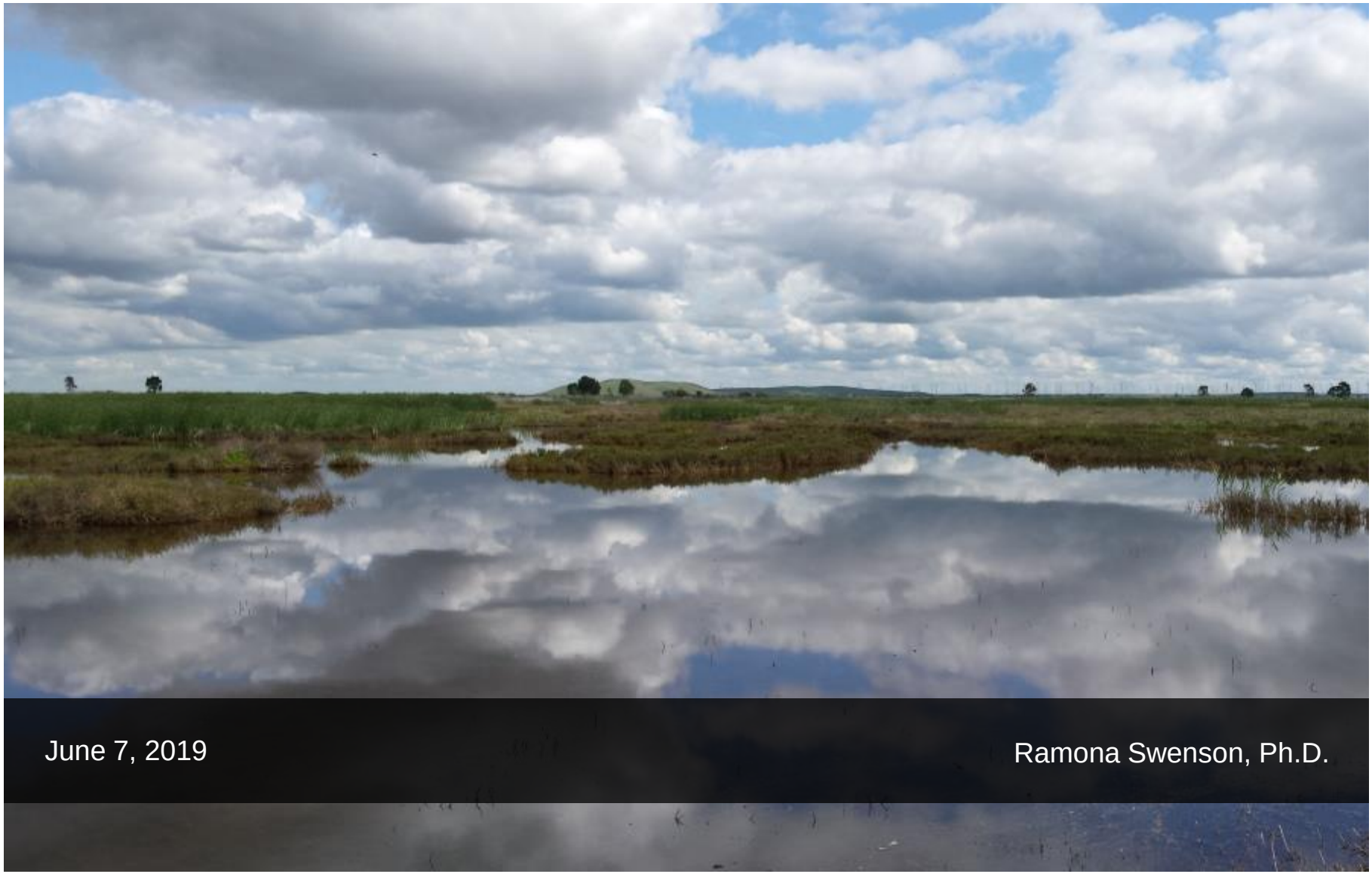
Water Education Foundation

Restoration and the Delta Landscape



June 7, 2019

Ramona Swenson, Ph.D.

Delta Landscape(s)

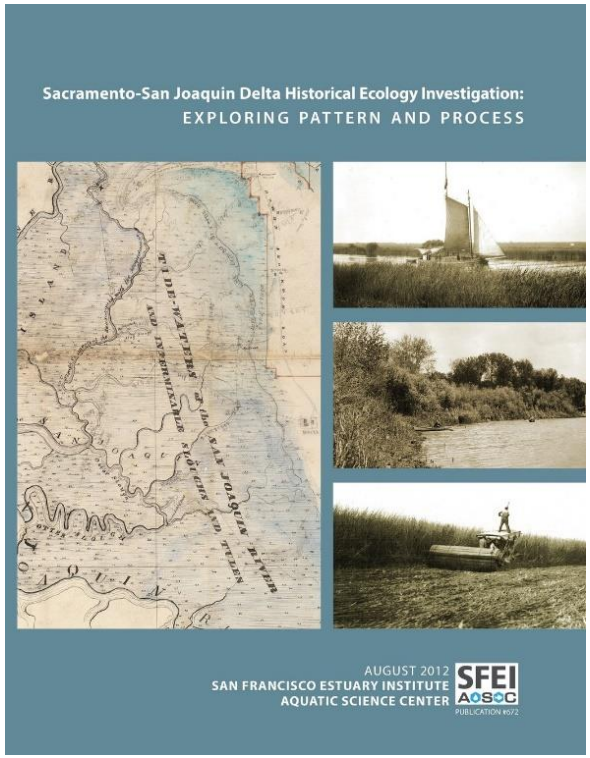
Restoration principles and goals

Restoration Projects

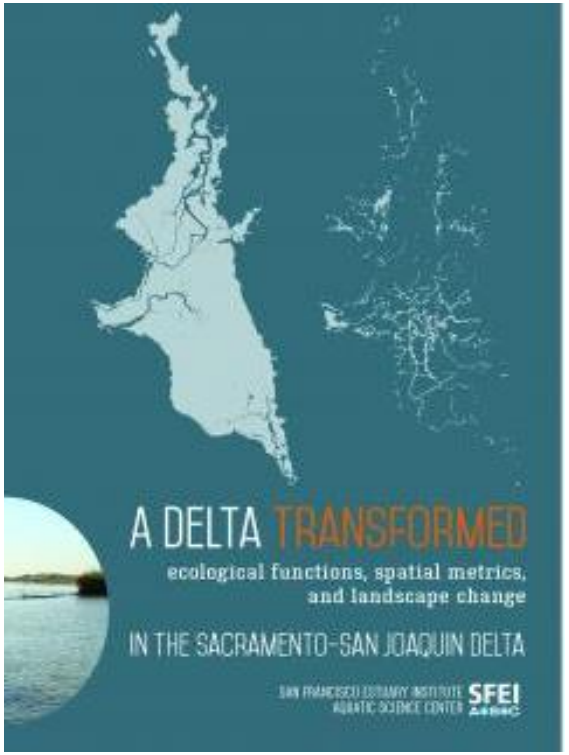
- Grizzly Slough Floodplain (Cosumnes River)
- Tule Red Tidal Wetlands (Suisun Marsh)

Delta Landscapes Project

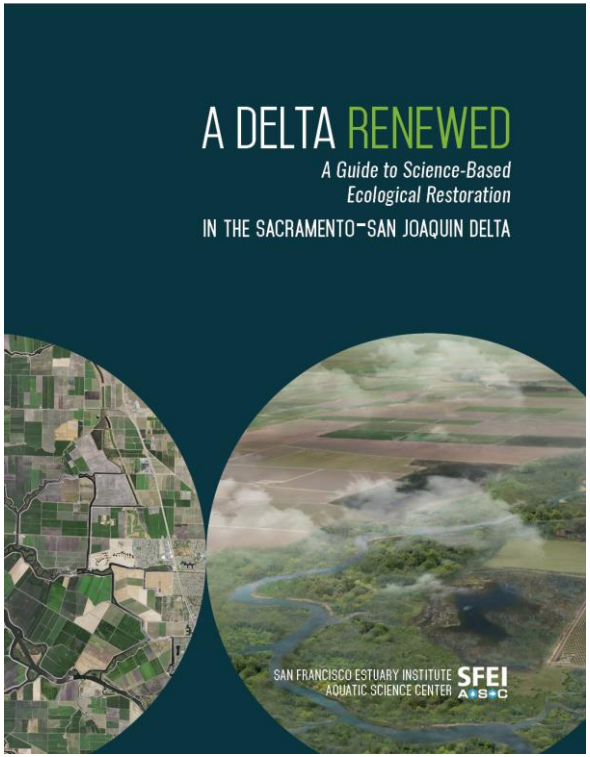
Past



Present



Future Vision



San Francisco Estuary Institute (SFEI)

