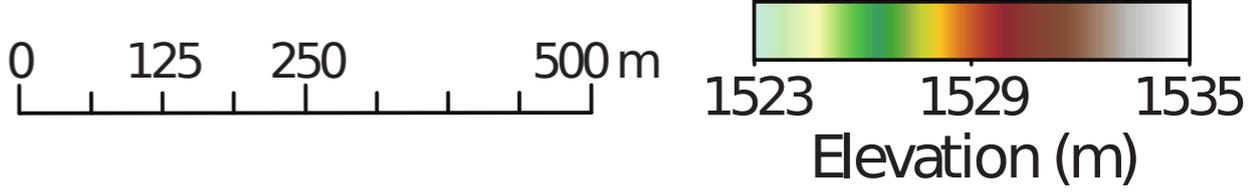
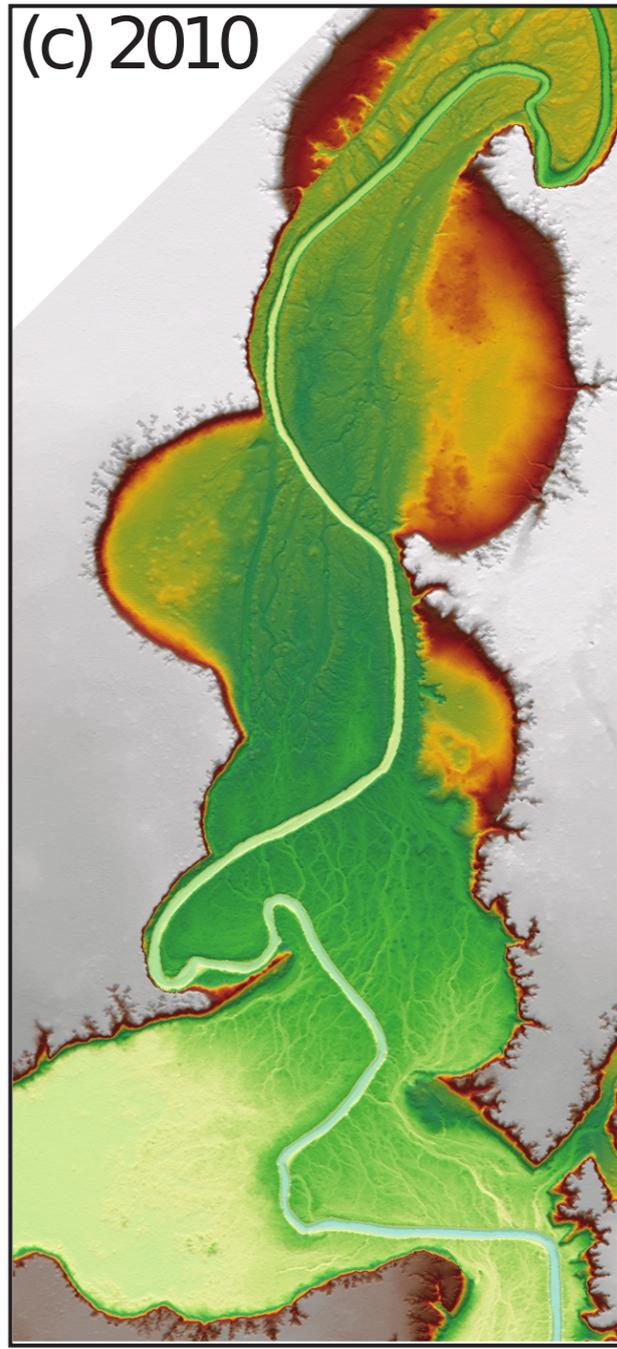
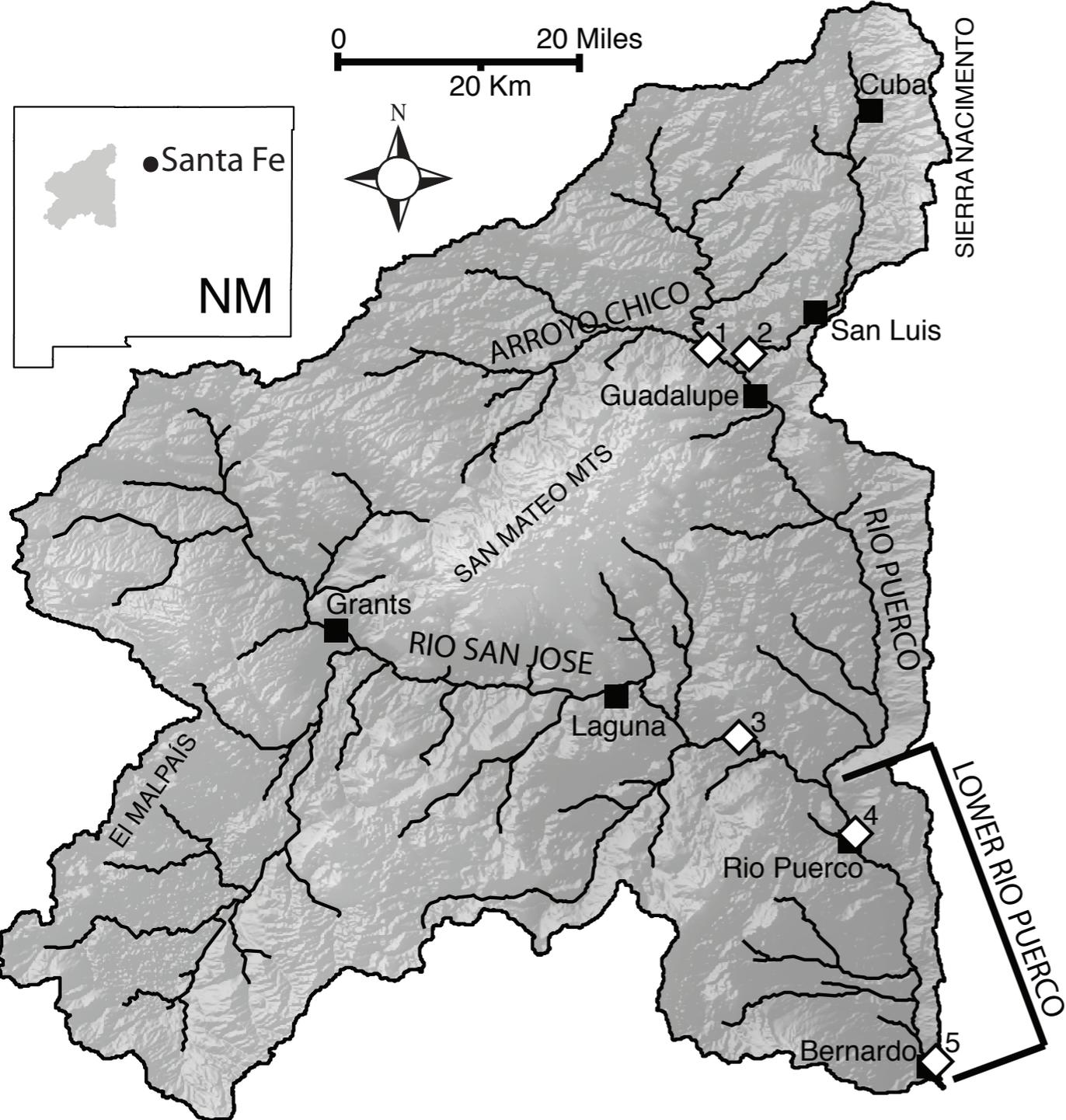


The Rio Puerco, New Mexico: a story of changing river morphology and invasive species



Rio Puerco, New Mexico:



