Gila River Navigability

Presentation to ANSAC

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Definition of Navigability

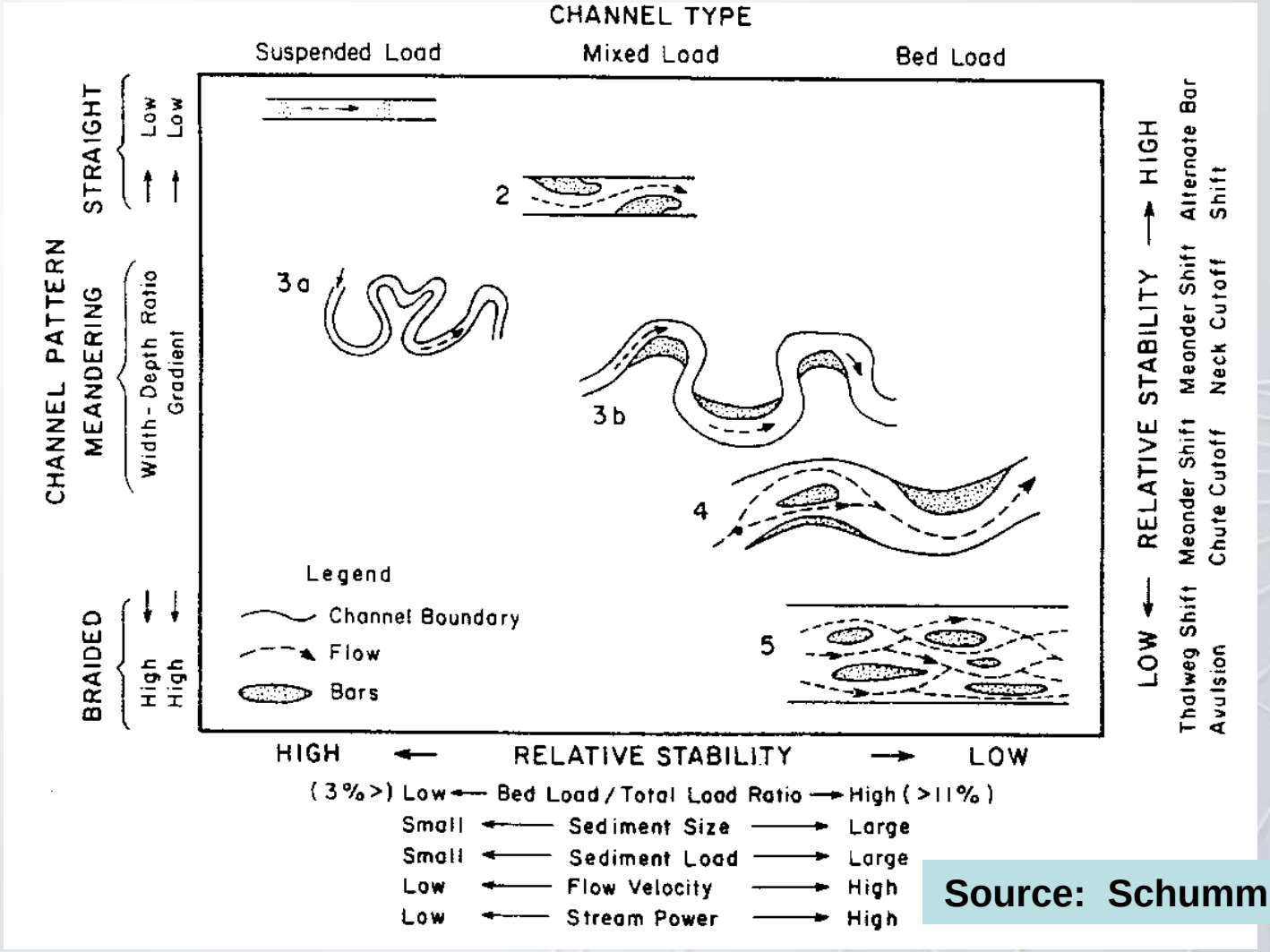
- A.R.S. § 37-1101(5)

"Navigable" or "navigable watercourse" means a watercourse that was in existence on February 14, 1912, and at that time was used or was susceptible to being used, in it ordinary and natural condition, as a highway for commerce, over which trade and travel were or could have been conducted in customary modes of trade and travel on water.

Definition of Navigability

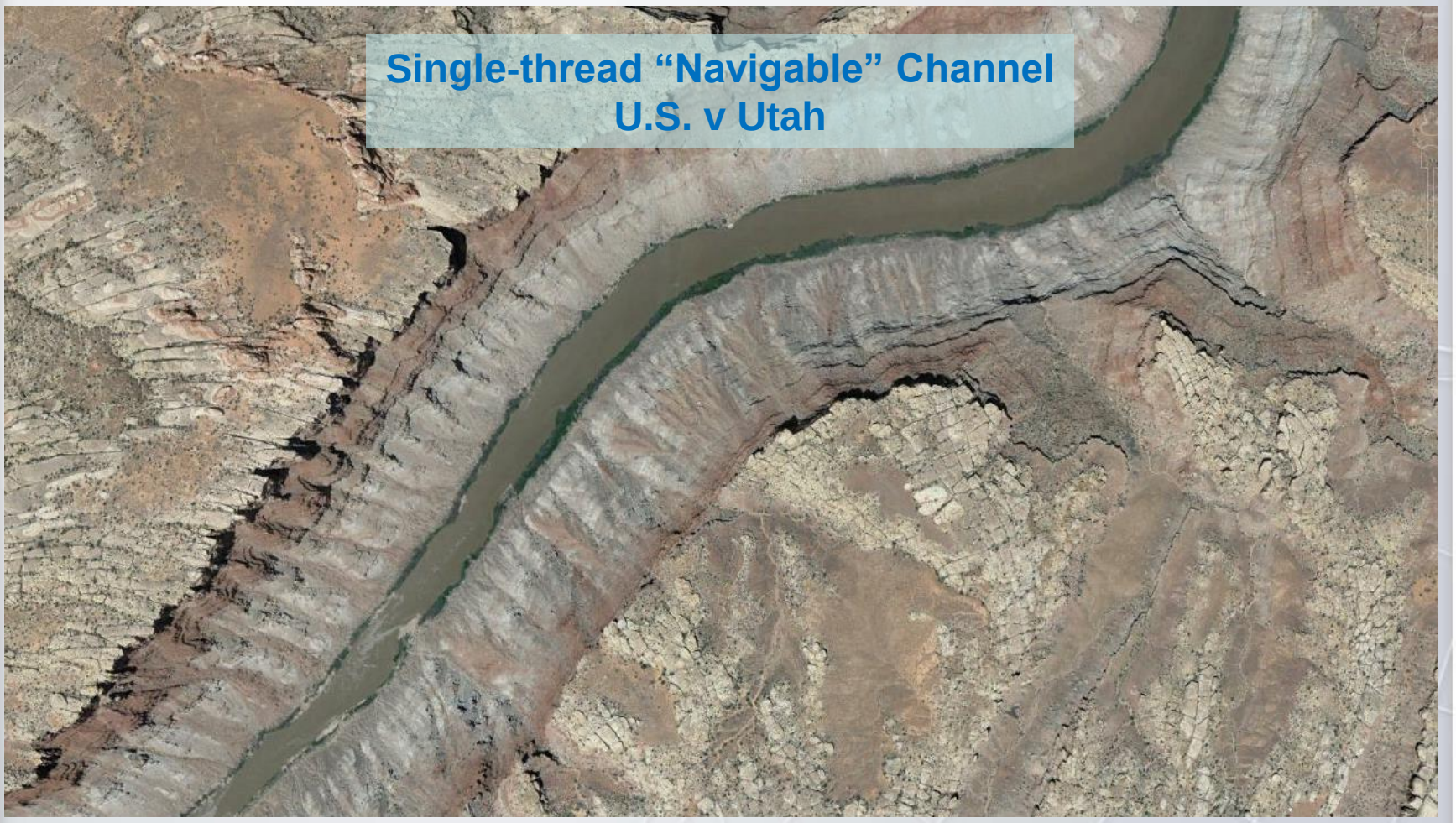
- PPL Montana
  - …ev*idence* [of present-day, primarily recreational use] *must be confined to that which shows the river could sustain the kinds of commercial use that, as a realistic matter, might have occurred at the time of statehood.*

