

HISTORICAL DELTA LANDSCAPES

Conceptual models for building a
diverse and resilient future

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San Francisco Estuary Institute/Aquatic Science Center



Bay-Delta Science Conference
September 27, 2010

ITEM REMOVED DUE TO COPYRIGHT STATUS

THANKS TO

FUNDING:

Department of Fish and Game, Ecosystem Restoration Program

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Brian Atwater

John Thompson

Chris Enright

UC Berkeley and The Bancroft Library

UC Davis and The Shields Library

The Bureau of Land Management

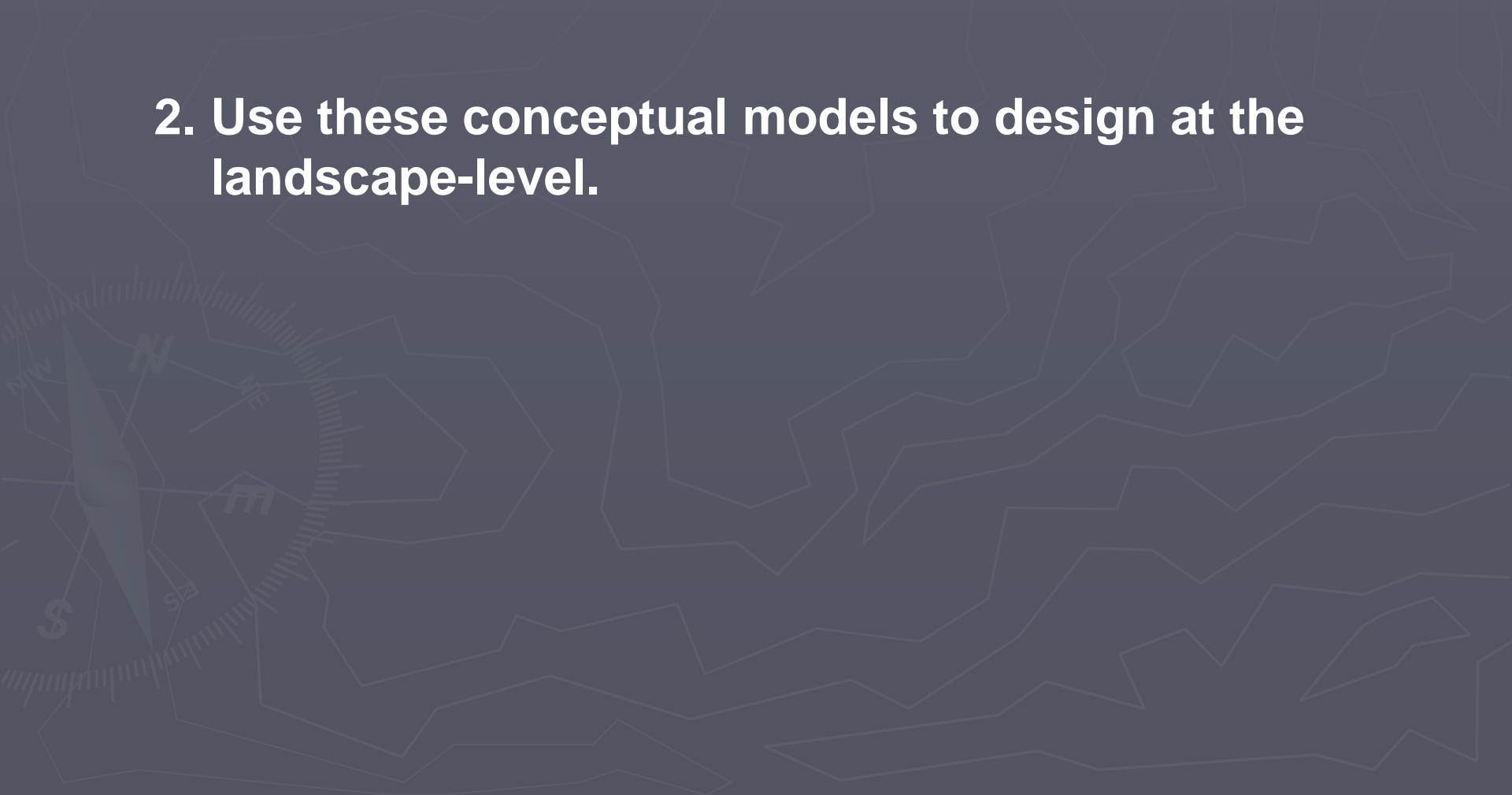
The State Lands Commission

Bob Webber and Reclamation District 999

Sacramento River Delta Historical Society

Central points

- 1. Look at historical Delta to identify the landscape functions that we need and what they require.**
- 2. Use these conceptual models to design at the landscape-level.**



TRANSLATING LANDSCAPE TO SPECIES SUPPORT FUNCTION

Physical Drivers

FLUVIAL
PROCESSES



TIDAL
PROCESSES

Habitats

Channels
Marshland
Ponds and lakes
Floodplain basins
Riparian forest
Upland ecotone

