

The Middle Rio Grande's Habitat: Historical Trends and Future Hope



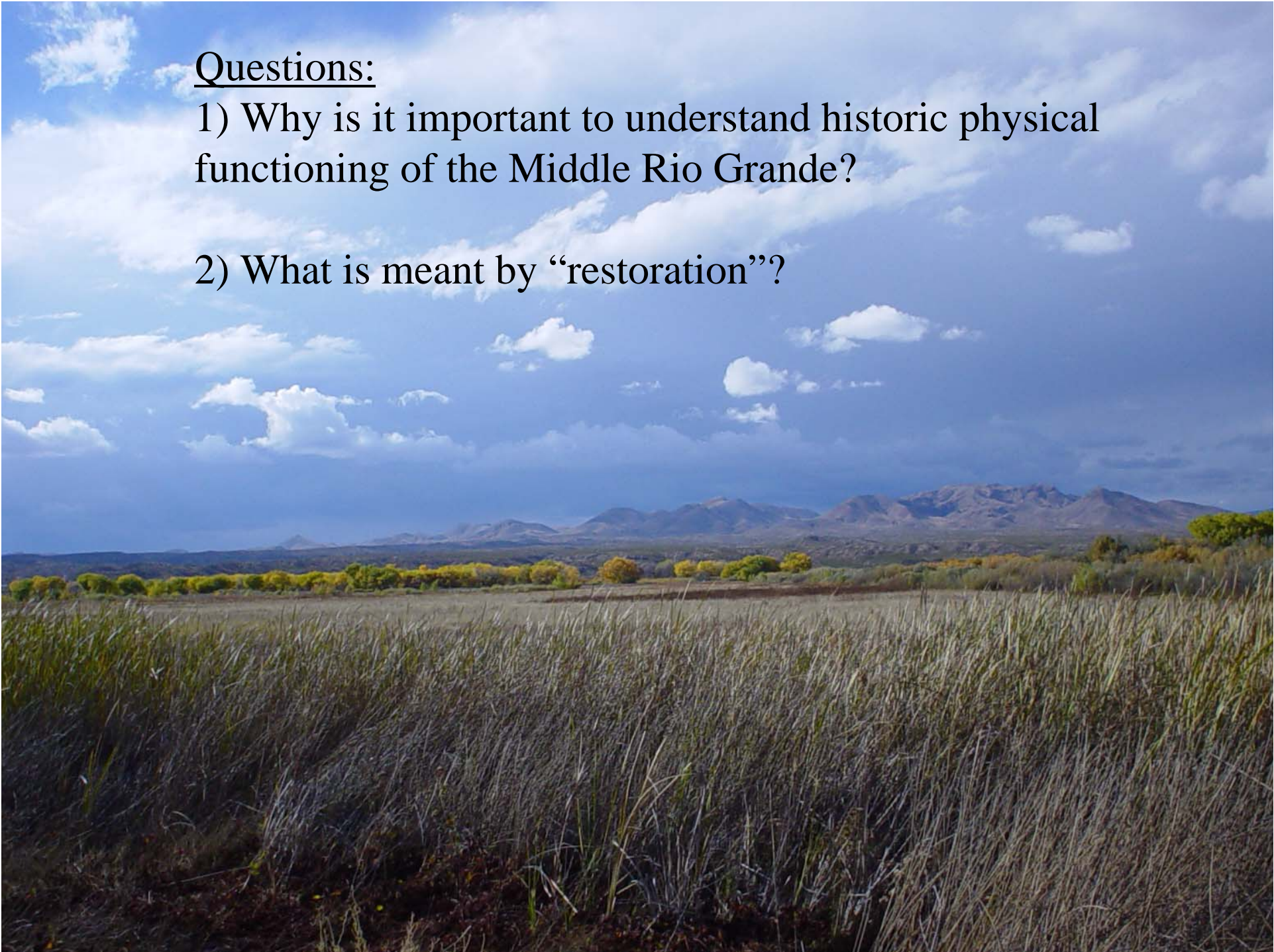
Paul Tashjian, USFWS, Water Resources

<http://bhg.fws.gov>

Questions:

1) Why is it important to understand historic physical functioning of the Middle Rio Grande?

2) What is meant by “restoration”?



Rio Chama

-regulated

-San Juan-Chama

Rio Grande

-regulated in Colorado



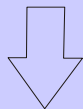
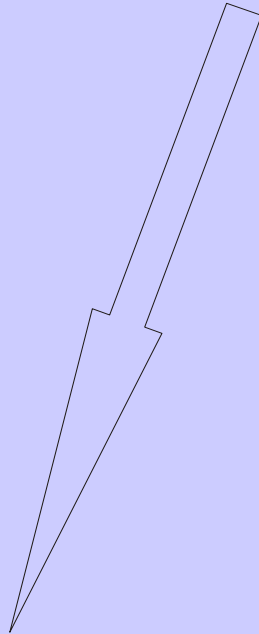
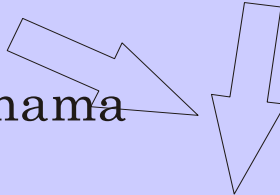
COCHITI RESERVOIR



ELEPHANT BUTTE RESERVOIR



CABALLO RESERVOIR



VALLEY CROSS SECTIONS

- 806** COCHITI

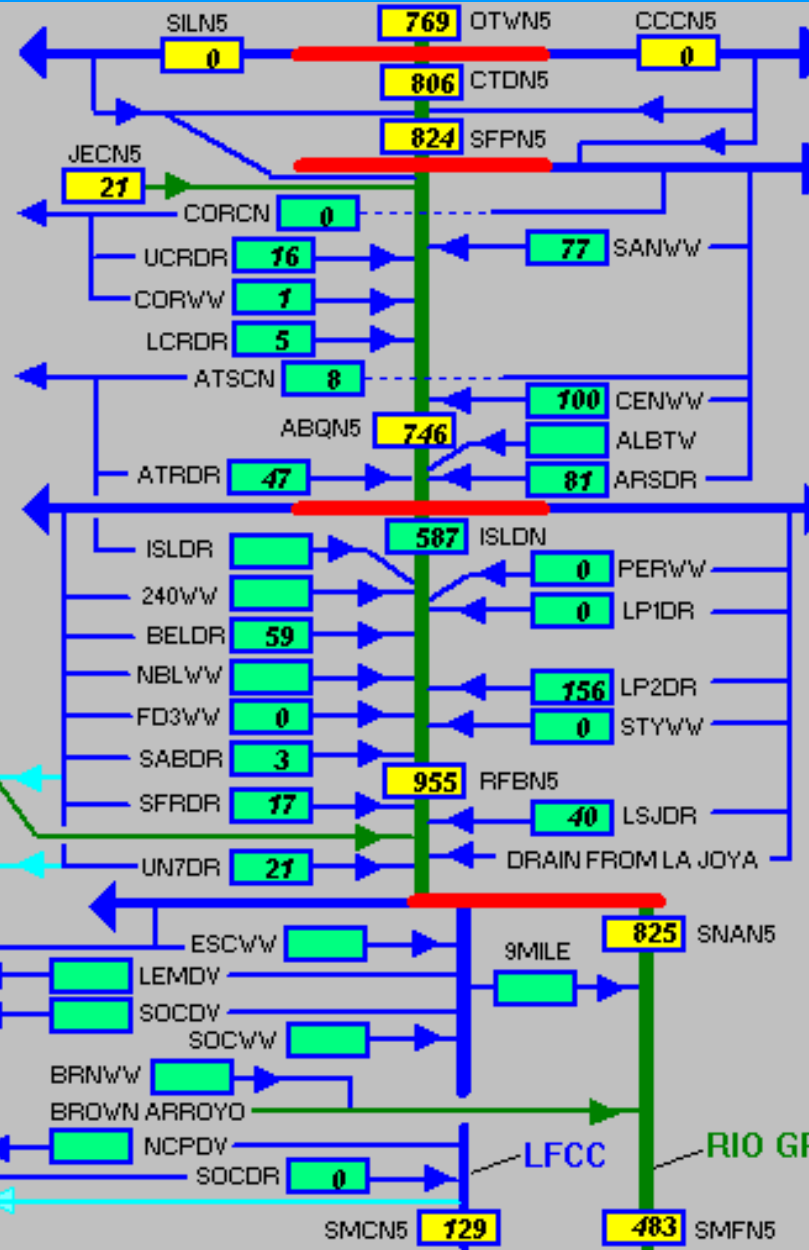
- 824** SAN FELIPE

- 22** ALBUQUERQUE

- 57** BERNARDO

- 7** SAN ACACIA

- 672** SAN MARCIAL



IRRIGATION

COCHITI DIVERSION

COCDV **N/A**

ANGOSTURA DIVERSION

ANGDV **8**

ALBCN 2	ARMCN 8
ATFCN 31	BERCN 0
ATDCN 0	ARECN 0
ALGDR 22	ALBDR 14

ISLETA DIVERSION

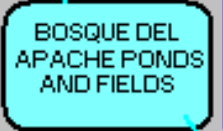
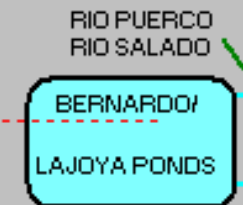
ISLDV **34**

