

Senate Bill 3 Environmental Flows Science Advisory
Committee (SAC)

May 9, 2011

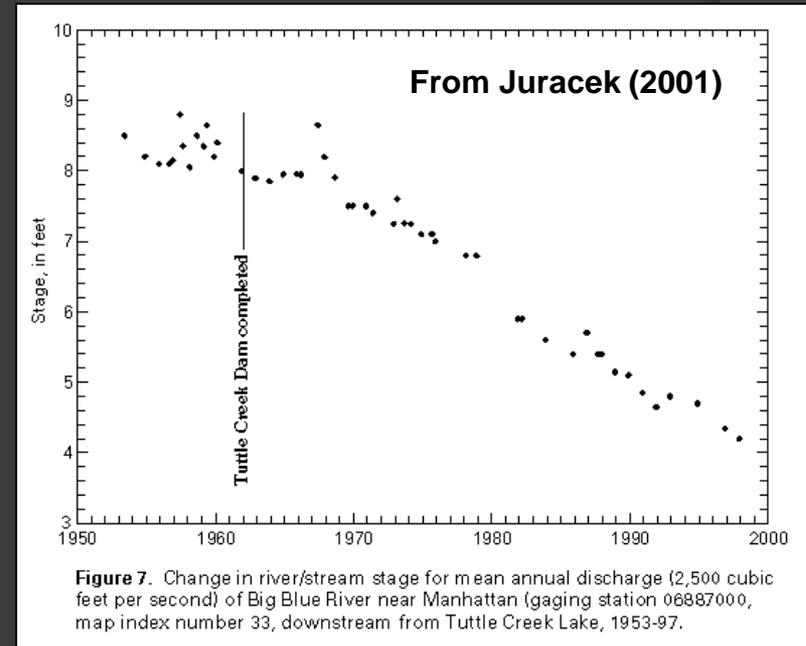
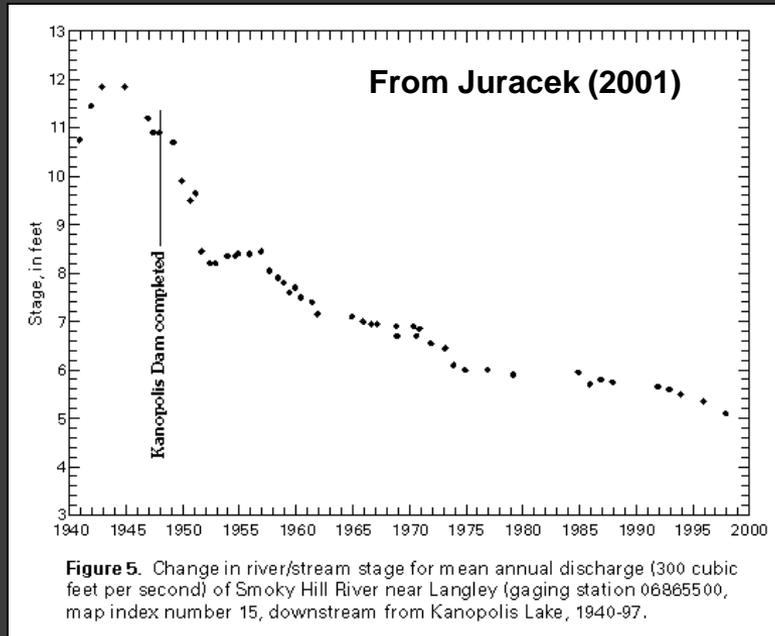
EXCERPTS OF GEOMORPHIC CHANGE ASSOCIATED WITH DAMS

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General Model for Perennial Rivers

