



An Overview of the Geomorphology of the Verde River

Arizona Navigable Stream Adjudication Commission

Philip A. Pearthree, Ph.D.

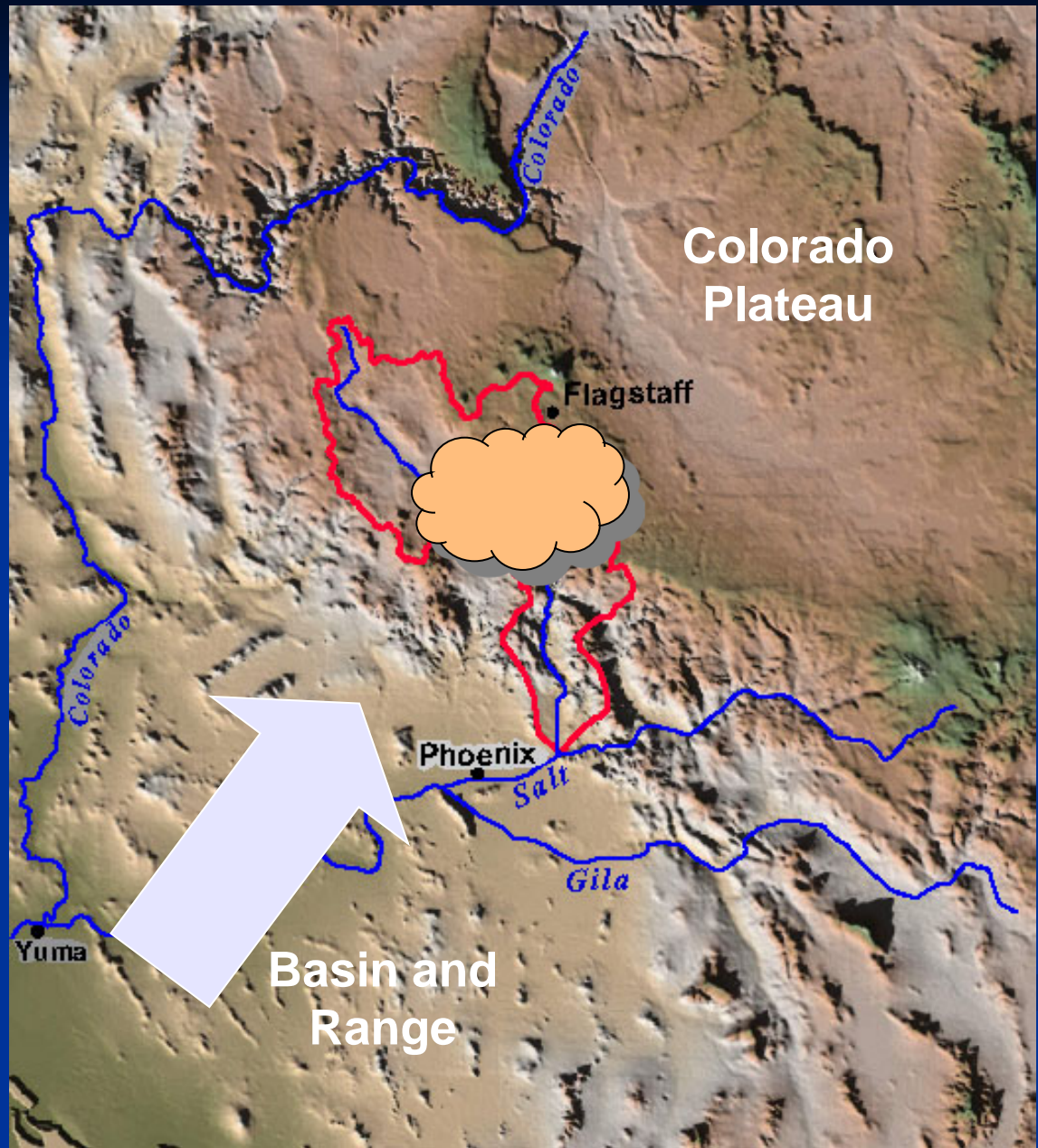
Research Geologist

Arizona Geological Survey

17 Nov 2005

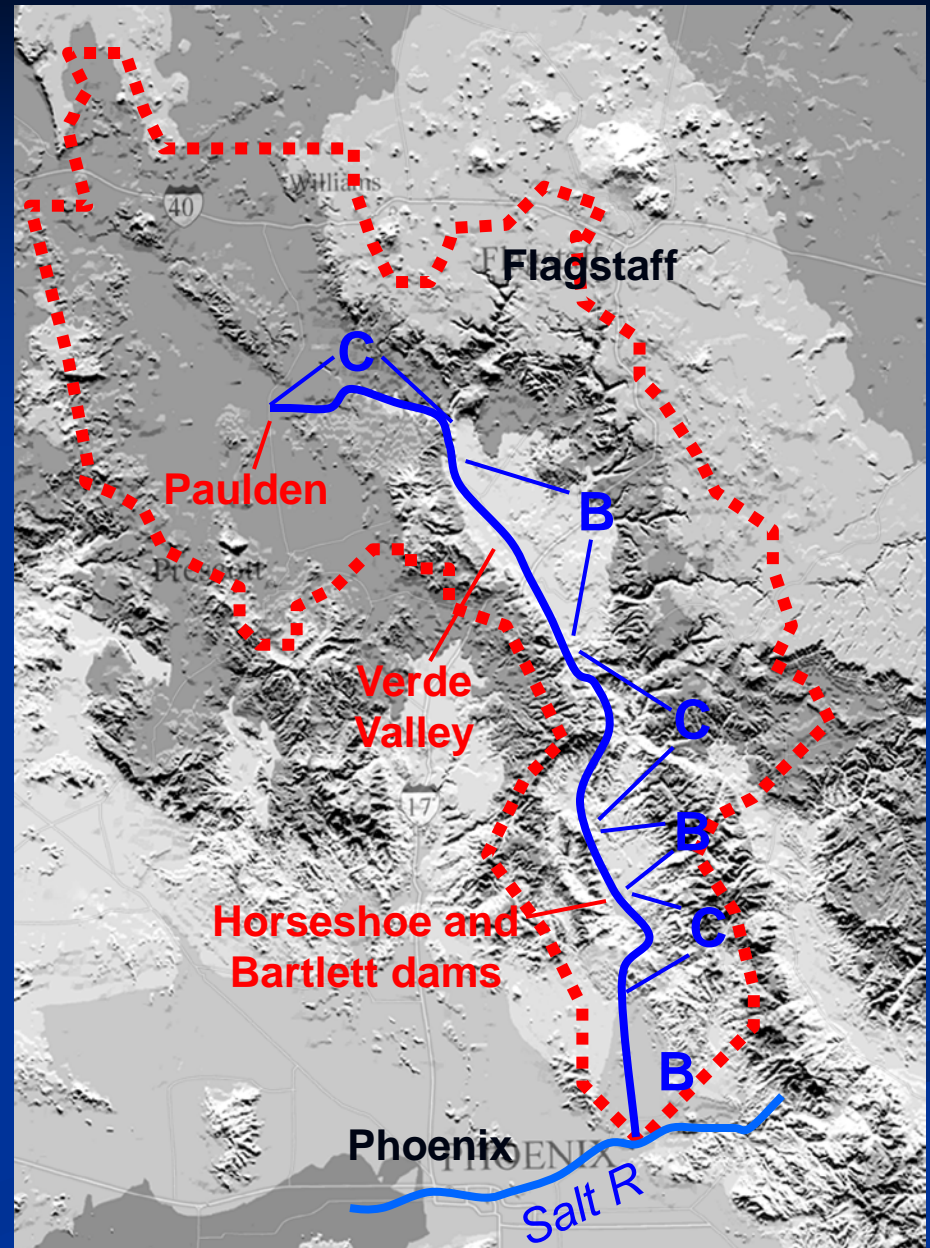
Major Rivers of Arizona

- Head in high, relatively wet terrain
- Flow through desert areas with $\frac{1}{3}$ to $\frac{1}{2}$ avg annual pptn
- They exist because regional topography rings water out of atmosphere