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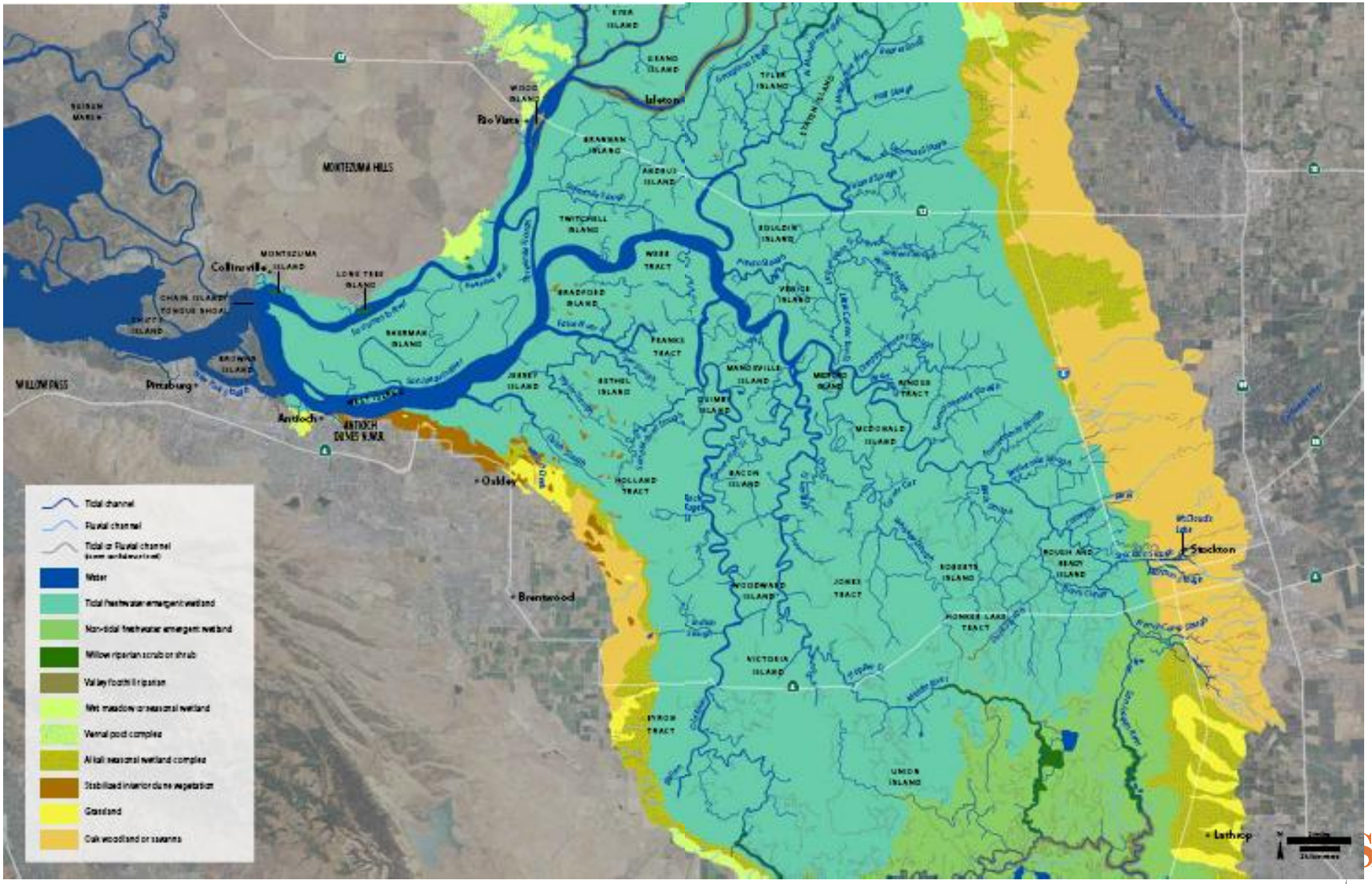
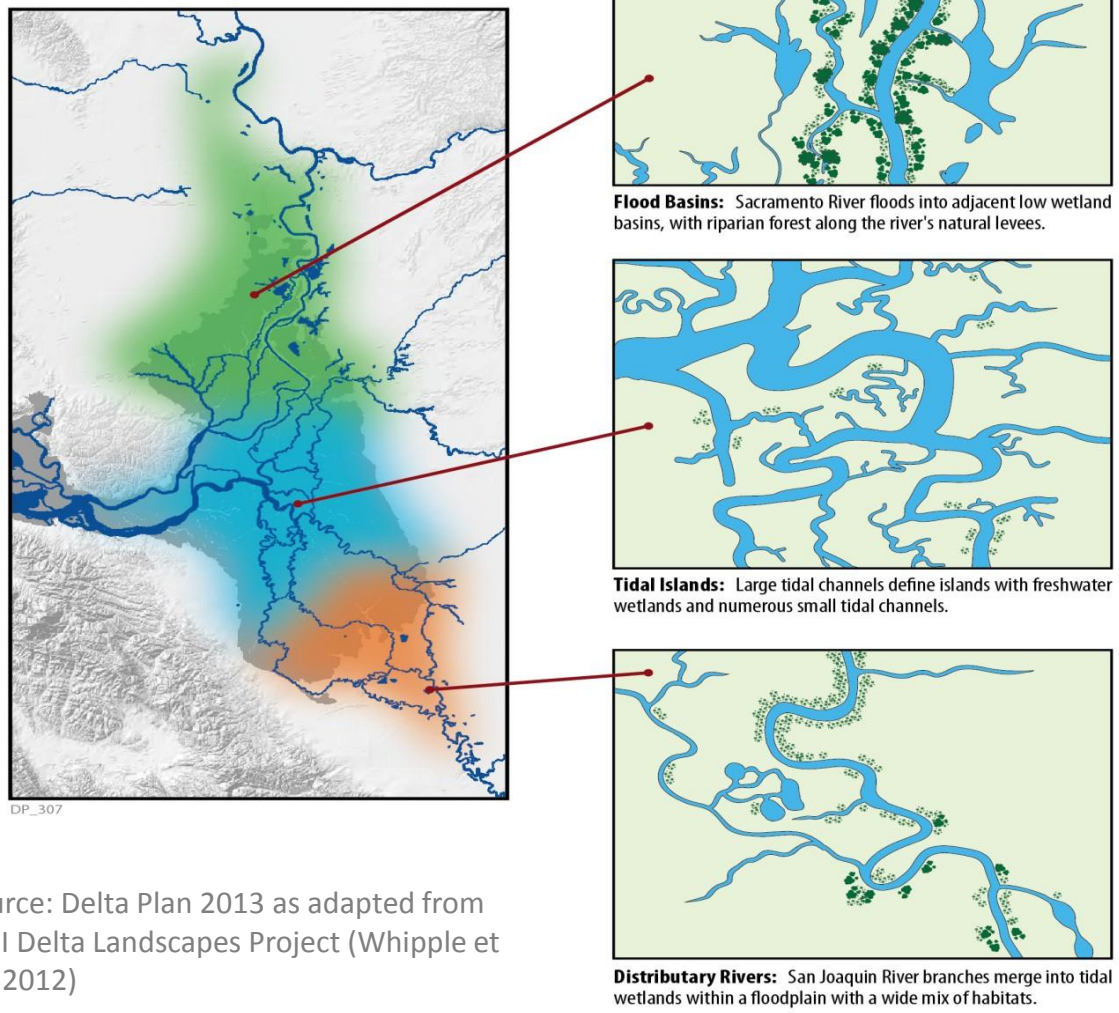
Landscape Context - Historic Delta 1800s



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)

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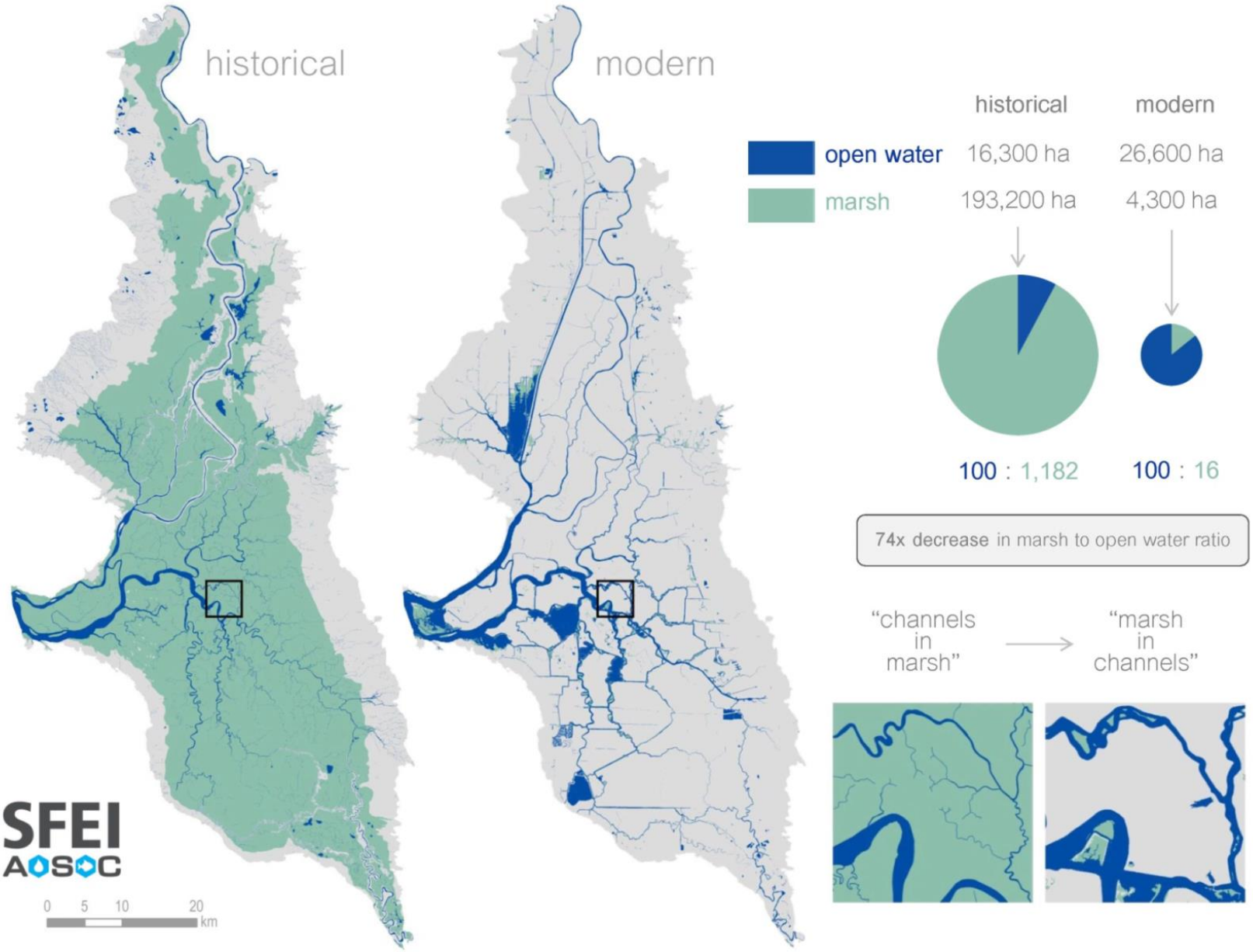
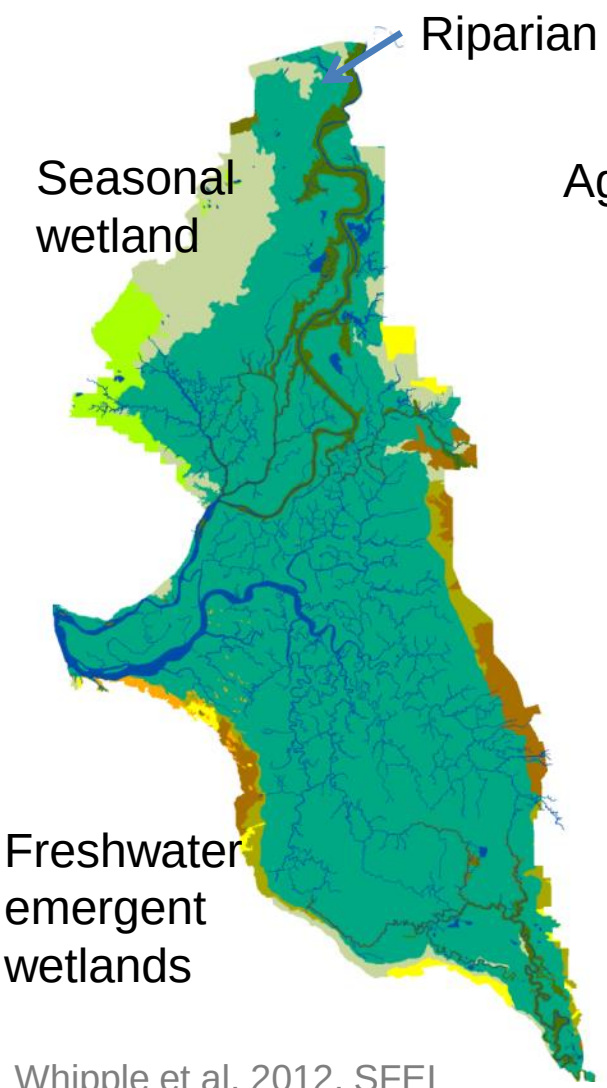
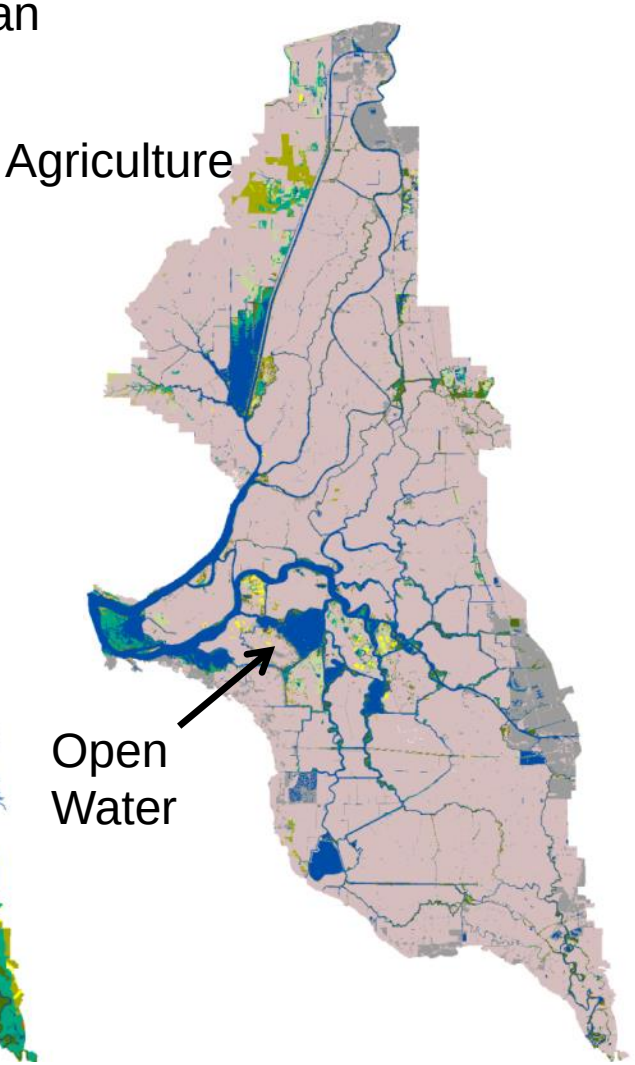
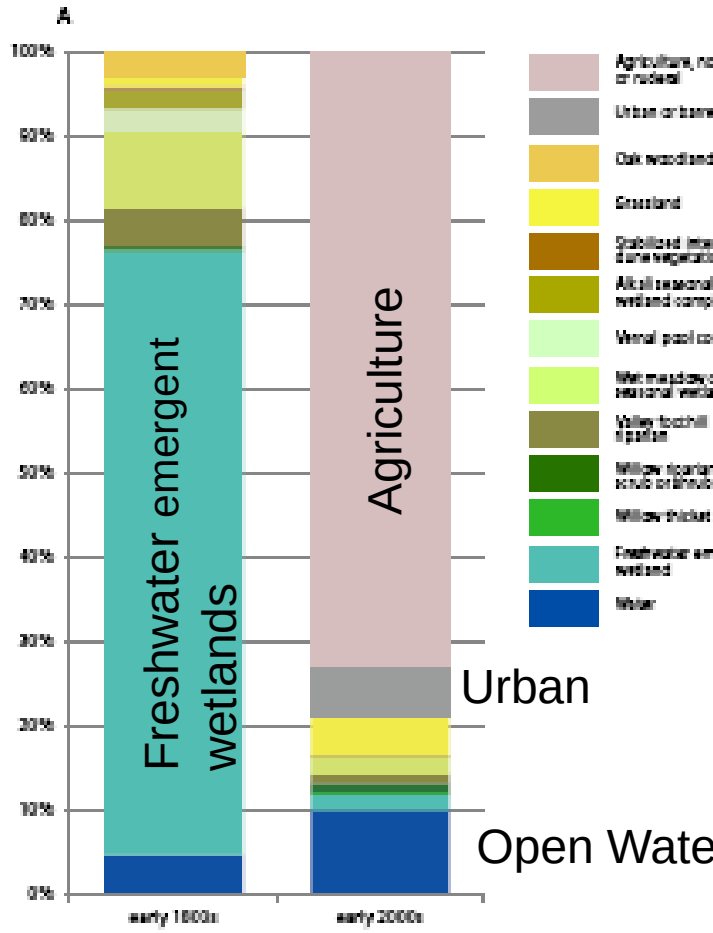
From Marshes… to Channels