Modern geometry:

vertical walls

flat, vegetated arroyo bottom

narrow channel



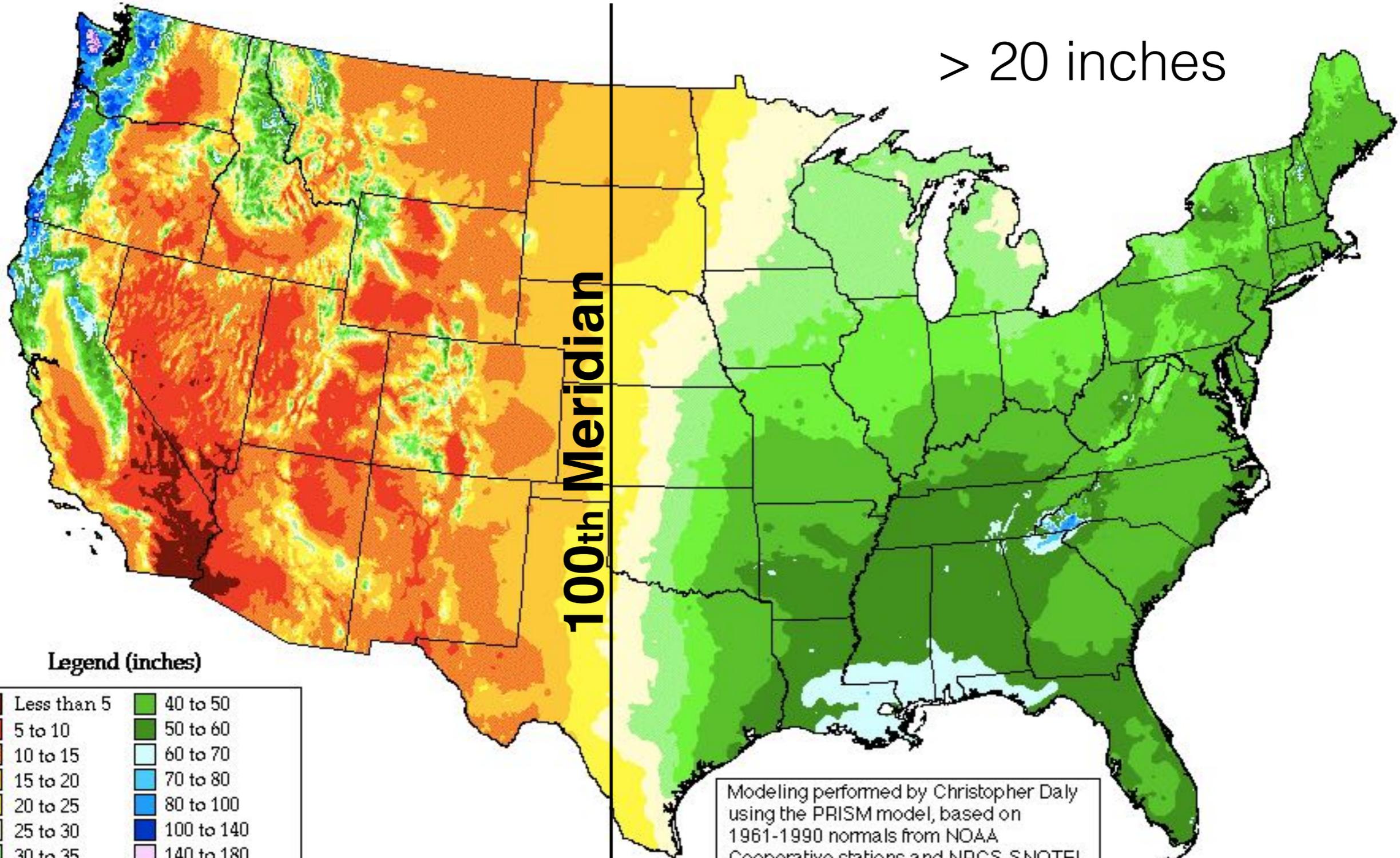
Regional climate

< 20 inches

Annual Average Precipitation

United States of America

> 20 inches



Legend (inches)

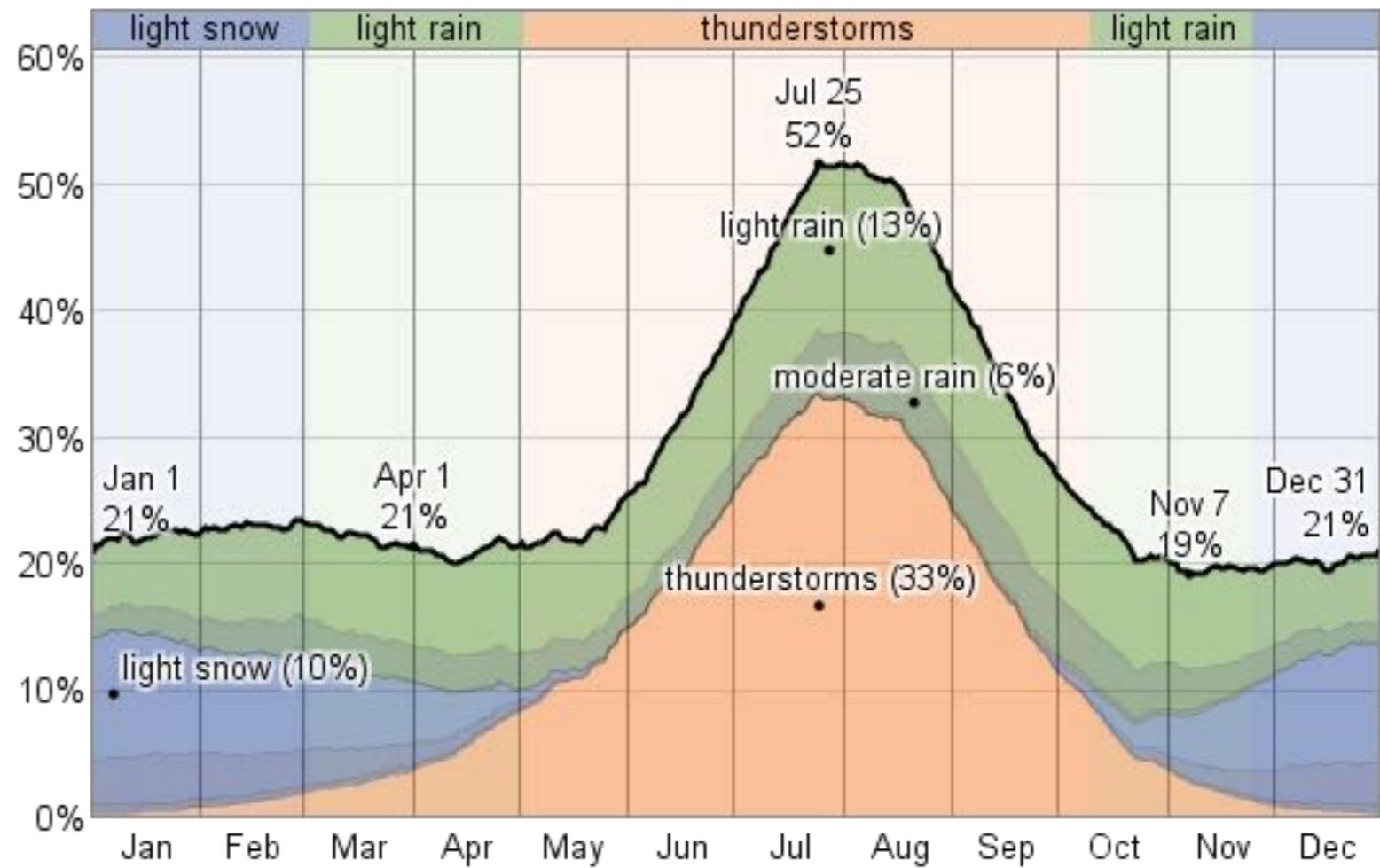
Less than 5	40 to 50
5 to 10	50 to 60
10 to 15	60 to 70
15 to 20	70 to 80
20 to 25	80 to 100
25 to 30	100 to 140
30 to 35	140 to 180
35 to 40	More than 180

