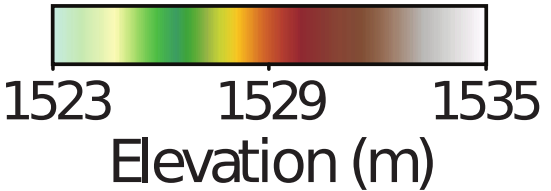
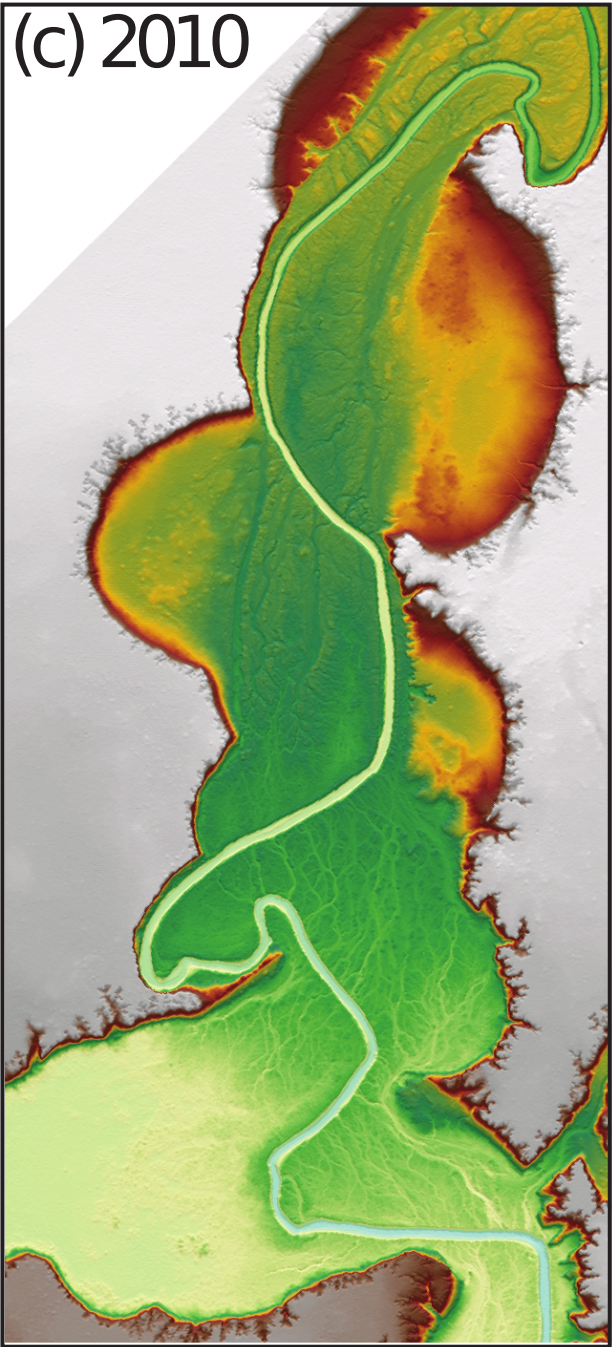
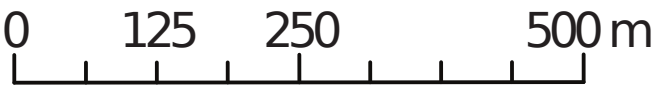
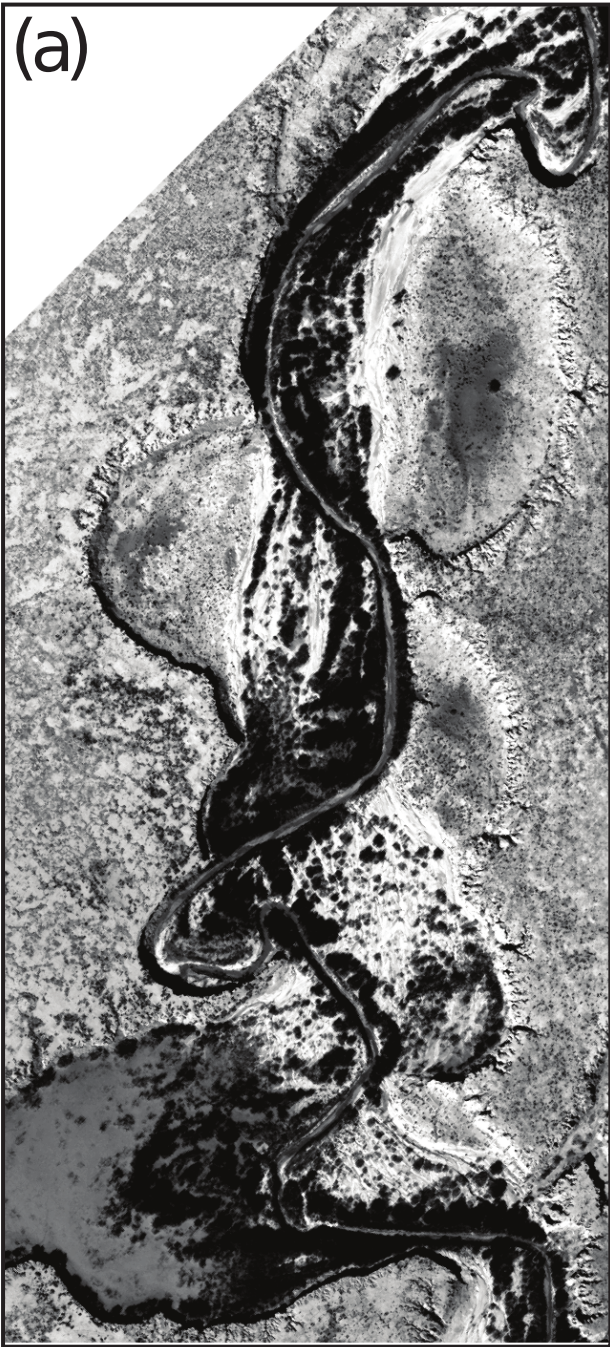
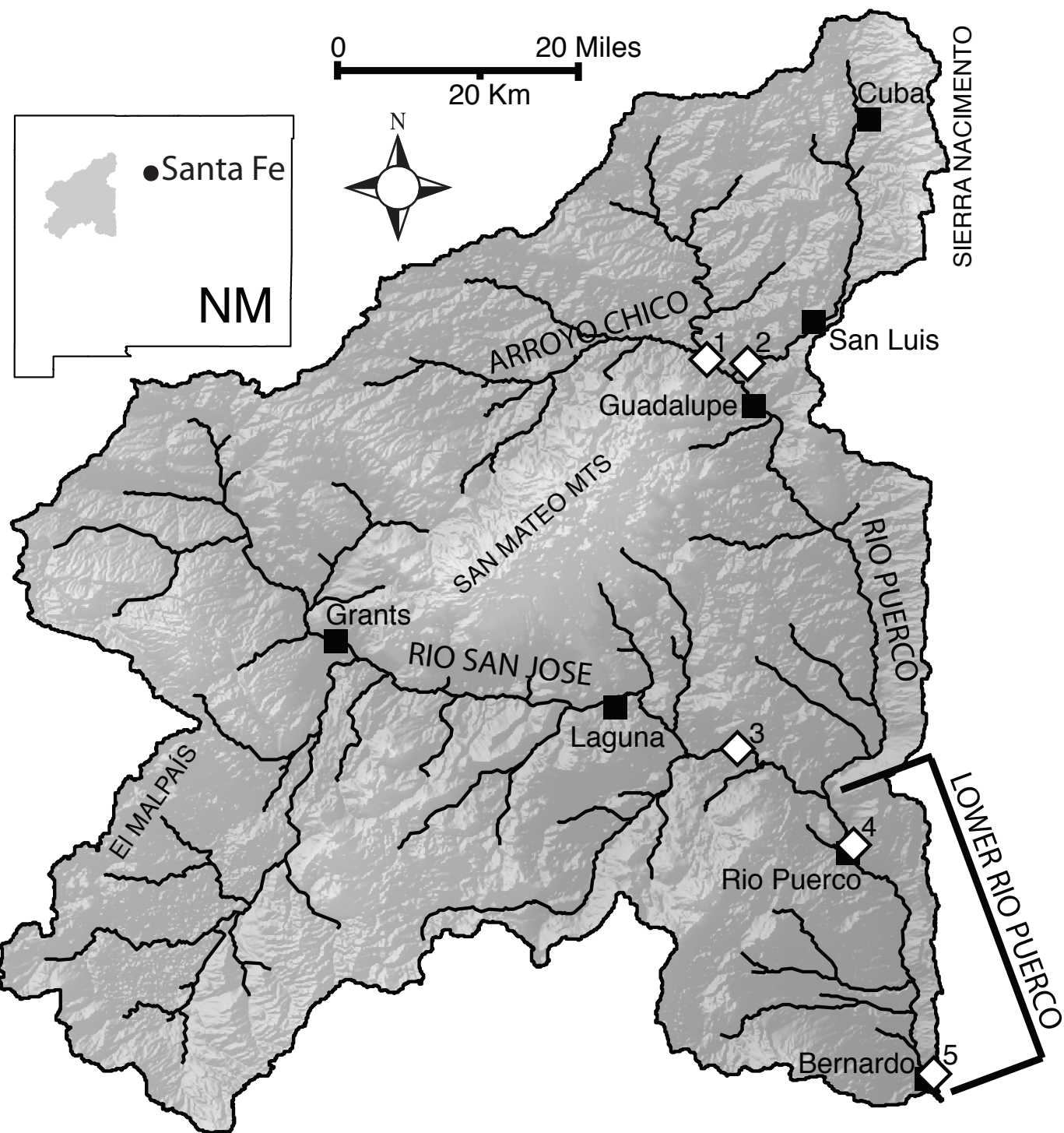