Land Cover - 1800s… to 2000s







Whipple et al. 2012, SFEI

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Restoration Goals

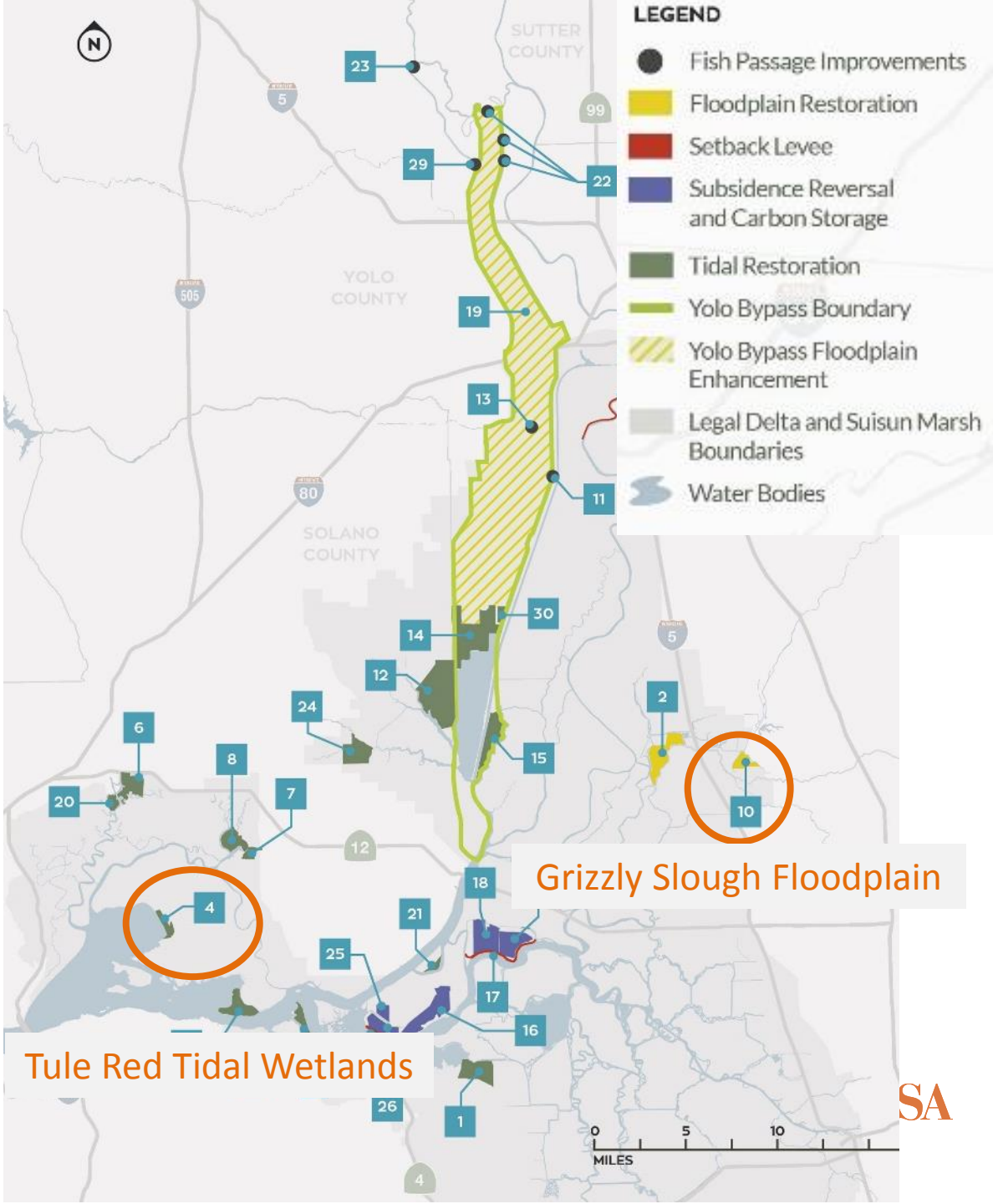
EcoRestore

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



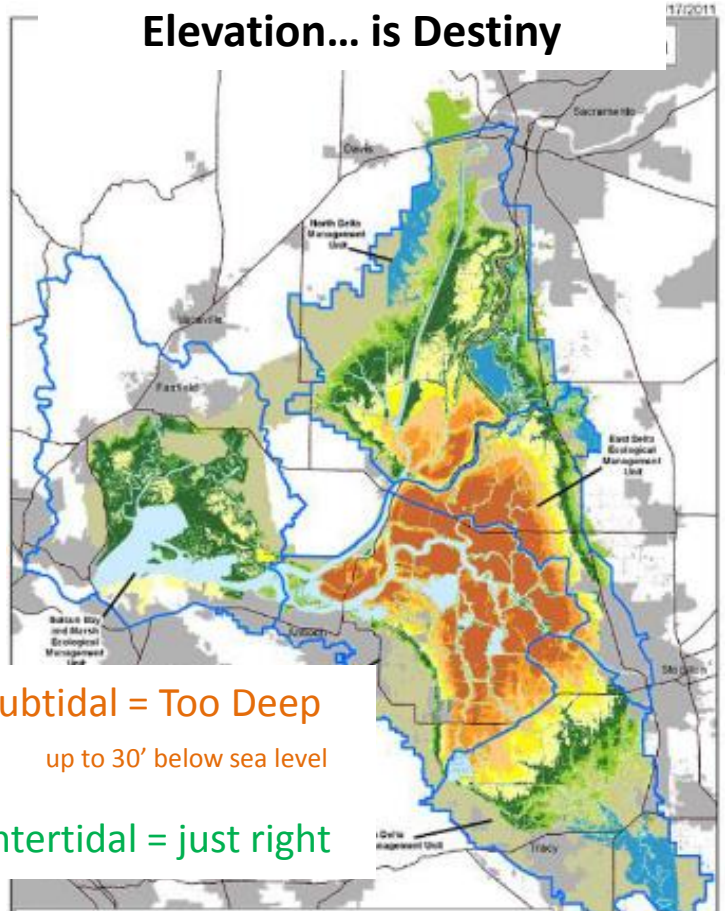
Guiding Principles for Restoration

- 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

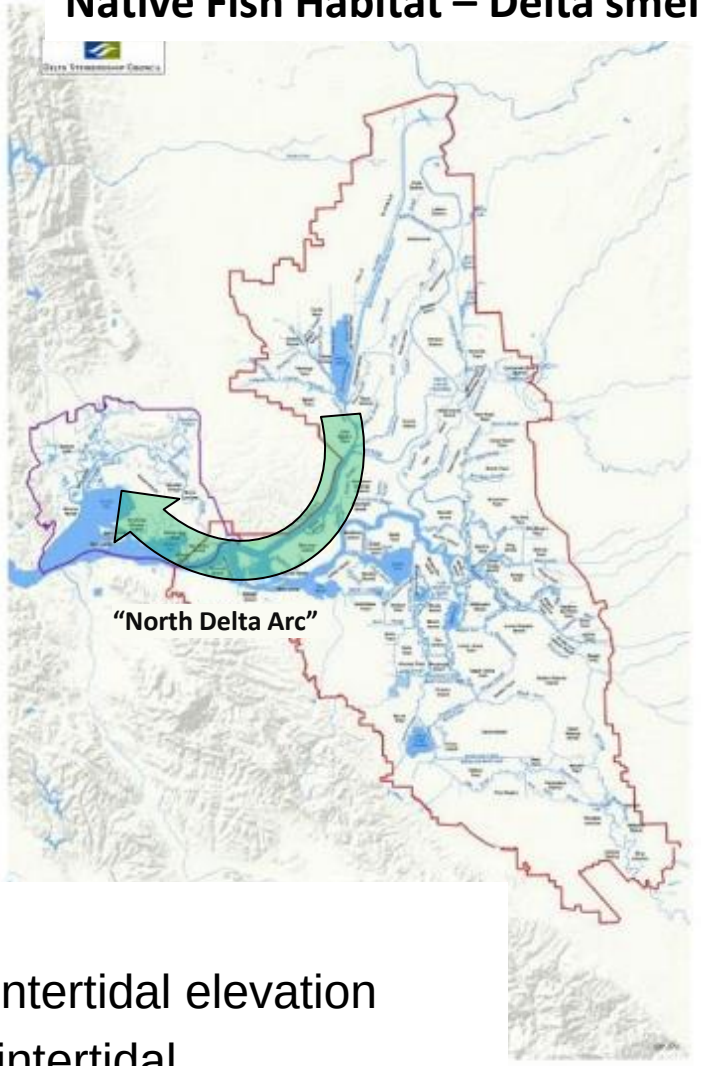


Subtidal = Too Deep

up to 30’ below sea level

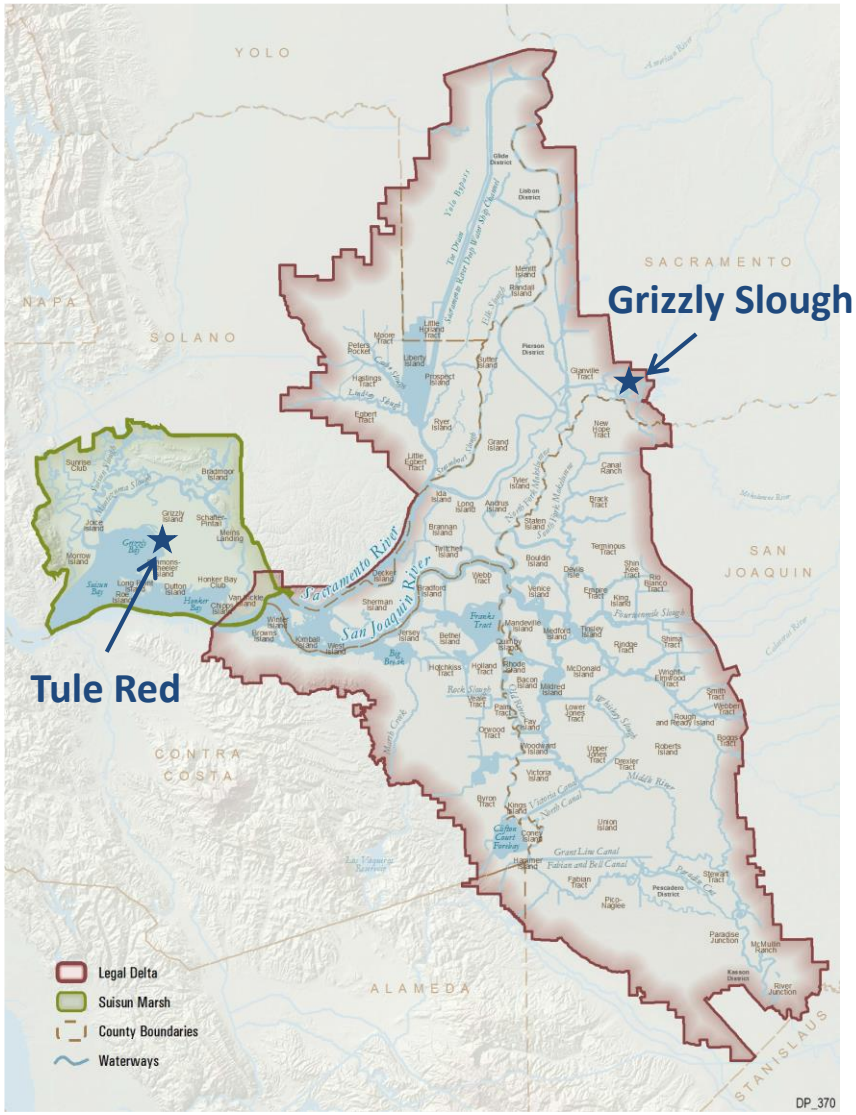
Intertidal = just right

Native Fish Habitat – Delta smelt



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

Restoration Project Examples



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

Source (map): Delta Plan

Grizzly Slough Floodplain Restoration - DWR

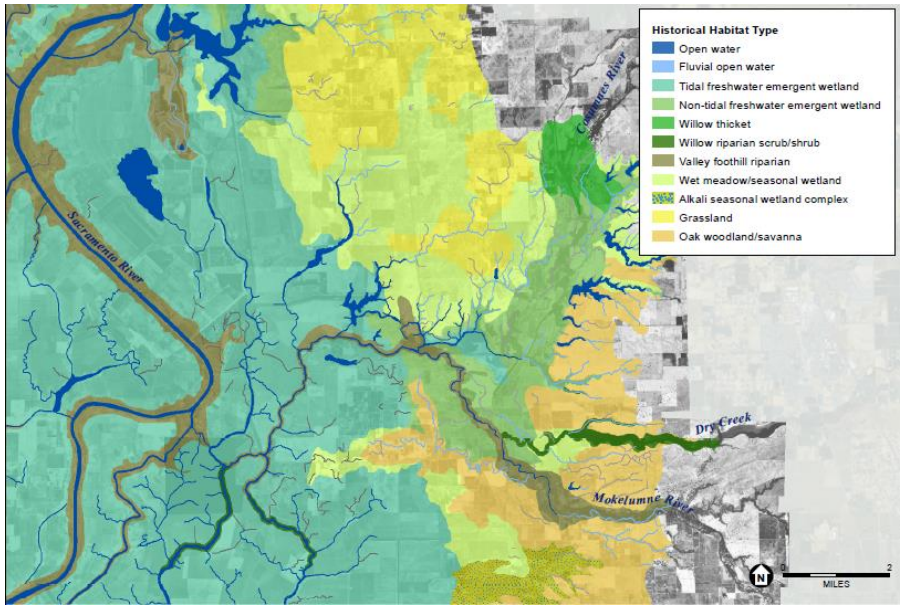
DWR and RD 348 New Hope Tract

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

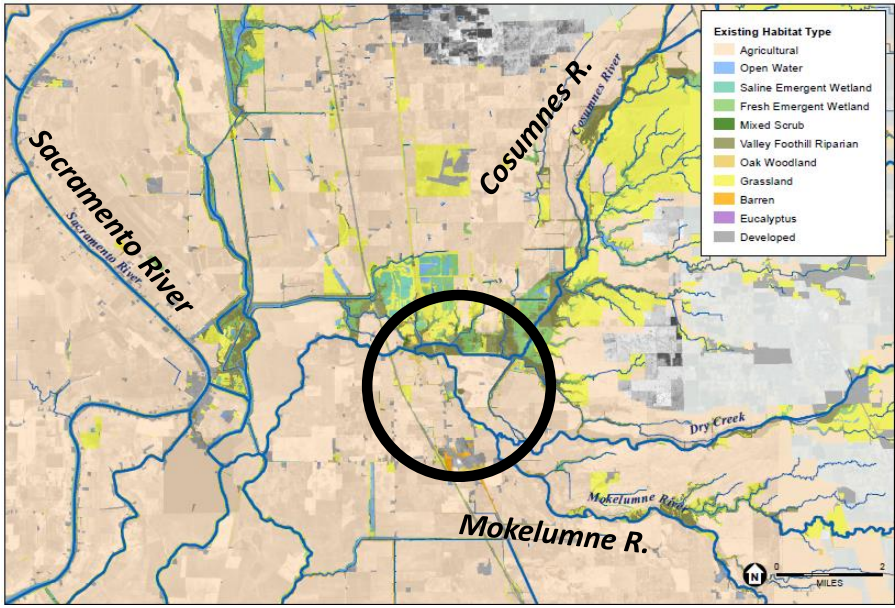
- Reconnect waterways to the floodplain to restore natural hydrologic and geomorphic processes.
- Recreate frequently flooded riparian woodland, tidal wetlands
- Enhance agriculture that supports wildlife