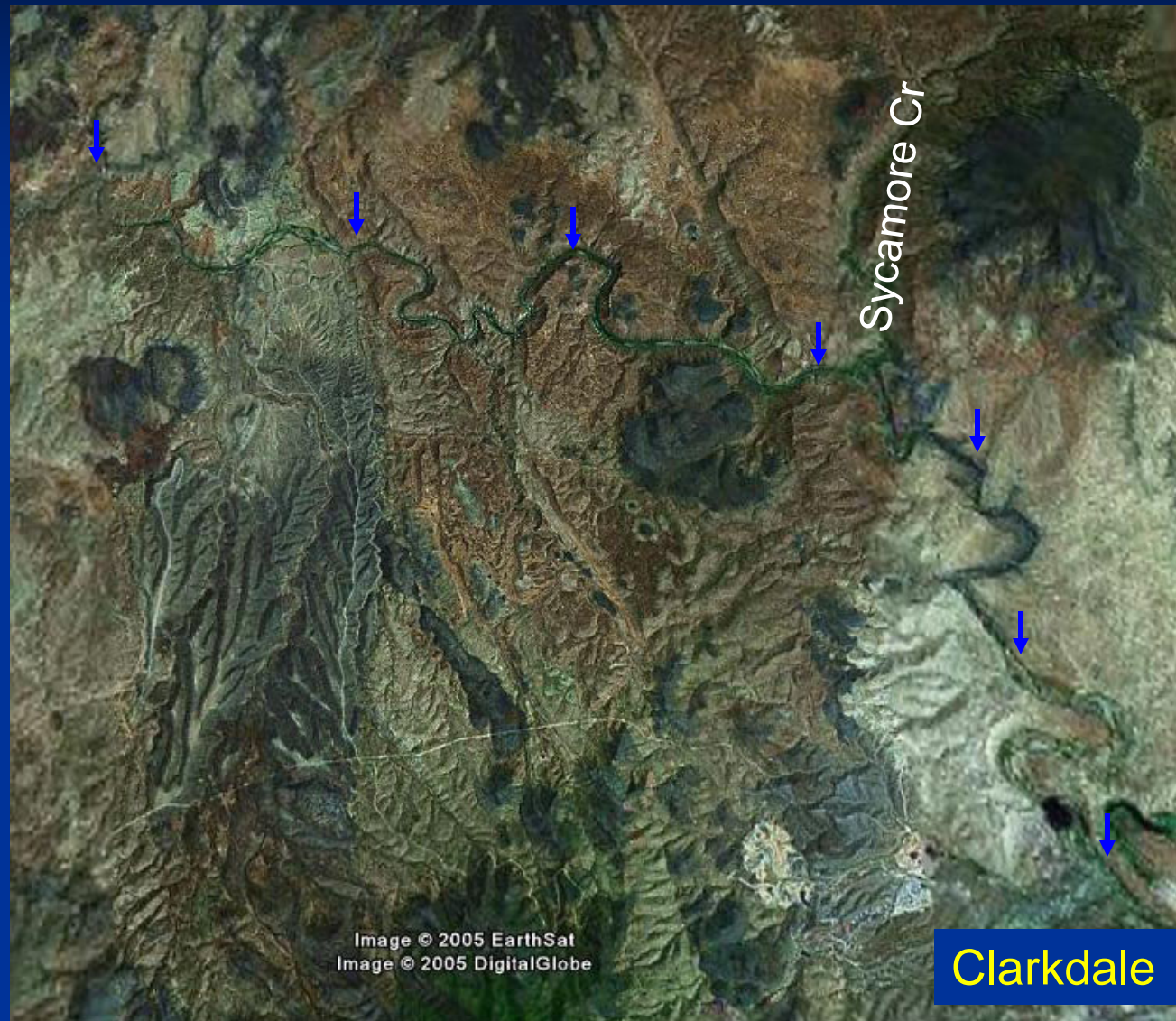
Verde River physiography

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



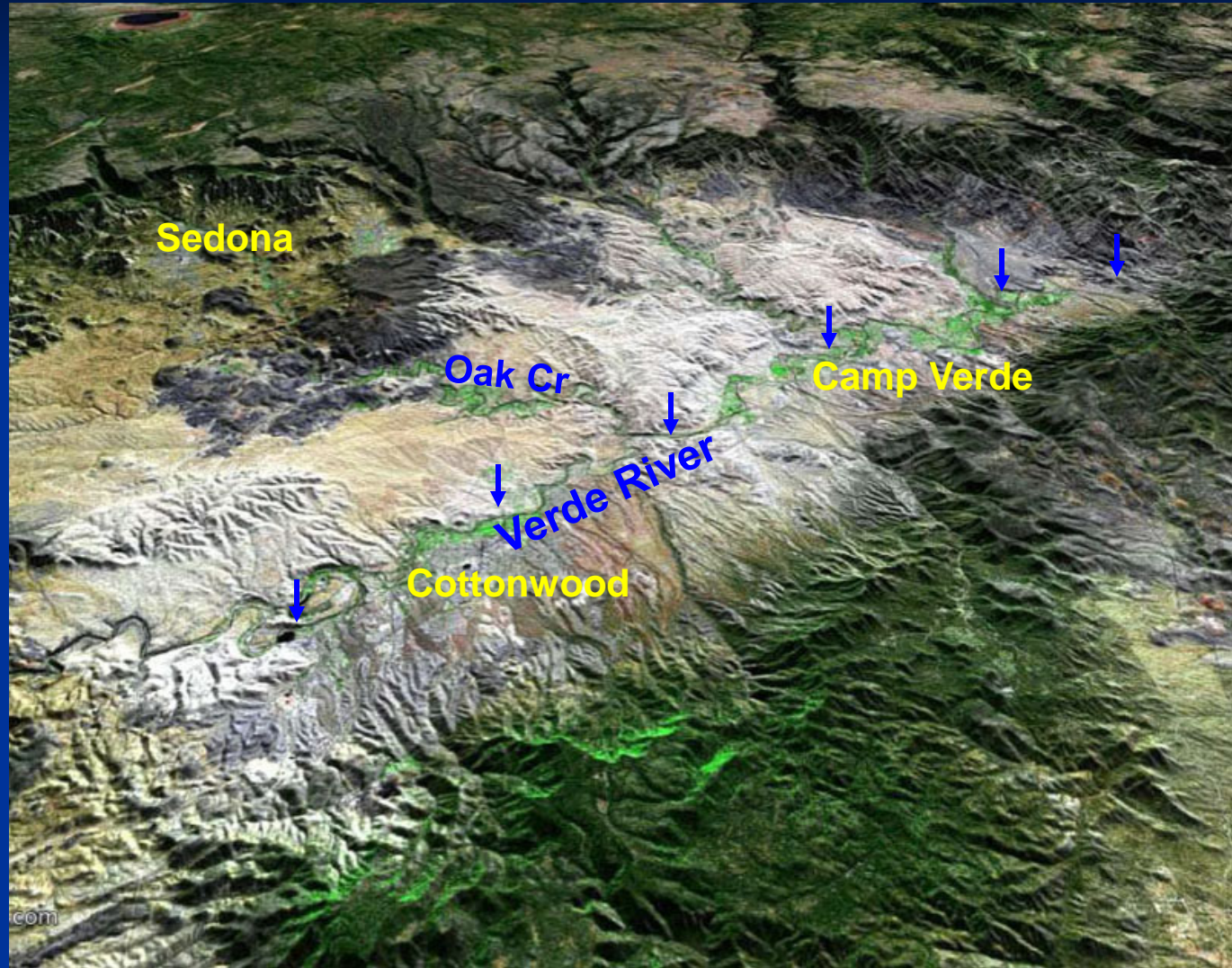
Upper Verde canyon reach

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