Function



Resting
Foraging
Breeding
Migration

**Raw
Data**
**(examined 1000s of
documents)**



**Collected
Data**
**(over 800
documents)**

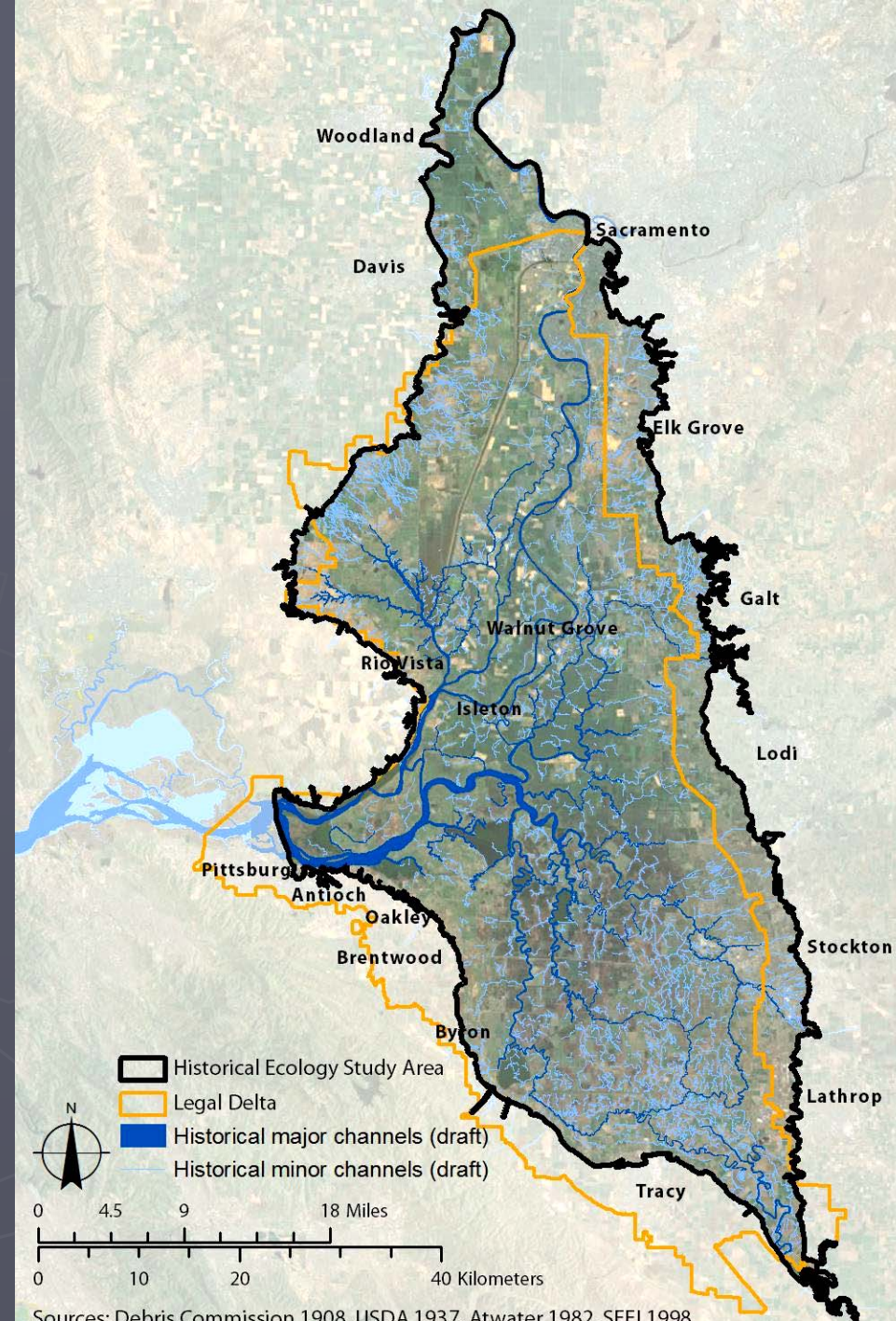


**Compiled
Data**

STUDY AREA

Size: ~800,000 acres

Extent: Feather to Stanislaus along the 25-ft contour





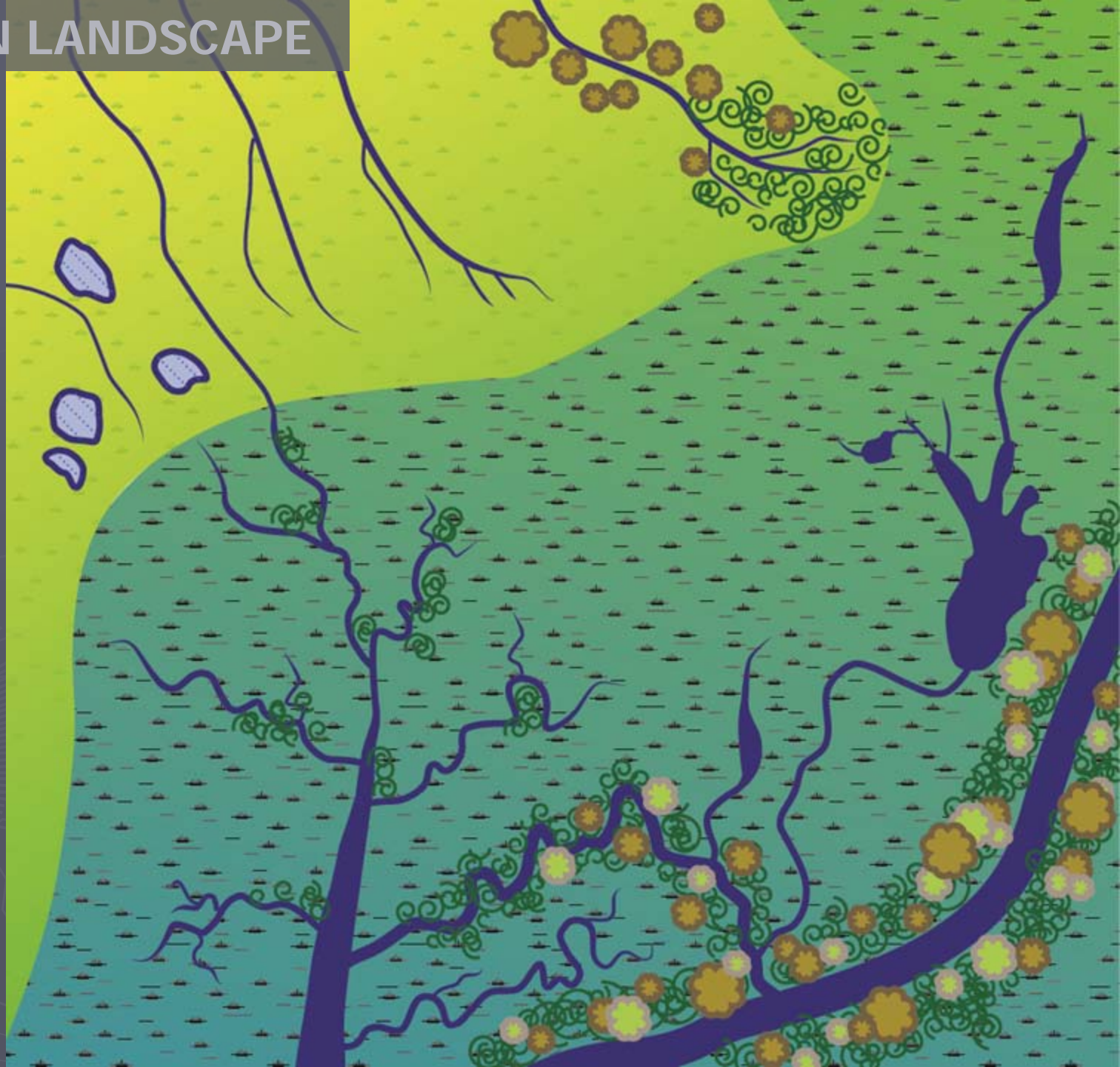
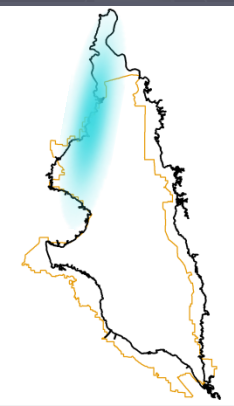
NORTHEAST DELTA
YOLO BASIN

