

Colorado River Basin Salinity Control Program

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Colorado River Basin Salinity Control Forum

Western States Water Council
September 29, 2016
St. George, UT



Outline

- Quick Overview
- Impetus for the Program
- Early History
- Why a Salinity Problem
- Program Nuts and Bolts
- Program Funding
- Economic Damages

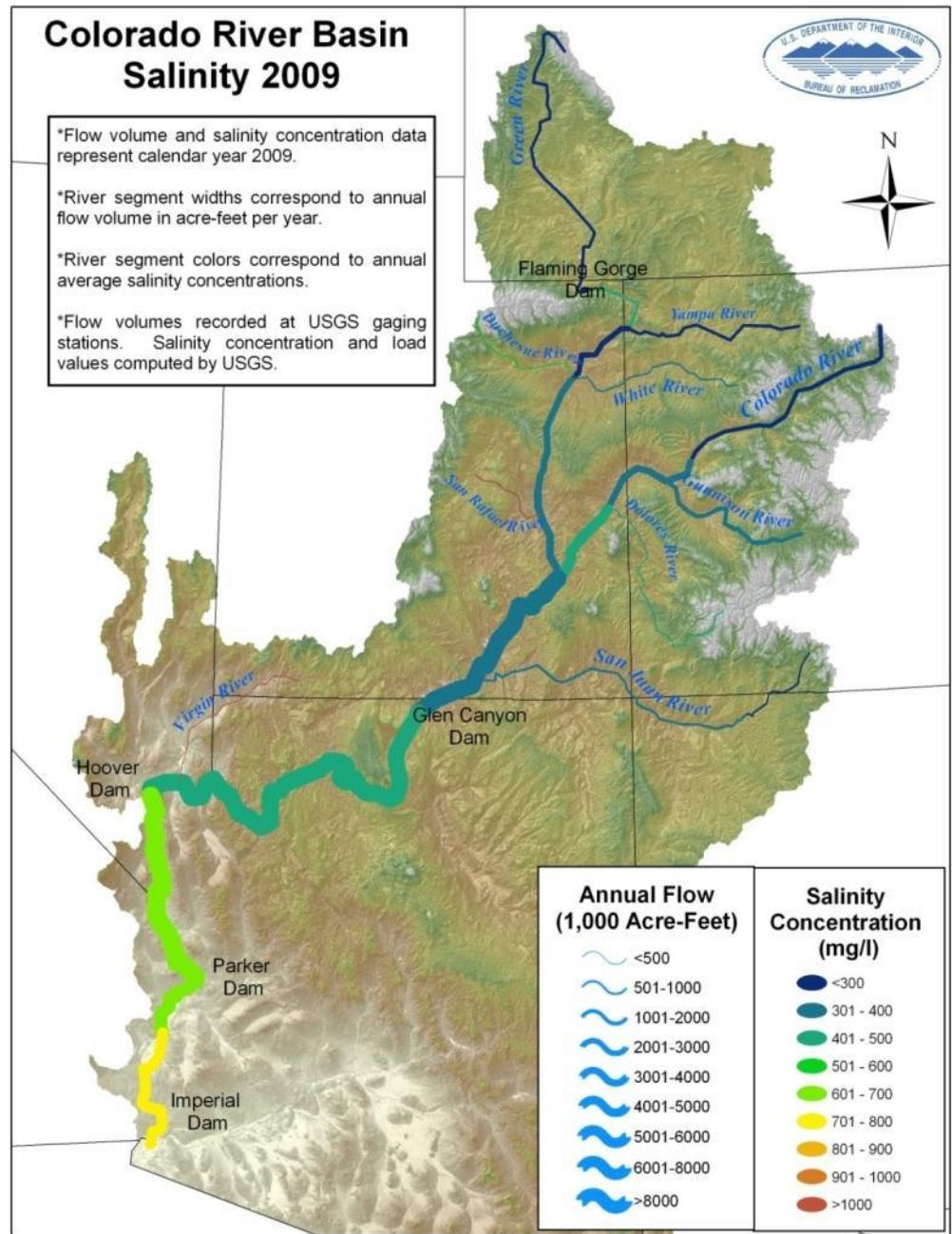


Facts/Results:

The Colorado River Basin Salinity Control Program...

- reduced the annual salt load by about 1.3M tons
- reduced the concentration at Imperial Dam by 90-100 mg/L (80-90 mg/L below Hoover)
- reduced quantified damages by several hundred million \$/yr
- \$50/ton

The Colorado River's salinity concentration increases from about 50 mg/L to 800 mg/L plus as it flows from its headwaters to the lowest diversion in the United States





Tale of Two Rivers



Upper Basin

- Good Quality Water
- Limited M&I Usage
- Often High Spring Water Supply
- Marginal Farm Economic Output
- Underlain by Saline Soils

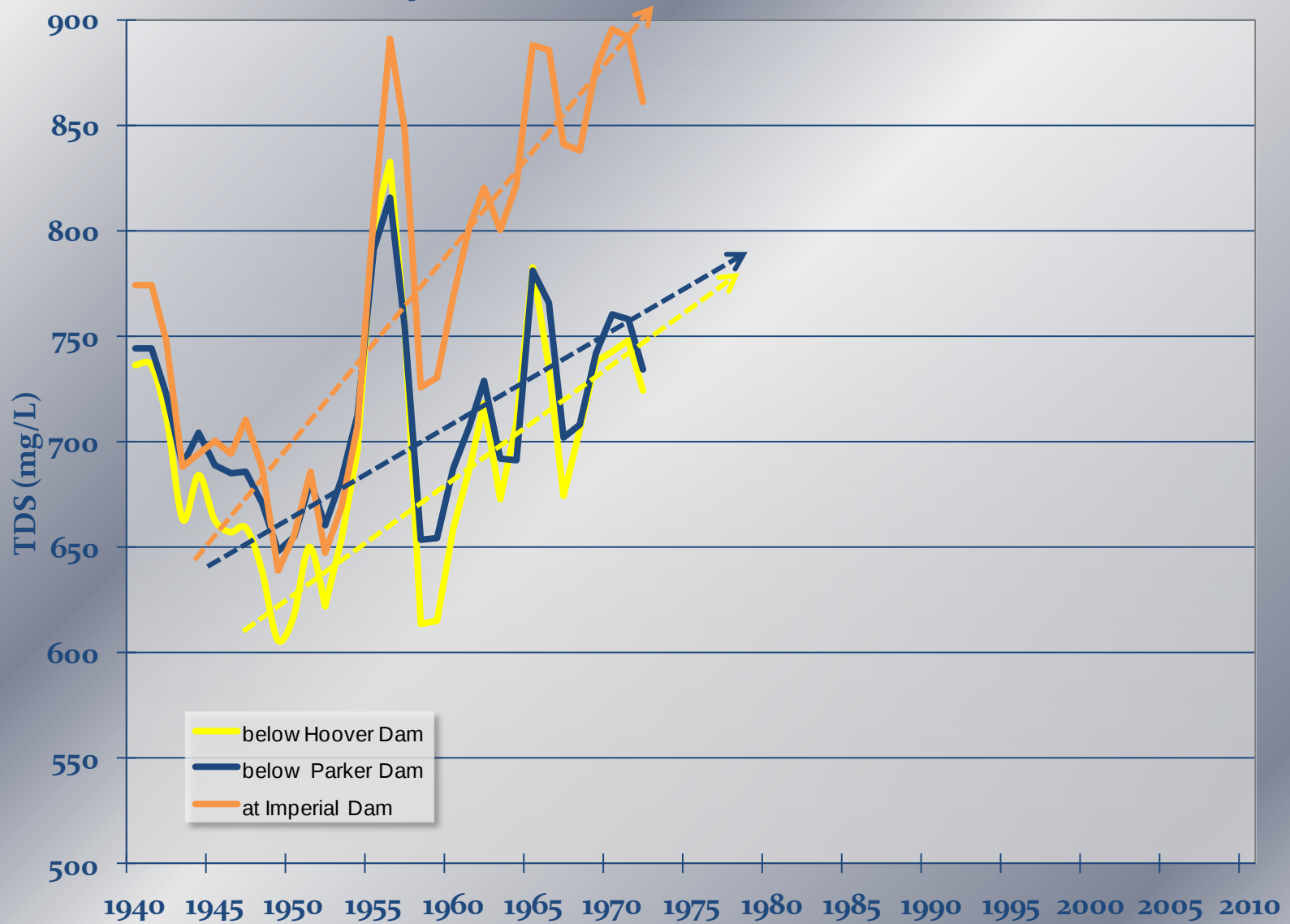


Lower Basin

- Significant M&I Usage
- Very High Economic Output from Farms
- Have Saline Soils
- Need to Deal with Saline Water Supply



