Wetland Typology and Historical Loss
Main Messages

- There is a great diversity of wetlands
  - All perform similar functions
  - May need different tools to assess different types

- Historical ecology provides insight into past losses
  - Patterns vary throughout the region

- New programs are being developed to track future change
  - Ability to evaluate effectiveness of management actions
Overall Goal: Protect Wetland Functions

“Purpose of the State Wetlands and Riparian Area Protection Policy is to **protect all waters of the State, including wetlands**, from dredge and fill discharges”
Key Questions

- Where are our wetlands?
- What is the condition of our wetlands?
- What are the major stressors affecting wetlands?
- How are things changing over time?
  - Effectiveness of management programs
Key Questions

- **What are wetlands?**
- Where are our wetlands?
- What is the condition of our wetlands?
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- How are things changing over time?
  - Effectiveness of management programs
Traditional View of Wetlands
Additional Wetland Types

- Rivers & Streams
- Lake margins
- Depressions
- Slopes and seeps
Dry (sometimes) is Normal
Programs Should Encompass All Conditions

Perennial  short-term non-perennial  Intermittent  long-term non-perennial  Ephemeral (episodic)

~12 mos.  10 mos.  8 mos.  6 mos.  4 mos.  2 mo.  < week

Typical flow duration

Functions occur across entire hydrologic gradient to varying degrees
Key Questions

- **What are wetlands?**

- Where are our wetlands?

- What is the condition of our wetlands?

- What are the major stressors affecting wetlands?

- How are things changing over time?
  - Effectiveness of management programs
Historical Ecology: Understanding Change Over Time
The Past Provides Insight into the Future

- What was the historical distribution of wetlands?
- How much wetlands have been lost?
- Which wetland types have been most impacted?
- What are our restoration priorities?

**GOAL IS NOT TO TRY AND RECREATE THE PAST**
Long Term Goal:
Understand historical extent and distribution of S. Ca coastal wetlands and watersheds
### Historical Ecology = Weight of Evidence

<table>
<thead>
<tr>
<th>Year</th>
<th>1750</th>
<th>1800</th>
<th>1850</th>
<th>1900</th>
<th>1950</th>
<th>2000</th>
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<tbody>
<tr>
<td><strong>Key Historical Documents</strong></td>
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<tr>
<td>Spanish explorers’ journals</td>
<td>Mexican diseños</td>
<td>US Coast Survey</td>
<td>USCGS and USGS</td>
<td>Landscape photographs by Alice Hare</td>
<td>USDA aerial photography</td>
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<tr>
<td><strong>Contemporary and Prior Land Use</strong></td>
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<td>Native management</td>
<td>Capacity-level grazing</td>
<td>Ditching of valley floor; extension of discontinuous stream channels</td>
<td>Tidal marsh reclamation</td>
<td>Intensive agriculture</td>
<td>Land surface subsidence due to groundwater pumping</td>
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</tbody>
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  - Landscape photographs by Alice Hare
  - USDA aerial photography

- **Contemporary and Prior Land Use**
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  - Capacity-level grazing
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What is a T-Sheet?
Comparison of Historical and Contemporary Wetlands
Santa Ana River

Historical Features:
- Beach
- Dune
- Gully
- Intertidal Flat
- Open Water
- River/Stream
- Subtidal Water
- Vegetated Wetland
- Vegetated, Woody
- Pacific Ocean
- Landward extent of T-sheet

Contemporary Wetlands:
- Estuarine Subtidal
- Estuarine Vegetated
- Estuarine Unvegetated
- Lacustrine
- Marine Subtidal (Ocean)
- Marine Intertidal
- Palustrine Vegetated
- Palustrine Unvegetated
- Riverine
- Landward extent of T-sheet
Historically (19,560 ha)
- 40% vegetated wetlands (e.g. salt marsh)
- 25% was unvegetated wetlands (e.g. salt flat and mudflat)
- 35% was subtidal water.