# The Rio Puerco, New Mexico: a story of changing river morphology and invasive species





# Rio Puerco, New Mexico:





Modern geometry:

**vertical** walls

**flat, vegetated** arroyo bottom

**narrow** channel





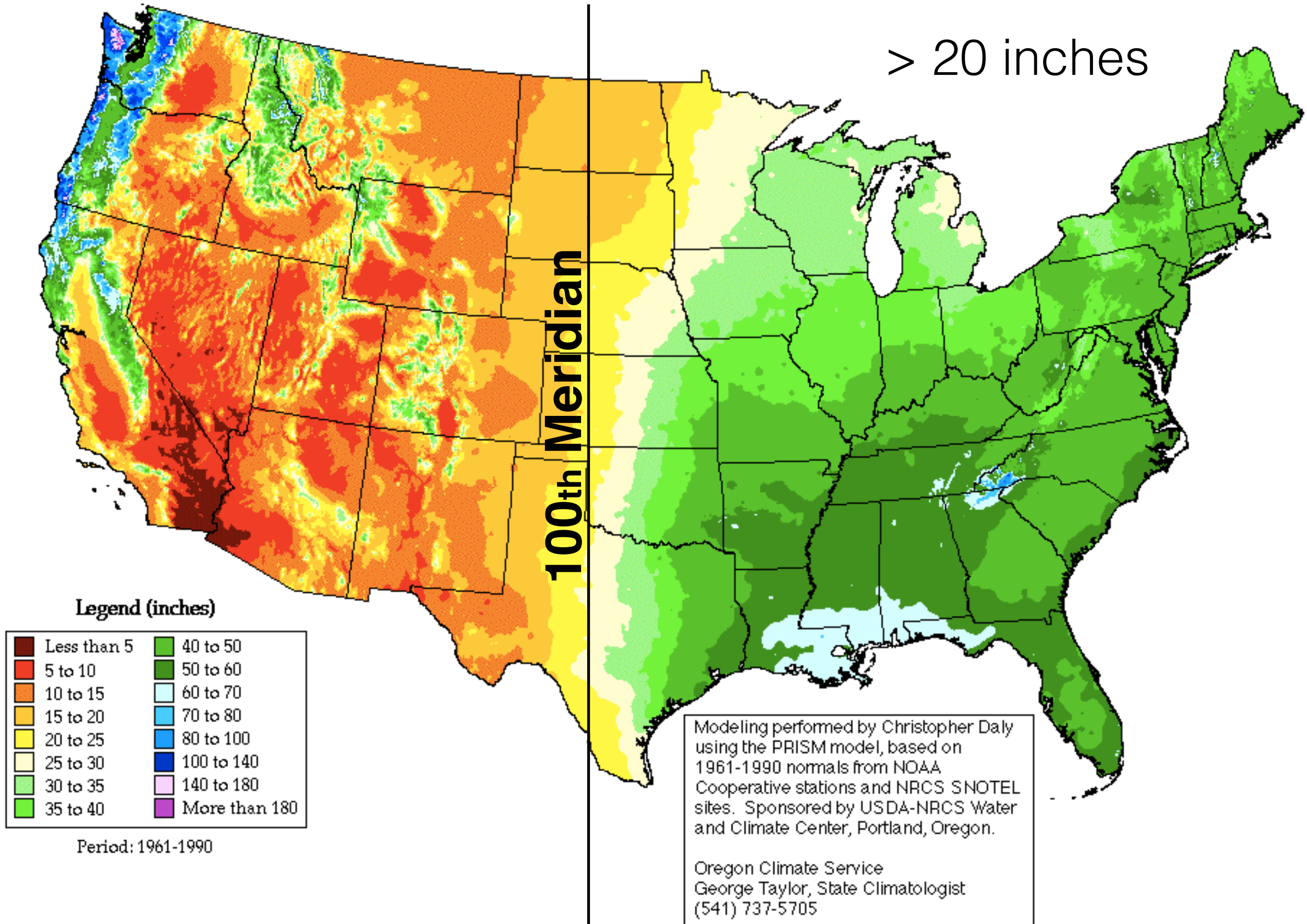
# Regional climate

< 20 inches

## Annual Average Precipitation

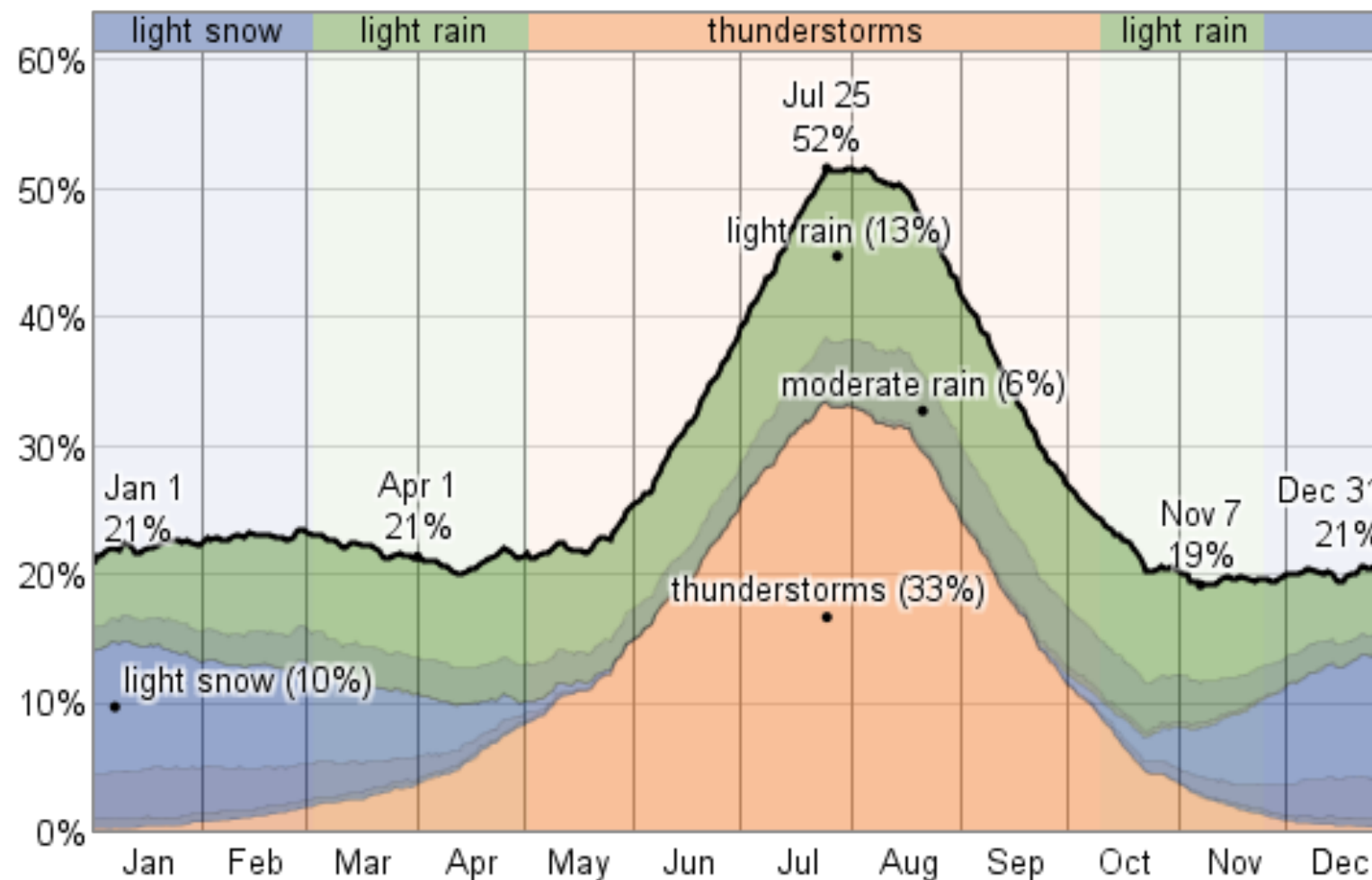
United States of America

> 20 inches

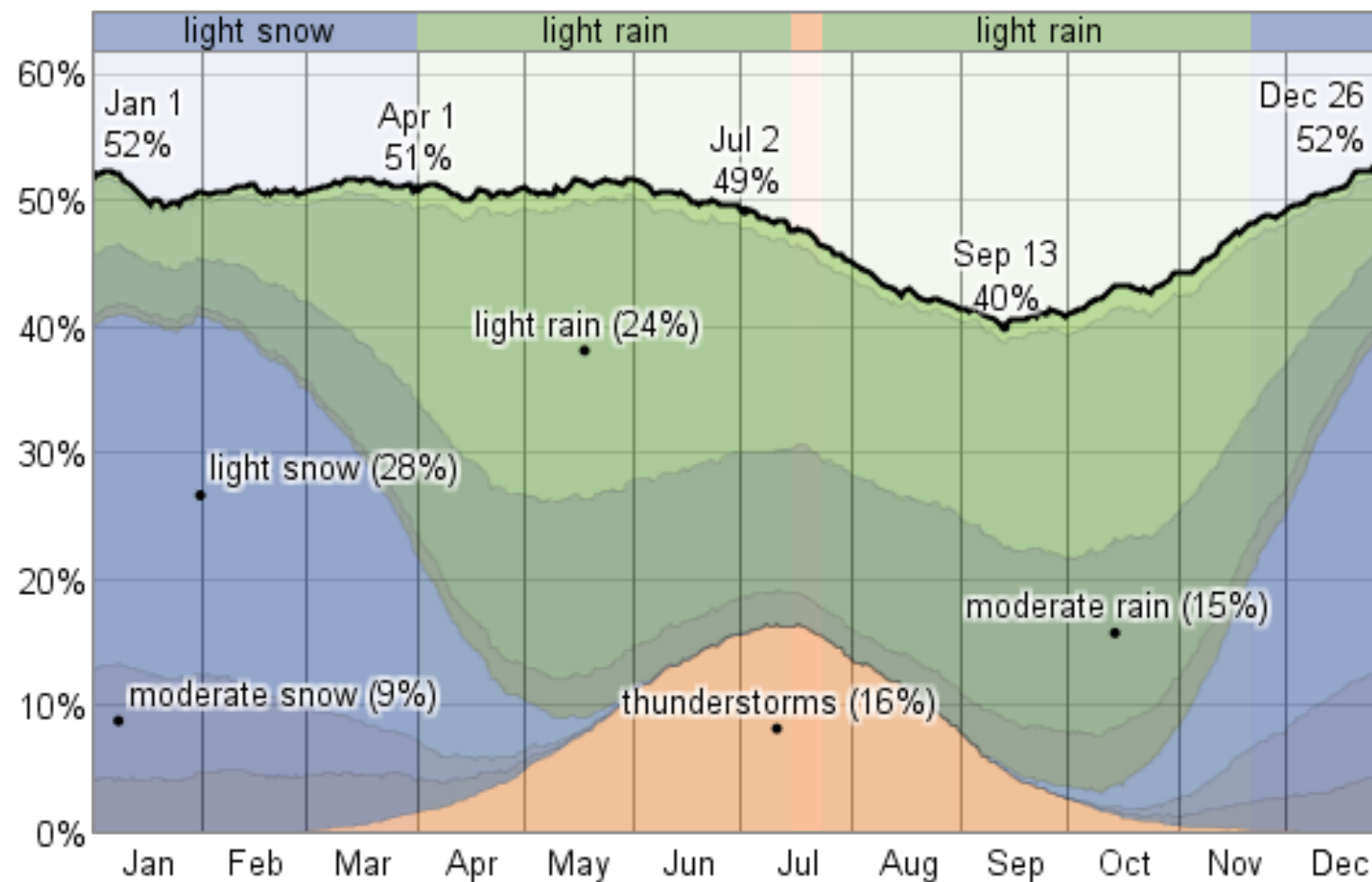




# Albuquerque, NM



# Concord, NH







A TYPE OF ACCIDENT PECULIAR TO NEW MEXICO AND THE SOUTHWEST--C  
UNEXPECTED RUSH OF WATER AT THE CROSSING OF AN ORDINARILY DRY A  
CROSSINGS ARE BEING RAPIDLY REPLACED WITH BRIDGES OR CULV

“A type of accident peculiar to New Mexico and the Southwest — caught [in the] unexpected rush of water at the crossing of an ordinary dry, arroyo, [these] crossings are being rapidly replaced with bridges or culverts”



Brackington Collection, 1936/37?