Period: 1961-1990

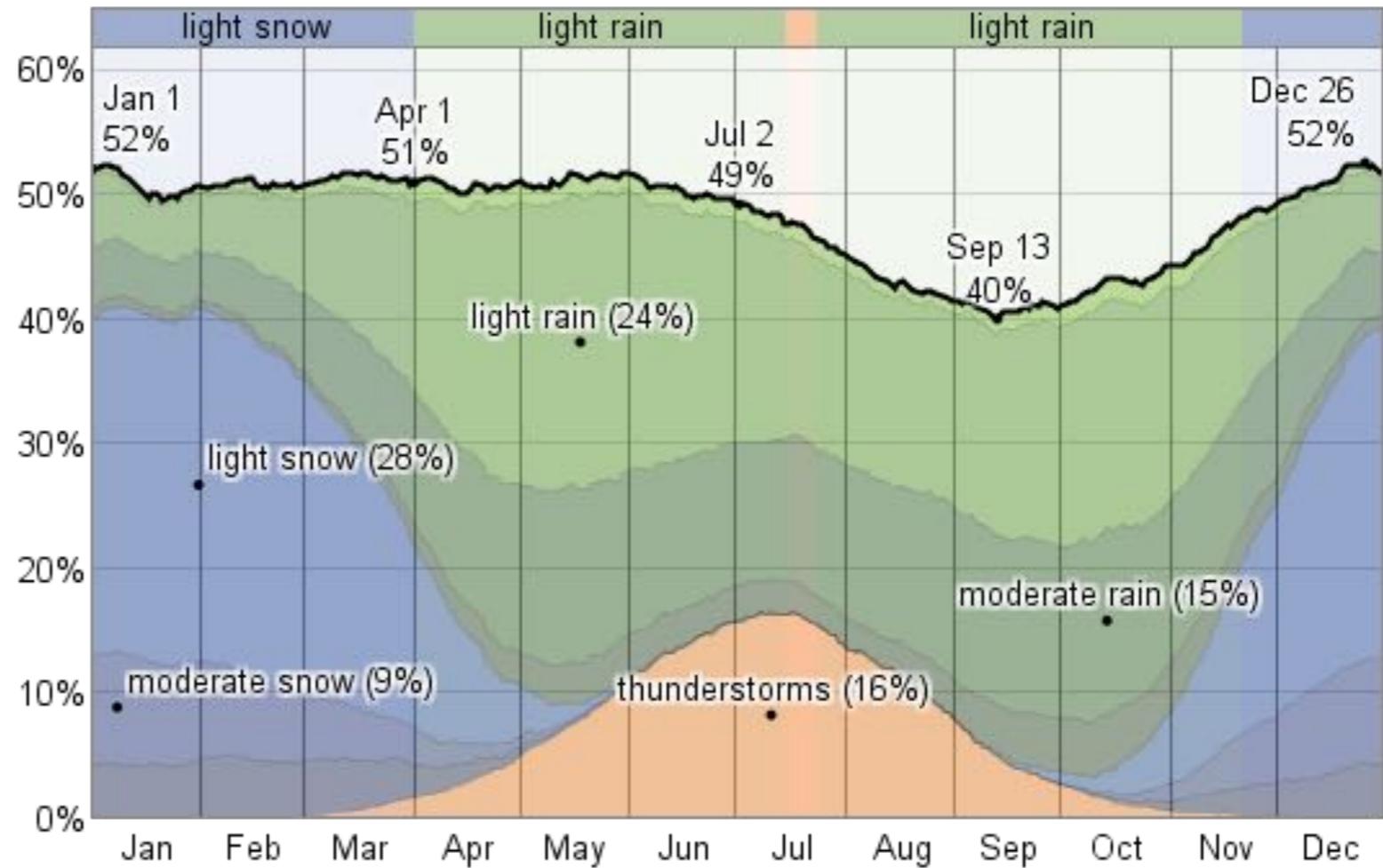
Modeling performed by Christopher Daly using the PRISM model, based on 1961-1990 normals from NOAA Cooperative stations and NRCS SNOTEL sites. Sponsored by USDA-NRCS Water and Climate Center, Portland, Oregon.

Oregon Climate Service
George Taylor, State Climatologist
(541) 737-5705

Albuquerque, NM



Concord, NH





“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”

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



Brackington Collection, 1936/37?







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

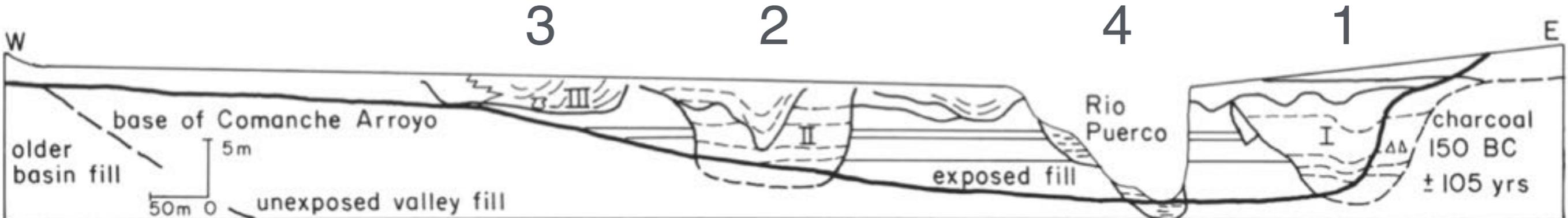


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983

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

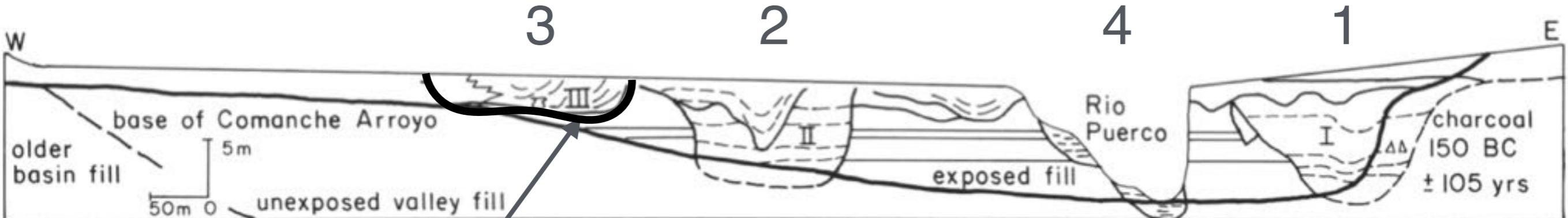
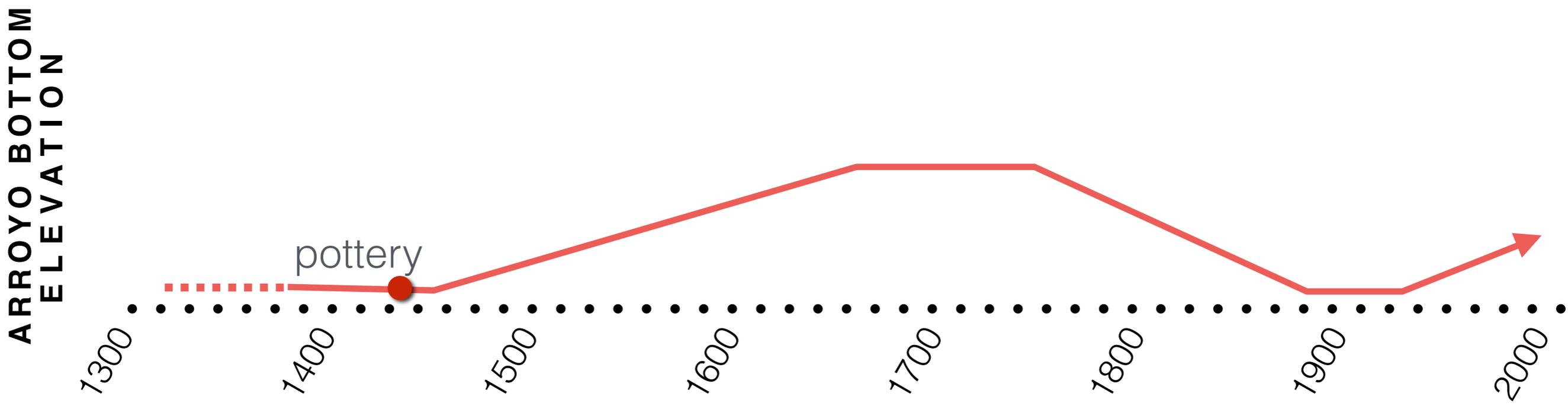