CHACN 0	BELCN 5
CACCN 0	PERCN 15
ISLUP 0	CHICN 0

SAN ACACIA DIVERSION

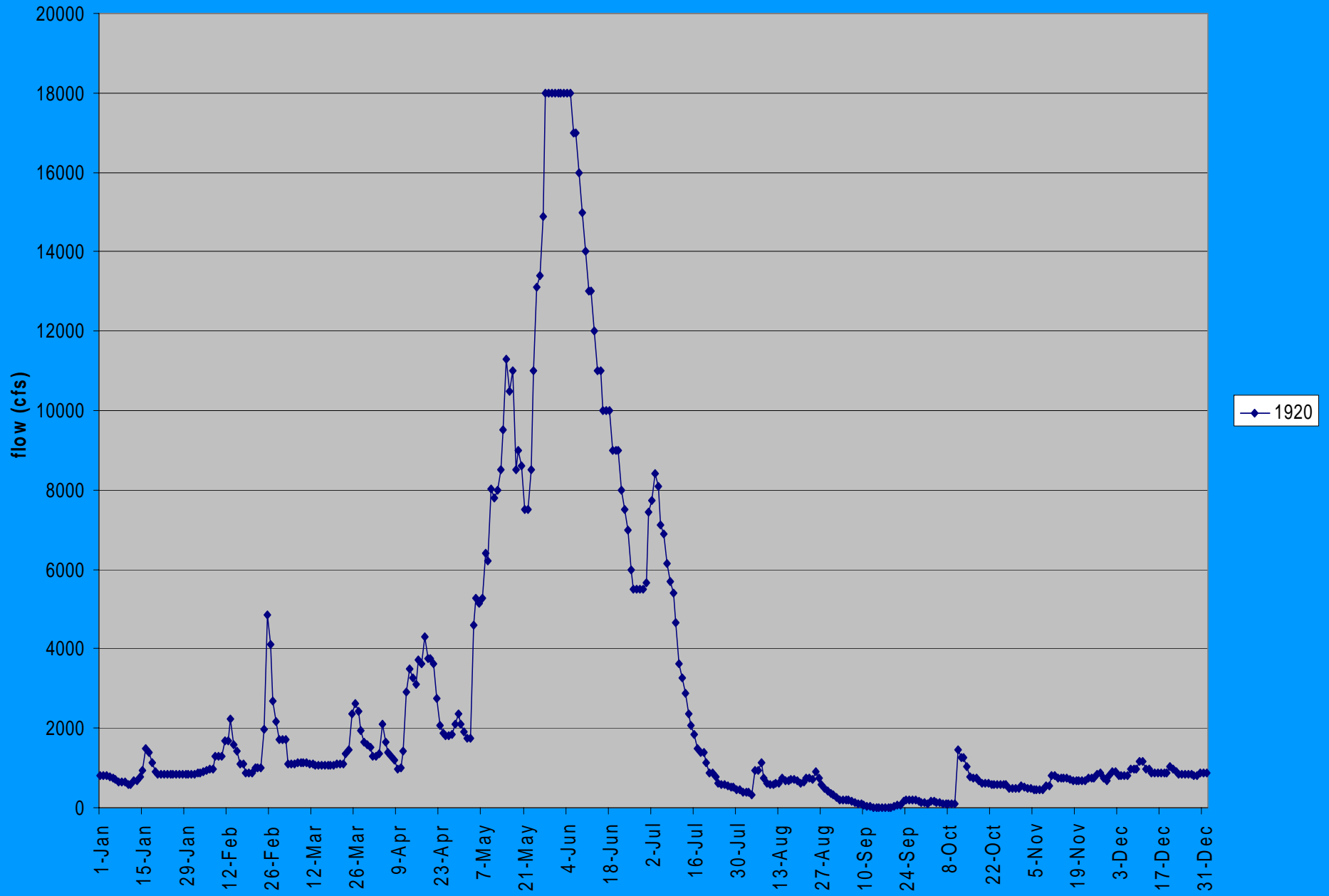
SNADV **-21**

SOCN **1**

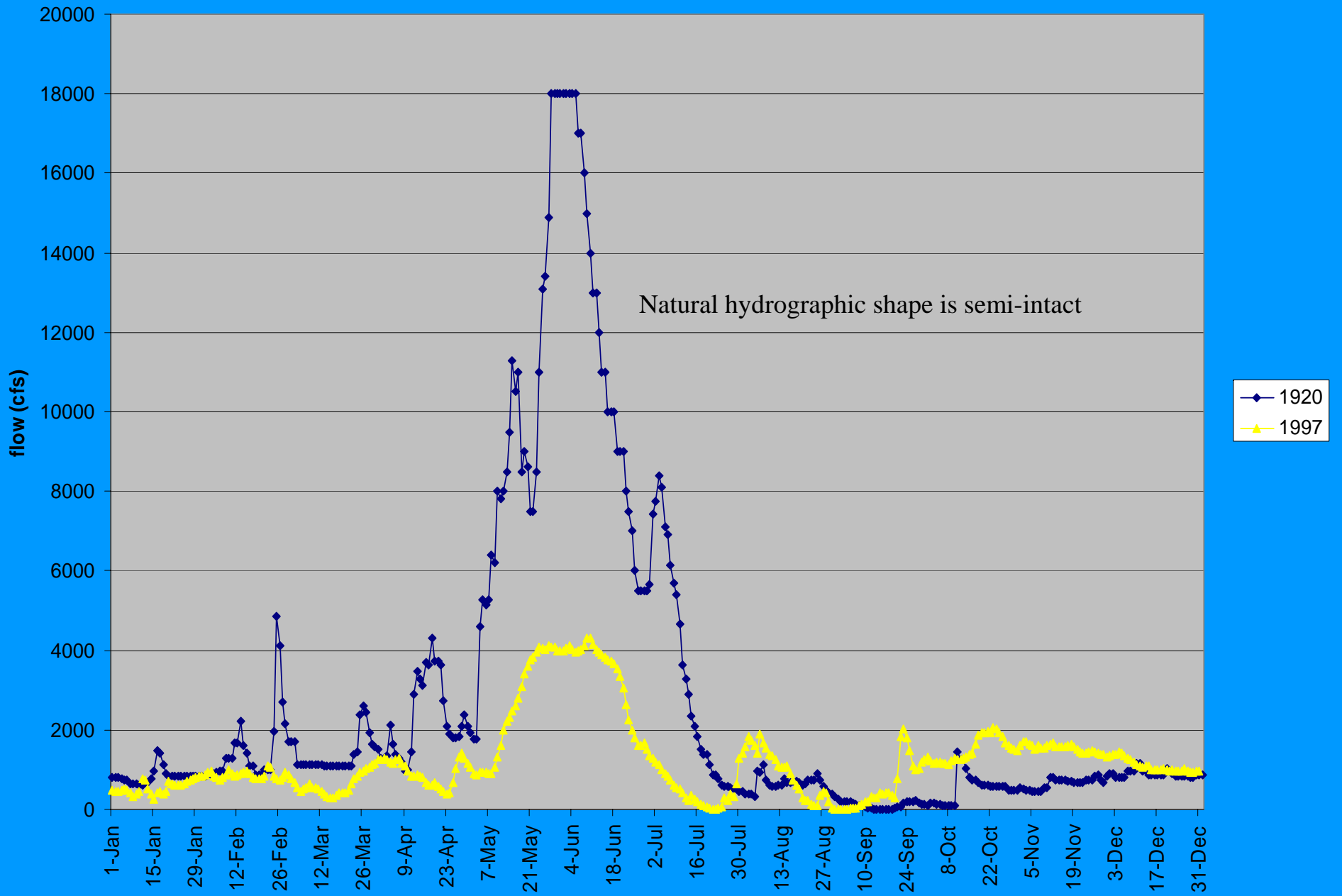


Updated: Nov 18 13:00 mst 2004

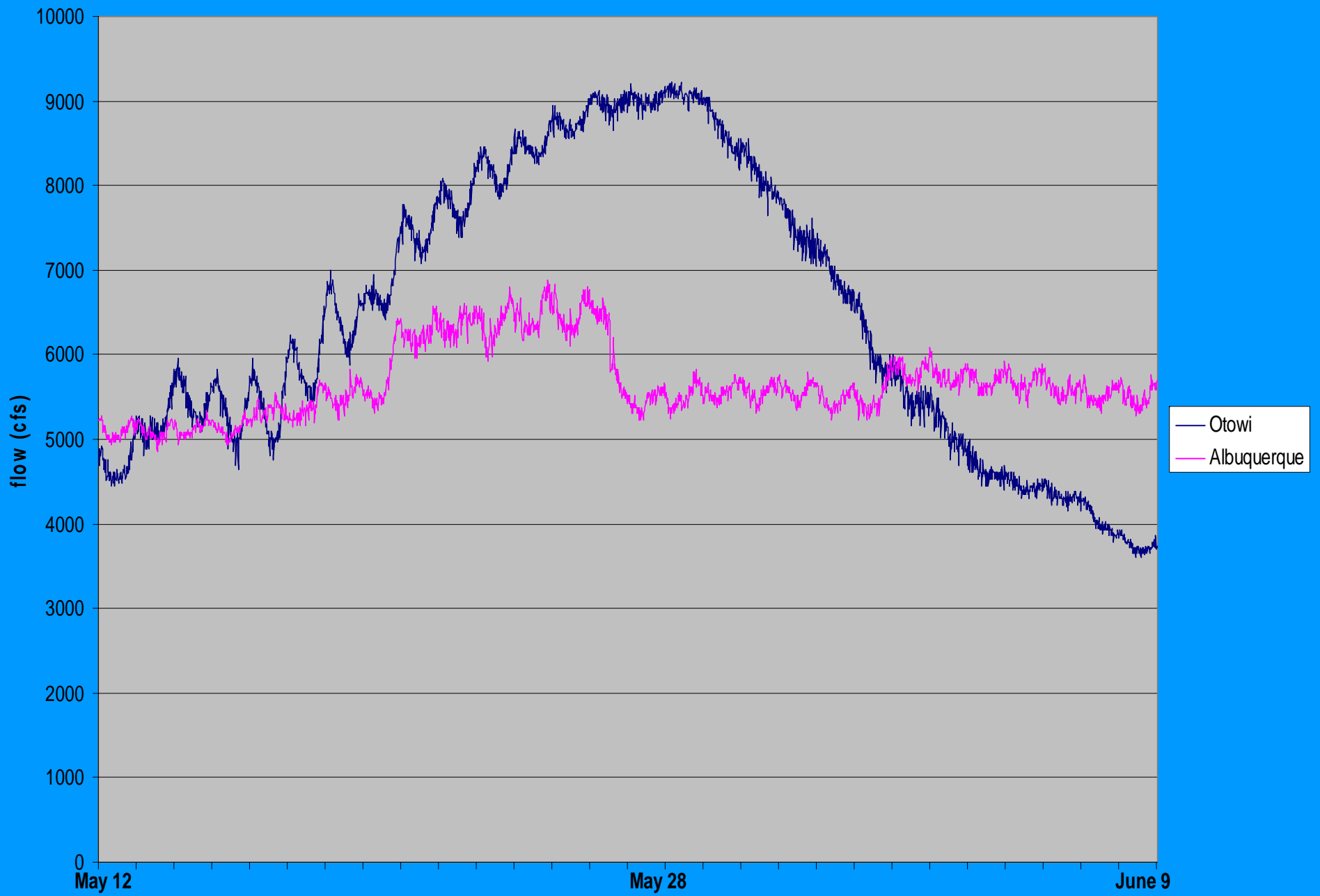
Rio Grande at San Marcial



Rio Grande at San Marcial

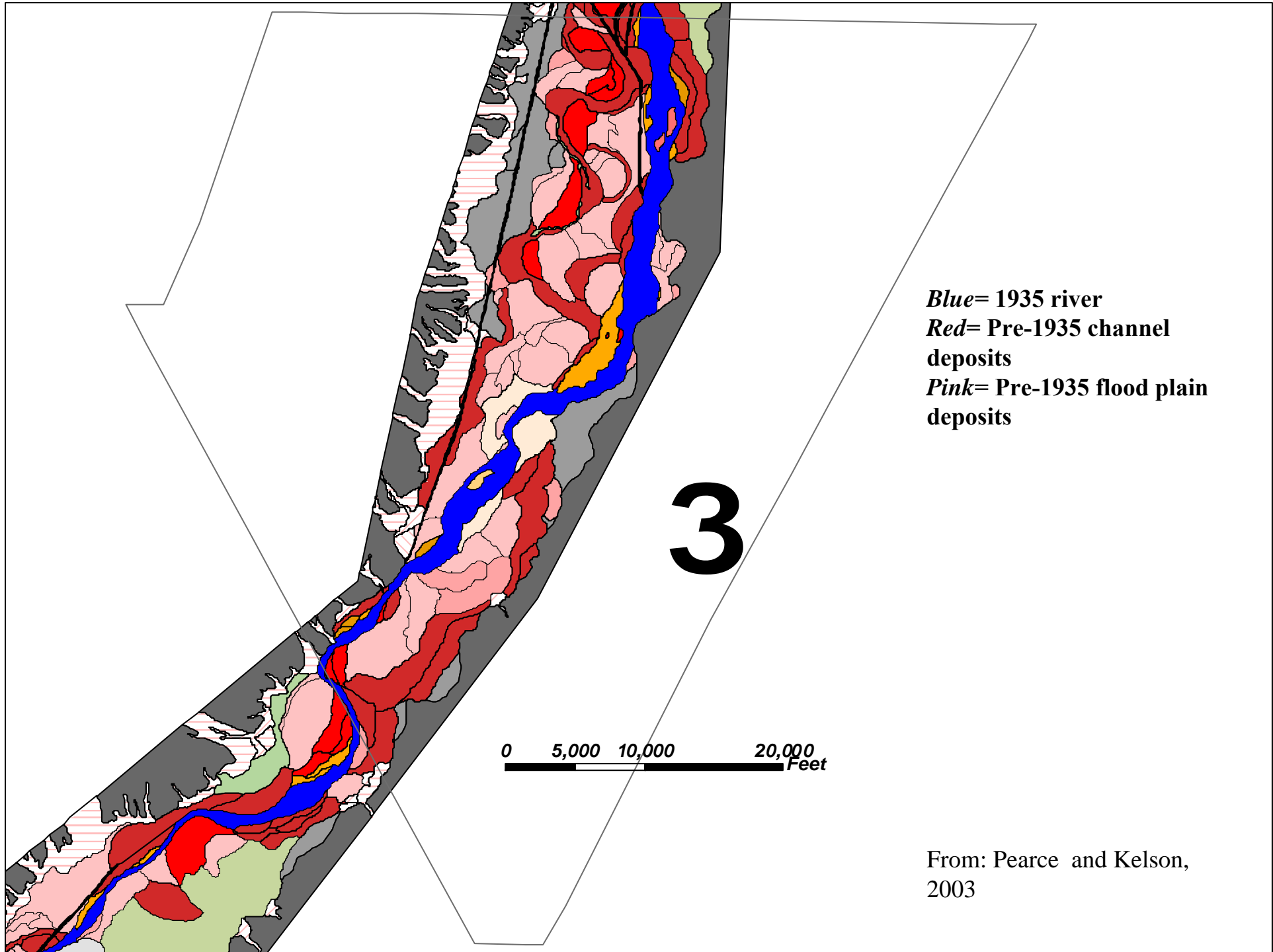


Spring Run-off 2005 Hydrograph: Otowi vs. ABQ

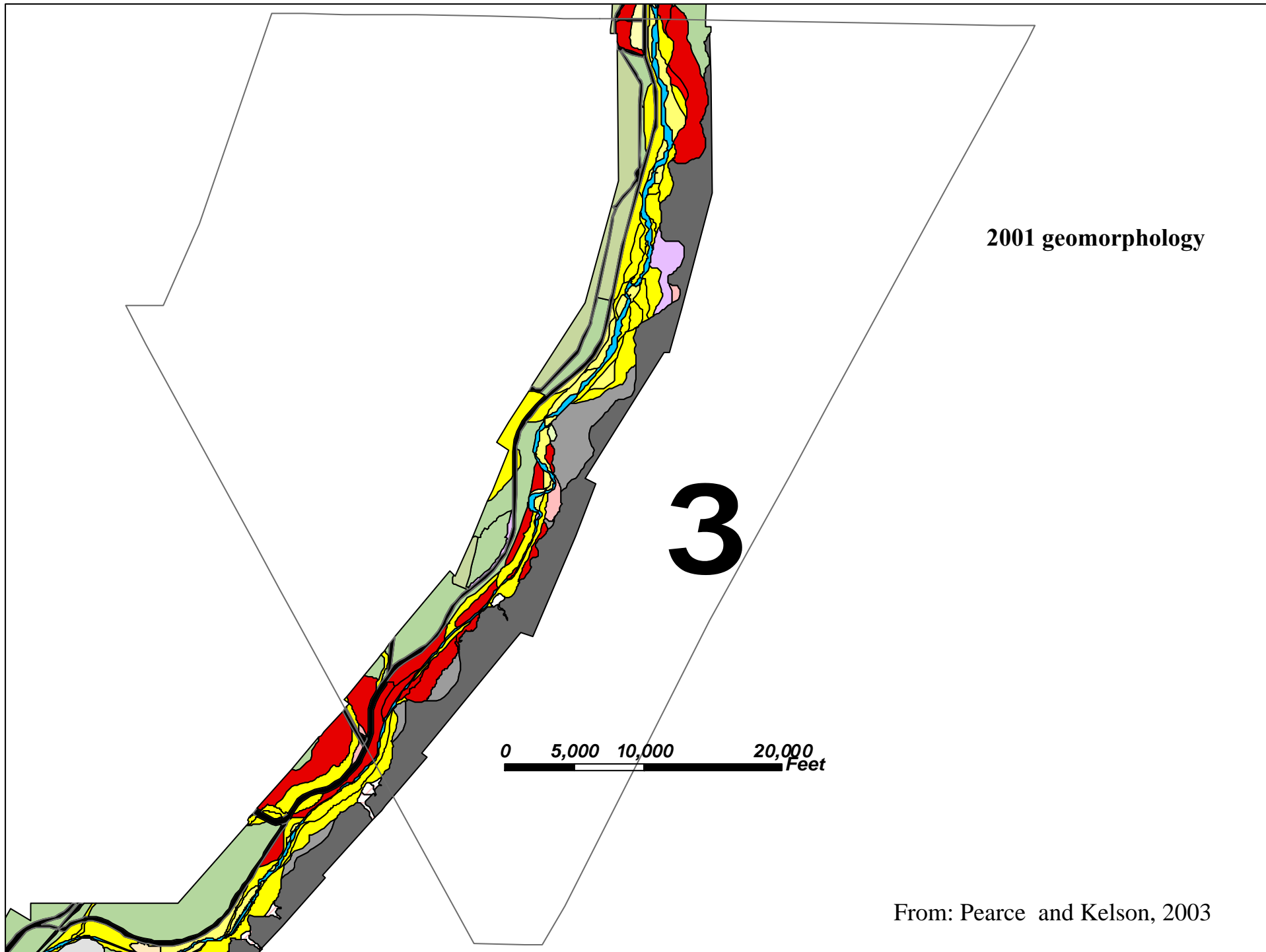


What was the historic physical functioning for the Middle Rio Grande?

- Channel mobility
- Connected floodplain
- Sediment balance
- Naturally shaped hydrograph
- Wide active channel
- “Charged” floodplain



From: Pearce and Kelson,
2003



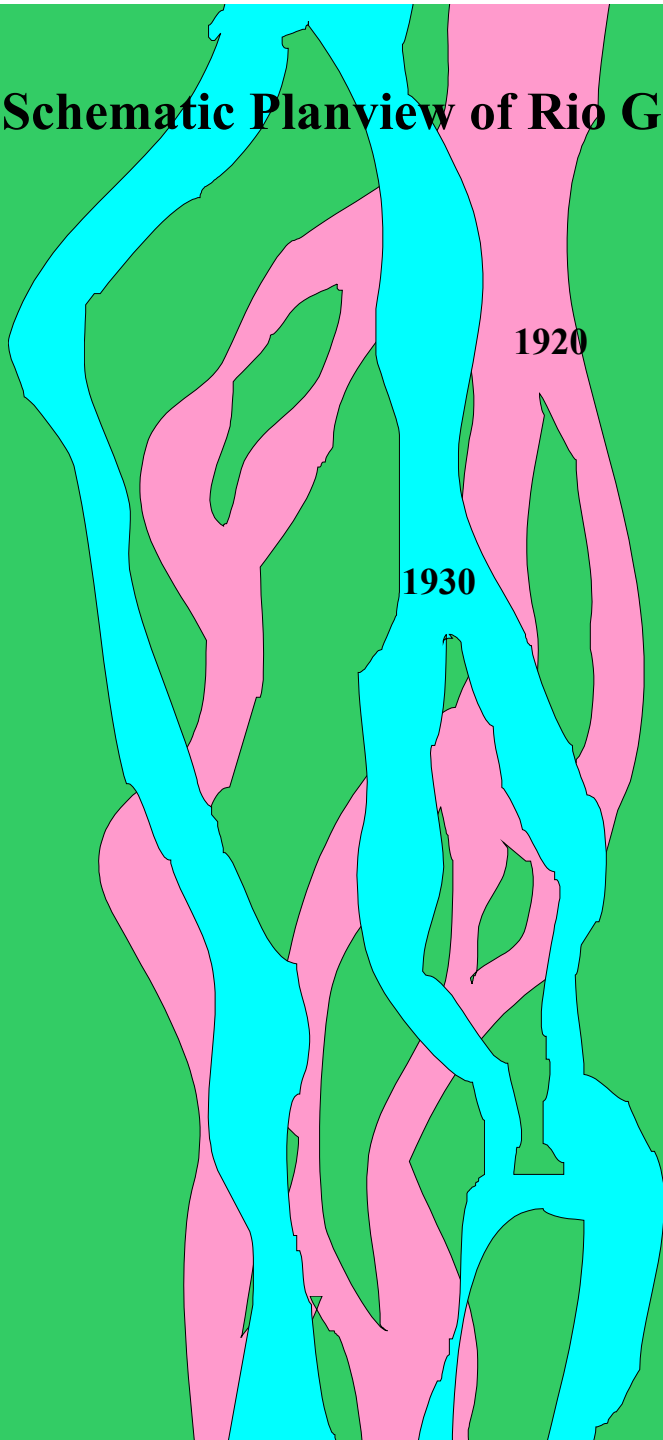
2001 geomorphology

3

0 5,000 10,000 20,000 Feet

From: Pearce and Kelson, 2003

Schematic Planview of Rio Grande



Channel Avulsion

Example from Santa Domingo area

Large floods would abruptly shift channel position within the active floodplain

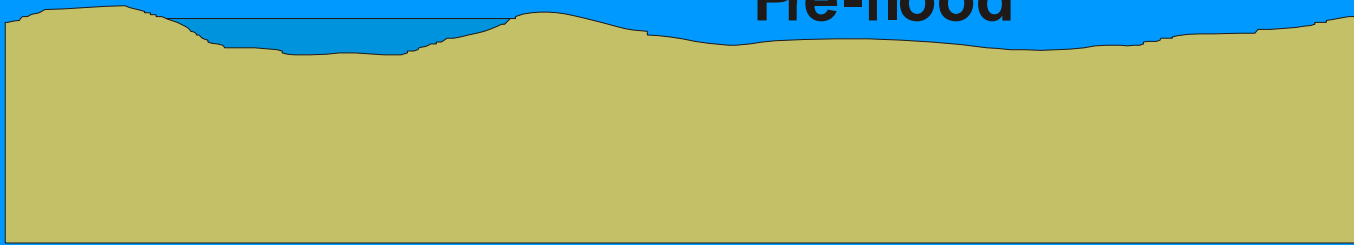
High sediment load

Active creation of new floodplains and erosion of older floodplains

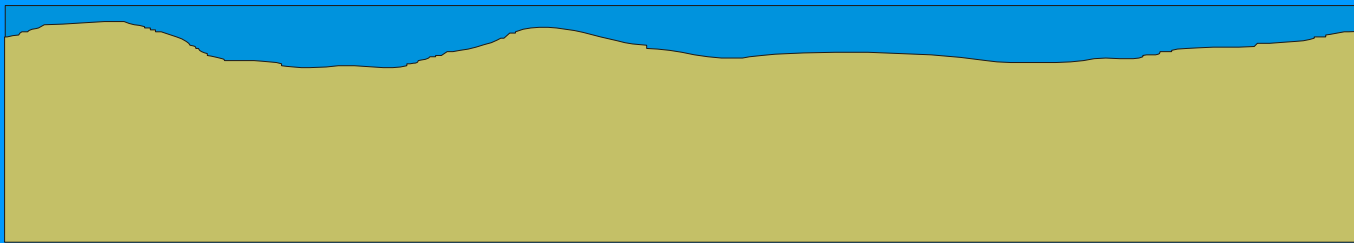
Abandoned channels become wetlands and lakes

