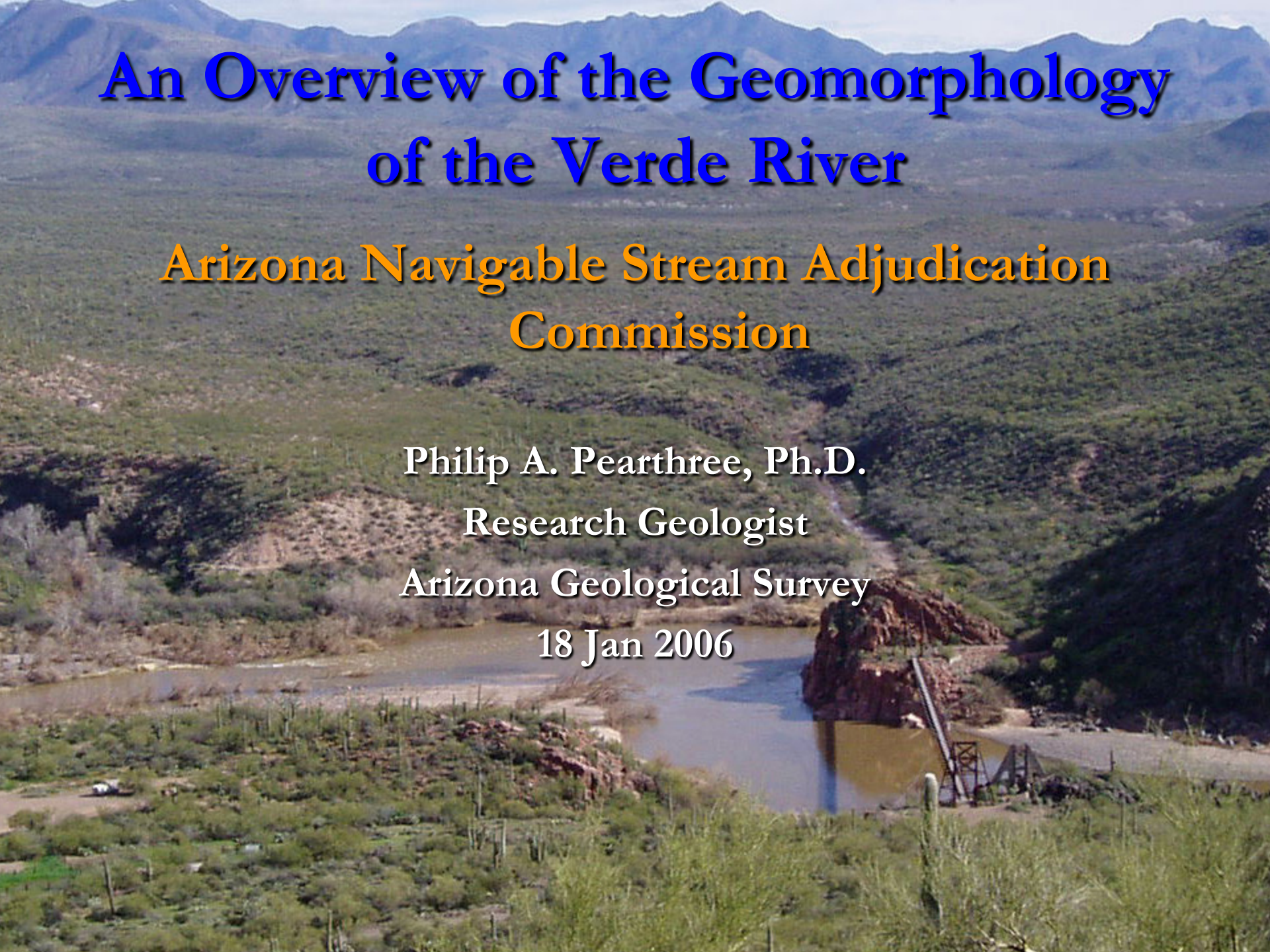

An Overview of the Geomorphology of the Verde River

Arizona Navigable Stream Adjudication Commission

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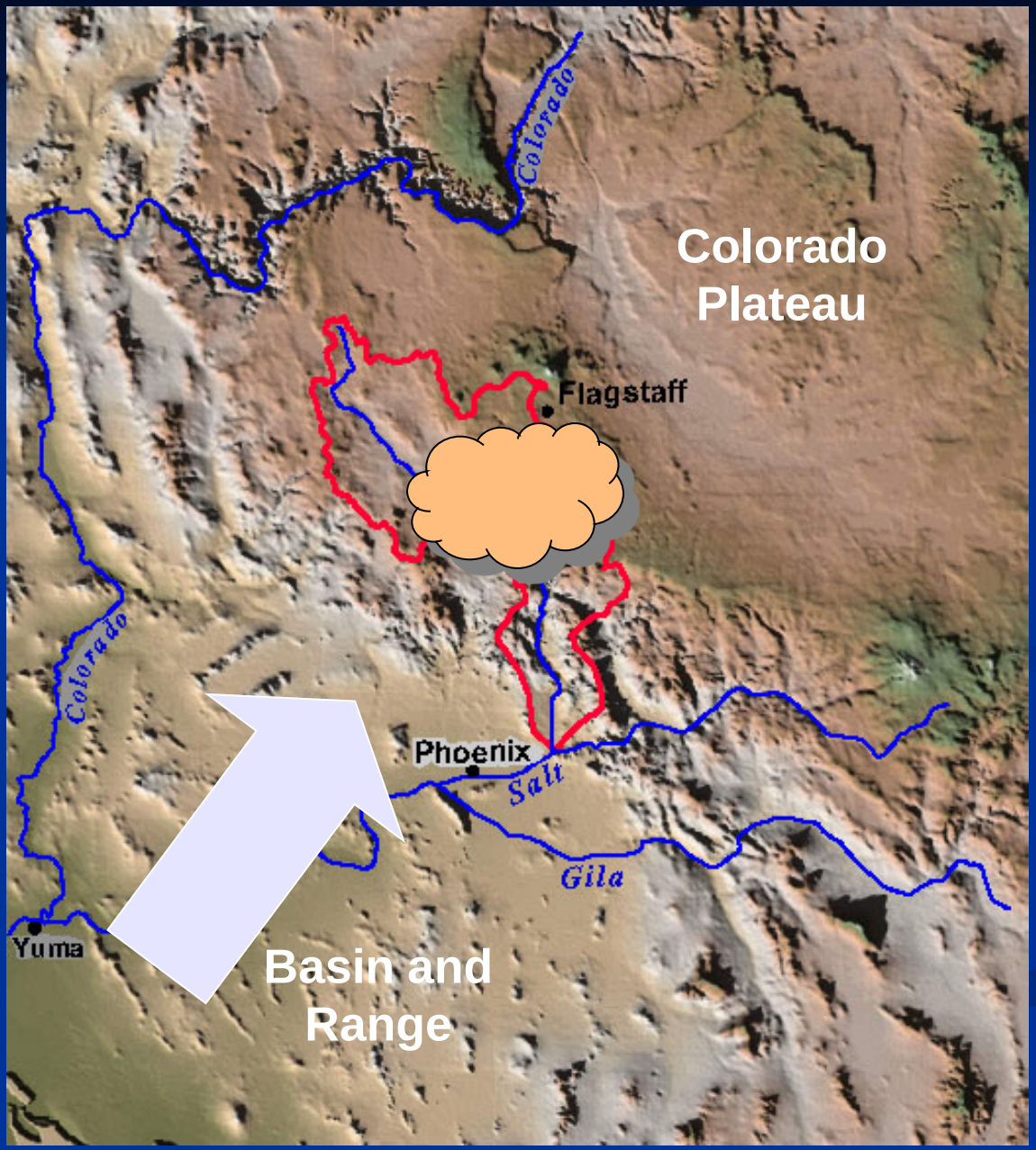
Research Geologist
Arizona Geological Survey
18 Jan 2006