EAST DELTA

CENTRAL DELTA

SOUTH DELTA

YOLO BASIN LANDSCAPE

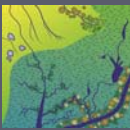


Interactions between flow, sediment supply, and vegetation influence the temporal conditions of habitat

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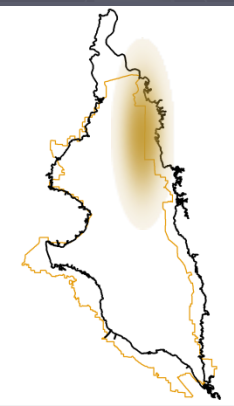
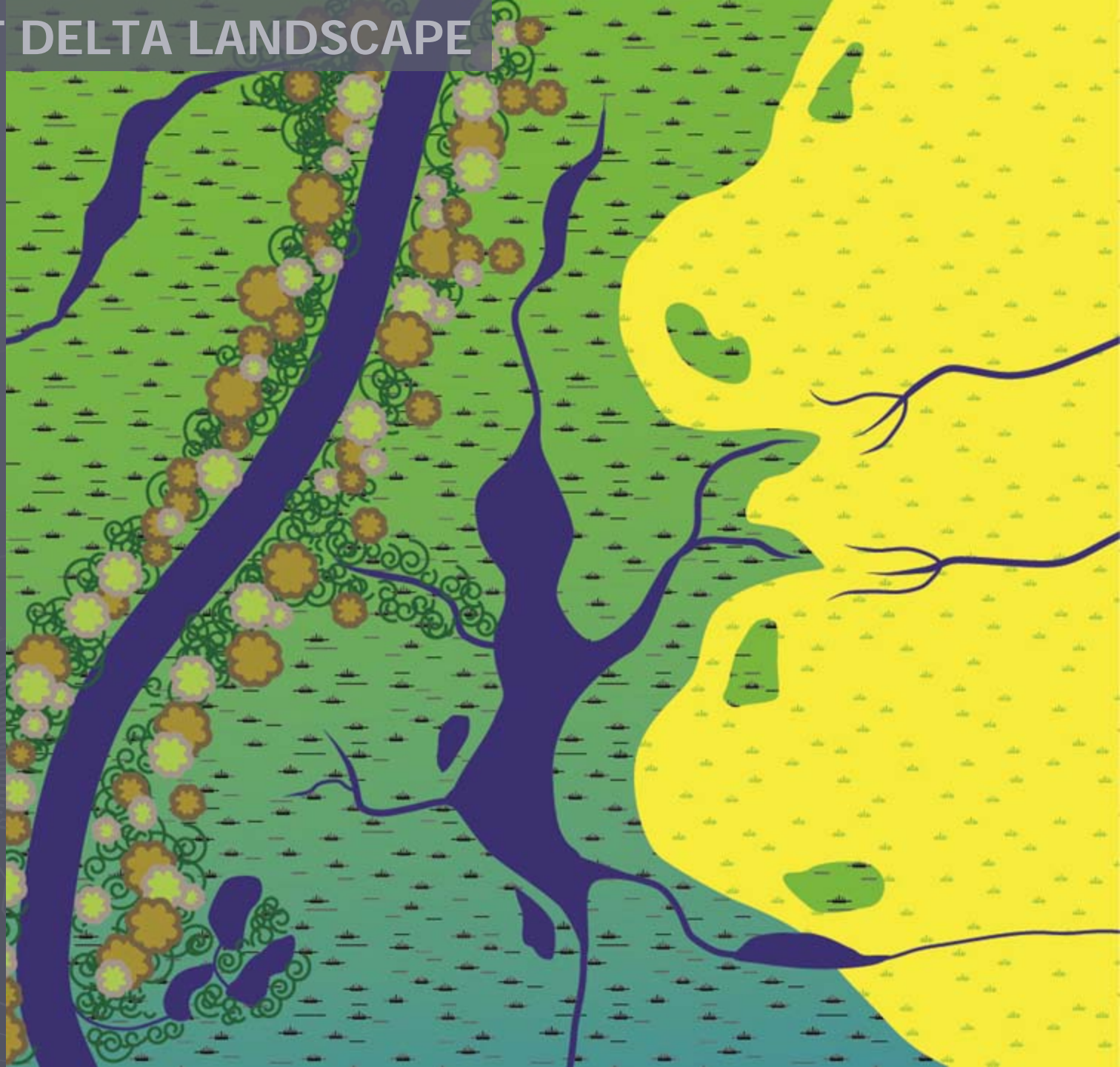
“Putu [sic] and Cache creeks...form in the rainy season **a lake some 40 miles long, and from 5 to 10 miles wide**. In some years this lake is increased by the overflowing of the Sacramento...”

- *Californian*, 26 April 1848

- 
- high fluvial influence
 - basin water storage
 - variable channel density
 - numerous large and small ponds/lakes
 - riparian gallery forest on natural levees



NORTHEAST DELTA LANDSCAPE



CHARACTER OF RIPARIAN FOREST

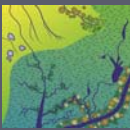
“Between this body of water and the river was a **narrow ridge of land mostly covered with a growth of oak, cottonwood, willow and sycamore trees, amidst which was a matted jungle** of grape and blackberry vines which, with other shrubbery...

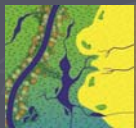
This slightly elevated ridge seemed to be exempt from overflow...”

