

# Early Implementation: Lessons Learned from the Tule Red Tidal Restoration Project

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# Restoration of 30,000 Acres of Habitat

1. Adaptive Management Program for California Delta Habitat Restoration
2. Regional Restoration Planning
3. Evaluating Restoration Effectiveness: Tidal Wetland Monitoring Framework
4. **Early Implementation: Lessons Learned from the Tule Red Restoration Project**



# Tule Red Tidal Restoration Project

- Background and Purpose of Project
- Project Team
- Design and Crediting
- Permitting
- Construction
- Monitoring
- Adaptive Management
- Lessons learned

# Water Operations

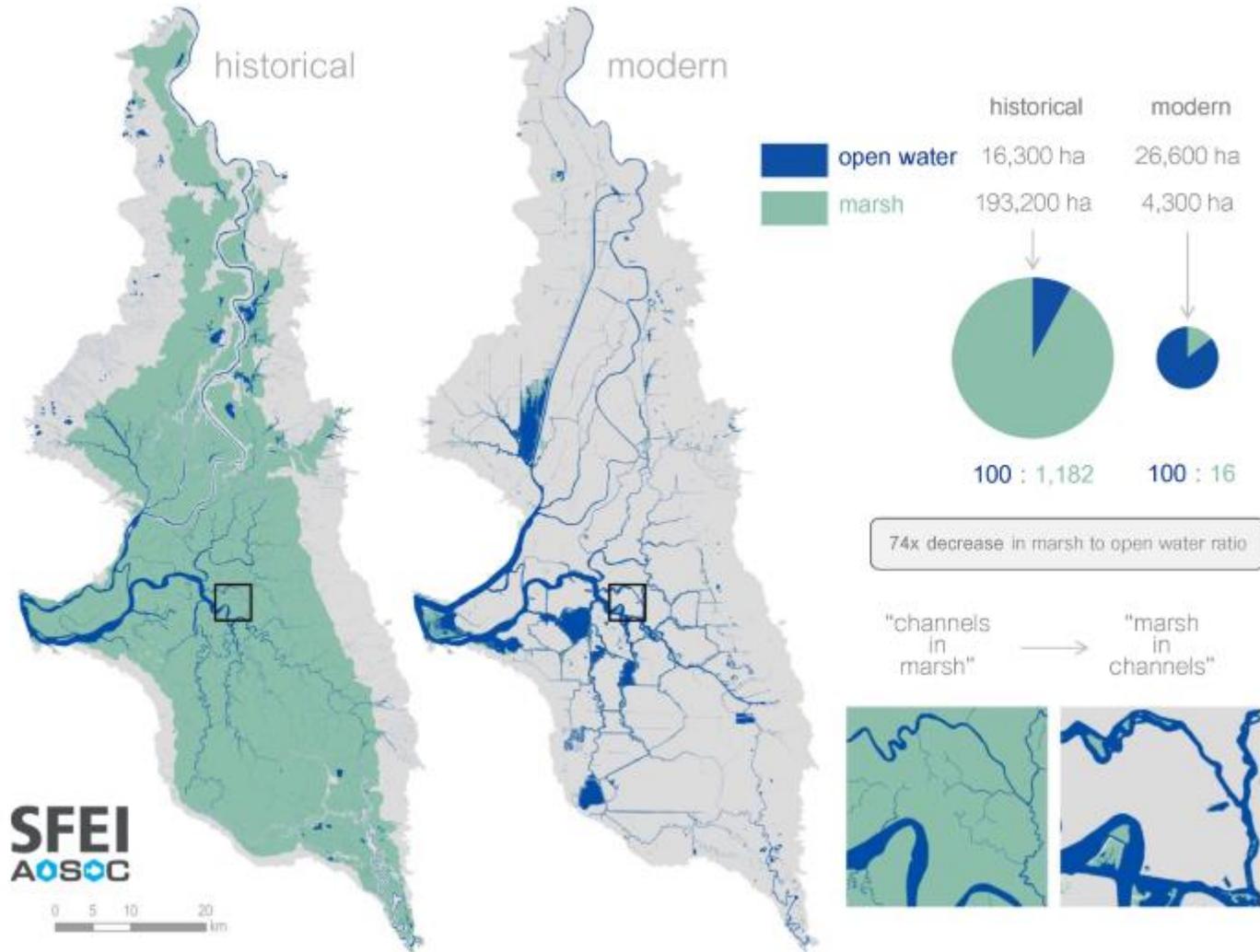


- Delta is the hub of California's water supply system
- Supplies water for **25 million people**
- Supports **\$47.1 Billion agricultural sector**
- California economy 5<sup>th</sup> largest globally, **\$2.66 Trillion GDP**