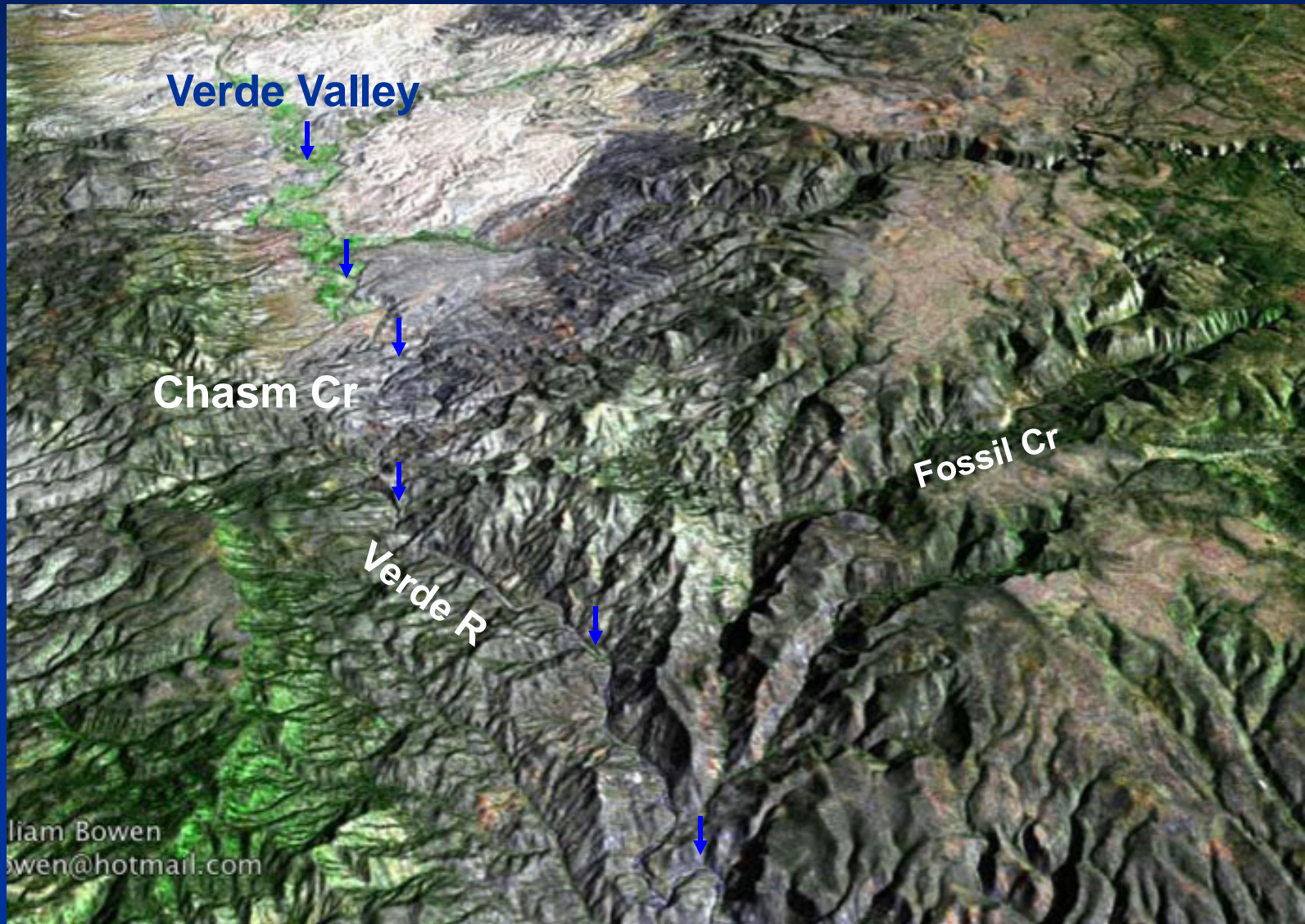


Verde Valley basin reach

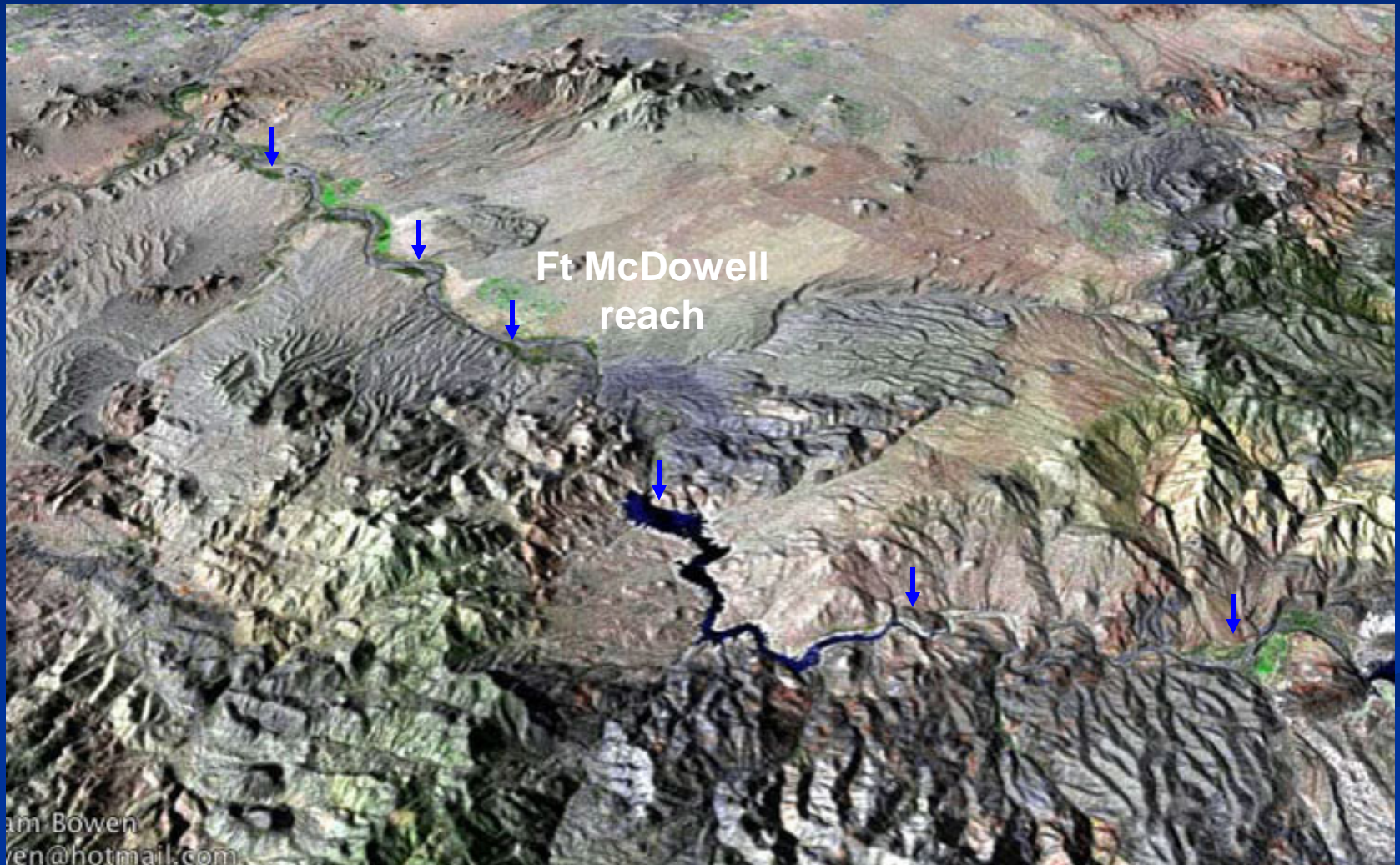
- *Relatively* broad floodplains
- River still entrenched
- Topographic confinement by older deposits



