

# Pre-Modification Habitat Mosaics of the Delta

Looking to the past to envision the future



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*and*

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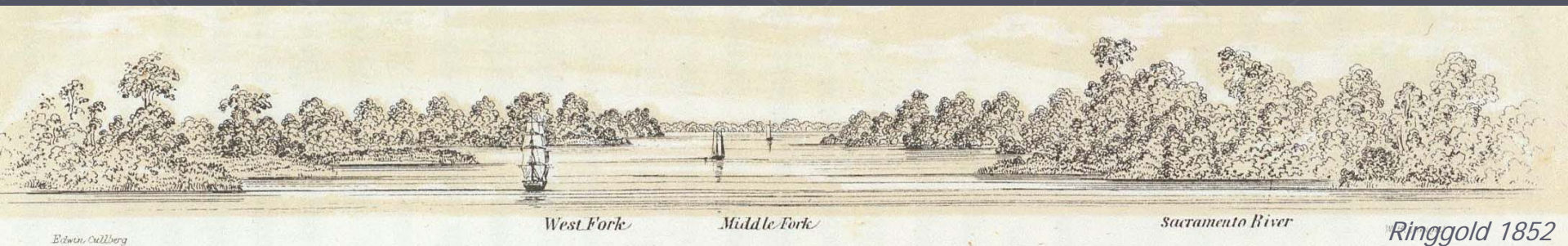
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# Talk Outline

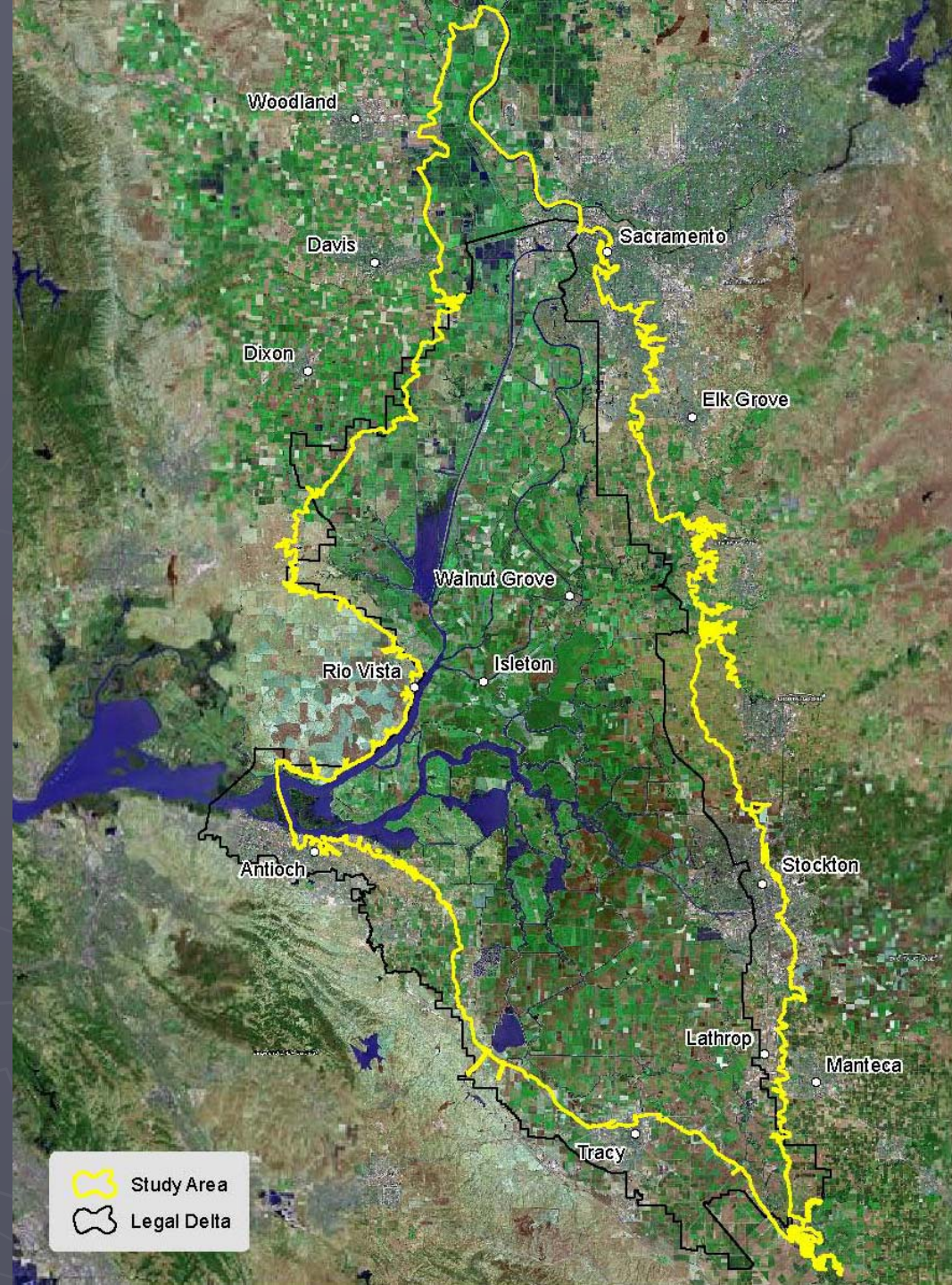
- ▶ Key questions and conceptual models
- ▶ Channel plan form: density and variation
- ▶ Marsh complexity and variation
- ▶ Upland ecotone
- ▶ Conclusions and Next Steps





# Key Questions

- ▶ What was the historical distribution and extent of critical habitats within the Delta?
- ▶ How can these habitats be explained by the system's physical drivers?