Since ca. 1850, overall loss of 48% of historical estuarine habitat
- Estuarine vegetated wetlands – 75% loss
- Estuarine unvegetated – 78% loss
- Subtidal water now is 71% of total area
“Along the river are small, isolated groves of cottonwoods and willows, with here and there an occasional sycamore.” – Evermann 1886

“The Saticoy springs furnished the only water in summer, and the only tree shelter for a circuit of three or four miles.” – Cooper 1887

“...the shallow river that creeps lazily out from the grove of alders and willows.” – Holder ca. 1893

“It is a fine grassy plain...with a few dry creeks or alkaline ponds” – Brewer 1861

“There is not on the said place, any kind of timber, for the few (trees) it produces are only good for firewood, so that for the purposes of building houses and fences it will have to be brought from the river Santa Clara...” – Carrillo 1833

“the bed is plainly over a hundred yards in width in spots” – Crespi 1769
UNITED STATES & MEXICO

TIJUANA RIVER VALLEY HISTORICAL ECOLOGY STUDY: DRAFT HABITAT TYPE MAP (CA. 1850)

- Orange: Dune
- Yellow: Beach
- Blue: Subtidal water
- Light green: Intertidal flat
- Green: Tidal marsh
- Red: Salt flat / Open water
- Light blue: River channel
- Medium green: Alkali meadow and other wetland types
- Light yellow: River wash / Willow scrub
- Brown: Live oak woodland / Alluvial scrub
- Light green: Grassland / Coastal sage scrub
- Light blue: Perennial freshwater wetland
- Blue: Perennial pond
- Light blue: Intermittent pond

Background aerials: ESRI et al.
Loss of 38,500 acres (15,500 ha) - 86% of historical wetlands lost

Palustrine wetland most impacted - greatest losses in the tidal fringe area

Contemporary lacustrine wetlands mostly man-made - shift in wetland profile
Major Agents of Change

- **Railroads**
  - 1870s

- **Groundwater Extraction**
  - 1890s

- **Flood control**
  - 1915-1940s
Long Term Goal:
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California’s Mapping Strategy

- Statewide, Probability-based S&T
- Intensive, Regional Maps
- Permit and Restoration Accounting
- Statewide, Comprehensive Mapping

Overall Strategy
Statewide Probabilistic Mapping

Statewide coverage

2,000 x 4 km plots

Static plots remapped on 5-year interval

Map everything in the plot

Wetlands

Streams

Riparian areas

Uplands

Developed Agriculture

Includes classification
Demonstrating Change Assessment
Change Assessment Products

- Report on overall changes:
  - Change in area by wetland type
  - Change in stream length by stream type
  - Change in stream area

- Report on specific change categories:
  - Wetland type to a different wetland type
  - Wetland/stream $\leftrightarrow$ open water
  - Wetland/stream $\leftrightarrow$ natural upland
  - Wetland/stream $\leftrightarrow$ developed
  - Wetland/stream $\leftrightarrow$ agriculture
  - Wetland/stream $\leftrightarrow$ structure
Conclusions

- California contains a diversity of wetlands
  - Wetlands span a broad range of hydrologic conditions
  - Available tools vary by wetland type

- Historical wetland losses vary from 50% - 90%
  - Varies by wetland type and location

- Many watersheds in S. CA. have not yet been assessed for historical losses
  - Historical ecology studies can inform planning

- New programs are being developed to track future change
  - Opportunities to support implementation through new wetland policies
Thank You

U.S. COAST SURVEY MAPS OF CALIFORNIA

Under the direction of some of the leading American scientists of the 19th century, the United States Coast Survey (USCS) created exceptionally accurate and detailed maps of the country's coastline. These surveys (commonly referred to as "T-sheets") are the single most important data source for understanding the physical and ecological characteristics of the US shoreline prior to Euro-American modification. Their depictions of coastal wetlands and estuaries prior to major development are valuable tools for coastal zone planning and estuary management.

THIS WEBSITE PROVIDES ACCESS to digital versions of the T-sheets, GIS layers based on the maps, and several related tools developed to support their use. T-sheets are currently available for parts of Southern California and San Francisco Bay.

We wish to thank the United States Fish and Wildlife Service Carlsbad Field Office, Coastal Program for providing the funding for this web site.

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http://www.caltsheets.org/