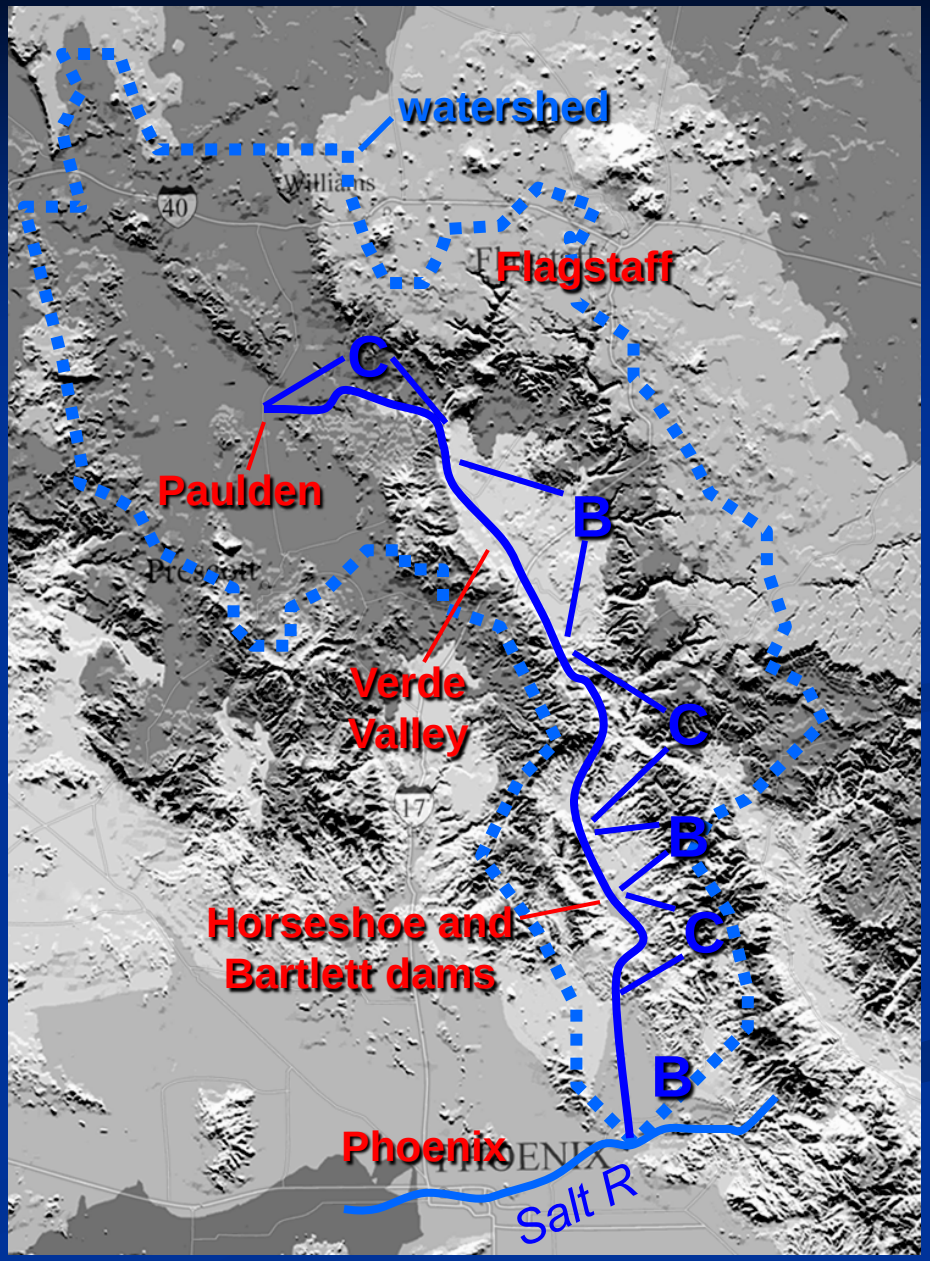
Major Rivers of Arizona

- Flow through dry desert areas with < 12 in. avg annual precipitation
- Head in high, relatively wet terrain
- Perennial rivers exist because regional topography rings water out of atmosphere



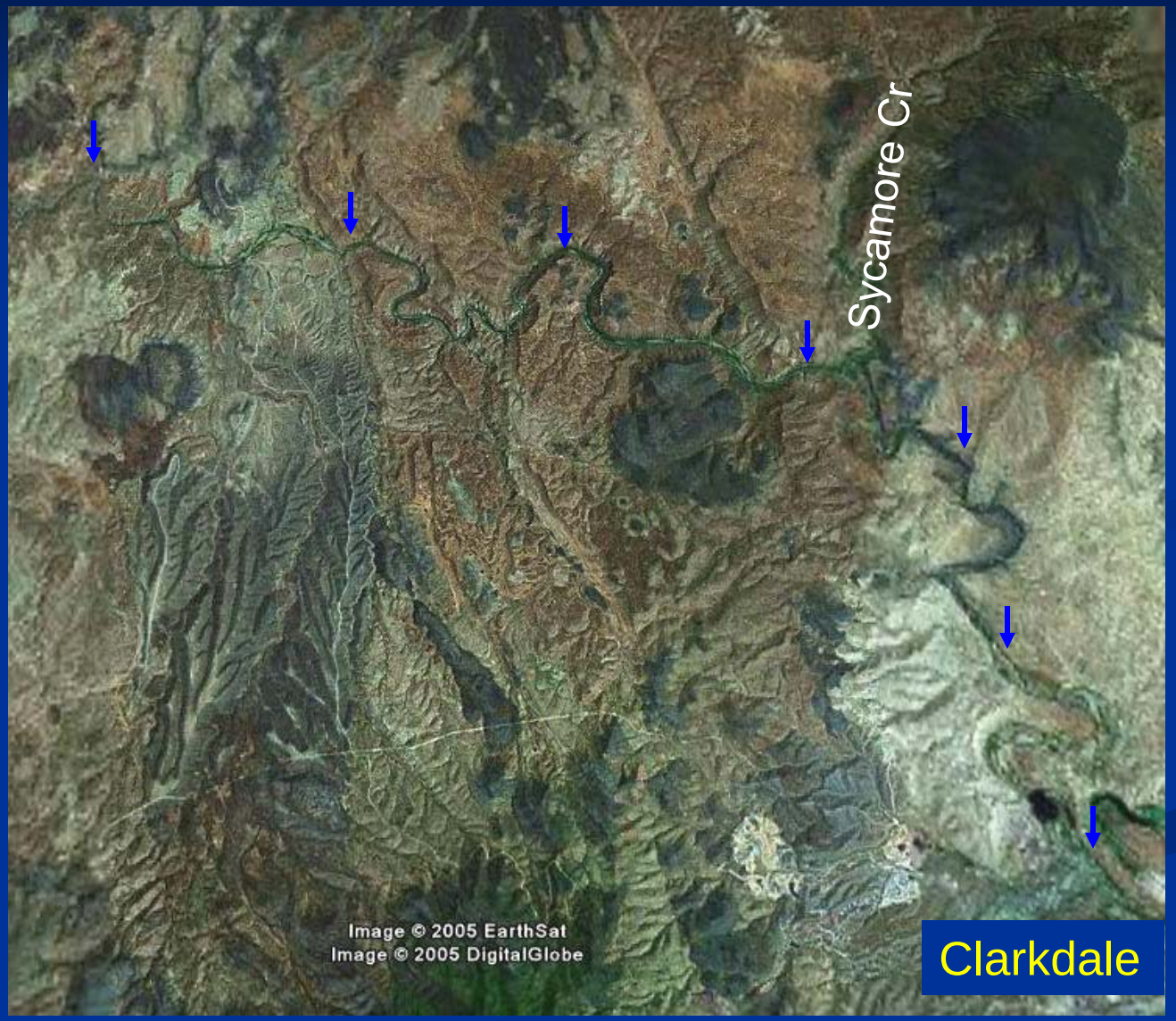
Verde River physiography

- Rugged watershed
- Alternating bedrock canyons and alluvial basins
- River entrenched and somewhat confined even in basins