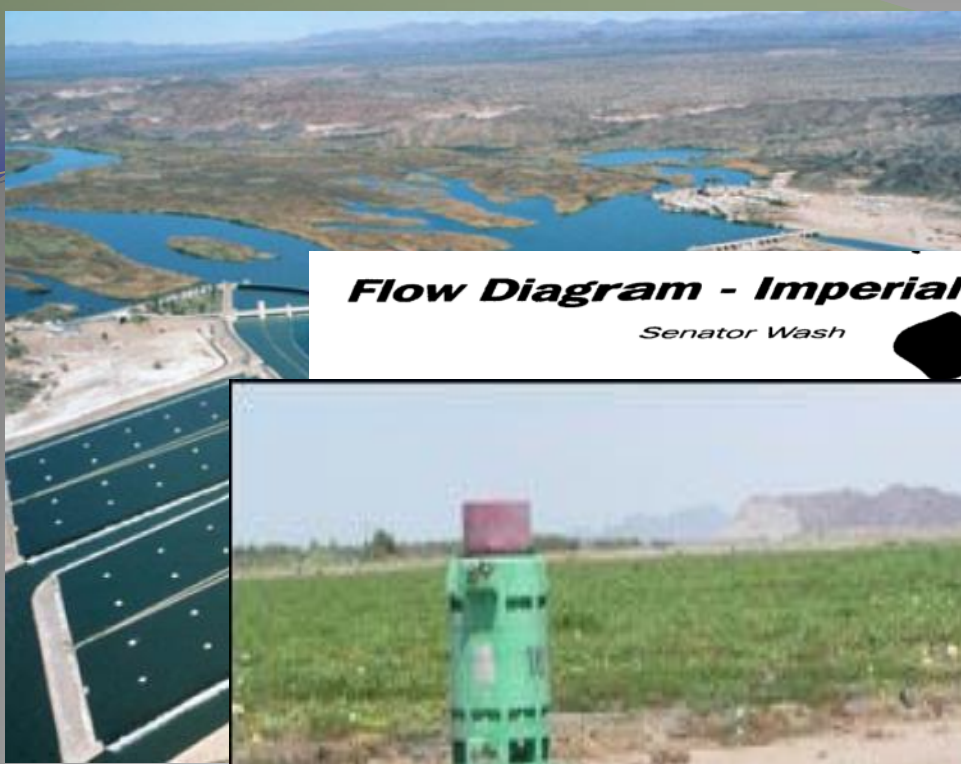
Colorado River Salinity Concentrations at Numeric Criteria Sites



Salinity Control Program History

- Early 1970's
 - Salinity of the Colorado River was rising
 - Significant concerns by Mexico





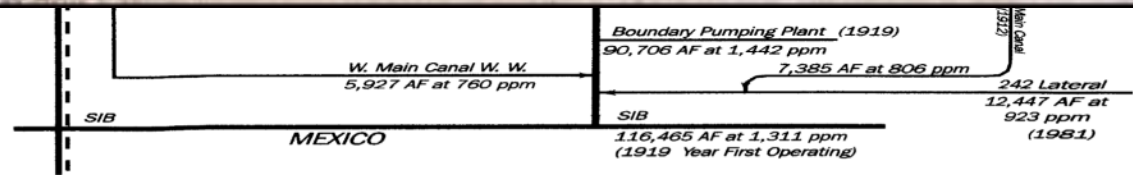
ogram History

Flow Diagram - Imperial Dam to SIB - 1995

Senator Wash



6,064,340 AF at 788 ppm
 Imperial Dam
 243,040 AF at 795 ppm



Unmeasured Return Flows: 60,357 af at 1,859 ppm

- - - = MOD, MODE, Bypass Drain

() = Date facility put in operation

/adams/don's stuff/Don9.cdr



and has 20 river gates and 12 intake

Salinity Control Program History

- Early 1970's
 - Salinity of the Colorado River was rising
 - Significant concerns by Mexico
 - The Basin States were concerned about the implications of the newly passed Federal Water Pollution Control Act amendments

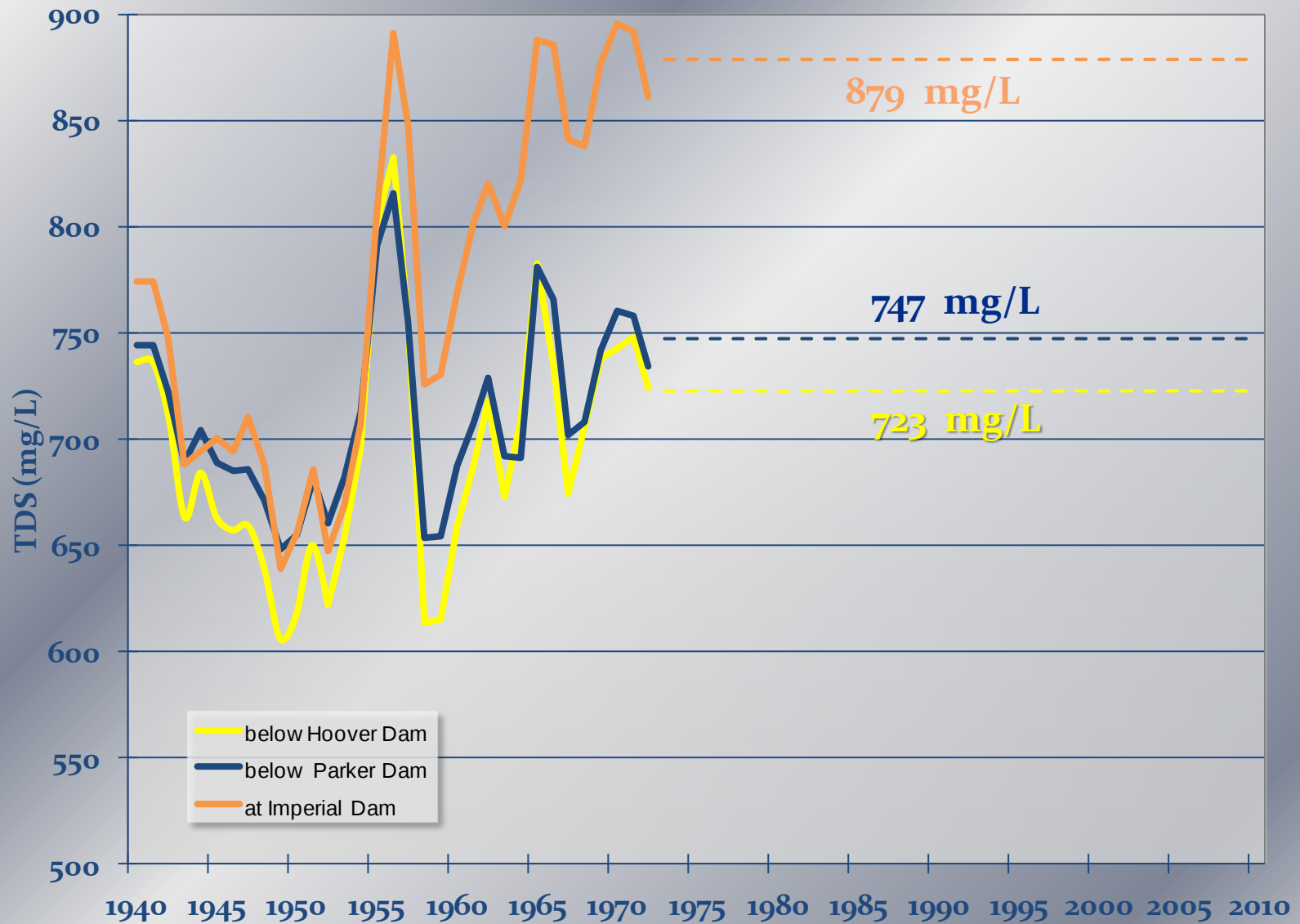


Salinity Control Program History

- 1973 – created the Colorado River Basin Salinity Control Forum (Forum)
 - Conference on the Matter of the Pollution of the Interstate Waters of the Colorado River and its Tributaries (concl'd 1972)
- 1974 – passed the Colorado River Basin Salinity Control Act (Act)
 - Title I and Title II
- 1975 – adopted salinity standards for the Colorado River