Cosumnes River – Grizzly Sough project

Historic Habitat



Current



Source: SFEI 2012

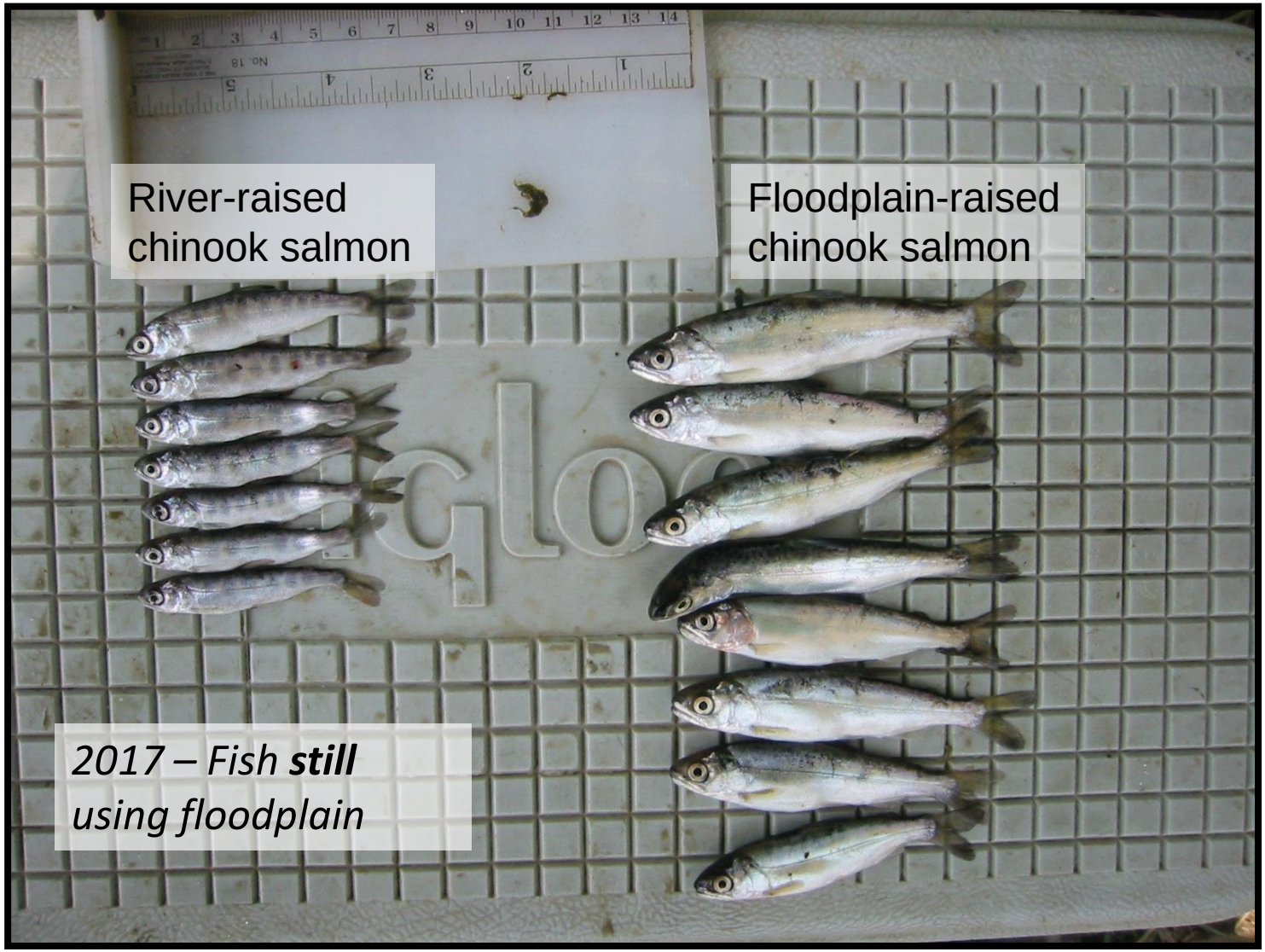
Hydrology

Flooding Restored

Restored floodplain – 9 years

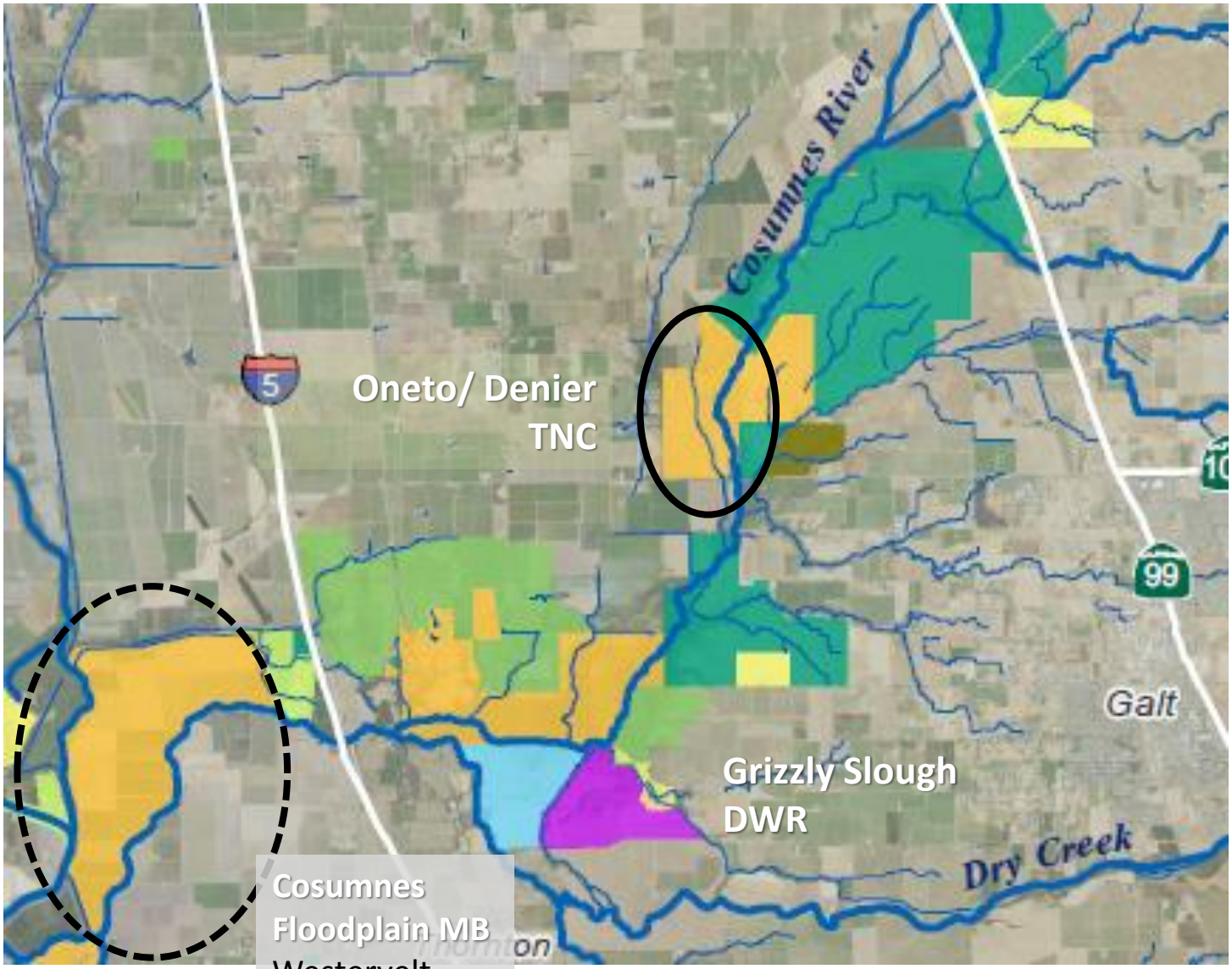
Fish photos: P. Moyle

Cosumnes River Floodplain Experiment



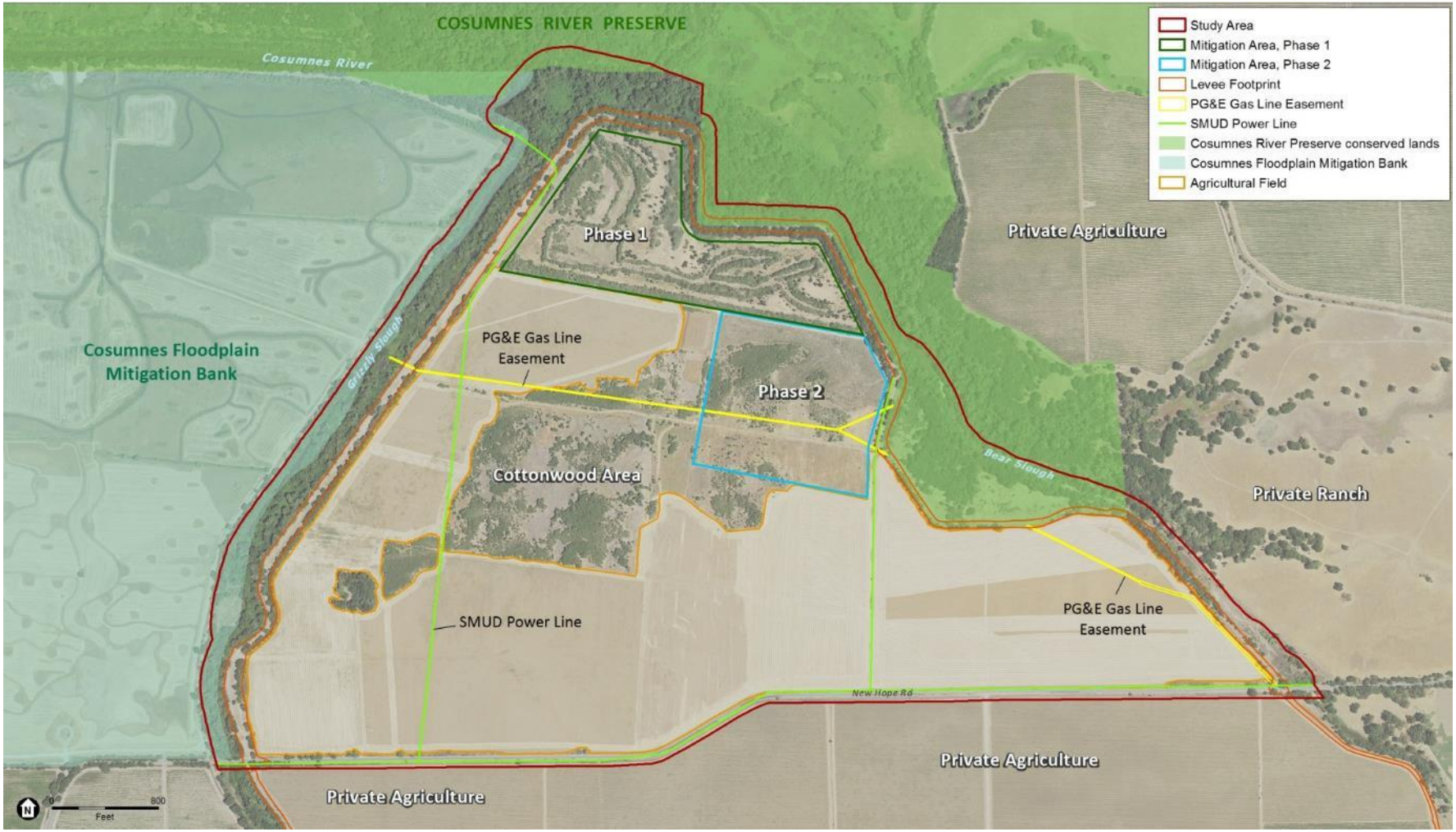
Source: Carson A. Jeffres, Peter B. Moyle, & Jeffrey J. Opperman

Let's go breach!