At least **3 cut-and-fill cycles** in last 3000 years

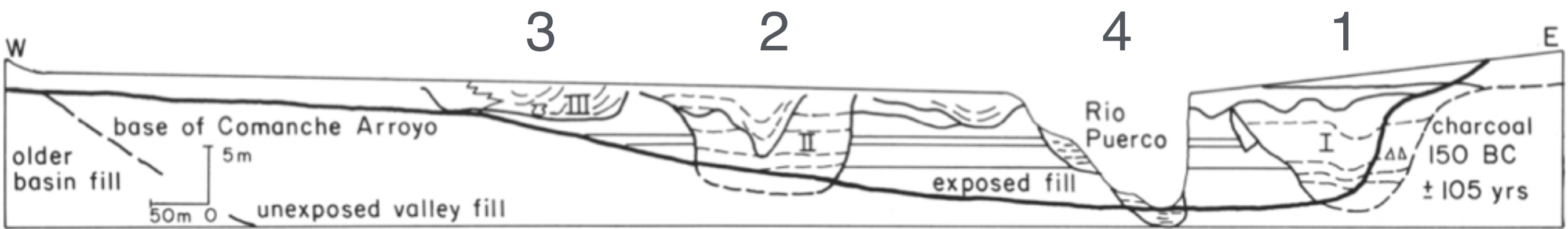


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983



At least **3 cut-and-fill cycles** in last 3000 years

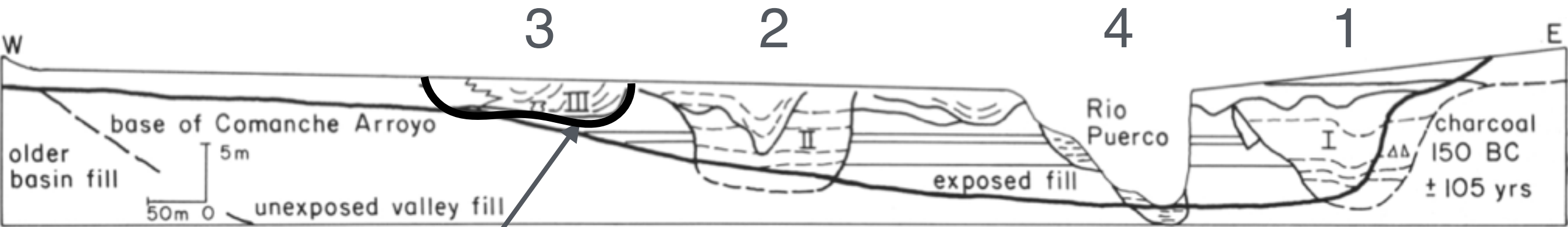
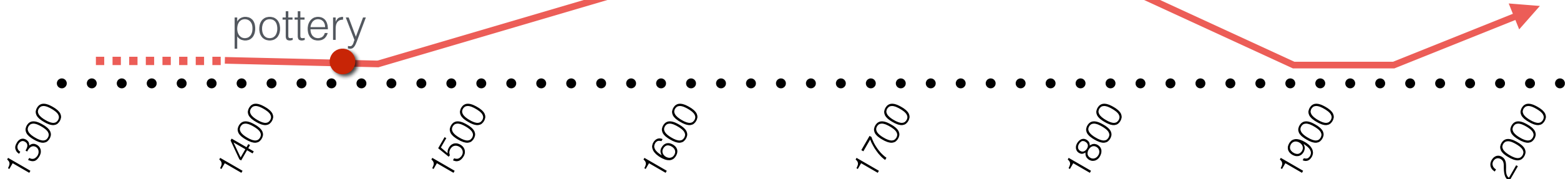


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983

1325 - 1450

ARROYO BOTTOM  
ELEVATION





# How has it changed over time?

Archeological Record:

**Pottery Mound**, prehistoric site

**Adobe pueblo**, 17 kivas with murals

Greatest variety of pottery in NM

Occupied between **1300** and **1500**





Cicadas



Mosquito Man





Parrot Girl



Gathering Mural





At least **3 cut-and-fill cycles** in last 3000 years

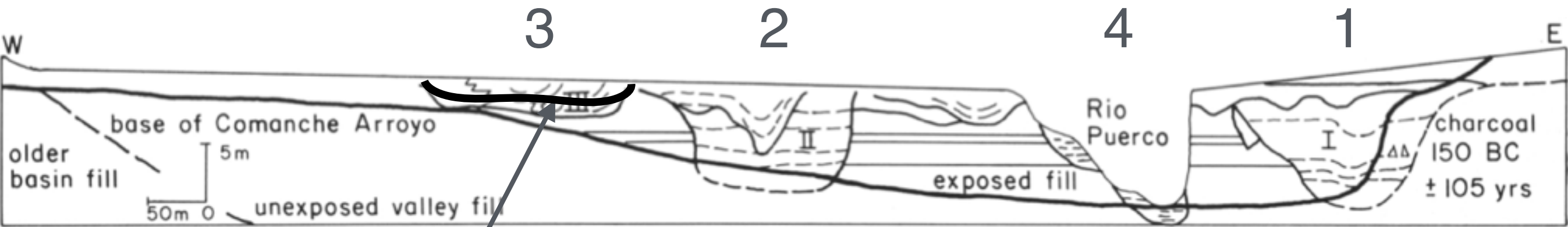
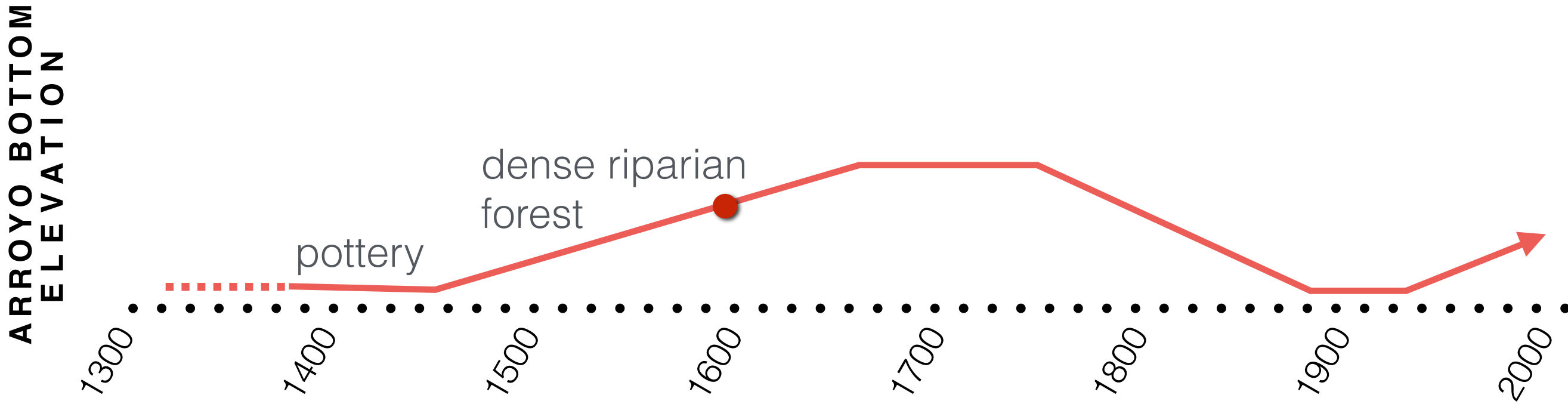