# Gradients in dominant physical drivers

## ***TIDAL SOURCE***

*Large tidal range*

*Less fluvial influence*

*Higher salinity*

## ***FLUVIAL SOURCE***

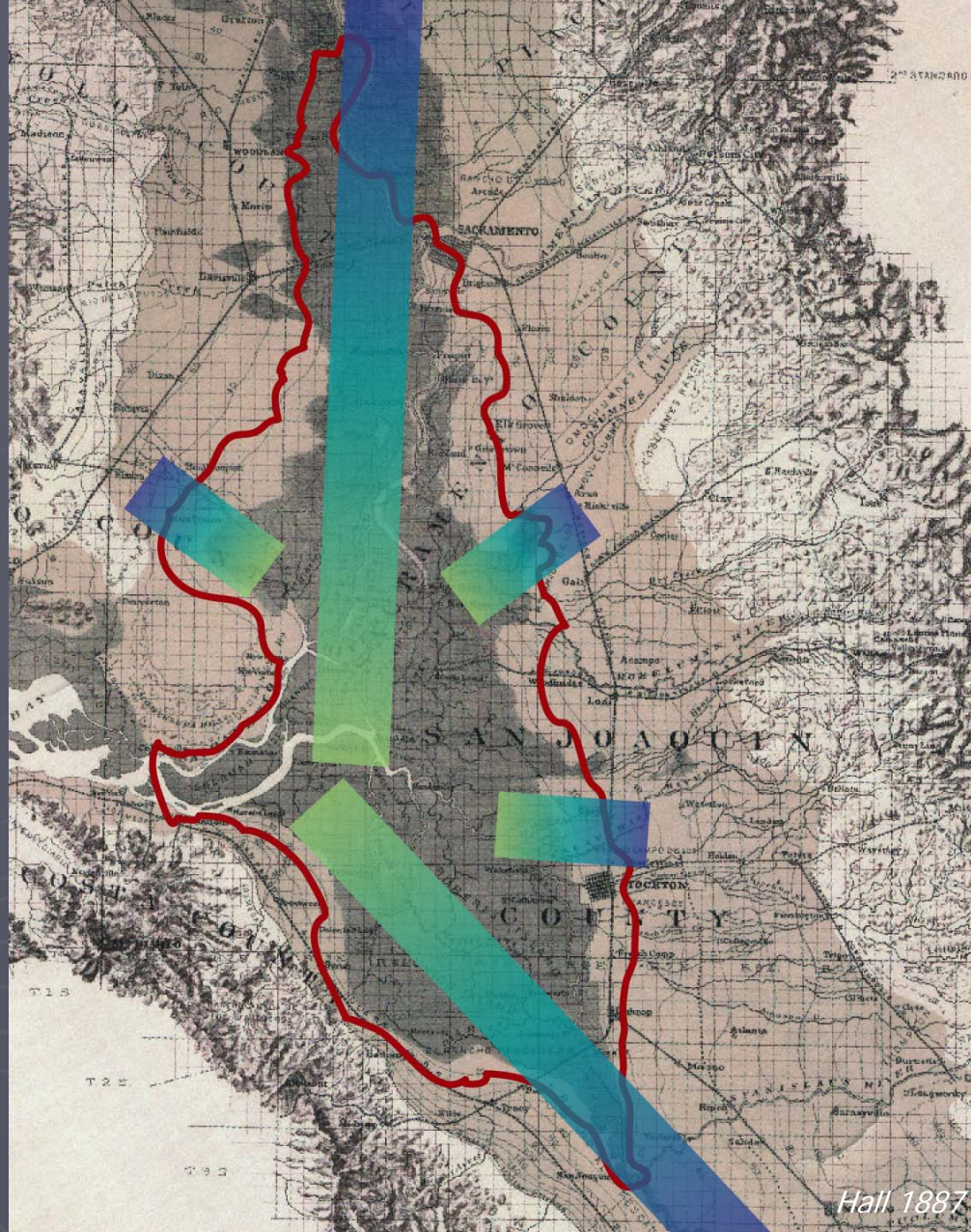
*Small to no tidal range*

*Large fluvial influence*

*Low salinity*





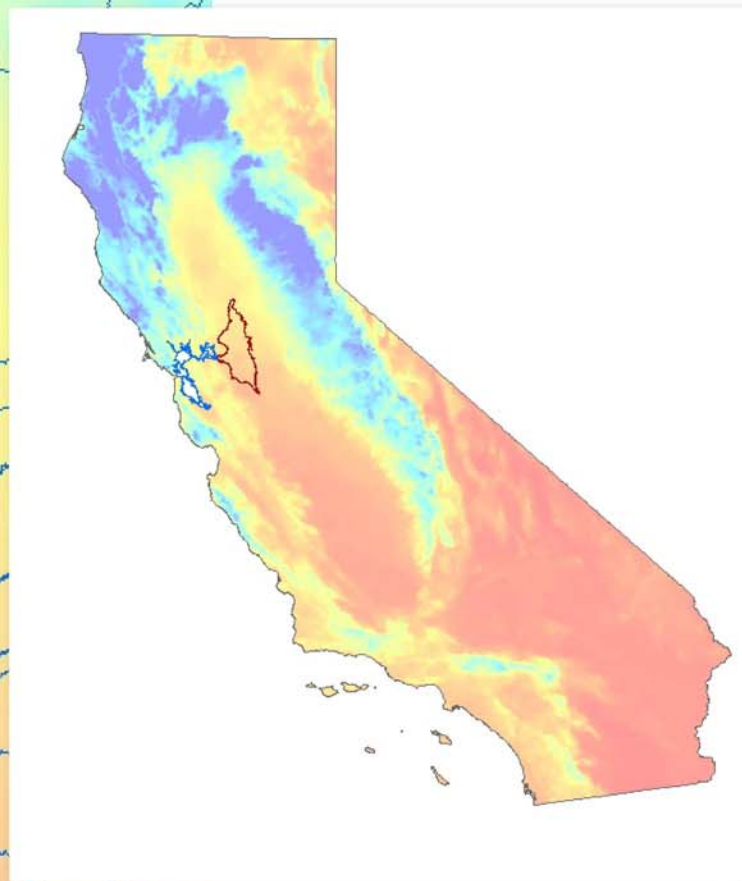
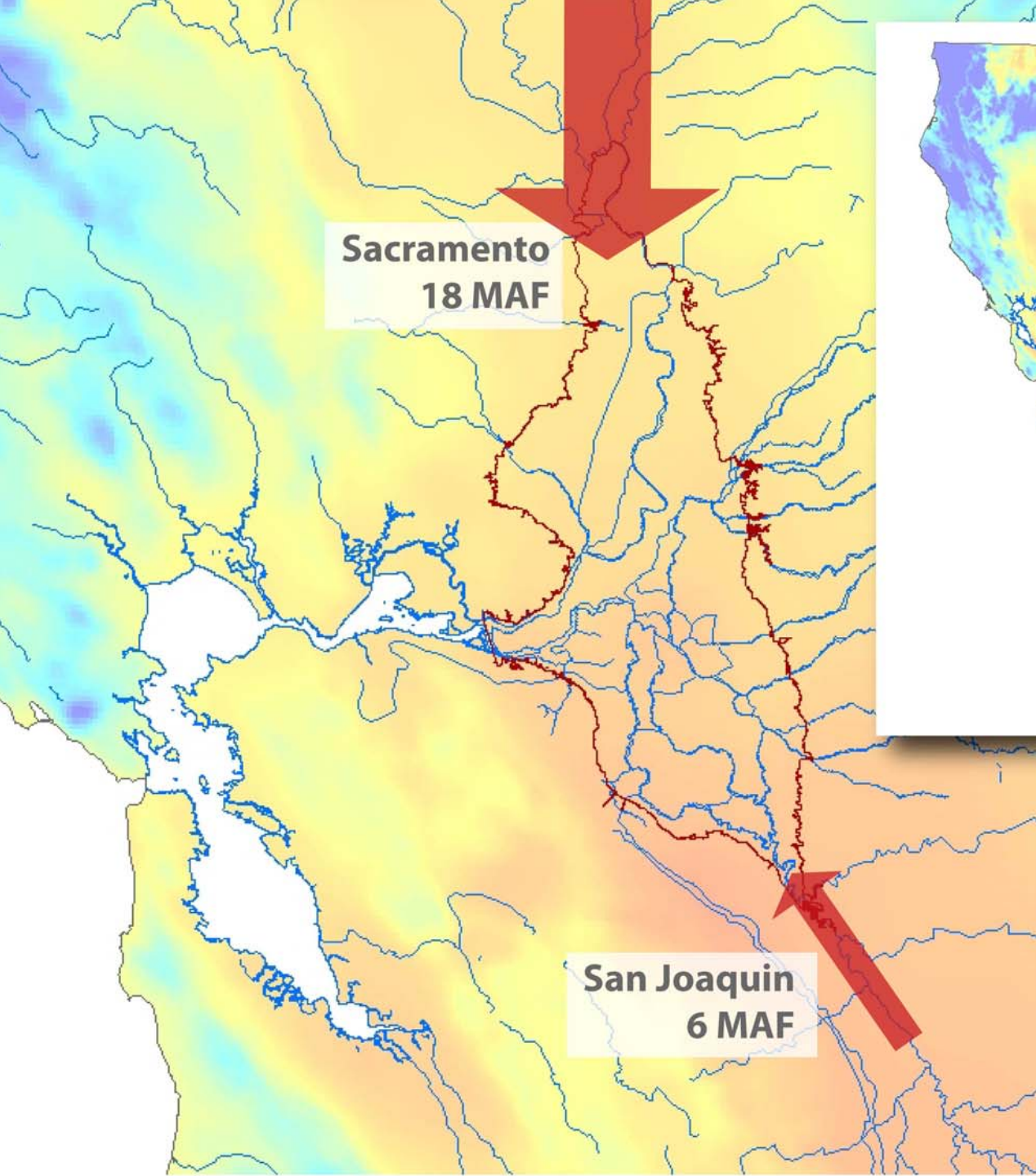