Central Valley Project (CVP)

State Water Project (SWP)

# Historical Decline of Tidal Marsh



**SFEI**  
AOSOC

0 5 10 20 km

**477,467 acres**

**10,509 acres (98% decline)**

# Declining Fish Populations

**Delta Smelt - Federal endangered**



**Chinook Salmon – 4 runs (2 runs federal endangered)**



**Longfin Smelt – State threatened**



- Entrained in water diversions
- Loss of habitat
- Lack of food
- Invasive non-native fish and clams

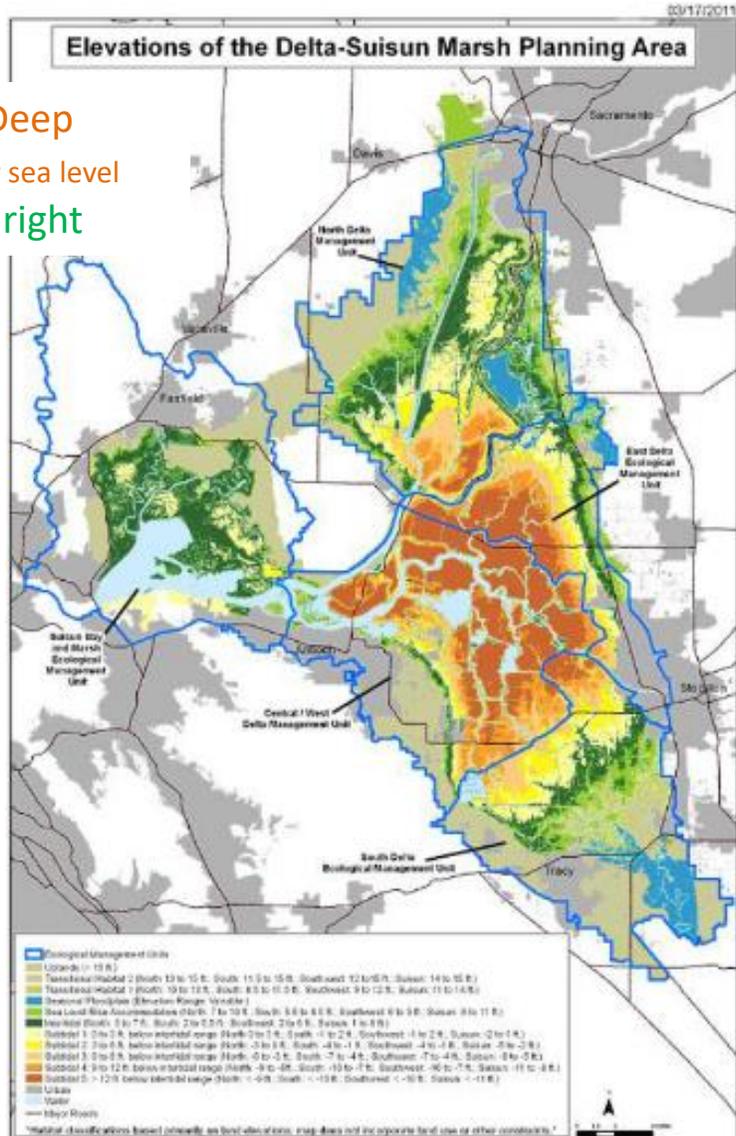
# Tidal Marsh Restoration Objectives

- Biological Opinions for CVP/SWP Operations (USFWS 2008, NMFS 2009)
  - Fish Restoration Program Agreement (FRPA)
  - **8,000 acres** intertidal and associated subtidal habitat restoration
- Suisun Marsh Plan 2013
  - **5,000 – 7,000 acres** tidal marsh restoration
- California EcoRestore 2015
  - **9,000 acres** tidal and subtidal habitat restoration
- Agency Plans and Programs
  - Delta Plan
  - Delta Conservancy Strategic Plan
  - Cache Slough Complex Conservation Assessment