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983

1325 - 1450



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



www.nmia.com

Gathering Mural



www.paultkay.info

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

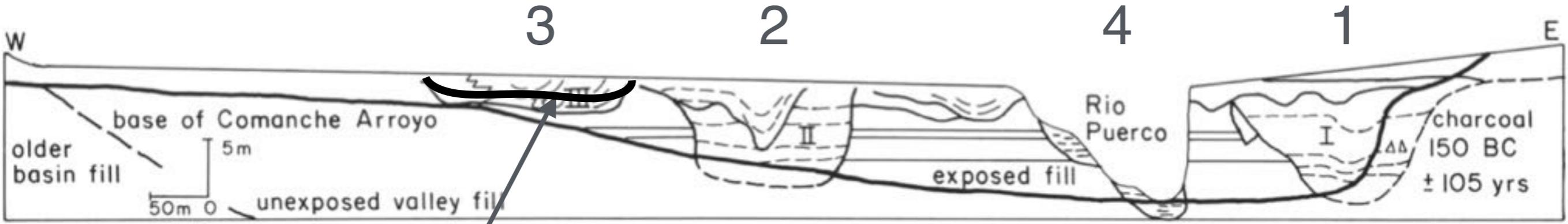
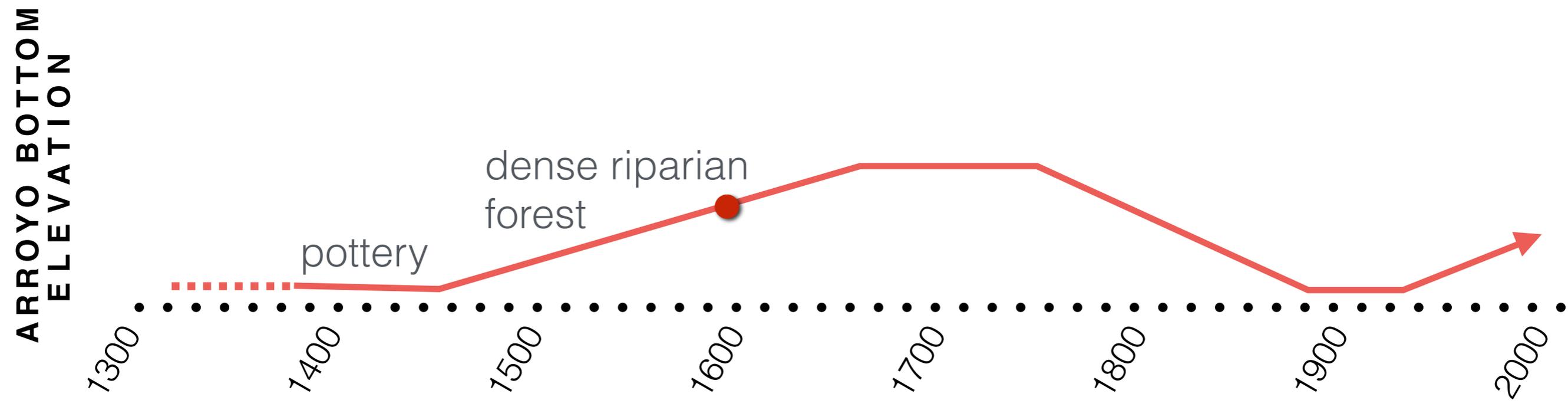


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text.

Love and Young, 1983

1599



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

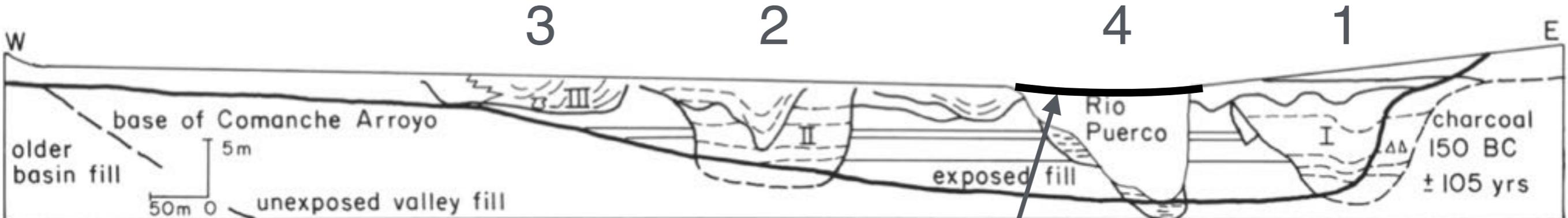
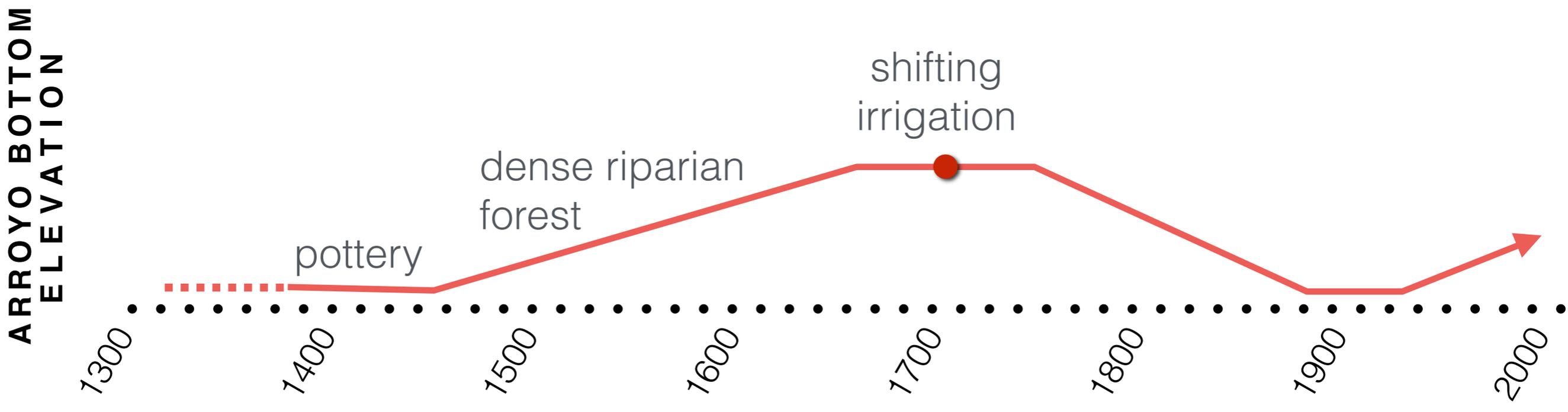


