

DELTA HISTORICAL ECOLOGY STUDY

October 2009 Aquatic Science Center

TASK 1.1: **FINAL** Target Questions for the Sacramento-San Joaquin Delta Historical Ecology Study

This document lays out target research questions to guide the data collection, compilation, and analysis tasks of the Delta Historical Ecology Study. The questions have been developed through conversations with project partners and local stakeholders, review of current scientific research questions in the Delta, and previous experience in systems with similar concerns. We expect questions will continue to evolve through future conversations with technical advisors and project partners.

This study aims to document the pre-modification habitat characteristics of the Delta at a spatial scale and level of detail relevant to restoration planning and conservation efforts. The target questions provide the guiding framework from which to assemble key scientific information towards this goal.

It will likely not be possible to answer all questions with the same certainty or thoroughness. Consequently, technical questions will be re-evaluated after data collection and compilation to decide which are worth pursuing or should be de-emphasized. This process shall include review by technical advisors to reach consensus on the approach and associated level of certainty with which questions can be answered. Key criteria for this re-evaluation shall include consideration of data availability and cost, as well as relevance to Delta restoration and conservation planning.

The fundamental goal of the Delta Historical Ecology Study is to document, to the extent possible, the pre-modification extent and character of different wetland, riparian, and terrestrial ecotonal habitats. This description of spatial patterns will help us better understand ecosystem support functions and controlling physical processes within the landscape context. Such information will

7770 Pardee Lane
Second floor
Oakland, CA 94621
p: 510-746-7334
f: 510-746-7300

Board Members

CHAIR Bruce Wolfe
VICE-CHAIR, SEC. Dave Tucker
TREASURER Frank Leung
Michele Pla
Darrin Polhemus
Chuck Weir
Alexis Strauss
Pamela Creedon

provide a basis for identifying target locations and physical conditions necessary to restore functional habitat mosaics within the projected future Delta landscape that are capable of providing multiple ecological services.

Channel Geometry and Hydrodynamics

Extent and Density: What was the density of tidal channels in the Delta? Did that vary significantly along ecological gradients? Were there large "undrained" occasionally tidal areas with no channel network -- such as along the eastern margin? Were the channels along this edge seasonal? Were they dominated by fluvial or tidal processes?

Order, size and sinuosity: What was the historical extent of channels of different sizes? How wide were second and third order channels? How does this compare to more saline systems? How much marsh area was associated with 2nd, 3rd, and 4th order systems? What was channel sinuosity relative to location within the Delta (e.g. relative to tidal and salinity gradient)?

Connectivity: What was the extent of "dead-end" versus connected channels and how did that (and associated residence time) vary across the Delta?

Tidal and salinity gradient: What was the extent of tidal influence upstream along main channels? Can we define historical X2?

Tidal Marsh

Tidal marsh extent: What were the historical boundaries of tidal marsh within the Delta? What was the character and extent of the transition between fully tidal, occasionally tidal, and nontidal marsh habitats? What was the extent of brackish versus freshwater tidal marsh?

Elevation: What was the proportion of low versus high elevation marsh?

7770 Pardee Lane
Second floor
Oakland, CA 94621
p: 510-746-7334
f: 510-746-7300

Board Members
CHAIR Bruce Wolfe
VICE-CHAIR, SEC. Dave Tucker
TREASURER Frank Leung
Michele Pla
Darrin Polhemus
Chuck Weir
Alexis Strauss
Pamela Creedon

Inorganic v. organic input: To what extent did inorganic inputs affect the form and function of the tidal marshes?

Marsh variability: How did marsh types vary regionally within the Delta and what were the physical drivers of these differences? What were characteristic features (e.g. size, mudflats, species, plant height) within the freshwater marshes? Were marsh interiors characterized predominantly by expansive homogenous tule stands or were there significant variations in interior marsh vegetation? How common were features associated with microtopography, such as swales on the margin, old channel levees, etc?

Floodplain basins: How extensive were perennial freshwater marshes along the tidal margin? How did they vary from South to North? Were these always associated with basins or sinks (e.g. Yolo Basin, Cosumnes Sink)? Were adjacent non-tidal marshes primarily supplied by groundwater or surface water? How wet were these features -- did they discharge significant freshwater to the tidal margin during summer months? With what frequency did these basins fill? How persistent were they? How was water routed within them -- sheet flow, sloughs?

7770 Pardee Lane
Second floor
Oakland, CA 94621
p: 510-746-7334
f: 510-746-7300

Ponds and Lakes

Landscape position: What positions and configurations did surface waters occupy within the marsh landscape? Did that vary significantly along ecological gradients (tidal, freshwater inflow, climate)? How common were terminal ponds at the ends of channels? What size channels were these associated with? How common were "chains of sloughs and ponds"? Are variations in form associated with identifiable physical controls (e.g. fluvial controls, tidal prism)?

Pond/Lake size: How big were they and did size vary depending on location? How does this compare to more saline conditions?

Hydrology: How persistent or well defined were open water bodies? What were their mechanisms of formation and how does this differ from the mechanisms governing terminal ponds? In what ways can they be distinguished from the form and function of the larger floodplain basins?

Board Members

CHAIR Bruce Wolfe
VICE-CHAIR, SEC. Dave Tucker
TREASURER Frank Leung
Michele Pla
Darrin Polhemus
Chuck Weir
Alexis Strauss
Pamela Creedon

Riparian

Regional variation: How did riparian forest habitat vary regionally within the Delta (differences in tree type, relative stand density, etc.)? How far downstream did riparian forest extend from different river mouths into the Delta? How wide were riparian corridors, and how did this vary among rivers?

Upland Ecotone


Transition characteristics: What habitats characterized the upland margin (e.g., oak savanna, grassland, alkali meadow, vernal pools, freshwater marsh)? What was the relative extent of these different ecotone types? How did the characteristics of the upland ecotone vary along the Delta margin? What physical factors/gradients controlled these differences? Are upland ecotone variations correlated with adjacent soil types or other persistent physical characteristics? How did fluvial input affect the upland habitat characteristics?

Ecosystem Support Function

Species composition: What evidence is there for habitat use and distribution of fauna of particular interest (e.g., Greater Sandhill Crane, Least Bell's Vireo, Western Yellow-billed Cuckoo, Giant garter snake, Sacramento splittail, Delta smelt, Green sturgeon, Chinook salmon, Steelhead, tule elk, antelope)?



7770 Pardee Lane
Second floor
Oakland, CA 94621
p: 510-746-7334
f: 510-746-7300



Board Members
CHAIR Bruce Wolfe
VICE-CHAIR, SEC. Dave Tucker
TREASURER Frank Leung
Michele Pla
Darrin Polhemus
Chuck Weir
Alexis Strauss
Pamela Creedon