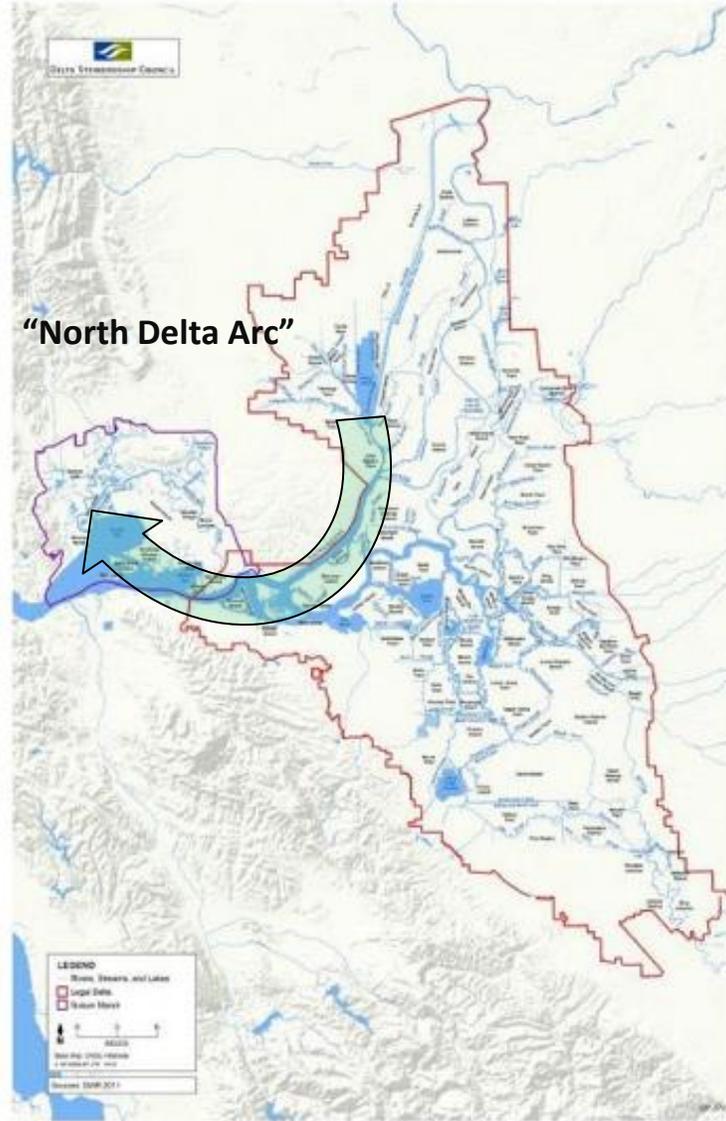
# Where is restoration suitable and valuable?