- *Fairchild 1934*

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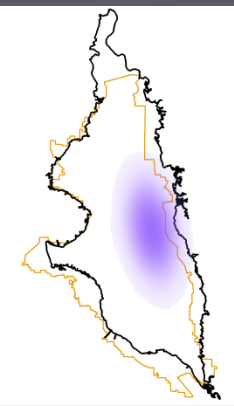
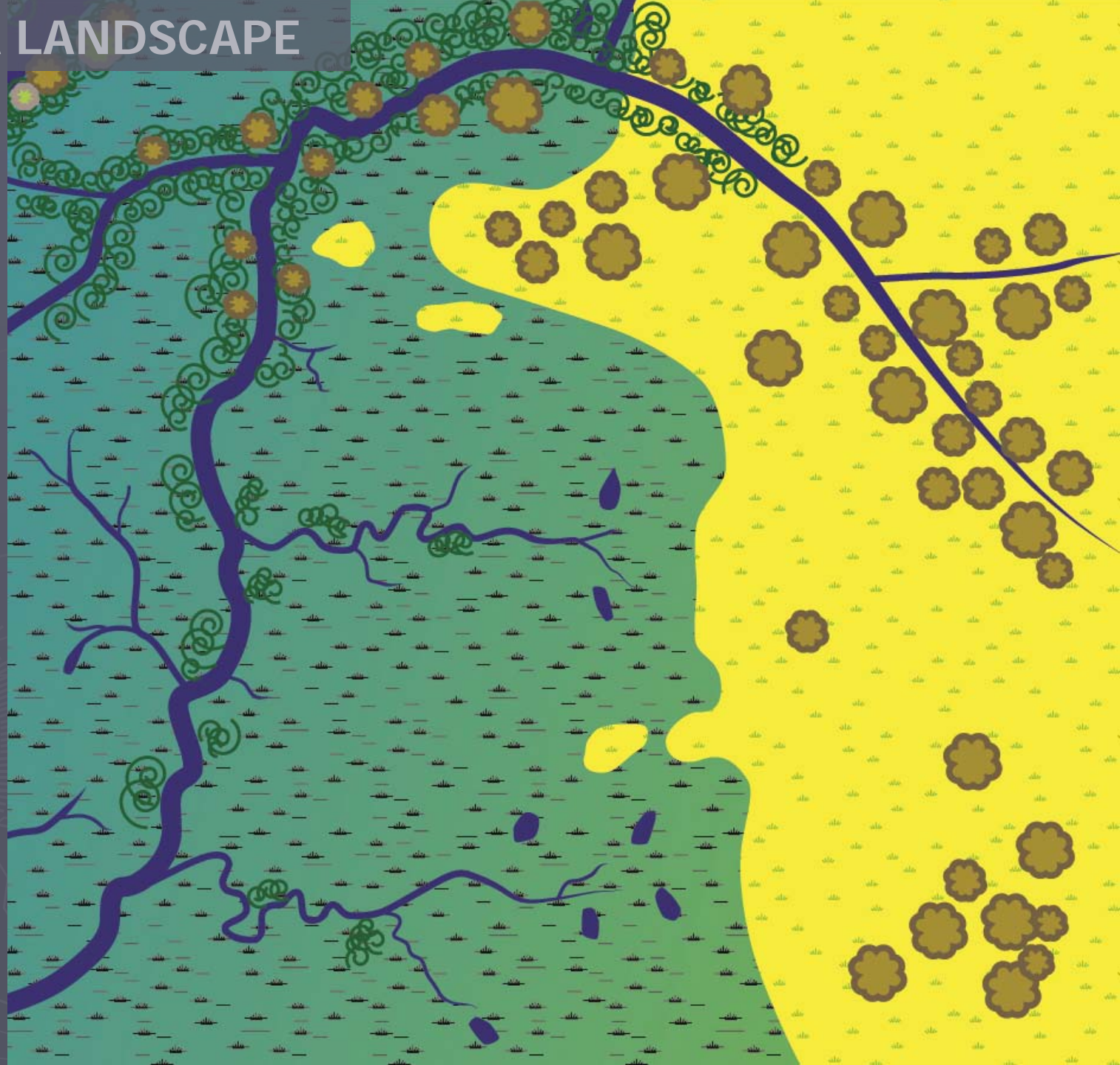
Grunsky ca. 1878
Courtesy The Bancroft Library

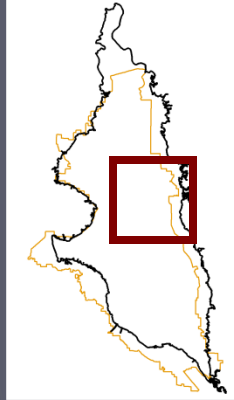
- 
- high fluvial influence
 - basin water storage
 - variable channel density
 - numerous large and small ponds/lakes
 - riparian gallery forest on natural levees



- very high fluvial influence
- basin water storage
- low to no channel density
- numerous large and small ponds/lakes
- riparian gallery forest on natural levees

EAST DELTA LANDSCAPE





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[q17] ...is there any land not covered with water at high tide, if so how much?

[a17] Several places or islands.

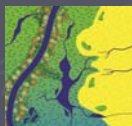
- *Thornton 1855*



- high fluvial influence
- basin water storage
- variable channel density
- numerous large and small ponds/lakes
- riparian gallery forest on natural levees