Rio Grande Avulsion

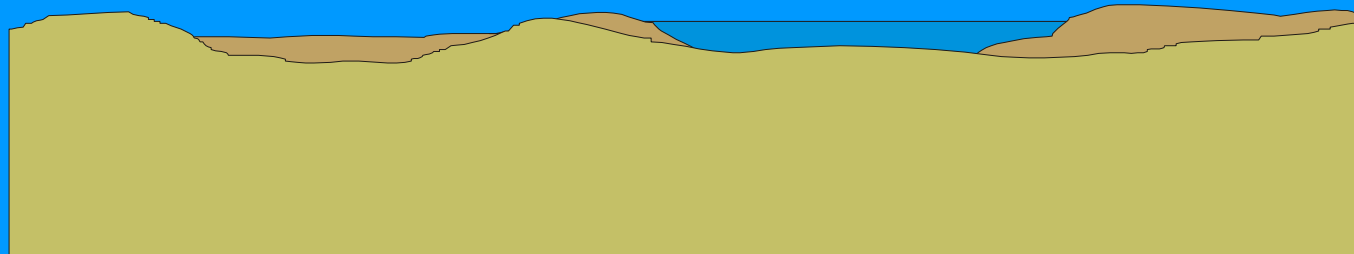
Pre-flood



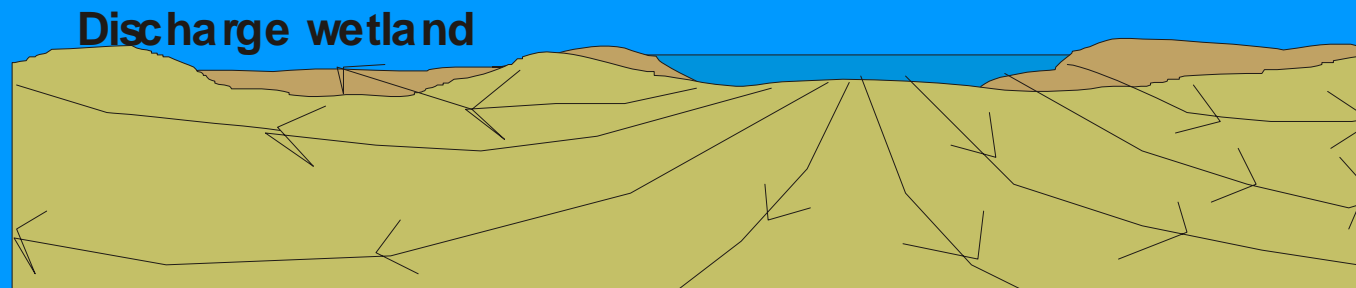
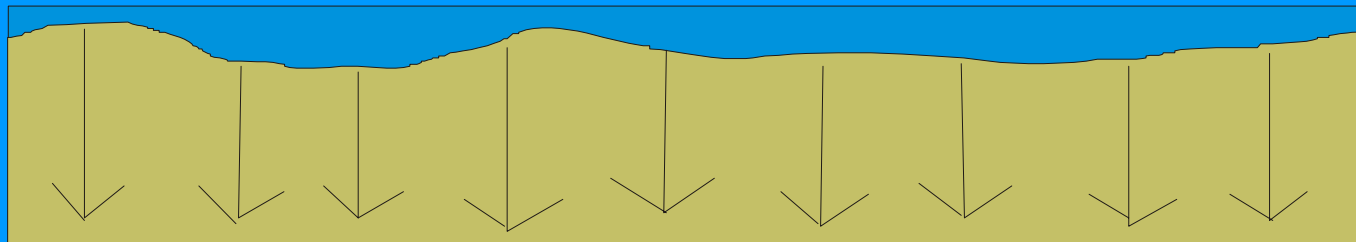
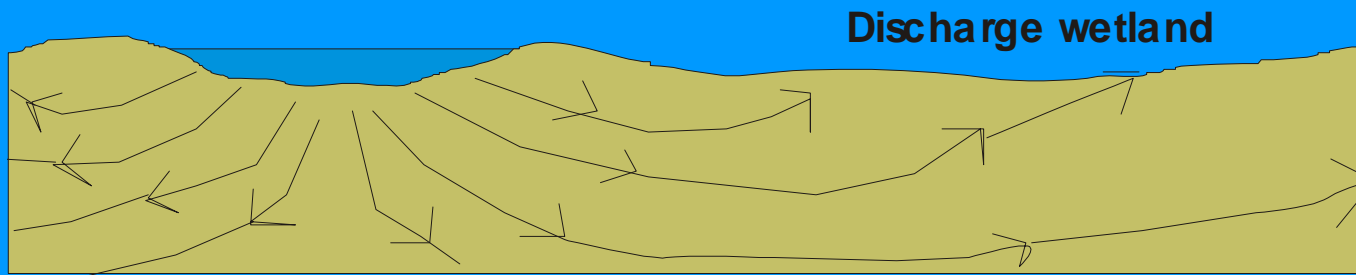
Flood



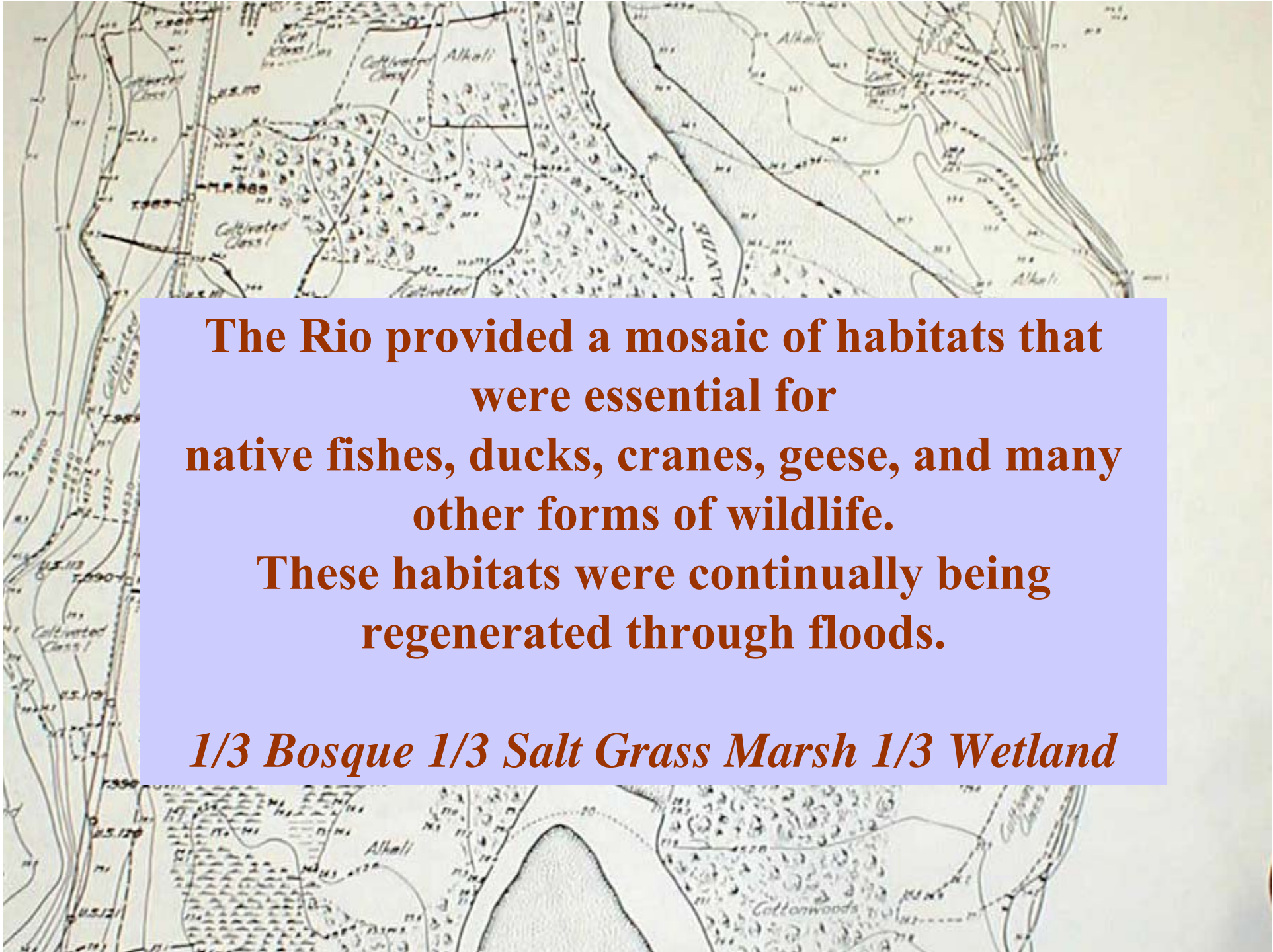
Post-flood



Groundwater flow



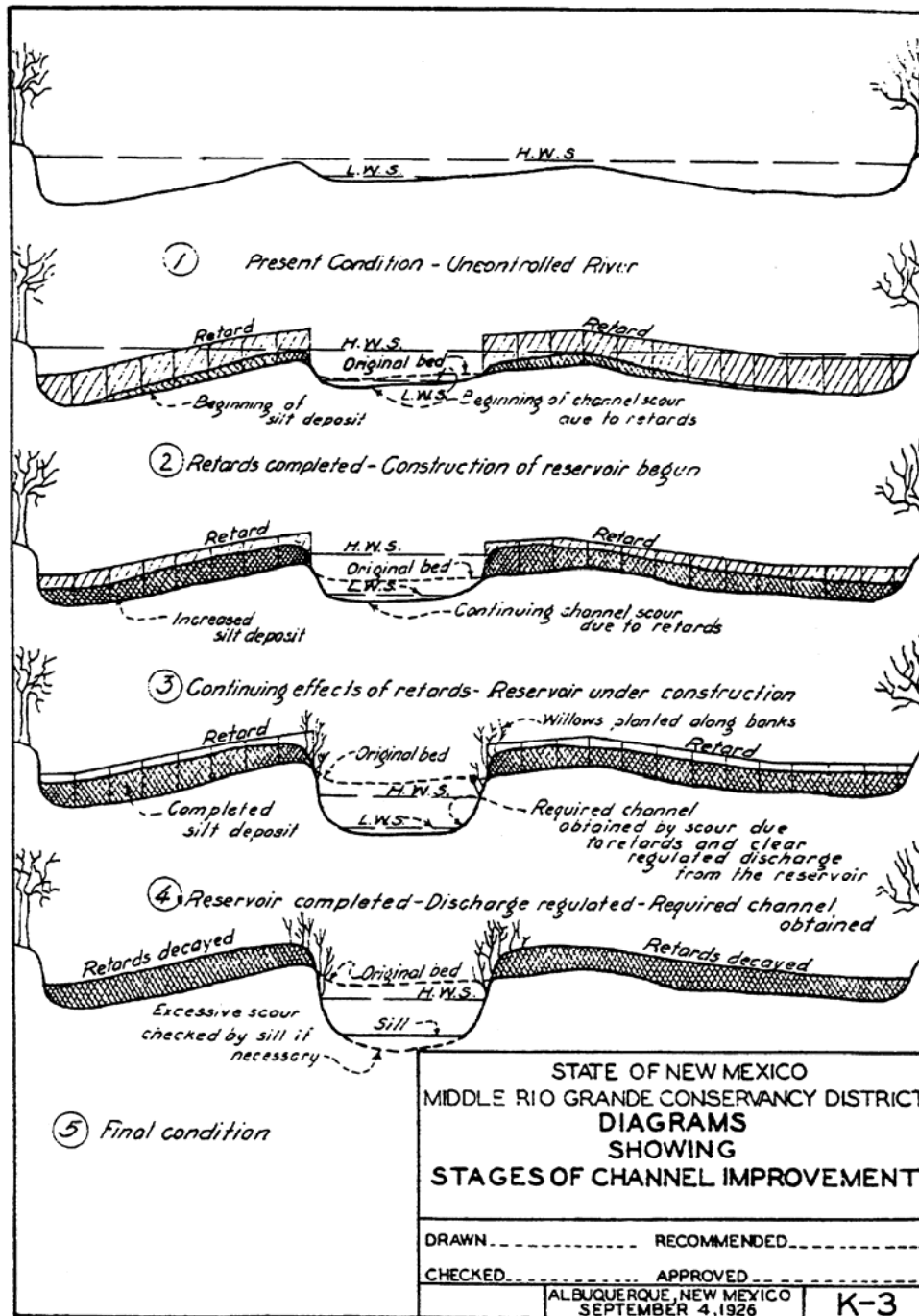
Groundwater flow (direction and speed) is dynamic!



The Rio provided a mosaic of habitats that were essential for native fishes, ducks, cranes, geese, and many other forms of wildlife.