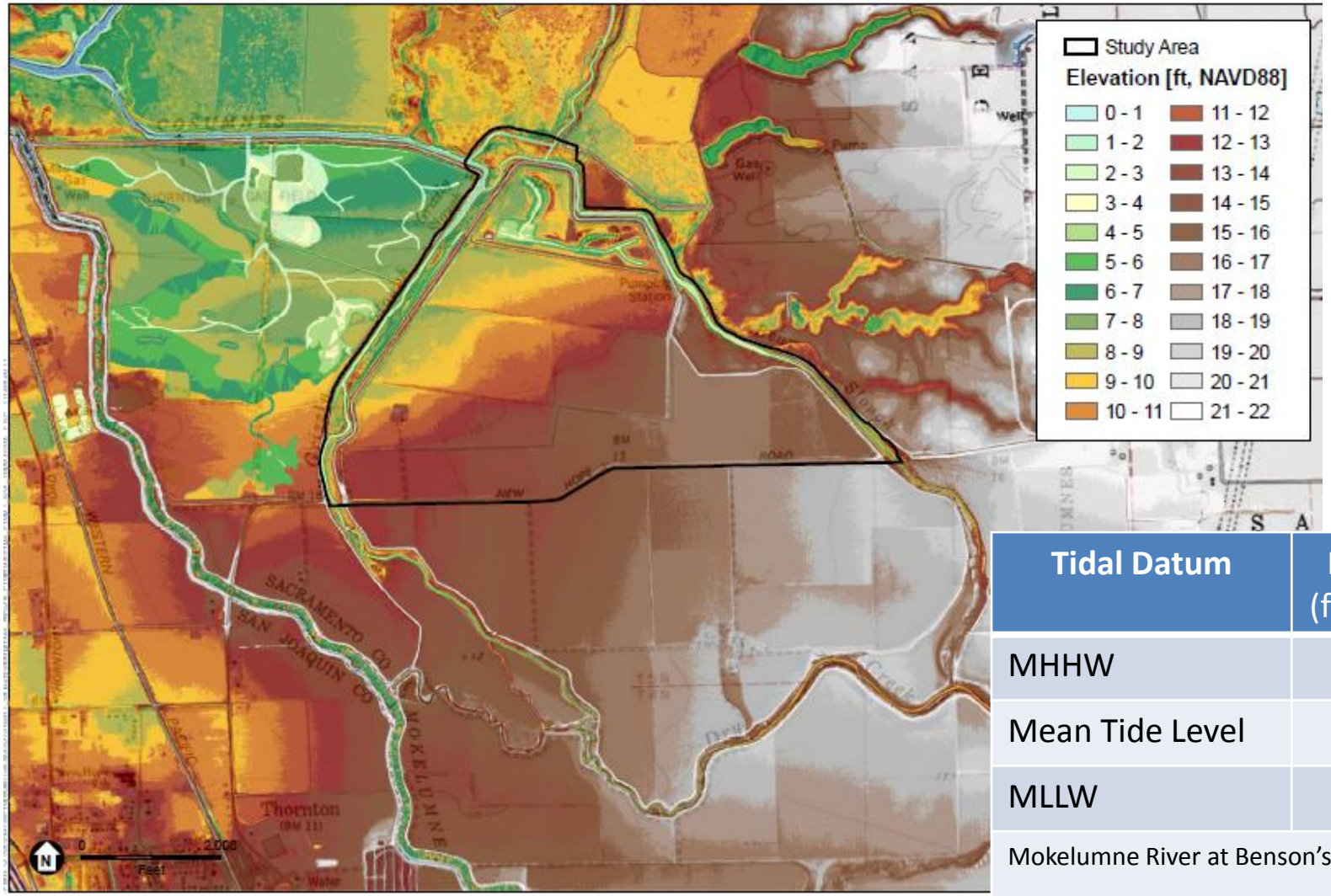


McCormack-
Williamson
TNC

Grizzly Slough Floodplain Restoration - DWR



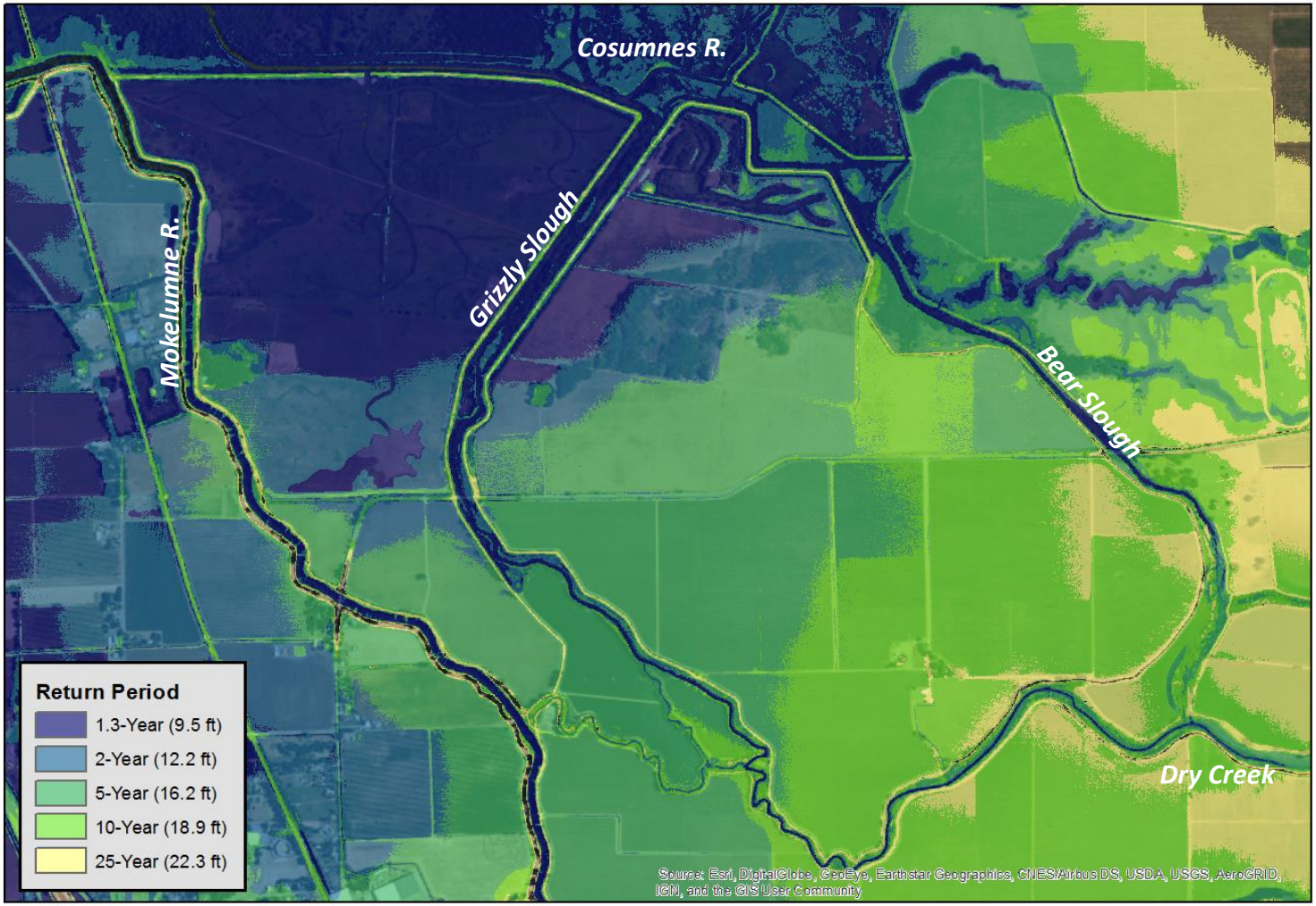
Elevation and topography



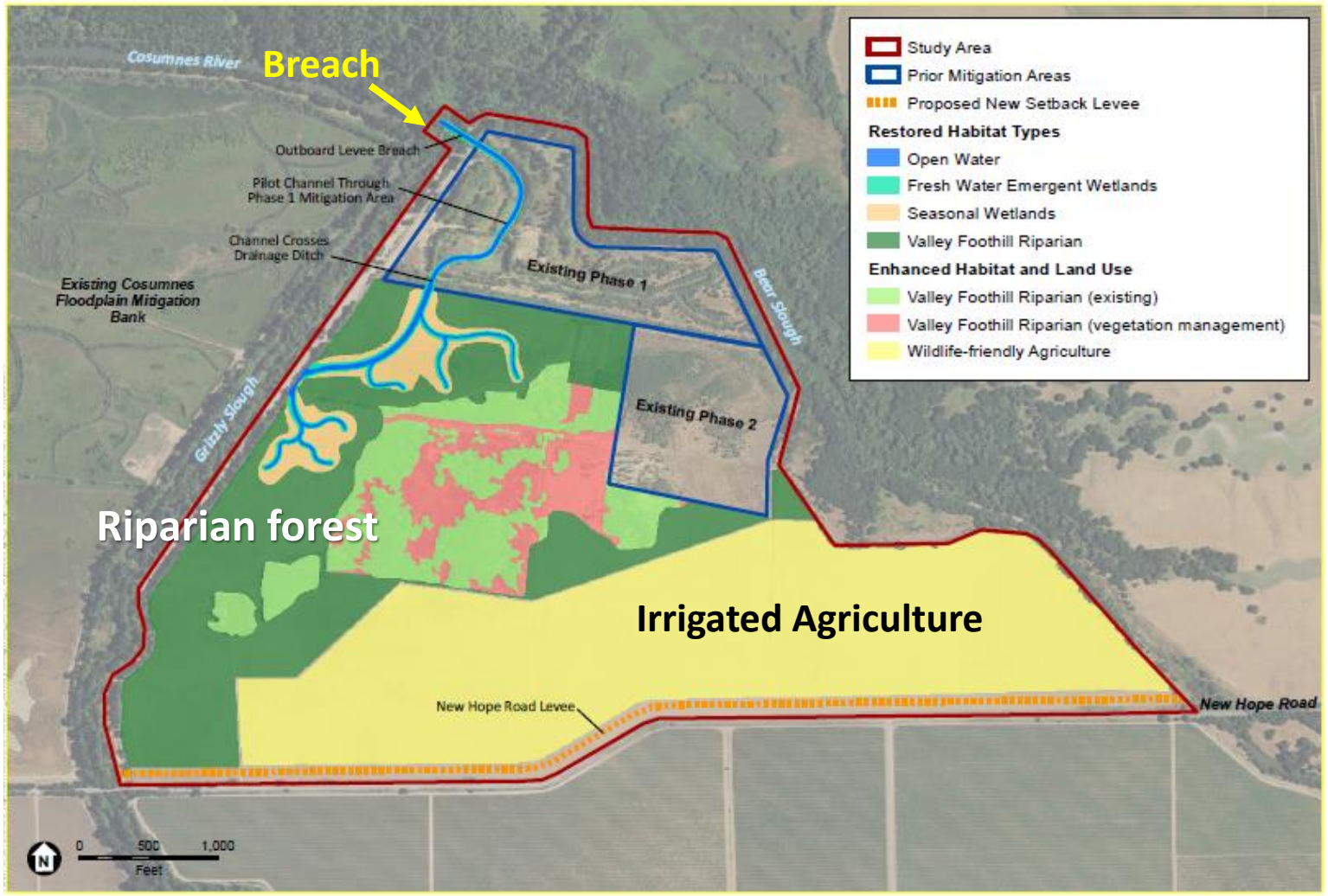
Tidal Datum	Elevation (ft NAVD88)
MHHW	5.8
Mean Tide Level	4.4
MLLW	2.8

Mokelumne River at Benson's Ferry

Flood Recurrence (modeled)