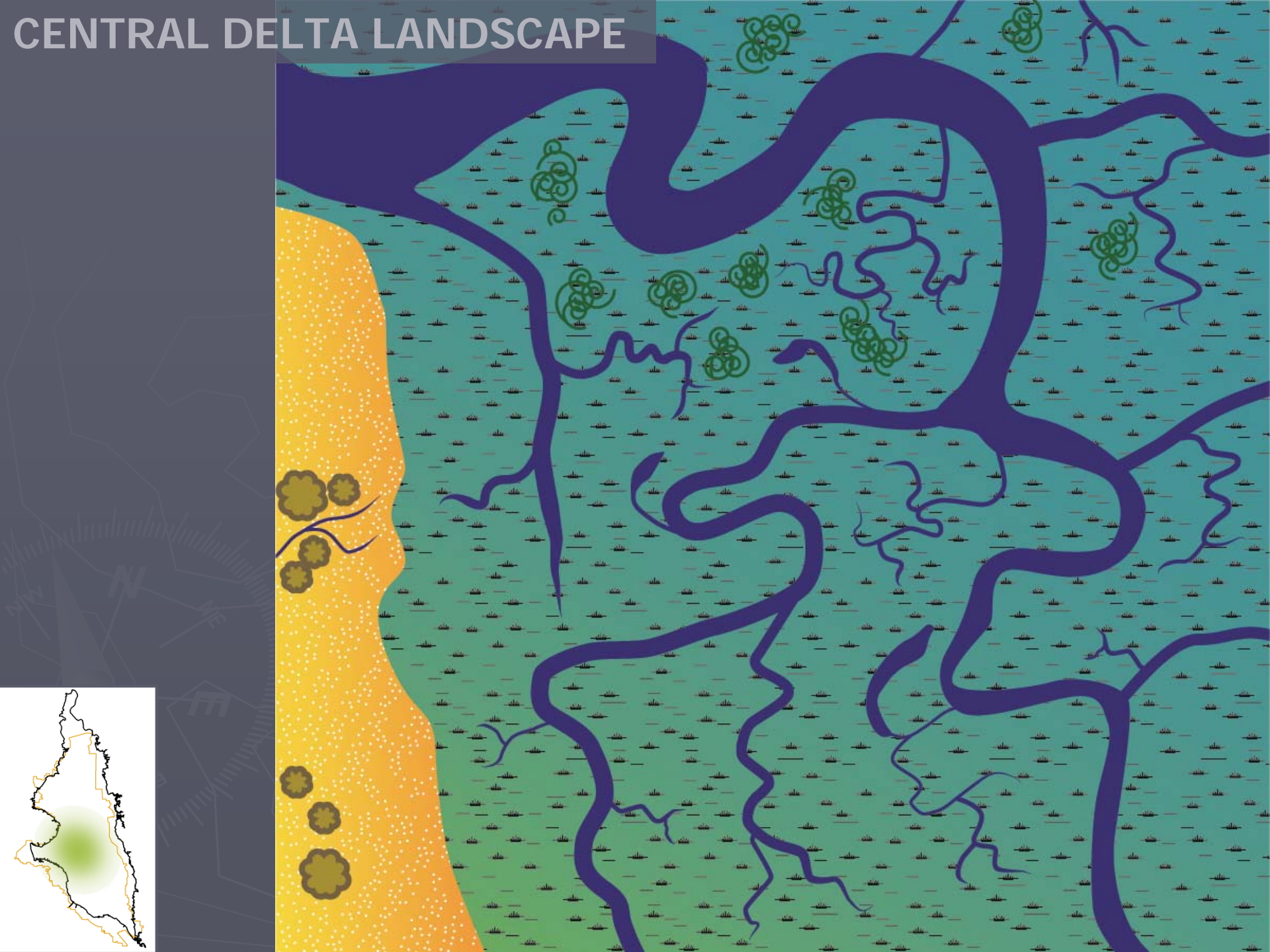


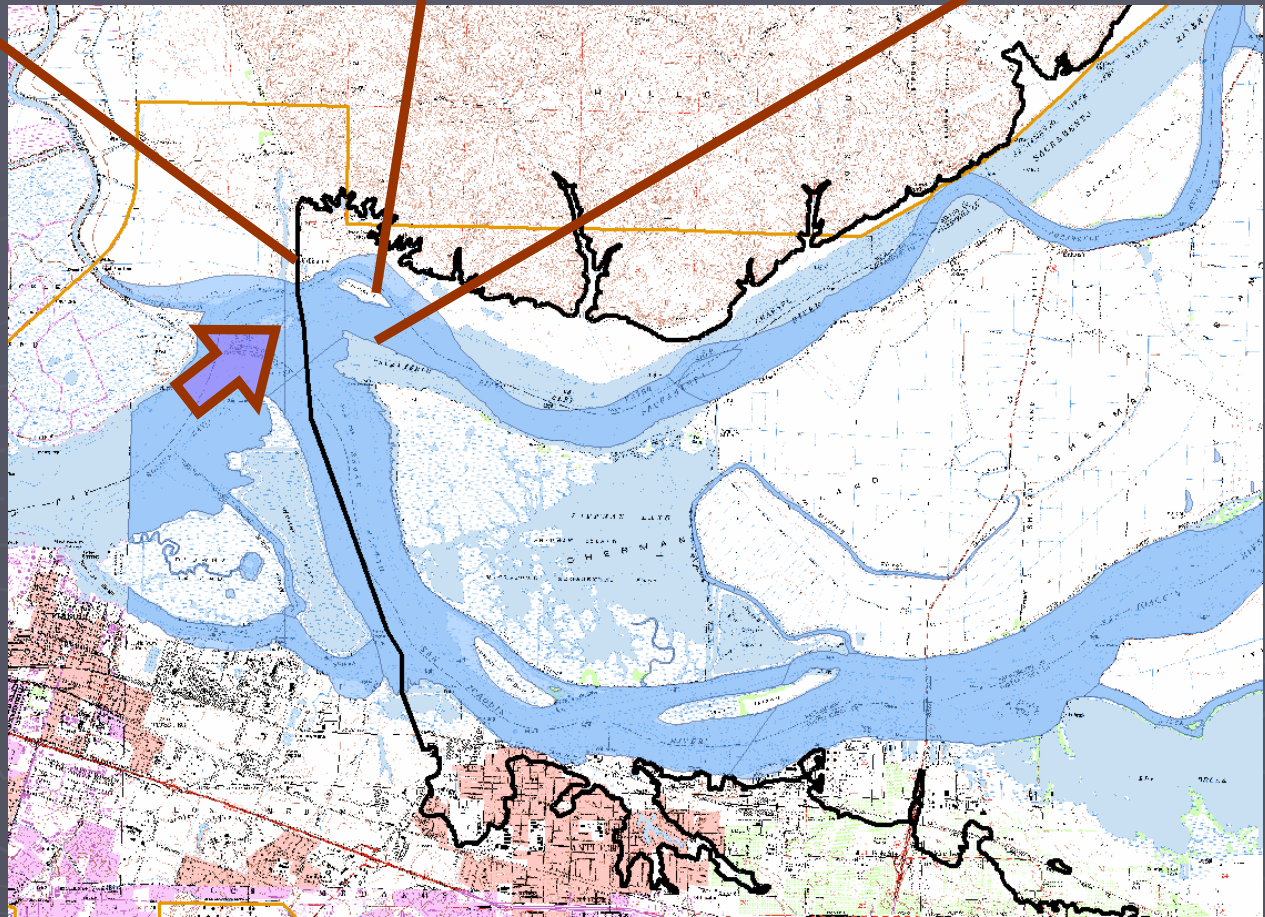
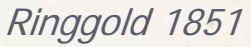
- moderate to low fluvial influence
- submerged by spring tides
- moderate channel density
- relatively small ponds/lakes
- moderate presence of riparian forest



- very high fluvial influence
- basin water storage
- low to no channel density
- numerous large and small ponds/lakes
- riparian gallery forest on natural levees