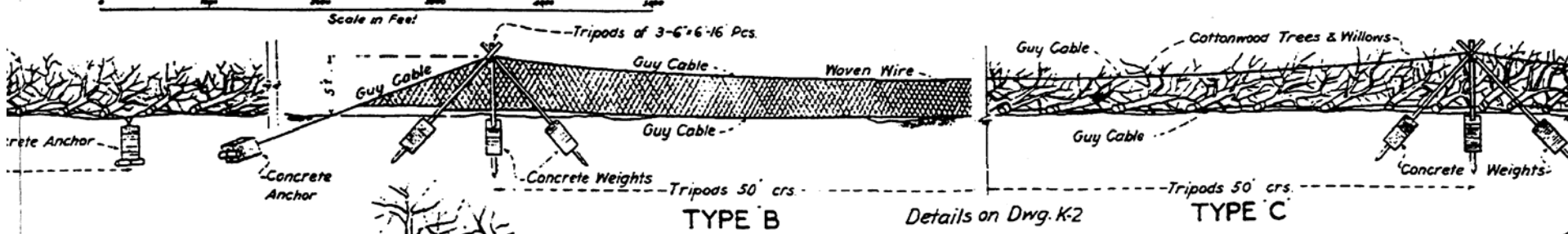
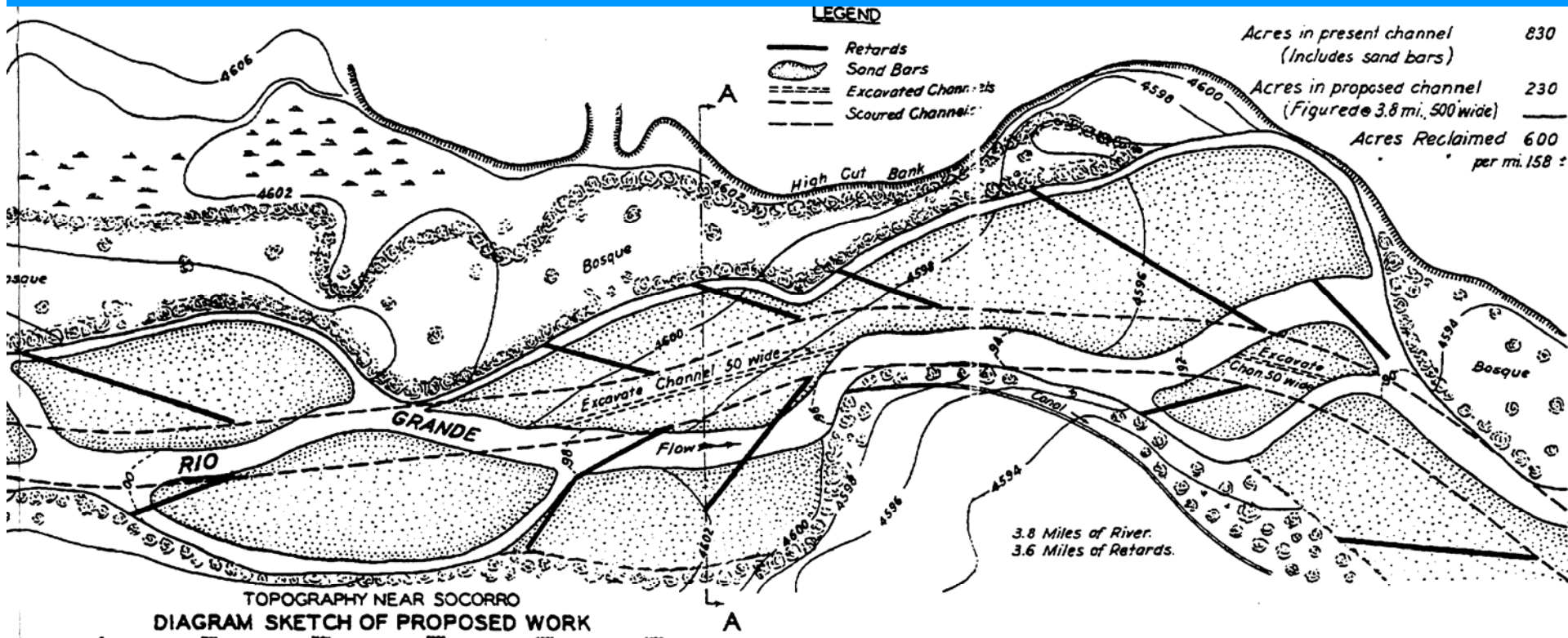
These habitats were continually being regenerated through floods.

1/3 Bosque 1/3 Salt Grass Marsh 1/3 Wetland



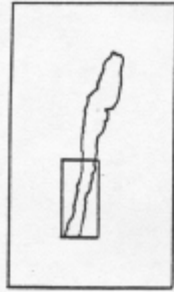


4/10/2



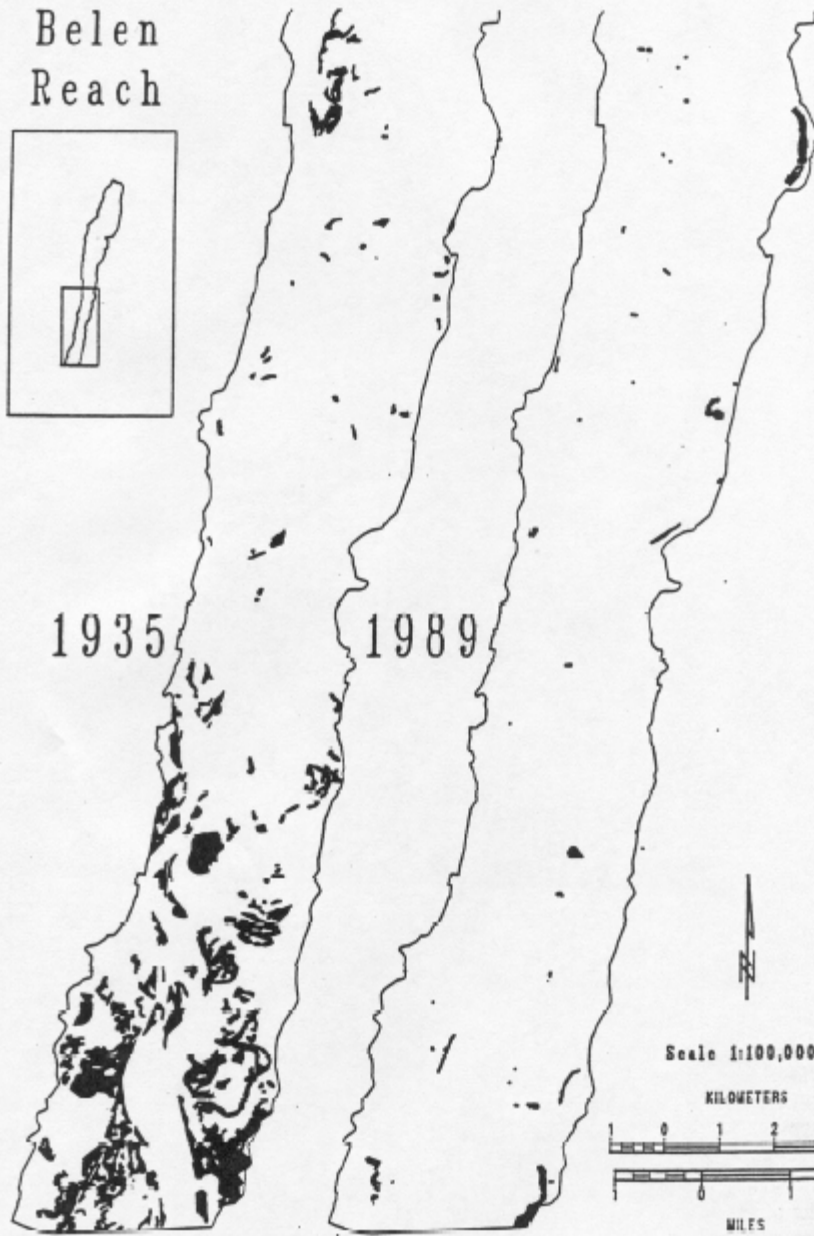


Belen
Reach



1935

1989



Scale 1:100,000

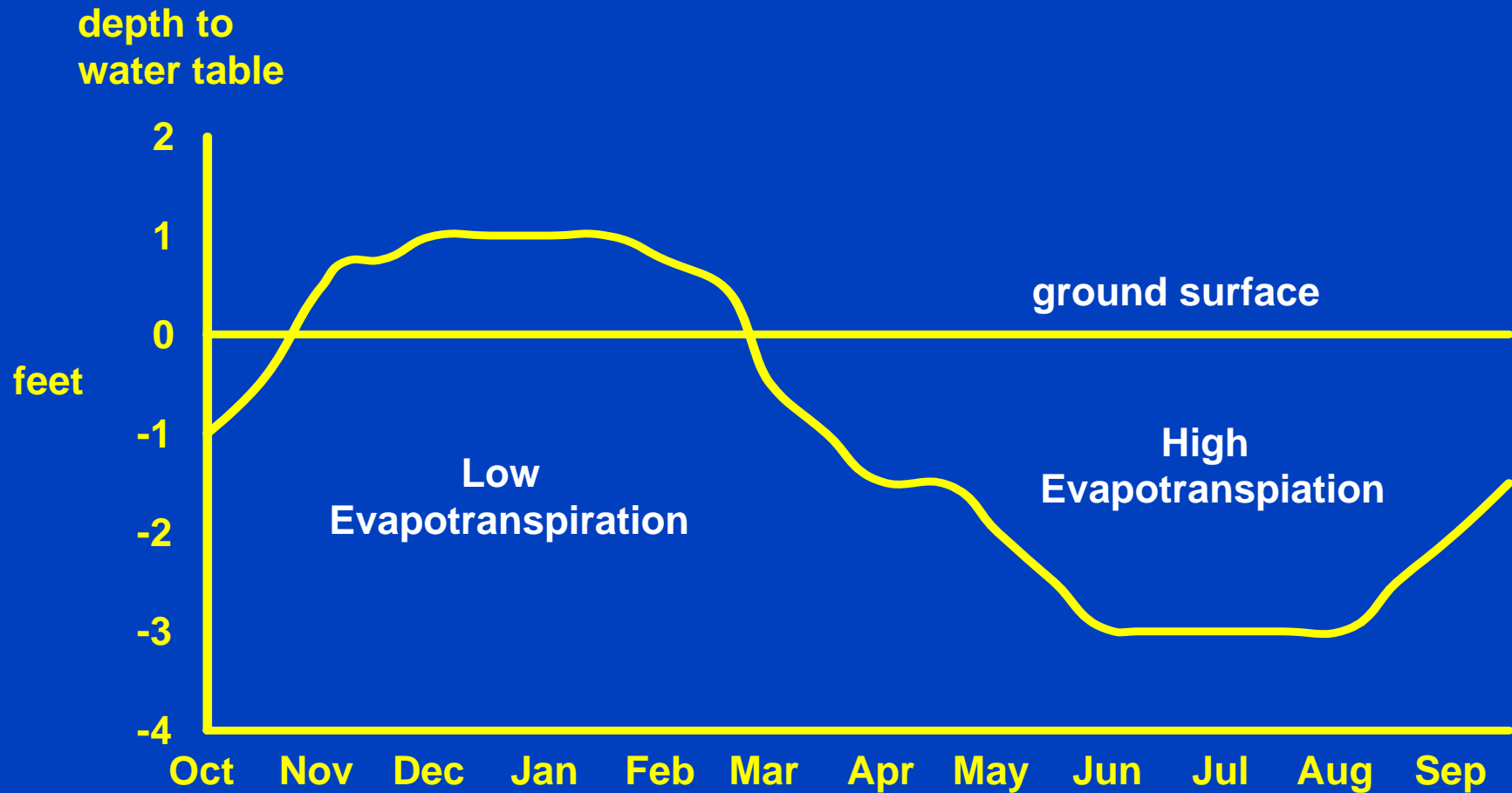
KILOMETERS



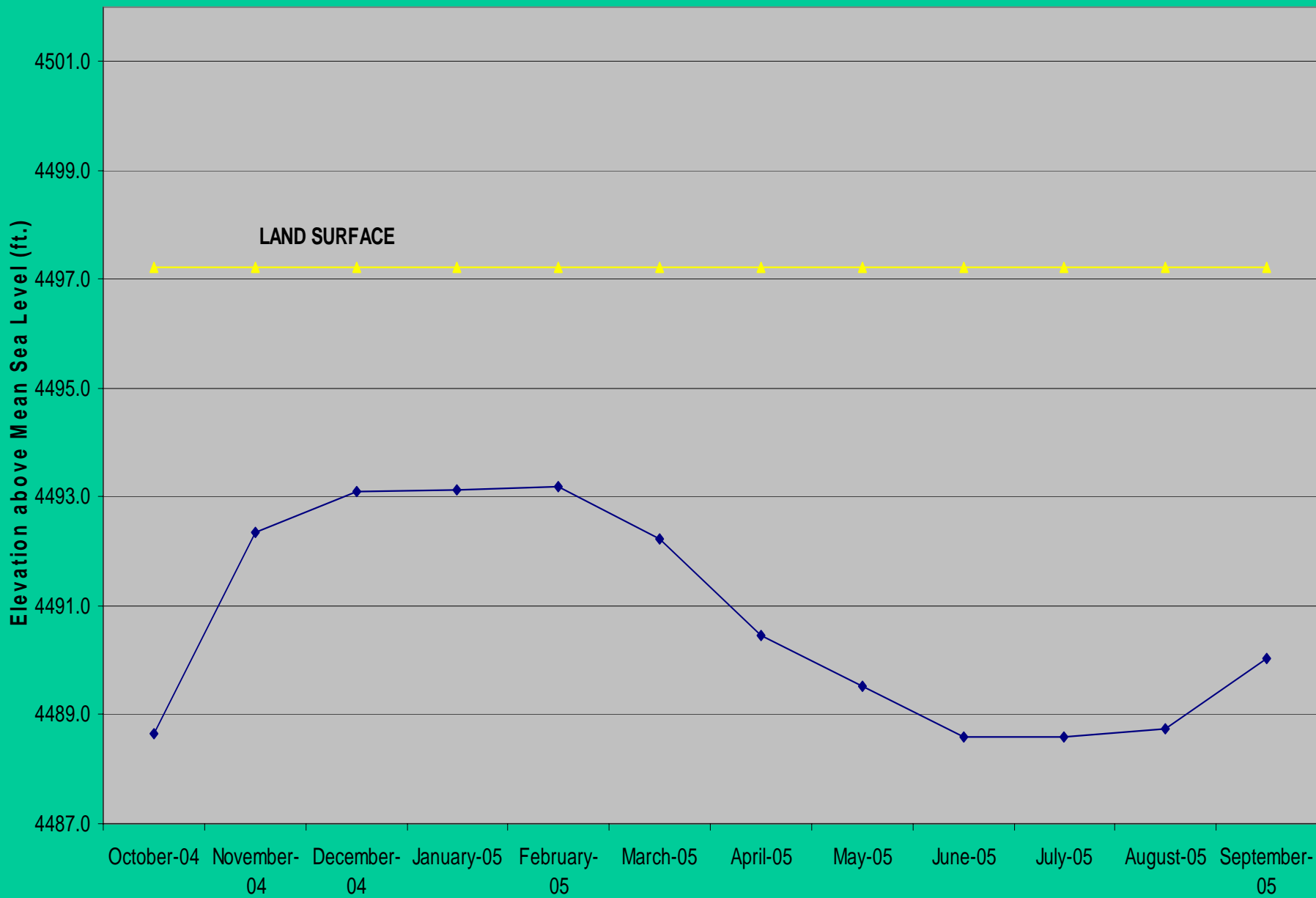
MILES



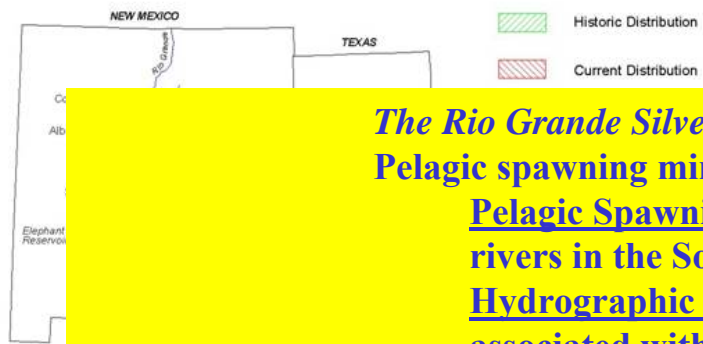
Saltgrass Community Groundwater



Modern Groundwater Hydrograph within a drained historic salt grass marsh



Distribution of the Rio Grande Silvery Minnow



The Rio Grande Silvery Minnow

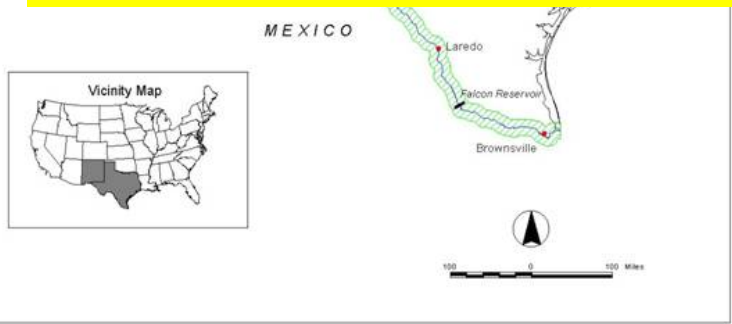
Pelagic spawning minnow: 1 of 5 remaining in MRG

Pelagic Spawning Cyprinids: Associated with sand bed rivers in the Southwestern and Great Plains United States.