Restoration design



SOURCE: USDA 2014, ESA 2017

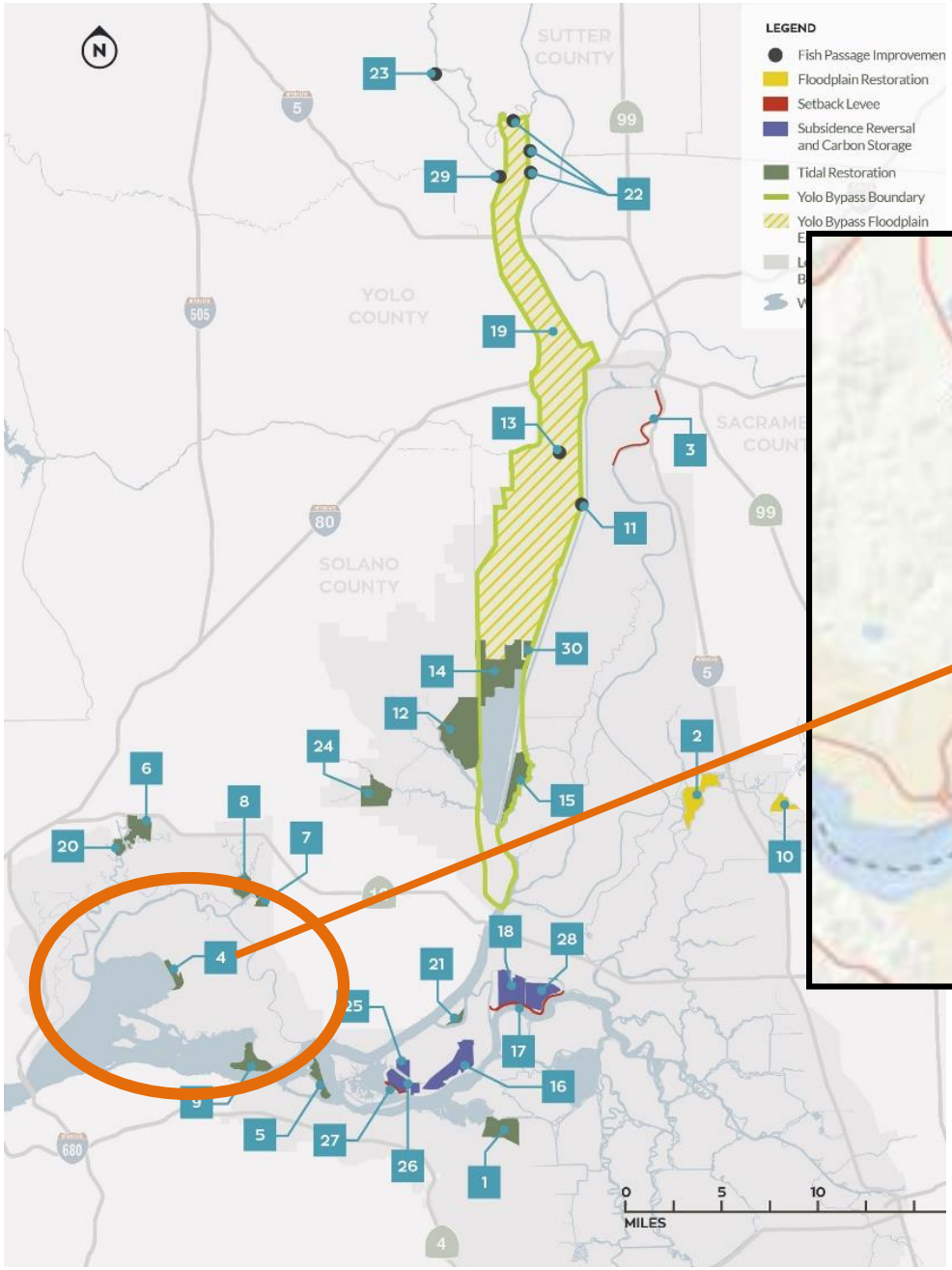
Grizzly Slough Floodplain Restoration

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



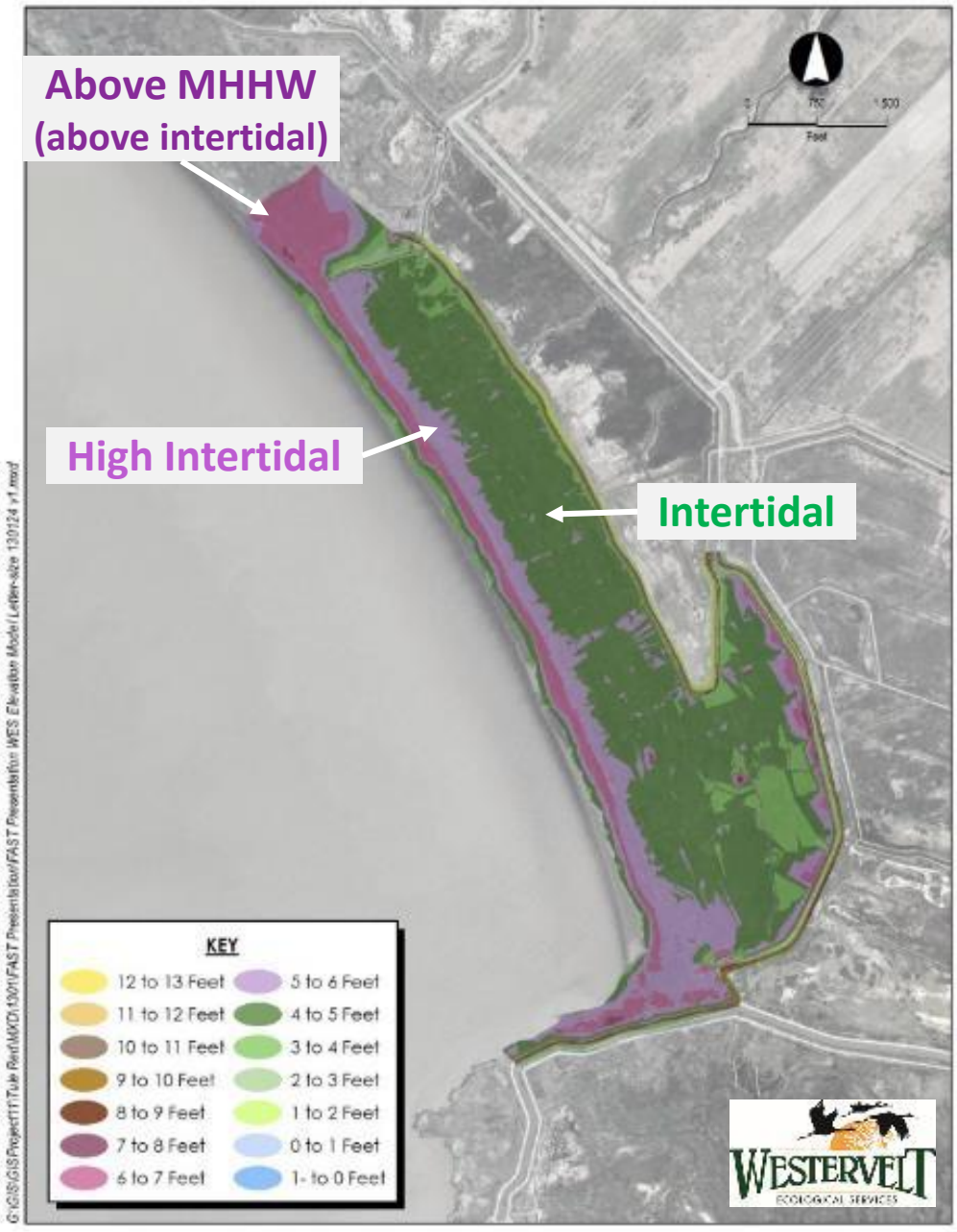
SFCWA State and Federal Contractors Water Agency

