

San Juan River
Historical Ecology Assessment
Funded by the U.S. Bureau of Reclamation

San Juan Recovery Implementation Program
Biology Committee Meeting
February 20, 2015



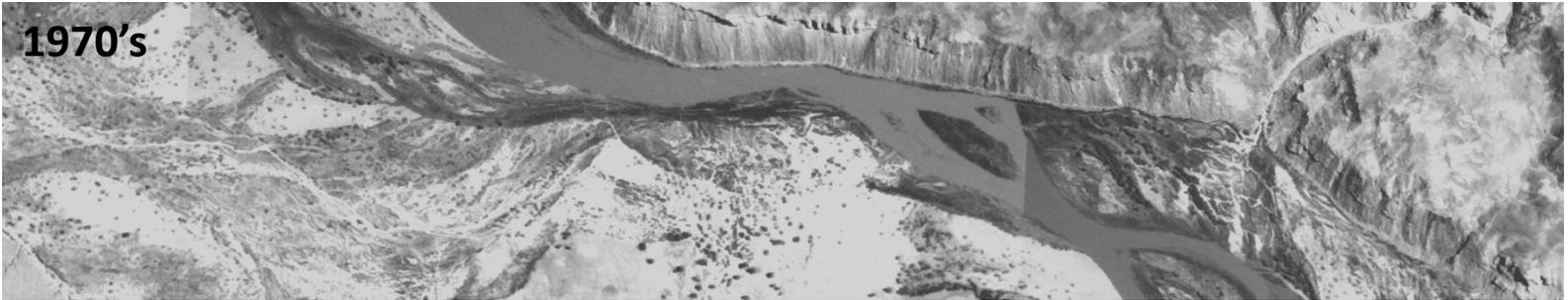
Steve Bassett *GIS Analyst*

The Nature Conservancy 
Protecting nature. Preserving life.®

1930's



1970's



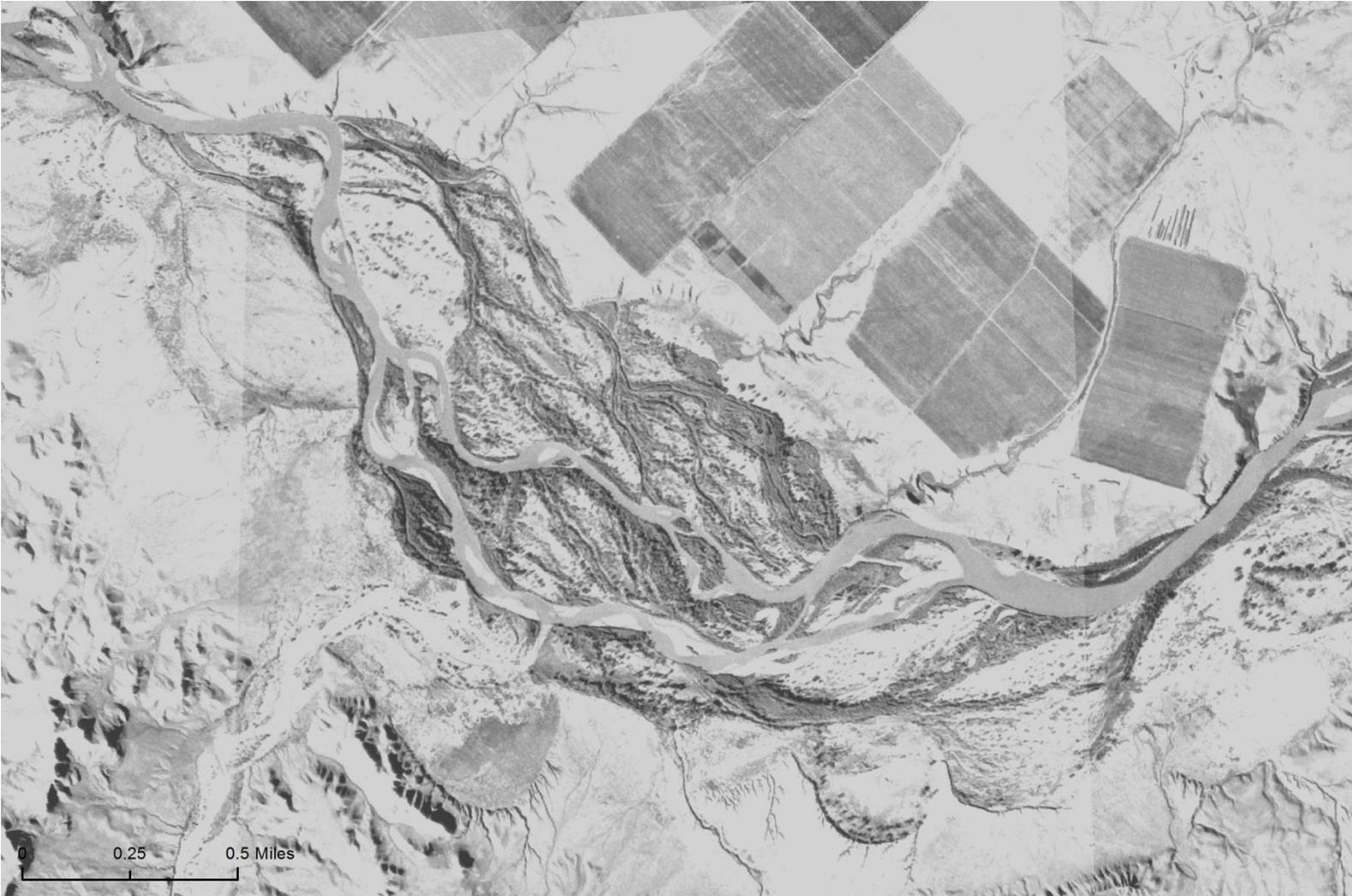
2011



Altered River



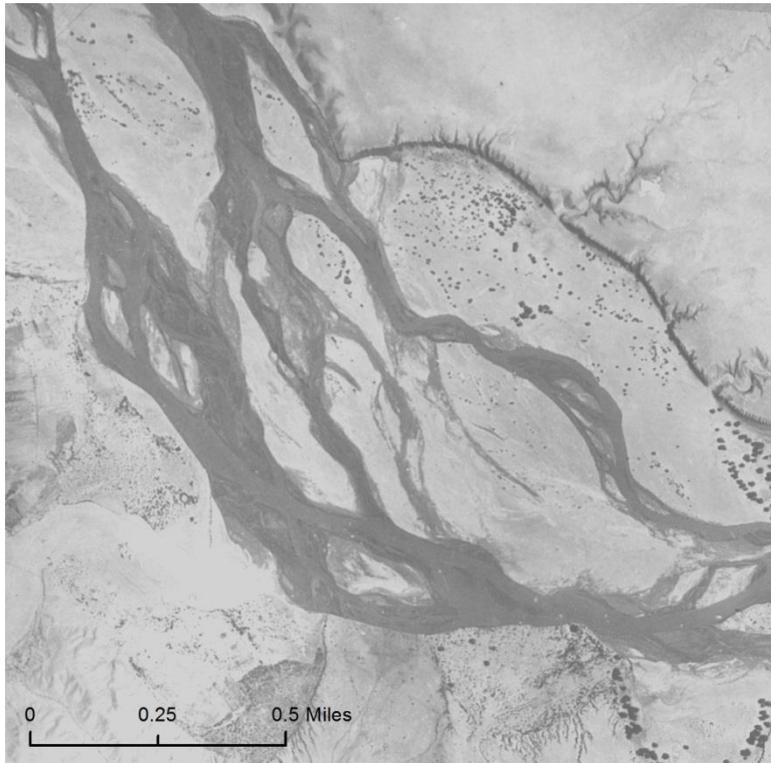
Altered River



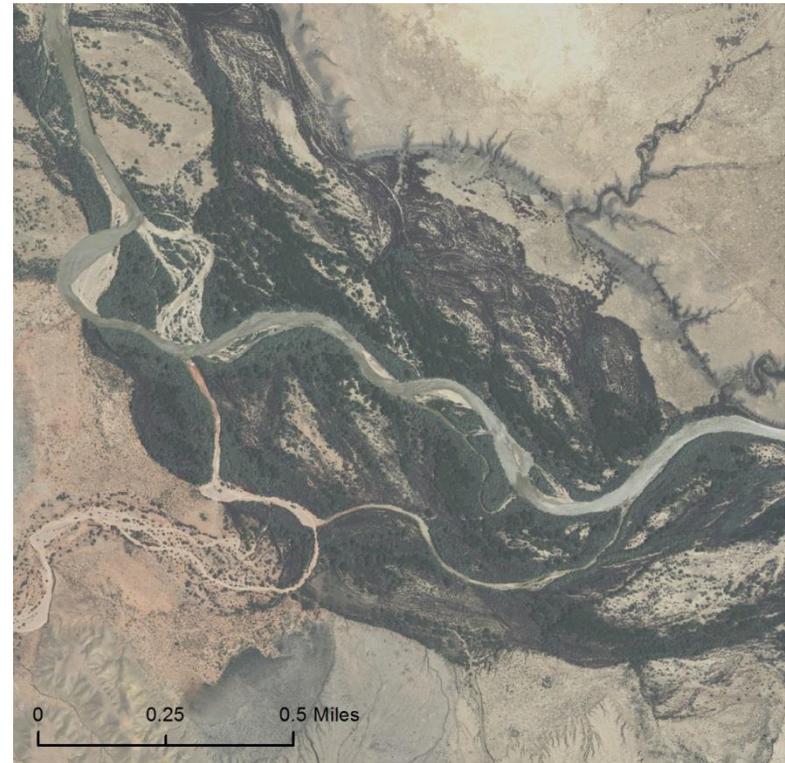
Altered River



Quantifying Change



- Planform Channel Morphology
- Bank Armoring



- 1) Channel Area**
- 2) Island Count & Area**
- 3) Bank Vegetation**

Study Area



Methods

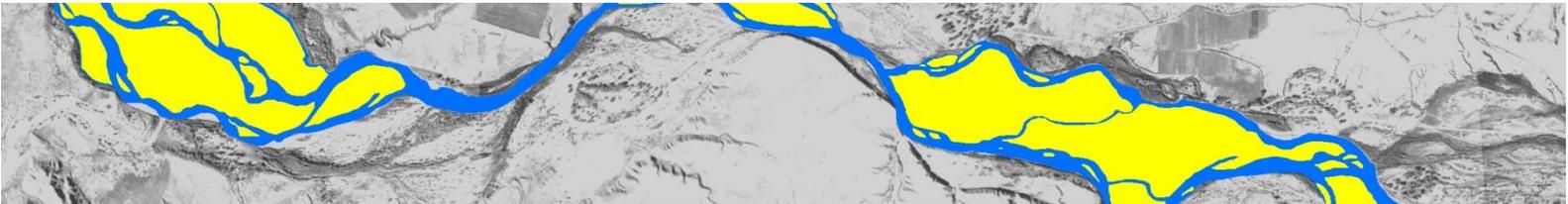
Imagery Acquisition



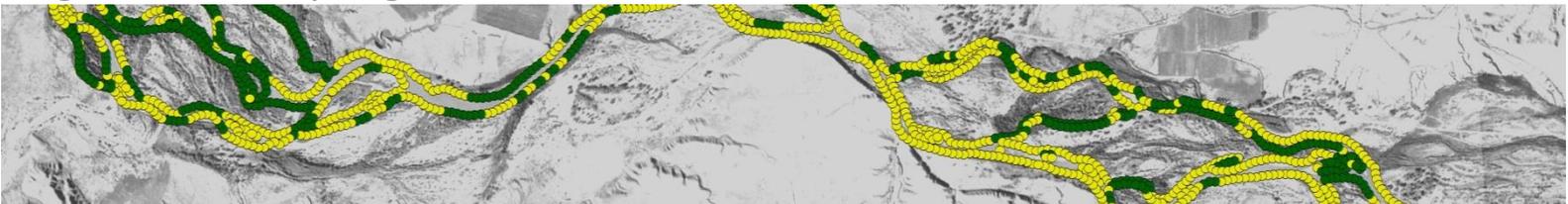
Image Georeferencing



Channel and Island Digitization



Vegetation Sampling



Methods – Imagery Acquisition

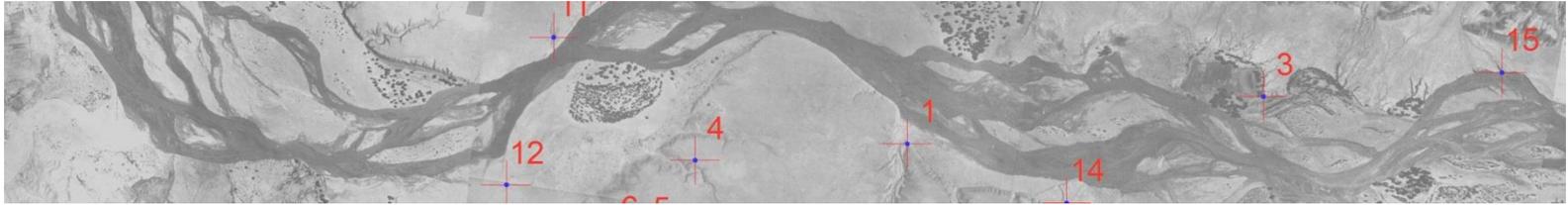


Gathered from multiple sources

Year	Series	Extent (VM)	Description	Scale
1934	Soil Conservation Service (via FWS)	131–150	B&W	1:30,000
1935	Soil Conservation Service(via NM EDAC)	187–249	B&W	1:31,680
1935	NAV 1935 (via UT DNR)	148–178	B&W	1:31,680
1975	USGS VDXK0	184–235	B&W	1:30,800
1978	USGS VEPO0	281–249	B&W	1:32,000
1979	USGS VETD0	131–189	B&W	1:24,000