Channel Classification Relevant to Gila River Navigability

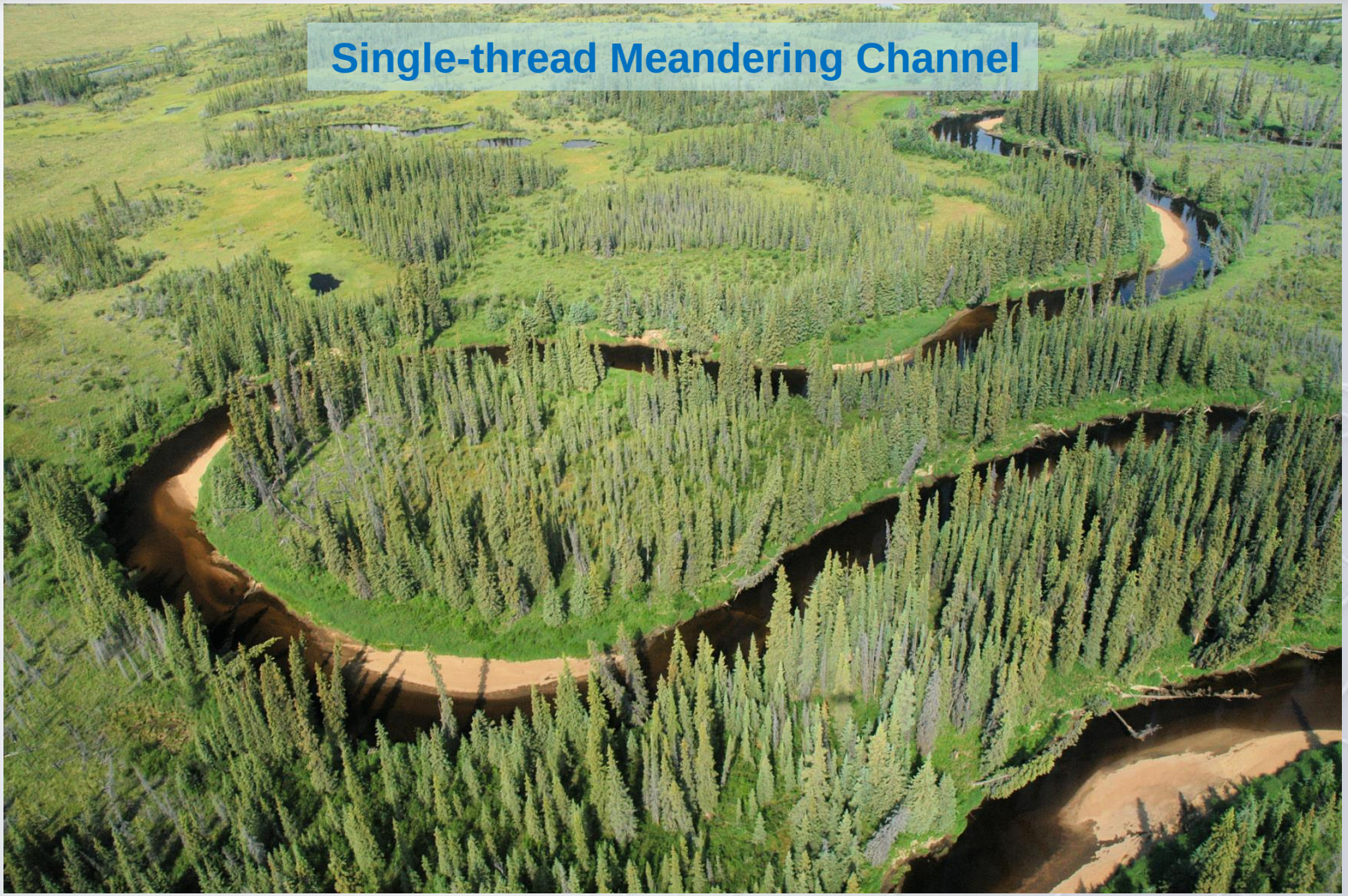


Source: Schumm (1981)

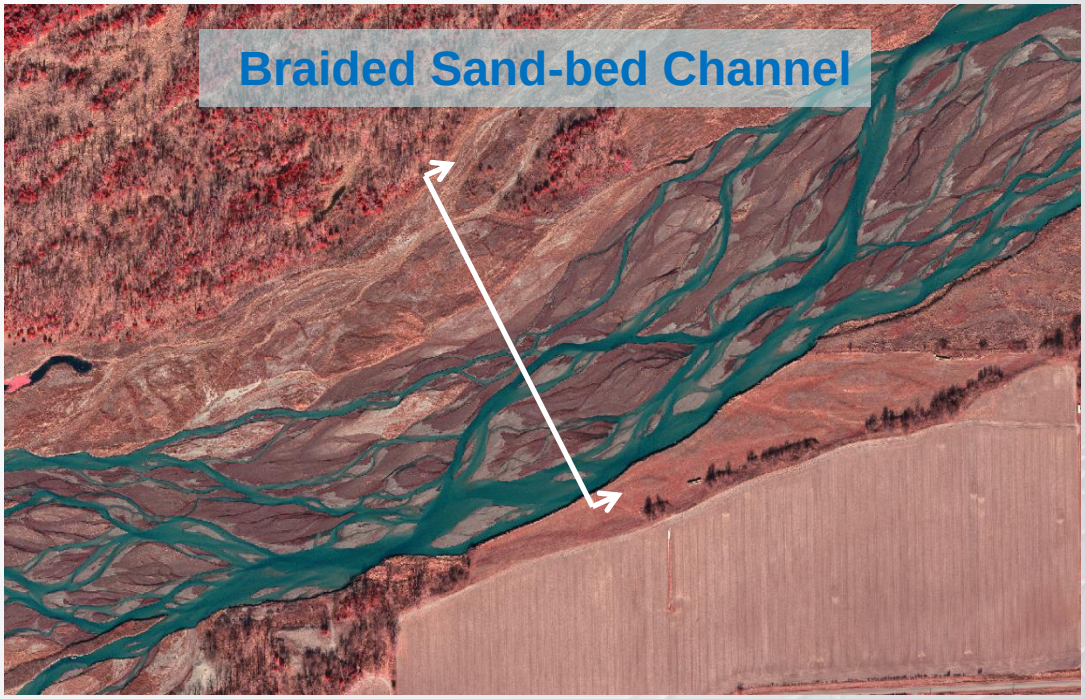
Examples of Channel Types

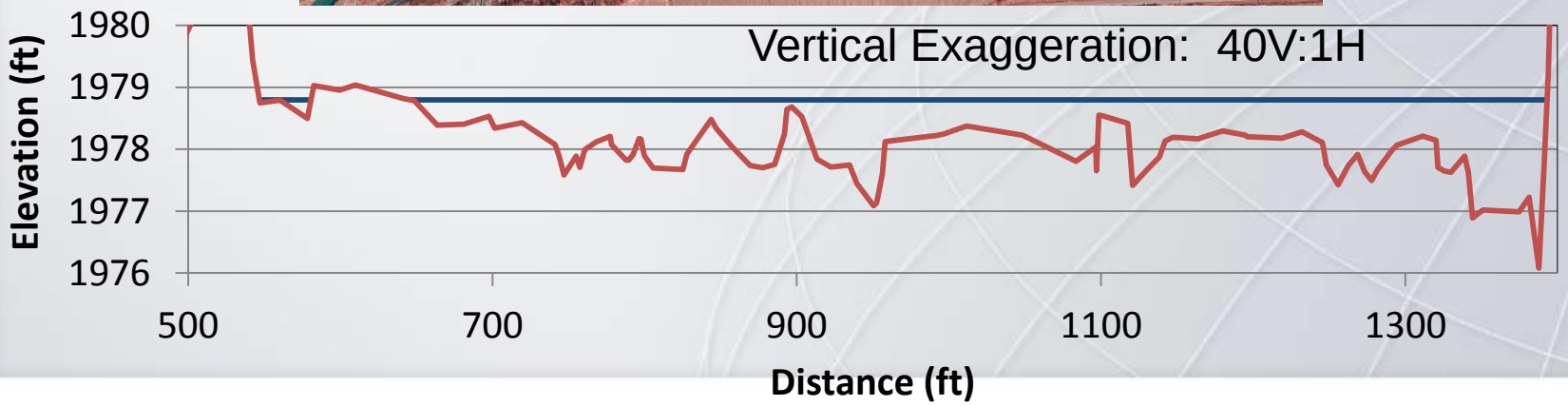


Examples of Channel Types



Examples of Channel Types





Examples of Channel Types

Examples of Channel Types

Channel Pattern IS Relevant to Navigability

- Braided channels:
  - Wide, shallow cross section
  - Multiple, unstable (i.e., shifting) channels
  - NOT conducive to boating