## Elevation

Subtidal = Too Deep  
up to 30' below sea level  
Intertidal = just right



## Native Fish Habitat – Delta smelt



# Challenges for Implementing Restoration

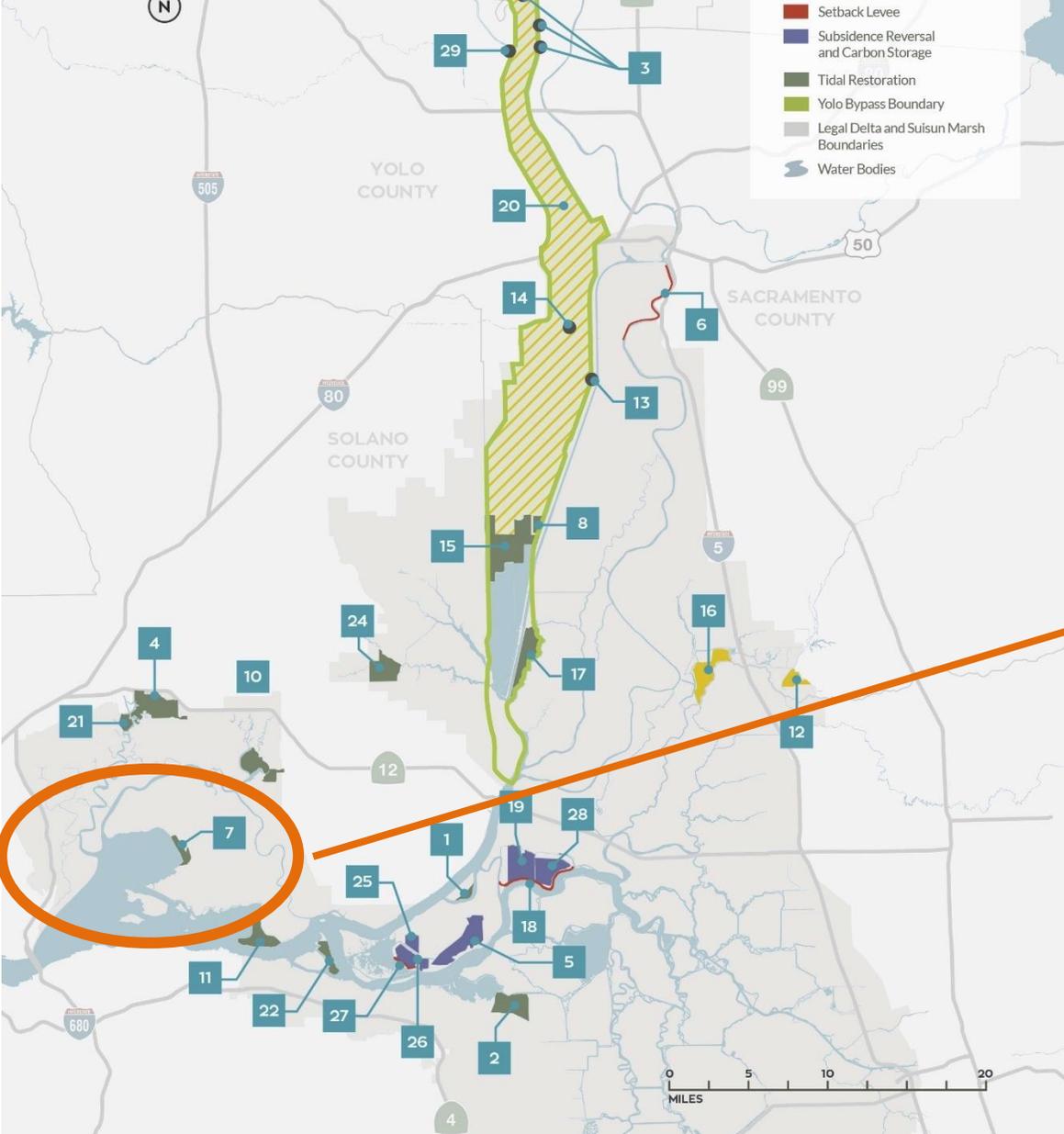
- Land values
- Existing mineral rights and infrastructure
- Water rights
- Local opposition
- Design challenges
- Lack of funding
- Environmental compliance and permitting
- Uncertainty about suitability to contribute to species recovery goals
- Public access vs. species preserve



# The Restoration Regatta

- **Regatta Officials**
  - USFWS, NMFS, CDFW, Delta Stewardship Council
- **Rowing Clubs**
  - State and Federal Water Contractors Water Agency
  - California Department of Fish and Wildlife
  - California Department of Water Resources
  - Suisun Resource Conservation District
- **Tule Red Boat**
  - Westervelt Ecological Services
  - CDFW
- **Tule Red Project Crew**
  - Coxswain – Rob Capriola, WES
  - Land Stewardship, Initial Bio surveys – WES
  - Engineering & Design – WES, Northwest Hydraulic Consultants, RMA
  - Permitting and Environmental compliance – ESA, ICF
  - Monitoring and Adaptive Management Plan – ESA
  - Construction – 4M Construction, KSN, WES
  - Long-term Stewardship - CDFW





# Tule Red Tidal Restoration Project



# Tule Red Duck Club



Diked managed wetlands for duck hunting-winter flooded only

Acquired in 2011 by WES  
360 acres WES/SFCWA  
60 acres CDFW

Approach: Establish tidal flows to create tidal wetland functions for fish and wildlife