Hydrographic cue: Spawn on increase in discharge associated with spring run-off.

Physical Habitat Preference: Braided sand bed and connected floodplain. Produce semi-buoyant eggs.

Drift as eggs and larvae for 3-5 days.



Only remaining pelagic spawner in the MRG – 2 others have gone extinct and 2 were extirpated

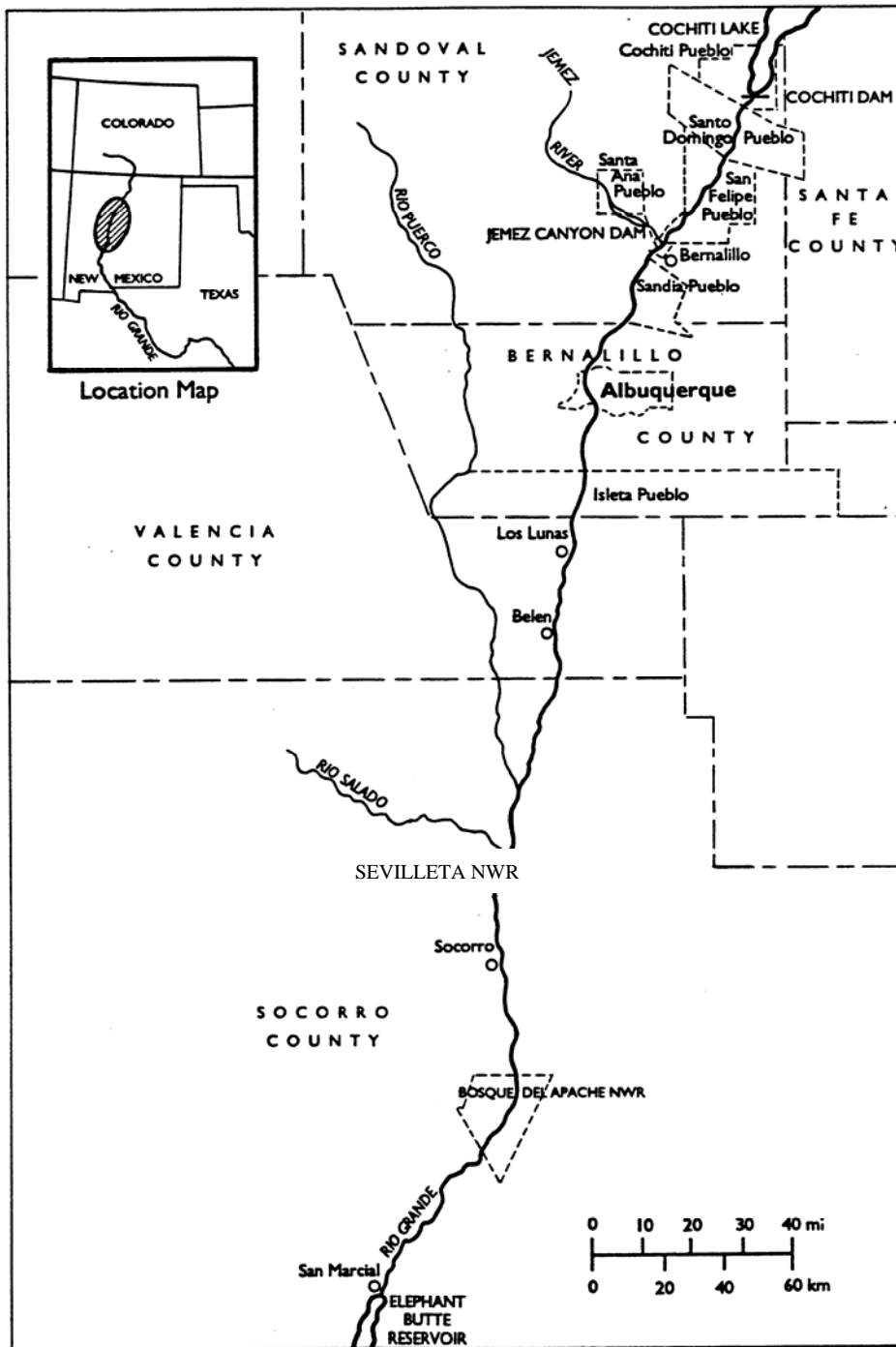
**stream of
s of Elephant**

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**nde from
co**

Historically one of the most widespread and abundant fishes in the Rio Grande Basin