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983

1599





At least **3 cut-and-fill cycles** in last 3000 years

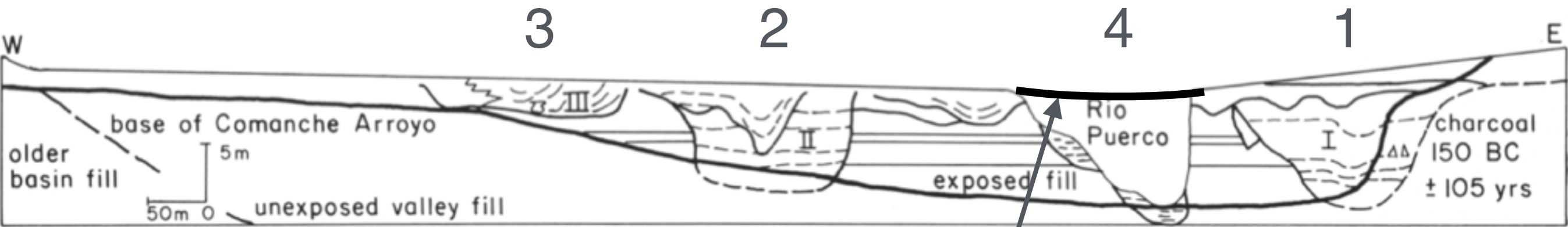
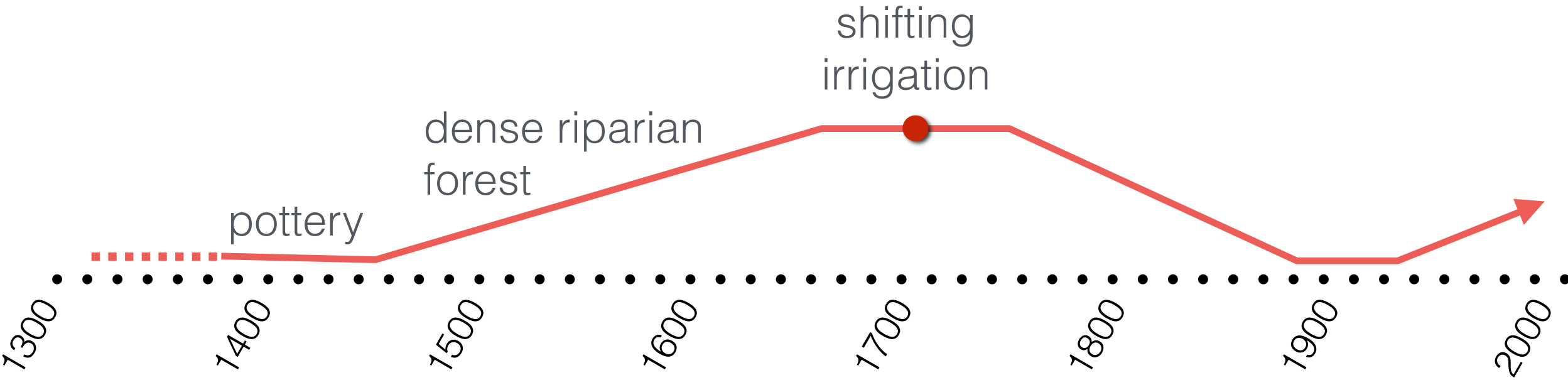


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Love and Young, 1983

~1700

ARROYO BOTTOM  
ELEVATION





1870s

Historical record:

Broad, **lush** valleys during John Wesley Powell expedition

**Irrigated agriculture** on valley floor



PANORAMA IN THE VALLEY OF THE PUERCO.



At least **3 cut-and-fill cycles** in last 3000 years

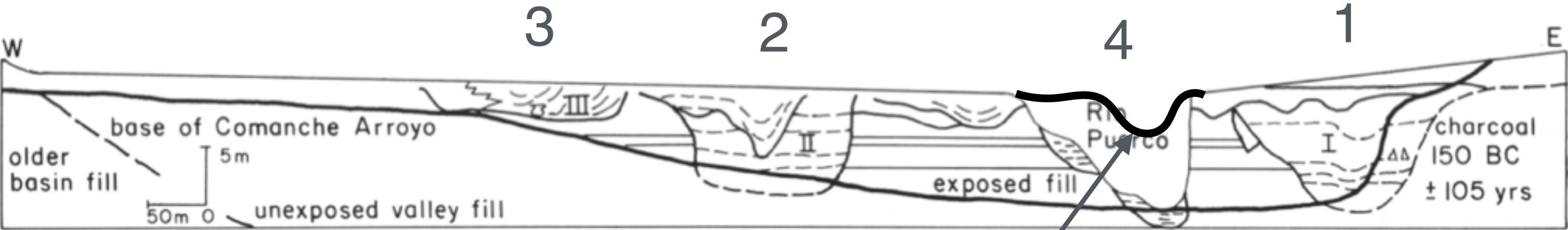
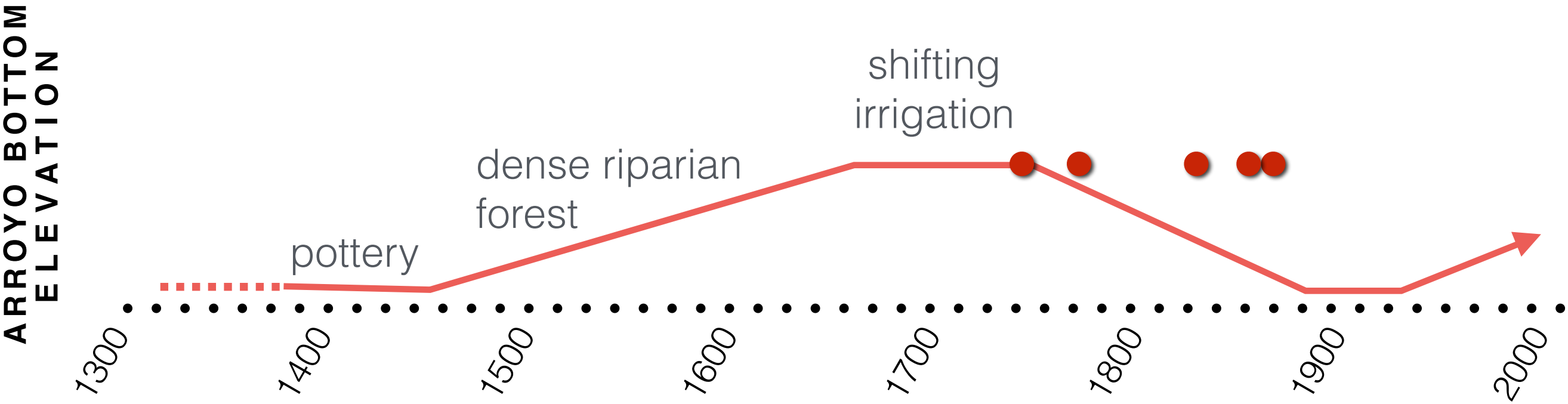


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983

Bernardo: 1760  
South of Hwy 6: 1881  
At Rio San Jose: 1765  
Poblazón: 1846  
Cabezón: 1888





At least **3 cut-and-fill cycles** in last 3000 years

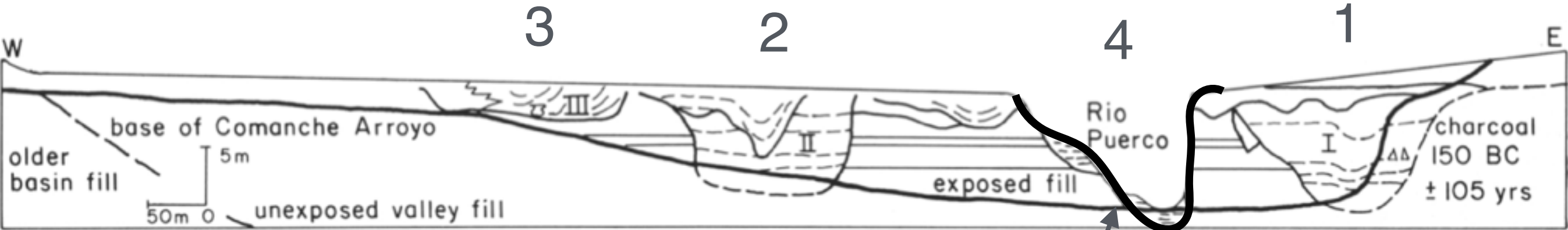
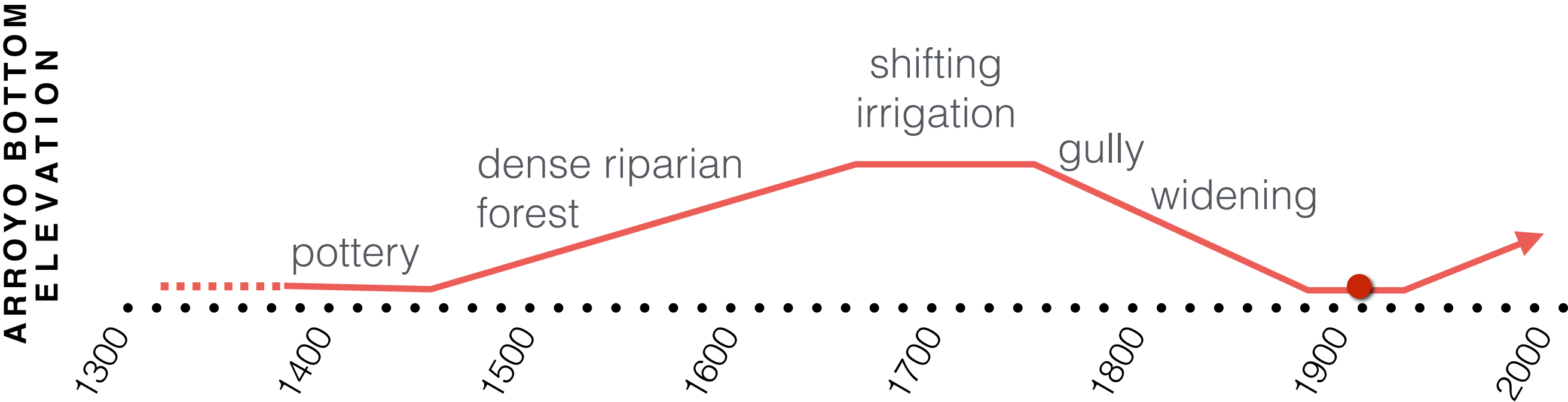