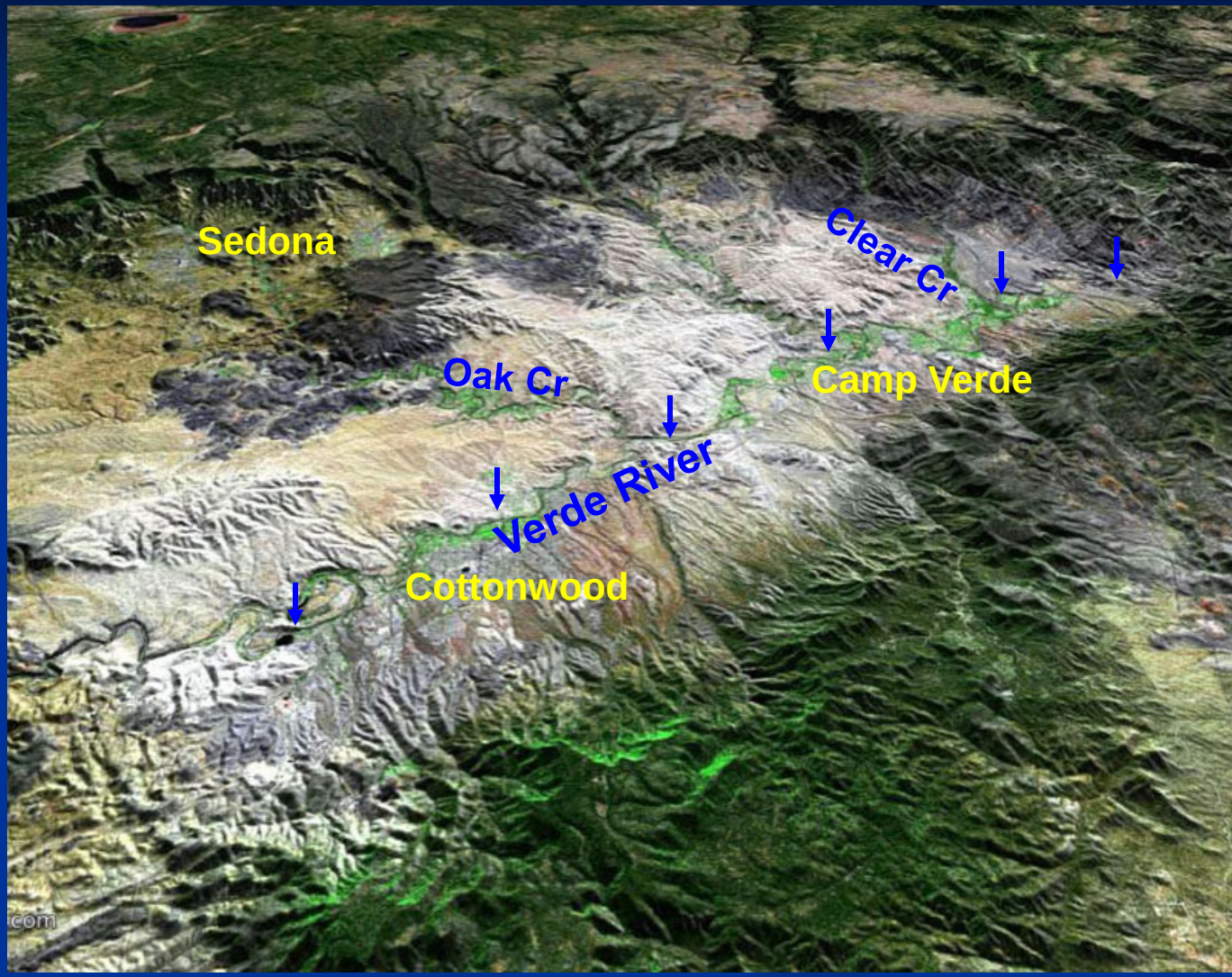
Upper Verde canyon reach

- River deeply entrenched into bedrock
- Very limited lateral channel movement

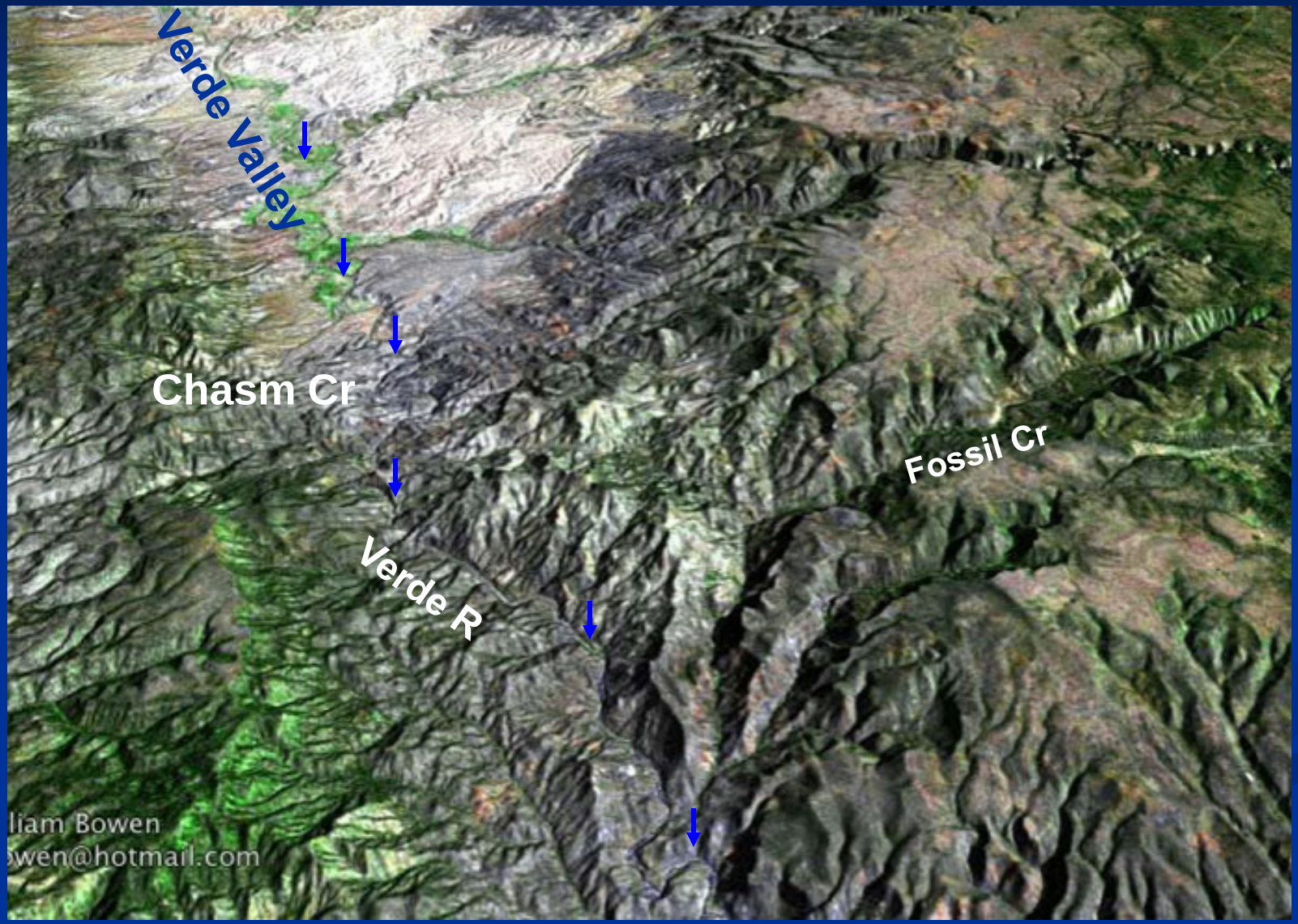


Verde Valley basin reach

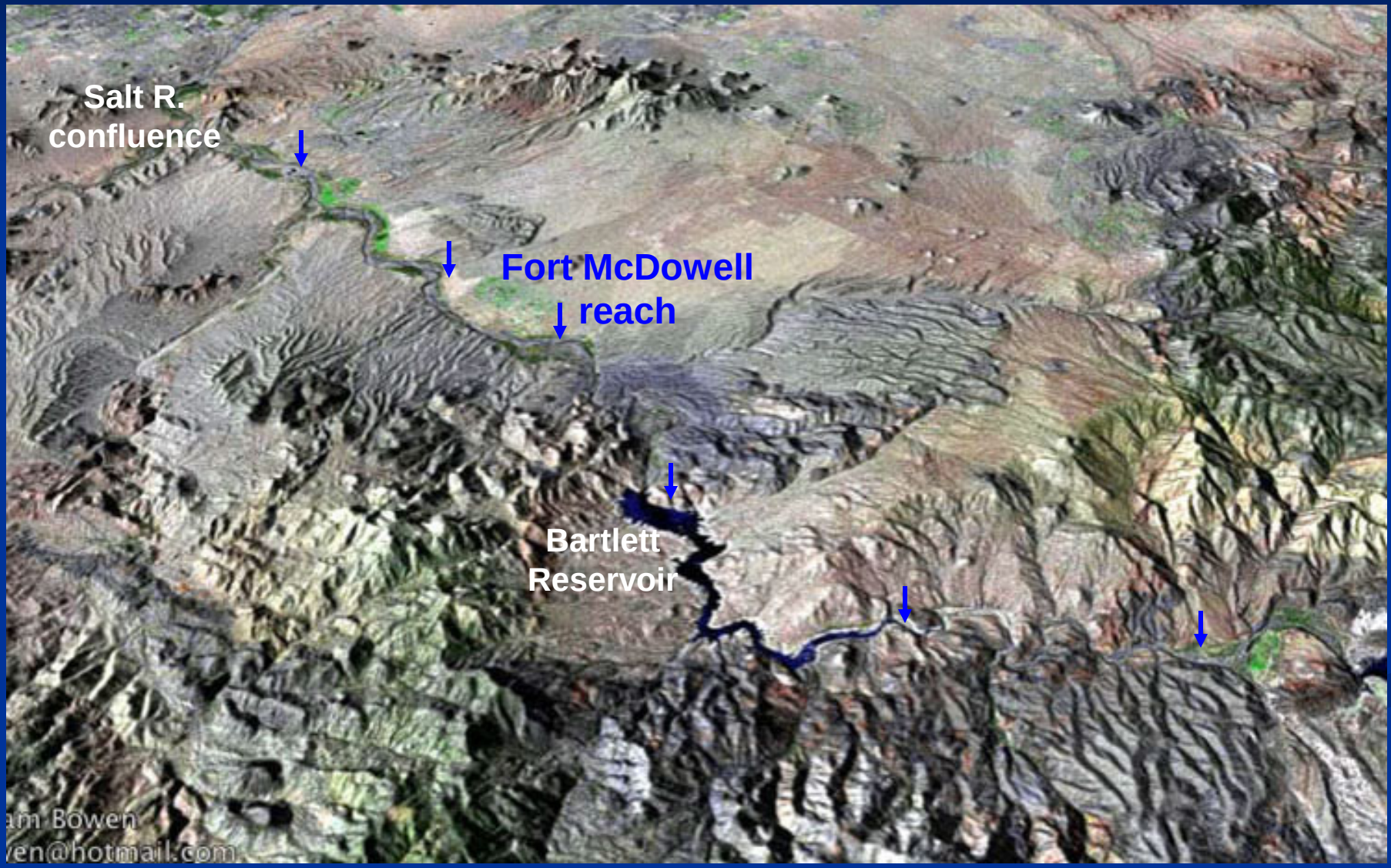
- *Relatively* broad floodplains
- River still entrenched
- Topographic confinement provided by older deposits