Chasm Creek canyon reach



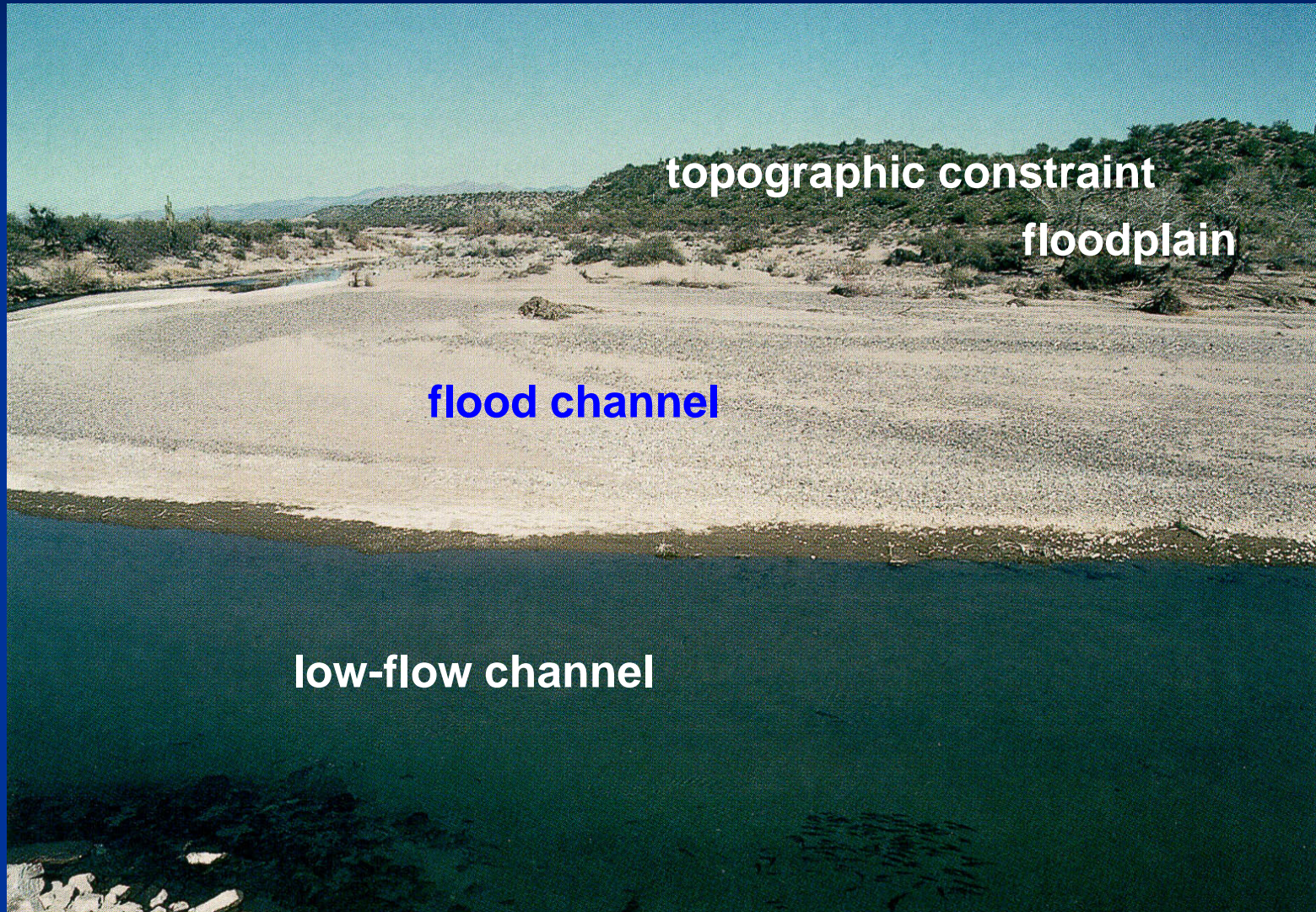
Lower Verde River dams, canyons, alluvial reaches



Basic river terminology

- Floodplains – areas along margins of river that are inundated in large floods; typically densely vegetated
- Flood channels – areas of deep, high-velocity flow in floods with relatively less 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)

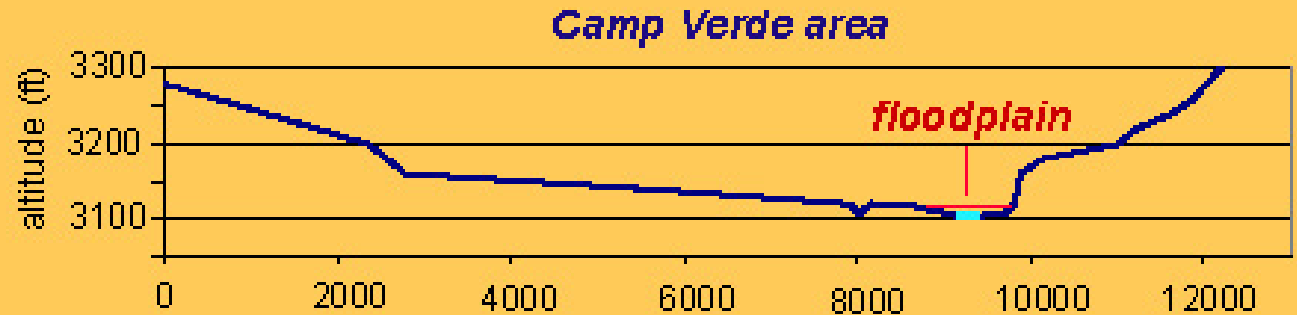
Major geomorphic elements of the river



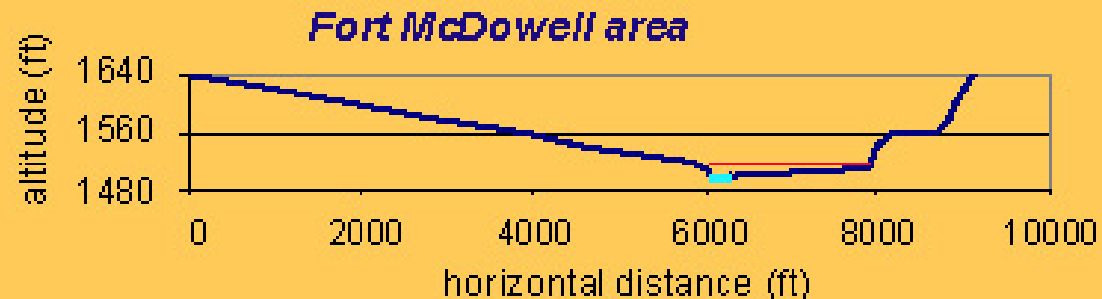
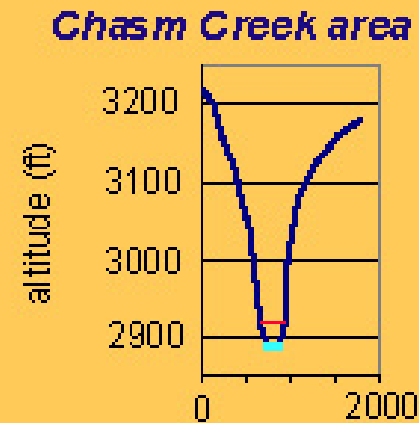
pools and riffles