CENTRAL DELTA LANDSCAPE







Bonnett 2009

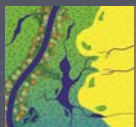
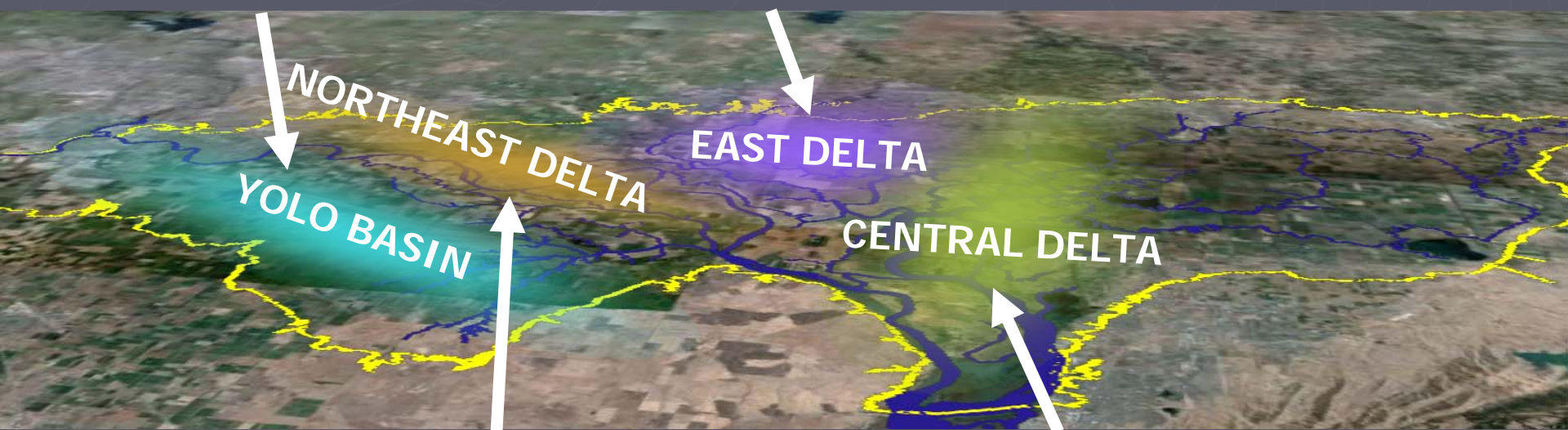
Cibbes 1851



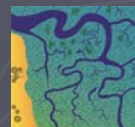
- high fluvial influence
- basin water storage
- variable channel density
- numerous large and small ponds/lakes
- riparian gallery forest on natural levees



- moderate to low fluvial influence
- submerged by spring tides
- moderate channel density
- relatively small ponds/lakes
- moderate presence of riparian forest

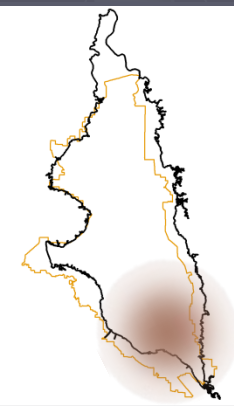
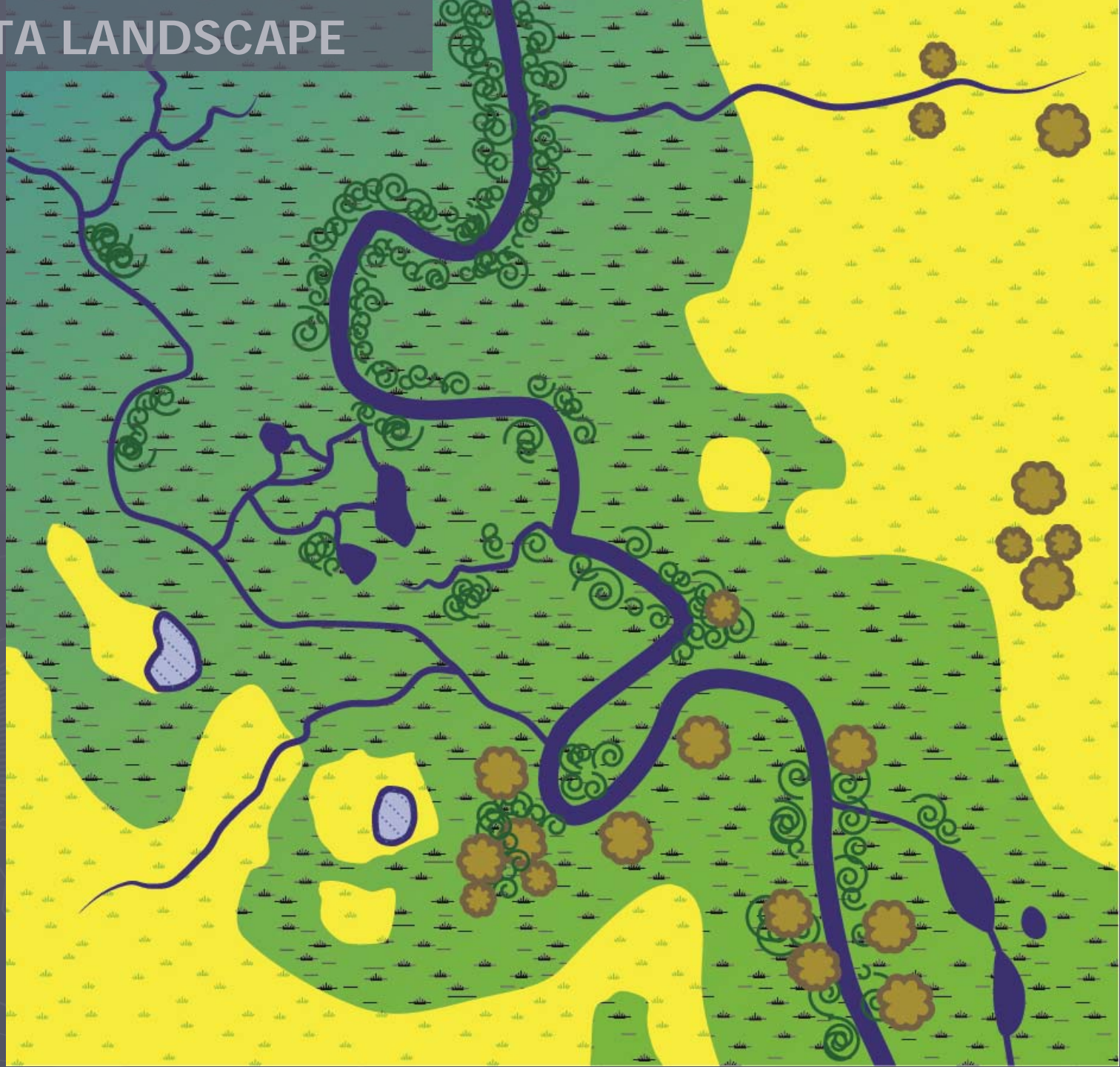