Colorado River Salinity Concentrations at Numeric Criteria Sites

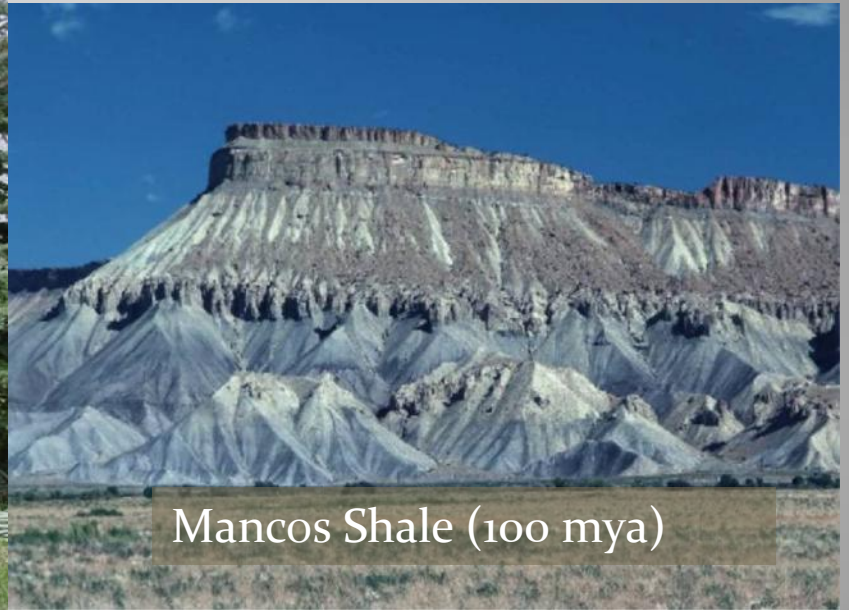


Why is There a Salinity Issue in the Colorado River Basin?

It's the geology...



Paradox Basin (and Eagle)
evaporites (300 mya)

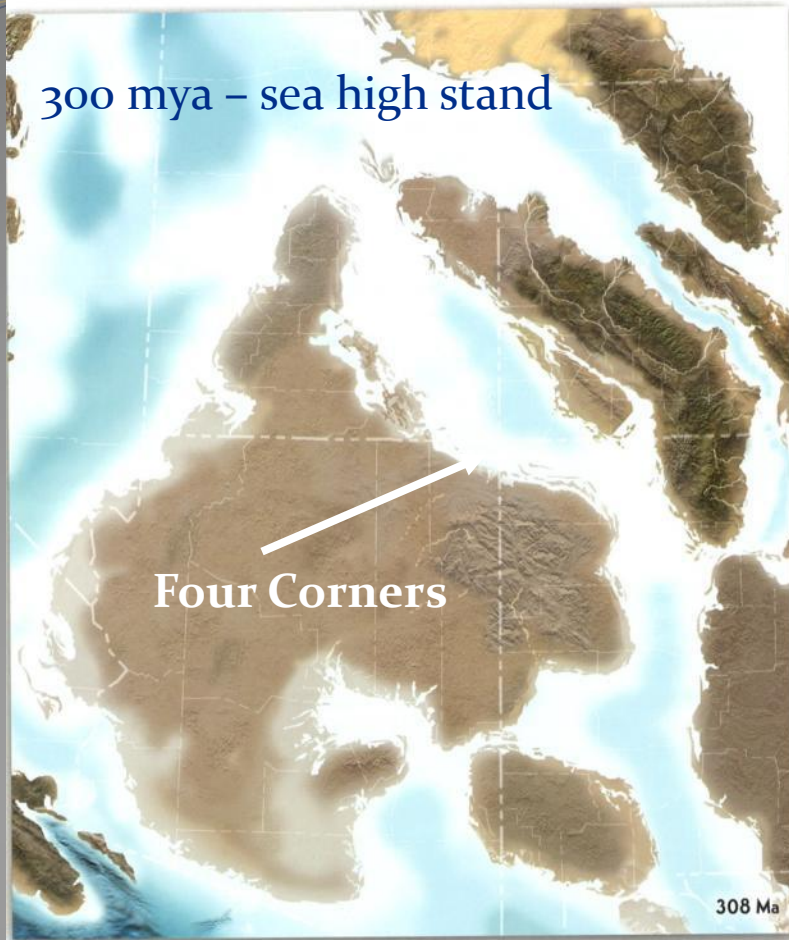


Mancos Shale (100 mya)

About 300 mya –
formation of
Pangea super
continent

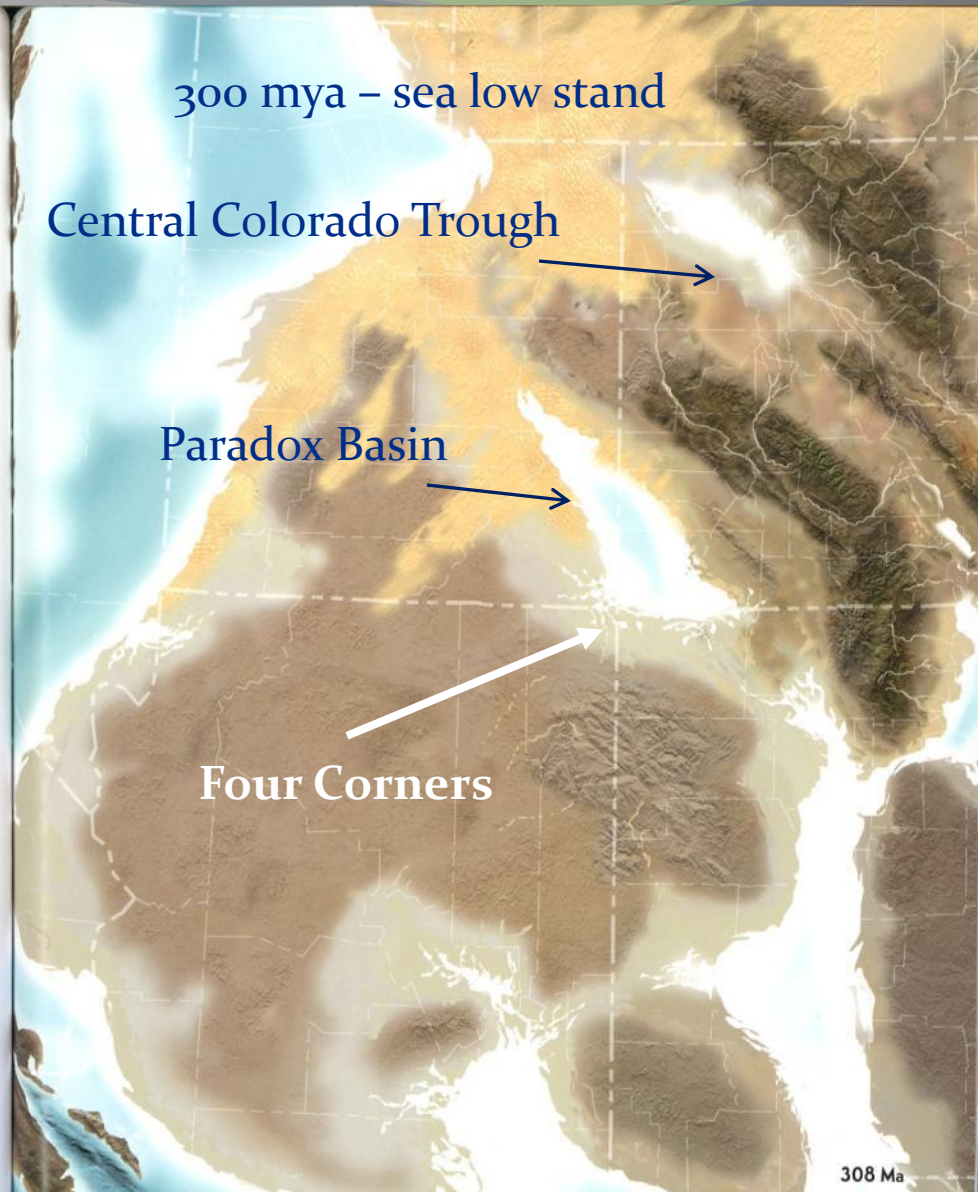
(paleogeographic map
from Blakey and
Ranney, 2008)





Above: Middle Pennsylvanian paleogeography (308 Ma). This map shows deposition during a sea level high. In southwestern Colorado and southeast Utah, normal marine deposits of the Paradox Formation were preserved.