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text. Love and Young, 1983

~1700

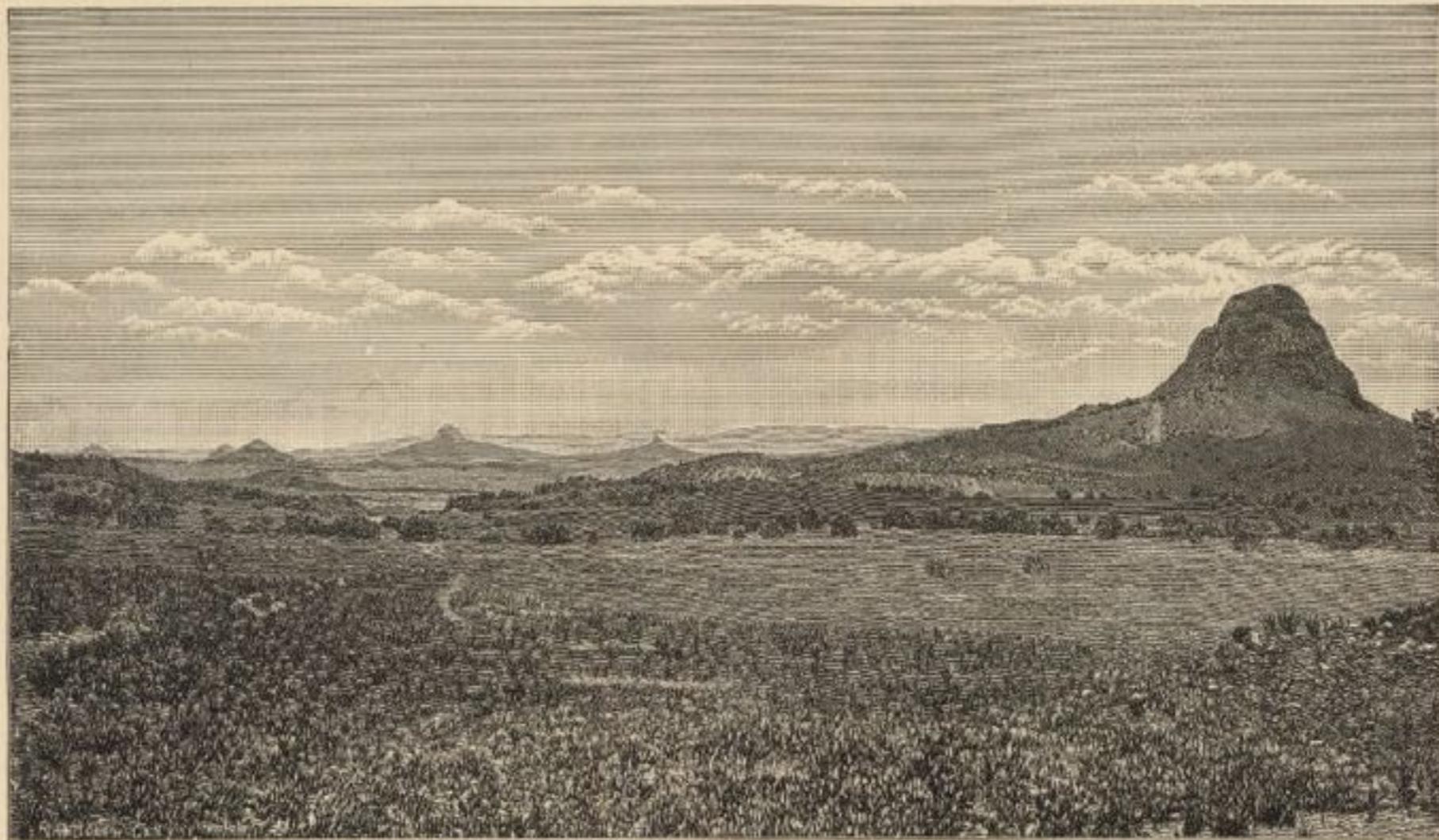


1870s

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

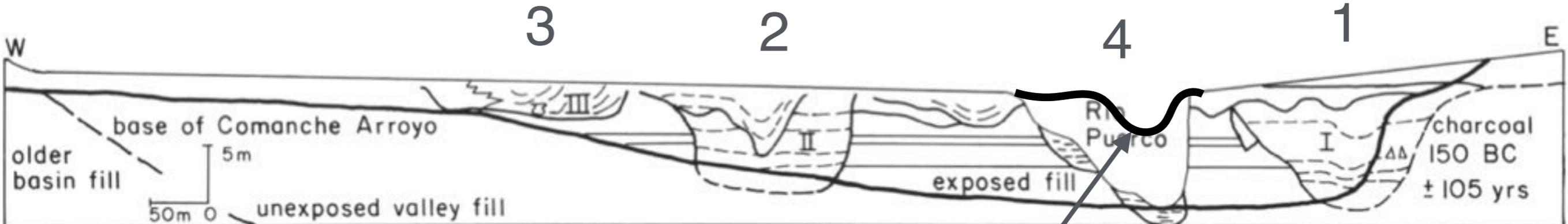
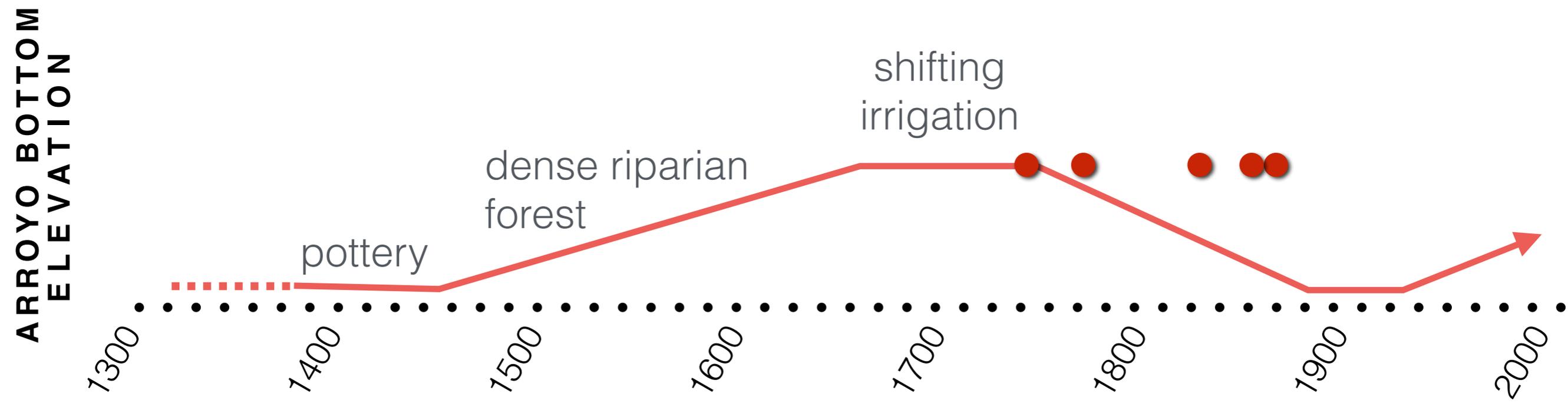


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text. Love and Young, 1983

- 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

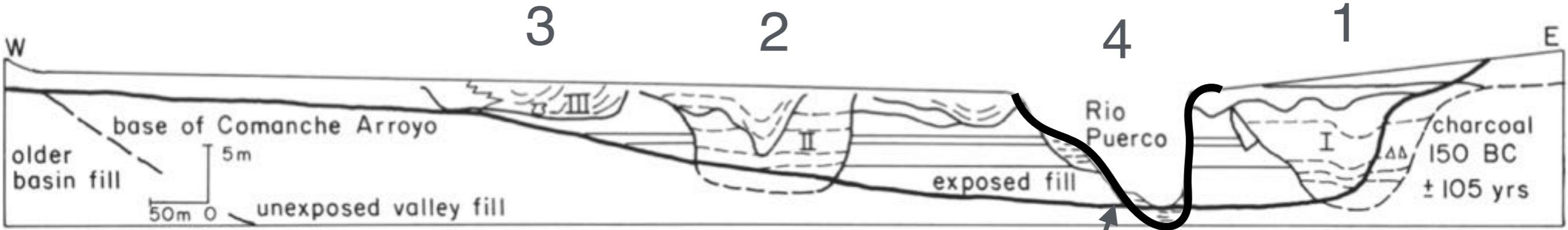
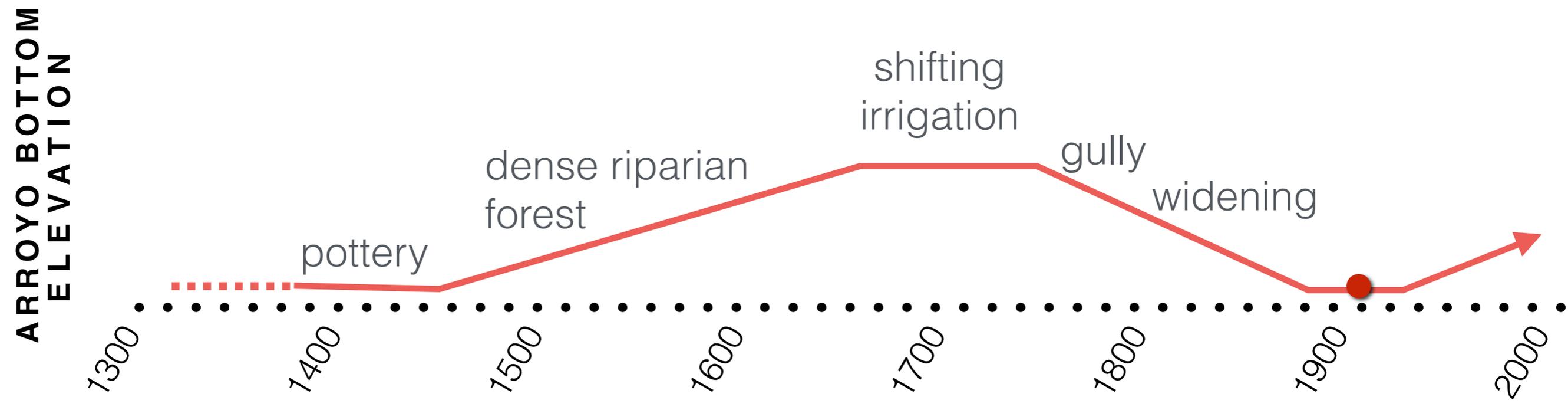