Chasm Creek canyon reach



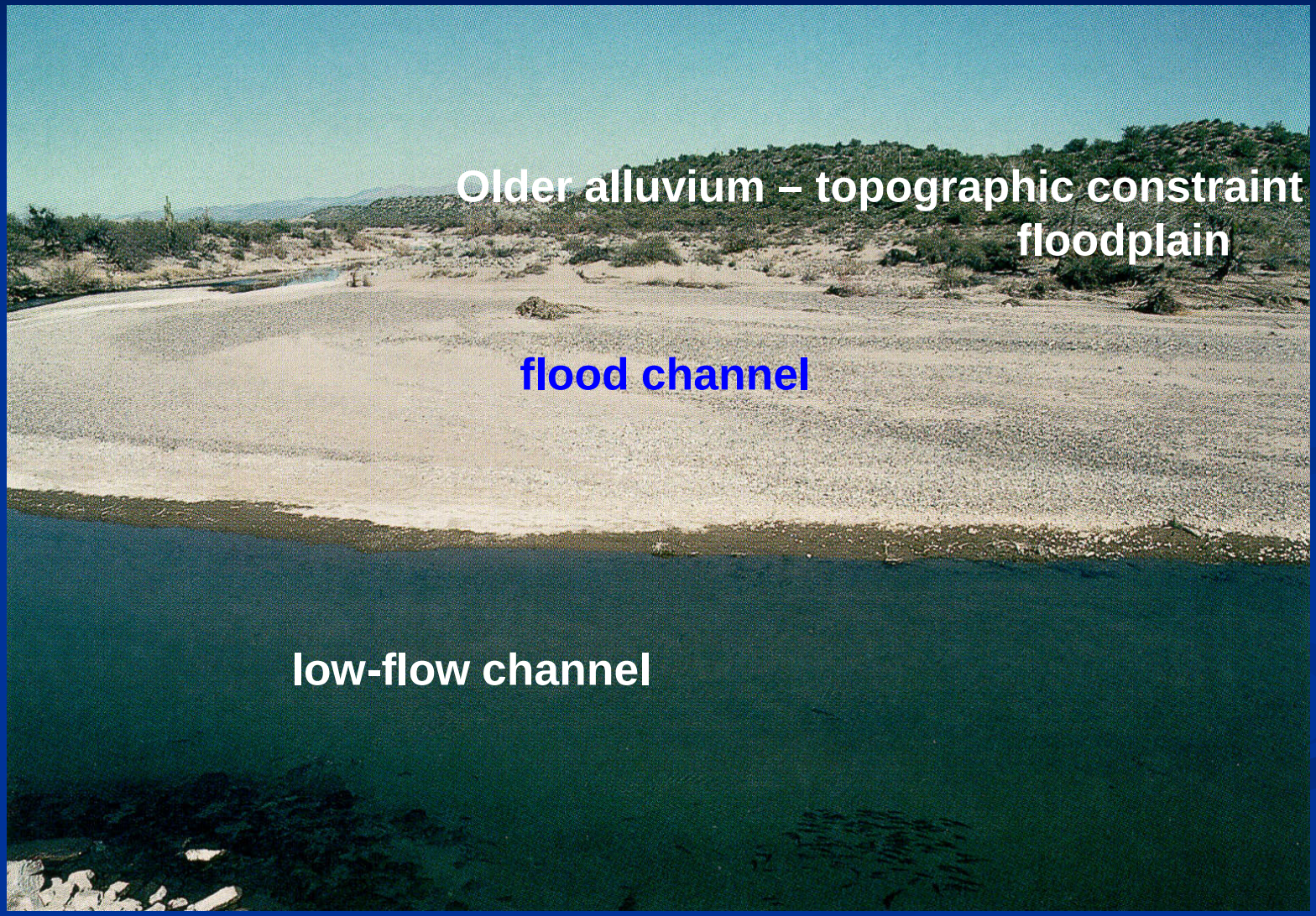
Lower Verde River
dams, canyons, alluvial reaches



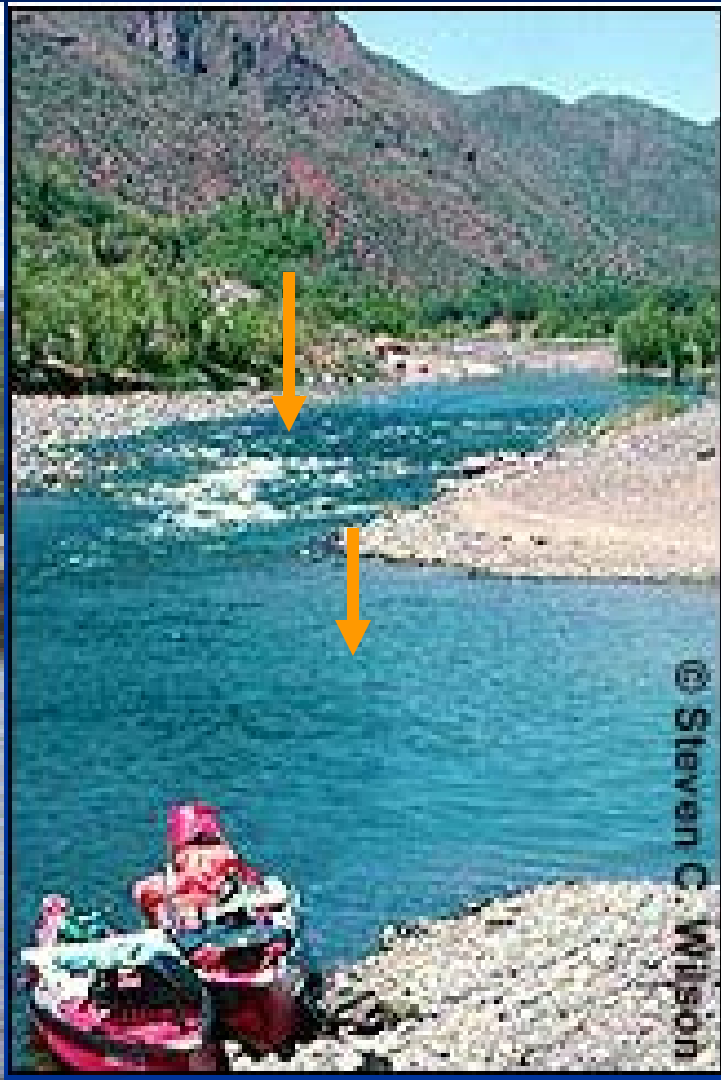
Basic river terminology

- Floodplains – areas along margins of river that are inundated in large floods; vegetation density variable
- Flood channels – areas of deep, high-velocity flow in floods with less large vegetation
- Low-flow channels – topographically lowest areas occupied by perennial stream flow, typically lined with vegetation
- Pools (wide, low-gradient, slow water)
- Riffles (narrow, steeper, coarse bed, relatively fast water)