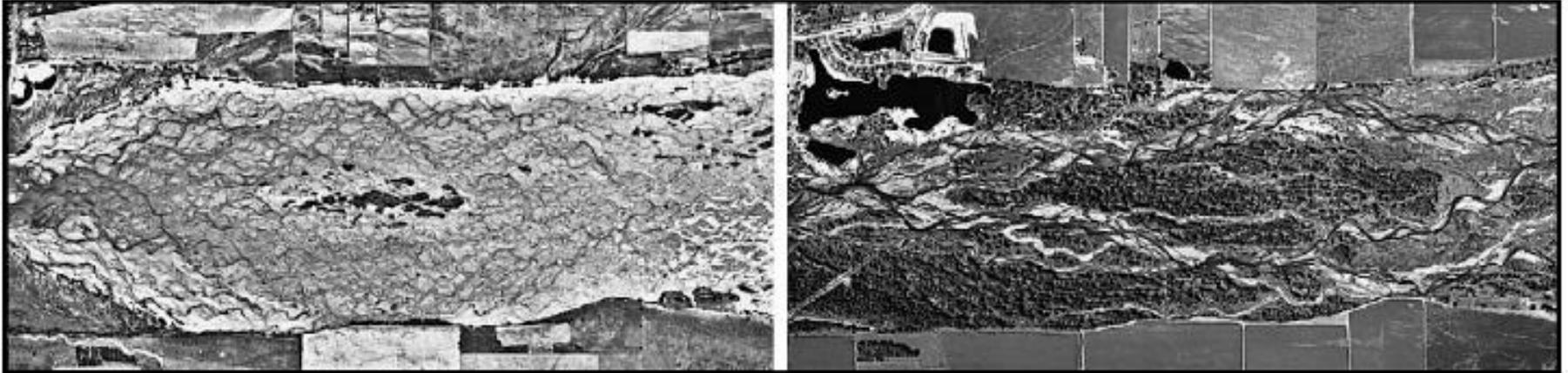
- Perennial, alluvial streams → *Channel incision* immediately downstream of dam
- *Reduced connectivity* with overbank riparian environments
- Channel deepening → “oversteepened” banks fail → *channel widening*
- *Bedrock* serves to limit vertical incision → alluvial banks might still fail → channel widening
- *Tributaries* draining to affected main-stem → upstream migration of an *erosional knickpoint*

Kansas Examples



- Progressive channel-bed degradation for decades
- Discharge is released, but sediment is trapped in reservoir

Platte River, Nebraska



From Graf (2006)

- Hydrologic variability is reduced → former “active” bar surfaces no longer accessed → woodland encroachment
- Associated changes in planform geometry → alteration of former habitat structure