Now one of the rarest fishes in the Rio Grande



COCHITI RESERVOIR, 0 Mile

- Cochiti Pueblo**
- Santa Domingo Pueblo**
- San Felipe Pueblo**

ANGOSTORA DIVERSION DAM, 22.9 Mile

- Santa Ana Pueblo**
- Sandia Pueblo**

Albuquerque

ISLETA DEVERSION DAM, 63.3 Mile

Isleta Pueblo

Belen

Sevilleta NWR

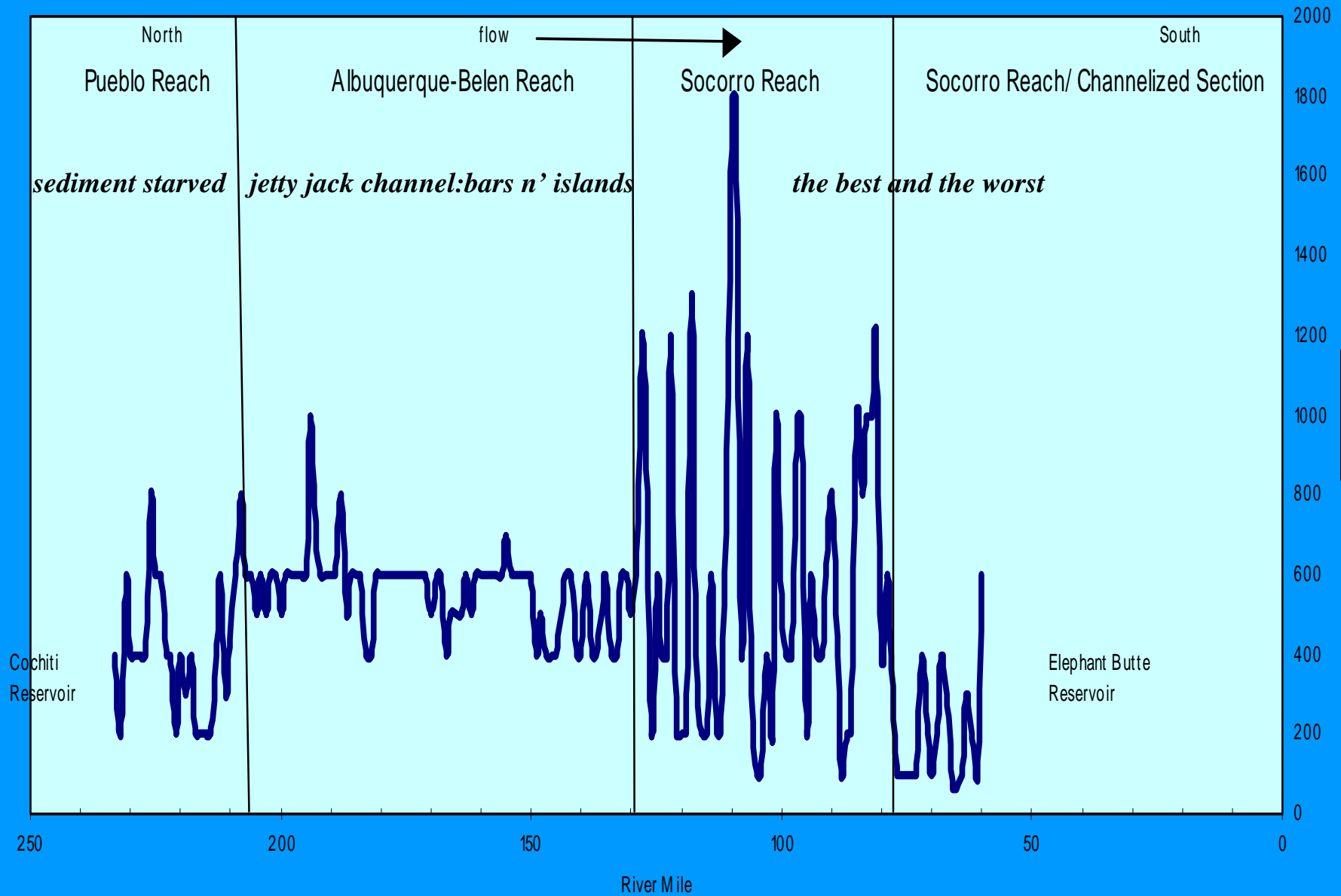
SAN ACACIA DIVERSION DAM, 116.4 Mile

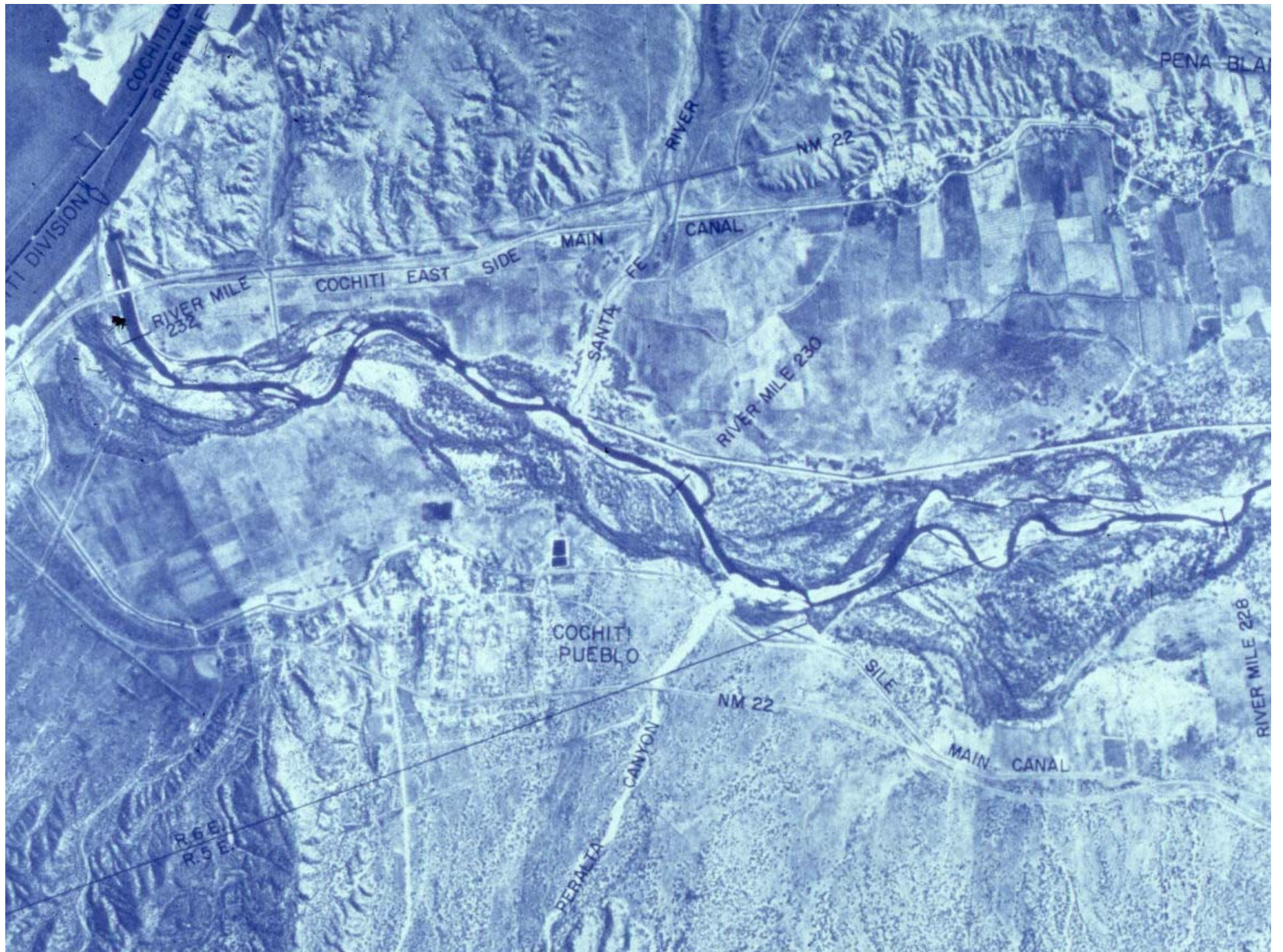
Socorro

Bosque Del Apache NWR

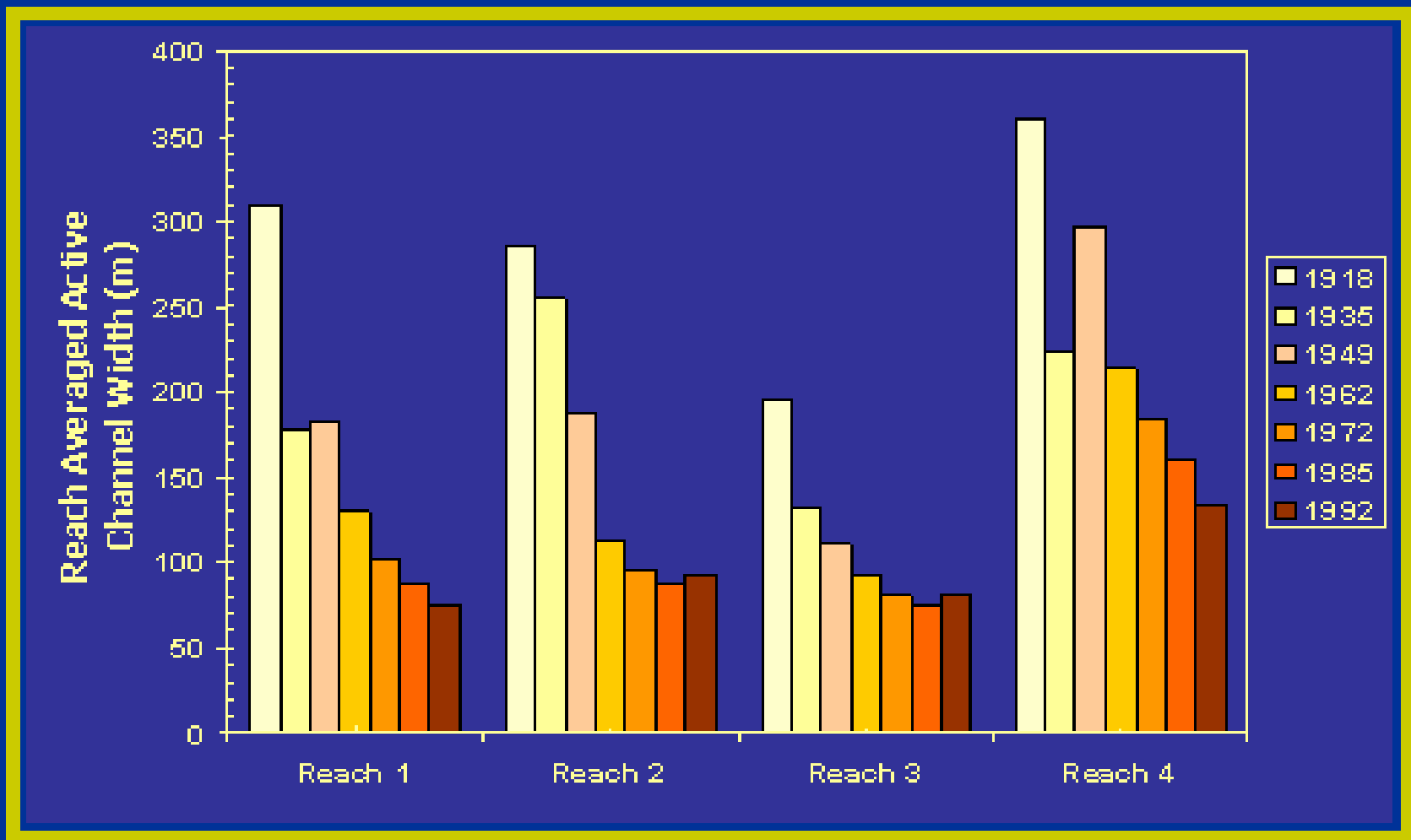
ELEPHANT BUTTE RESERVOIR, 176.6 Mile

Middle Rio Grande in 1992: River Mile vs. Channel Width



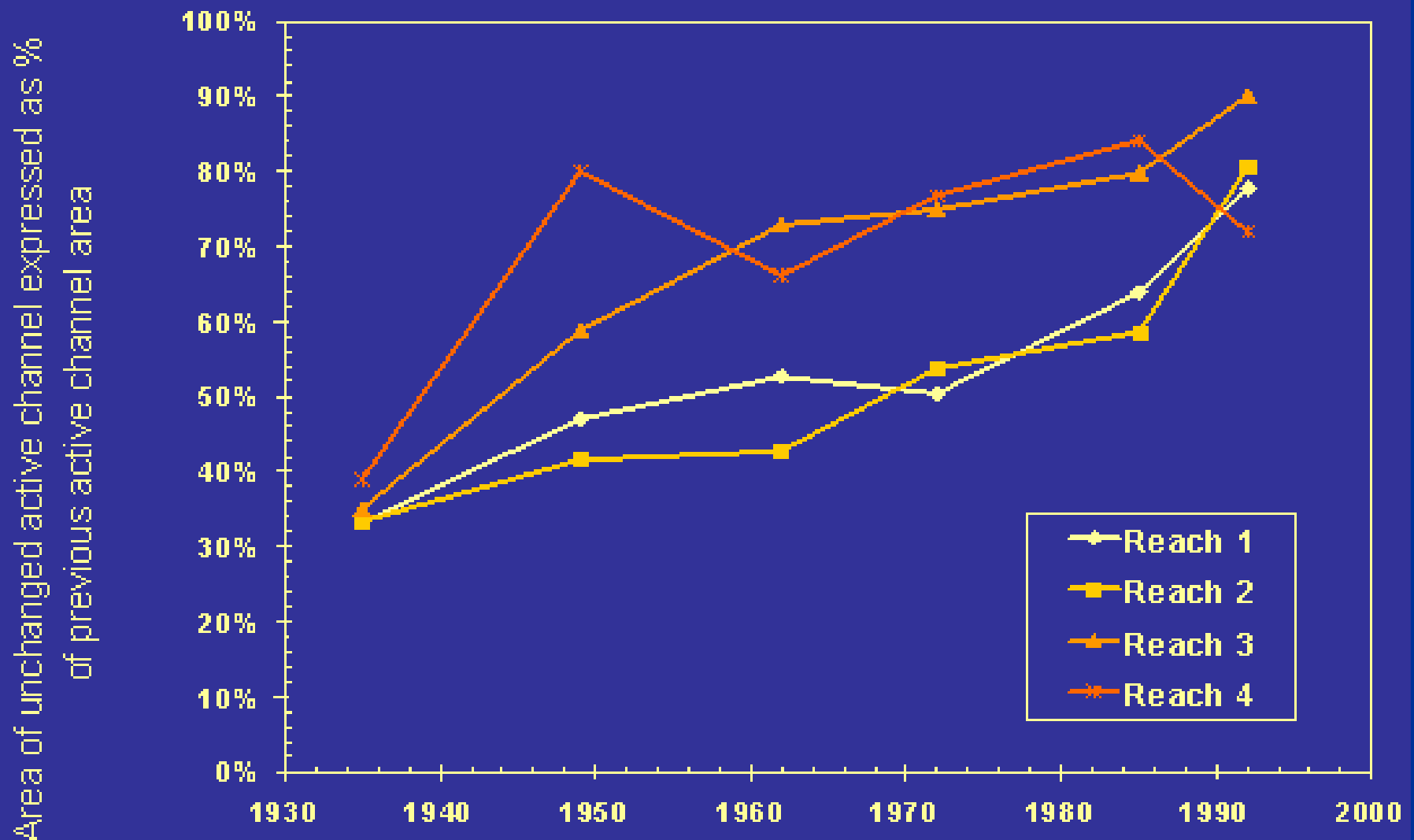


Active Channel Width



From Gigi Richard, 2000

Stability of channel planform



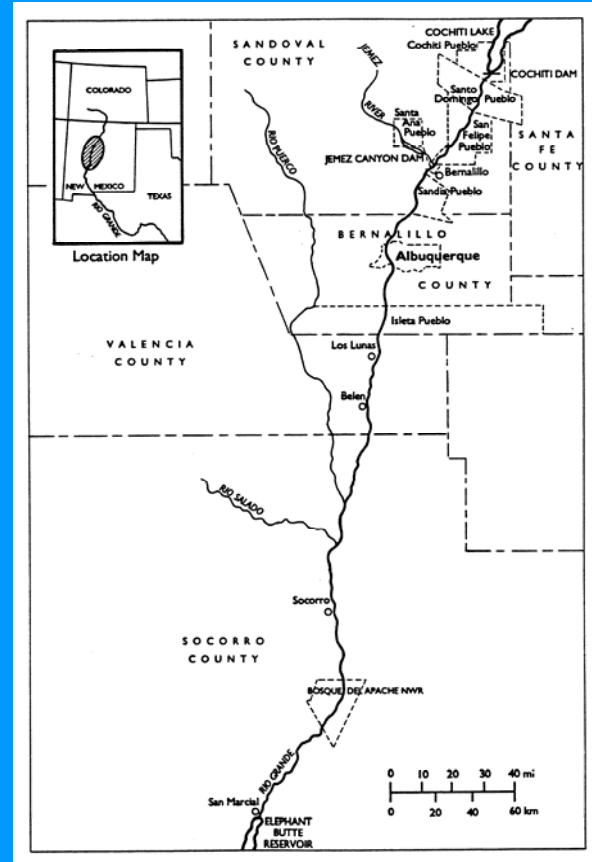
From Gigi Richard, 2000





La Orilla

300 150 0 300 Meters



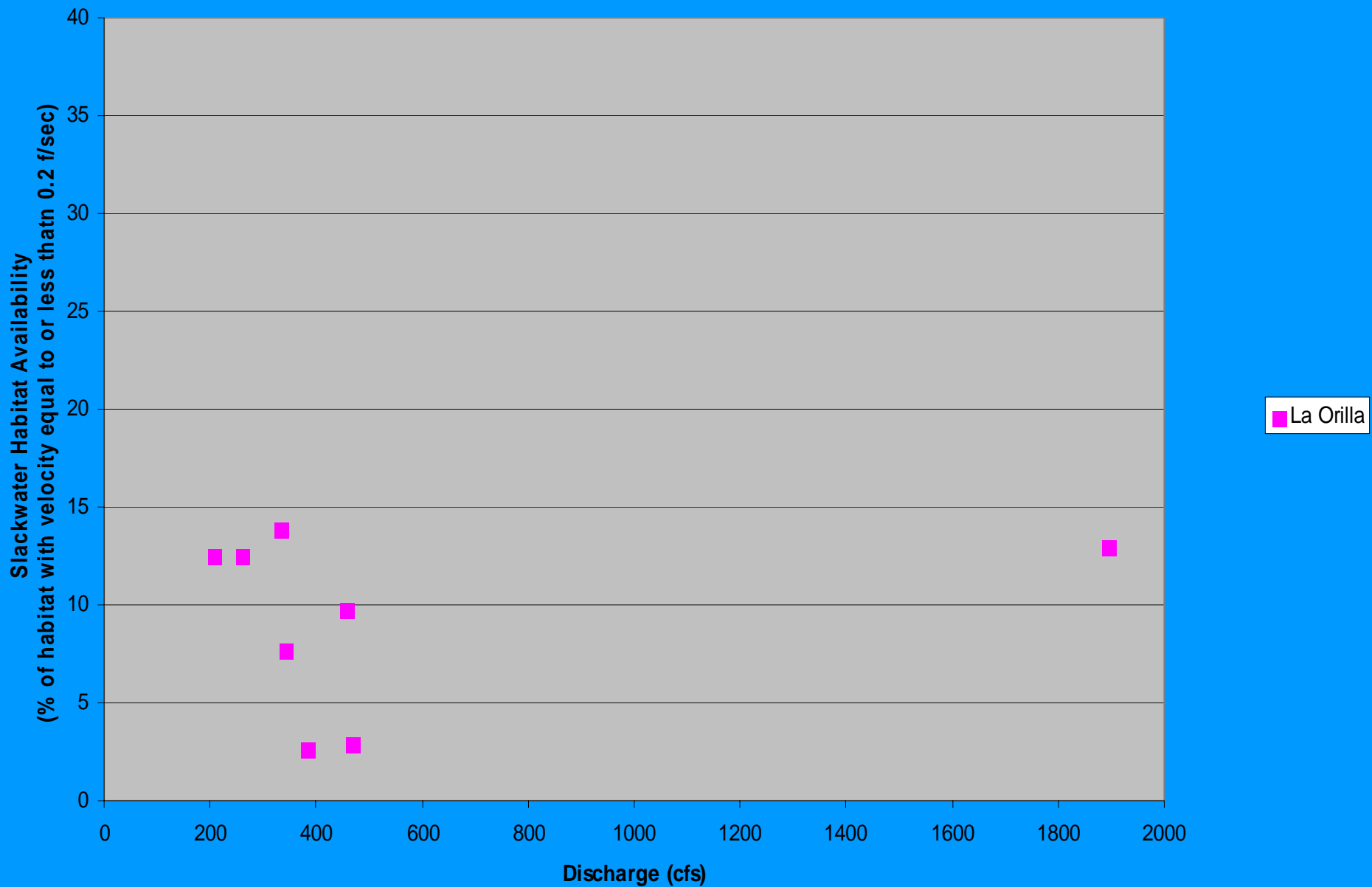
Shorelines at differing discharge (cfs)

- FLO2D_9000
- GPS_1894
- GPS_469
- GPS_261
- GPS_208

3

Middle Rio Grande Habitat Sites: Discharge vs. Slackwater Habitat Availability

Data from 2002-2004









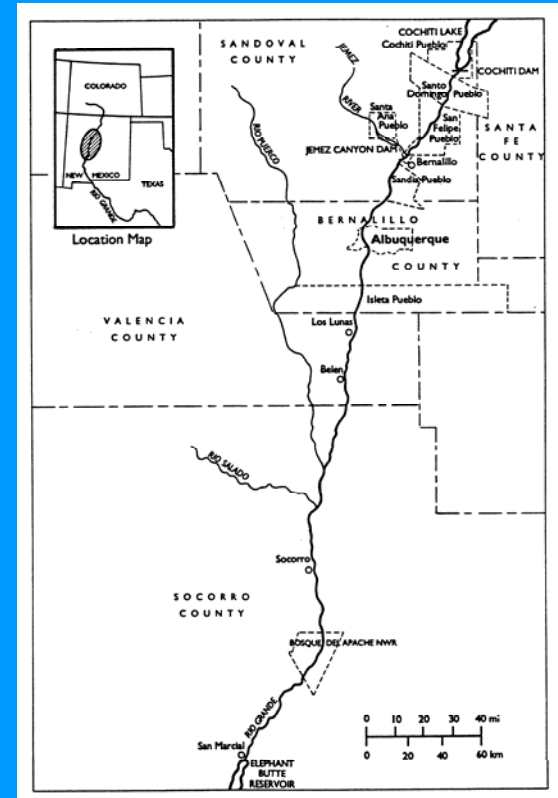






Los Lunas

300 150 0 300 Meters

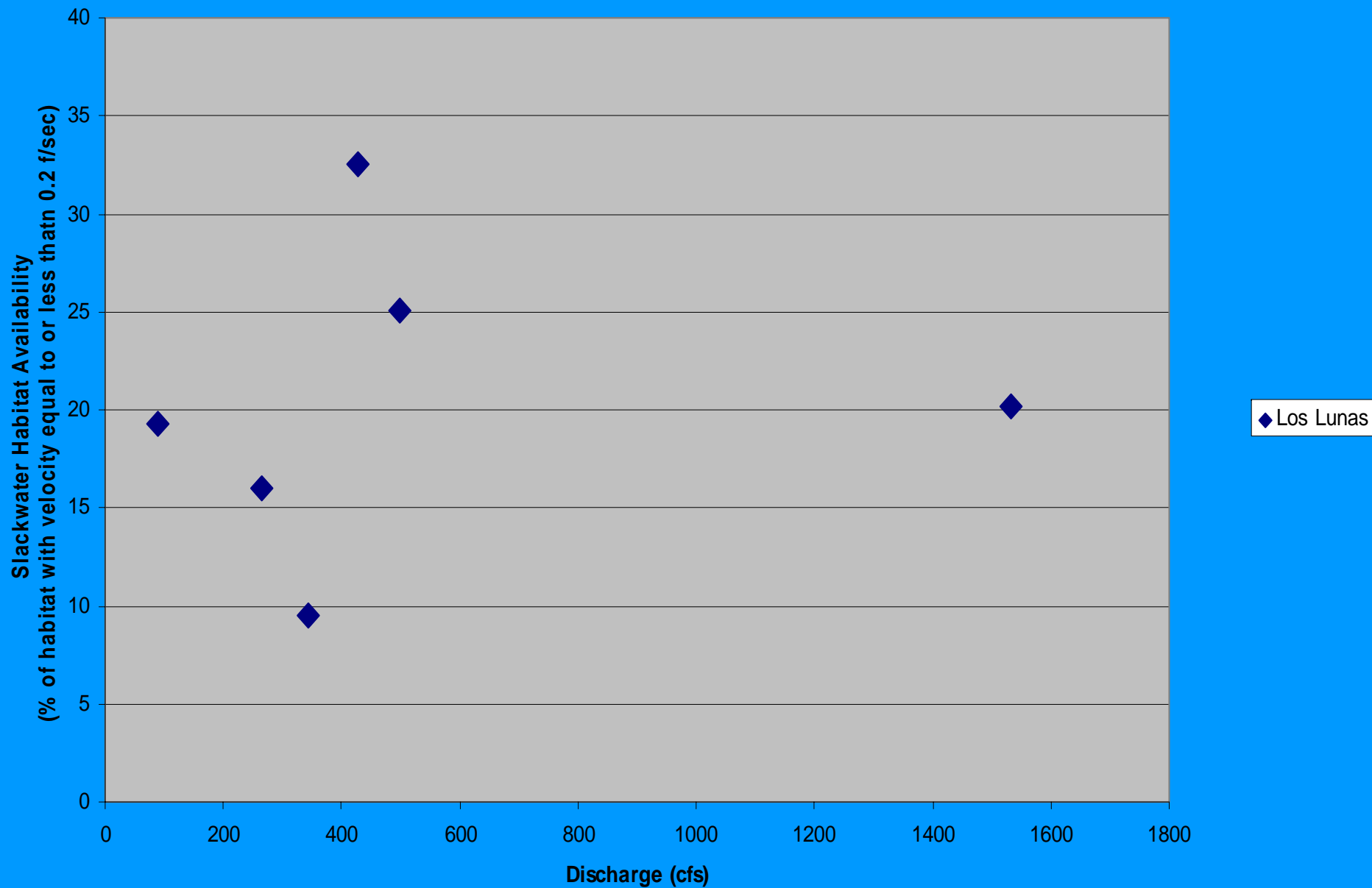


Shorelines at differing discharge (cfs)