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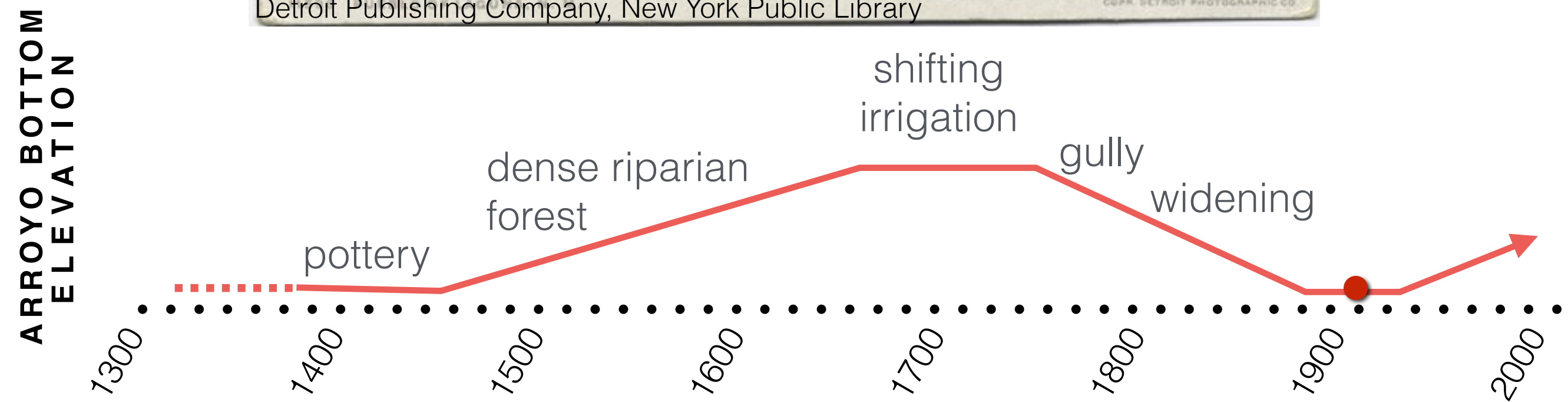
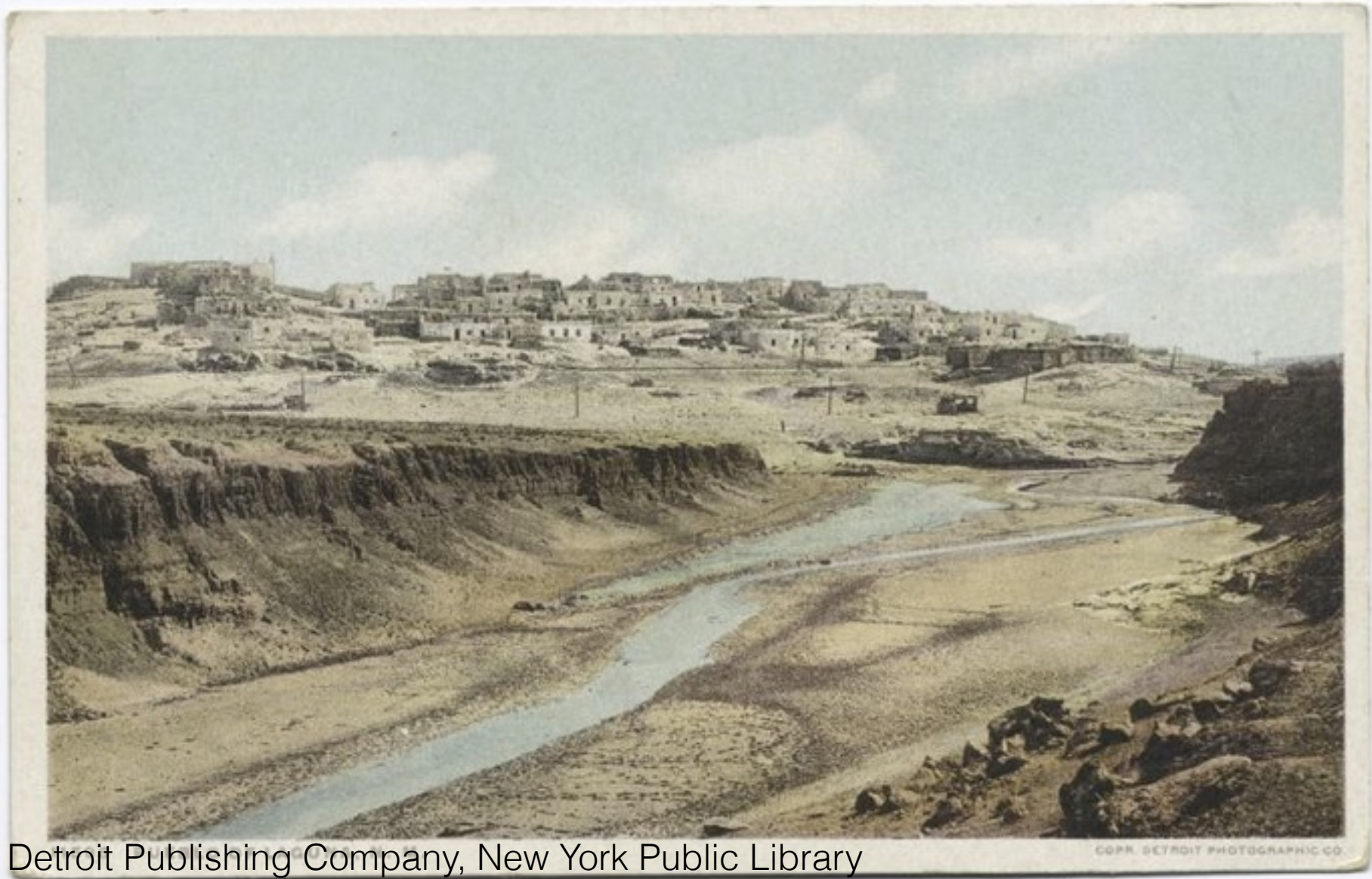
Love and Young, 1983