Tidal

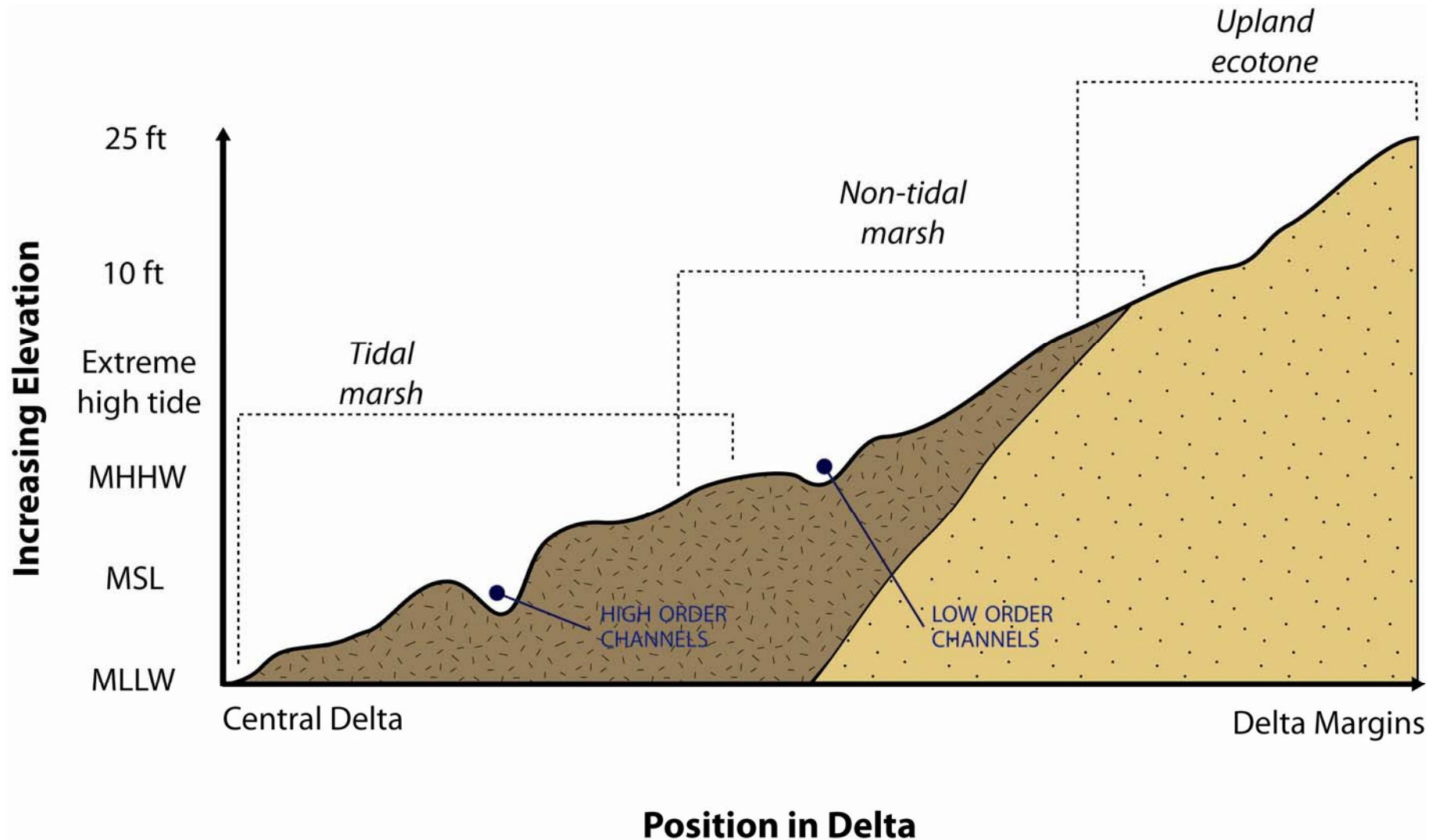
Fluvial

Bay Institute 1998





# Elevation gradient

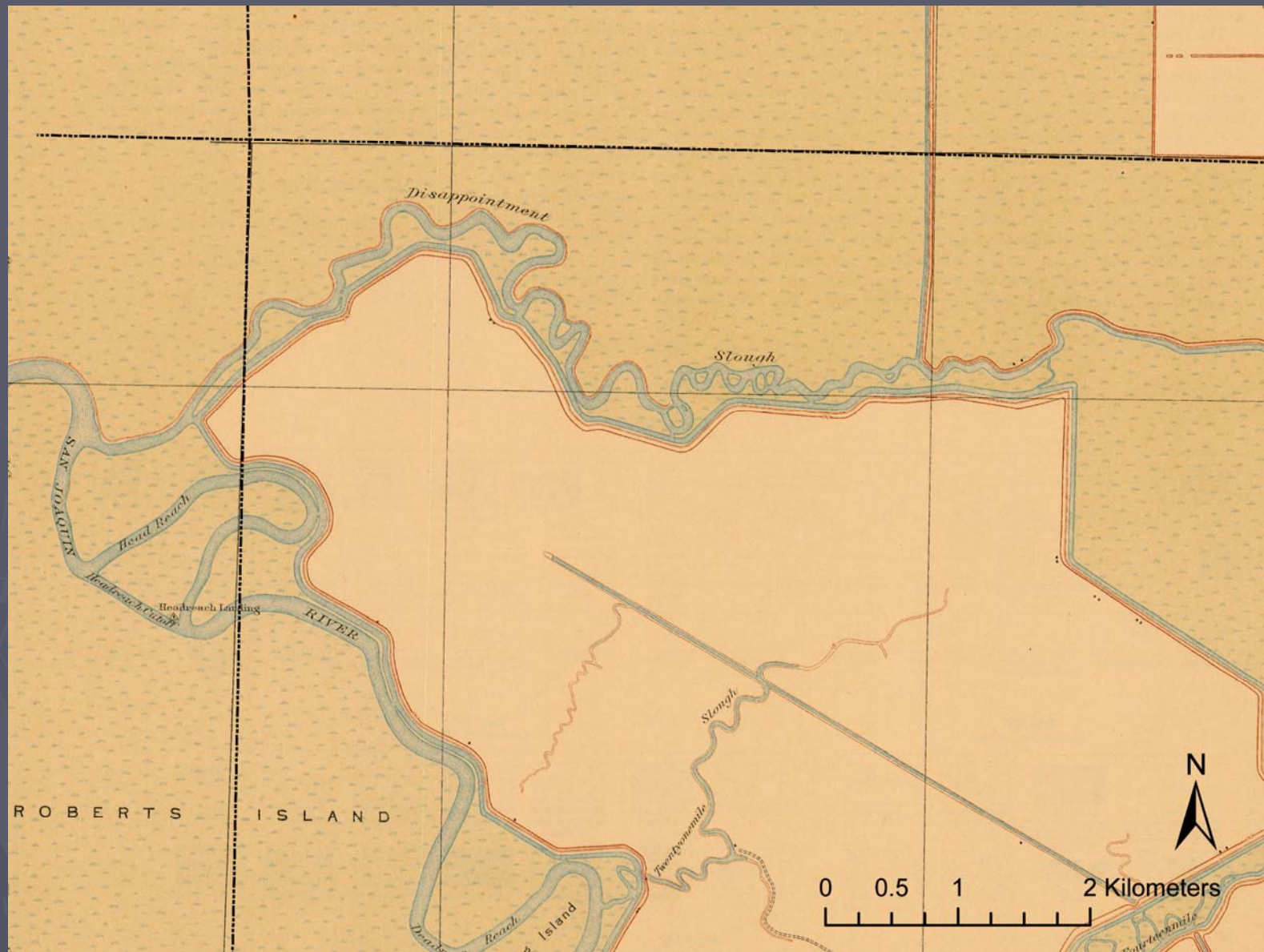




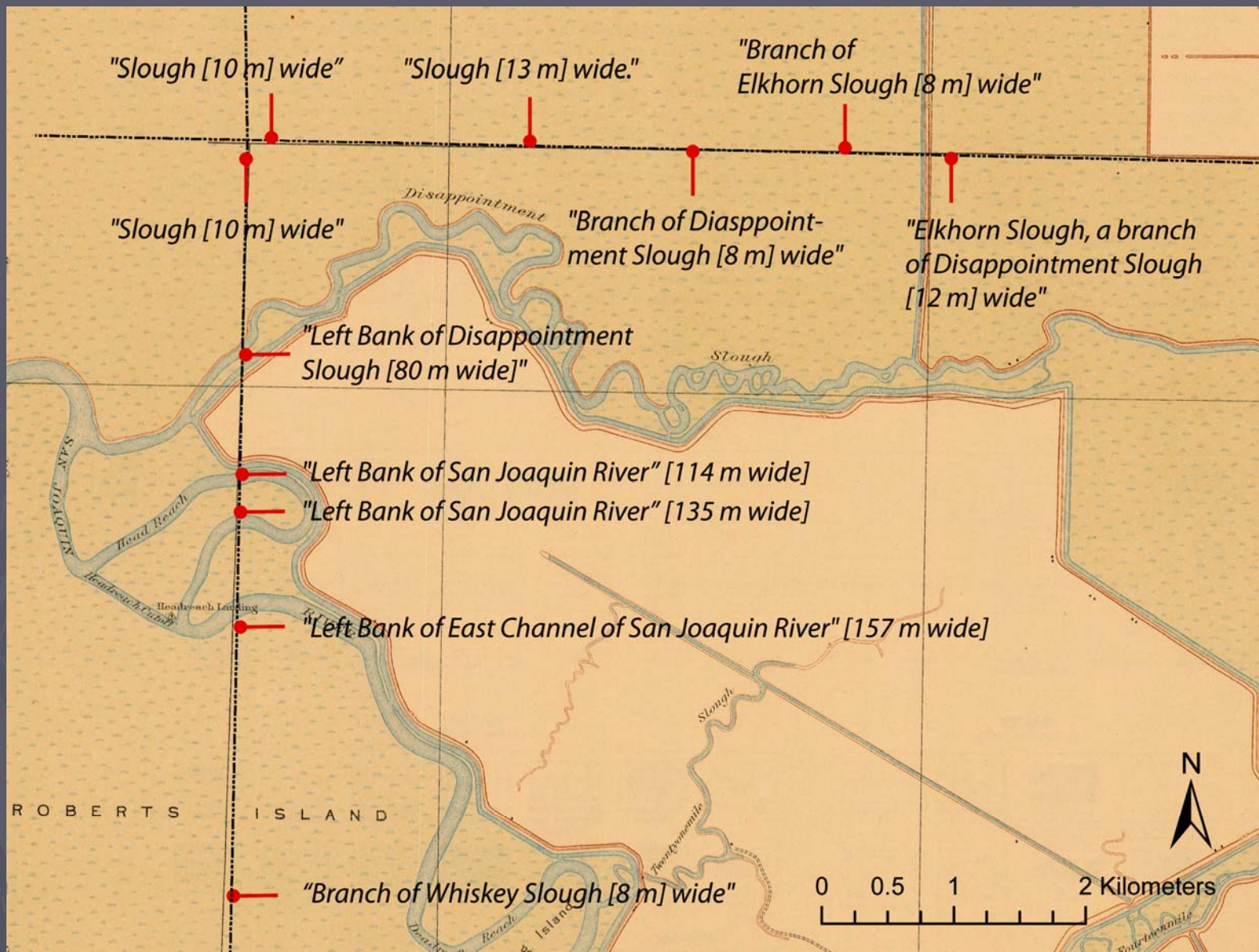
# 1 Channel plan form

- ▶ Channel density
- ▶ Area/channel order
- ▶ Areas of little or no channel
- ▶ Channel sinuosity
- ▶ Dead-end versus connected
- ▶ Regional variation