Brazos River, Texas

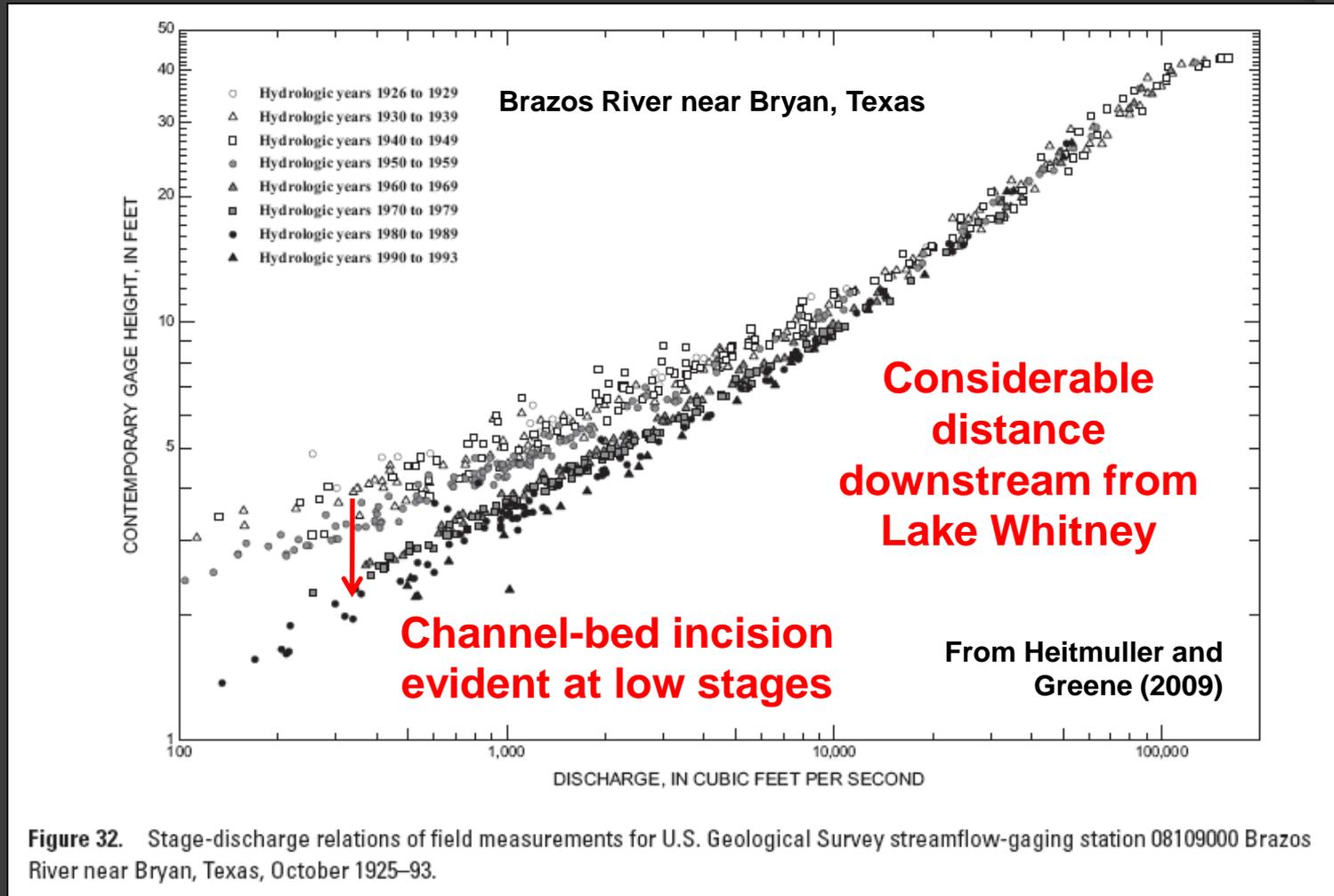
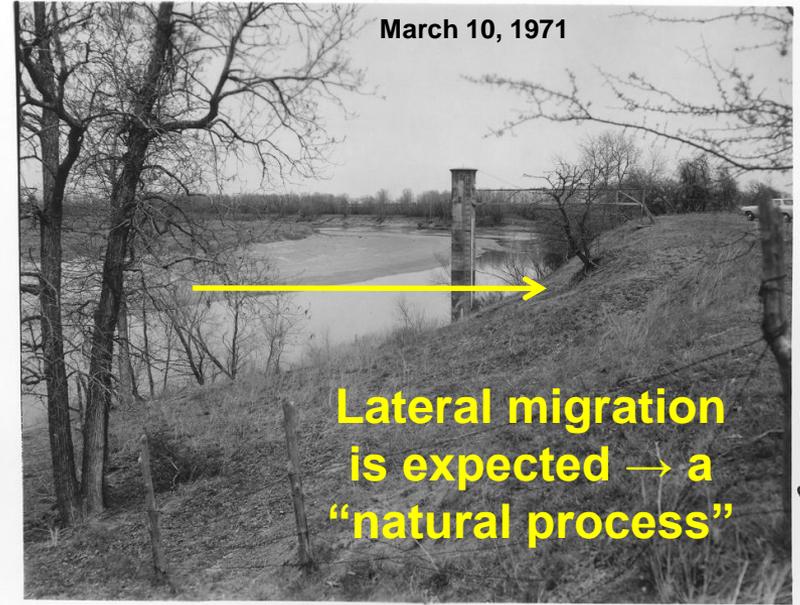


Figure 32. Stage-discharge relations of field measurements for U.S. Geological Survey streamflow-gaging station 08109000 Brazos River near Bryan, Texas, October 1925–93.