Typical Braided Reach of Gila River
~3.5 mi Below Gillespie Dam

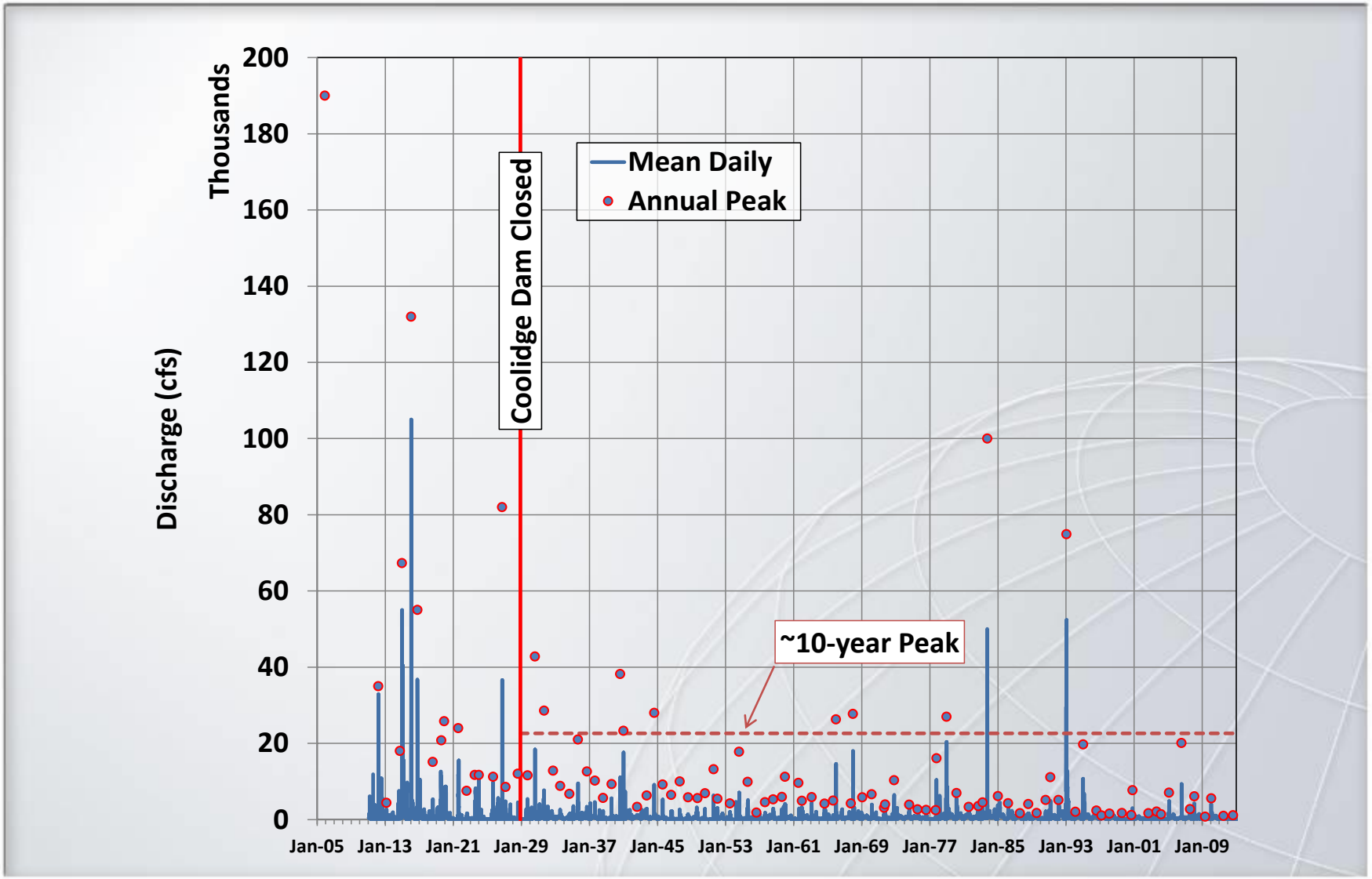
Gila River Dynamics

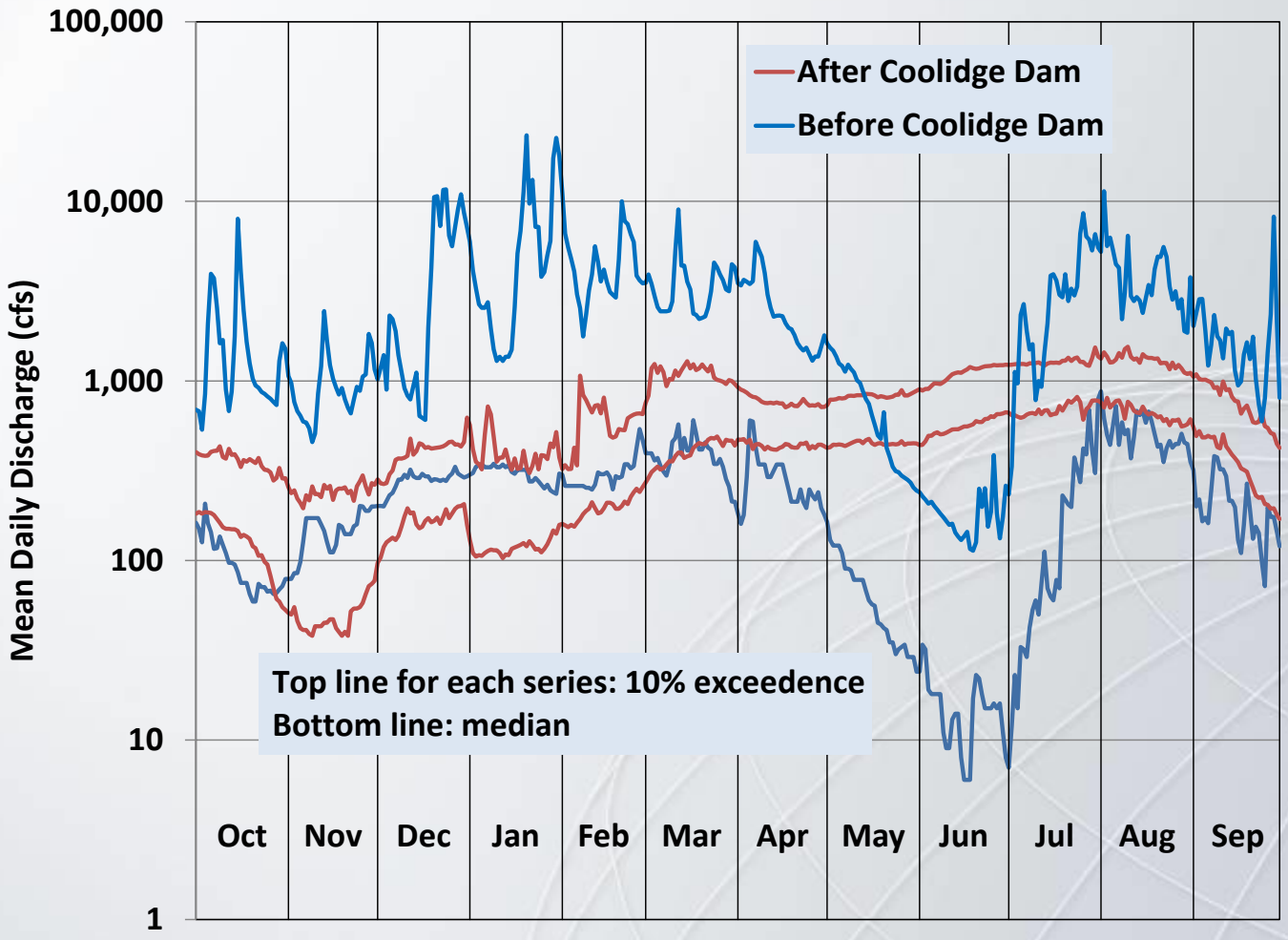
- Mid-1800s:
  - Gila River may have been single-thread channel during periods of extended low flow; however…
- Strongly flood driven:

  Periods of increased flood frequency are more likely to be associated with wide, braided channel conditions on the Gila River (Burkham, 1972; Huckleberry, 1993b). Huckleberry (1996), p 4