General Land Office Survey Data

W. F. Benson - January 1879



# Channel plan form



West Delta: Cache Slough



0 0.25 0.5 1 Miles  
0 0.5 1 2 Kilometers

USDA 1937

NAIP 2005

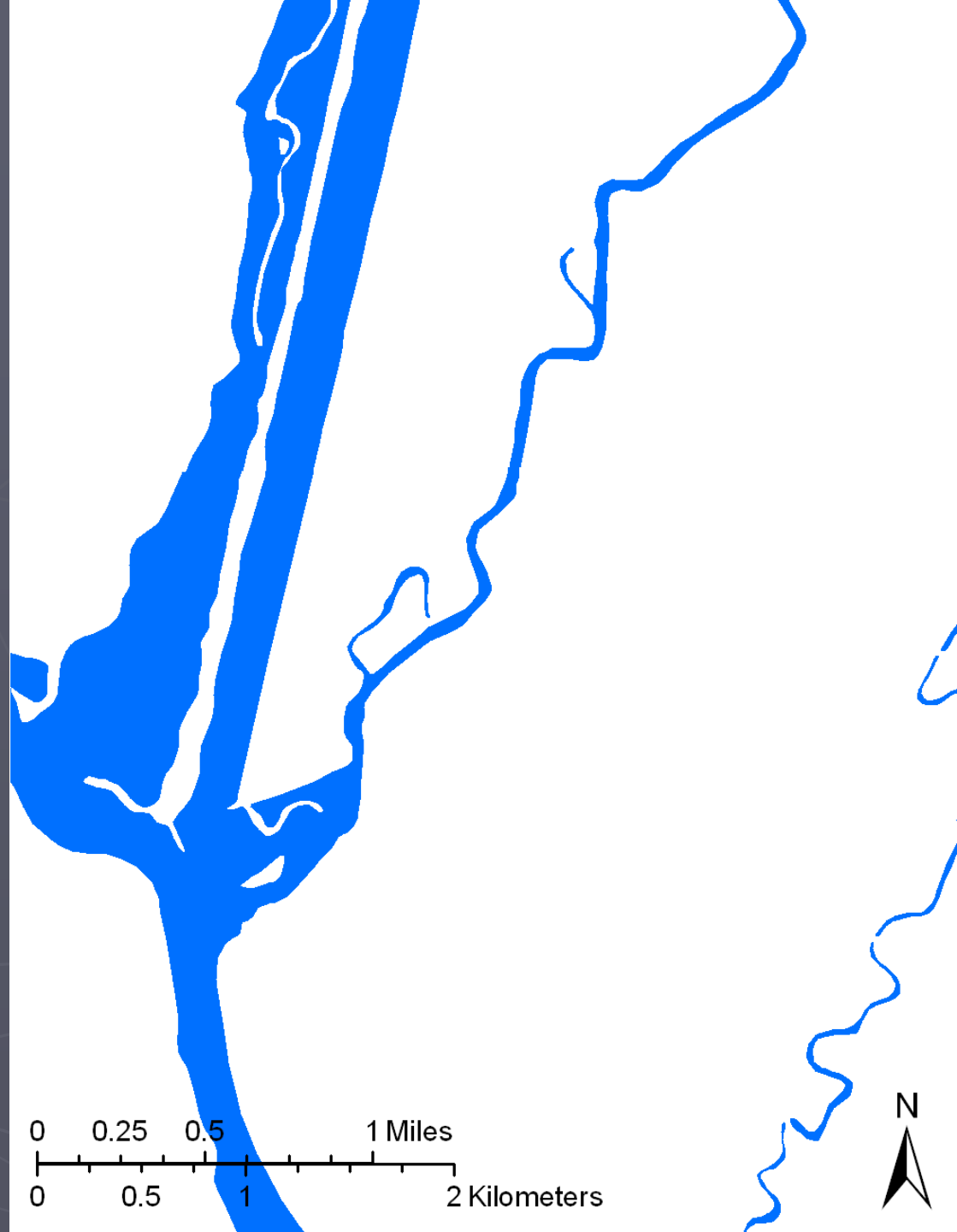


Channel plan form

Modern channel network



2005



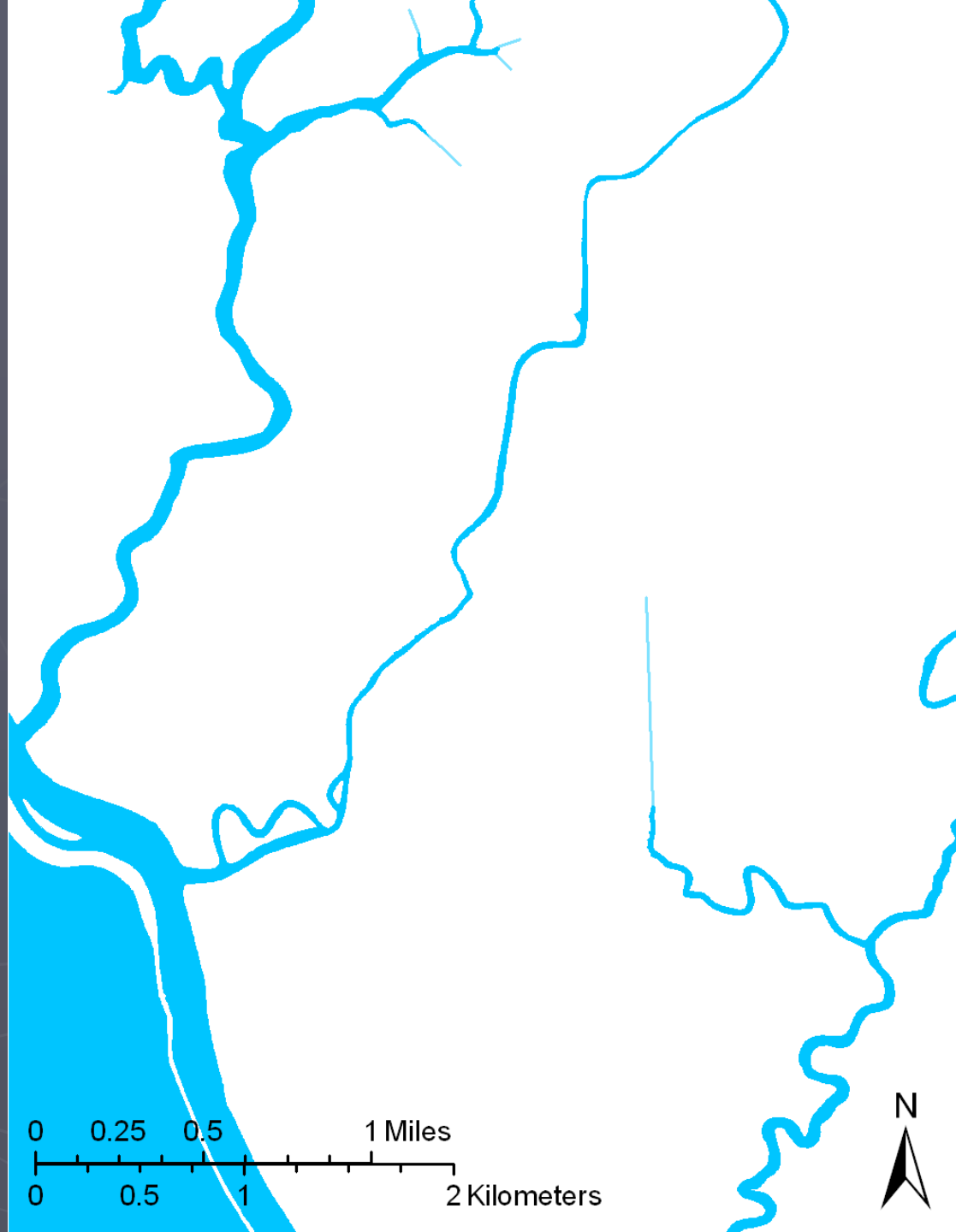
0 0.25 0.5 1 Miles

0 0.5 1 2 Kilometers



# Channel plan form

Digitized from the historical  
USGS topographic quads

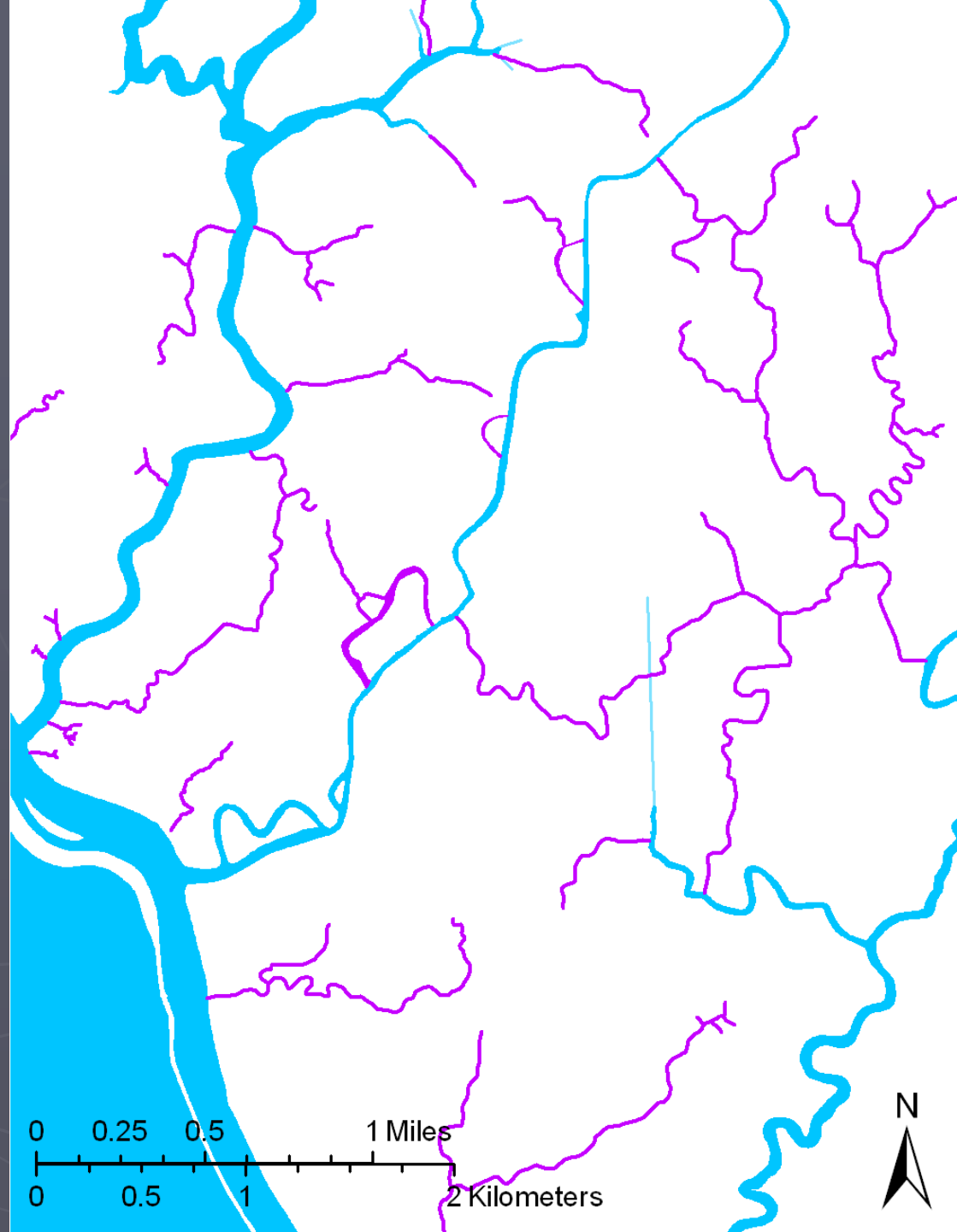




# Channel plan form

Using the 1937 historical  
aerial photography...

pre-1900?