2011	USDA NAIP	131–249	Color + IR	1m

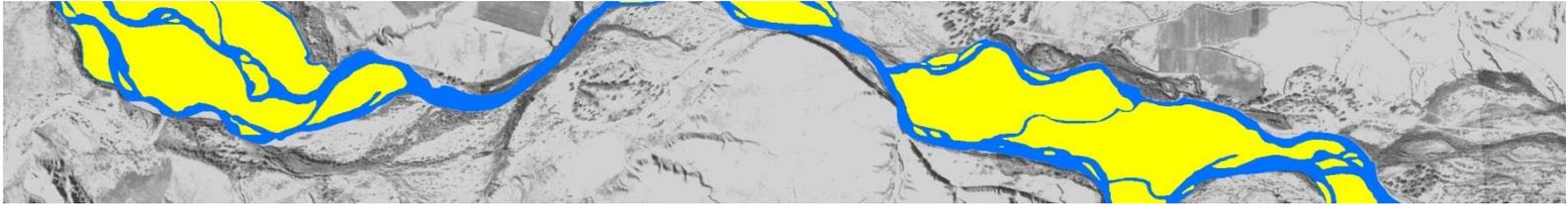
Cropped and stitched adjacent imagery with Adobe Photoshop

Methods – Image Georeferencing



- georeferenced to 2011 NAIP imagery
- manual control points placed at features visible in both images
 - higher density near river
- spline transformation used to align imagery
- protocol for images with high distortion

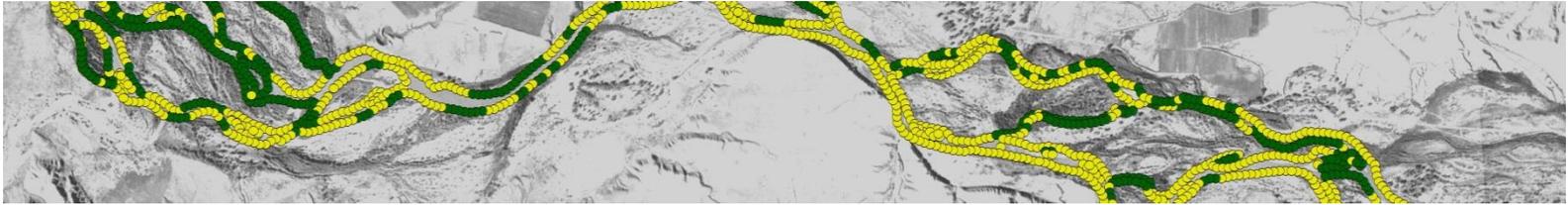
Methods - Digitization



Interpretation and digitization protocol

- 1:5,000
- Left bank, right bank, and islands
- Digitized by 1st analyst and then reviewed by a 2nd analyst
- Protocols for poor image quality
- Repeat digitization 2.02 m average horizontal error
 - largest error on sand-bars
 - in sample reach ≈ 0.02 acres per acre (2%)*

Methods – Vegetation Sampling



Bank Armoring Estimation

- Transect offset 2m from digitized river edge
- Sample points placed at 37.4 m intervals (≈ 43 samples/bank/VM)
- Presence or absence of vegetation recorded at each point (1:5,000)
- Cover estimates for individual banks in each RM are reported with $\approx 90\%$ confidence that values are within 10% of actual cover
- Sample size for most islands is too low to report vegetation cover
- When multiple river miles are combined the sample size becomes much larger