- FLO2D_8000
- GPS_1532
- GPS_498
- GPS_428
- GPS_266

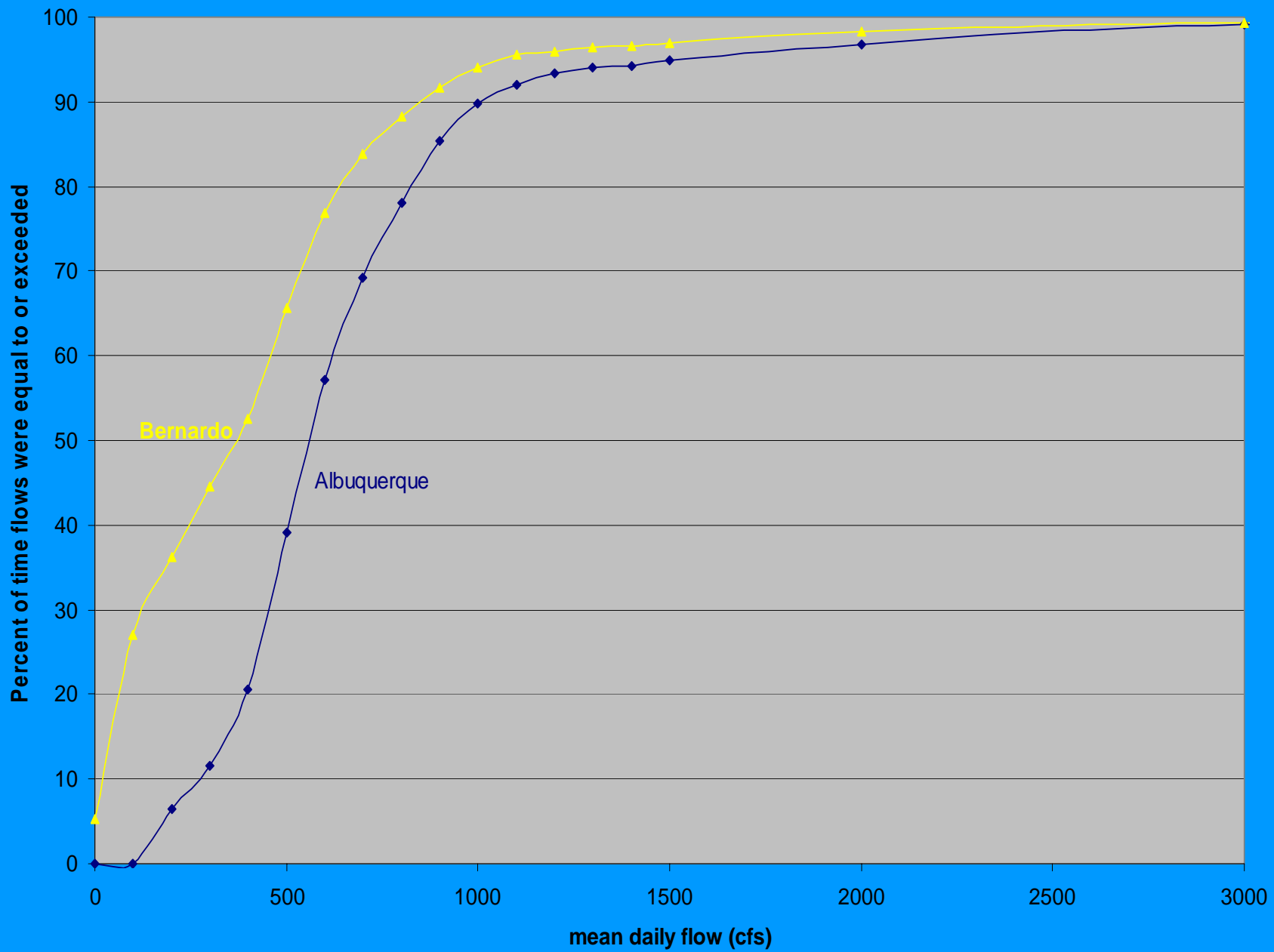
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Middle Rio Grande Habitat Sites: Discharge vs. Slackwater Habitat Availability
Data from 2002-2004





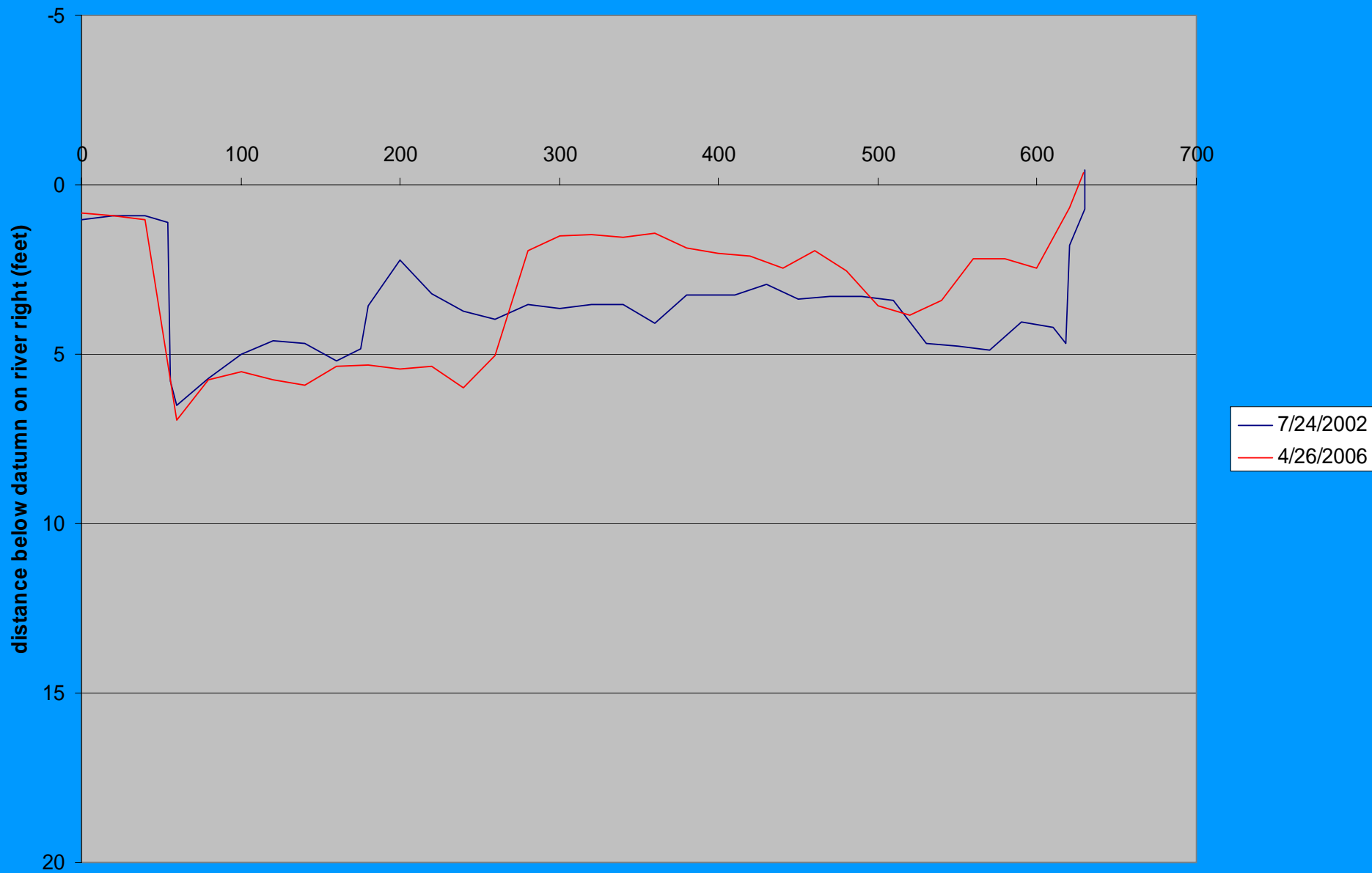
Mean daily flow frequency 2000-2004: Albuquerque vs. Bernado





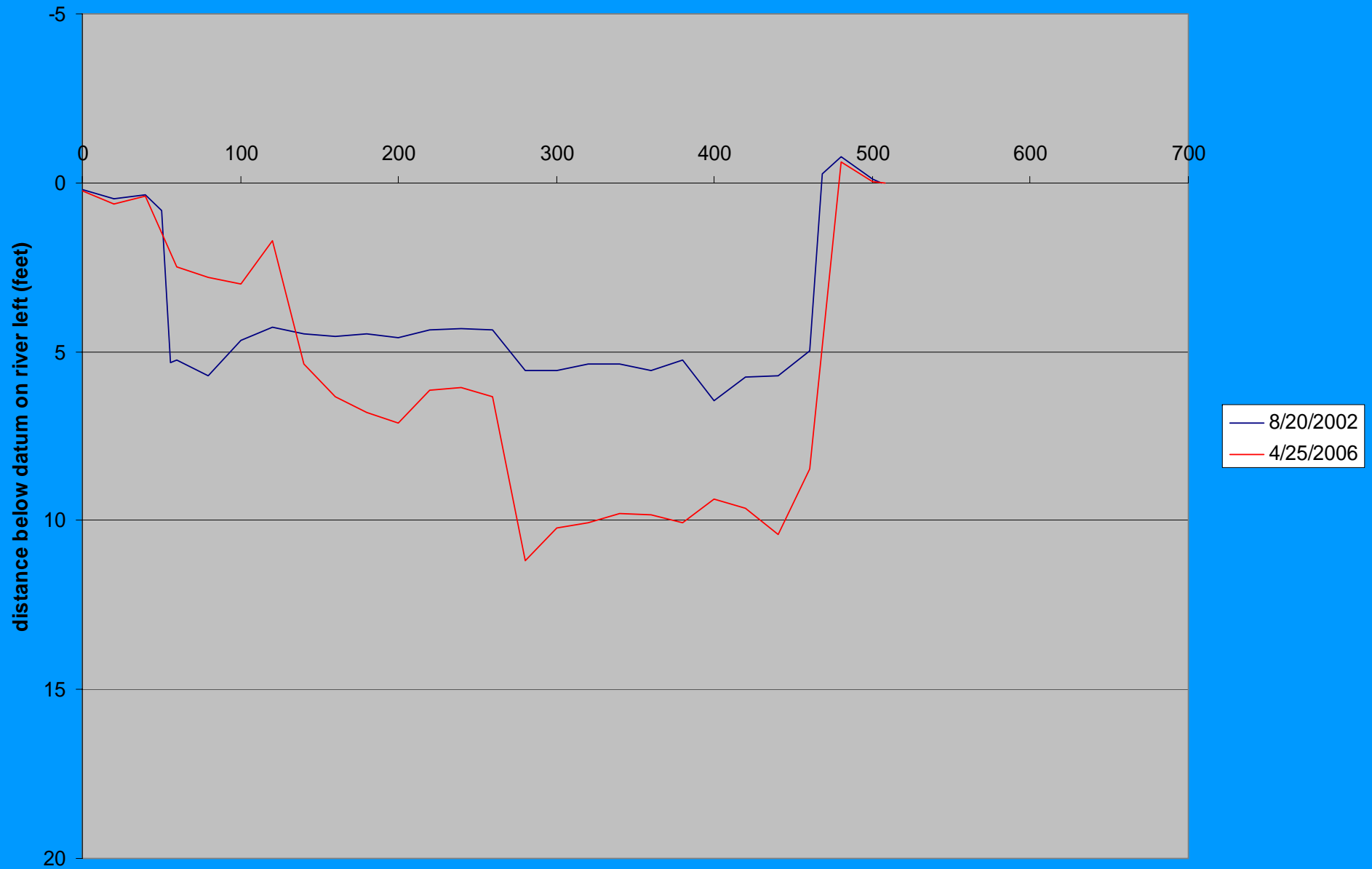
Los Lunas cross section data: 2002 vs. 2006

distance from datum on river right (feet)



Abeytas cross section data: 2002 vs. 2006

distance from datum on river left (feet)