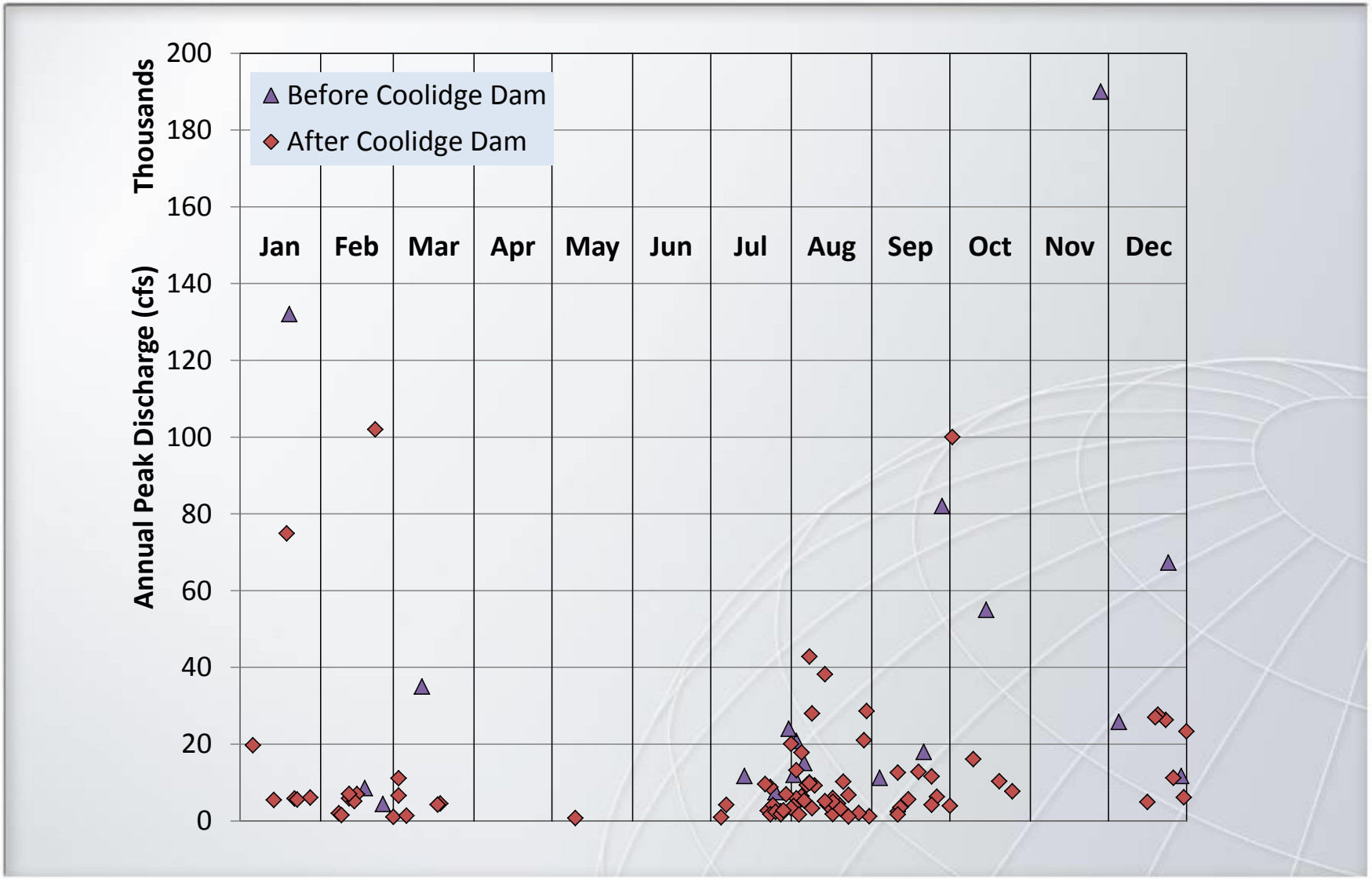
  The channel changed its geometry when the sustained flow of the floods of January, 1993 converted the compound channel above Pima Butte into a single, wide, braided channel. Huckleberry (1996), p 8

Gila River at Kelvin Flows

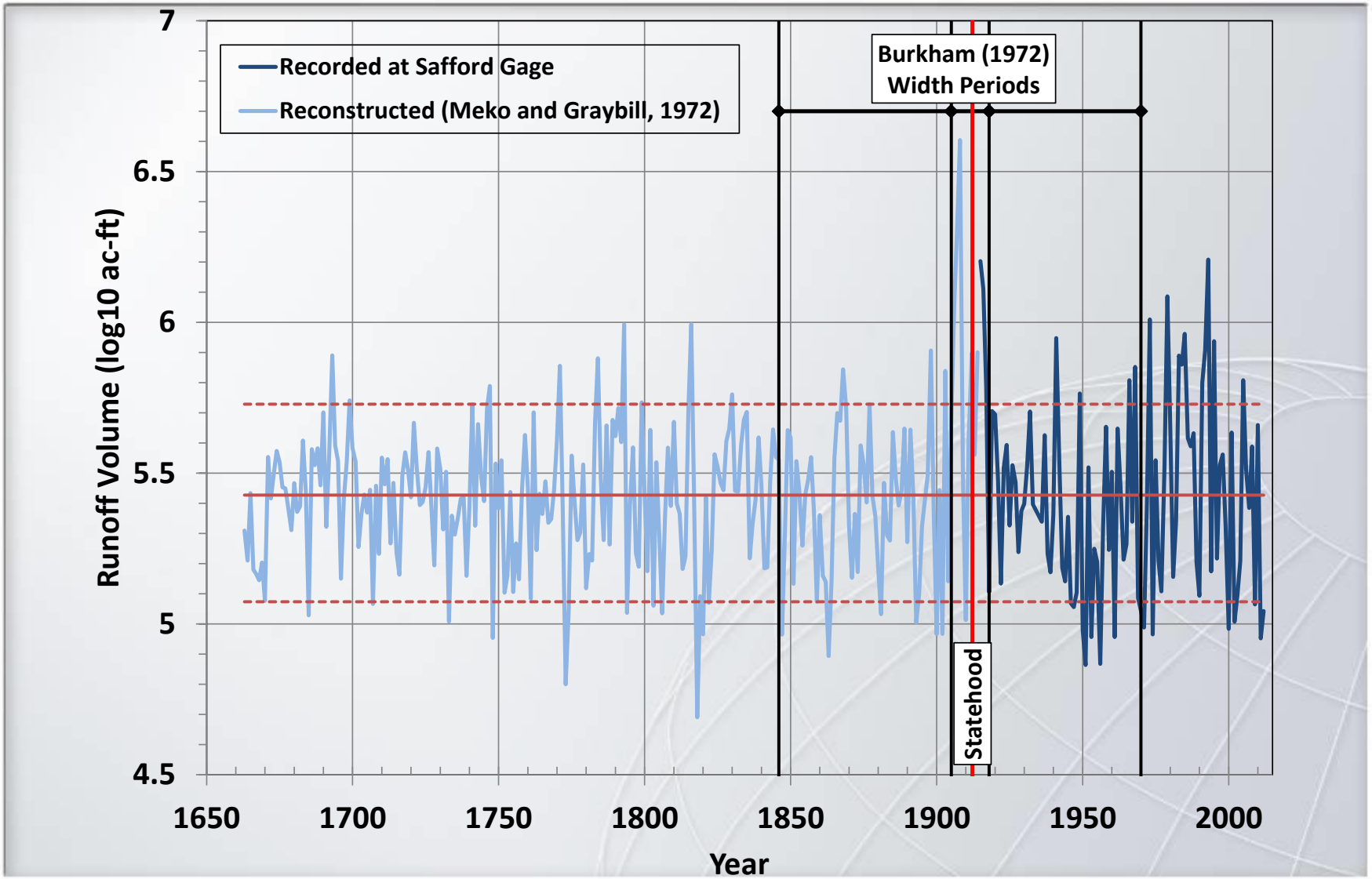



100,000
10,000
1,000
100
10
1
Mean Daily Discharge (cfs)
After Coolidge Dam
Before Coolidge Dam
Top line for each series: 10% exceedence
Bottom line: median
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

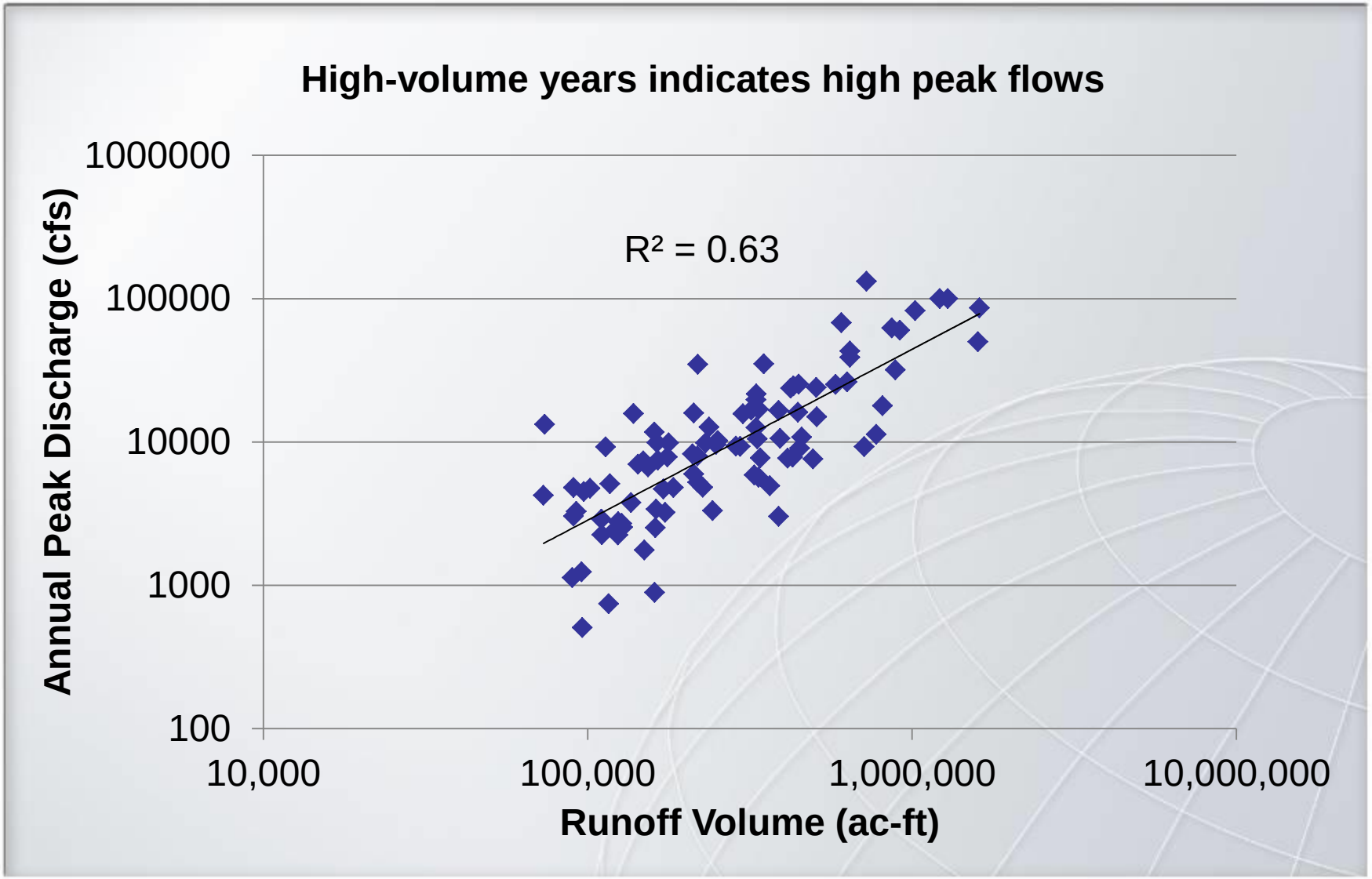
Annual Flood Peaks: Snowmelt and Monsoon