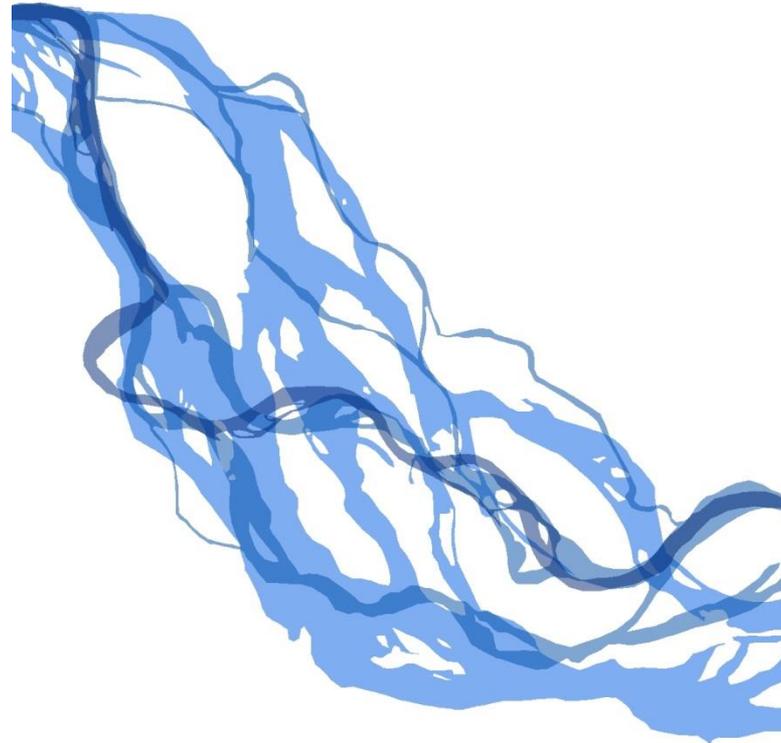
Analysis

Historical Conditions

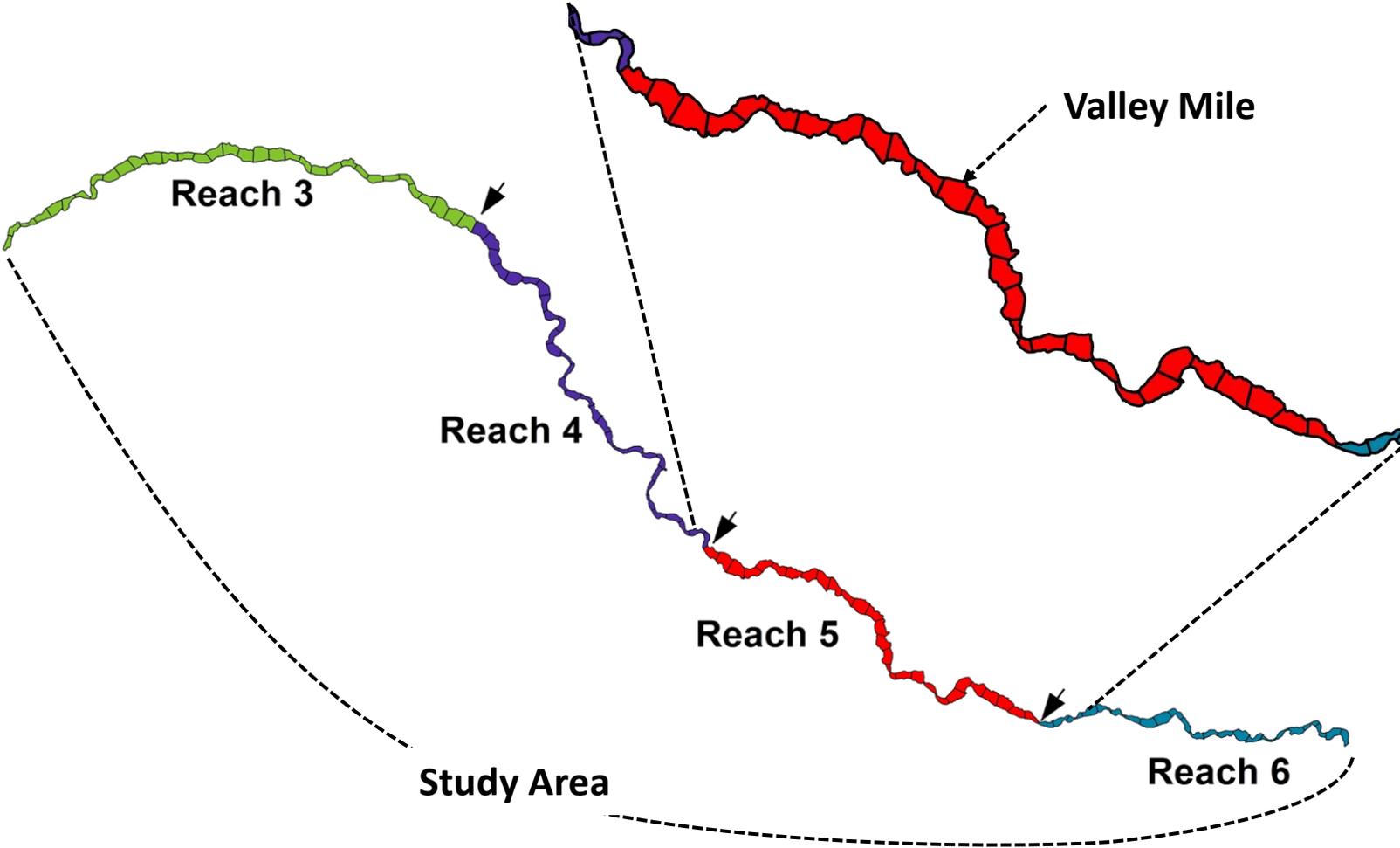
- ***Bank Armoring***
- ***Channel Area***
- ***Island Count***
- ***Island Area***
- Channel Percent of Valley Floor