Westervelt ECOLOGICAL SERVICES

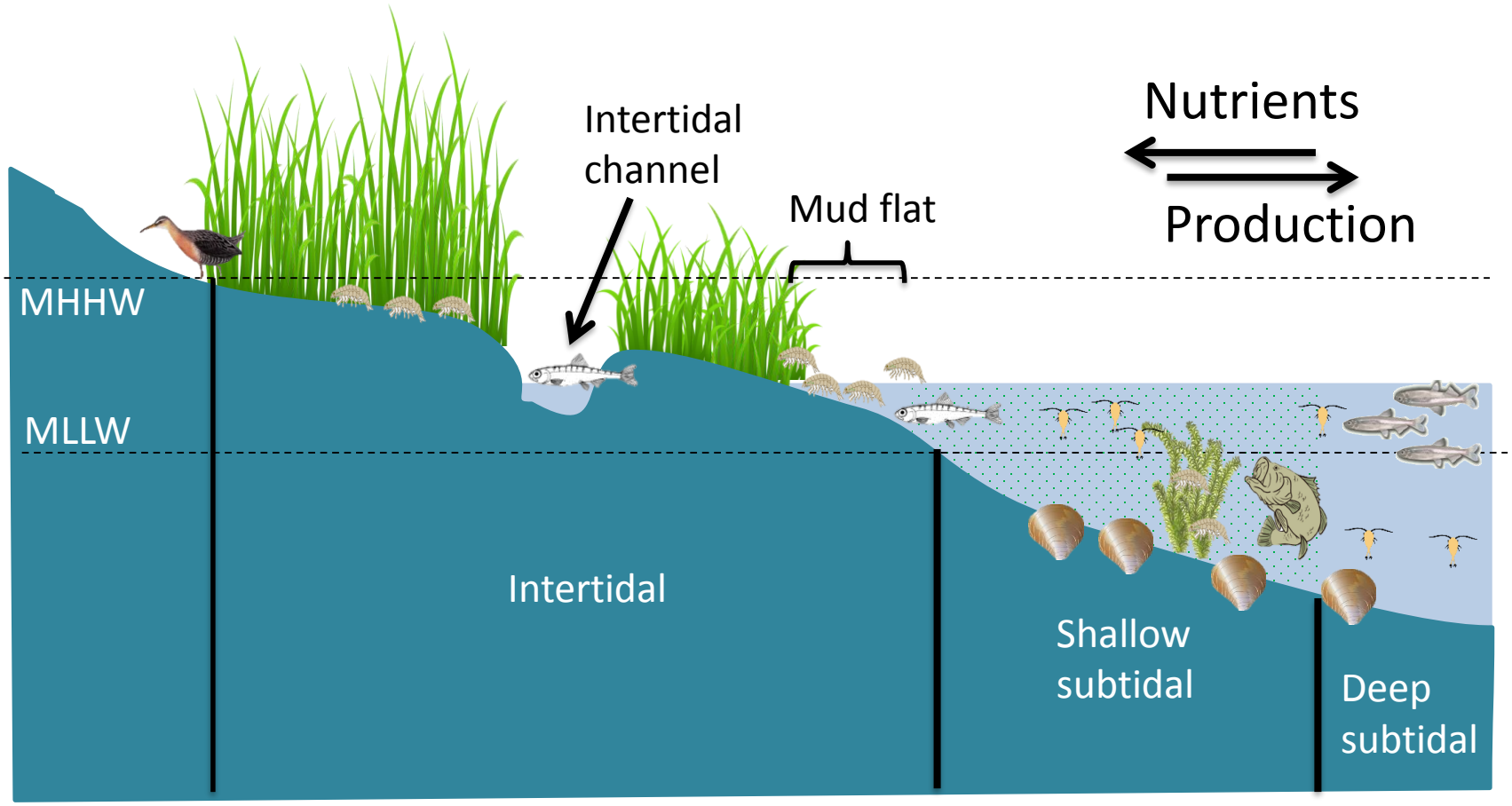
ESA

From duck club… to tidal marsh to benefit fish

Tule Red Duck Club



Tidal Wetland Benefits



CDFW Fish Restoration Program

Tule Red Tidal Restoration Project

377 ac tidal wetlands

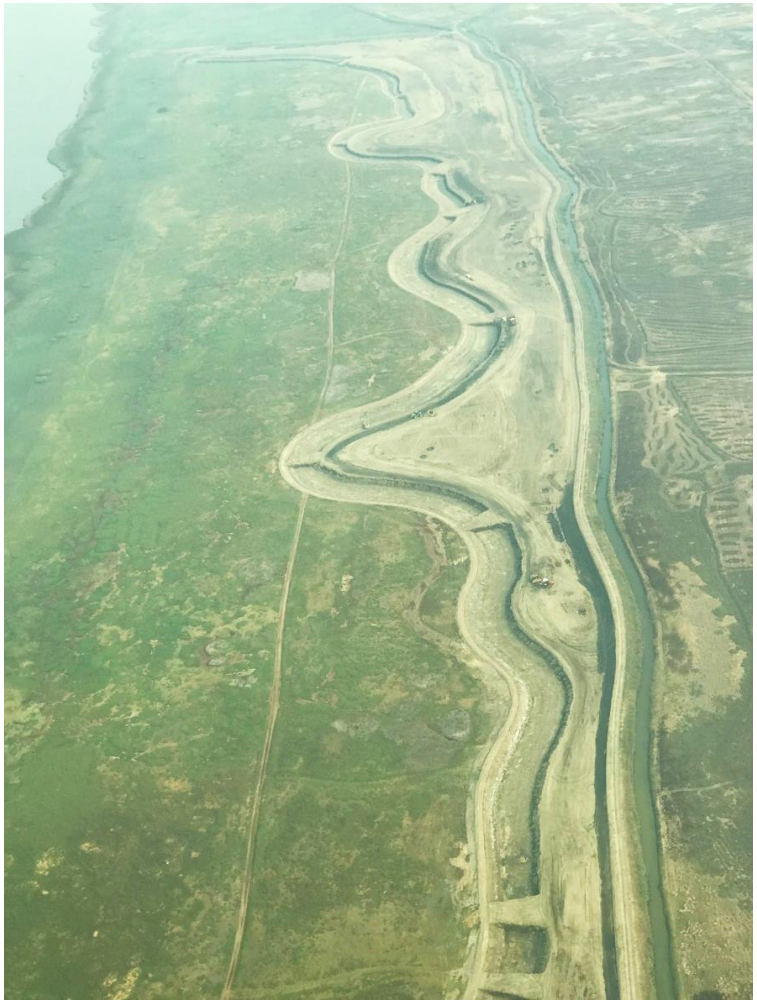
30 ac tidal channels & ponds

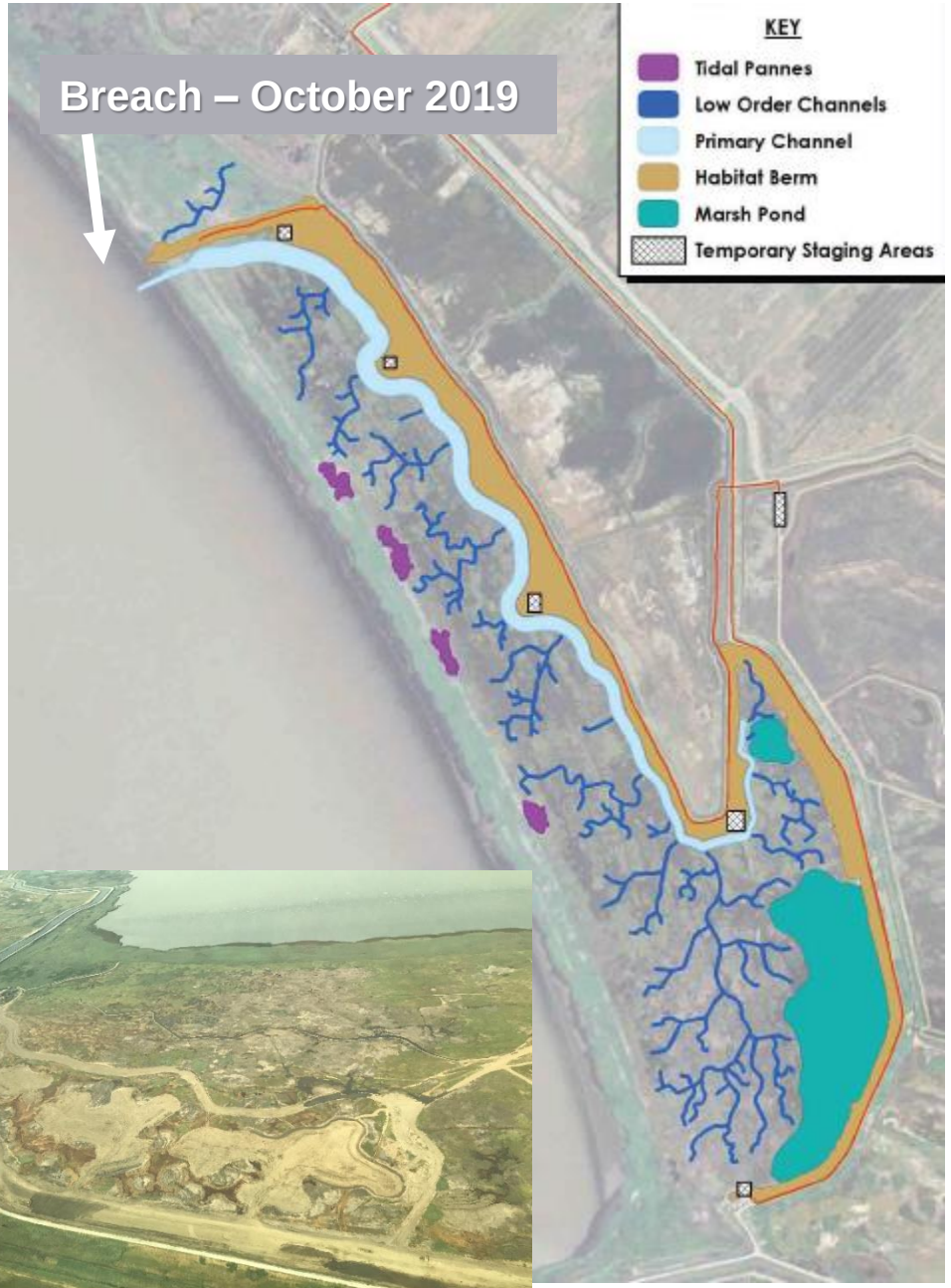
2018

Westervelt Ecological Services

2018 Construction

2018





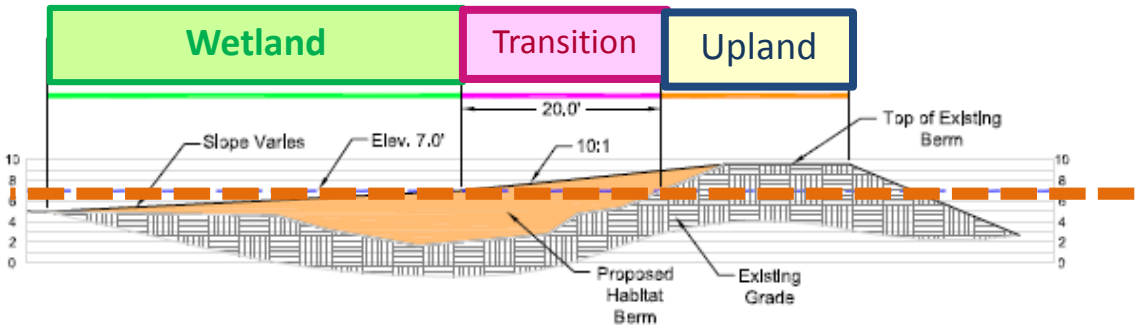
Westervelt ECOLOGICAL SERVICES

ESA

Habitat Berm

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

Ridgway's rail
(formerly California clapper rail)



10:1 - Proposed Habitat Berm