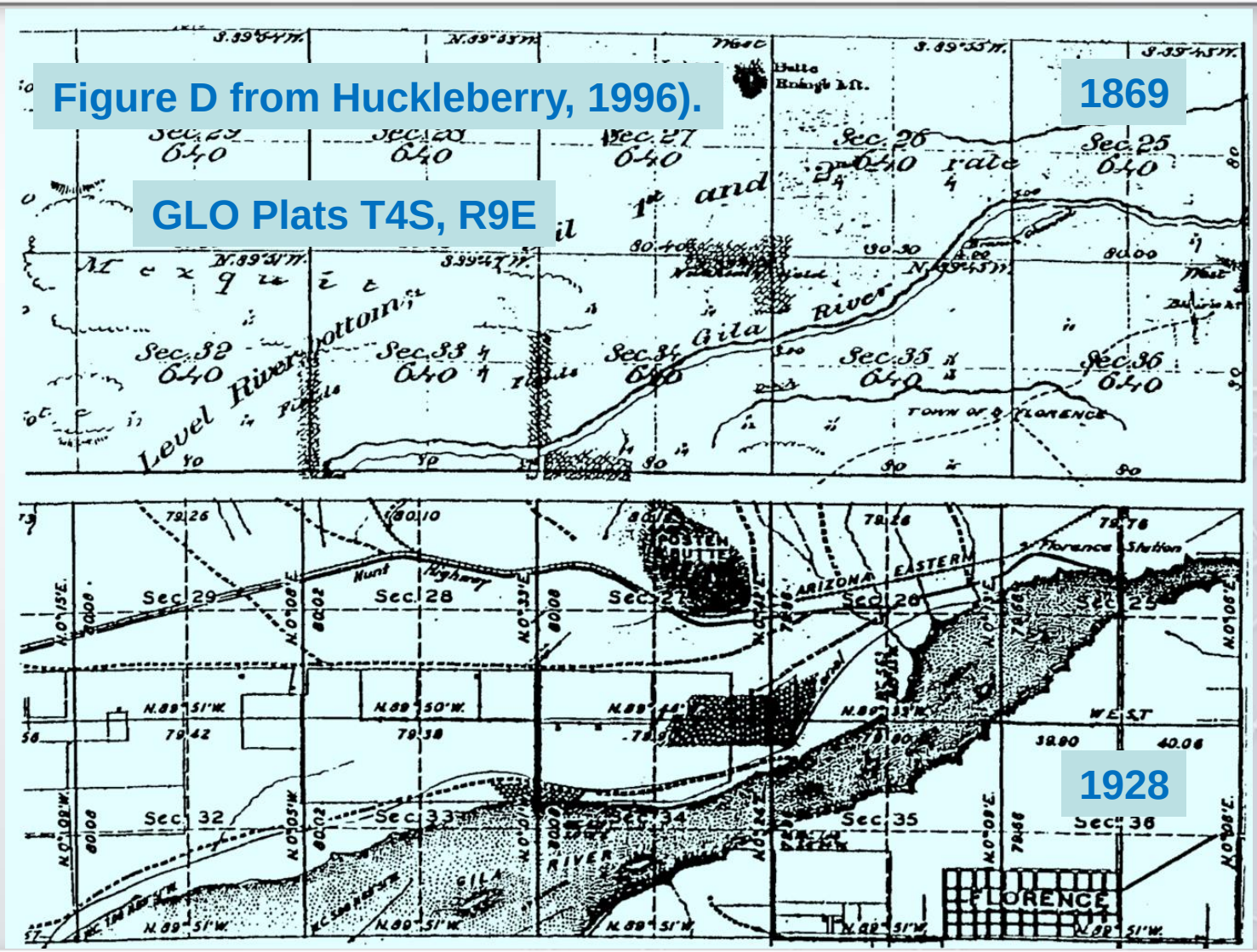
Similar Variability in Annual Volume Pre- and Post-statehood



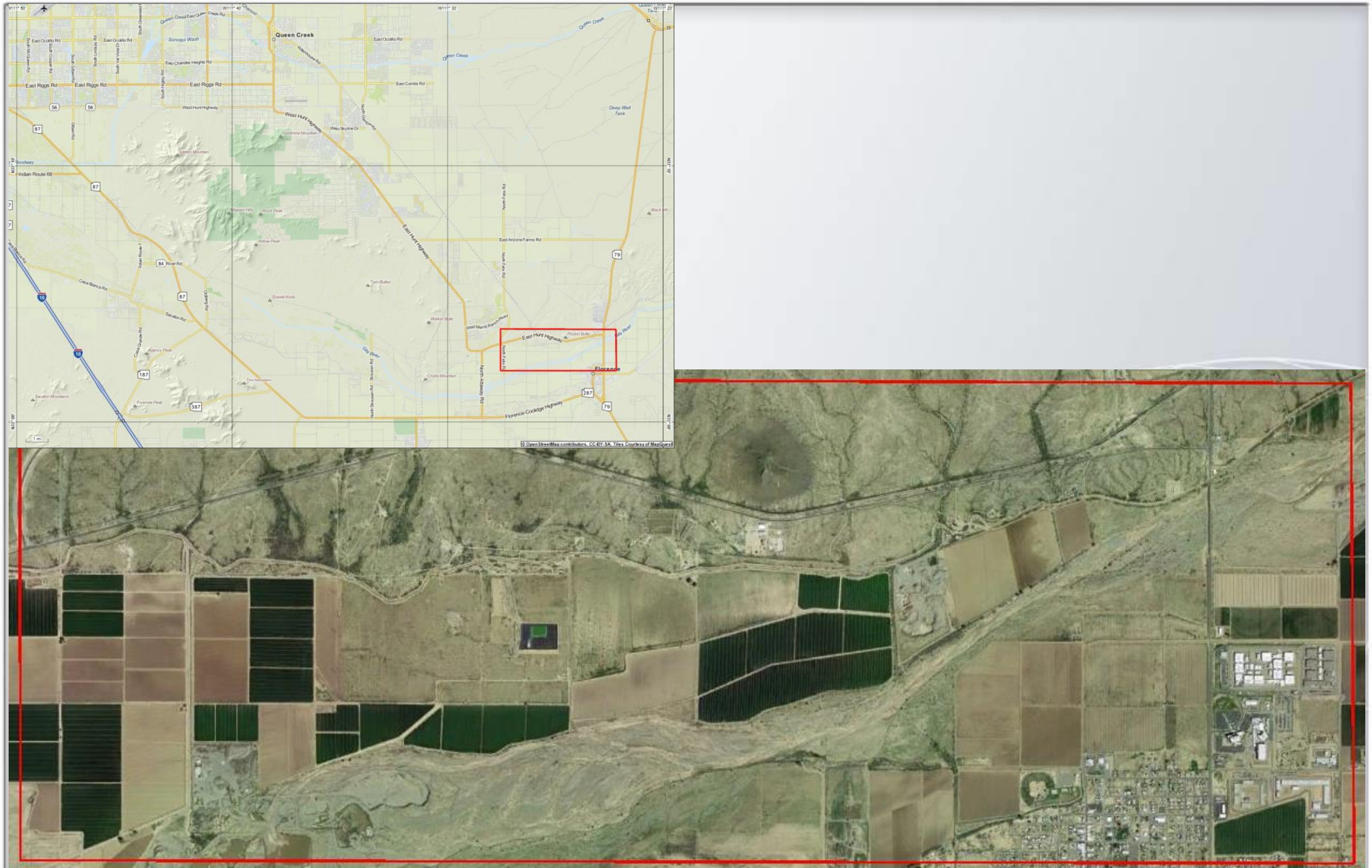
Annual peak is correlated with annual volume