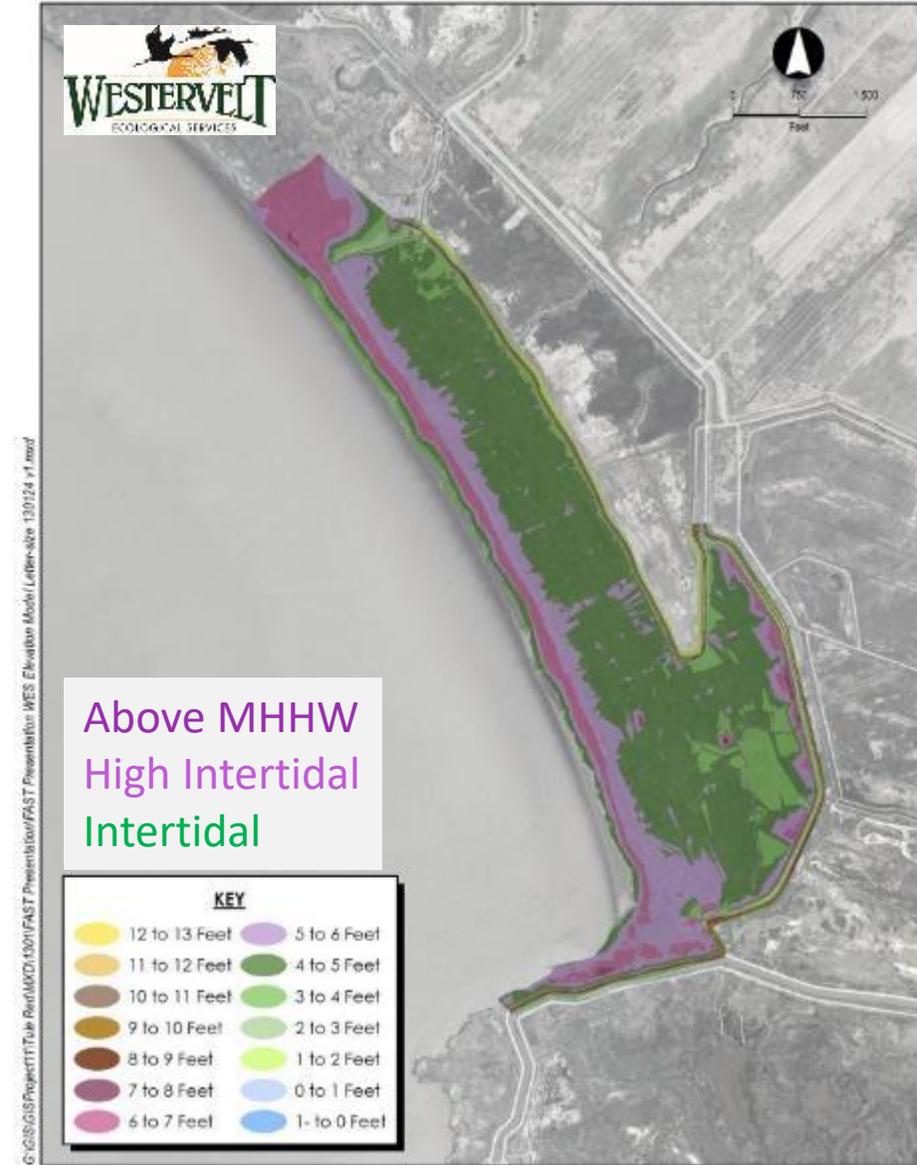


## Tule Red Tidal Restoration Objectives

1. Enhance **food web** productivity and export to support **delta smelt** and **longfin smelt**
2. Rearing habitat for young **salmonids**
3. **Habitat** for other aquatic and wetland species
4. Provide **ecosystem functions** of Delta brackish aquatic-wetland-upland interface
5. Provide **topographic variability** for succession and resilience to climate change/sea level rise

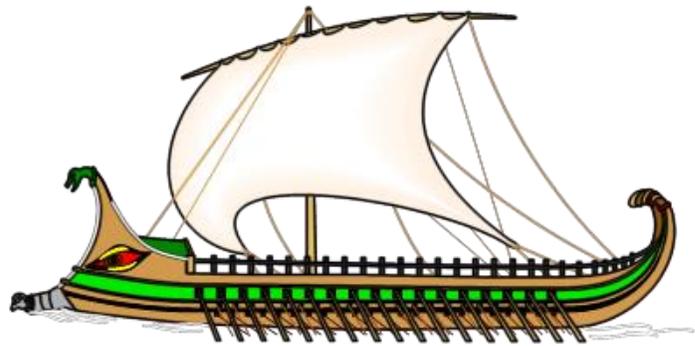
# Tule Red Elevations

- Suitable elevation - Intertidal elevation within the site
- Which design?
  - Stability of channels
  - Full tidal exchange



# Concept Design #1

- WES and NHC
- Engineering design of channel layout for full tidal inundation
- 685,000 CY of Excavation



## Concept Design #2

- Revised Channel Layout
- Reduced excavation to that required by fill for Habitat Berm
- Technical Review
  - University of CA Davis
  - Expert Panel