Change Between Periods

- Changes 1930's to 2010's
- Changes 1930's to 1970's
- Changes 1970's to 2010s

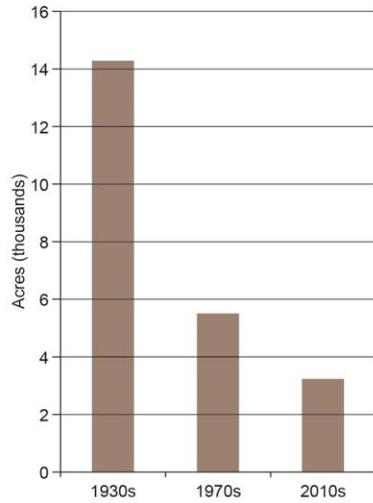


Summary Levels

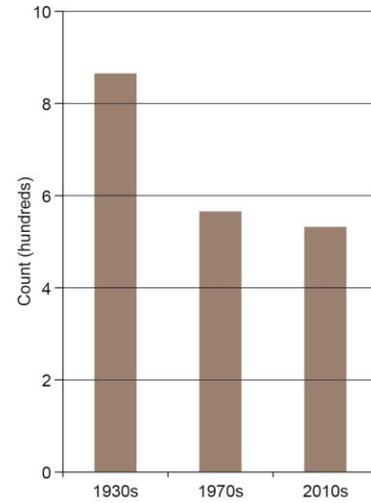


Results – Study Area

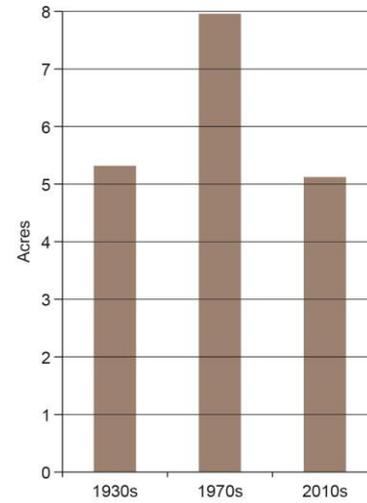
a. Channel Area



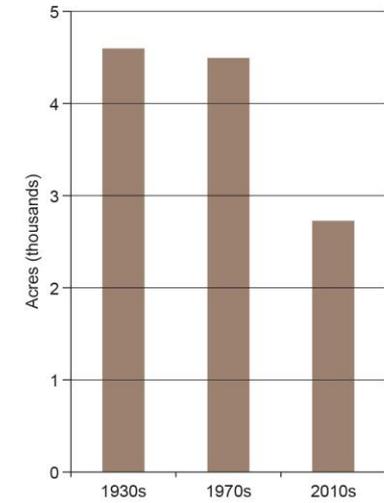
b. Island Count



c. Average Island Size

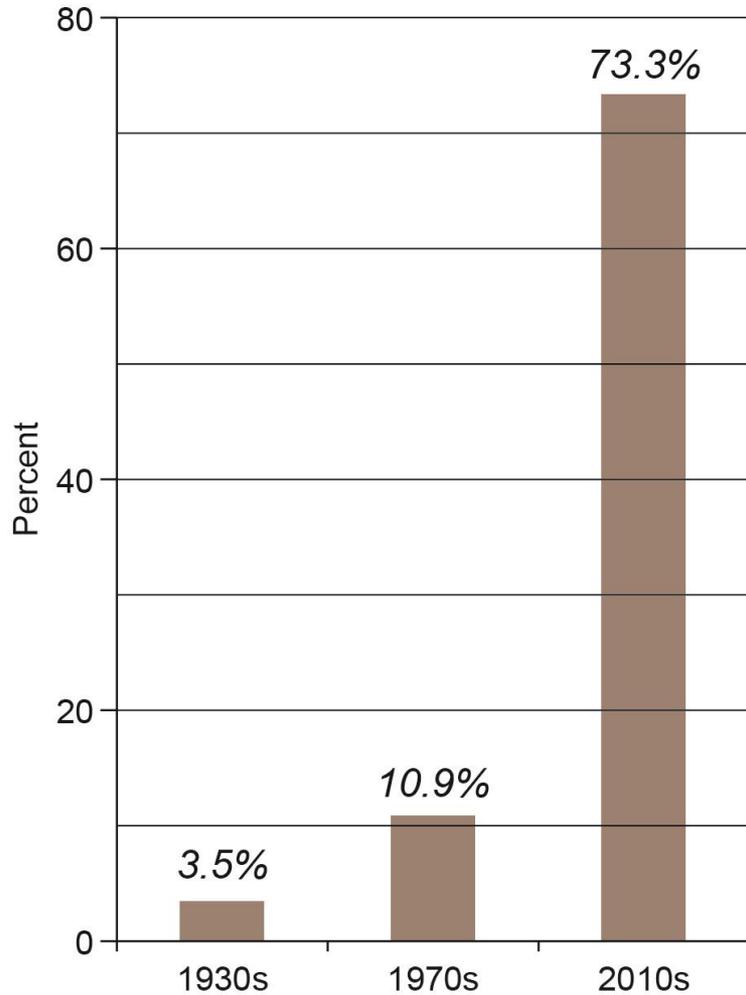


d. Total Island Area



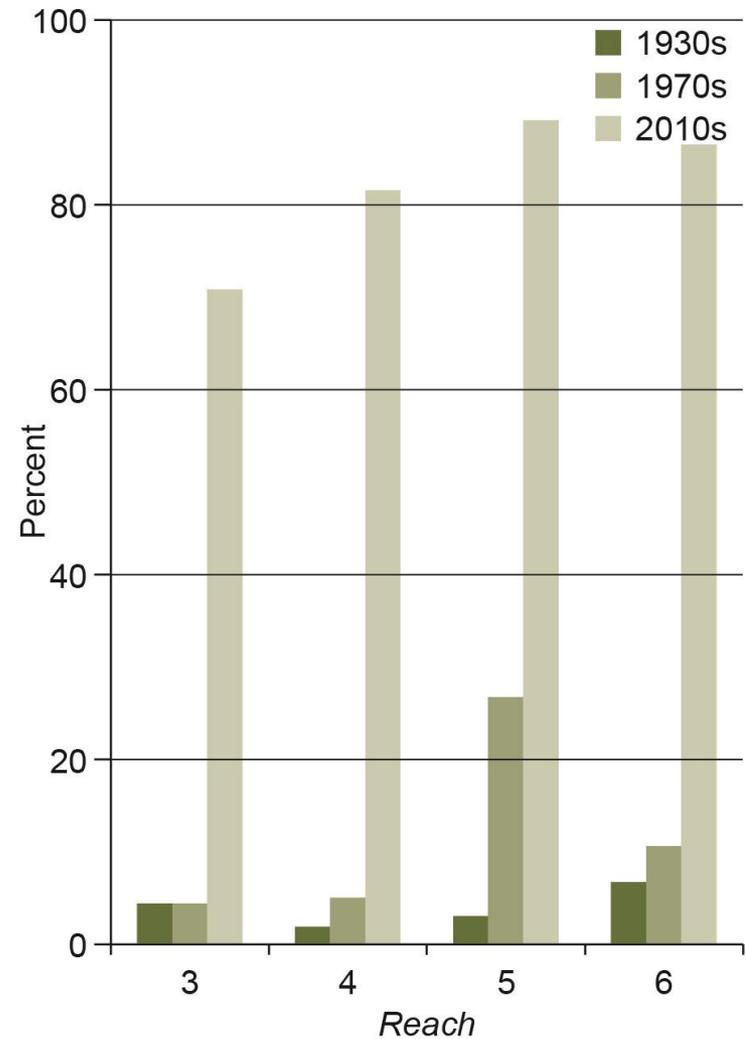
Results – Study Area

Vegetation Cover



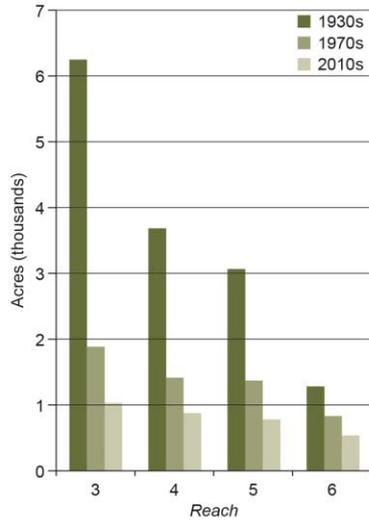
Reach

Vegetation Cover

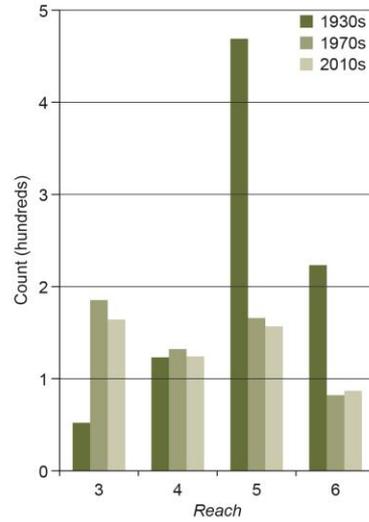


Results – Reach

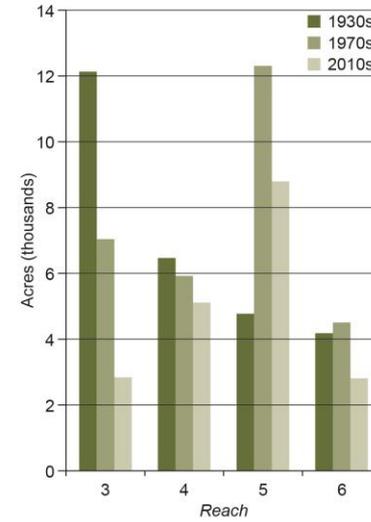
a. Channel Area



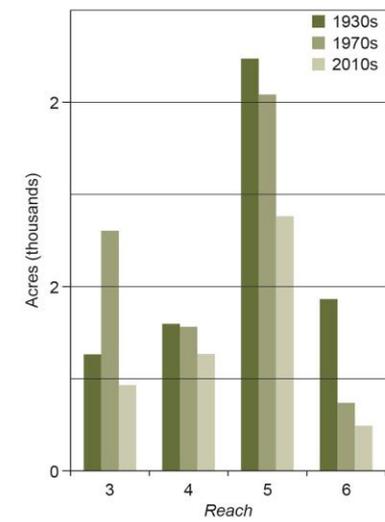
b. Island Count