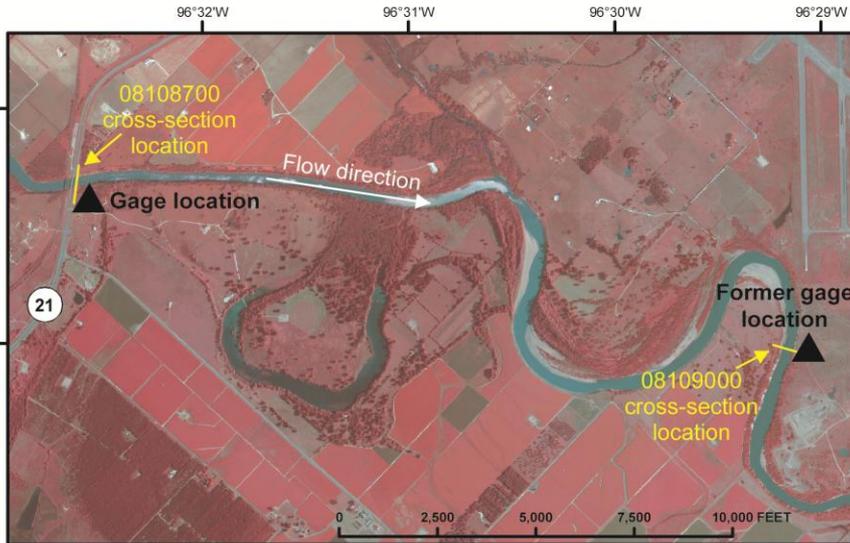
February 5, 1954



March 10, 1971



Lateral migration is expected → a "natural process"



2004 National Agriculture Imagery Program color infrared imagery
Projection: Universal Transverse Mercator Zone 14 North
Datum: North American Datum 1983

From Heitmuller and Greene (2009)

Channel bench

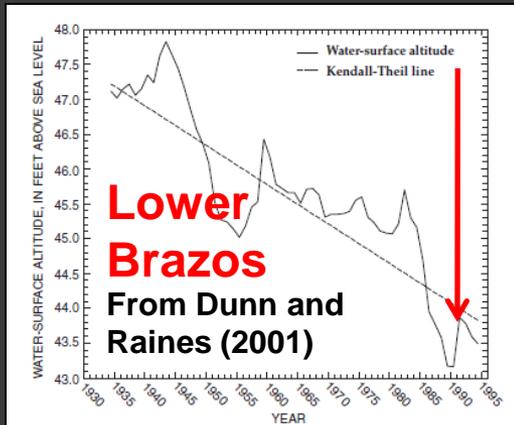
April 2, 2008



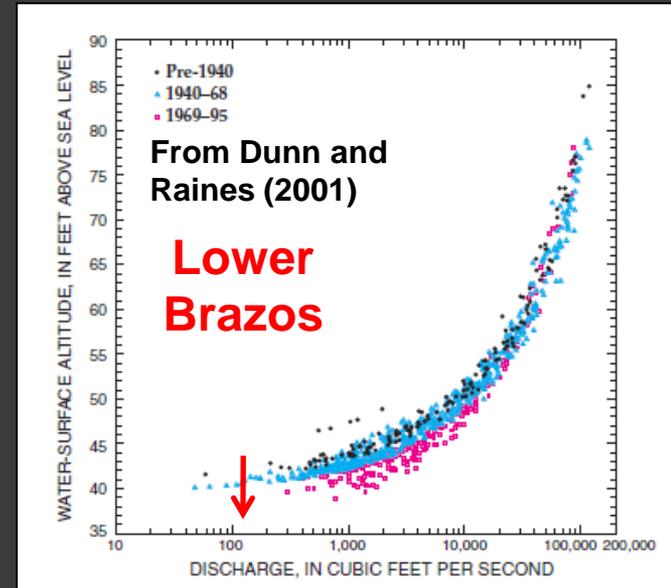
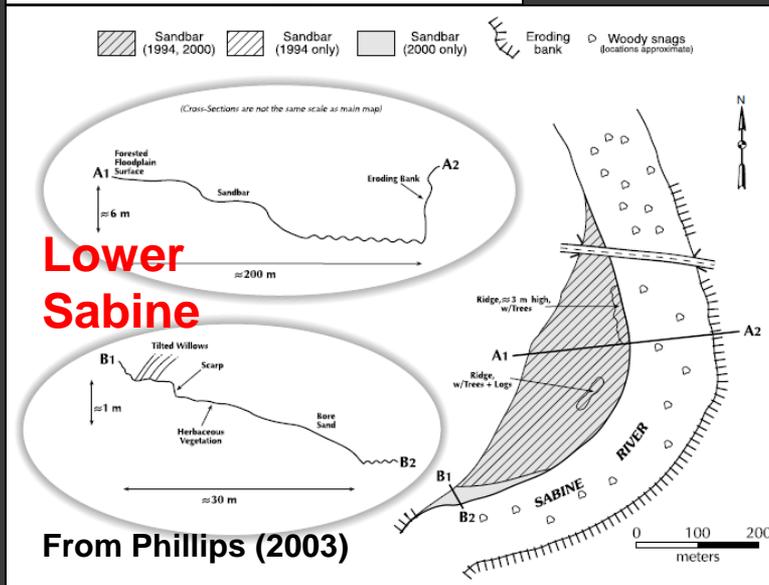
Brazos River near Bryan, Texas