Variations in valley and floodplain form

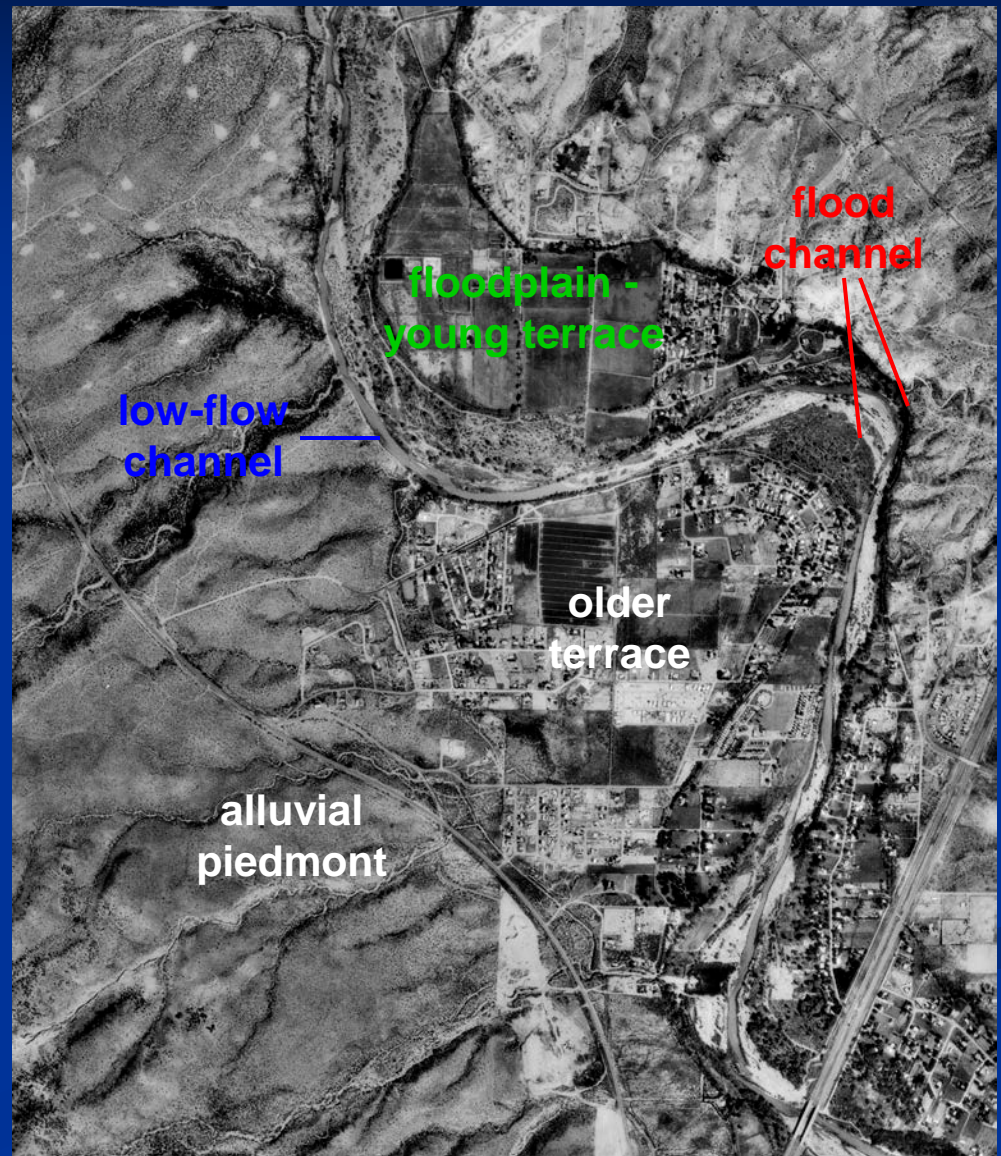


<i>Area</i>	<i>floodplain width</i>	<i>low-flow channel*</i>
Camp Verde	1000	175
Chasm Cr	370	140
Fort McDowell	1850	175