1880s-1930s





At least **3 cut-and-fill cycles** in last 3000 years





At least **3 cut-and-fill cycles** in last 3000 years

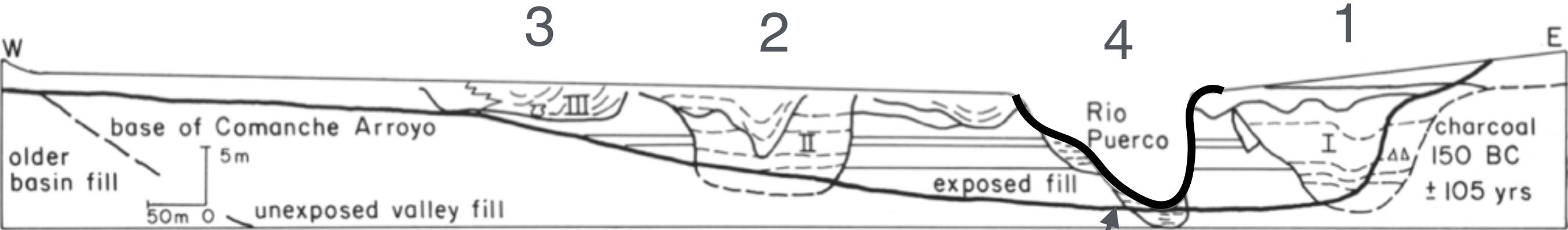
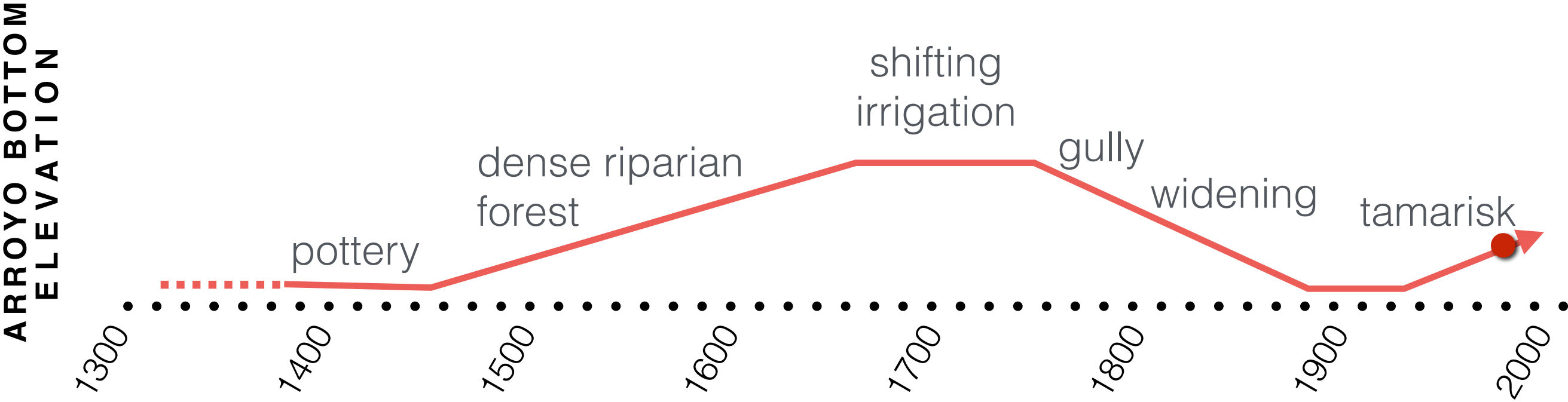