Heitmuller, F.T., and Greene, L.E., 2009, Historical channel adjustment and selected hydraulic values in the Lower Sabine River and Lower Brazos River Basins, Texas and Louisiana: U.S. Geological Survey Scientific Investigations Report 2009-5174, 144 p.

Lower Brazos and Sabine Rivers



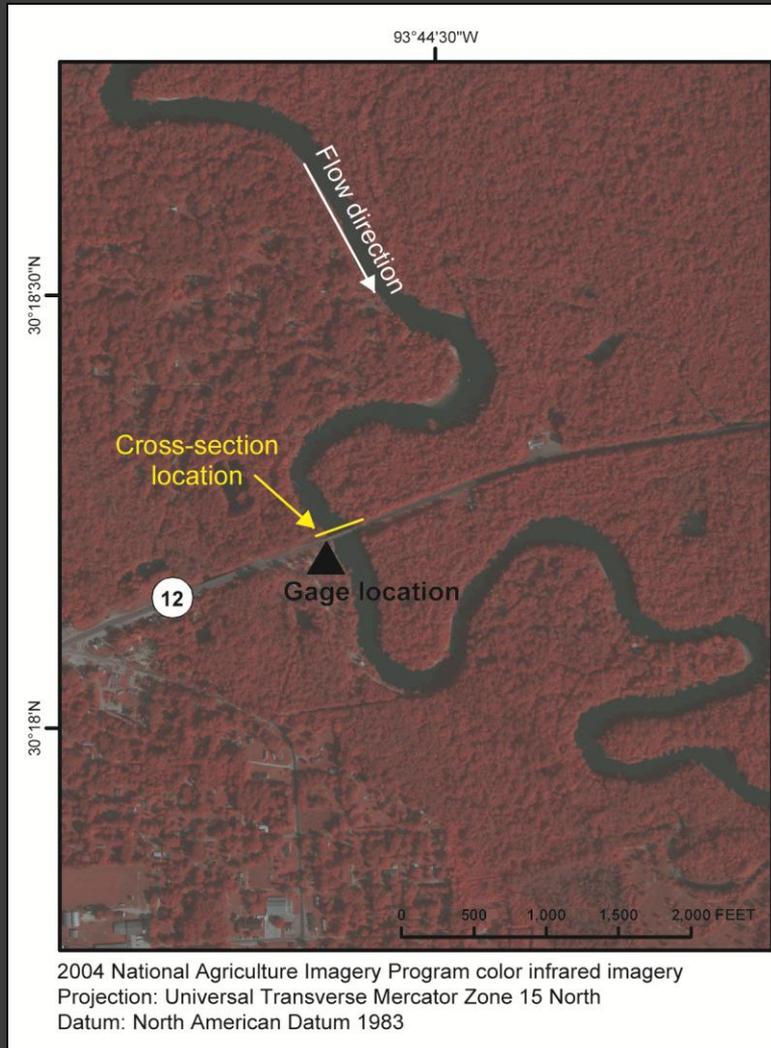
- **Lower Brazos River** → channel-bed incision documented (Dunn and Raines, 2001)
- **Lower Sabine River** → incision only documented immediately downstream of Toledo Bend (Phillips, 2003)