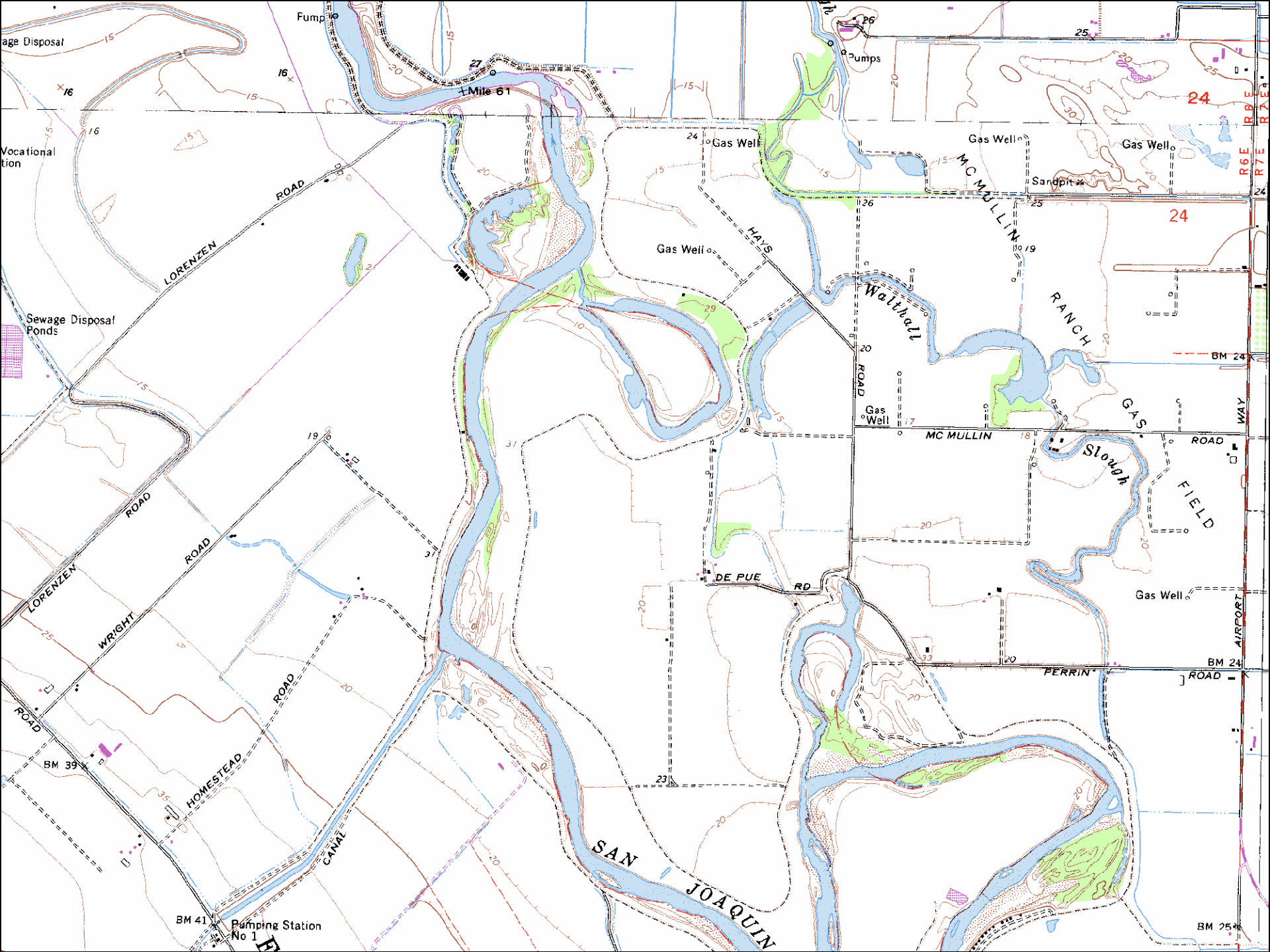
- very high fluvial influence
- basin water storage
- low to no channel density
- numerous large and small ponds/lakes
- riparian gallery forest on natural levees



- low fluvial influence
- submerged by daily tides
- high channel density (low relative to salt marshes)
- relatively few small ponds/lakes
- no riparian forest

SOUTH DELTA LANDSCAPE







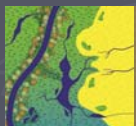
- high fluvial influence
- basin water storage
- variable channel density
- numerous large and small ponds/lakes
- riparian gallery forest on natural levees



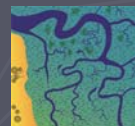
- moderate to low fluvial influence
- submerged by spring tides
- moderate channel density
- relatively small ponds/lakes
- moderate presence of riparian forest



- moderate fluvial influence
- no basin water storage
- moderate channel density
- small ponds/lakes
- sparse riparian forest








