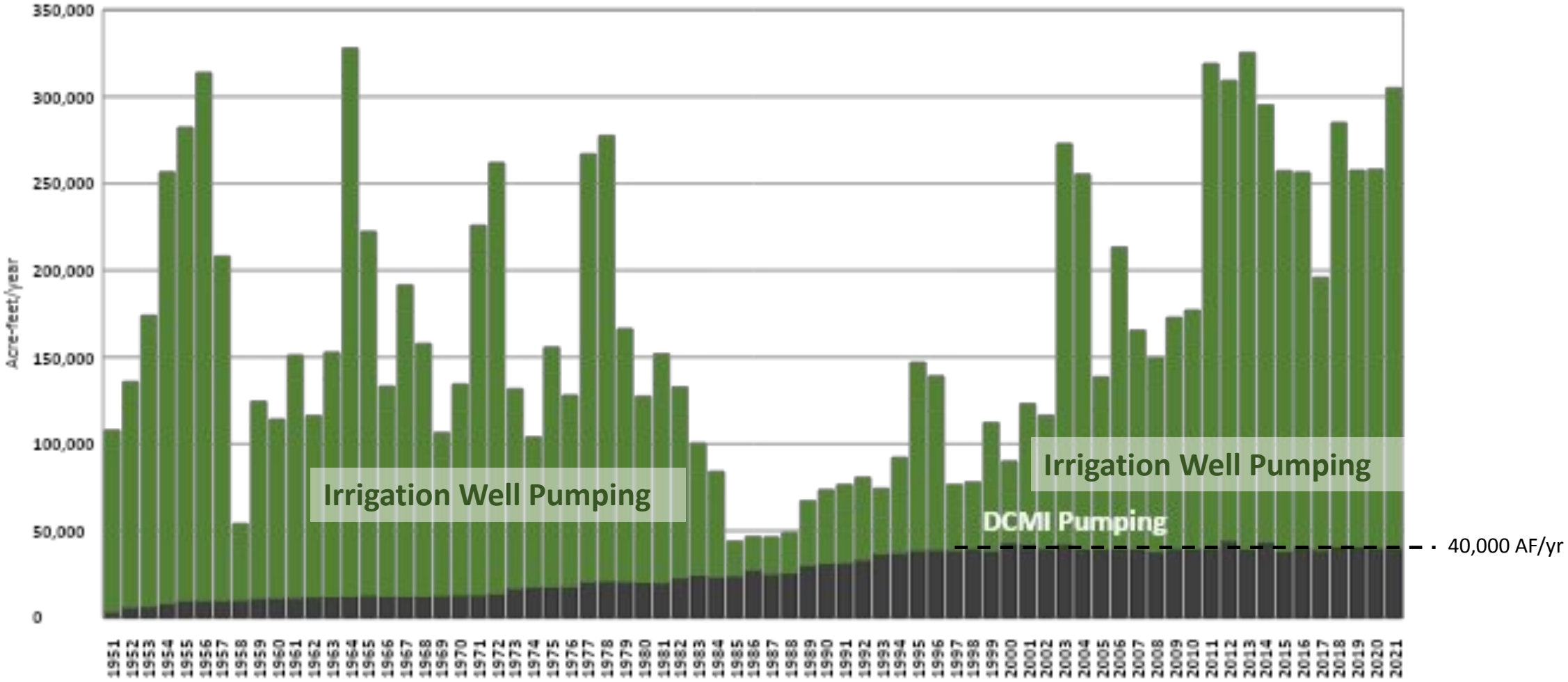
Total Consumption of water by irrigated agriculture is pretty flat (relatively constant)



Groundwater Pumping in the LRG: Historical Amounts and Breakdown

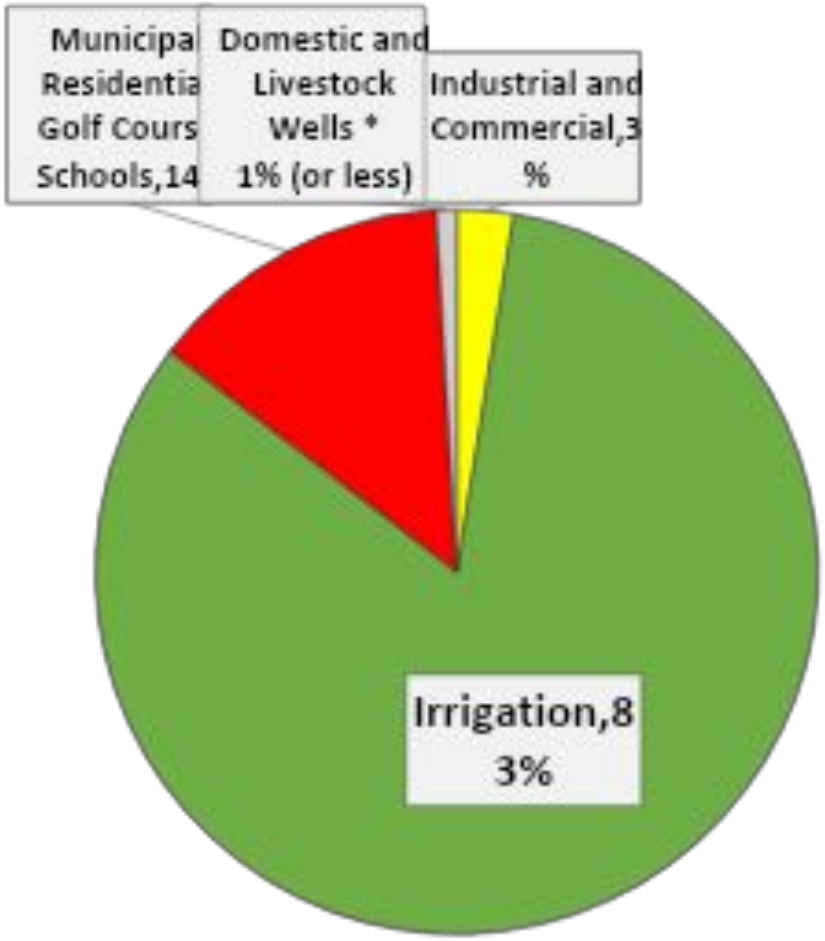
- Historical Trends in groundwater pumping
- Breakdown between:
  - Irrigated Agriculture and
  - DCMI (Domestic, Commercial, Municipal and Industrial pumping)
- Recent Meter Data: 2020

All Groundwater Pumping
Mesilla and Rincon Basins



2020 Groundwater Withdrawals in the Lower Rio Grande

Percentages Based on Meter Data, except for Domestic and Stock Wells, which are Estimated



Conclusions

- Supply of surface water to the LRG has been relatively low for past 20 years
  - Low recharge to aquifer
  - High irrigation well pumping
- Groundwater levels have fallen, without much recovery, since about 2000
- Drain flows are low to non-existent
  - Low efficiency for Project and for delivery of water to El Paso Gage
- Recent groundwater use and depletions are incompatible with low surface water supplies and low aquifer recharge
  - Total irrigation depletions have been stable over time, but low surface water supplies have led to large amounts of irrigation well pumping in recent years
  - DCMI water use has increased over time; but has been stable since about 1995.