Major geomorphic elements of the river

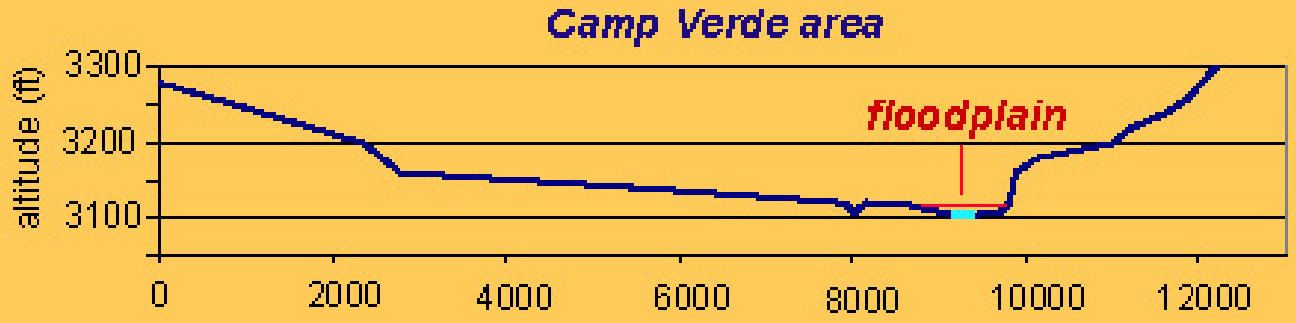


Pool & Riffles

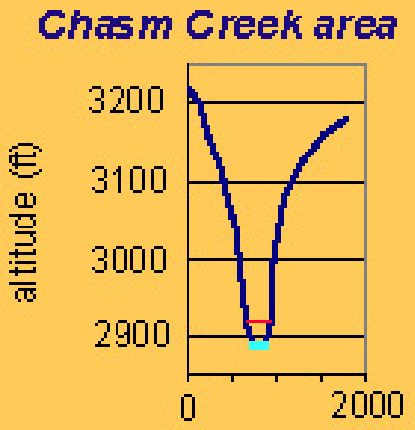


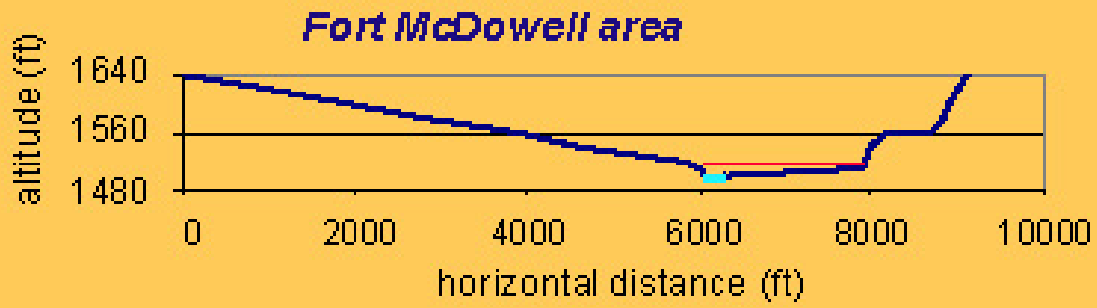
Verde River below Childs

Variations in valley and floodplain form



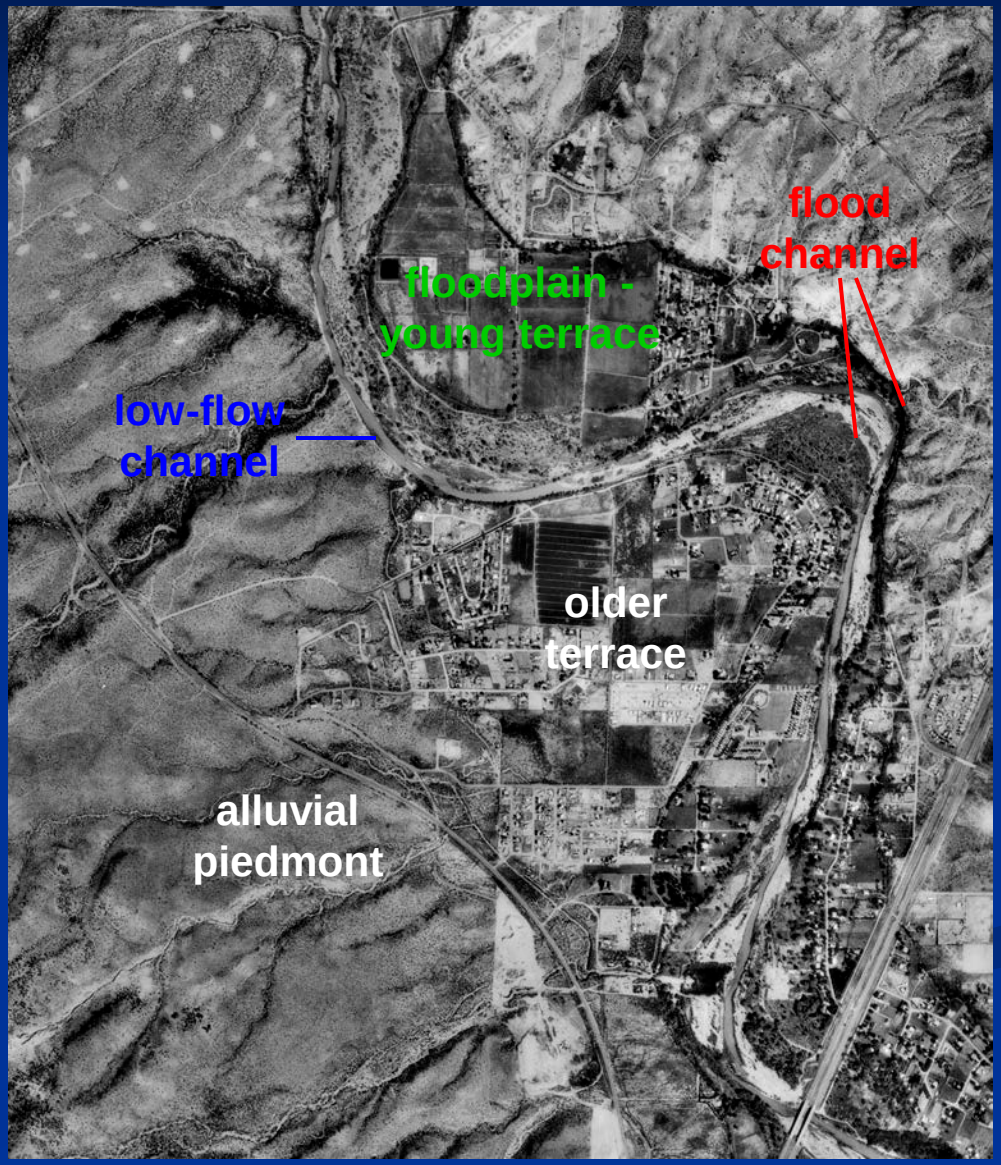
Area	floodplain width	low-flow channel*
Camp Verde	1000	175
Chasm Cr	370	140
Fort McDowell	1850	175



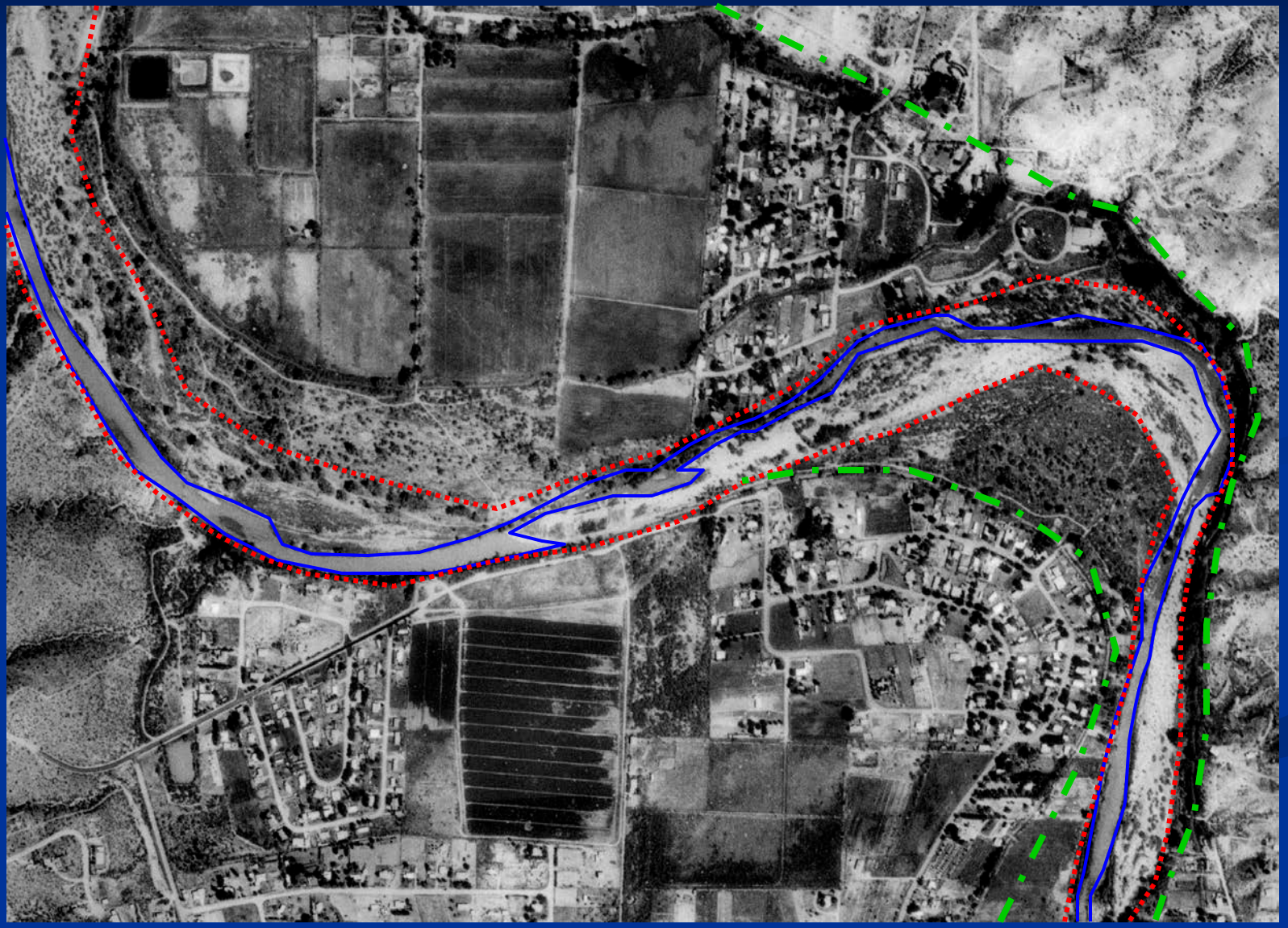


Geomorphic elements of the Verde R

- Low-flow channel a small part of river system
- Single or multi-threaded low-flow channels
- Broad flood channels formed by floods
- Anthropogenic impacts on channel and floodplain
- Topography constrains river movement