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983

1930s-present





**Deepest in 1930s**

Now filling

February 25th, 1936



April 1st, 2010



April 26th, 2014





Evolving channel **shape**  
**Vegetation** cover

August 16th, 1936

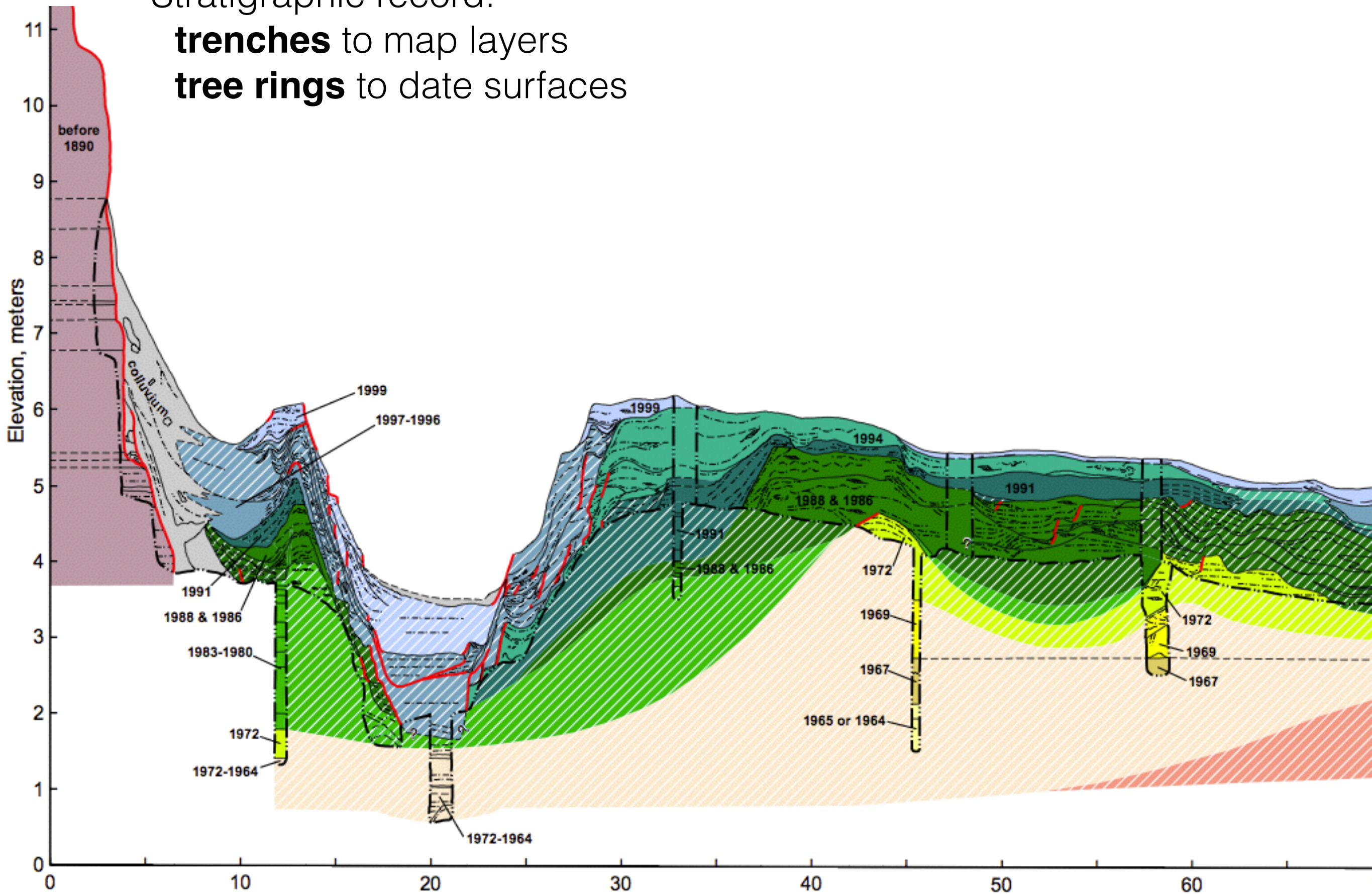


April 27, 2014



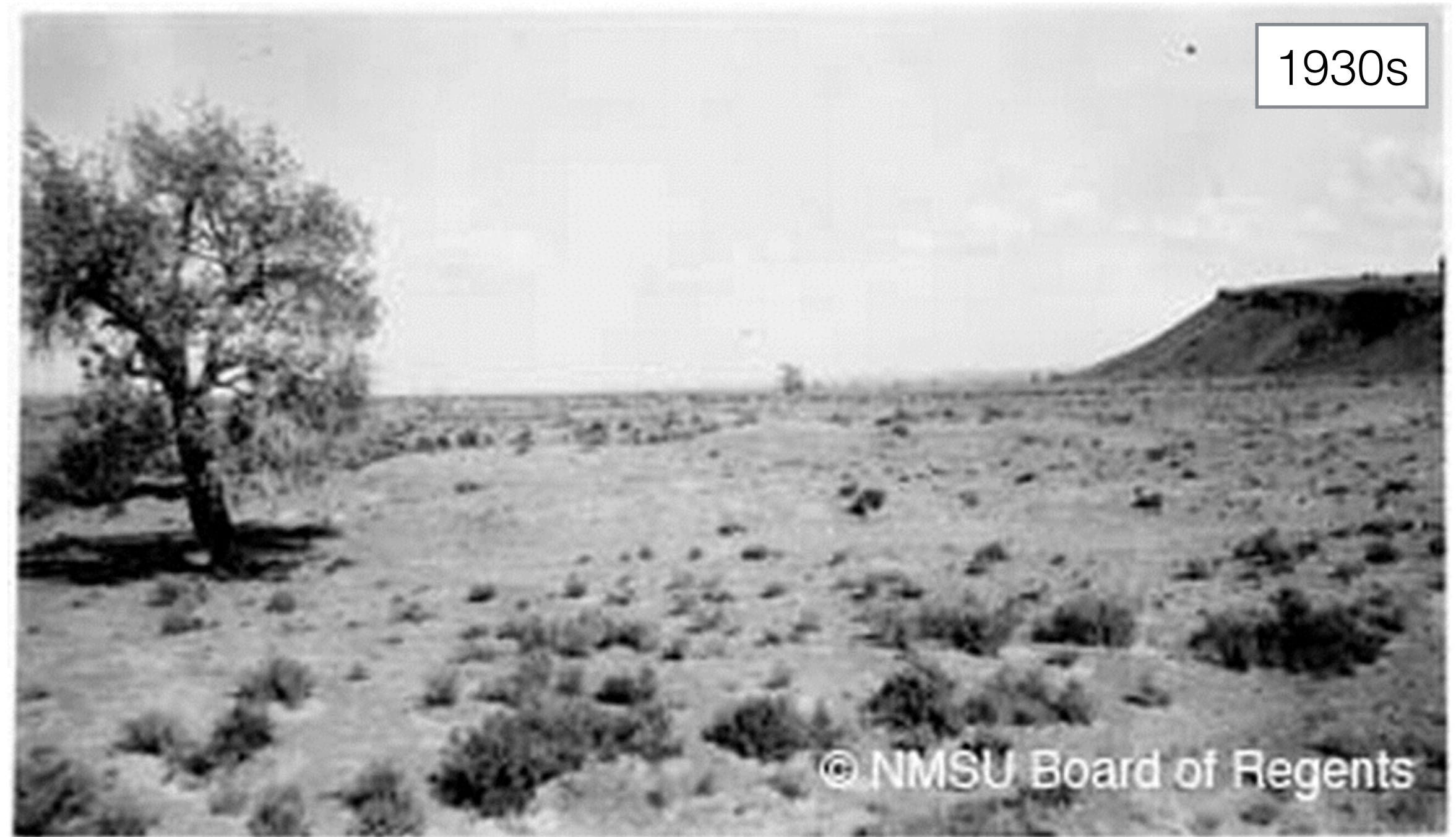


Stratigraphic record:  
**trenches** to map layers  
**tree rings** to date surfaces





# How has the vegetation changed?



Native **sandbar willow** on banks, **cottonwoods** on floodplains  
Much denser invasive **tamarisk** on levees



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# Tamarisk (saltcedar)

Originally from **Africa and Eurasia**  
In America in the **1800s**, maybe earlier  