c. Average Island Size

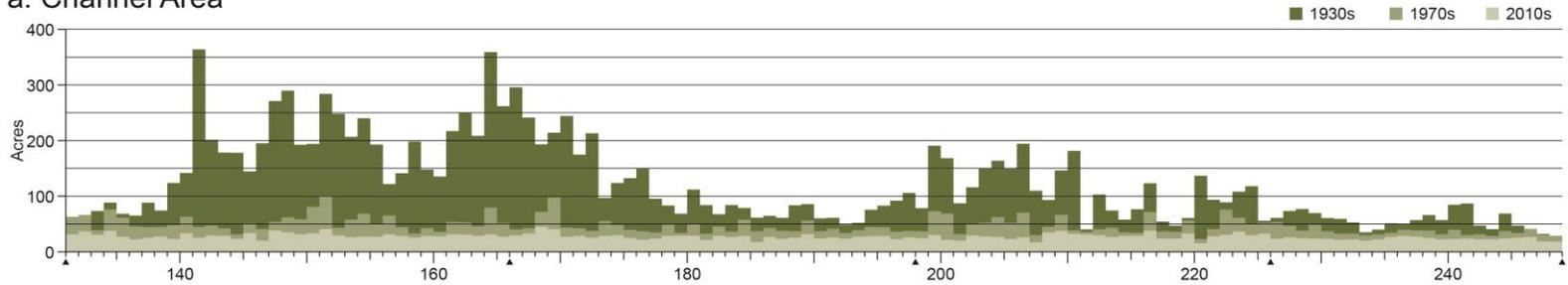


d. Total Island Area

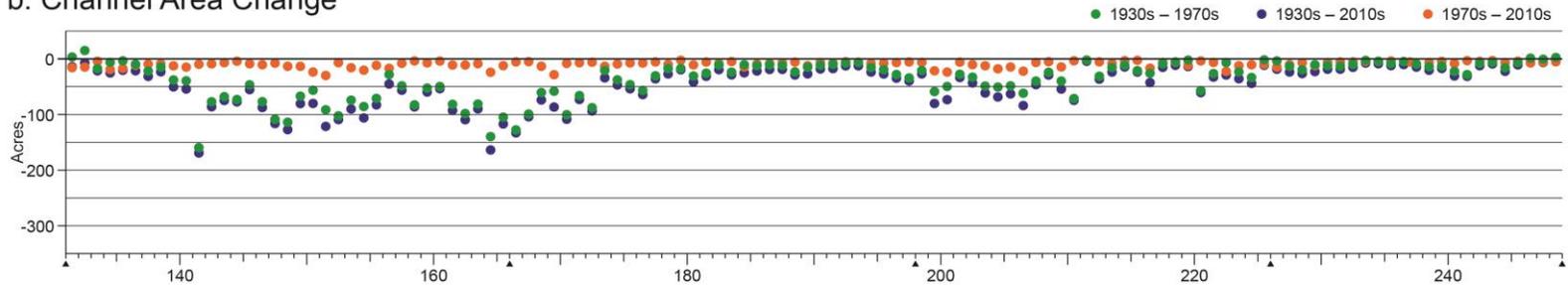


Results – Valley Mile Channel Area

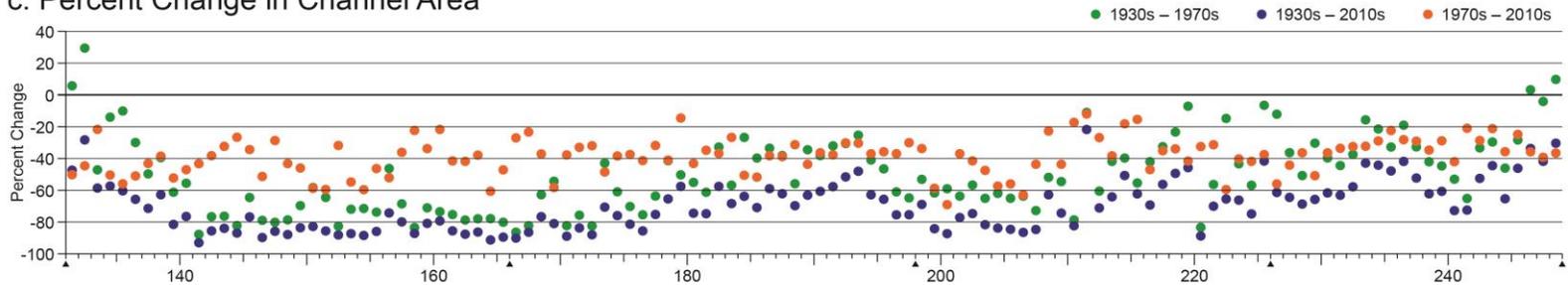
a. Channel Area



b. Channel Area Change

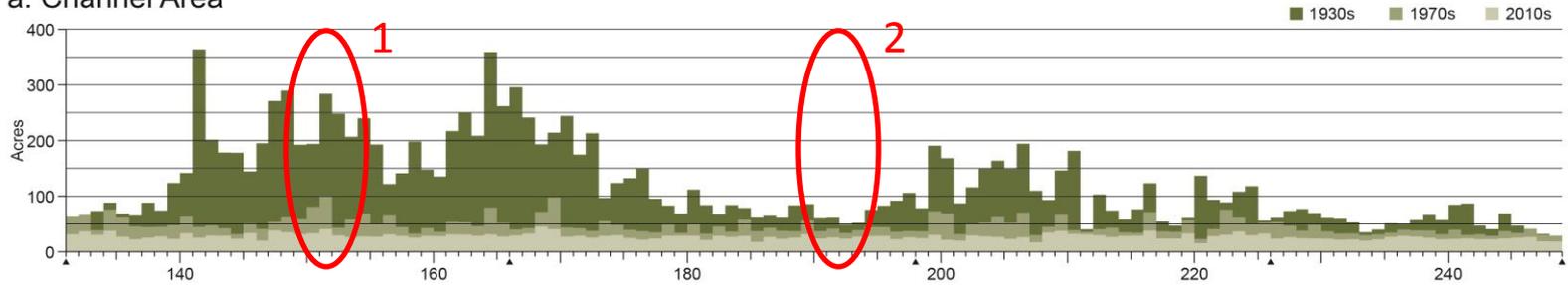


c. Percent Change in Channel Area

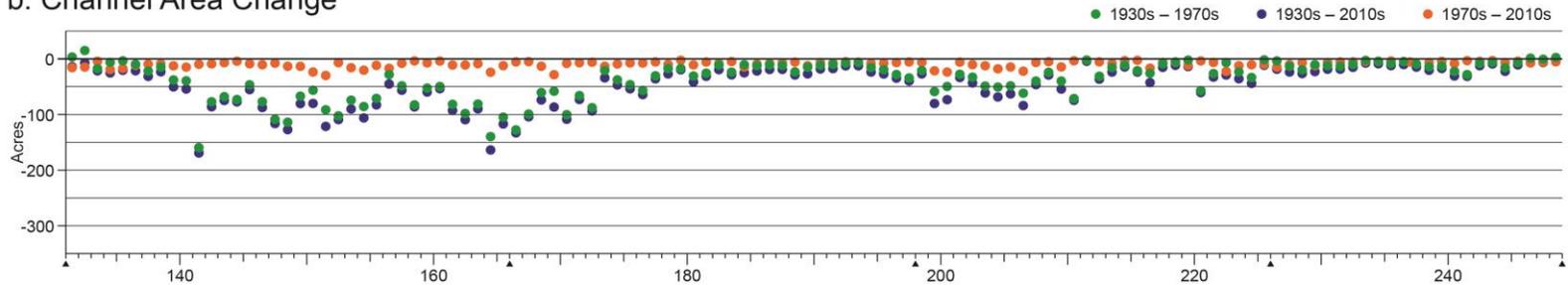


Results – Valley Mile Channel Area

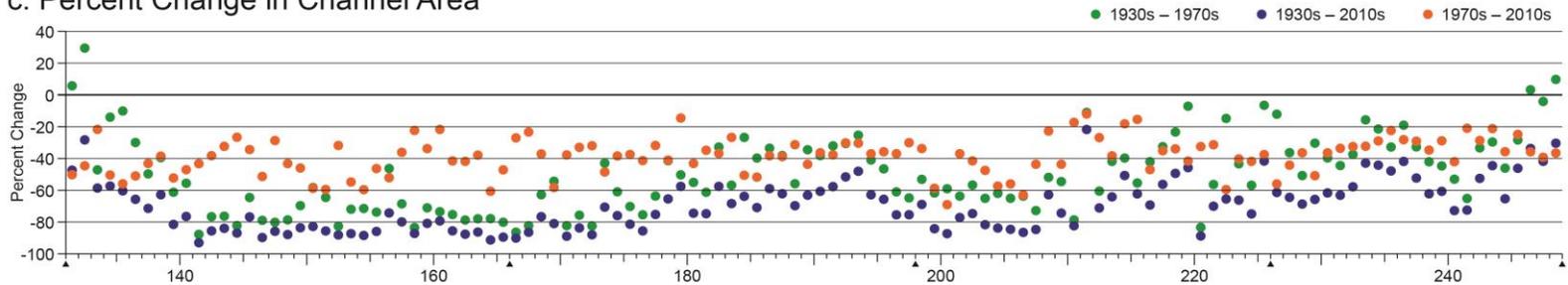
a. Channel Area



b. Channel Area Change

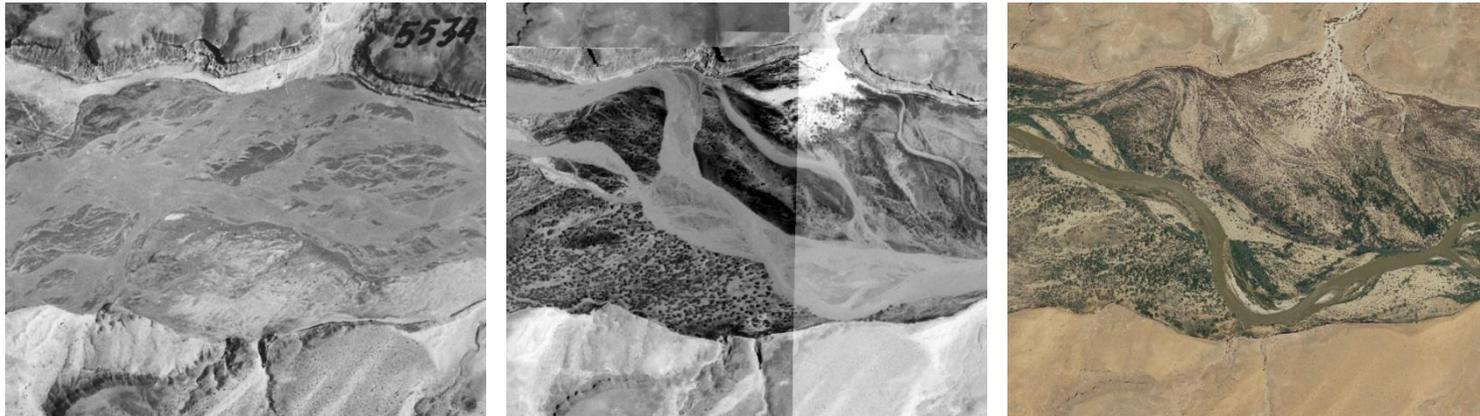


c. Percent Change in Channel Area



Results – Valley Mile Channel Area

Ex. 1 [VM 151] (large area in 1930's, high decrease to 2010's)

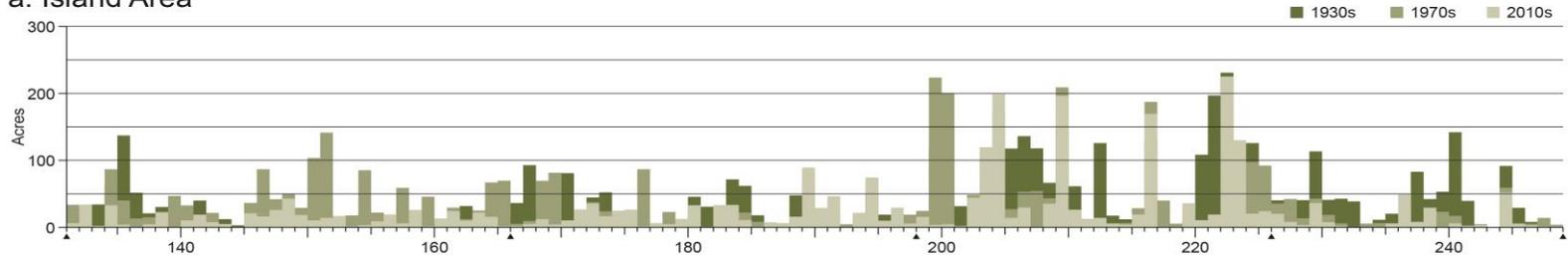


Ex. 2 [VM193](relatively small area in 1930's, still a 50% decrease)