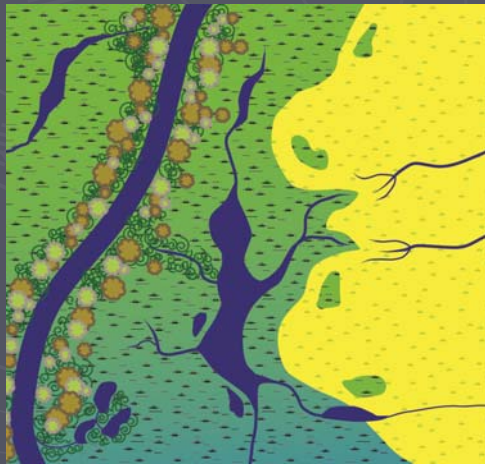
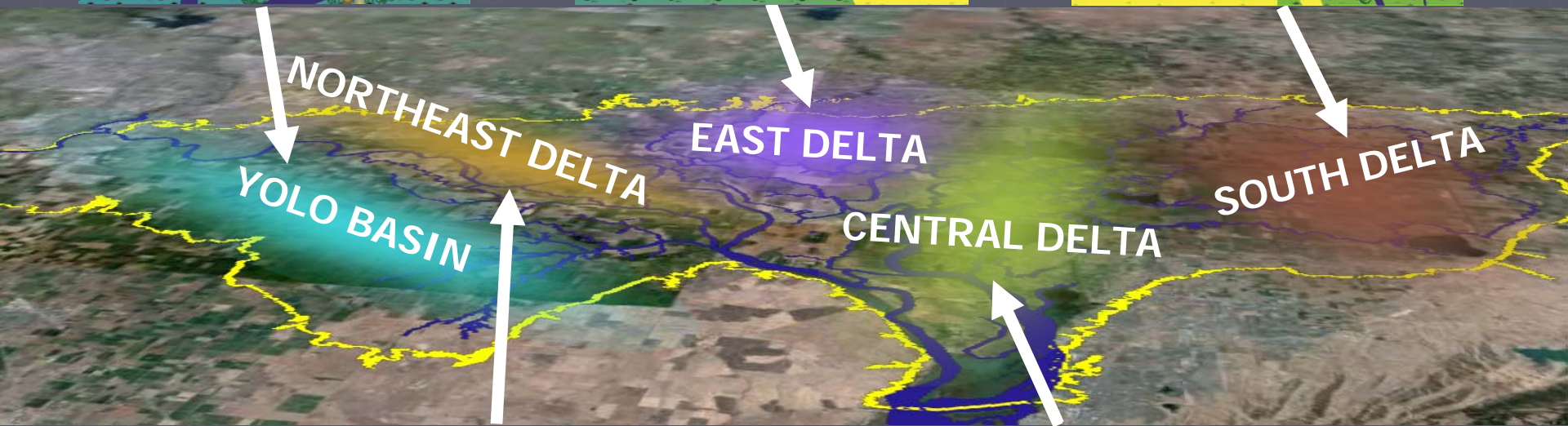
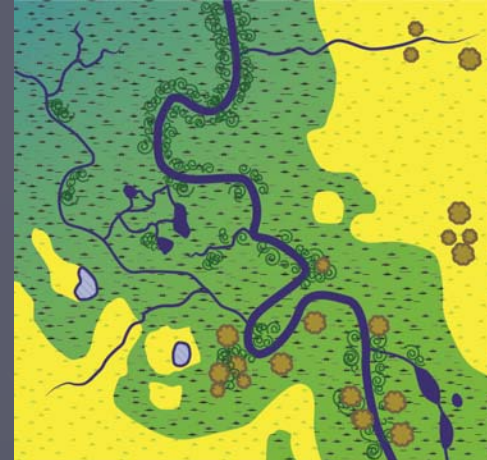
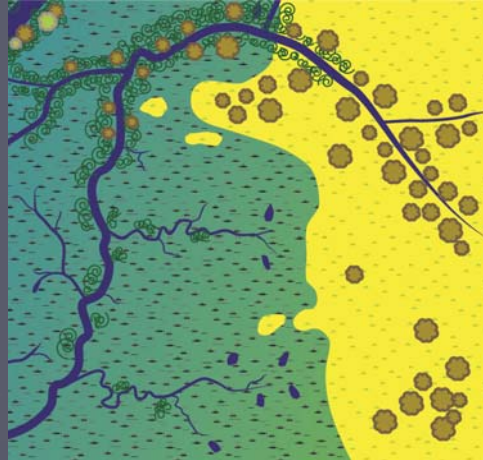
- very high fluvial influence
- basin water storage
- low to no channel density
- numerous large and small ponds/lakes
- riparian gallery forest on natural levees



- low fluvial influence
- submerged by daily tides
- high channel density (low relative to salt marshes)
- relatively few small ponds/lakes
- no riparian forest

Distinguishing landscape characteristics

	Yolo basin 	Northeast 	East Delta 	Central 	South 
relative fluvial influence	high	very high	moderate to low	low	moderate
summer moisture	wet	wet	submerged by spring tides	submerged by daily tides	dry
channel density	high to none	low to none	moderate	high	moderate
pond/lake size	large	very large	small	small	medium
riparian gallery forest density	high	high	moderate	no forest	low

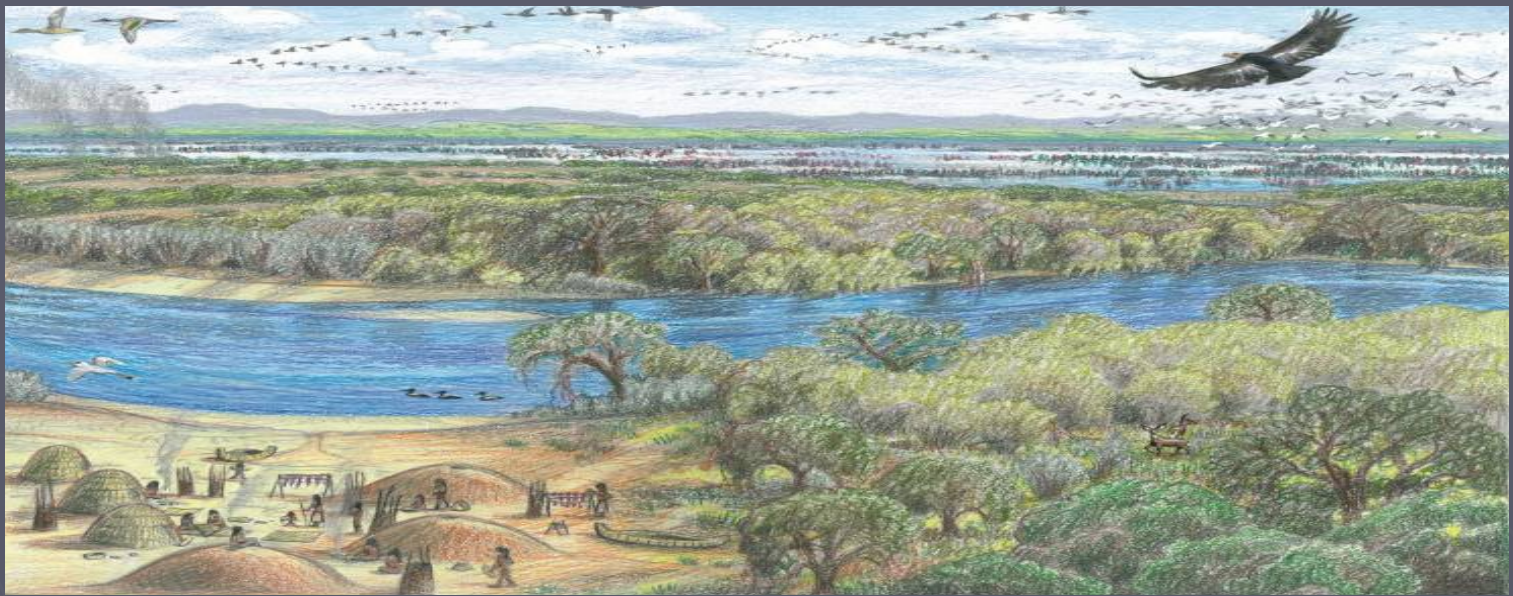


- ▶ Habitat representation and linkages
- ▶ Hydrological (dis)connectivity
- ▶ Processes at appropriate scales
- ▶ Complex channel plan form through tidal and fluvial interaction
- ▶ Basin dynamics including presence of shallow open water
- ▶ Connectivity between wetland and upland

[illegible]

NEXT STEPS

- ▶ Finish GIS and documentation next year
- ▶ Translate into species support functions and abiotic/biotic controls
- ▶ Define parameters needed for restoration planning and design



NORTHEAST
DELTA



SOUTH DELTA



Thank You



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www.sfei.org/HEP

Cunningham 2010
Bay Nature