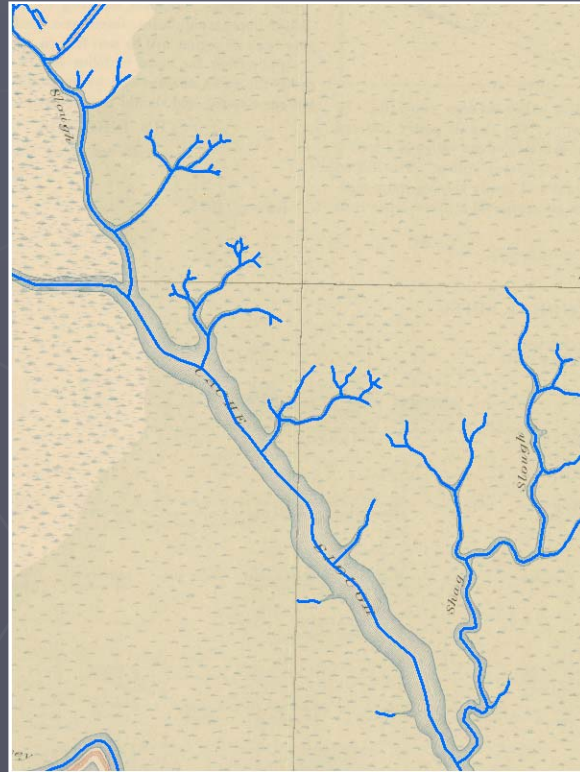


## Channel plan form

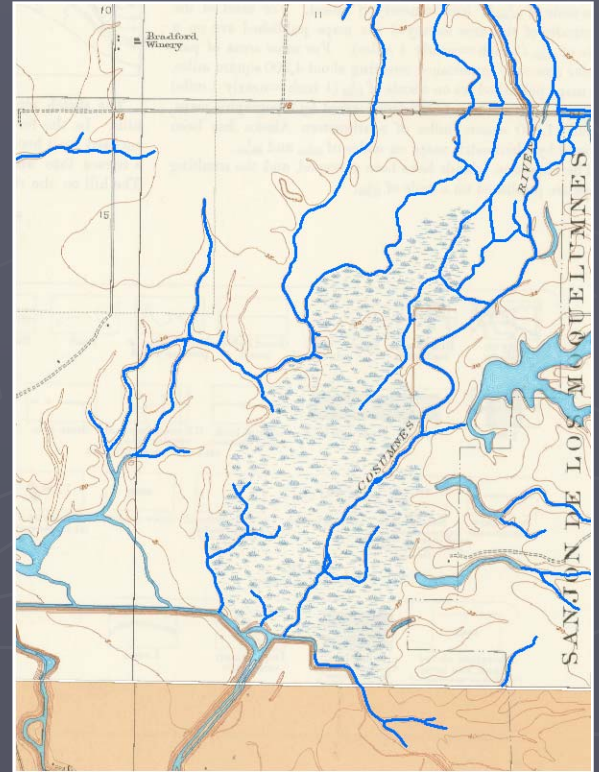
## Central Delta



## West Delta: Cache Slough



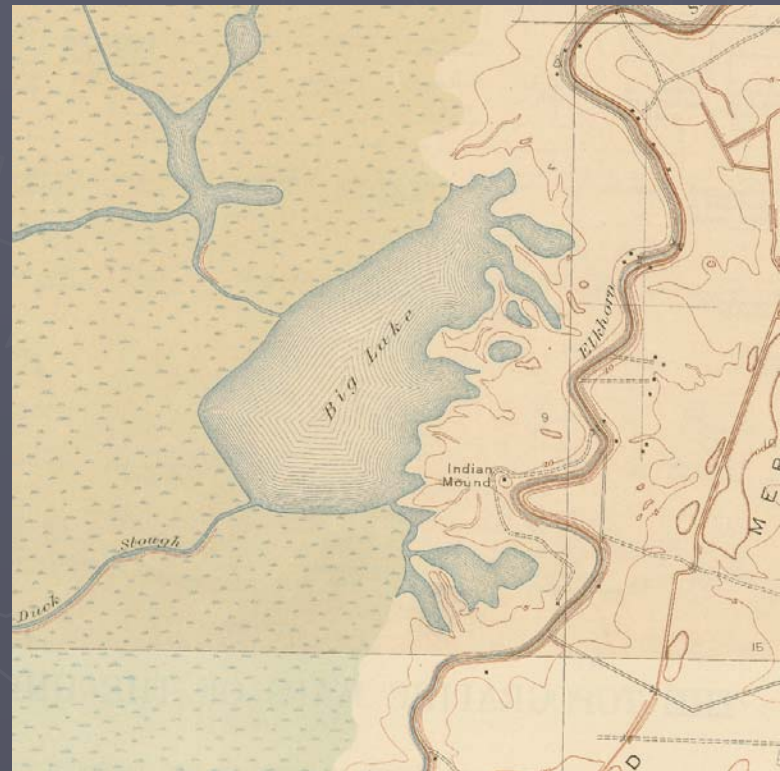
## East Delta: Cosumnes Sink





# 2 Marsh complexity and regional variation

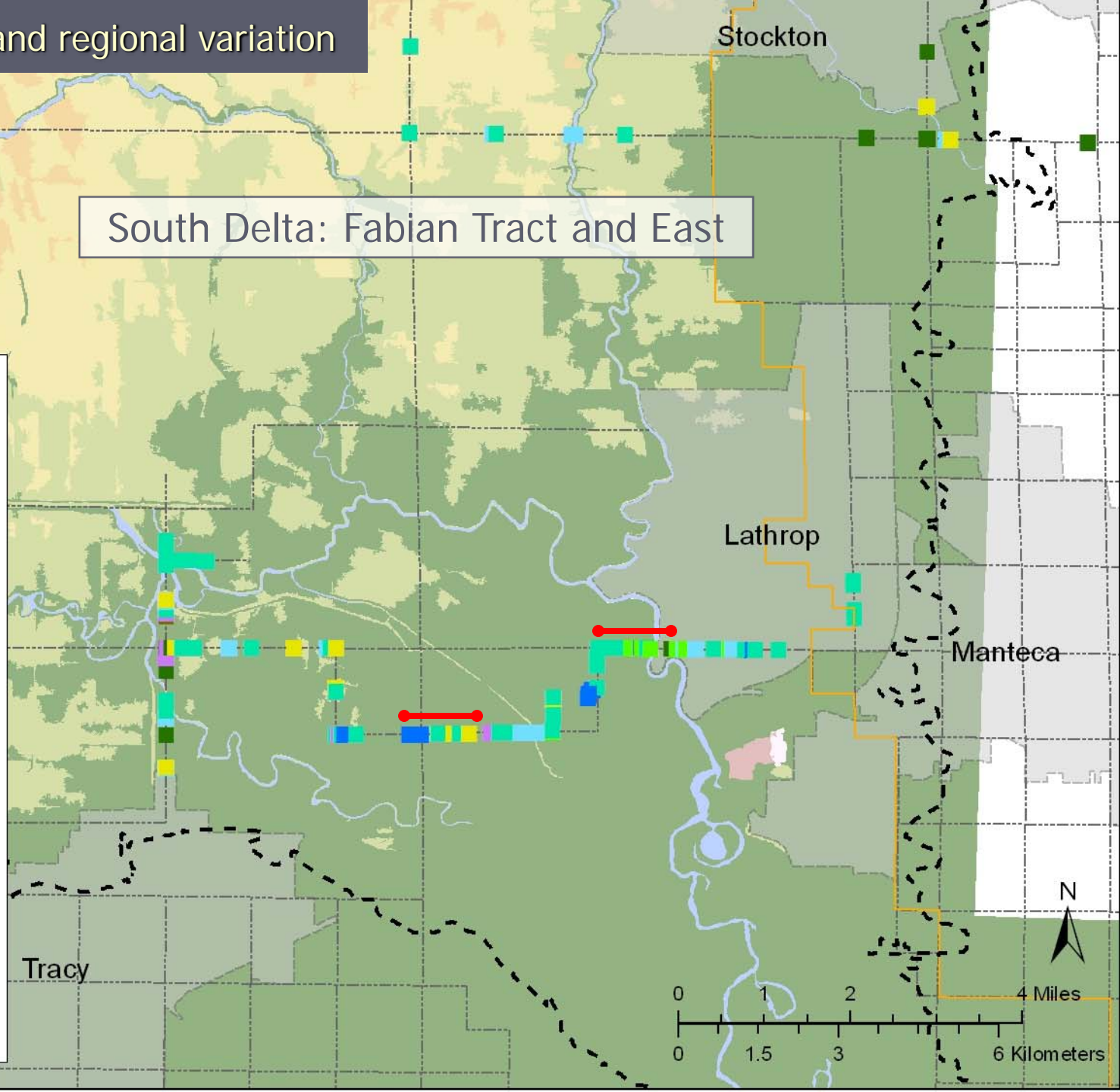
- ▶ Local scale variability
  - *More than just tule?*
- ▶ Ponds/lakes
  - *How common? Size?*
  - *Connected to sloughs?*
- ▶ Persistence
- ▶ Regional variation