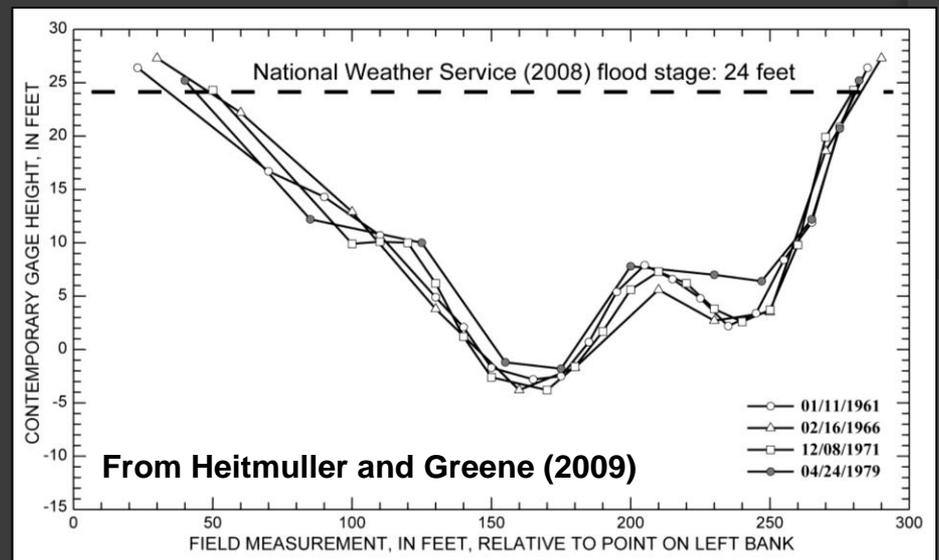
Dunn, D.D., and Raines, T.H., 2001, Indications and potential sources of change in sand transport in the Brazos River, Texas: U.S. Geological Survey Water-Resources Investigations Report 01-4057, 32 p.

Phillips, J.D., 2003, Toledo Bend Reservoir and geomorphic response in the lower Sabine River: River Research and Applications, v. 19, p. 137-159.