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text. Love and Young, 1983

1880s-1930s

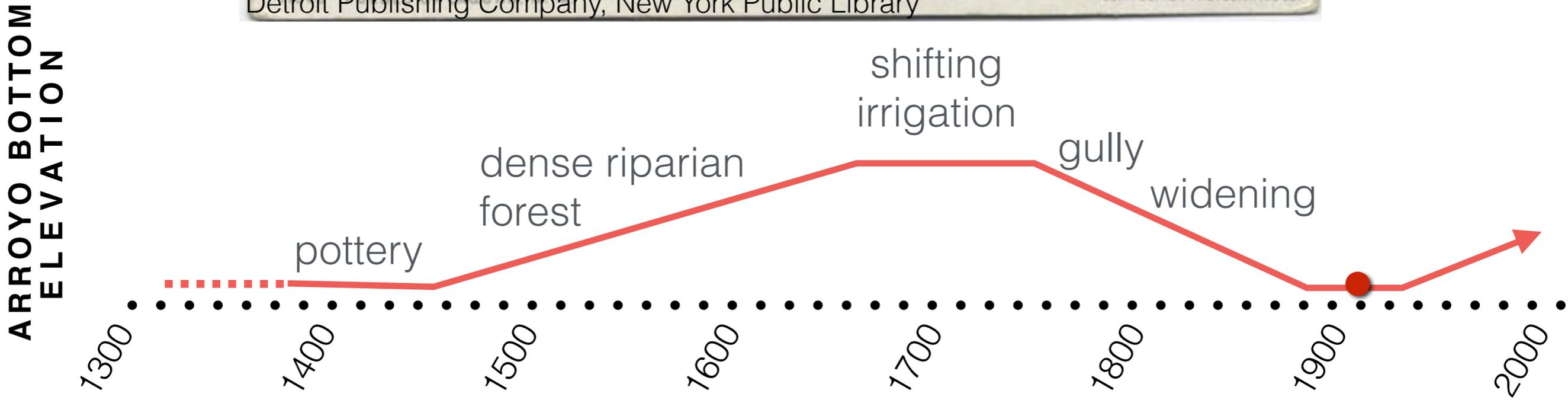


At least **3 cut-and-fill cycles** in last 3000 years



1907-1908
Pueblo de
Laguna

Detroit Publishing Company, New York Public Library



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

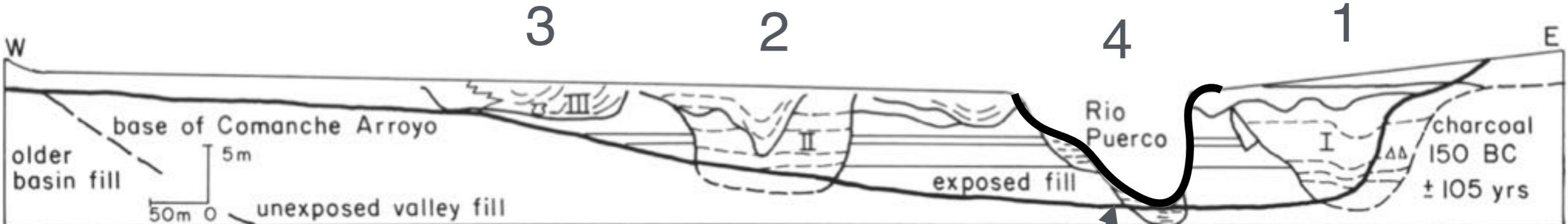
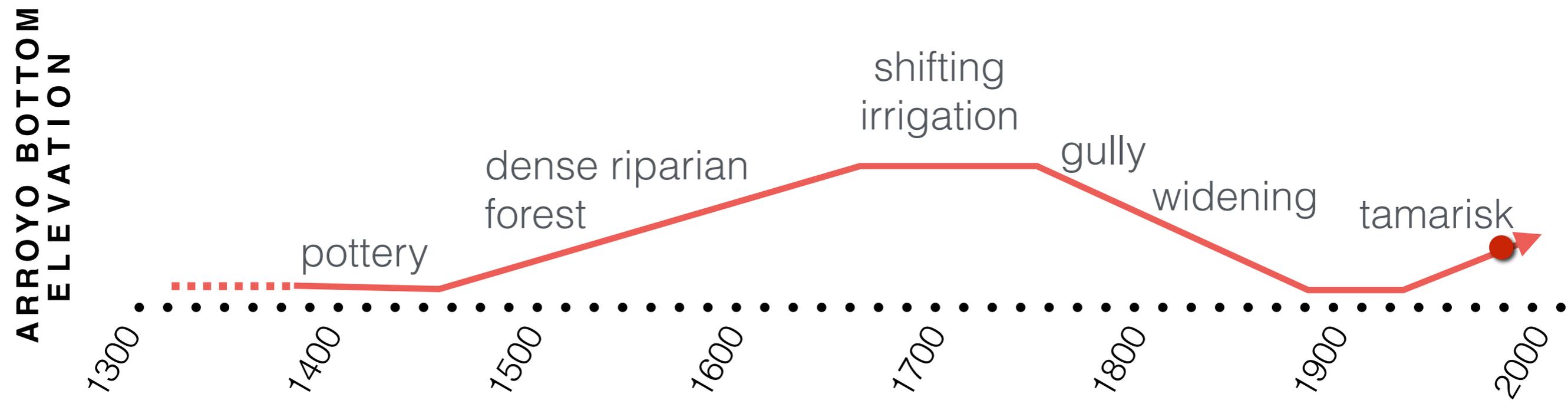


Figure 5. Schematic cross section of Rio Puerco valley fill near the mouth of Comanche Arroyo. Numbered channels are discussed in text. Love and Young, 1983