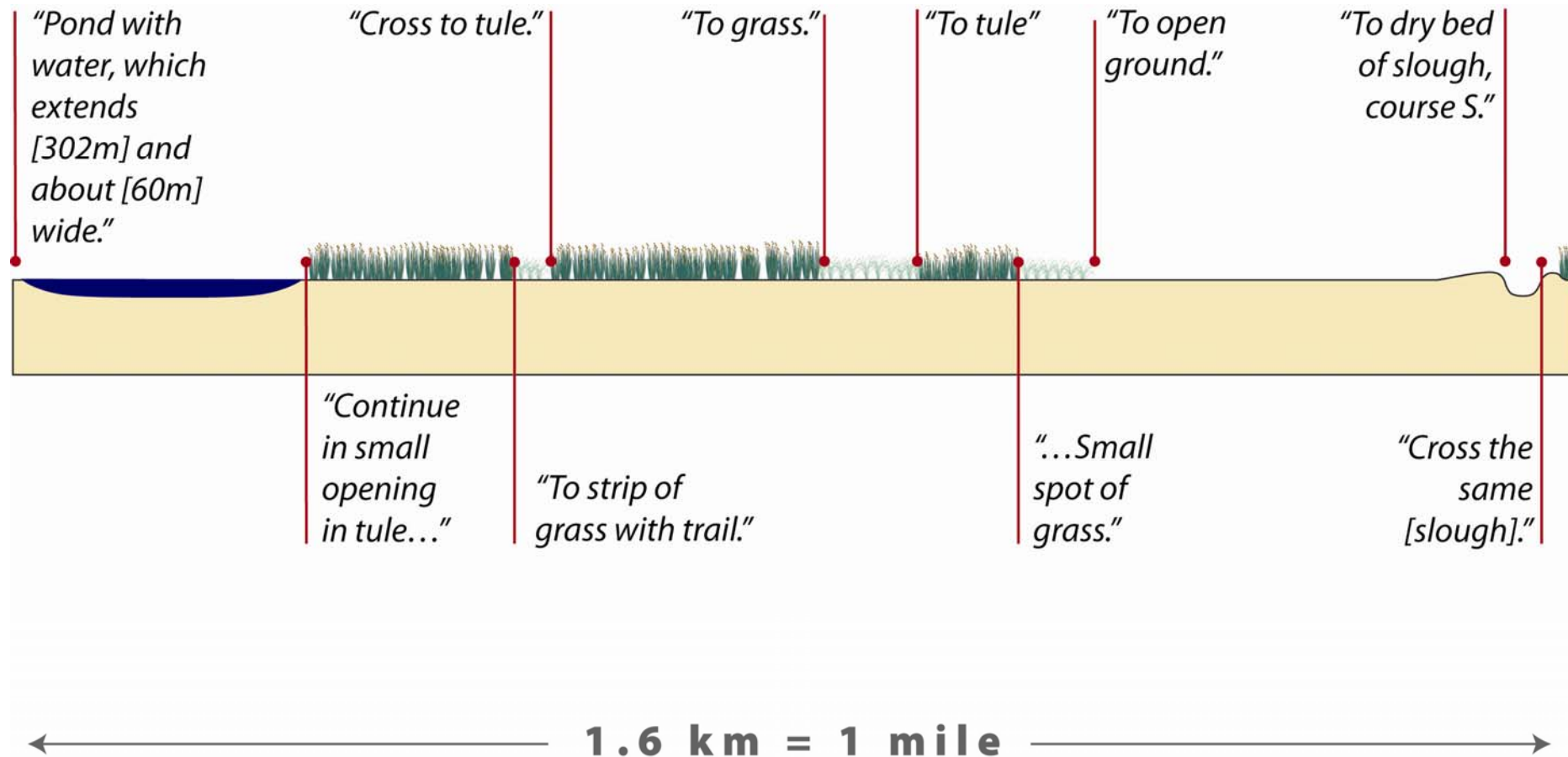
Big Lake, Yolo Basin  
USGS 1916

# Marsh complexity and regional variation

## South Delta: Fabian Tract and East



# Marsh complexity and regional variation





# Marsh complexity and regional variation

## South Delta: Fabian Tract and East

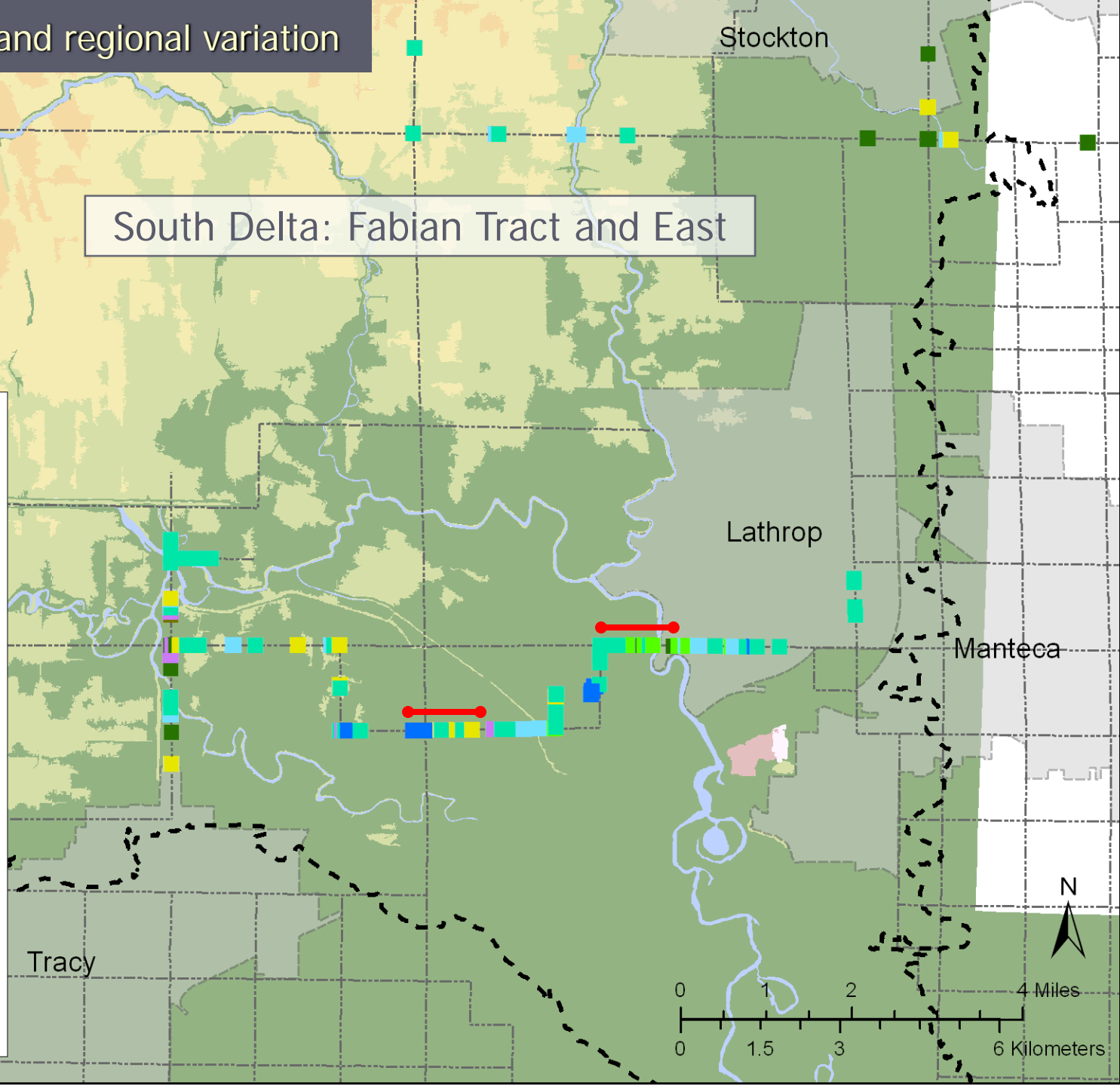
### GLO survey data (ca1860)

- Slough
- Lake, pond, lagoon
- Creek, drain
- Tule marsh
- Willow scrub
- Woodland
- Meadow, grass

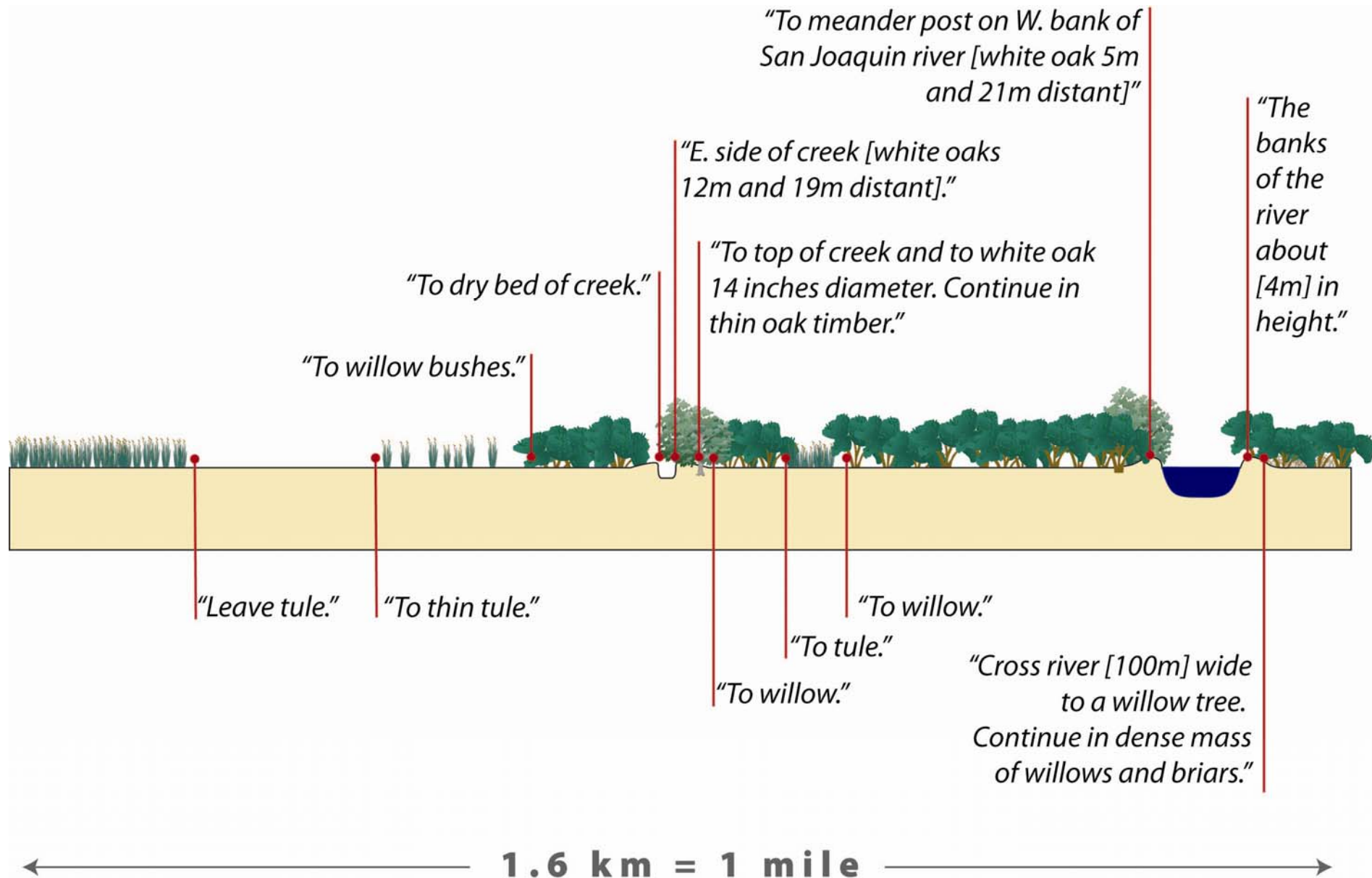
### Study area boundary

### Elevation (Contemporary)

- > 10 feet
- 5 - 10 feet
- 0 - 5 feet
- 5 - 0 feet
- 10 - -5 feet
- 15 - -10 feet
- < -15 feet