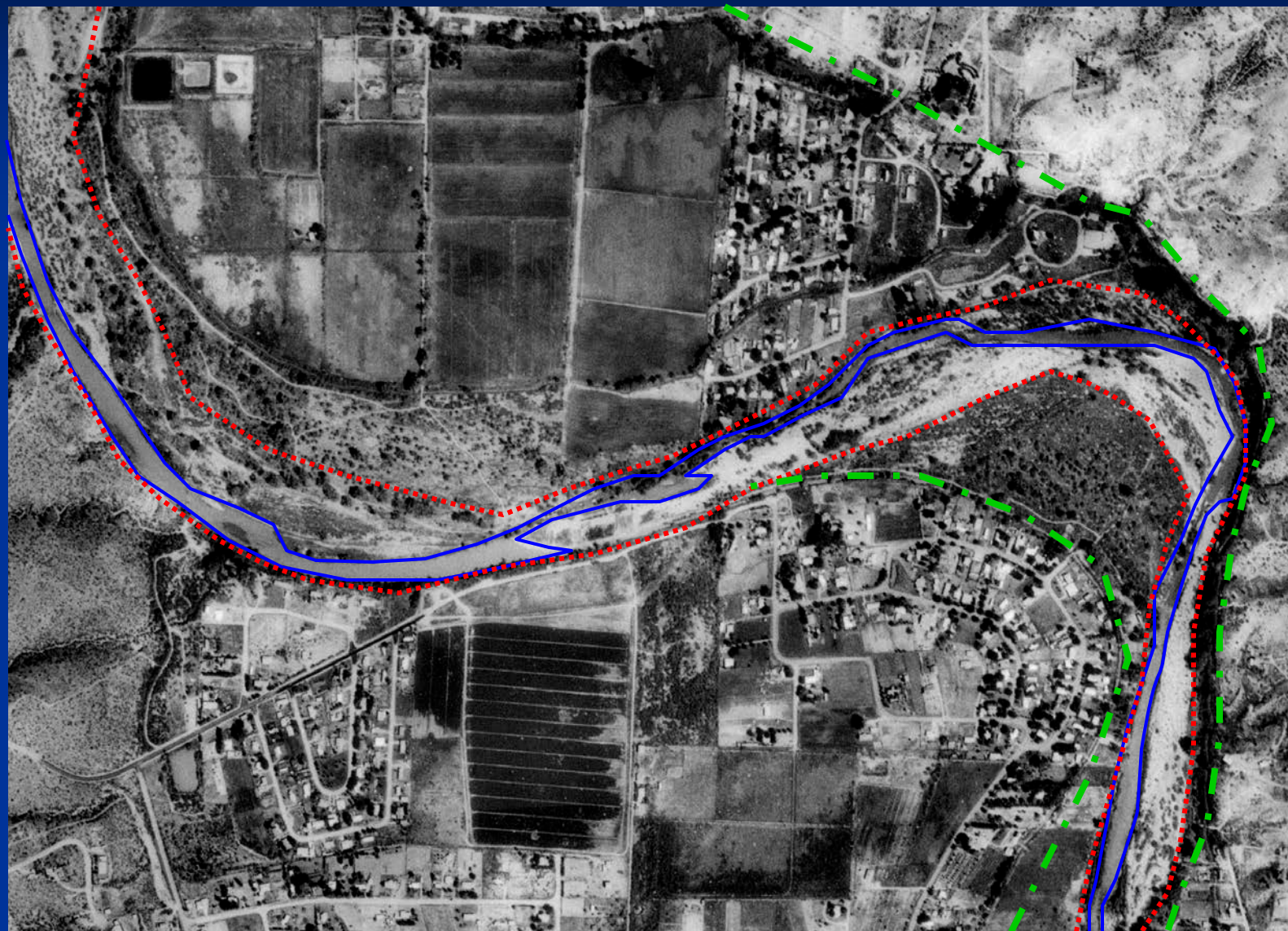


Geomorphic elements of the Verde R

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



Camp Verde reach



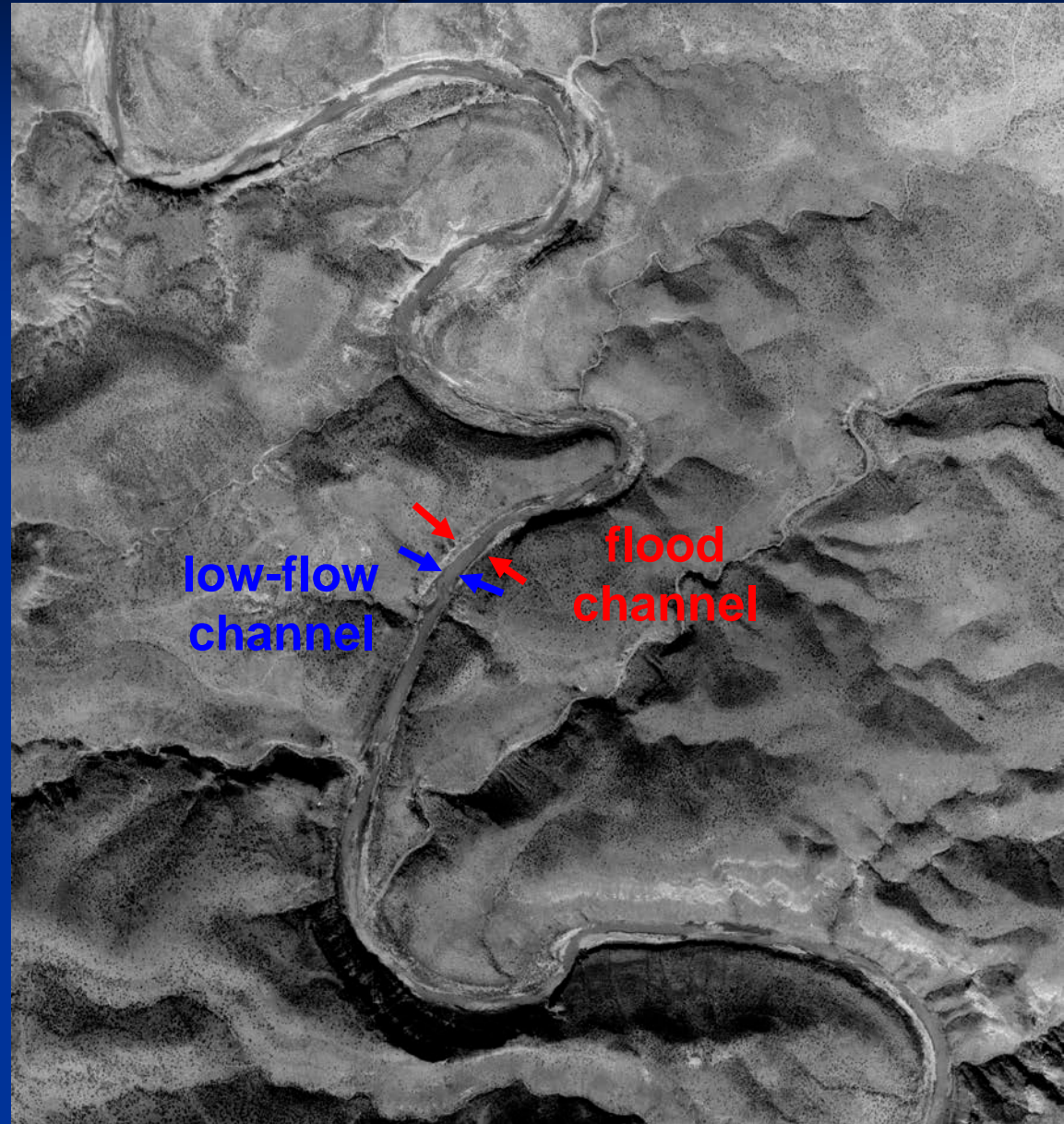
low-flow
channel

flood
channel

floodplain

Chasm Creek canyon reach

- Deeply entrenched in narrow valley
- Low flow channel occupies relatively more of flood channel and valley bottom
- 1 to 2 low-flow channel threads common