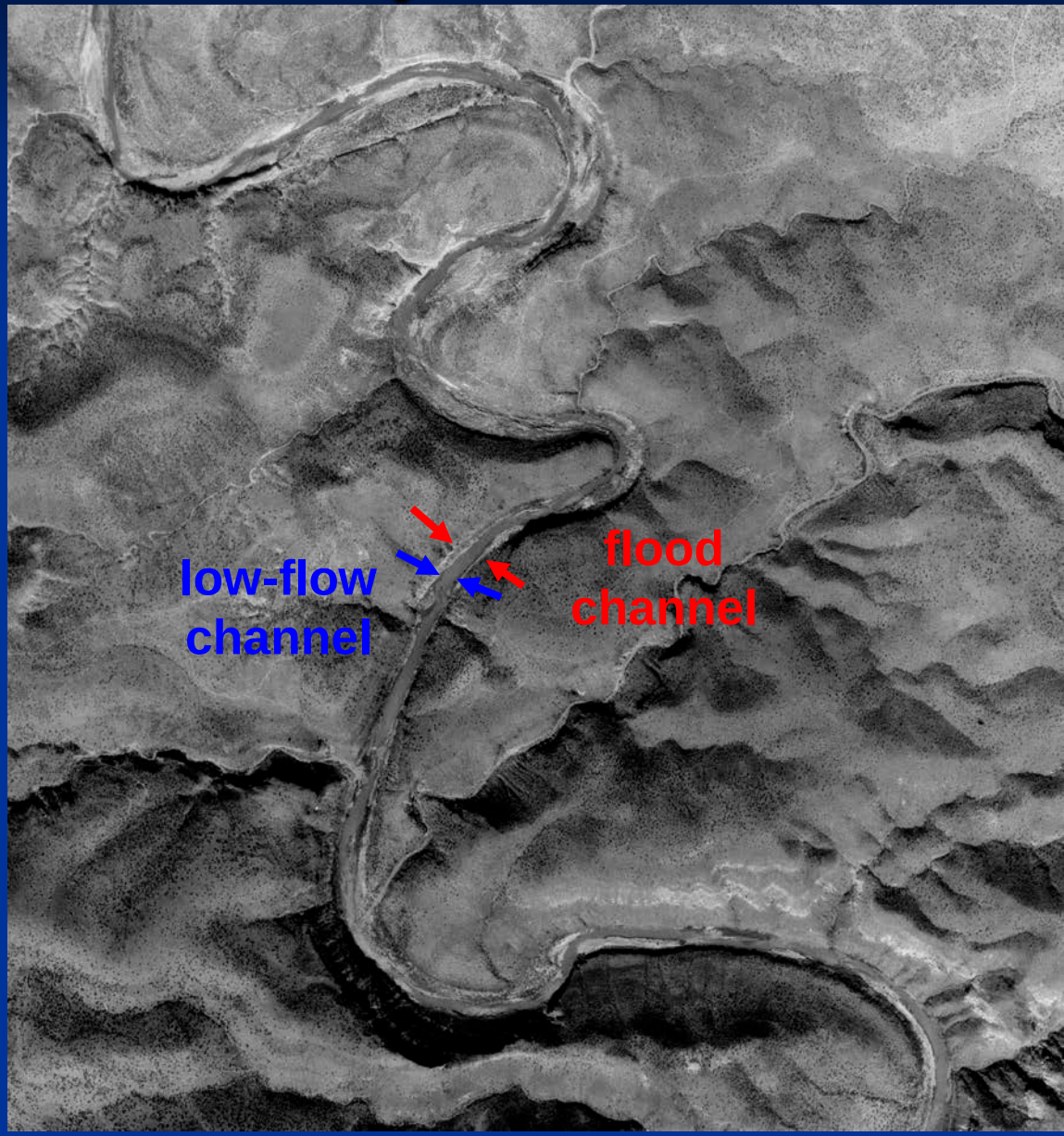


Camp Verde reach



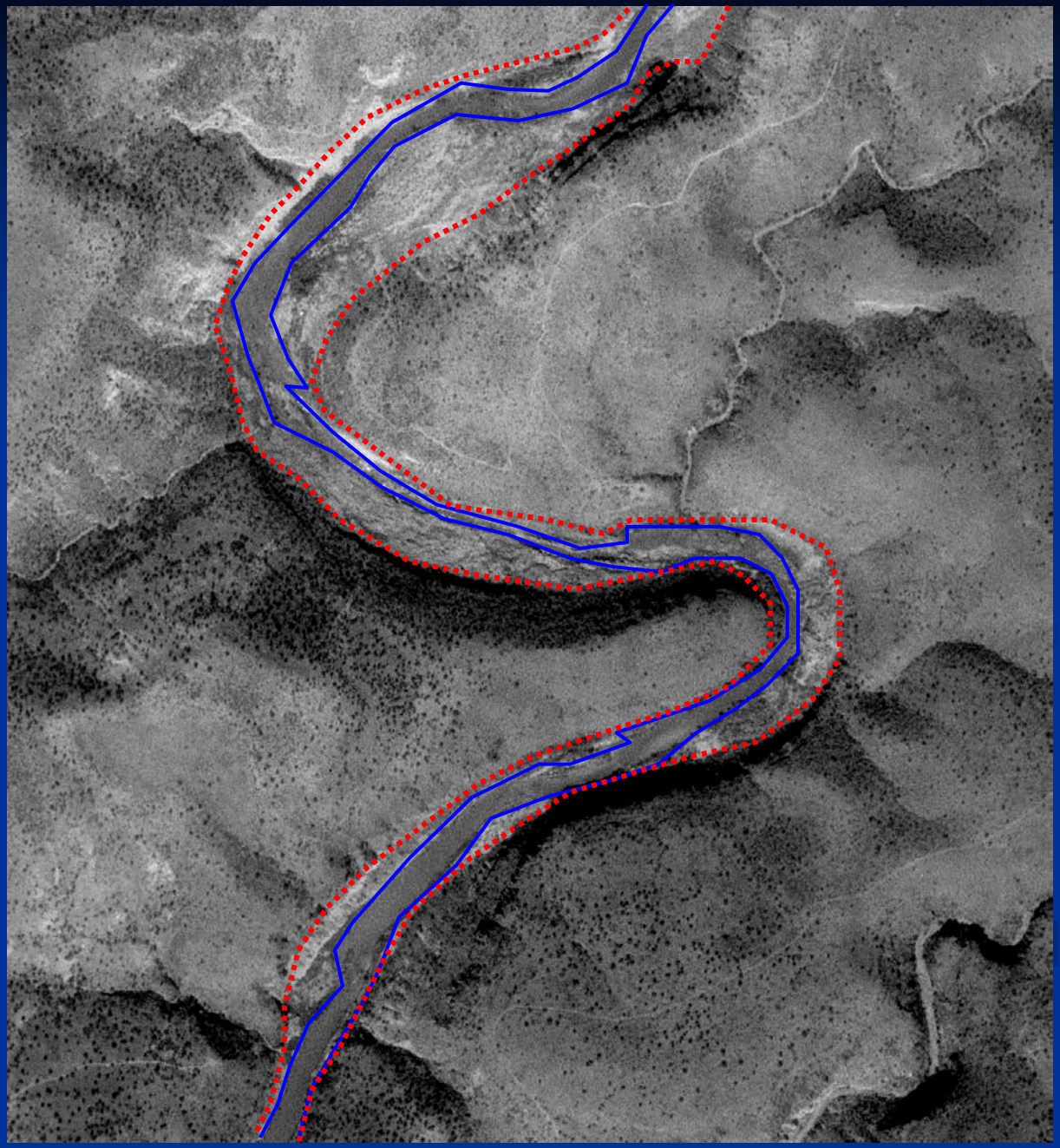
Chasm Creek canyon reach

- Deeply entrenched in narrow valley
- Low flow channel occupies more of flood channel and valley bottom