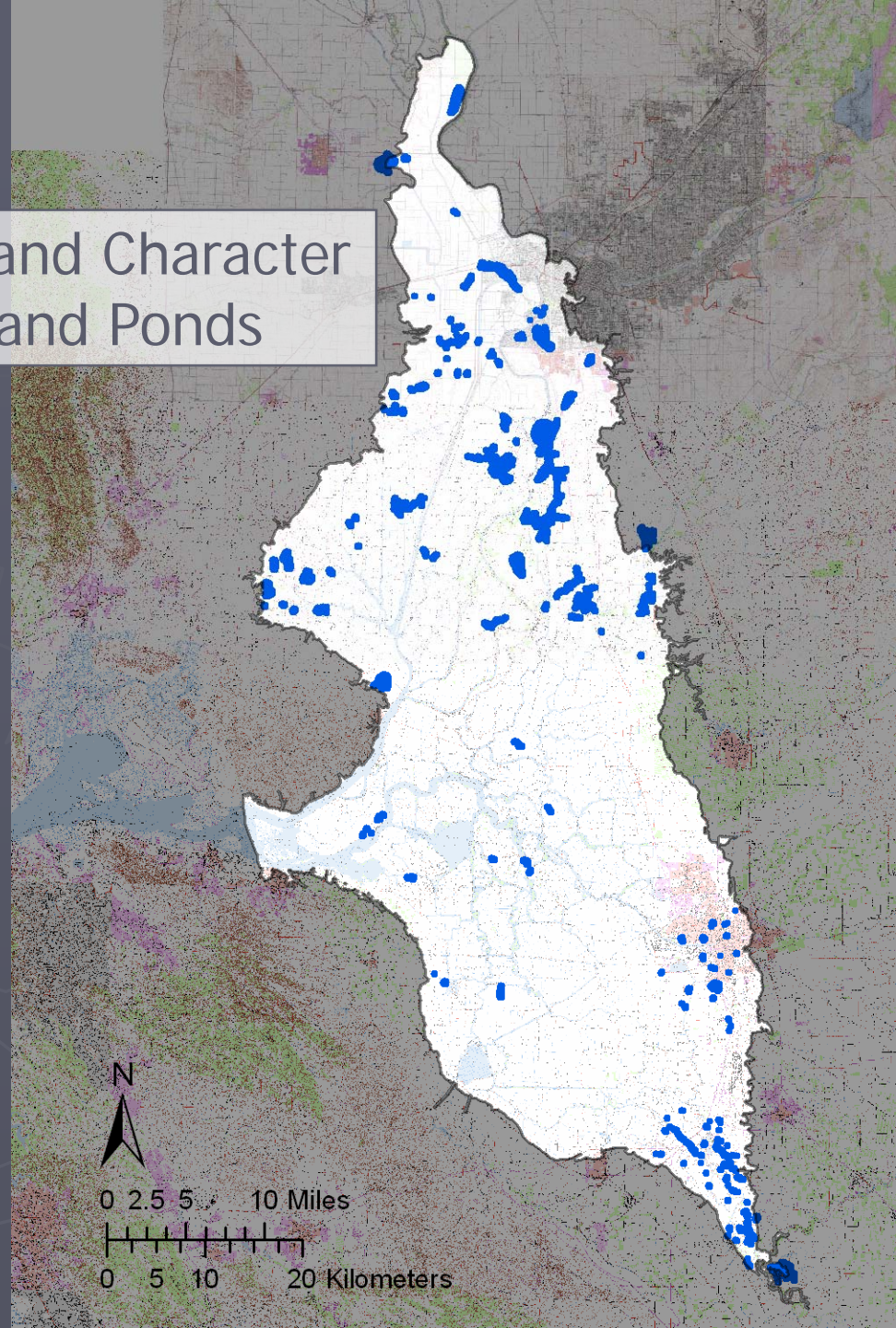
# Marsh complexity and regional variation





# Marsh complexity and regional variation

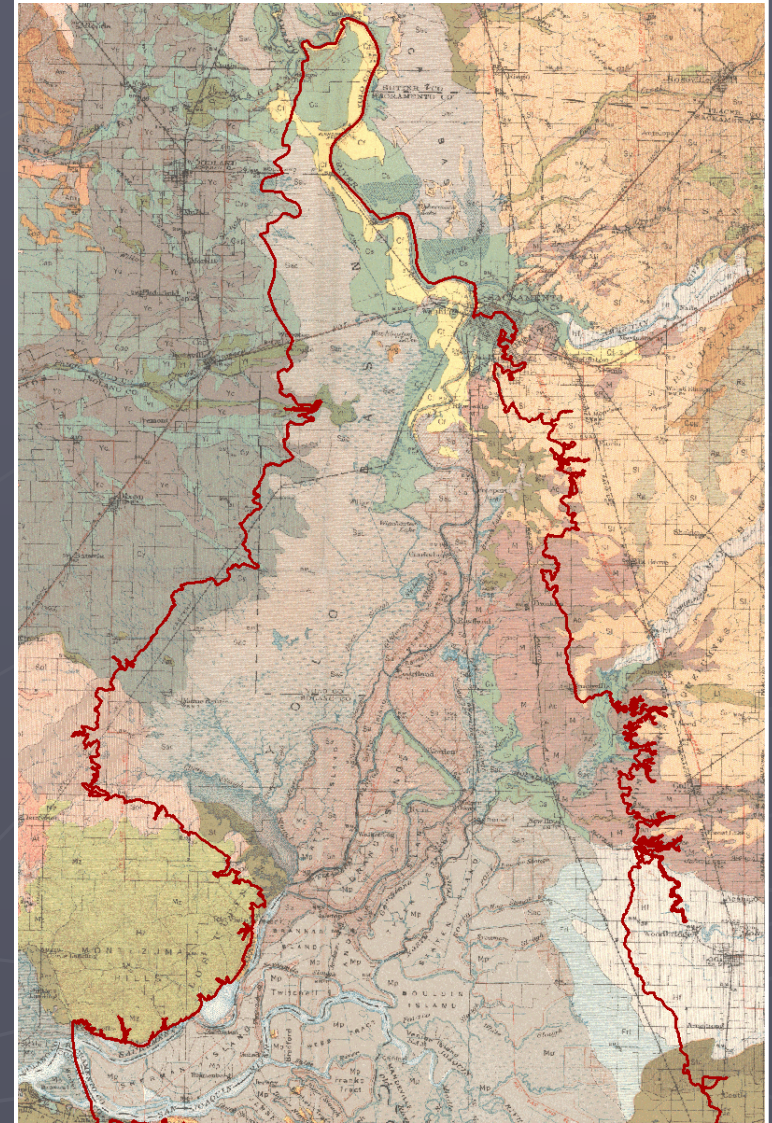
## Distribution and Character of Lakes and Ponds





### 3 Upland ecotone

- ▶ Character of tidal ecotone
  - *Downstream extent of riparian forest*
  - *Relative proportion of habitats around the periphery*
- ▶ Extent of freshwater marsh/adjacent "basins"
  - *Natural "wet-period" water storage*
- ▶ Soil type as indicator
- ▶ Estuarine transgression
  - *(where the marsh needs to go)*





# Upland Ecotone

Northwestern Delta: Cache  
Slough to Putah Creek

“poor drainage,” “subject to  
inundation each rainy season”

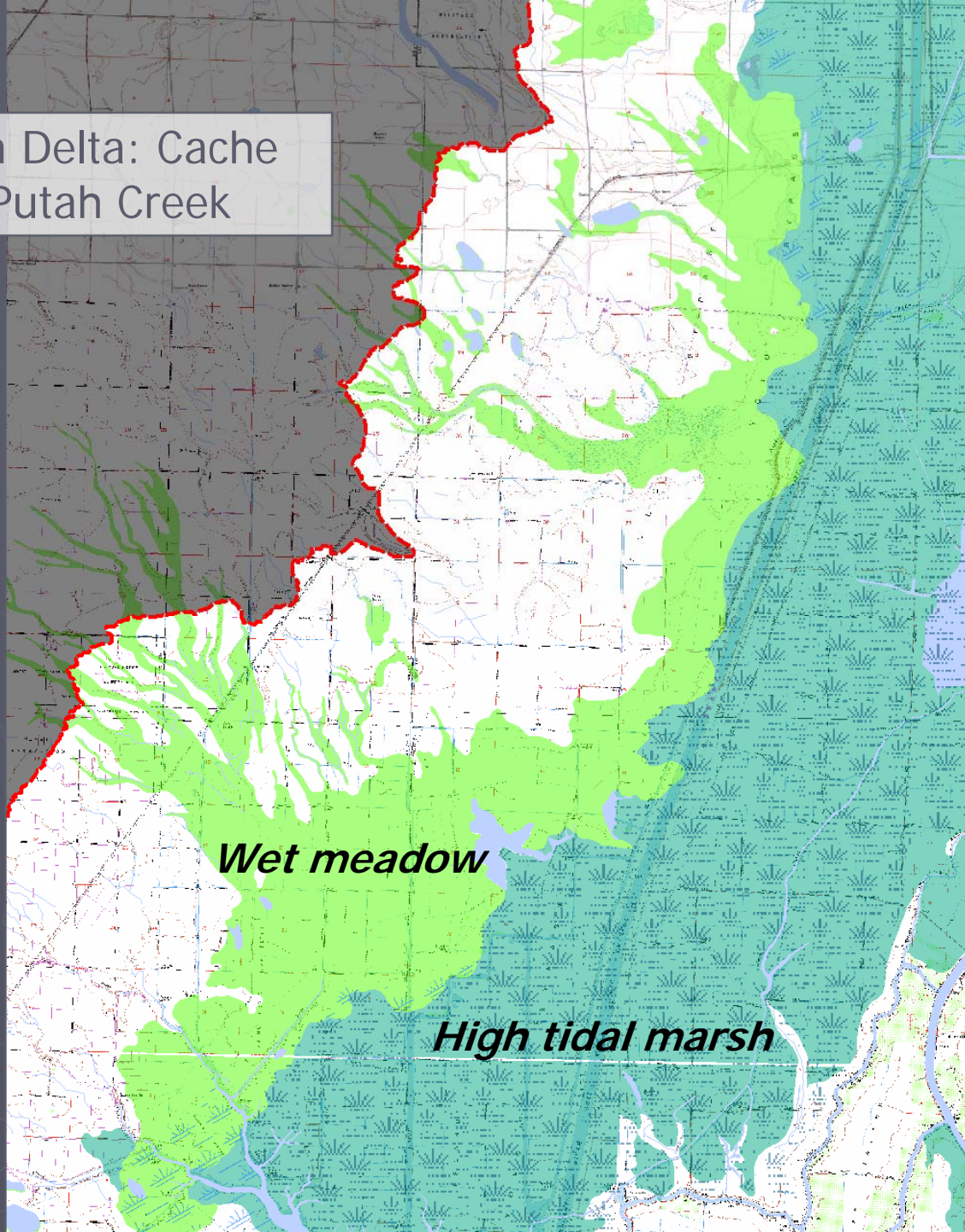
- Carpenter and Cosby 1930

(Southwestern Delta:  
alkali grasslands)