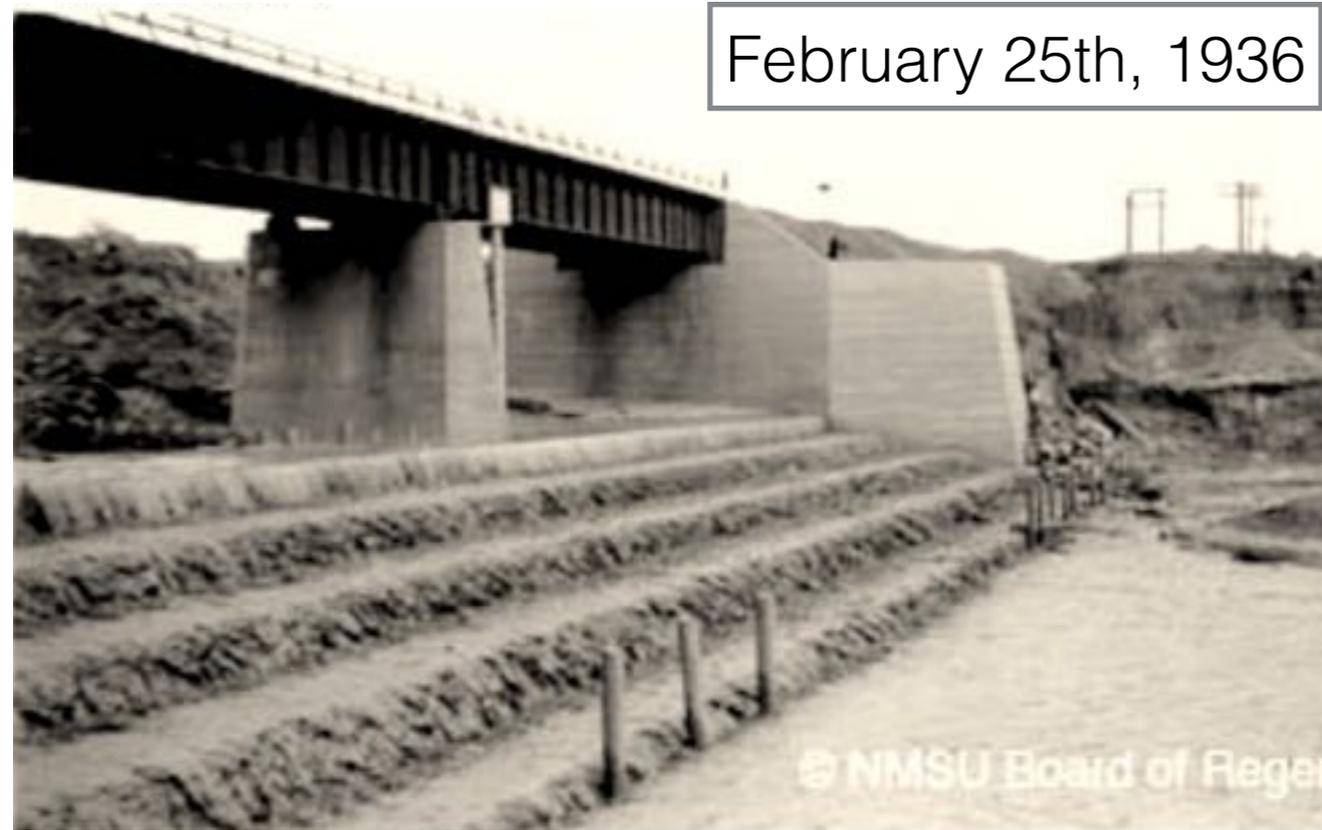
1930s-present



Deepest in 1930s

Now filling

February 25th, 1936



April 1st, 2010



April 26th, 2014



Evolving channel **shape**
Vegetation cover

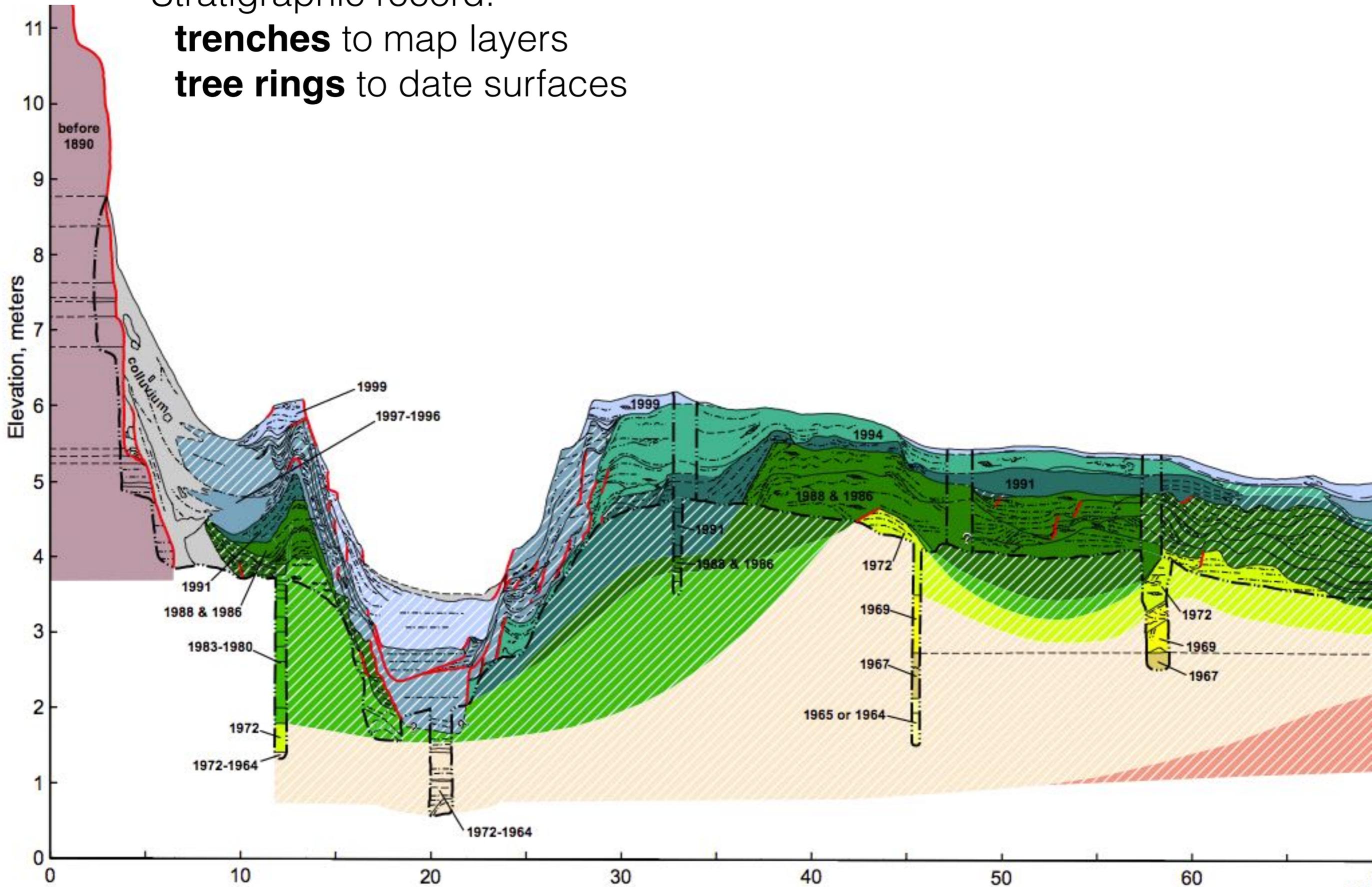
August 16th, 1936



April 27, 2014



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



How has the vegetation changed?

1930s



© NMSU Board of Regents

Native **sandbar willow** on banks, **cottonwoods** on floodplains

Much denser invasive **tamarisk** on levees

How has the vegetation changed?



Native **sandbar willow** on banks, **cottonwoods** on floodplains

Much denser invasive **tamarisk** on levees

How has the vegetation changed?



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

Tamarisk (saltcedar)

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



<http://deelish.ie/>

<http://kurowski.pl/>

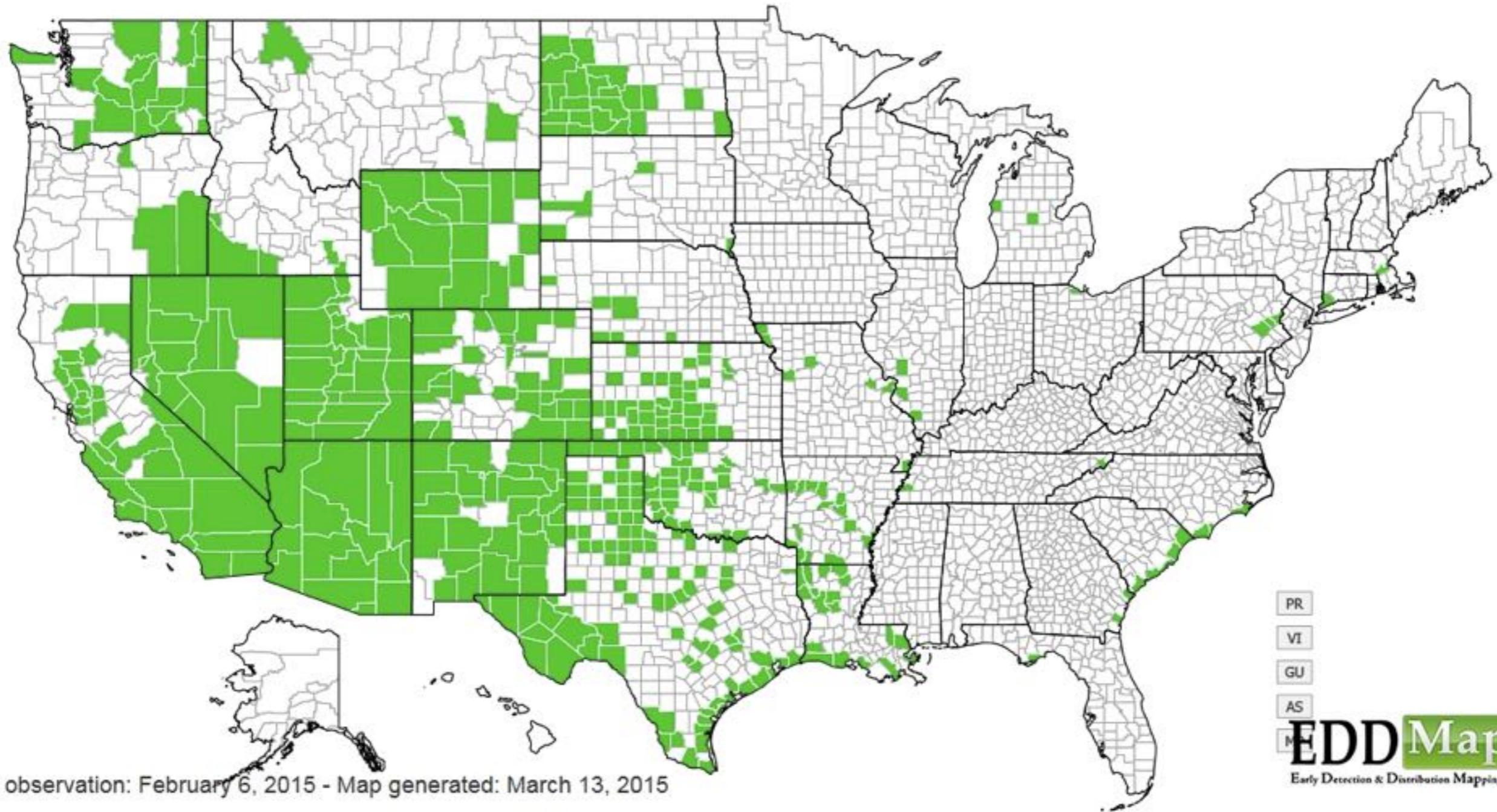
In the desert, planted for
windbreaks
hedges to divide land
shade for cattle

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

“Escaped” plant



Tamarix spp.



