Restoration and the Delta Landscape

June 7, 2019

Ramona Swenson, Ph.D.
Delta Landscape(s)
Restoration principles and goals
Restoration Projects
- Grizzly Slough Floodplain (Cosumnes River)
- Tule Red Tidal Wetlands (Suisun Marsh)
Delta Landscapes Project

Past

Sacramento-San Joaquin Delta Historical Ecology Investigation: EXPLORING PATTERN AND PROCESS

Present

A DELTA TRANSFORMED: ecological functions, spatial metrics, and landscape change IN THE SACRAMENTO-SAN JOAQUIN DELTA

Future Vision

A DELTA RENEWED: A Guide to Science-Based Ecological Restoration IN THE SACRAMENTO-SAN JOAQUIN DELTA

San Francisco Estuary Institute (SFEI)
esassoc.com
Landscape Context - Historic Delta 1800s

From: Whipple et al. 2012, SFEI
Landscapes of the Historical Delta (1800’s)

**Flood Basins**
- Sacramento River floods low wetland basins, riparian forest along natural levees

**Tidal Islands**
- Large tidal channels
- Islands of freshwater wetlands and small tidal channels

**Distributary Rivers**
- San Joaquin floodplain
- Merge into tidal wetlands

Source: Delta Plan 2013 as adapted from SFEI Delta Landscapes Project (Whipple et al., 2012)
From Marshes... to Channels

historical

modern

open water

marsh

historical

modern

16,300 ha

26,600 ha

193,200 ha

4,300 ha

100 : 1,182

100 : 16

74x decrease in marsh to open water ratio

"channels in marsh"  "marsh in channels"
Land Cover - 1800s… to 2000s

Whipple et al. 2012, SFEI
Restoration Goals

EcoRestore
30,000+ acres by 2020

• ~9,500 ac tidal wetlands
• ~18,500 ac floodplain
• 377 ac upland and riparian forest

Suisun Marsh Plan
• 5,000 – 7,000 ac tidal marsh restoration
Guiding Principles for Restoration

• Consider **landscape context**
  - Location in watershed
  - Elevation

• Restore critical **physical and biological processes**
  - Flows – tides and river floods,
  - Sediment - deposition and erosion

• Restore appropriate landscape **connectivity**
  - From channel onto plain
  - From headwaters to estuary

• Focus on complexity and **diversity**

• Create **multiples** of landscape elements, populations, habitats

• Restore at **large scales**, with a **long time horizon** in mind

SFEI 2016
Where is restoration suitable and most valuable?

Elevation... is Destiny

Native Fish Habitat – Delta smelt

Subtidal = Too Deep
up to 30’ below sea level

Intertidal = just right

• Central delta too subsided
• The perimeter and Suisun Marsh at intertidal elevation
• Sea level rise will submerge current intertidal

“North Delta Arc”
Restoration Project Examples

- Cosumnes River - Grizzly Slough Floodplain
- Suisun Marsh - Tule Red Tidal Restoration Project

Source (map): Delta Plan
Grizzly Slough Floodplain Restoration - DWR

DWR and RD 348 New Hope Tract

Goal: Restore and enhance riparian and wetland habitats to benefit native fish and wildlife

- Reconnect waterways to the floodplain to restore natural hydrologic and geomorphic processes.
- Recreate frequently flooded riparian woodland, tidal wetlands
- Enhance agriculture that supports wildlife
Cosumnes River – Grizzly Sough project

Historic Habitat

Current

Source: SFEI 2012
Jan 1997 93,000 cfs

Mar 2005 10,000 cfs

Hydrology
Flooding Restored

Cosumnes River Preserve
The Nature Conservancy

December 1995

Photo: TNC
Restored floodplain – 9 years

March 2005
Fish photos: P. Moyle
Cosumnes River Floodplain Experiment

2017 – Fish still using floodplain

Source: Carson A. Jeffres, Peter B. Moyle, & Jeffrey J. Opperman
Let’s go breach!

McCormack-Williamson
TNC

Cosumnes
Floodplain MB
Westervelt

Oneto/Denier
TNC

Grizzly Slough
DWR
Grizzly Slough Floodplain Restoration - DWR
Elevation and topography

**Tidal Datum** | **Elevation (ft NAVD88)**
---|---
MHHW | 5.8
Mean Tide Level | 4.4
MLLW | 2.8

Mokelumne River at Benson’s Ferry
Flood Recurrence (modeled)
Restoration design

- Breach
- Riparian forest
- Irrigated Agriculture

Restored Habitat Types:
- Open Water
- Fresh Water Emergent Wetlands
- Seasonal Wetlands
- Valley Foothill Riparian

Enhanced Habitat and Land Use:
- Valley Foothill Riparian (existing)
- Valley Foothill Riparian (vegetation management)
- Wildlife-friendly Agriculture
Next Steps

- Received Prop 1 funding for implementation
- Final Design and Permitting 2019
- Construction to commence in winter 2019-2020

January 28, 2018, New Hope Road overtopped due to levee failure upstream on Mokelumne River
Tule Red Tidal Restoration Project
From duck club… to tidal marsh to benefit fish
Tule Red Duck Club

Above MHHW (above intertidal)

High Intertidal

Intertidal
Tidal Wetland Benefits

Intertidal channel

Mud flat

Nutrients
Production

MHHW

MLLW

Intertidal

Shallow subtidal

Deep subtidal

CDFW Fish Restoration Program
Tule Red Tidal Restoration Project

377 ac tidal wetlands

30 ac tidal channels & ponds
2018

Westervelt Ecological Services
2018 Construction
2018

Breach – October 2019
Habitat Berm

ggradual slope to provide habitat during high tides…. And sea-level rise

Ridgway’s rail
(formerly California clapper rail)

Salt marsh harvest mouse

USFWS photo

USGS photo
Restoration Projects

Grizzly Slough Floodplain
- DWR
- RD 348 New Hope Tract

Tule Red Tidal Wetlands
- DWR
- State and Federal Contractors Water Agency
- Westervelt Ecological Services
Thank you!
Ecological Outcomes of Process-Based Floodplain Restoration

- Hydrologic connectivity
- Sediment deposition and scour
- Topographic complexity
- Seed dispersal and cuttings for recruitment
- Riparian forest establishment and succession
- Native fish spawning and rearing
- Aquatic productivity boost

Greater ecological function when restore processes
Floodplains Grow Fish

• How it works
  - Small floods bring nutrients onto floodplain
  - Shallow water + sunlight + nutrients = plankton bloom!
  - Fish come onto floodplain to spawn and eat
  - Draining water exports food resources into channels

• Recipe for aquatic food web
  - Small flood pulses every 2-3 weeks
  - Inundate at least 9 days to stimulate algae bloom
  - Then Zooplankton grow ~3 weeks
  - Ideally inundate 30+ days January-March

Ahearn, Viers, Mount & Dahlgren. 2006. Freshwater Biology 51:1417–1433