Ornamental plant



<http://kurowski.pl/>



<http://deelish.ie/>



In the desert, planted for  
windbreaks  
hedges to divide land  
shade for cattle

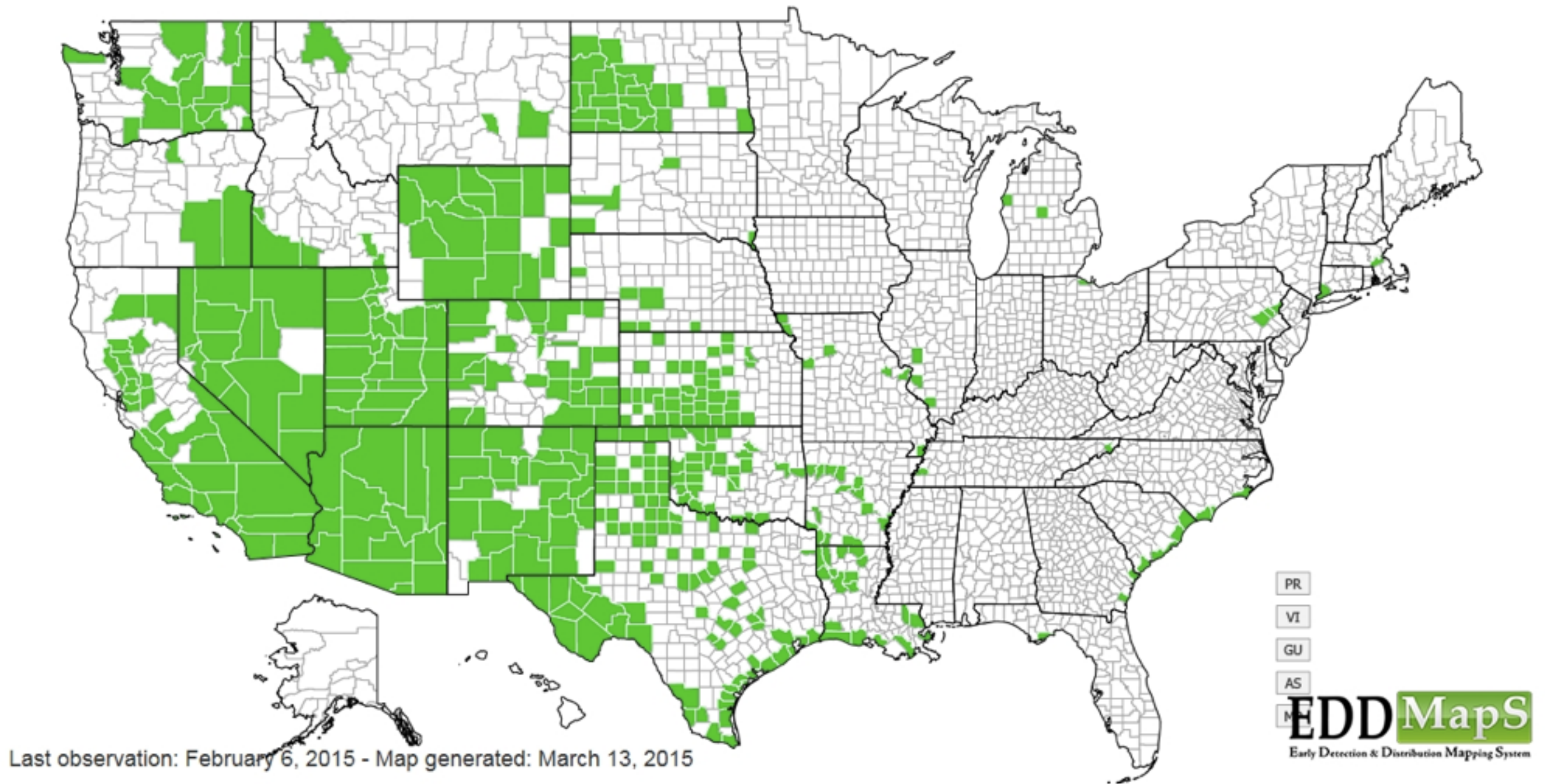
Spread for erosion control:  
1920s and 30s  
increases **drag**  
**traps** sediment

**“Escaped” plant**





*Tamarix spp.*





Evolving channel **shape**  
**Vegetation** cover



July, 1961



October 5th, 1961



April 27, 2014



Up to 1930s, high **sediment load** to Rio Grande  
Now, channel **narrowing**, stability





Attempts at tamarisk removal:  
Channel **widening**, wall **retreat**





# Why? How?

Fully filled / pre-incision

Incision

Widening /  
floodplain development

Filling

Present day