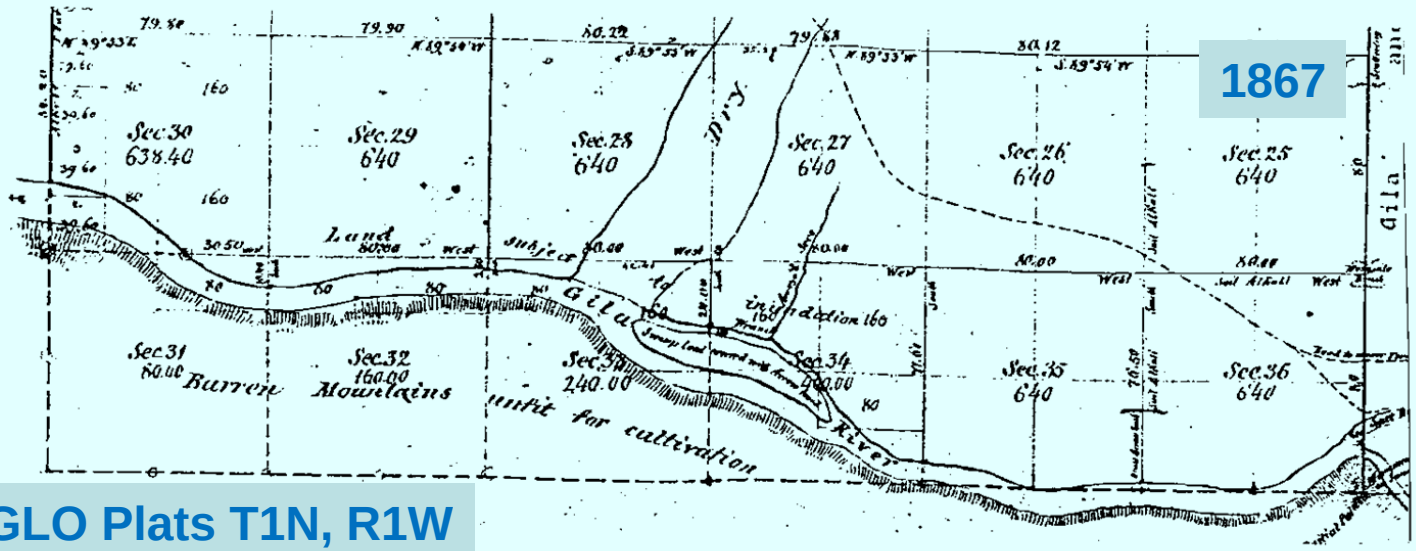
Flood-induced Changes in Channel Width



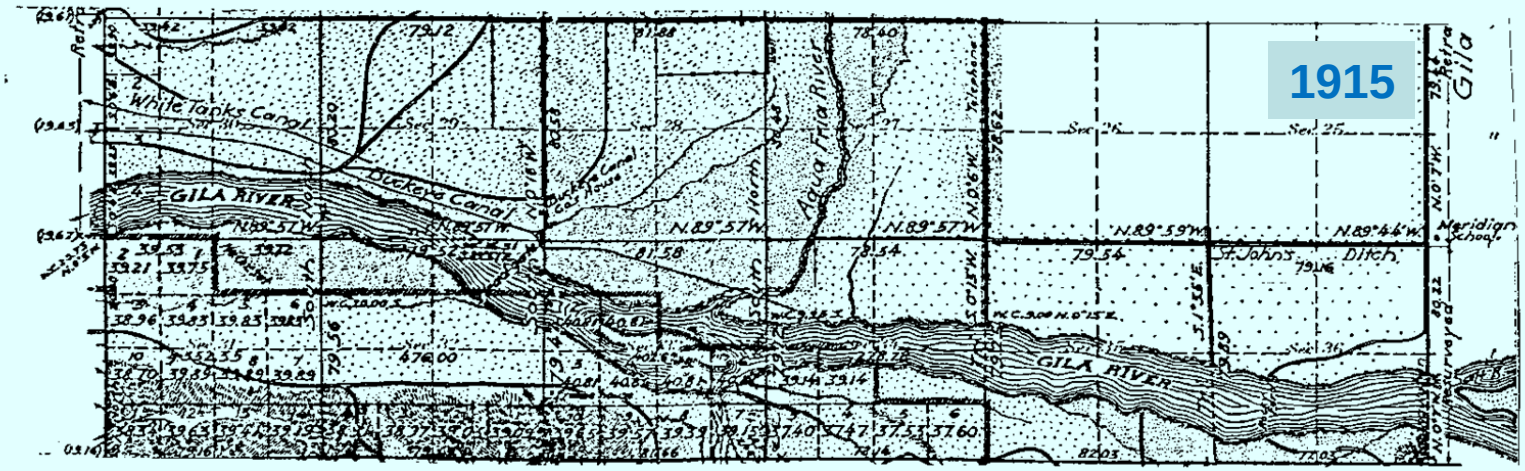
Location of GLO Plat (April 24, 2013)