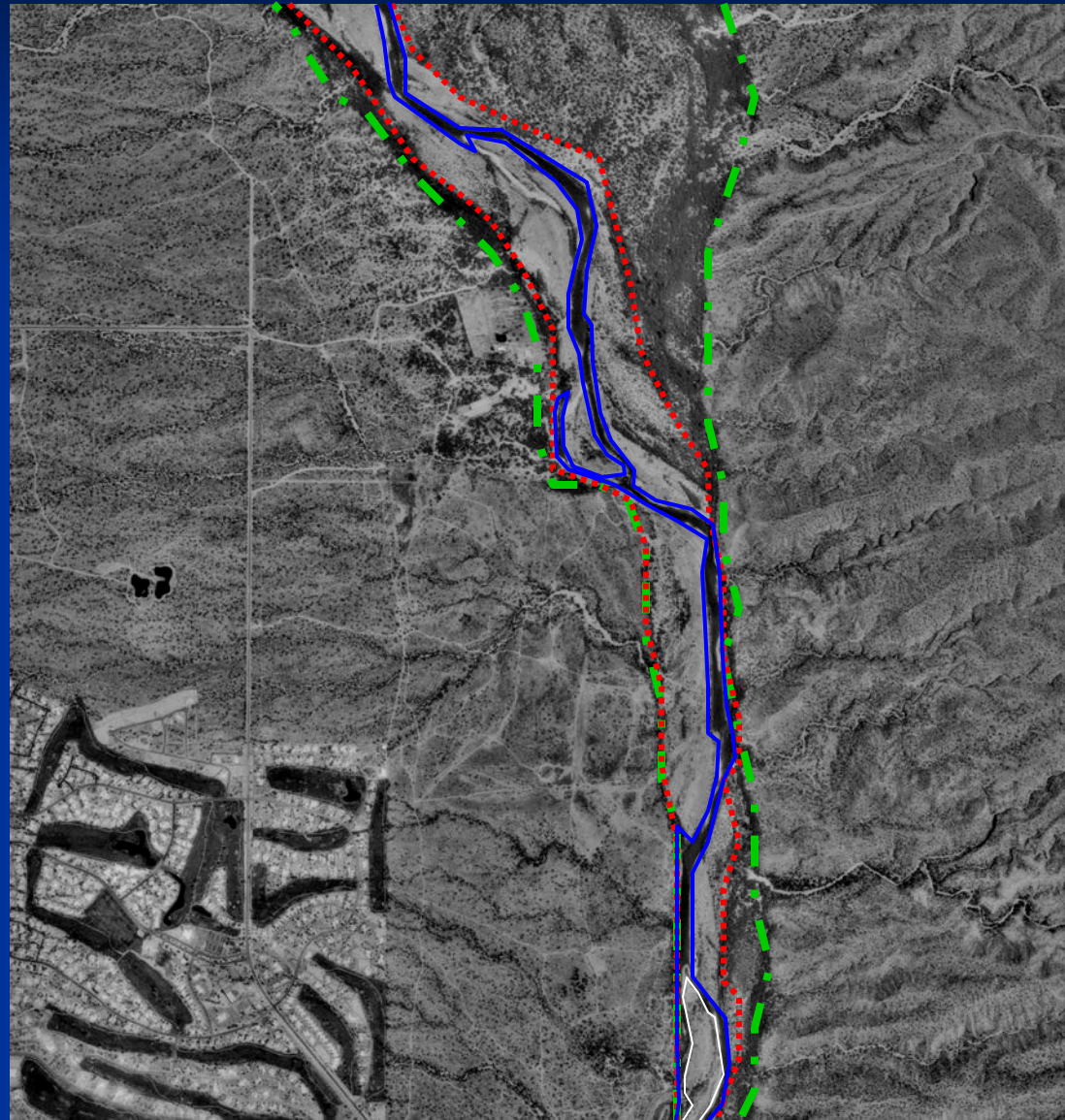
Chasm Creek canyon reach

- Low flow channel
- Flood channel



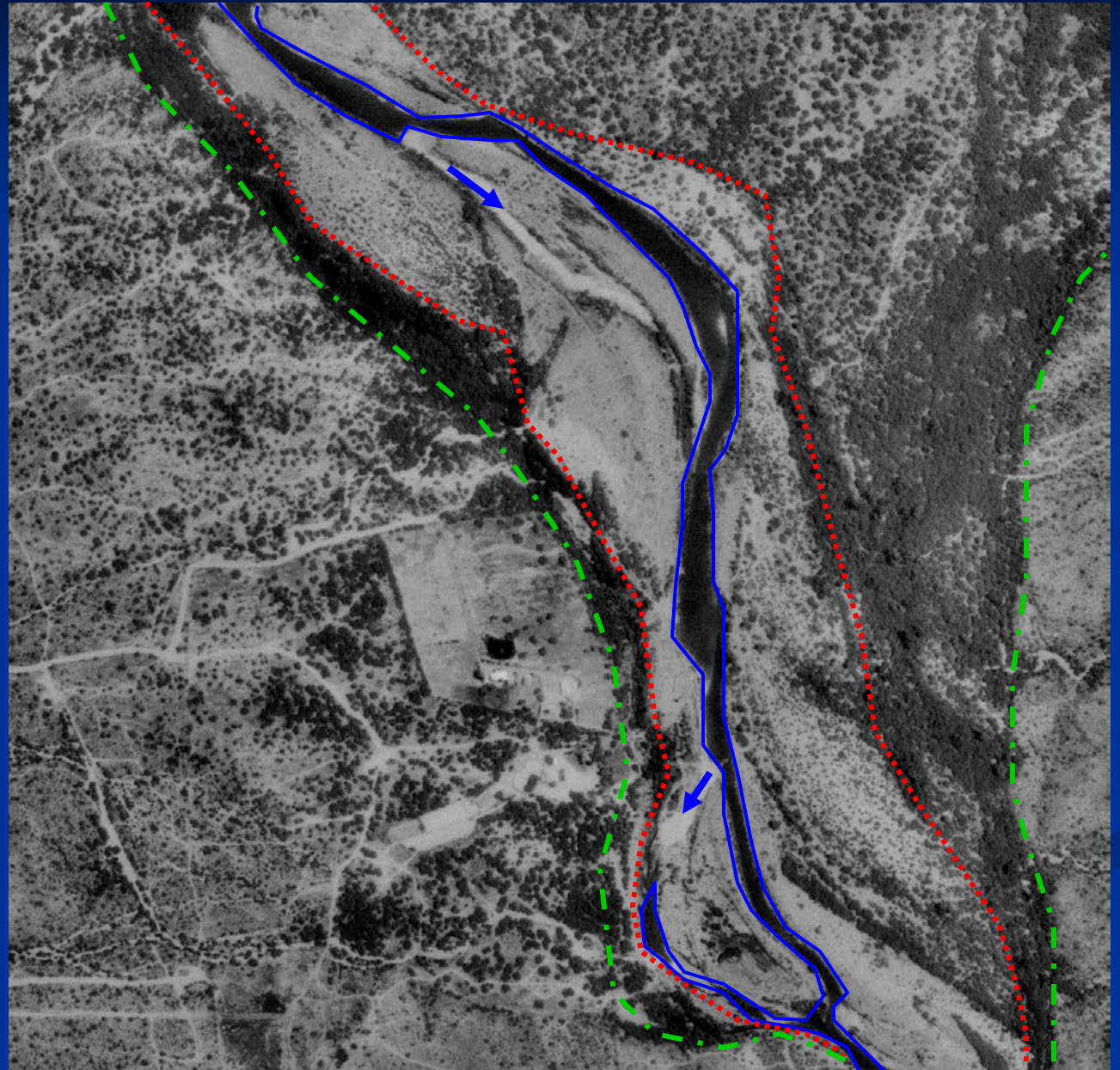
Fort McDowell alluvial reach

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

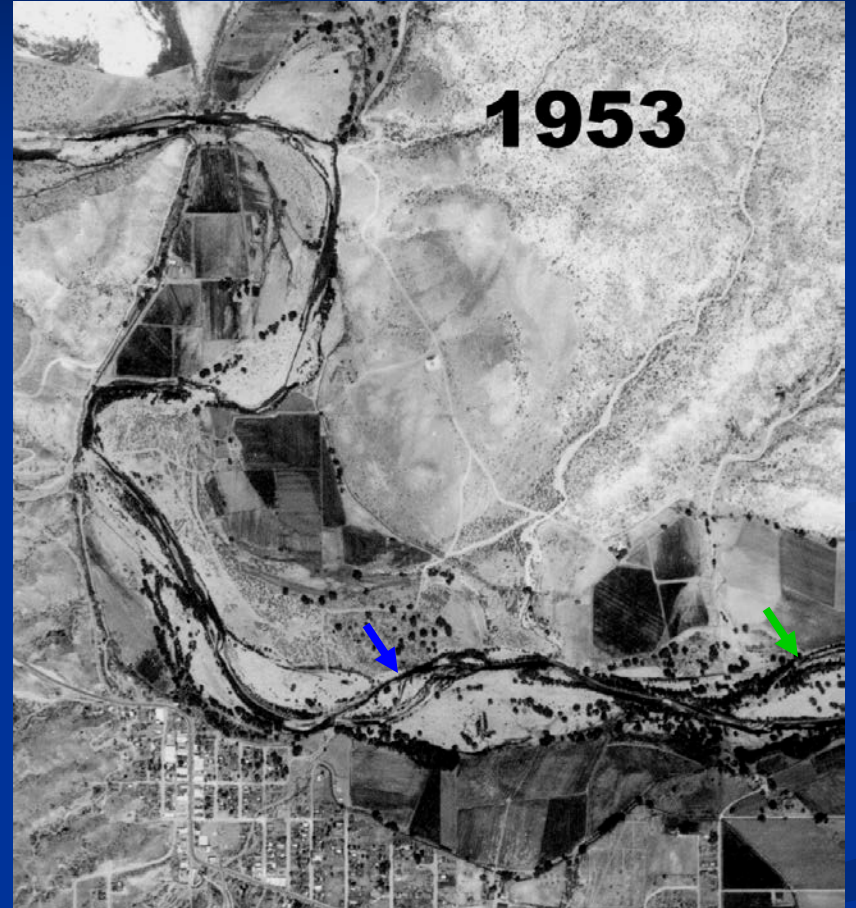


Fort McDowell alluvial reach

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



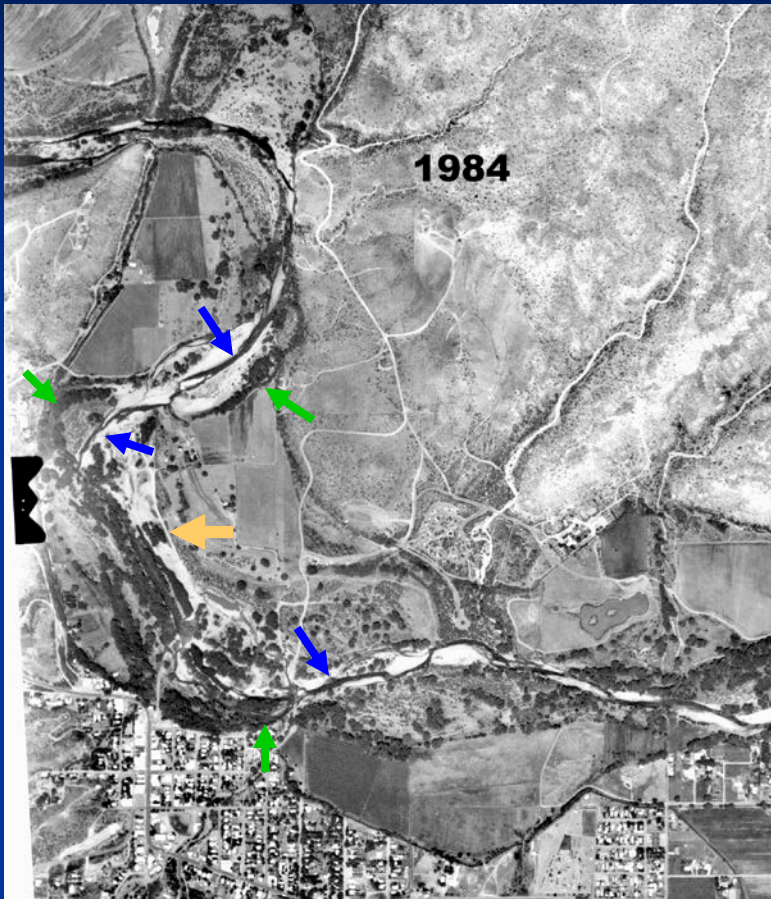
Channel changes - Cottonwood reach