Salt marsh harvest mouse

USFWS photo

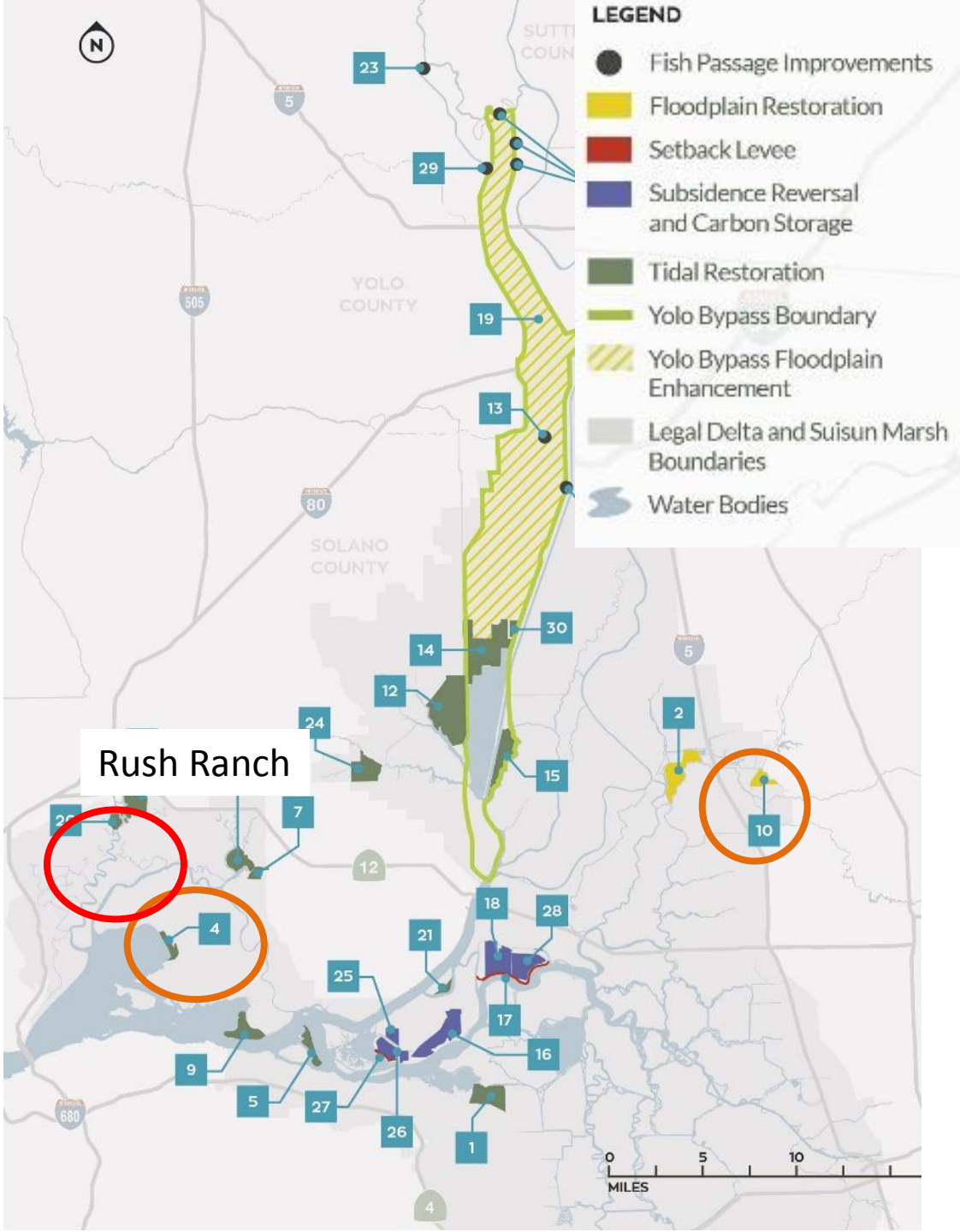
Restoration Projects

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!

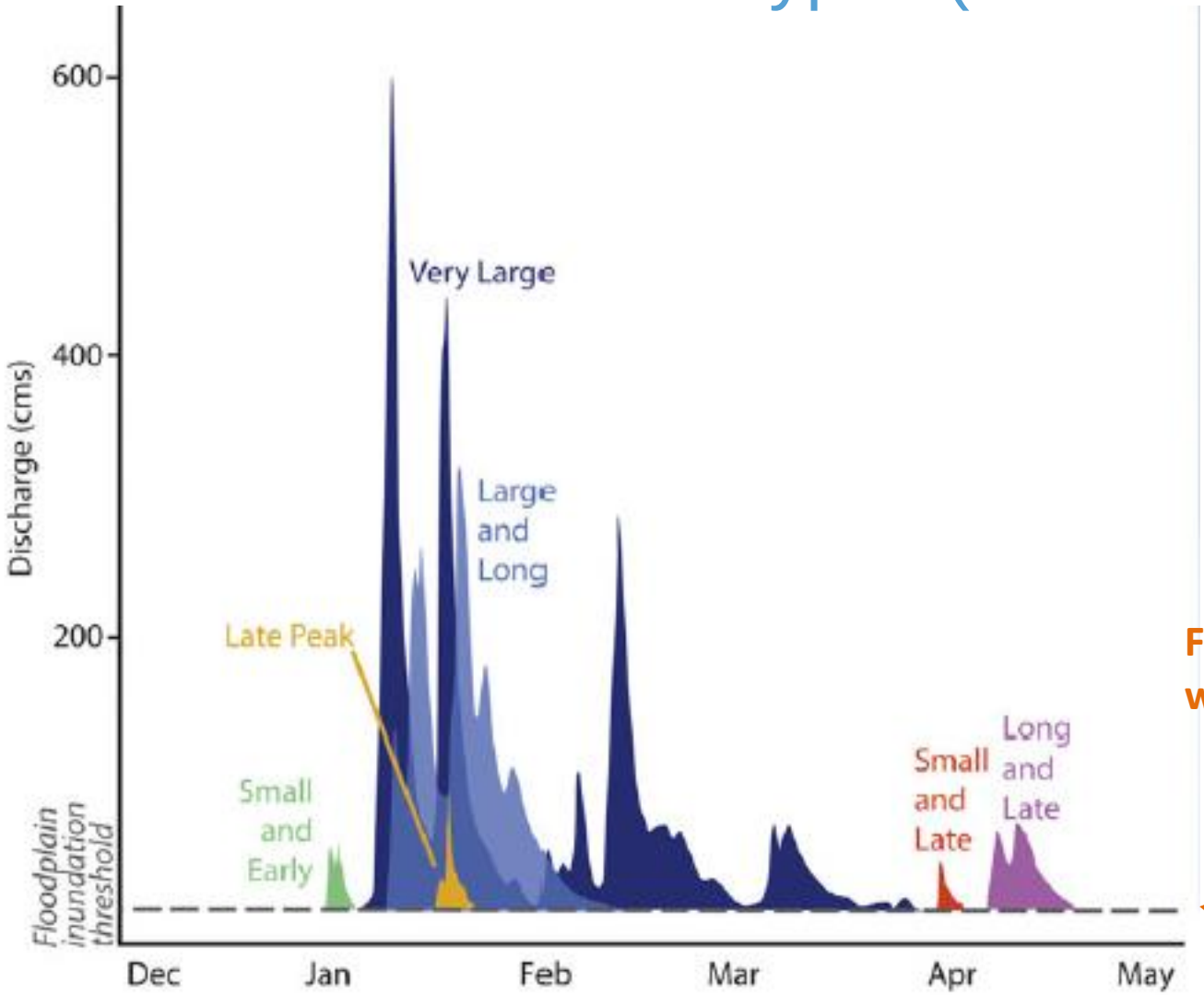

Cosumnes River floodplain
10,000 cfs, March 25, 2006

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

Cosumnes Flood Types (1908-2014)



Floodplain inundation when >812 cfs

Whipple, Viers, Dahlke. 2017. Flood regime typology for floodplain ecosystem management as applied to the unregulated Cosumnes River. March 2017. Ecohydrology

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
Grosholz & Gallo. 2006. Hydrobiologia 568:91-109.

ESA