South

Rio Grande

Rio Salado



San Acacia Diversion

Low Flow Canal
Socorro Main

North



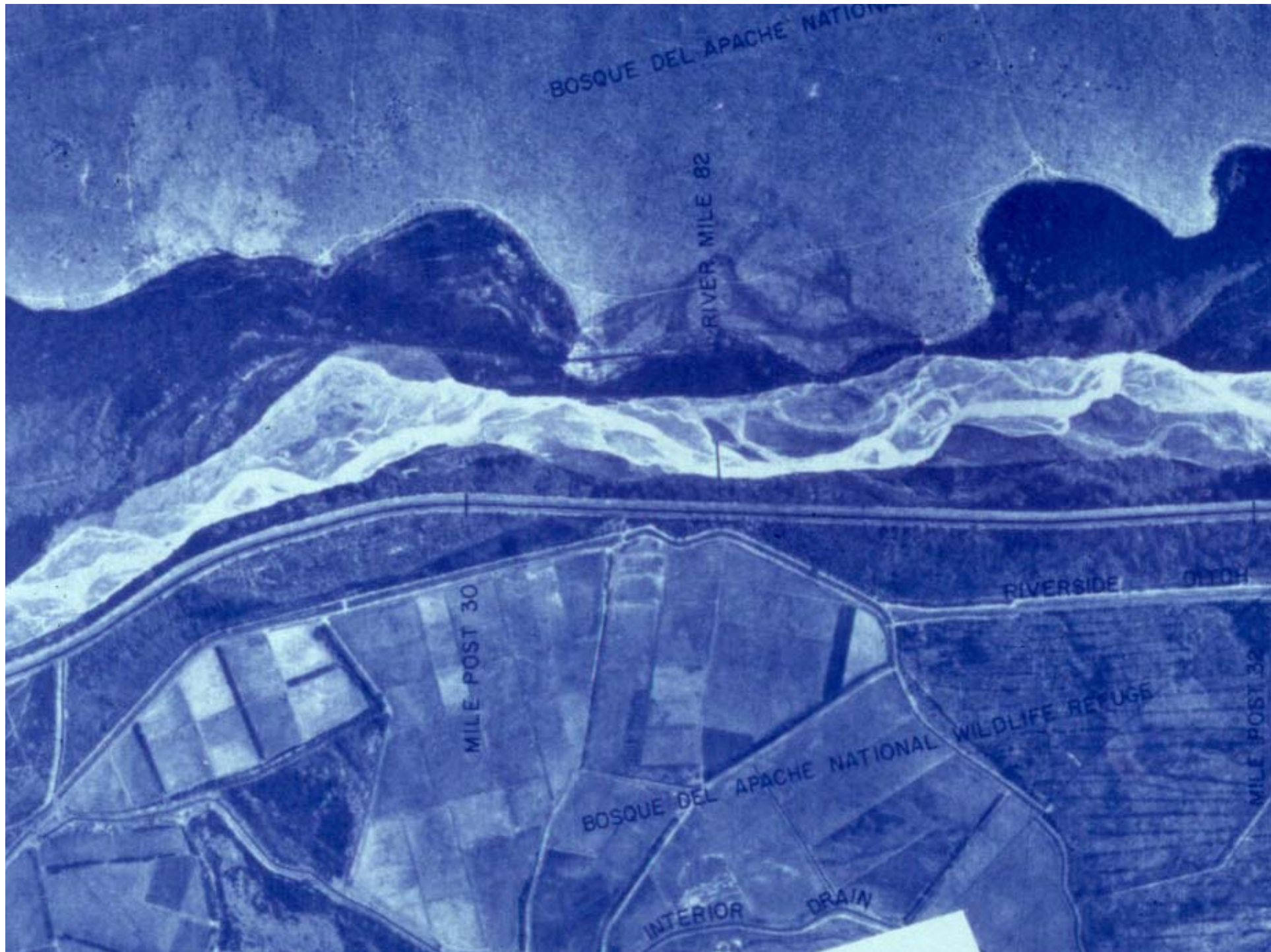
Rio Grande

Low Flow Canal

South

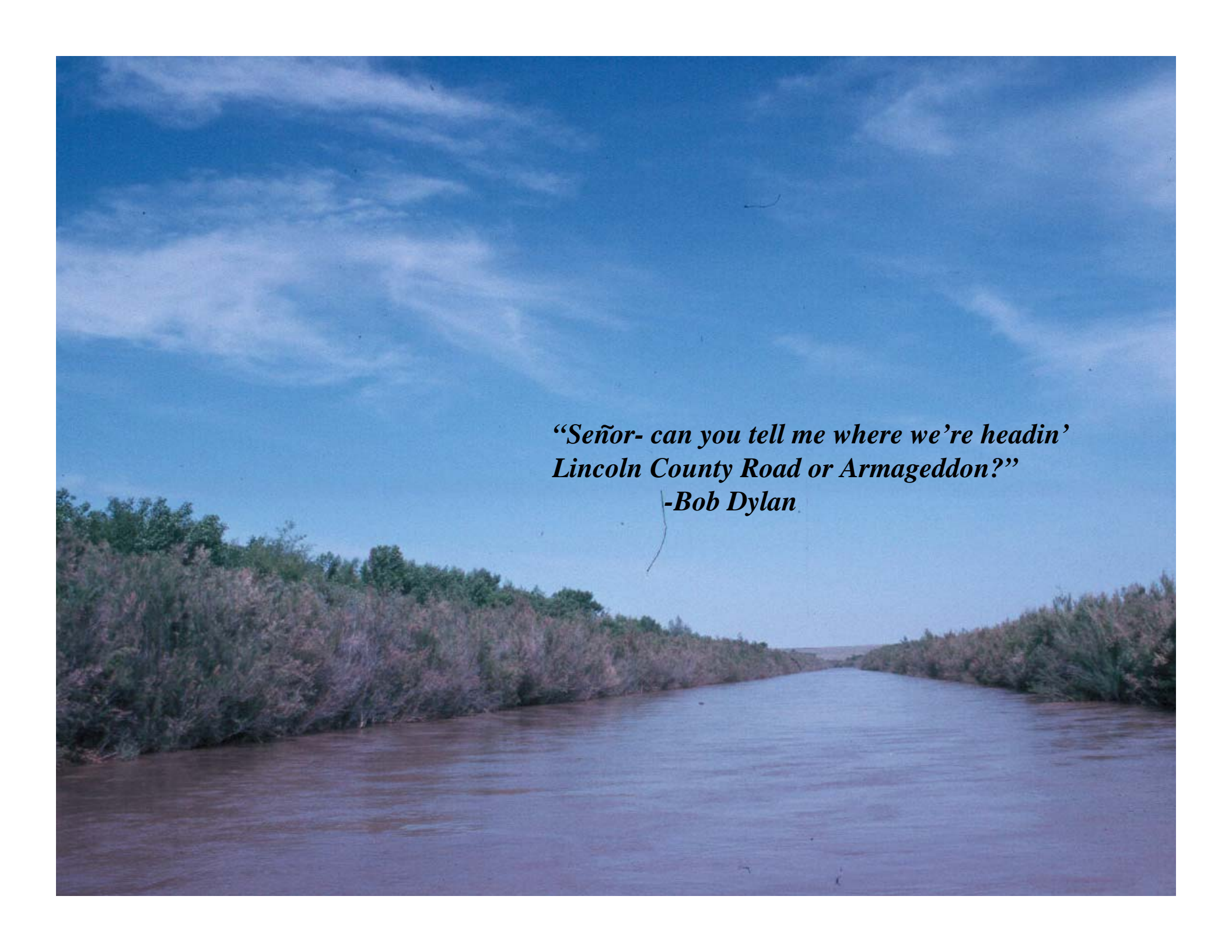
6/8/1999









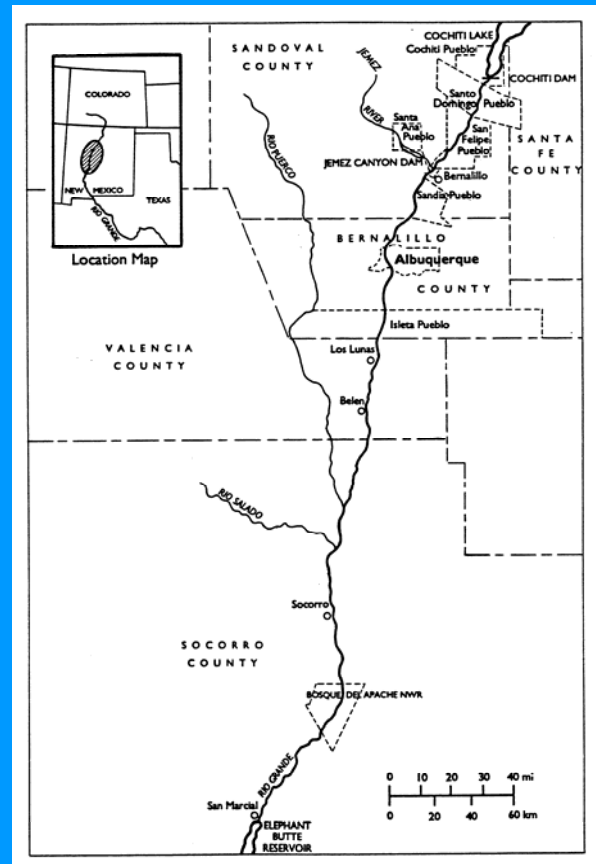


*“Señor- can you tell me where we’re headin’
Lincoln County Road or Armageddon?”
-Bob Dylan*



Arroyo Del Tajo

300 150 0 300 Meters

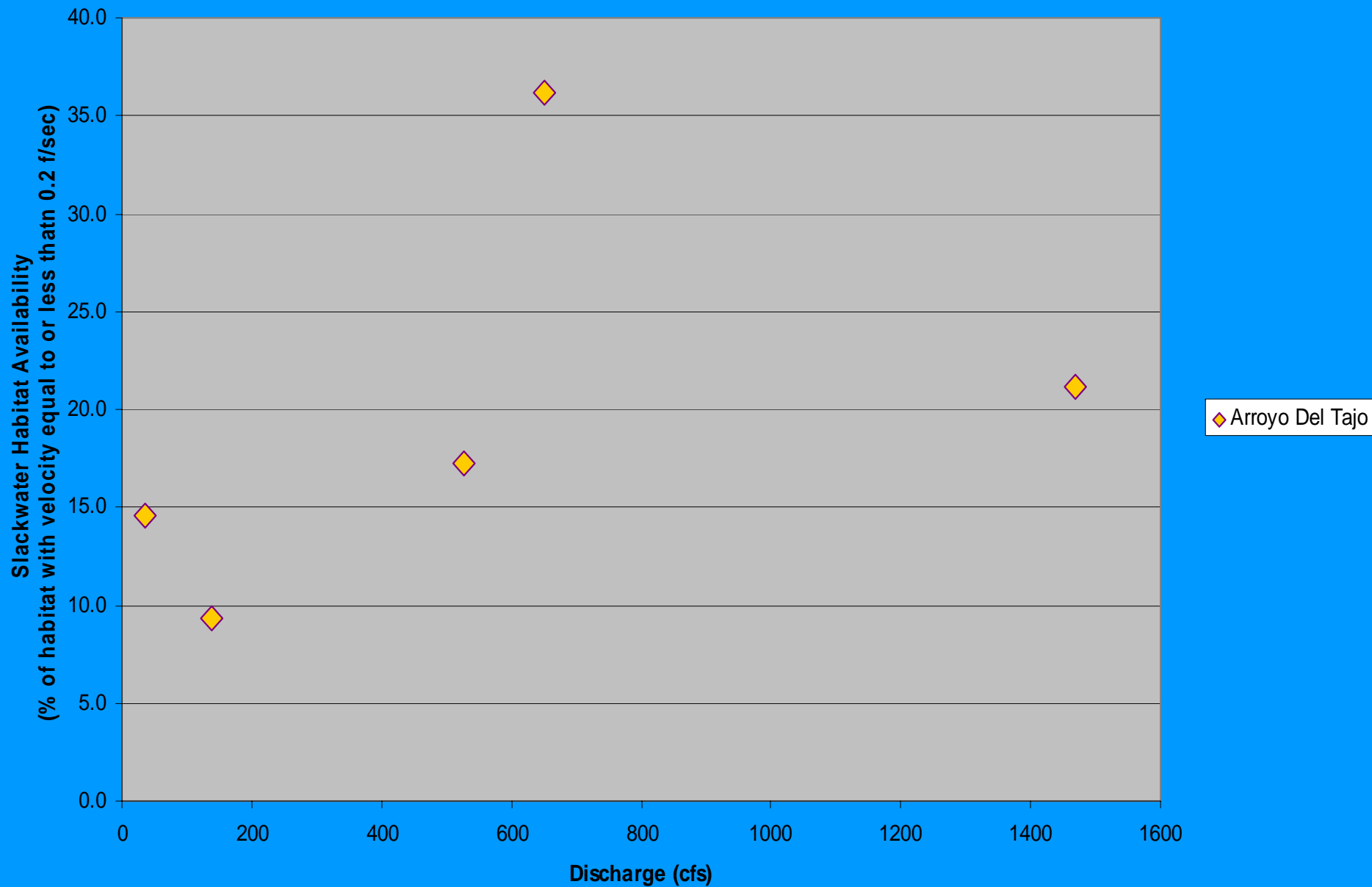


Shorelines at differing discharge (cfs)

- FLO2D_7000
- GPS_1470
- GPS_555
- GPS_190
- GPS_139
- GPS_36

3

Middle Rio Grande Habitat Sites: Discharge vs. Slackwater Habitat Availability Data from 2002-2004





outh

Nor

Salt Cedar Forest

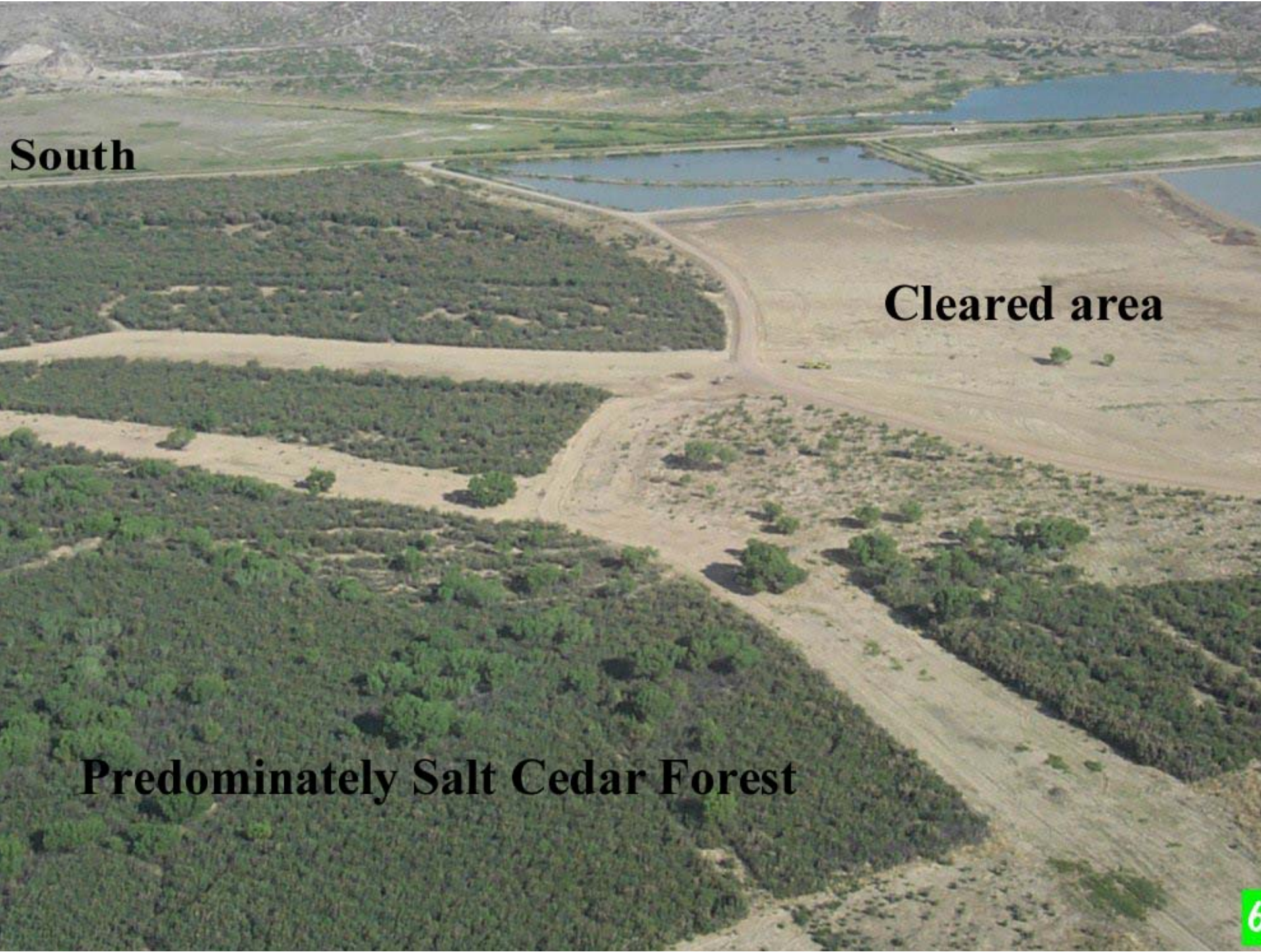
Predominately Open Native Bosque

6/8/1999



Photo John Taylor



An aerial photograph showing a landscape with a cleared area and a forest of salt cedar trees. The cleared area is a large, flat, light-brown expanse on the right side of the image. The forest is a dense, green area on the left side. A dirt road or path runs through the center, separating the cleared area from the forest. In the background, there are several rectangular ponds or reservoirs. The word "South" is written in the top left corner, "Cleared area" is written in the middle right, and "Predominately Salt Cedar Forest" is written in the bottom left. A small green square with the number "6" is in the bottom right corner.

South

Cleared area

Predominately Salt Cedar Forest

A landscape photograph showing a wide, flat field of tall, dry grass in the foreground. In the middle ground, there is a dense line of trees and shrubs. A few larger, more prominent trees with green and yellowing leaves stand out on the right side. The sky is a clear, bright blue with a few wispy white clouds scattered across it.

**Water budgets of restored versus non restored riparian forests
at Bosque Del Apache NWR demonstrate a 25%-50%
reduction in water consumption.**

ECONOMIC BENEFITS OF RESTORATION

Fire Threat Reduction:

- Impact of fires on neighboring communities, health, safety and community structures.*
- Feedback between fires and non-native phreatophytes.*

Water Salvage:

- Estimates of water budgets for non-native phreatophyte dominated vs. restored native-dominated mosaic forests indicate promise for salvage.*

Flood Peak Attenuation:

- The potential benefits of an active floodplain comprised of an open structured native dominated forest for flood control.*

A large flock of birds, likely waterfowl, is seen in flight against a clear blue sky. The birds are scattered across the upper two-thirds of the image. Below them, a body of water is visible, with a shoreline and some vegetation in the distance. The overall scene is a natural, outdoor setting.

Restore historic processes by:

- remove jetty jacks: assist channel mobility, protect levees
- assist with a connected floodplain and floodplain

Economic analysis of 2004

- forest to **Bosque Del Apache NWR**
- manage **generated ~\$20 million of economic activity in Socorro, Bernalillo and Sierra Counties** g flows
ease low

- sediment balance: add sediment up north
- wetland restoration in floodplain and farmland

QUESTIONS?