## Questions and Uncertainties

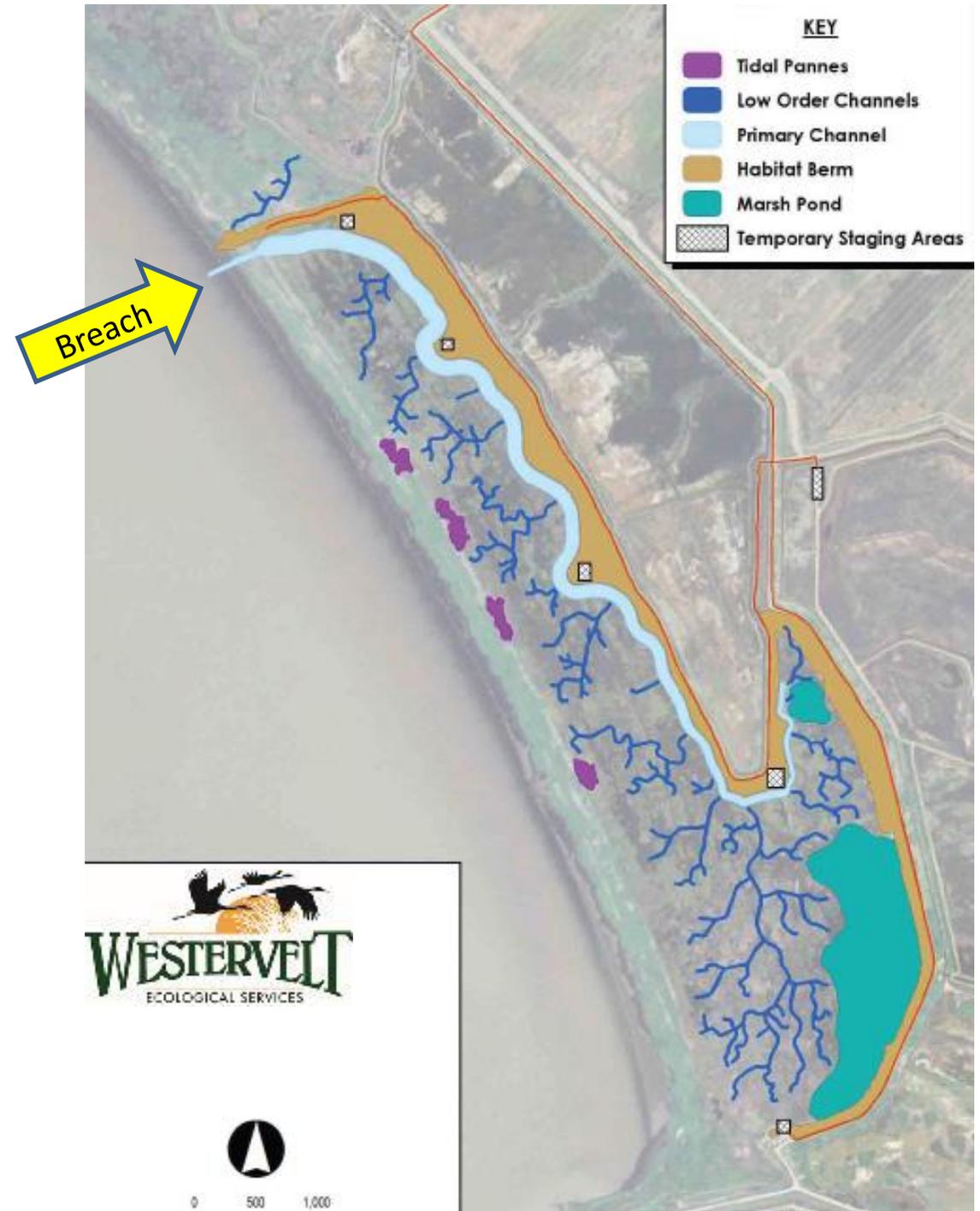
- Will the **breach fill** with sediment and close?
- Will the **channels erode**?
- Will wave **erosion affect the berm** and neighboring properties?
- What **food resources** will be produced/exported?
- Which habitat component **contributes most food**?
- What control measures for **invasive plants**?
- Will **clams** take over?
- Will **methyl mercury** production and bioaccumulation exceed ambient levels?
- How will **climate change** and **sea level rise** affect habitat outcomes?