Last observation: February 6, 2015 - Map generated: March 13, 2015

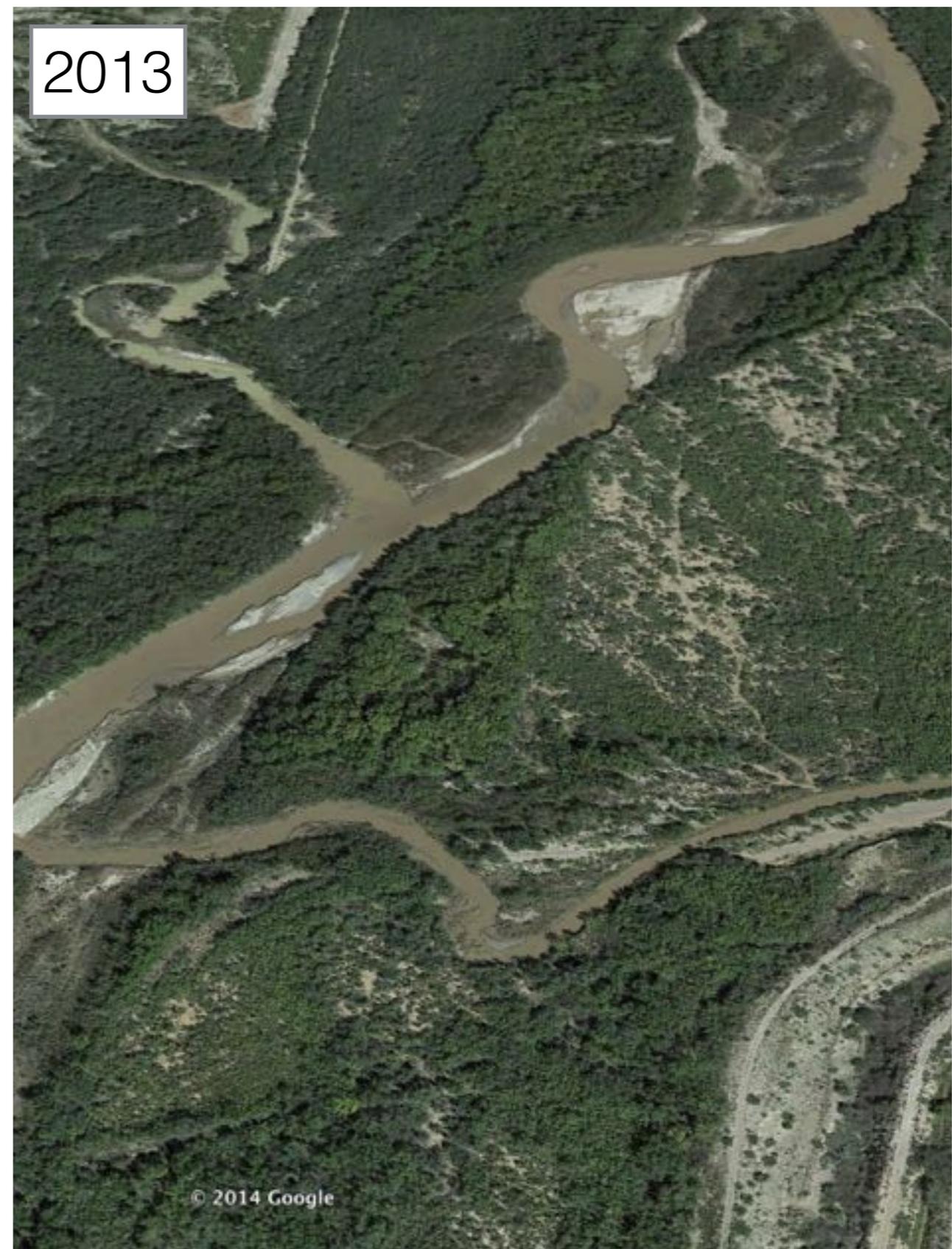
PR
VI
GU
AS
HI
EDD MapS
Early Detection & Distribution Mapping System

<http://www.invasive.org/>

Evolving channel **shape**
Vegetation cover



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

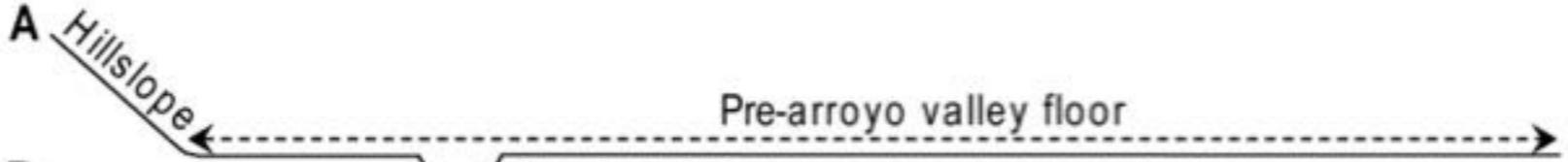


Attempts at tamarisk removal:
Channel **widening**, wall **retreat**

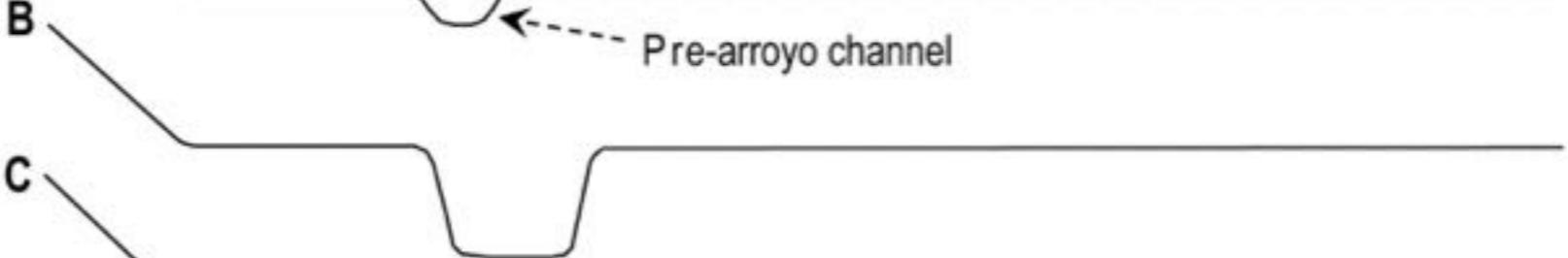


Why? How?

Fully filled / pre-incision



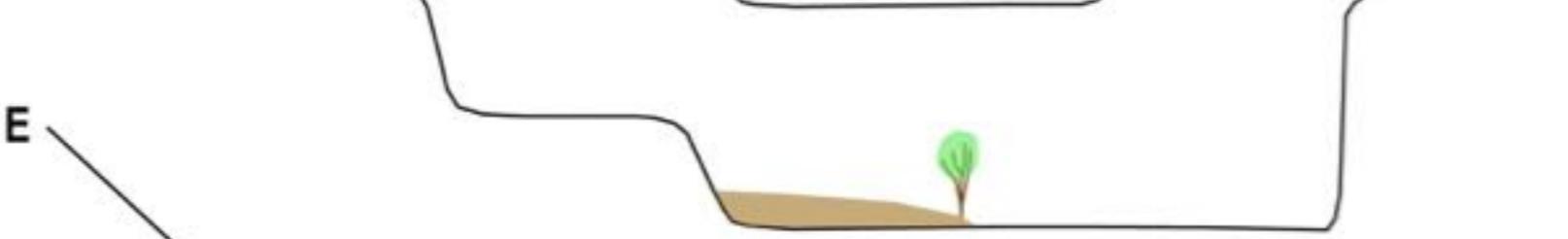
Incision



Widening / floodplain development



Filling



Present day