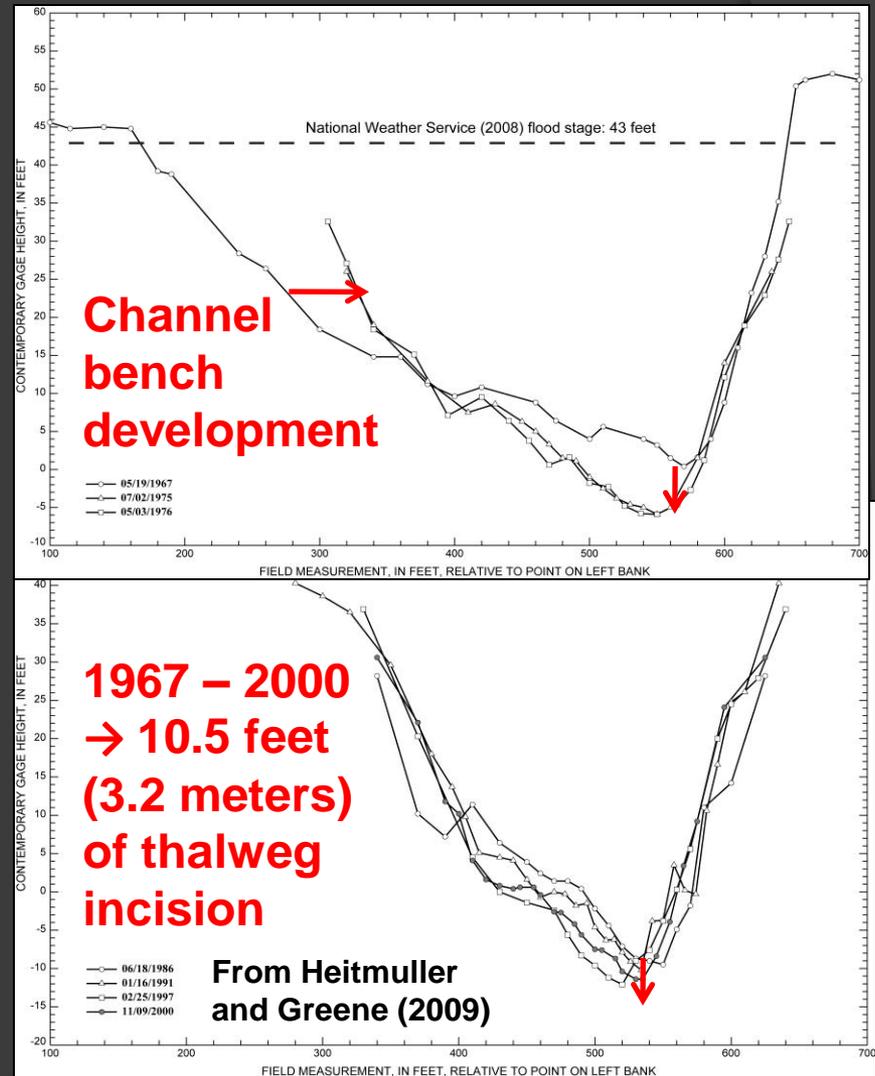
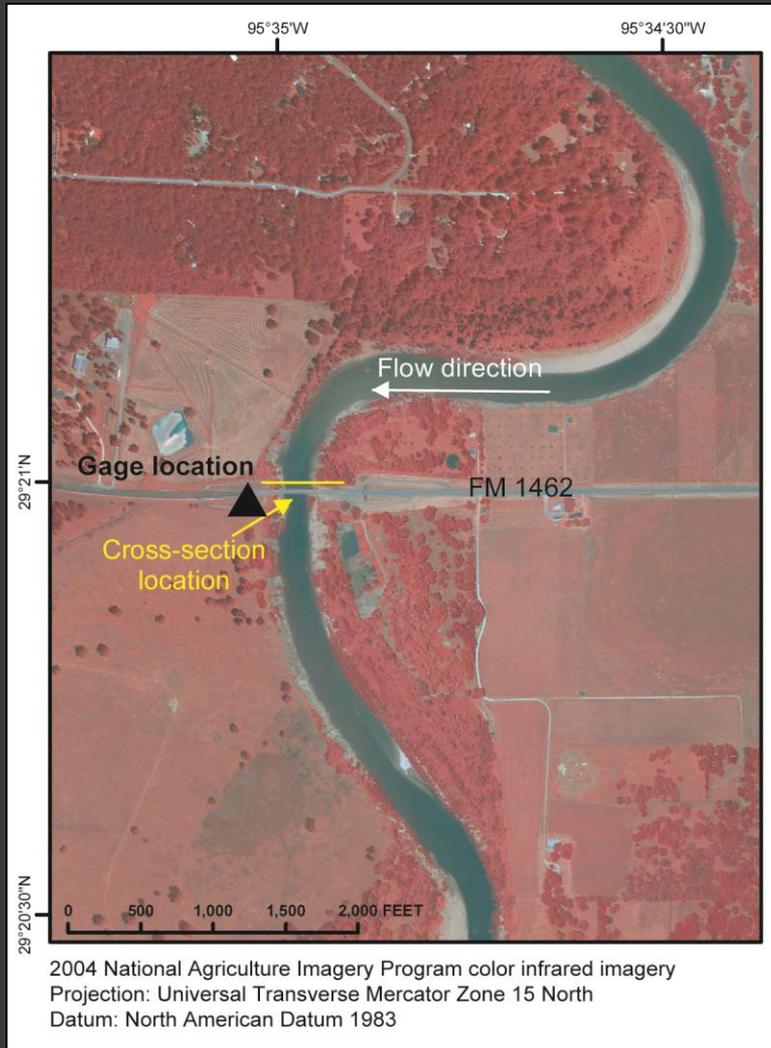
Lower Sabine River



- Much closer to upstream dam than Brazos River
- Lowermost gaging station
- Measurement section relocated in late 1970s
- 1961 – 1979 → *Stable* cross section



Lower Brazos River



Lower Brazos River