Both photos shortly after one or more decent-sized floods

Higher flow in 1940?

Channel changes - Cottonwood reach

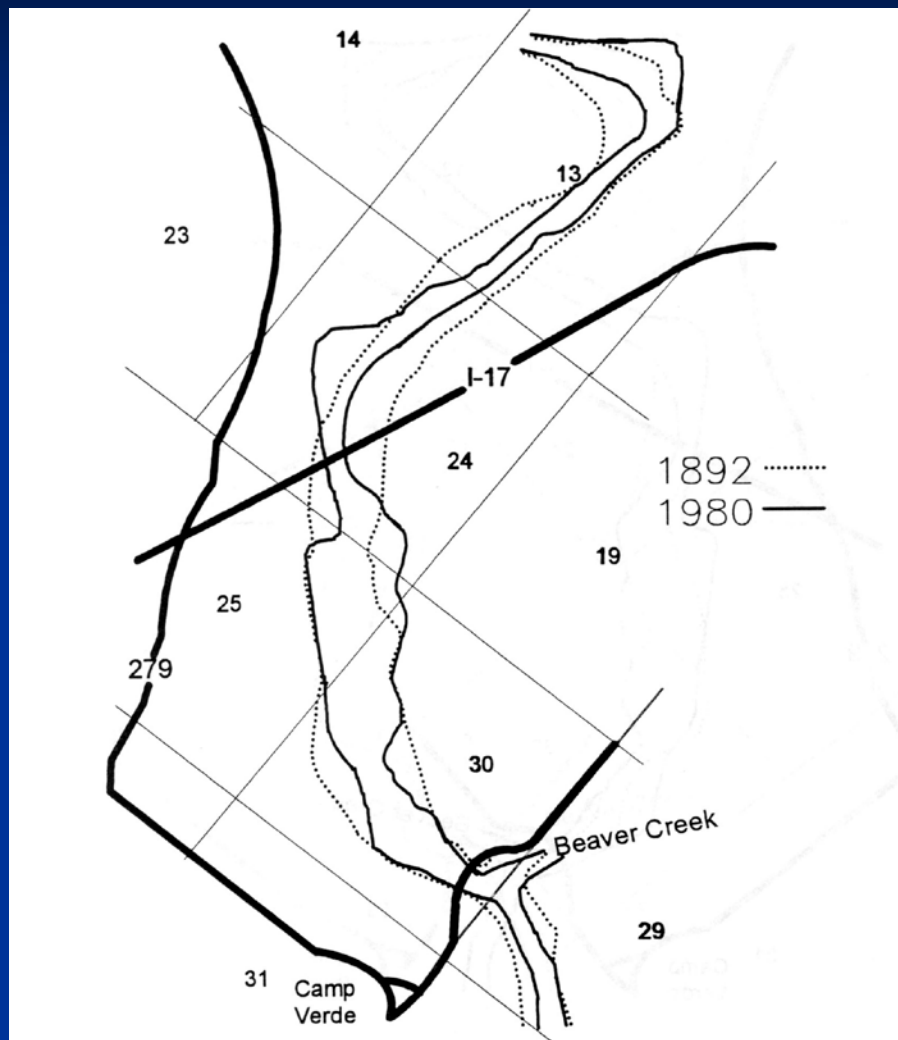


Large floods in late 1970's

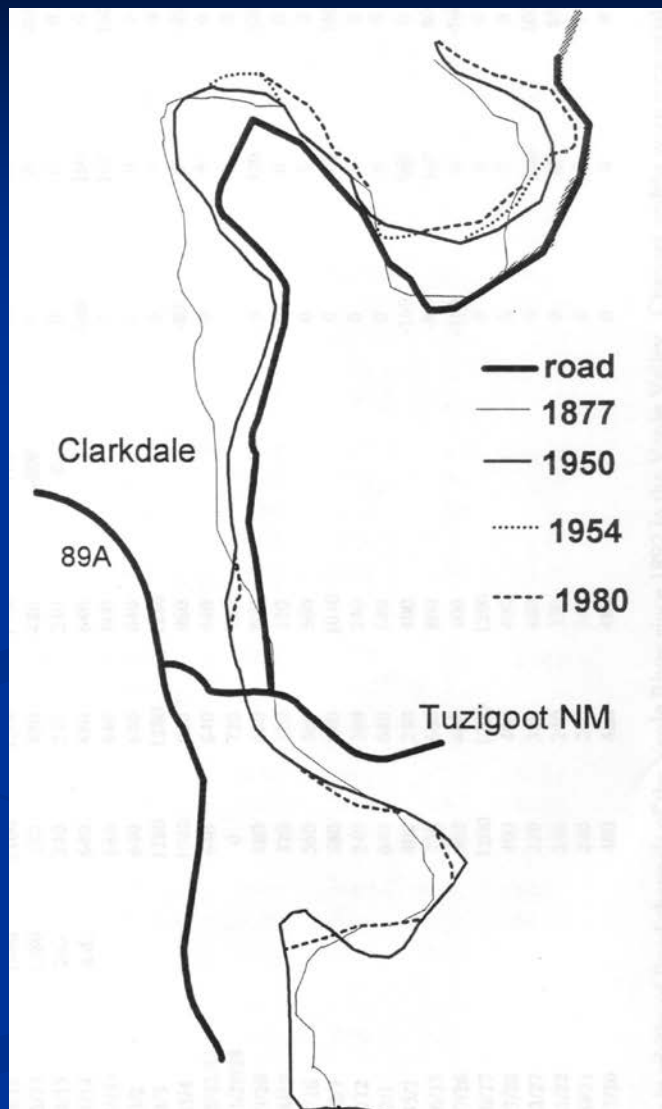
Increasing human impacts on channel

Aggregate operations

Examples of historical channel changes



Net flood channel change, Camp Verde area



Low-flow channel positions, Clarkdale - Tuzigoot area

Summary

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