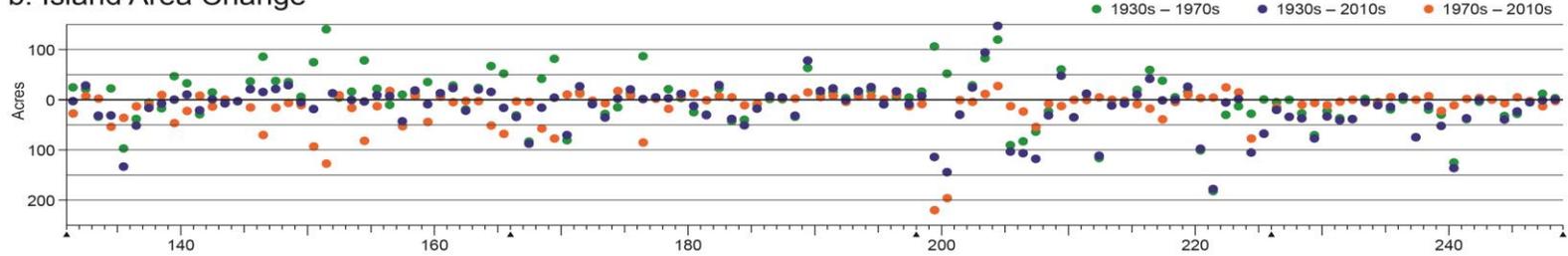


Results – Valley Mile Islands

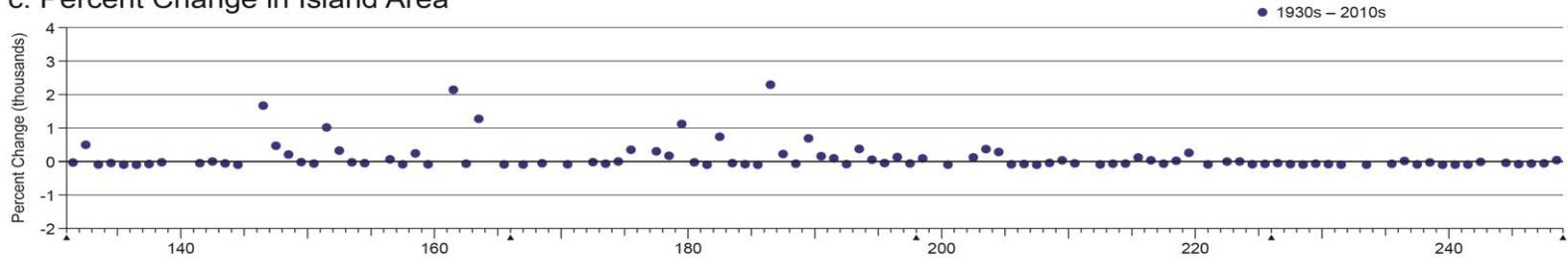
a. Island Area



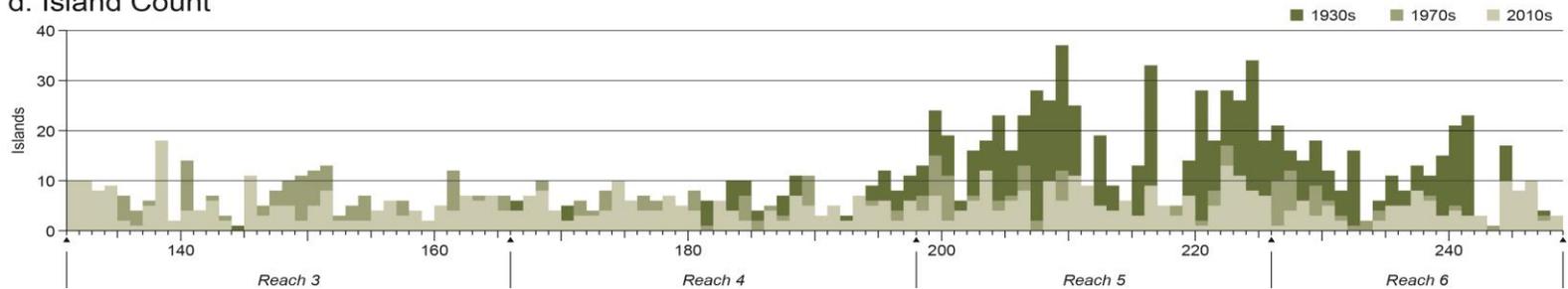
b. Island Area Change



c. Percent Change in Island Area

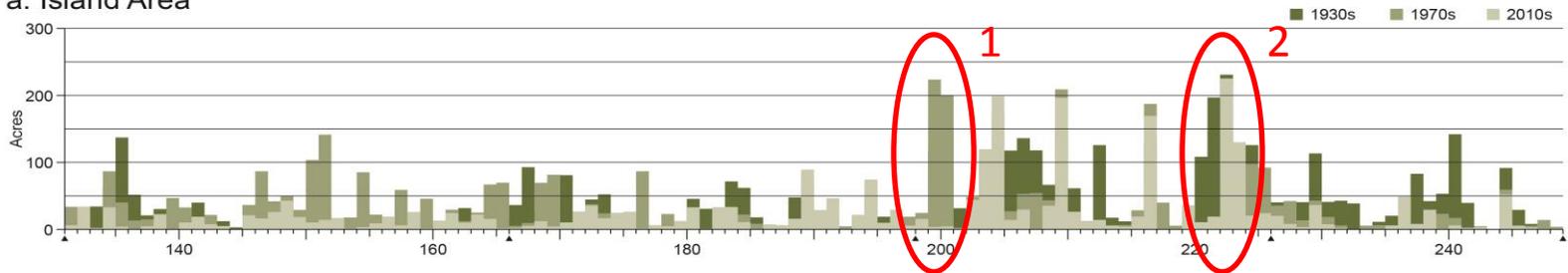


d. Island Count

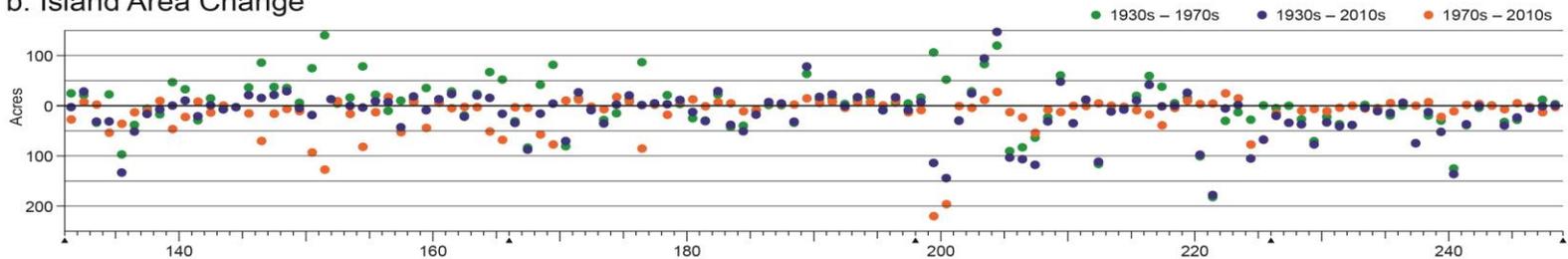


Results – Valley Mile Islands

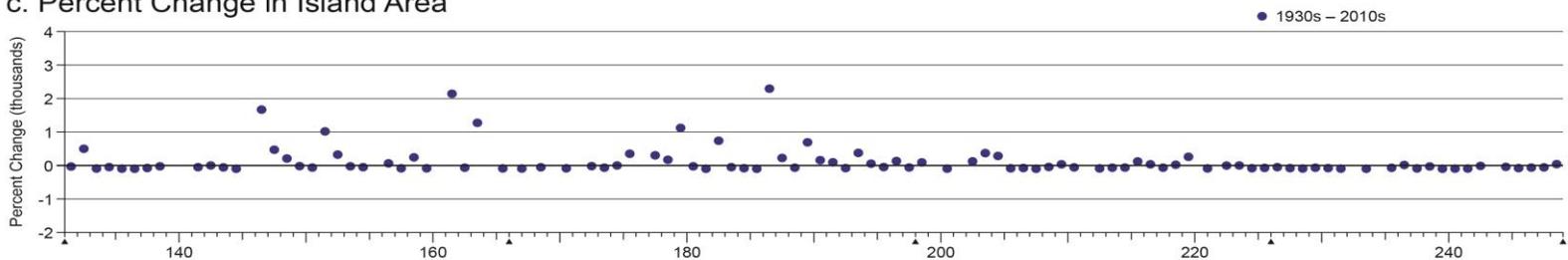
a. Island Area



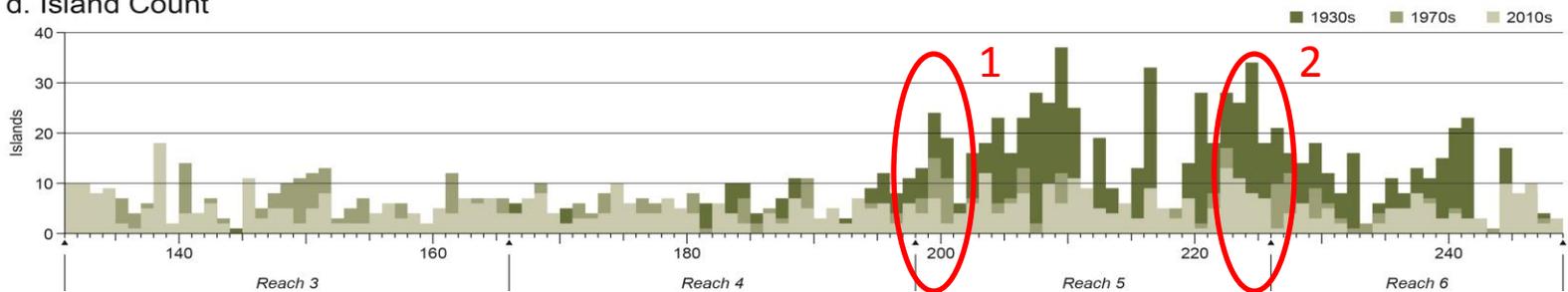
b. Island Area Change



c. Percent Change in Island Area



d. Island Count

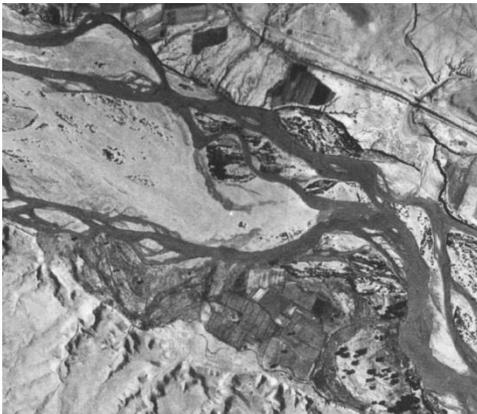


Results – Valley Mile Islands

Ex. 1 [RM 204/205] Island Area stays the same

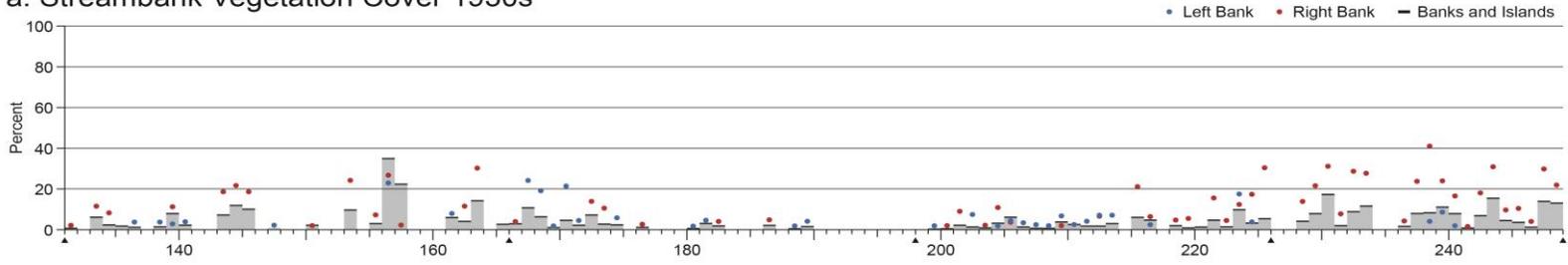


Ex. 2 [RM 222]