Opposite: Middle Pennsylvanian time (308 Ma) during low sea level. The Paradox and Eagle basins became the sites of isolated seas (like the modern Caspian Sea), and large amounts of salt precipitated in the warm, restricted water. Calculations suggest a 400–600-foot difference between high and low sea levels, and the changes may have occurred rapidly in less than 200,000 years. As many as sixty cycles have been documented and resulted from fluctuating glaciations in the Southern Hemisphere.



308 Ma

Paradox Evaporite Diapir

Overlying Bedrock

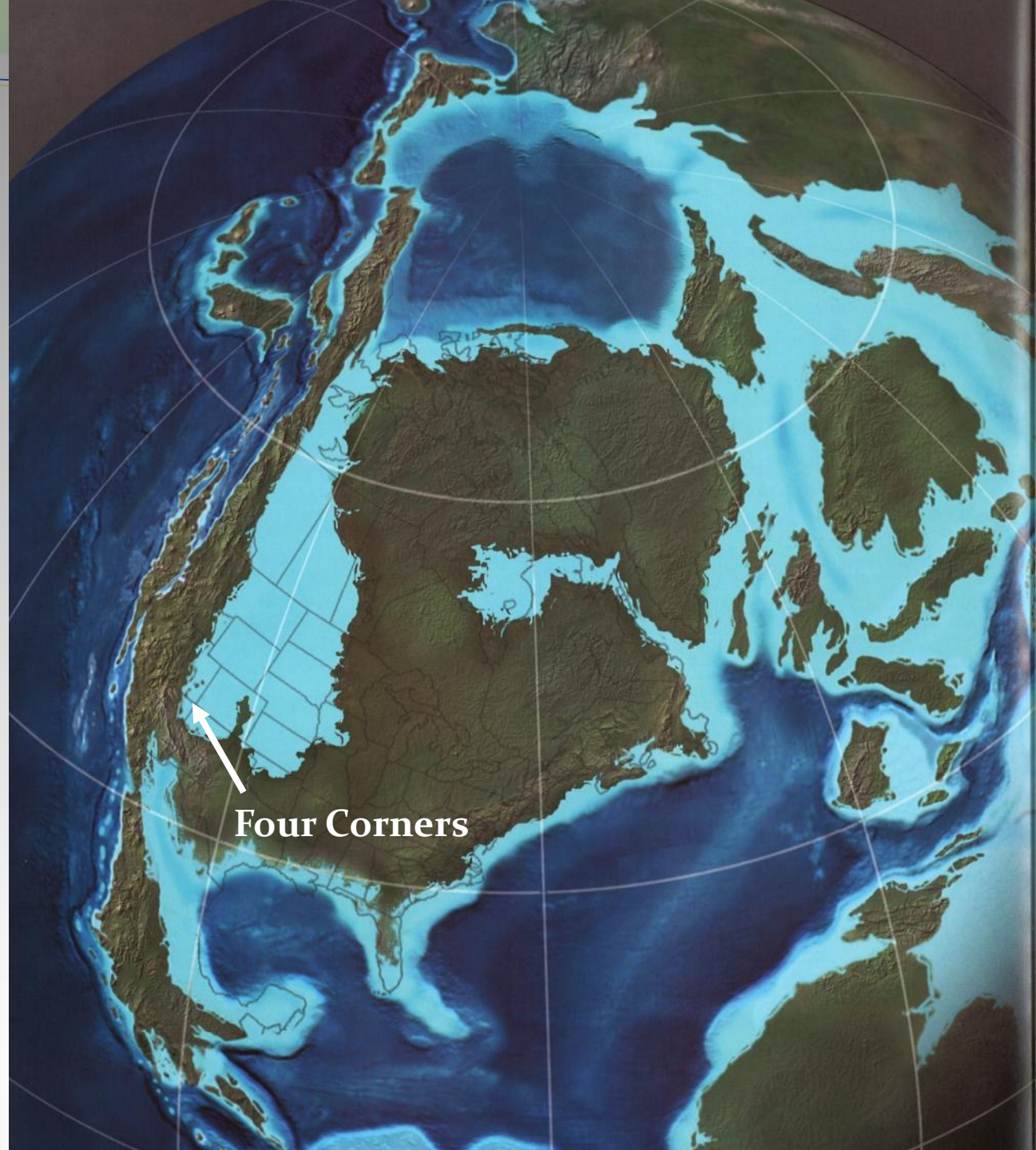
Roaring Fork River





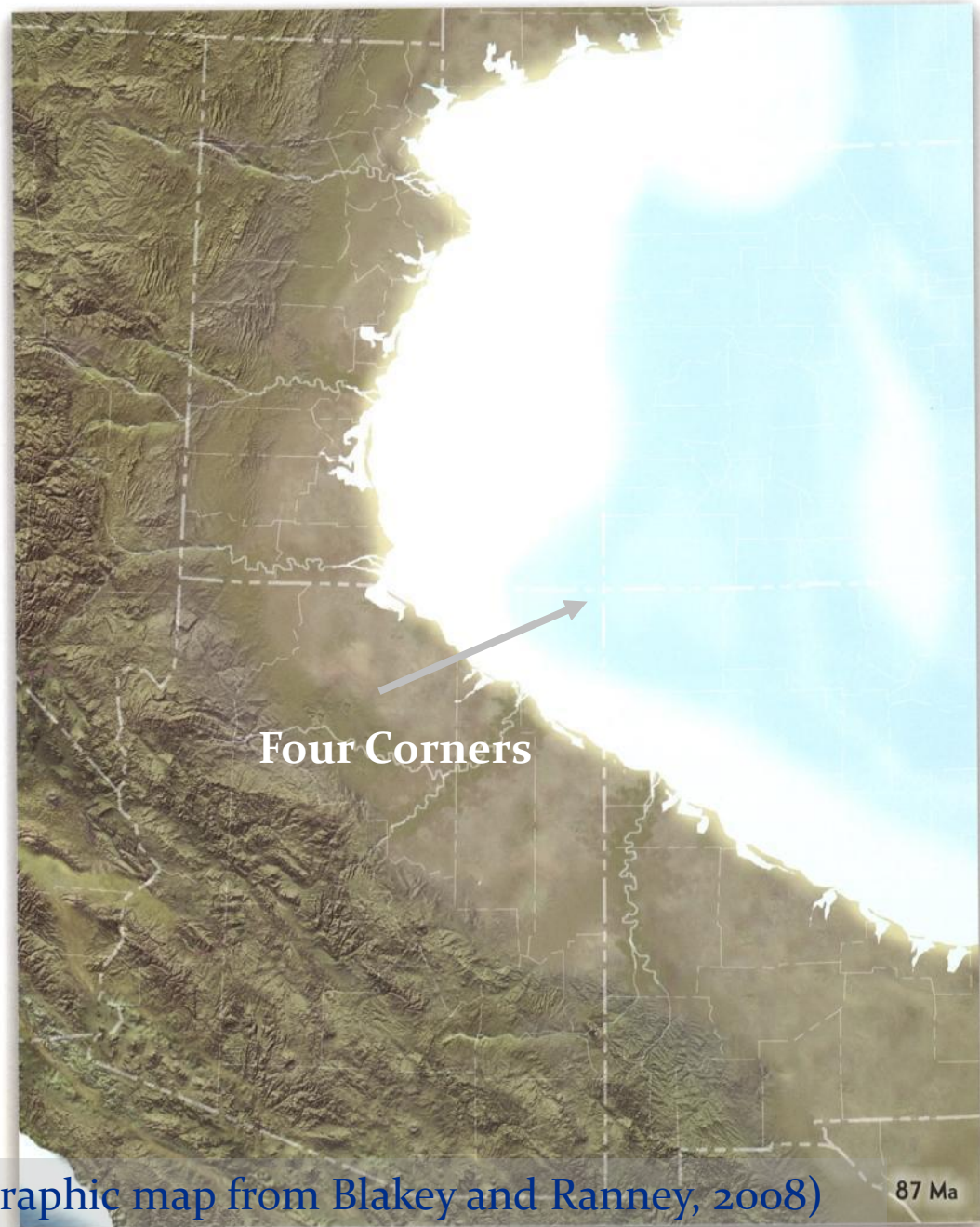
About 100 mya – transgression of Western Interior Seaway