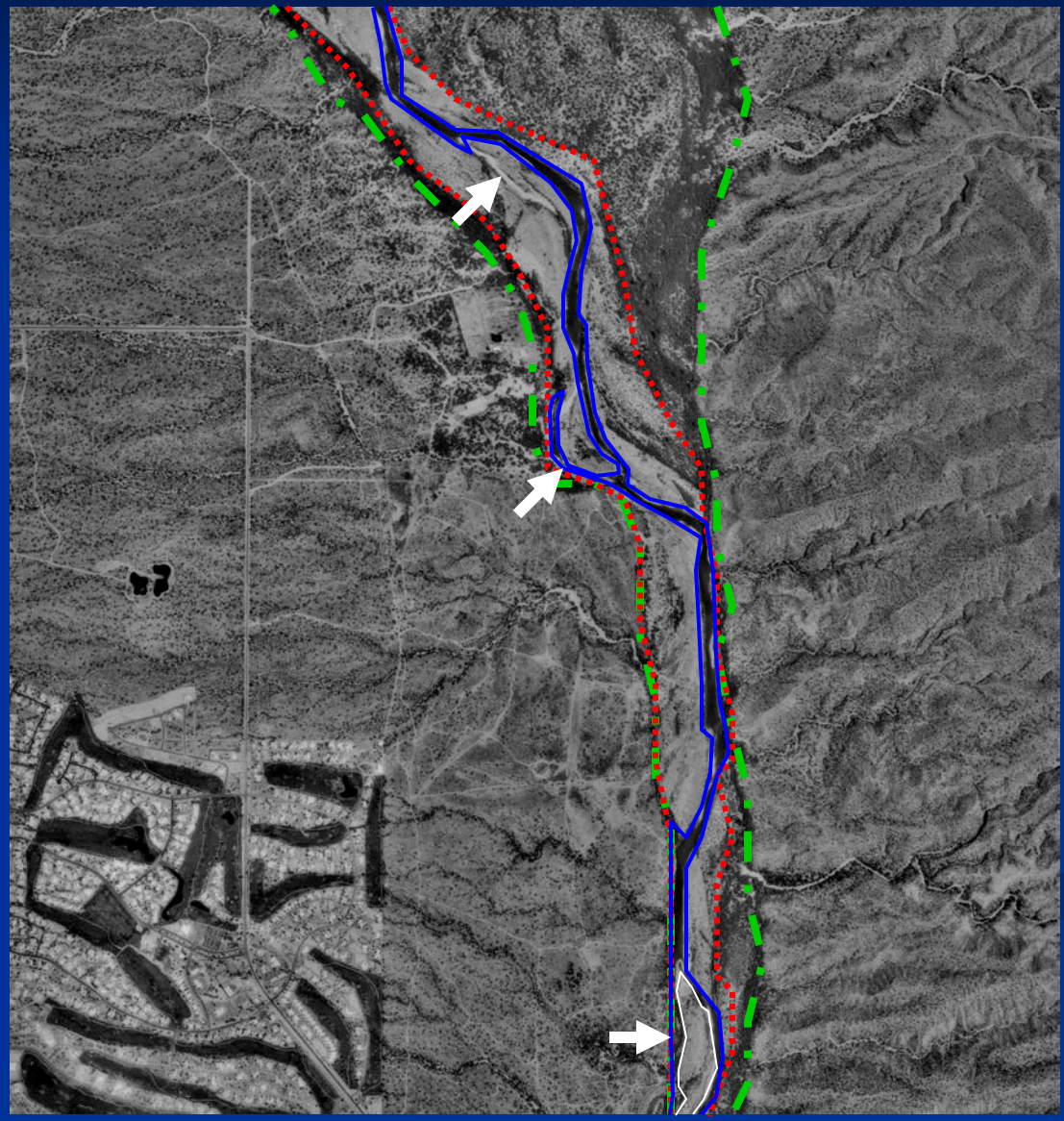
Chasm Creek canyon reach

- Low flow channel
- 1 to 2 low-flow channel threads common
- Flood channel
- Occupies all of valley bottom



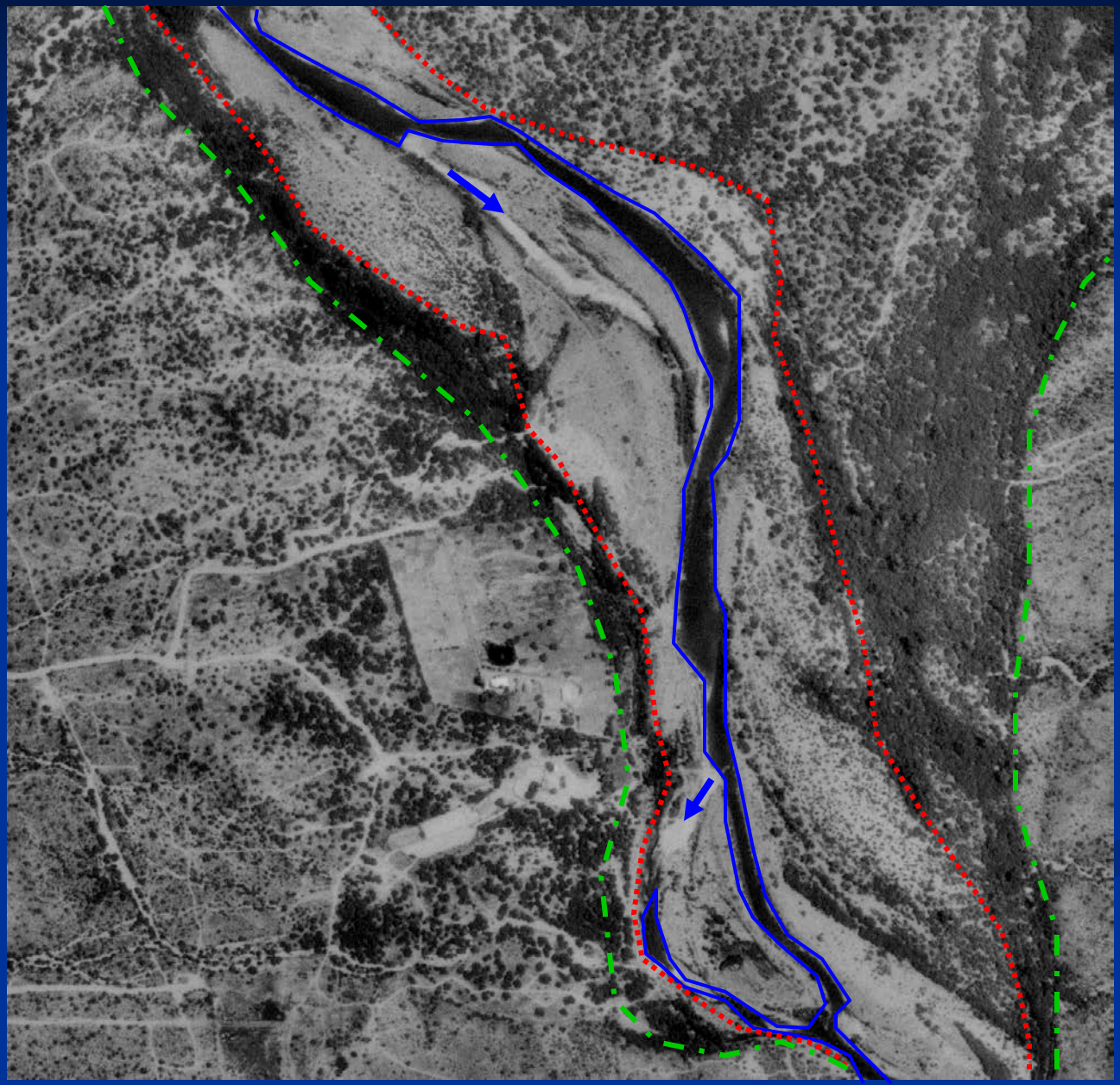
Fort McDowell alluvial reach

- Low-flow channel small part of floodplain
- 1 to 2 low-flow threads – stage dependent
- Lots of change in low-flow channel positions after floods

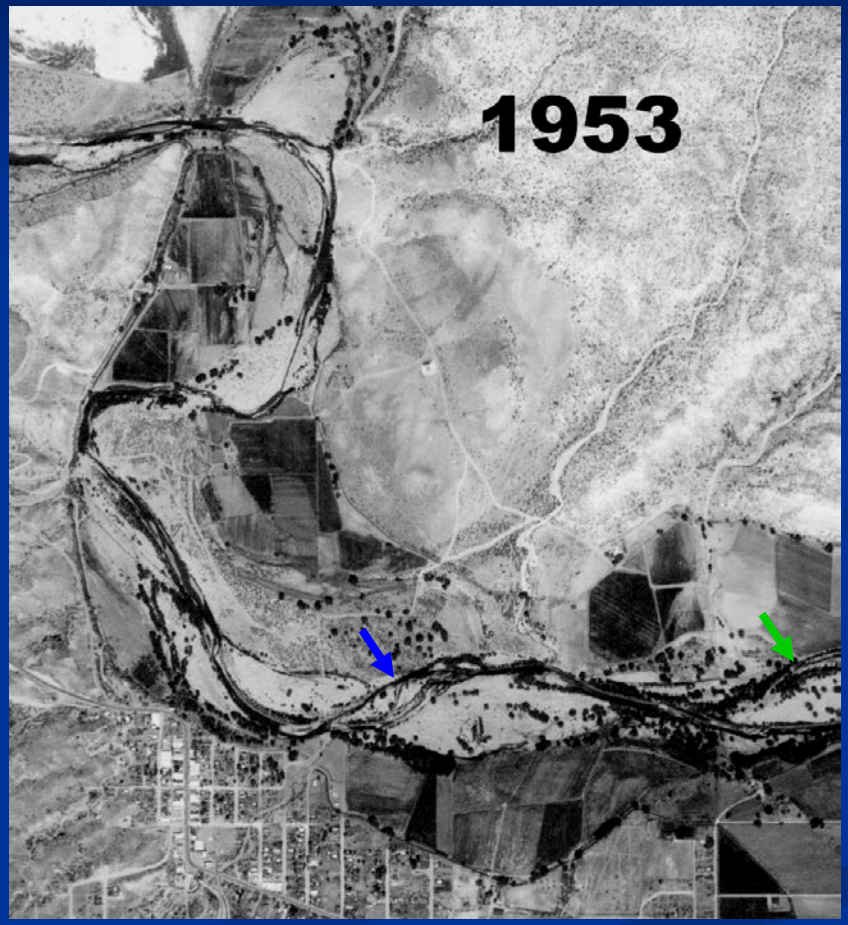


Fort McDowell alluvial reach

- low-flow channel
- *tendency for multiple channels at slightly higher flow*
- flood channel
- floodplain