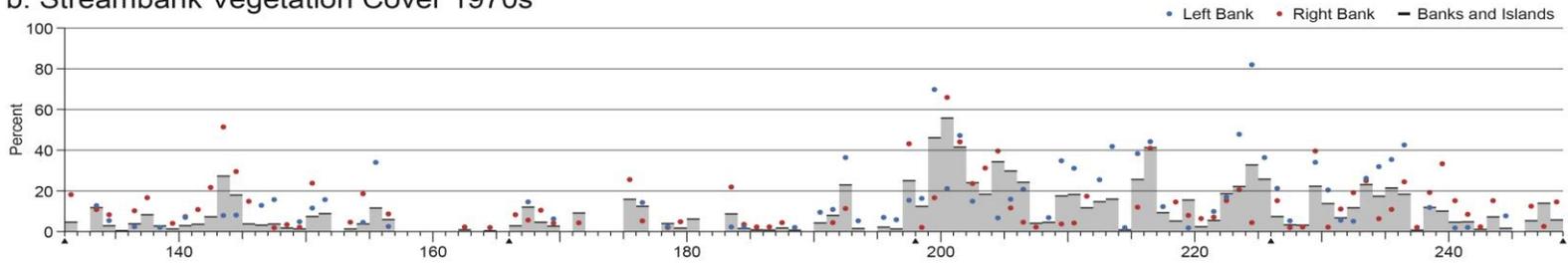


Results – Valley Mile Vegetation

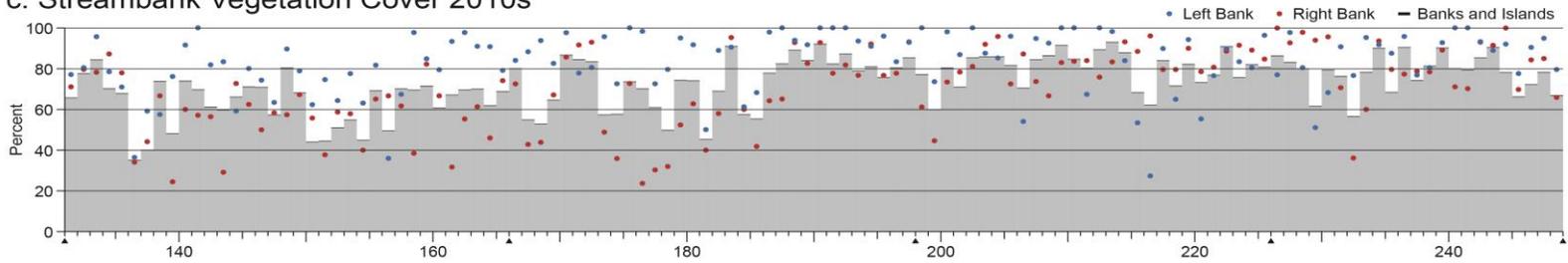
a. Streambank Vegetation Cover 1930s



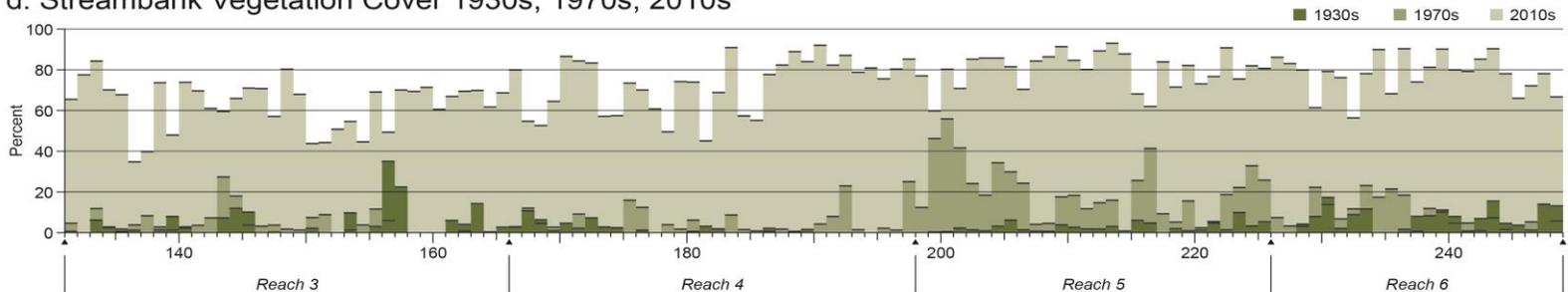
b. Streambank Vegetation Cover 1970s



c. Streambank Vegetation Cover 2010s

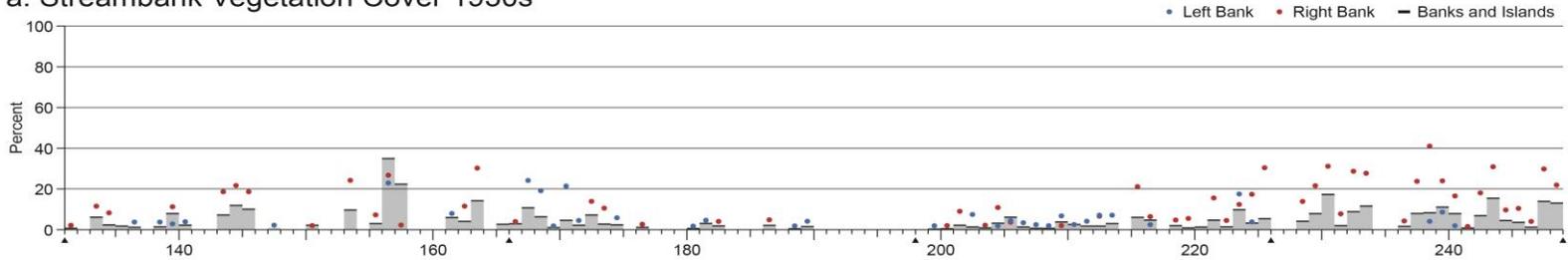


d. Streambank Vegetation Cover 1930s, 1970s, 2010s

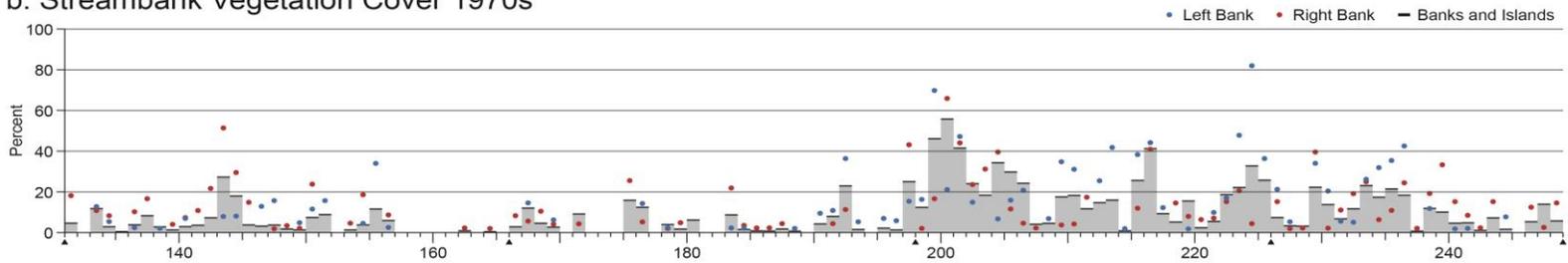


Results – Valley Mile Vegetation

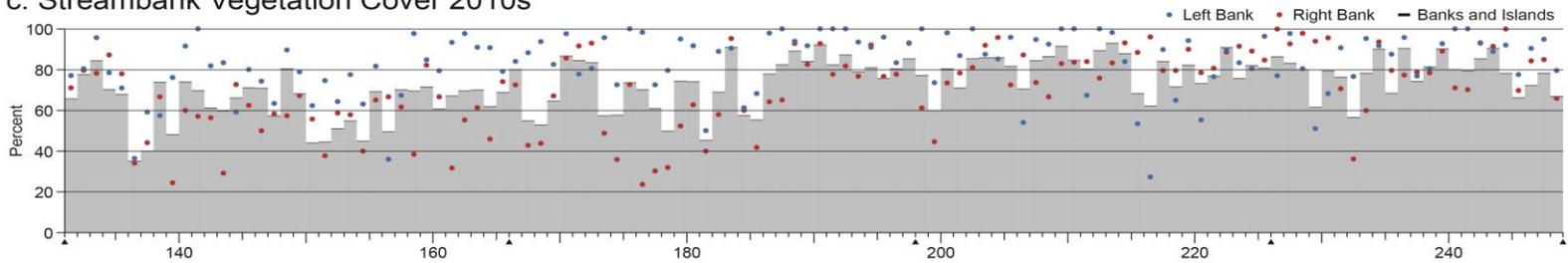
a. Streambank Vegetation Cover 1930s



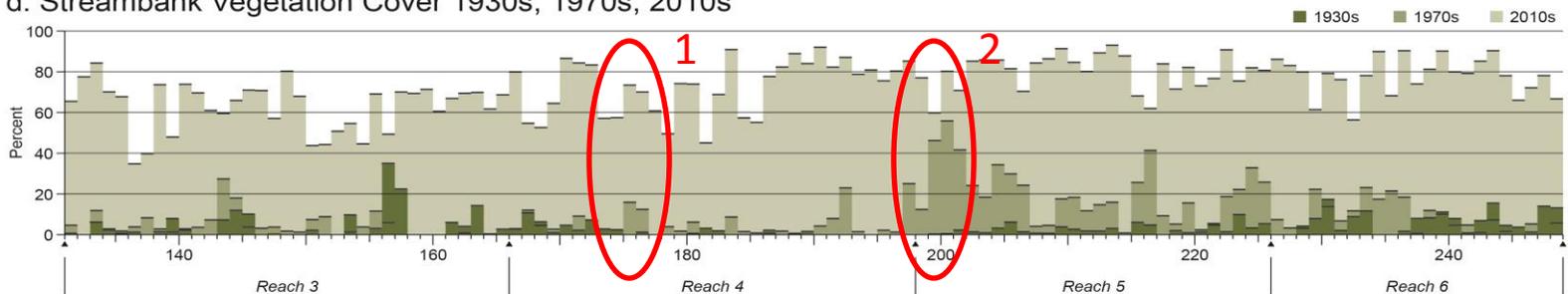
b. Streambank Vegetation Cover 1970s



c. Streambank Vegetation Cover 2010s