*Wet meadow*

*High tidal marsh*

*Ralph W. Norris, September 1853*



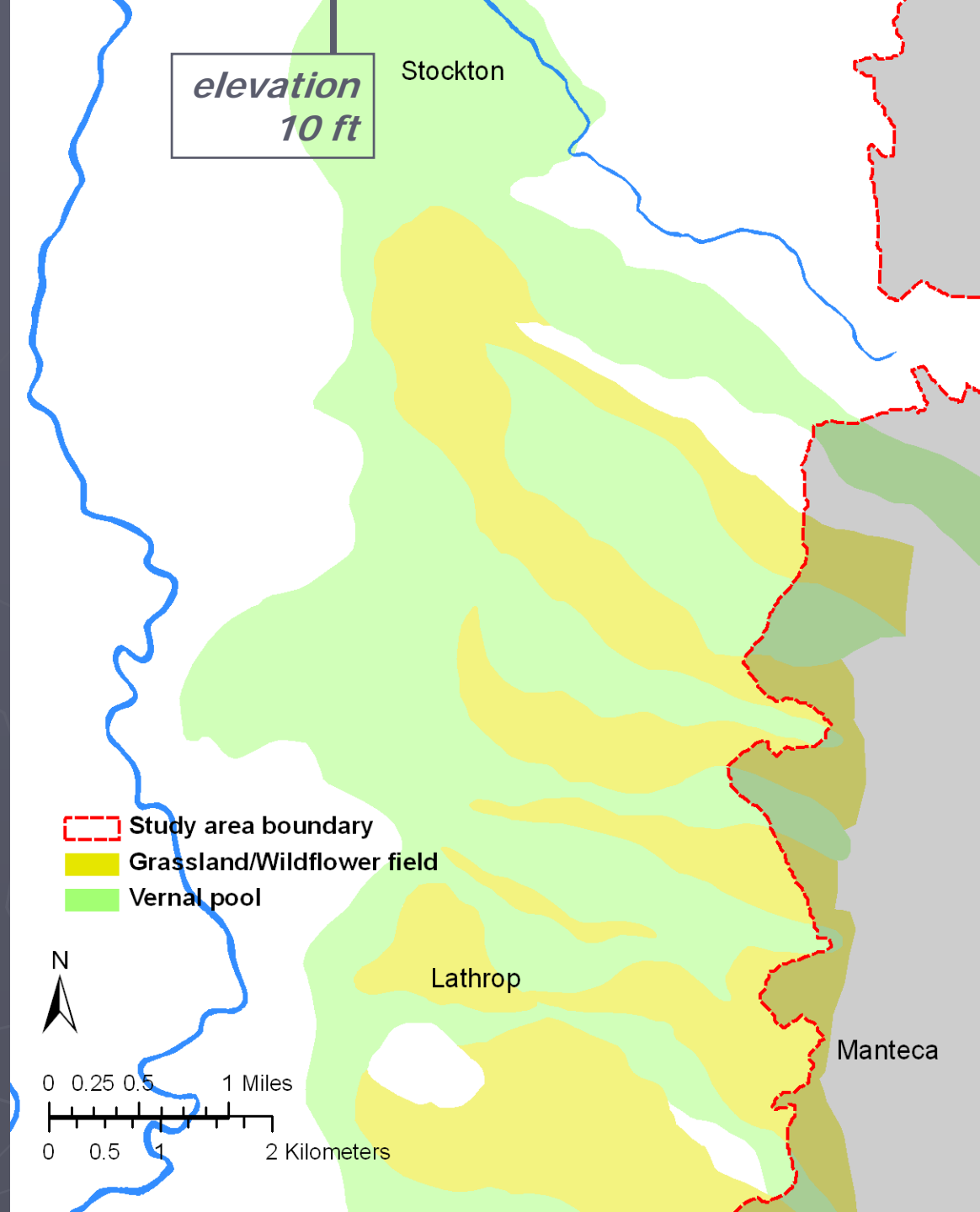
# Upland Ecotone

Southeastern Delta:  
E of Roberts Island

"... treeless, and unmarked by vegetation except **wild grasses** and a great variety of **brilliantly colored wild flowers** appearing during the early spring."

– Lapham and Mackie 1905

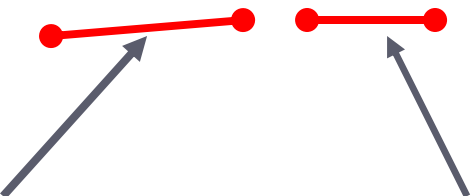
"...Land slightly undulating.  
Soil sandy and 2nd rate..."  
– Ralph W. Norris 1851





Northeastern Delta:  
E of Roberts Island

MAP REMOVED FOR COPYRIGHT STATUS

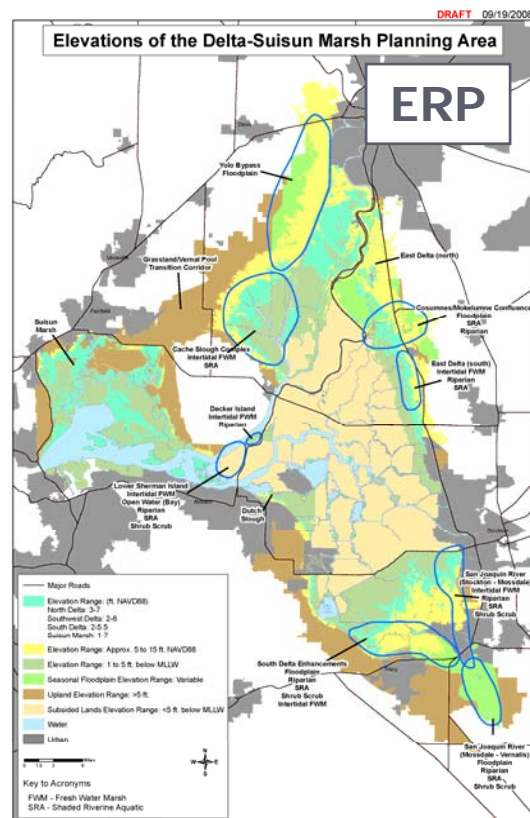
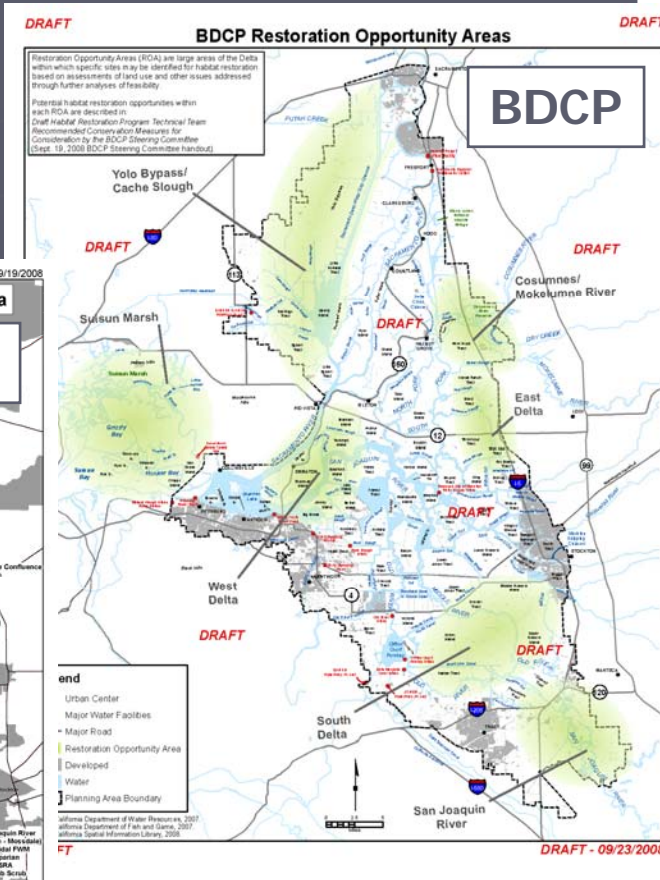
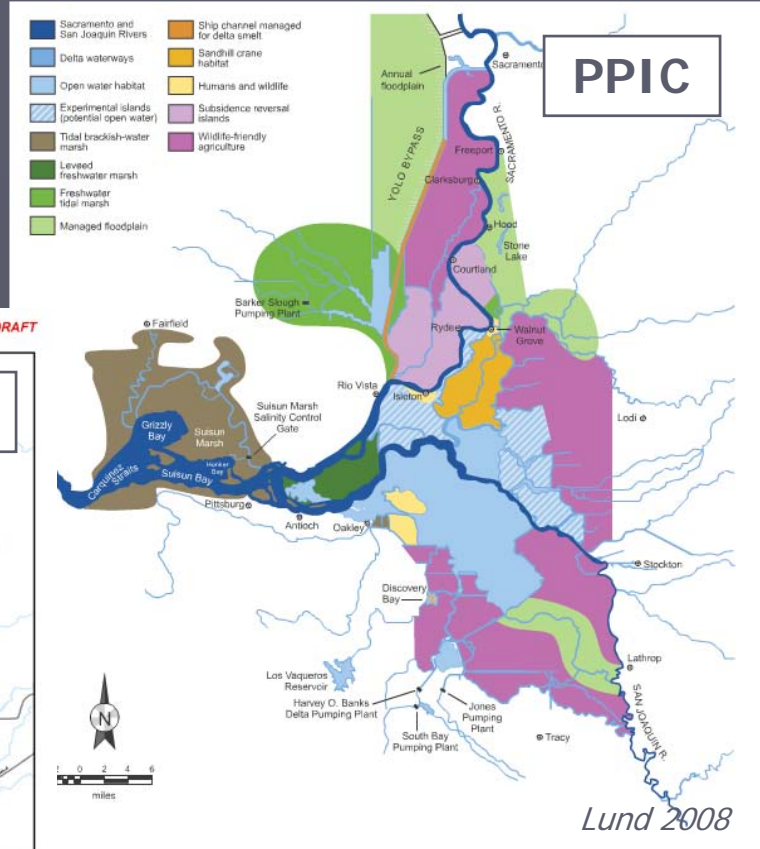


*High marsh > MLLW  
1000-2000 m wide  
6-8" inundation at MHW*

*Ecotone  
700-1200 m wide  
occasional inundation*

"at time of **high water** they are **principally all under water**: at the time of **low waters** there are **points and ridges** which can be **followed in for some distance** - in some places for a mile or two."  
- W.C. Miller 1859

# Restoration planning efforts





# Conclusions

- ▶ Aim for subregionally specific habitat mosaics
- ▶ Re-establish habitat diversity
- ▶ Consider the Delta as a series of deltas
- ▶ Manage toward target ecological functions along physical gradients





Thank You

NIGHT SCENE ON THE SAN JOAQUIN RIVER—  
MONTE DIABLO IN THE DISTANCE  
- Hutchings 1862

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