(paleogeographic map from
Blakey and Ranney, 2008)



Four Corners

Deposition of Cretaceous Mancos Shale during transgression of Great Western Interior Seaway

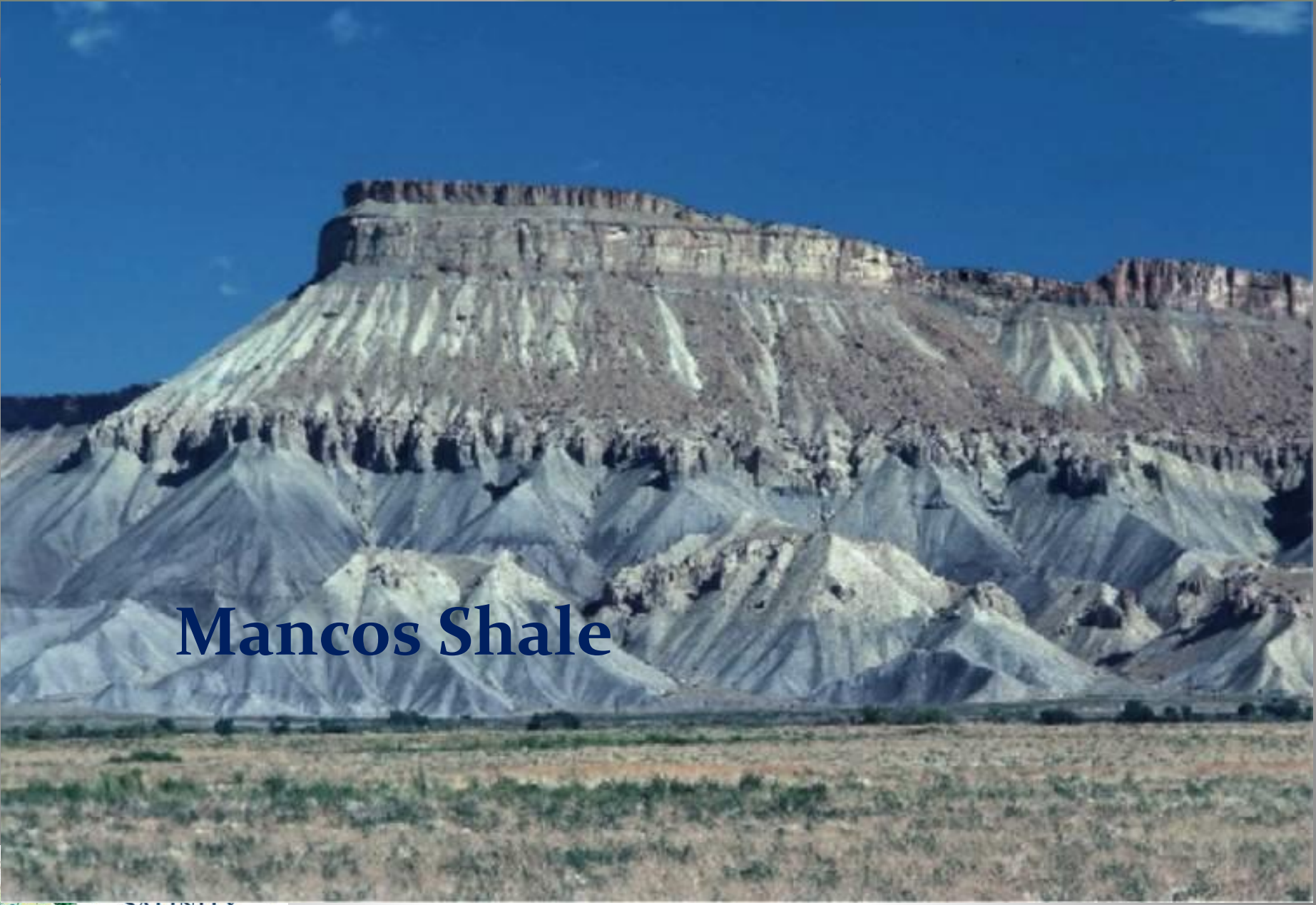


(Paleogeographic map from Blakey and Ranney, 2008)

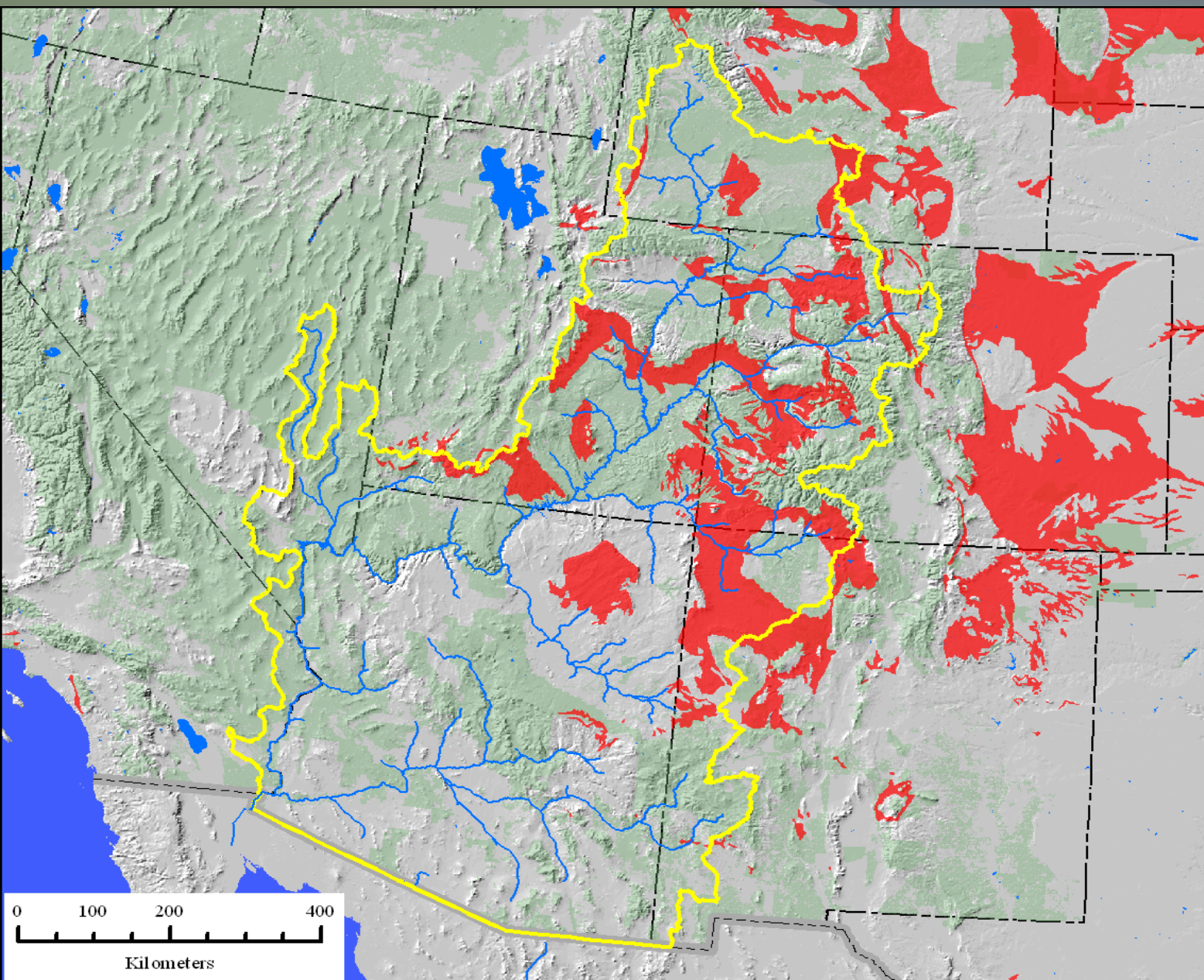
87 Ma



Above: Late Cretaceous (Coniacian) paleogeography (87 Ma) during transgression of Mancos Shale