d. Streambank Vegetation Cover 1930s, 1970s, 2010s

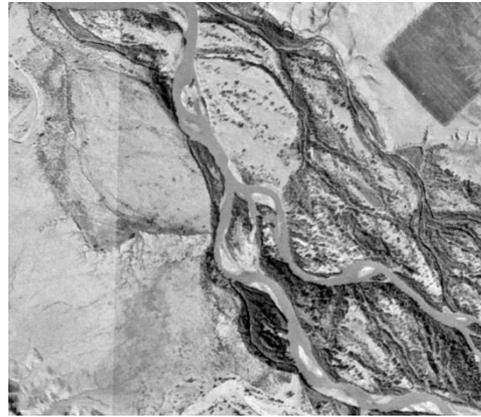


Results – Valley Mile Vegetation

Ex 1 [RM 171/172]



Ex 2 [RM 199/200]



Discussion

Quantified Change

Tool to Assist with Recovery

- Prescribed restoration
- Identify factors correlated with sustained complexity
- Compare observed streamflow to quantified changes

Multiple Uses

Resources

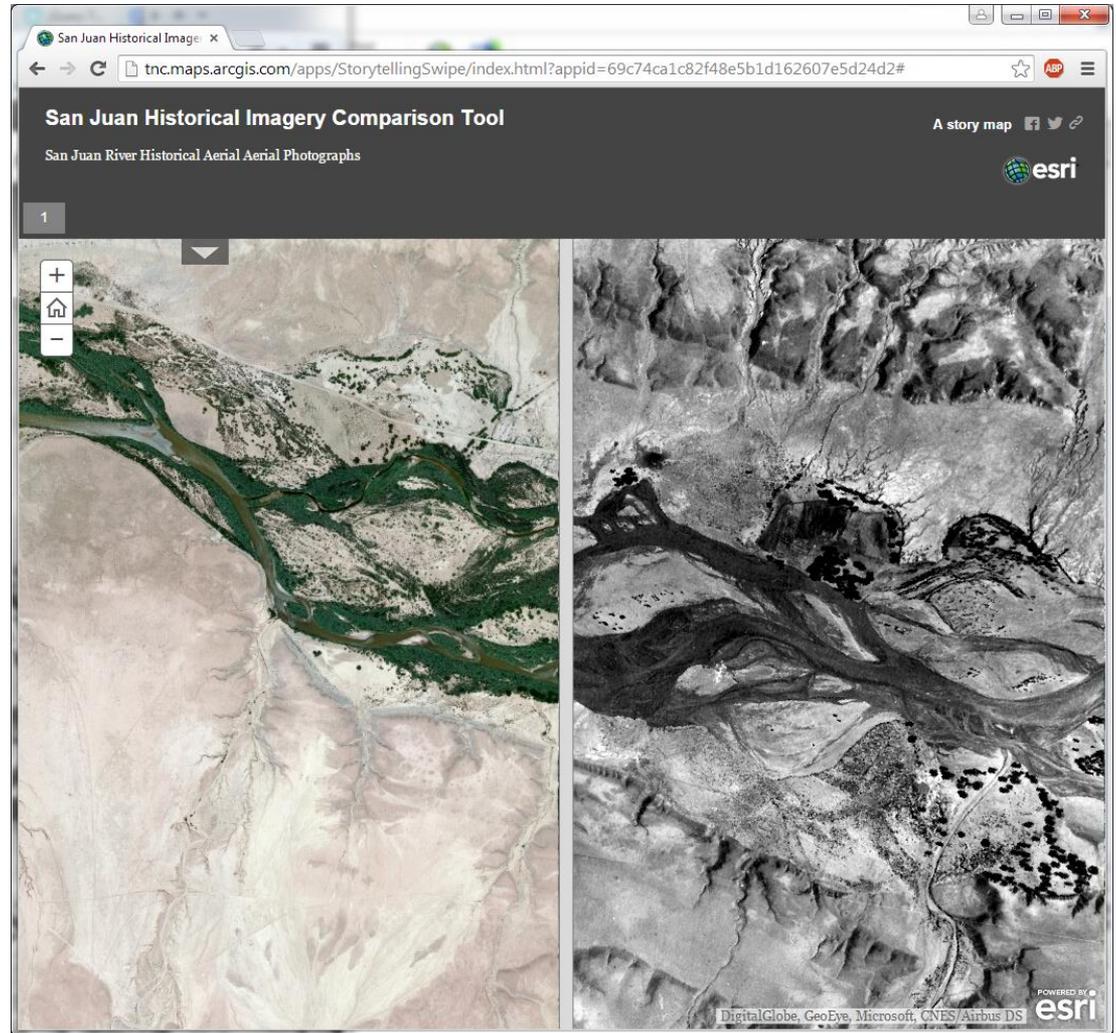
Draft Report

Online Interactive Maps

- Browse imagery
- Compare time periods

Open Access to Data

- Time consuming
- Data availability



<http://nmconservation.org/sanjuan/historicalhabitat/>

Acknowledgement

Assessment funded by the U.S. Bureau of Reclamation