# Refining the concept design

- **Questions**
  - Sediment budget
  - Salinity modeling
  - Interior Habitat berm
  - Channel design
  - Food web support
  
- **Design guidance**
  - Take advantage of existing topography
  - Enhance primary production by increase retention of water in ponds – “Crockpot”
  - Create additional habitat diversity – from subtidal to upland
  - Balance cut/fill on-site

# Design #3 FINAL

- Breach channel moved north
- Increase sinuosity and length of channel
- Habitat Berm
- Add high and low marsh plain ponds
- Add high marsh plain areas
- Build marsh plain ponds so inundated twice a month
- Add north high marsh channels
- 377 ac tidal wetlands
- 30 ac tidal channels & ponds

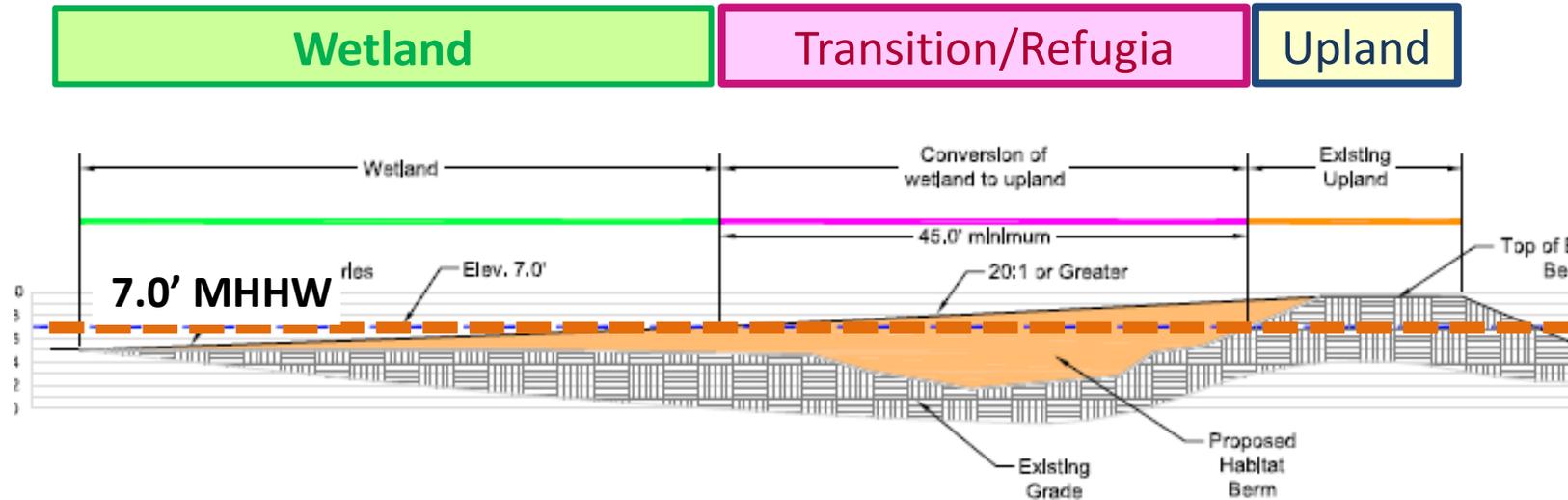


# Habitat Berm Refinements

Ridgway's rail  
(formerly California clapper rail)