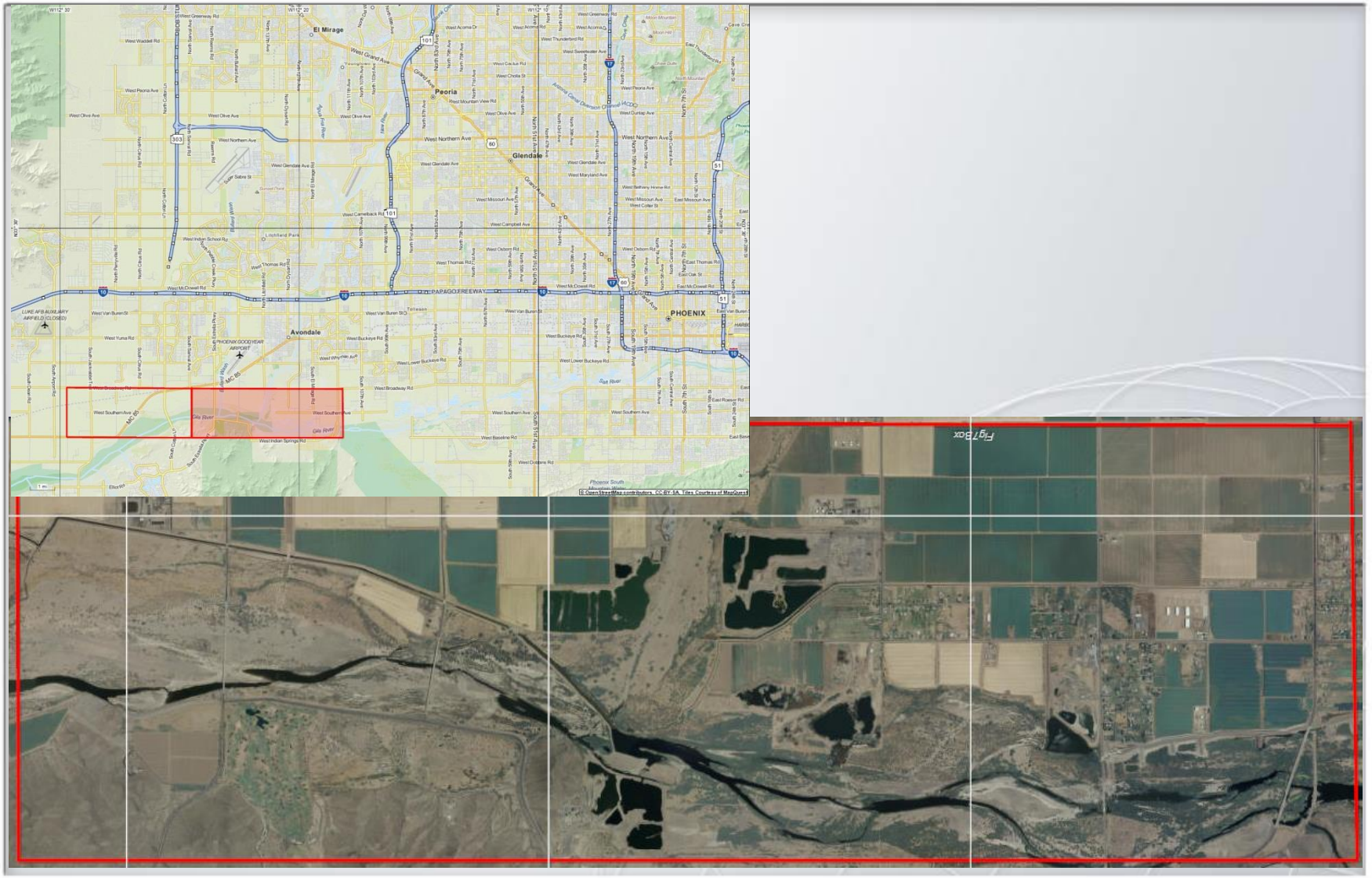
Flood-induced Changes in Channel Width



GLO Plats T1N, R1W



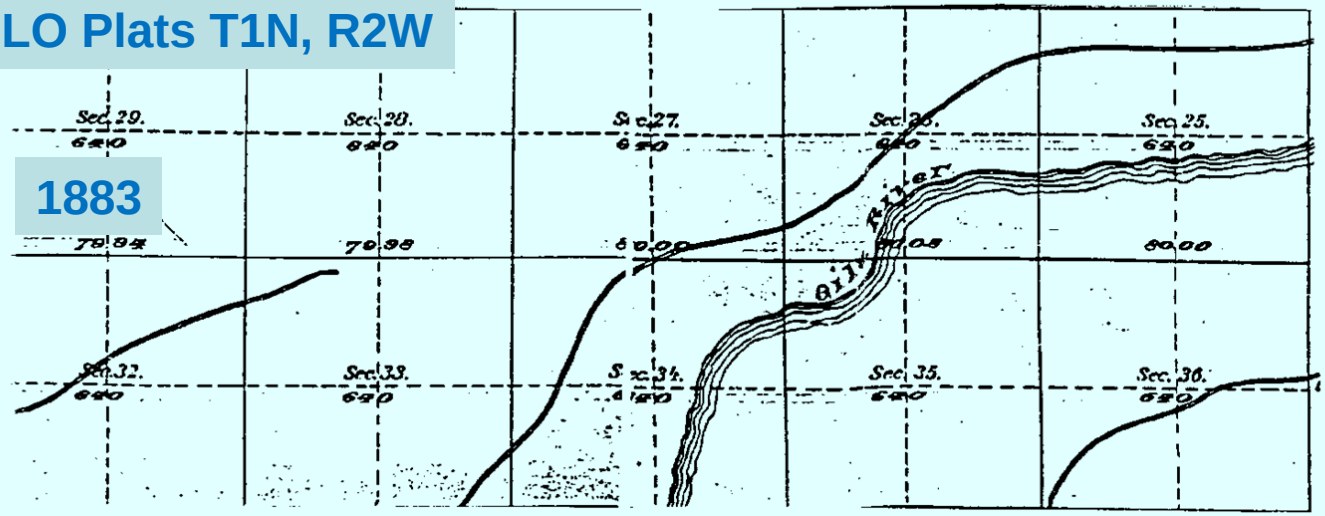
Location of GLO Plat (March 7, 2014)