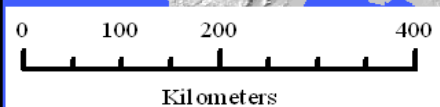
Mancos Shale



**Colorado
River Basin**



**Mancos
Shale**



Salinity

- Non-

- Lin

- Or

- Ra

- Point

- Sta

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- Sal

- Re

- Plugging of saline wells (BLM)

- Basinwide Program
- FOA
- \$8M Appropriation
- \$3.5M Cost Share



n)

- EQIP
- Applications by Producers
- \$10M Appropriation
- \$4.3M Cost Share



- BLM
- Soil Water and Air Program
- \$1.5M Appropriation
- \$0M Cost Share



Salinity Control

- Non-Point Source Activities
 - Lining and piping of canals
 - On-farm irrigation efficiency
 - Rangeland improvement
- Point Source Activities
 - State NPDES administration pursuant to Forum's policies (7 States and EPA)
 - Saline spring disposal (Paradox Valley Unit, Reclamation)
 - Plugging of saline wells (BLM)



Salinity Control Program Efforts

- Non-Point Source Activities
 - Lining and piping of canals and ditches (Reclamation)
 - On-farm irrigation efficiency improvements (NRCS)
 - Rangeland improvements (BLM)
- Point Source Activities
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Paradox Valley Unit (PVU)



La Sal Mountains (recharge)

brine

Dolores River

deep
injection well

shallow collection wells



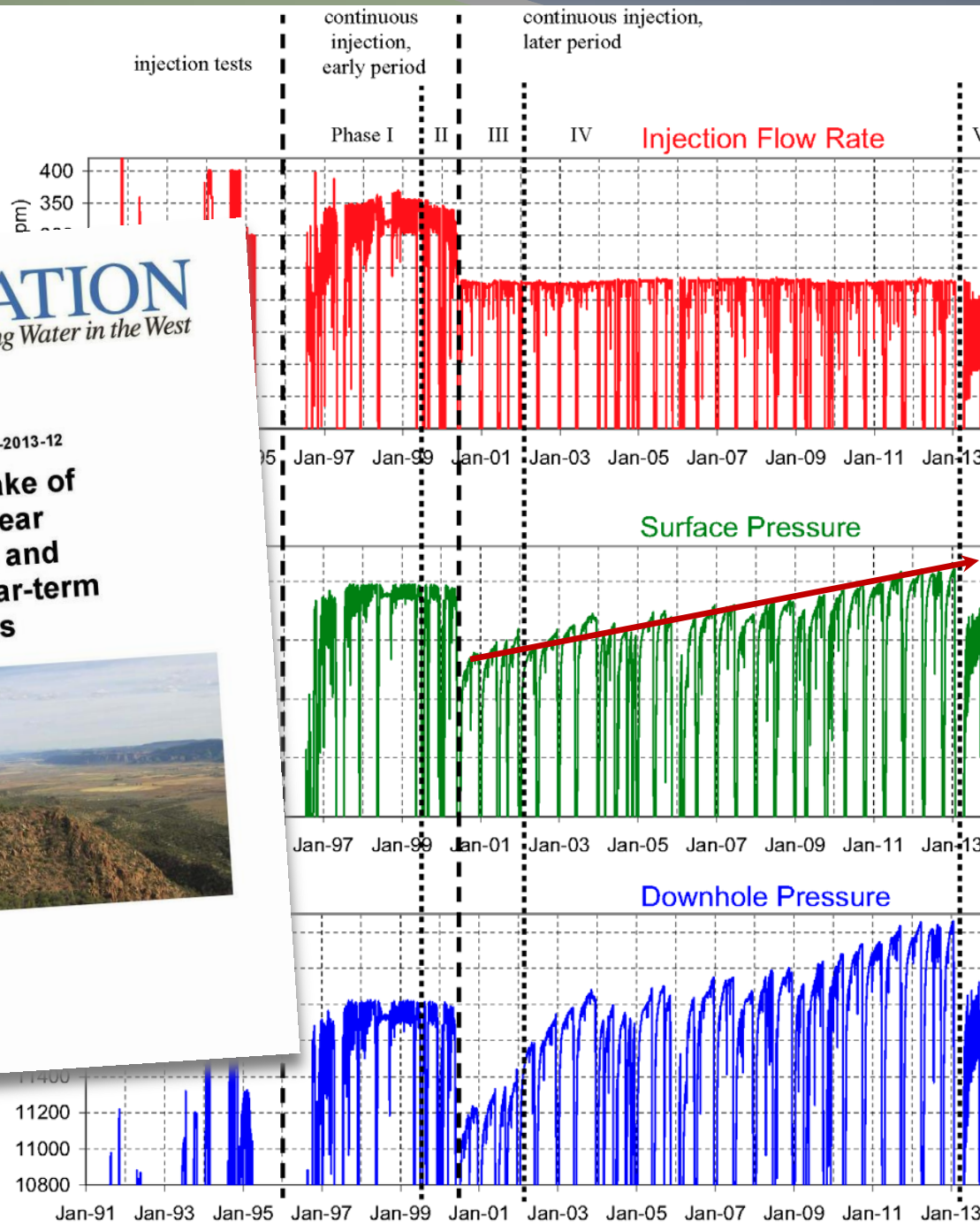
RECLAMATION

Managing Water in the West

Technical Memorandum TM-86-68330-2013-12

The M_L 4.4 Earthquake of January 24, 2013, Near Paradox, Colorado, and Implications for Near-term Injection Operations

Colorado Basin
Salinity Control
Project,
Paradox Valley
Unit, Colorado
Upper Colorado
Region



Salinity Control Program Efforts

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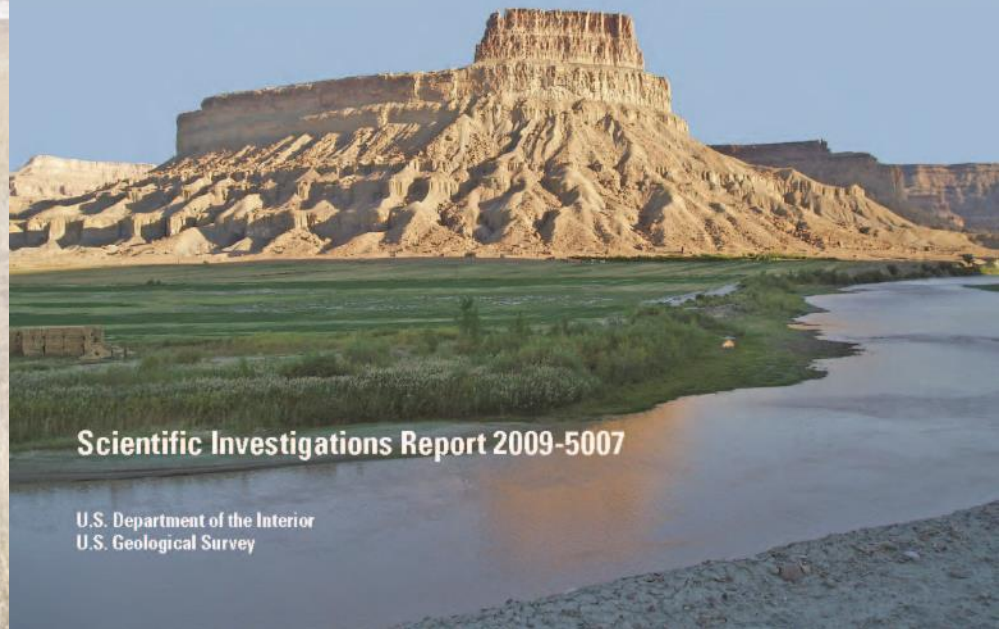


Science Support (USGS)



Prepared in cooperation with the U.S. Department of the Interior Bureau of Reclamation and Bureau of Land Management

Spatially Referenced Statistical Assessment of Dissolved-Solids Load Sources and Transport in Streams of the Upper Colorado River Basin



