Historic Channel Changes in the Salt River, Arizona 1890-1931
Wendy Bigler, Department of Geography, Arizona State University

Introduction
Channel stability and the nature of channel change are important considerations for development along rivers as well as river restoration. Our ability to predict and understand channel change is imperfect, particularly for dryland rivers. An historic, geographical approach to channel change can provide important insights into the dynamic nature of river environments. The Salt River through Phoenix provides a unique setting to combine historic photographs and hydrological data in an effort to better understand channel change.

My research addresses the questions:
- How stable was the Salt River prior to dam construction?
- How are channel stability and instability reflected in vegetation patterns?

Study site and timeframe
- Hayden Butte: This reach of the river has undergone substantial changes in the past century, and these changes are conveniently documented through photographs taken from the butte.
- 1890-1931: This time period represents the river prior to extensive regulation, and the ground photographs predate earliest available aerial photographs.

Methods
- Collected historic photographs from the Tempe Historical Museum, and chose the subset that best reflected channel change due to the 1891 flood, the largest flood on record.
- Visually analyzed the photographs in conjunction with hydrological data and a collection of historic accounts (Graf et al. 1994) to assess channel stability and vegetation patterns.

Results
Three historic photographs, 1890, 1900, and 1931, captured a view of the Salt River northwest of Hayden Butte from approximately the same orientation and elevation.

Hydrologic data recorded at Granite Reef Diversion Dam (25 km upstream) reflects a large flood event in 1891, followed by a series of much smaller events through 1931.

1890
Note groves of trees (cottonwoods, willows and elder according to historic accounts) lining the banks of the high flow channel. Floodplain terraces north of the river support mesquite, greasewood, and palo verde thickets with saguaro and native grasses in more open areas. Agricultural fields dominate the southern bank in the foreground, with the darkest area possibly native vegetation. The low flow channel is slightly wider than the middle section of the bridge, and sand bars and point bars occur along its length. Strings of vegetation mid-channel indicate stabilized sand bars and help direct flow.

1900
The bank vegetation is talier and more extensive (compare trees near railroad bridge with those in the 1900 photograph), as are the planted rows of trees surrounding the fields. Following a flood in 1891, the low flow channel shifted north, and is delineated by bands of dark vegetation. The most dominant stream of vegetation in 1890 is still visible, now south of the low flow channel. The trees marking the north bank of the low flow channel in 1890 delineate the south bank of the low flow channel in 1900. The trees closest to the bottom of the photograph mark the Hayden Canal, an irrigation canal out of view (but present) in the 1890 photograph.

1931
This photograph shows the Salt River in flood, obscuring some vegetation and channel details. The tops of mature cottonwoods are visible between the two automobile bridges, and the low flow channel in the 1931 photograph is still visible in 1931 as parallel bands of vegetation. Agricultural fields replaced native vegetation north of the river. In the center foreground, conveyor belts mark a sand and gravel quarry, and the Tempe Beach Park swimming pool is located south of the river between the two automobile bridges.

2000
This modern view reflects the impacts of urbanization on the Salt River during a period of rapid growth. In 1996, the city of Tempe constructed Tempe Town Lake to stimulate economic growth. The river is entirely channelized and native vegetation is minimal.

All photographs were taken from Hayden Butte facing northwest, with the river flowing towards the west. Tempe Historical Museum provided the 1890, 1900, and 1931 photographs, and the 2000 photograph is by Wendy Bigler. Salt River Project provided the hydrological data.

Funding provided by a National Science Foundation Integrative Graduate Education Research and Training fellowship.