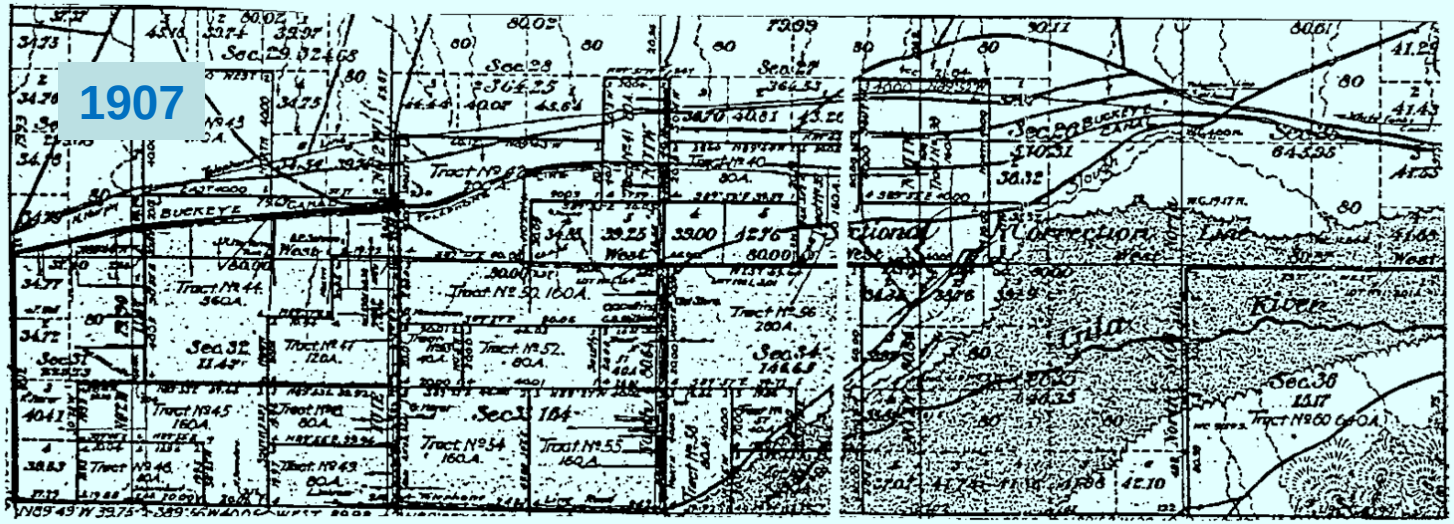
Flood-induced Changes in Channel Width

GLO Plats T1N, R2W

1883



1907



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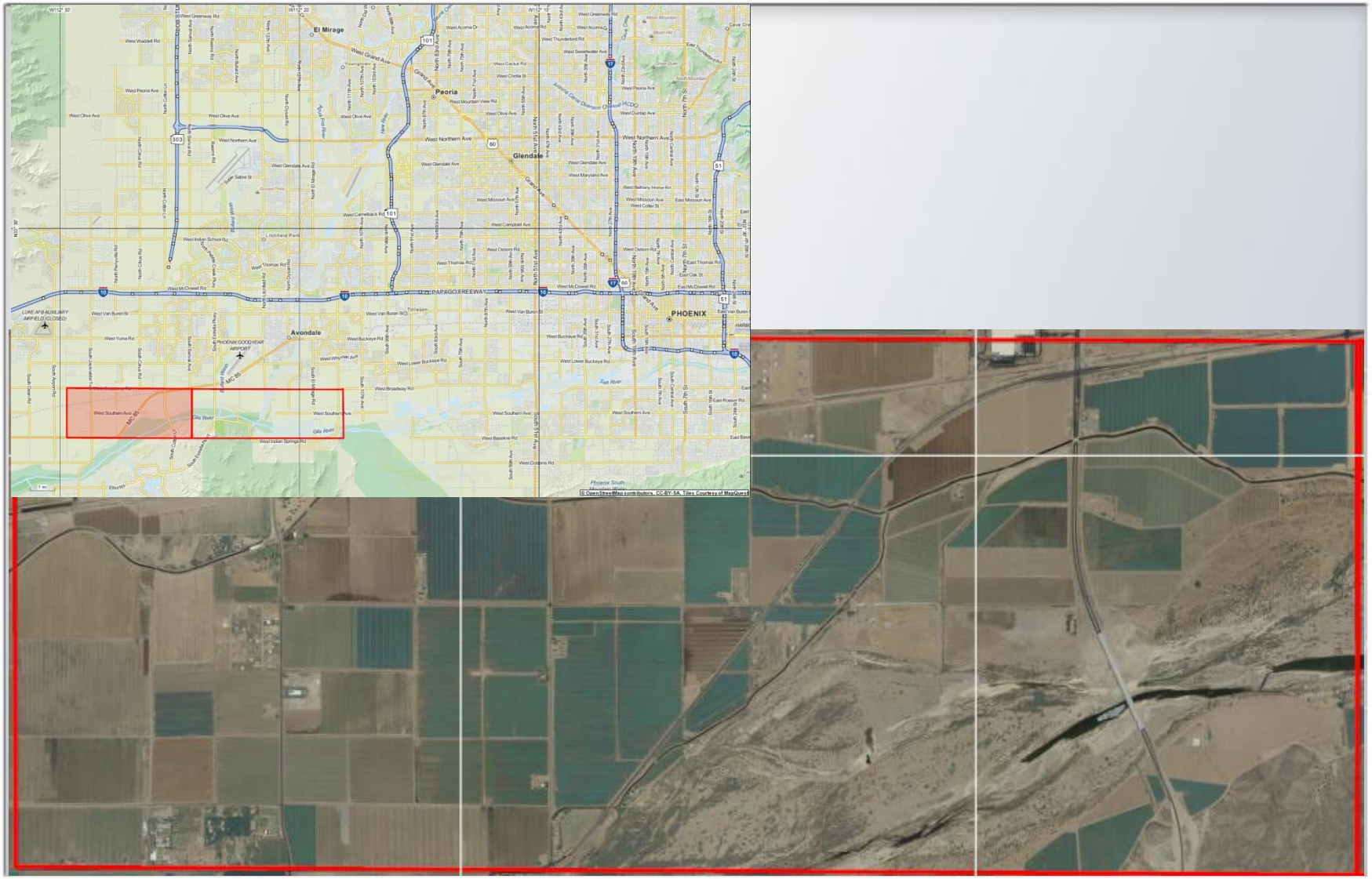
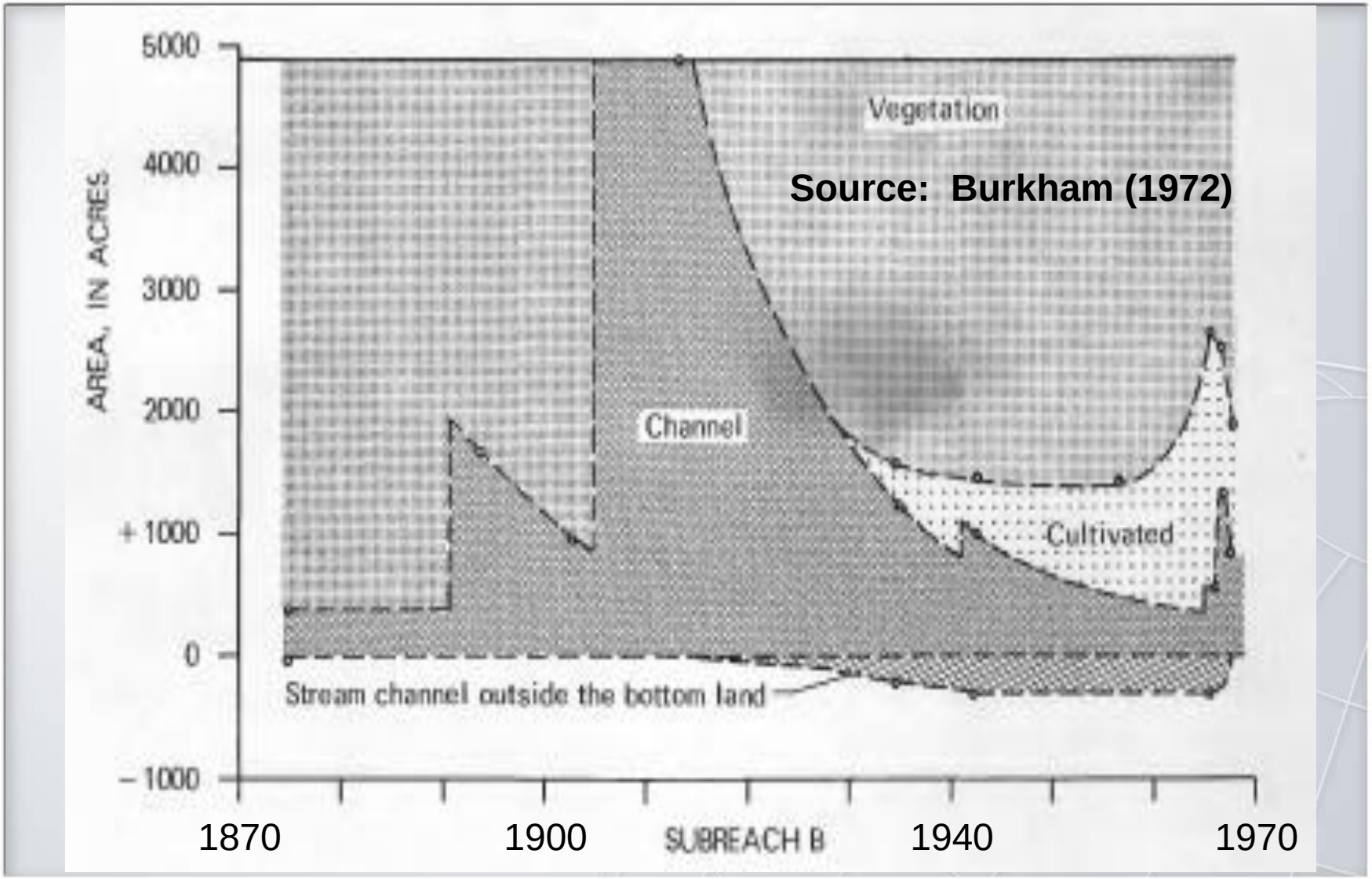
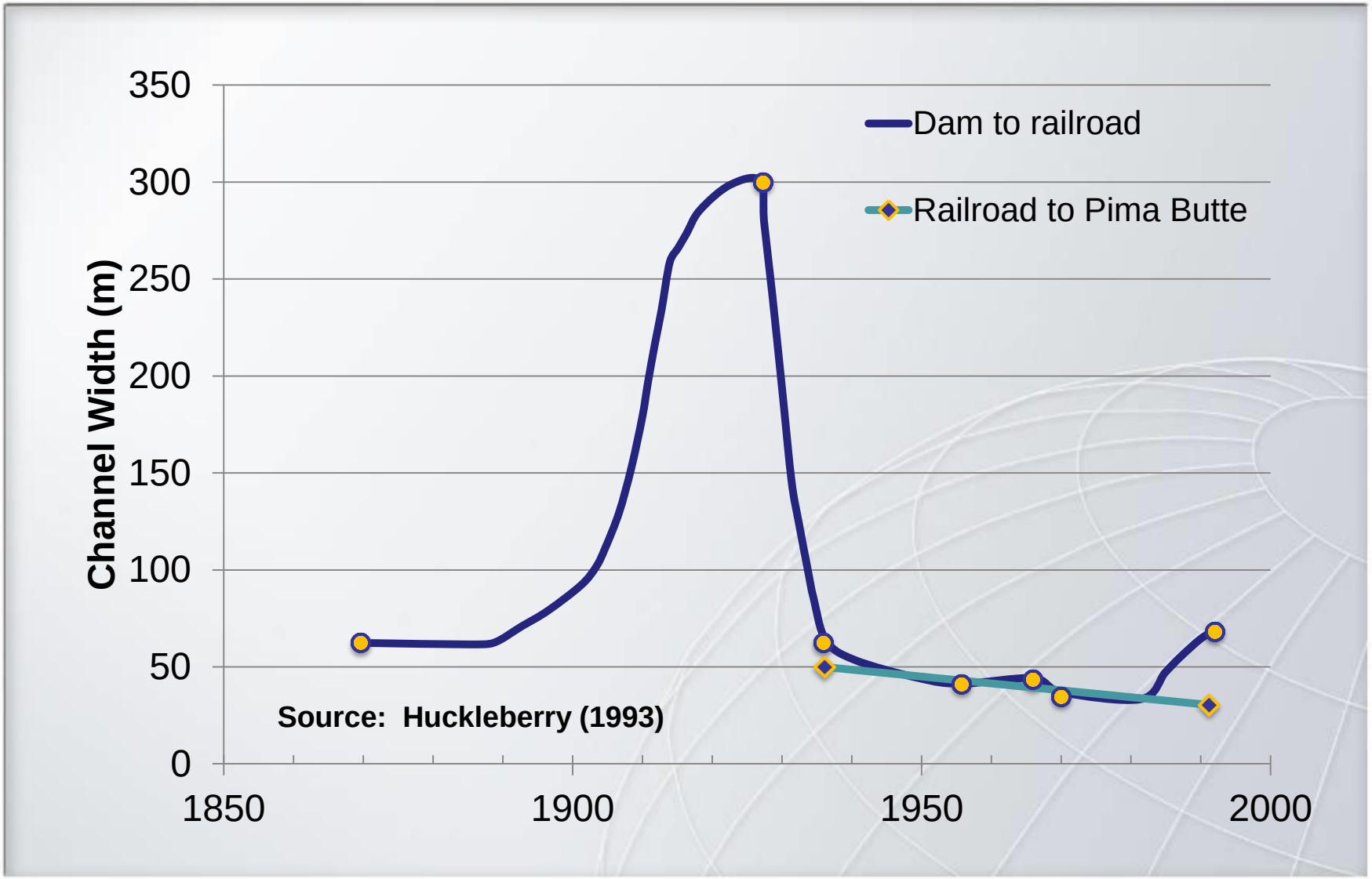


Historical Changes in Gila River (San Simon to Pima)



Source: Burkham (1972)

Channel Width Change, Middle Gila River



Summary of Opinions

- Mid-1800s:
  - Portions of Gila River had single-thread channel lined with thick stands of woody riparian vegetation.
  - It may have been possible to float a small boat in some reaches under some flow conditions
- 1895 to1916:
  - Large floods scoured vegetation, eroded the banks, widened the channel,
  - Gila River developed wide braided planform.

Summary of Opinions

- Early-1900s, including date of statehood:
  - Extensive reaches were dry; carried little or no flow except during flooding.
  - Braided planform and low to non-existent flows would have made commercial navigation impractical.
  - During flood periods, navigation also impractical due to hazardous conditions, debris, uncertain and unstable channels.
- Prior to mid-1800s:
  - Reconstructed flow records show mid-1800s unusually dry
  - Large floods routinely occurred in the ordinary and natural condition of the Gila River

Summary of Opinions

The Gila River was NOT used nor susceptible to being used, in it ordinary and natural condition, as a highway for commerce, using customary modes of trade and travel on water at the time of Arizona's statehood.