Scientific Investigations Report 2009-5007

U.S. Department of the Interior
U.S. Geological Survey



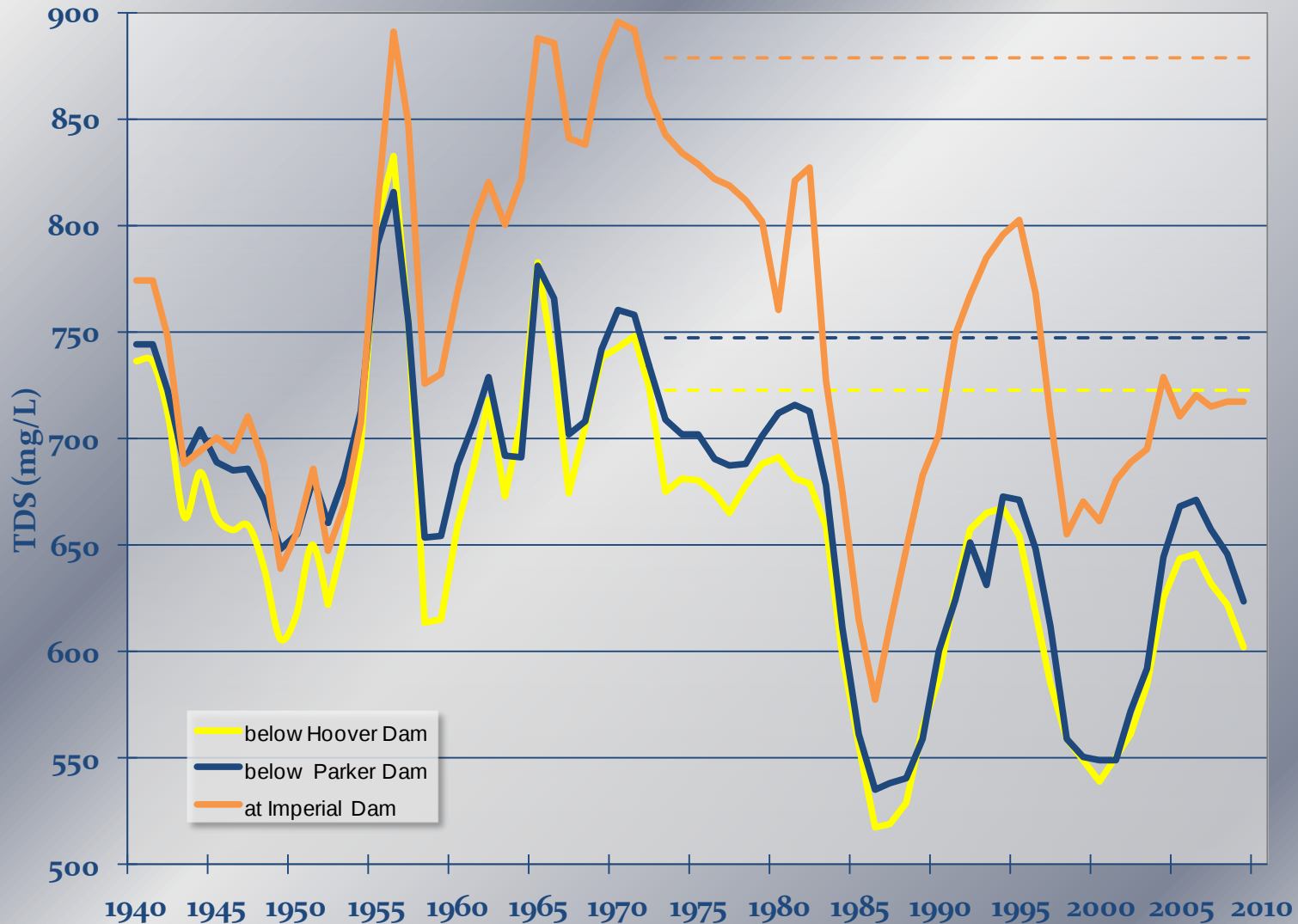
How is the Program Funded

- Act provides that because “most” of the salt comes from federally administered lands:
 - 70% paid by federal government
 - 30% paid as cost-share by basin states through the Basin Funds (generated from a mill levy on power sales)
 - However, Program participants also cost-share in their projects
 - 2016 Funding Levels
 - Reclamation $\cong$ \$14M
 - BLM $\cong$ \$1.5M
 - NRCS $\cong$ \$12M
 - Basin States Cost Share $\cong$ \$11M

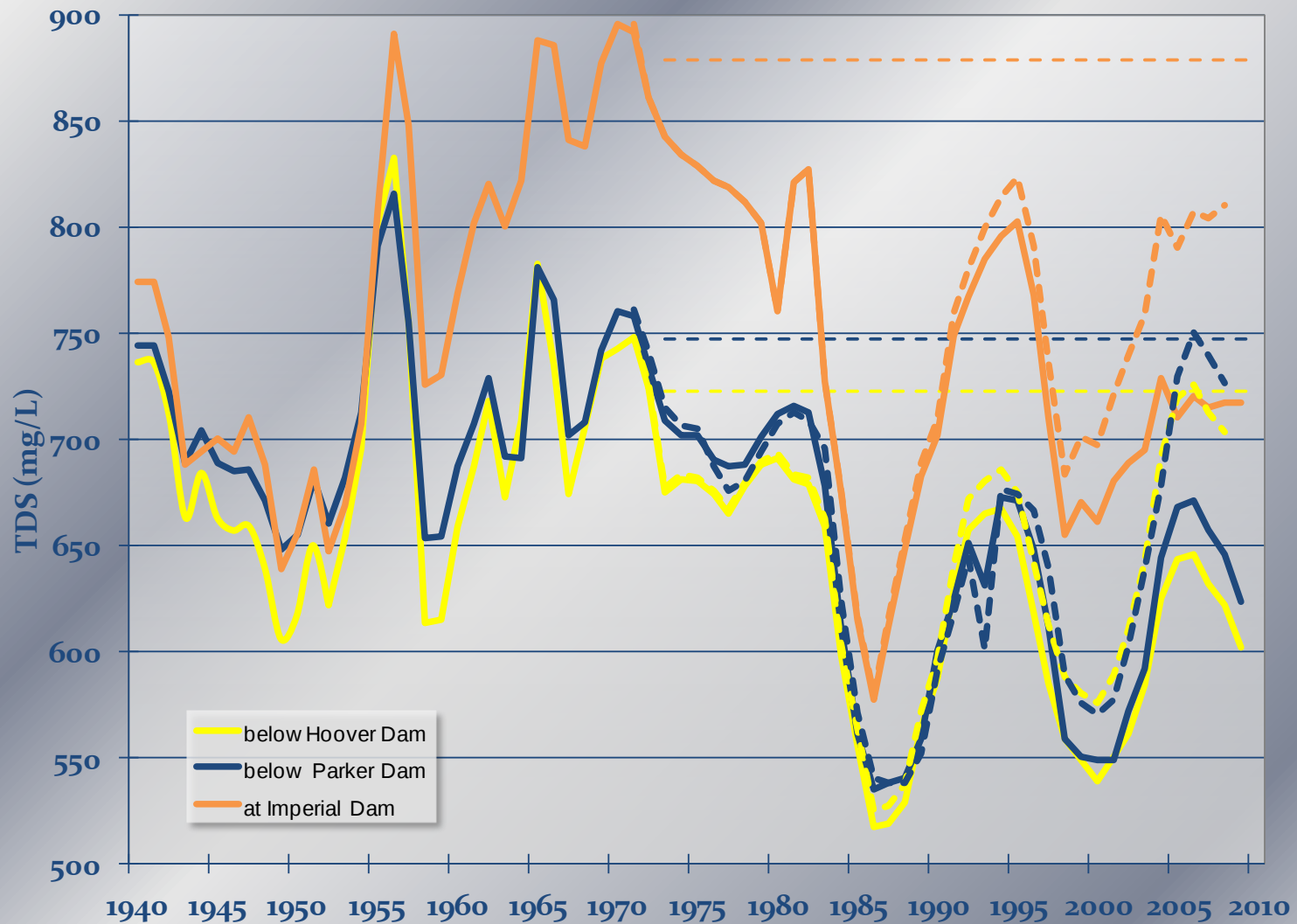


How Have We Done?