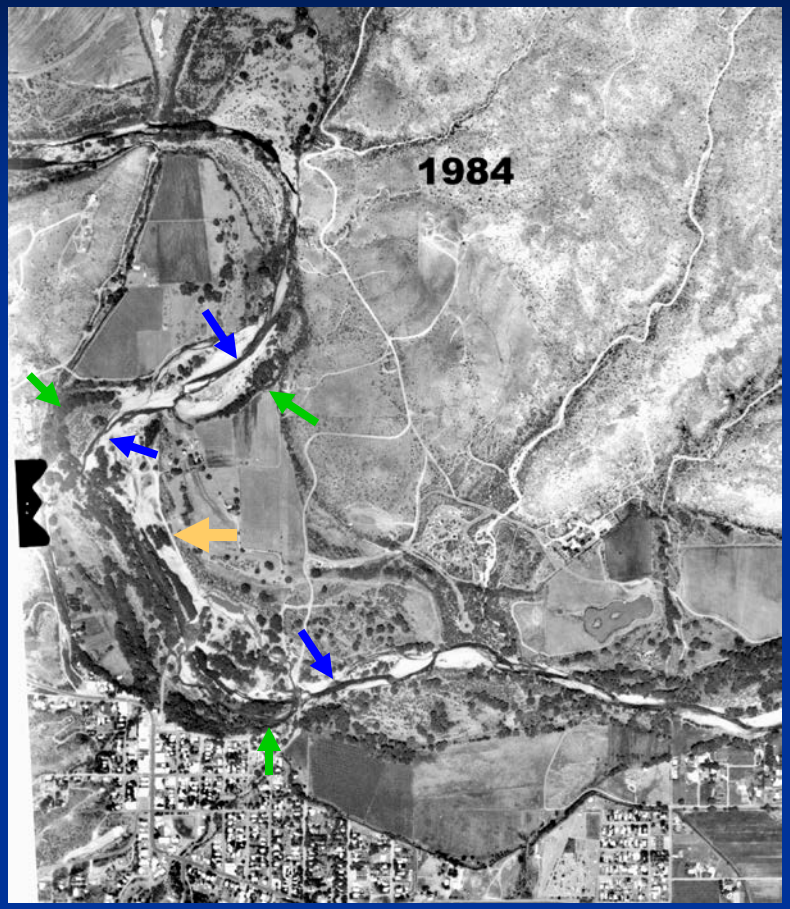
Channel changes - Cottonwood reach



Both photos shortly after one or more decent-sized floods

Higher flow in 1940?

Channel changes - Cottonwood reach

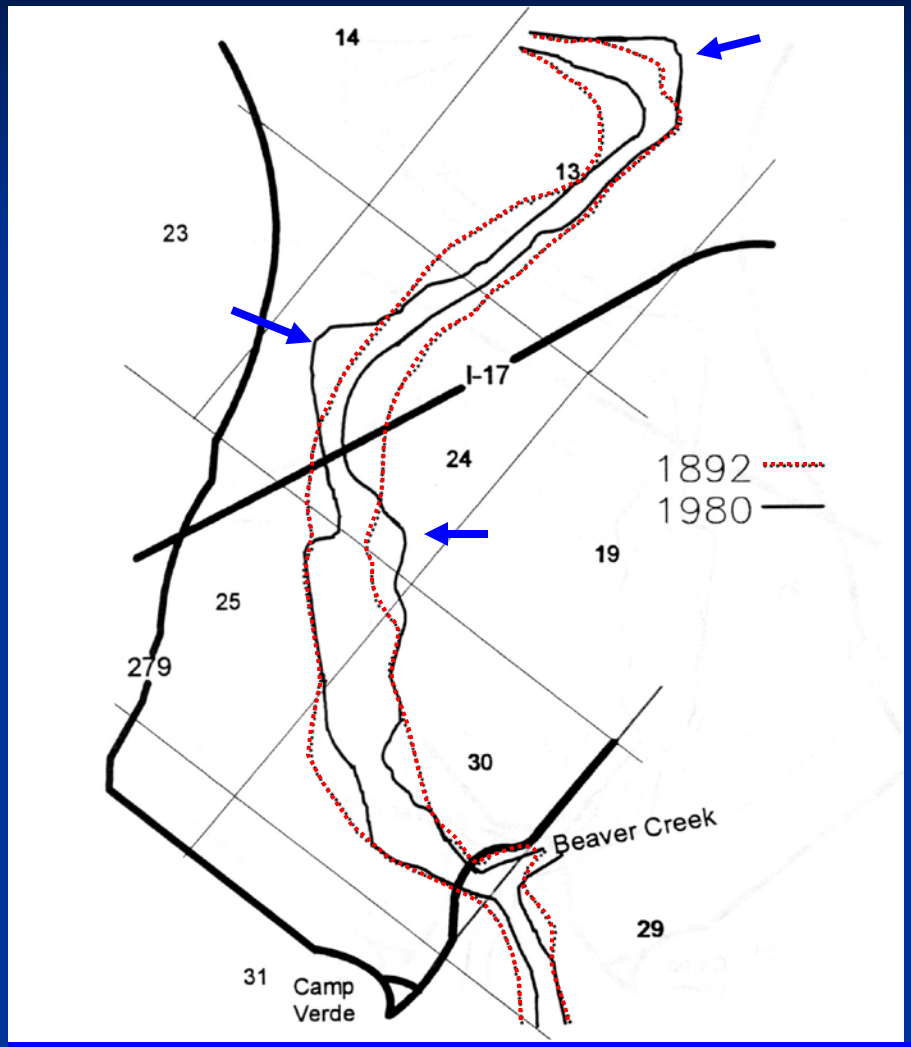


Large floods in late 1970's

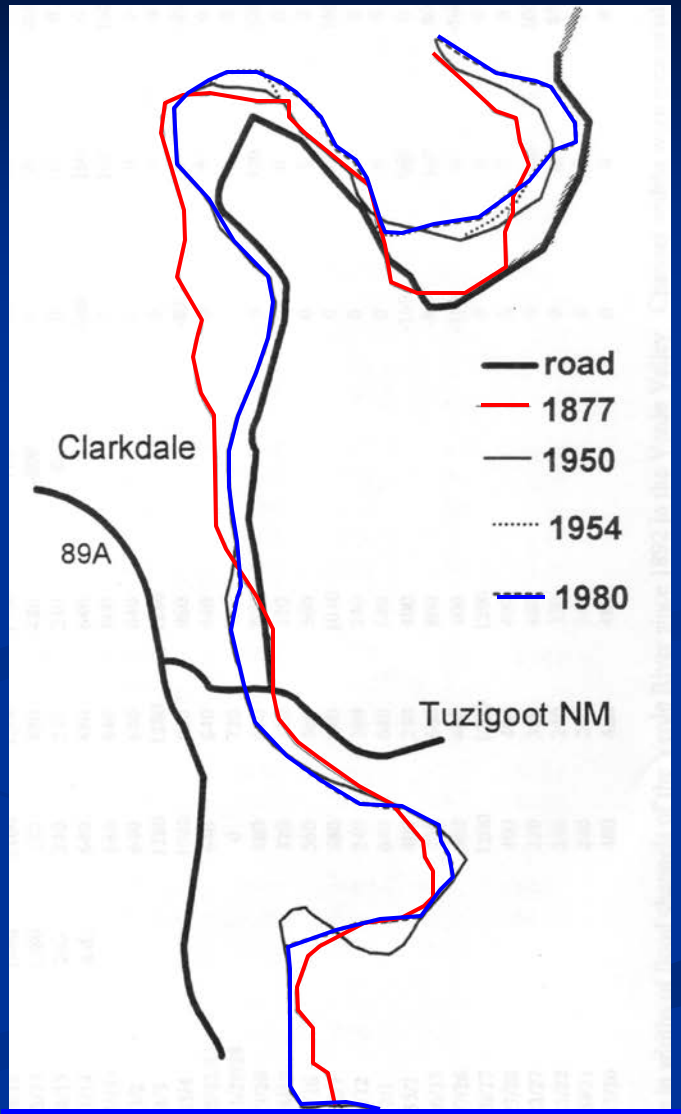
Increasing human impacts on channel

Aggregate operations

Examples of historical channel changes



Net flood channel change, Camp Verde area



Low-flow channel positions, Clarkdale – Tuzigoot area

Summary

- Verde River characterized by variations in valley, floodplain, and flood channel morphology
- Flood channels and low-flow channels modified in floods, especially ***low-flow channel positions***
- ***Low-flow channel morphologies and patterns*** vary a lot less than floodplains and flood channels
- Single low-flow channels with pools and riffles (rapids) characteristic