Colorado River
Salinity Concentrations at Numeric Criteria Sites

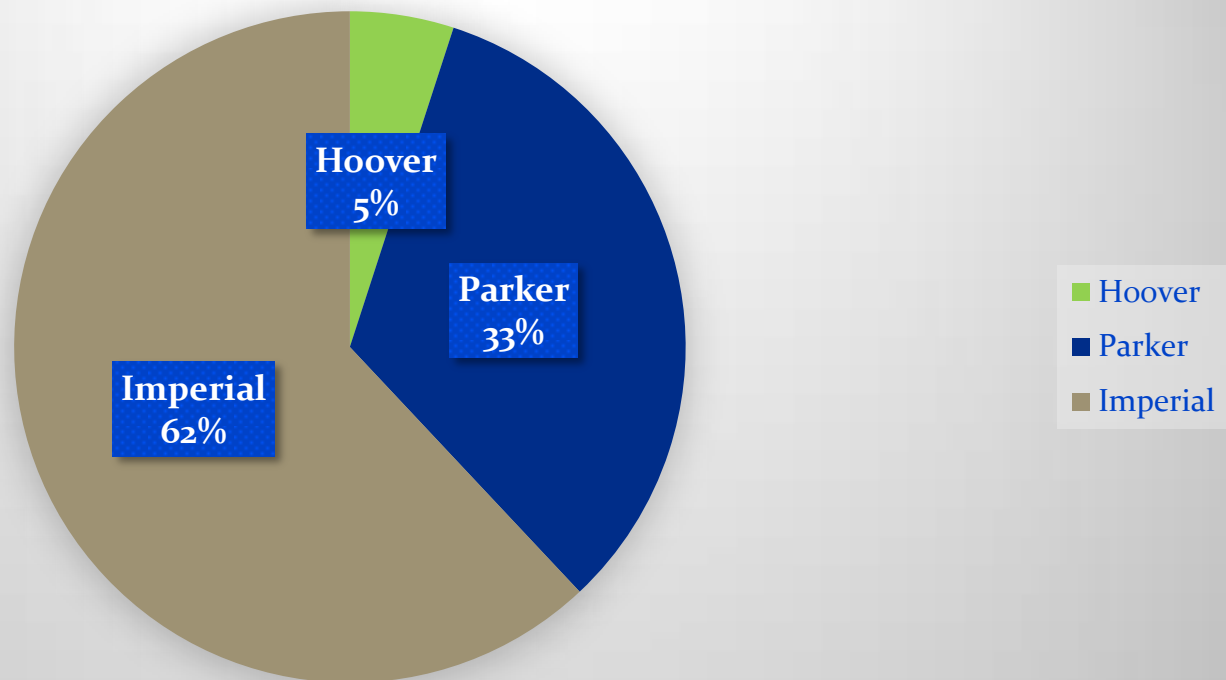


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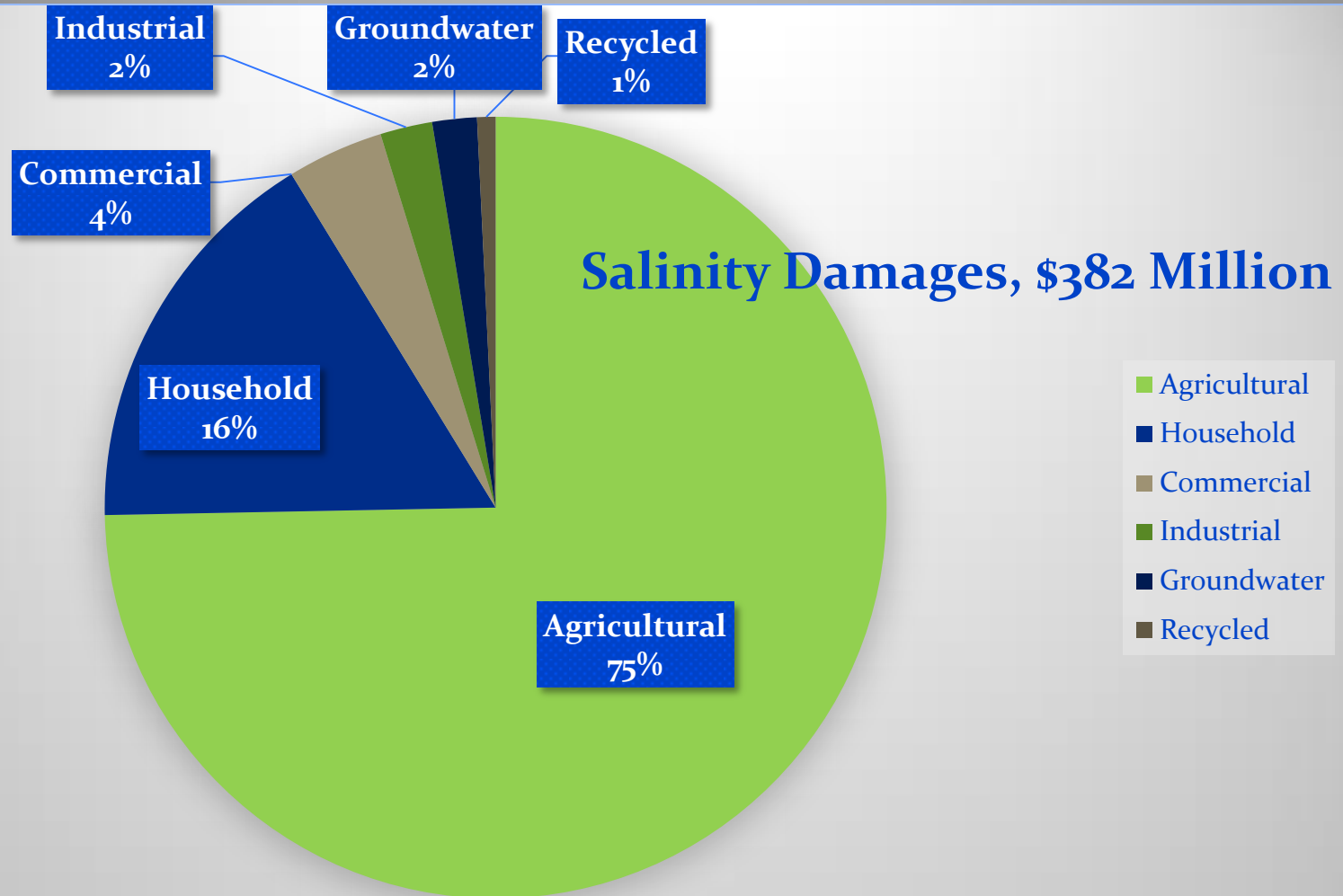


Damages by Diversion

Salinity Damages, \$382 Million



Damages by Sector



Summary

- Very unique and successful state/federal/water users partnership - voluntary
- More than half a billion dollars thus far expended
- 1.3 million tons of annual salt load reduction
- Downstream concentration is 90-100 mg/L better
- Several hundred million dollars in reduced annual damages





Colorado River Basin SALINITY CONTROL FORUM



News and Announcements

On May 27, Agriculture Secretary Vilsack announced that he has designated the Colorado River Basin as a Critical Conservation Area under the newly created [Regional Conservation Partnership Program](#) under the 2014 Farm Bill.

Reclamation has just released [Final Findings and Strategies, Lower Gunnison Basin, Colorado](#) and [Final Report on Findings and Strategies, Uinta Basin, Utah](#), which represent the conclusion of an 18-month study regarding program implementation in the Lower Gunnison and Uinta Basin salinity areas respectively.

The new 2014 Farm Bill (known as the ["Agricultural Act of 2014"](#)) passed both the House and the Senate and was signed into law by President Obama on February 7, 2014.

Welcome to the Colorado River Basin Salinity Control Forum Website

Recognizing the rapidly increasing salinity concentration in the Lower Colorado River and its impact on water users, the Colorado River Basin States came together in 1973 and organized the Colorado River Basin Salinity Control Forum (Forum). In 1974, in coordination with the Department of the Interior and the U.S. State Department, the Forum worked with Congress in the passage of the Colorado River Basin Salinity Control Act (Act). Title I of the Act deals with the United States' salinity commitments to Mexico. Title II of the Act creates the Colorado River Basin Salinity Control Program (Program) which focuses on improving the water quality of the Colorado River to U.S. users above Imperial Dam.

Since implementation of the Program, measures have been put in place which now control more than 1.2 million tons of salt annually. The salinity concentration at Imperial Dam has been reduced by about 90 mg/L. However, *quantifiable* damages to U.S. users presently are approximately \$376 million per year. Damages are projected to increase to \$577 million per year if the Program does not continue to be aggressively implemented.

Colorado River Basin Salinity Control Program

Questions?