USGS photo

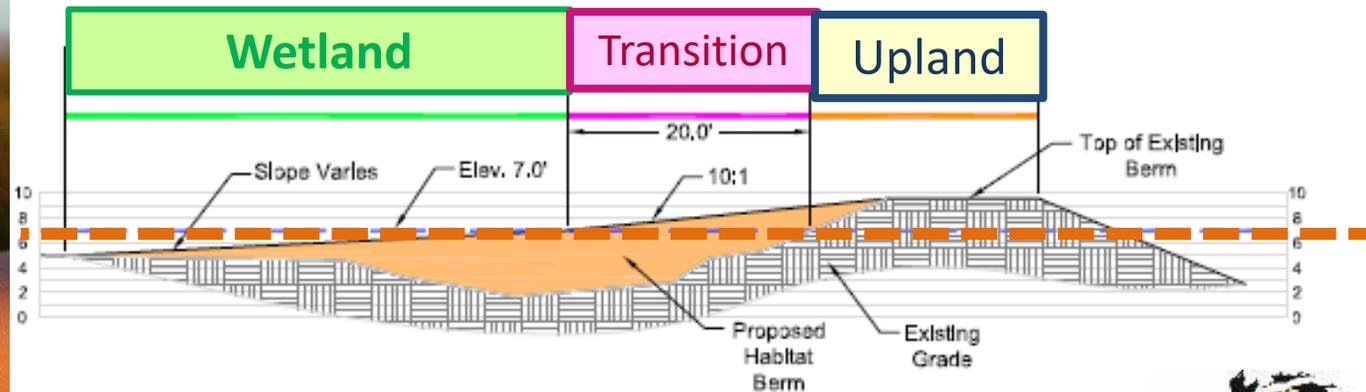


Salt marsh harvest mouse

20:1 or Greater - Proposed Habitat Berm



USFWS photo



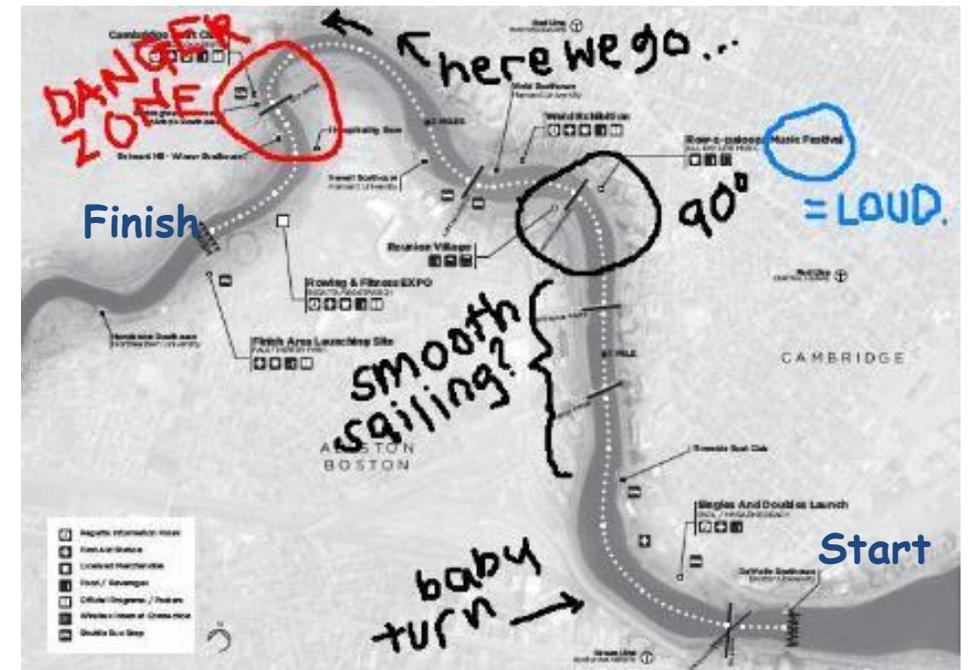
10:1 - Proposed Habitat Berm



# Navigating Regulations

Many regulatory agencies with overlapping responsibilities:

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- California Department of Fish and Wildlife
- Regional Water Quality Control Board
- Delta Stewardship Council
- Bay Conservation and Development Commission
- State Lands Commission
- Coast Guard
- Counties



# Permitting and Environmental Compliance

- CEQA Compliance
- NEPA Compliance
- Environmental Permits
  - Clean Water Act Section 404
  - RHA Section 10
  - Clean Water Act Section 401
  - NHPA Section 106
  - California Fish and Game Code Section 1600
  - ESA Section 7 USFWS
  - ESA Section 7 NMFS
  - CESA ITP
  - Bay Conservation and Development Commission permit
  - Porter-Cologne WDR/Clean Water Act Section 402 (SWPPP)
  - State Lands Commission Lease
  - Delta Plan Consistency Determination
  - Suisun Marsh Plan Consistency



# Ready, Set, Go!

- 2017
  - Construction prep
  - Soil surcharge at new crossing
- 2018
  - Construct channel network and habitat berm
  - Structure modifications to CDFW outfall
  - Vegetation planting (tules), native herbaceous seeding
- 2019
  - Revegetation, weed control
  - Remove existing structures and tide gates
  - fall 2019 - breach outer berm, connect channel to tidal exchange
- 2020
  - Begin Year 1 post-construction monitoring



2018



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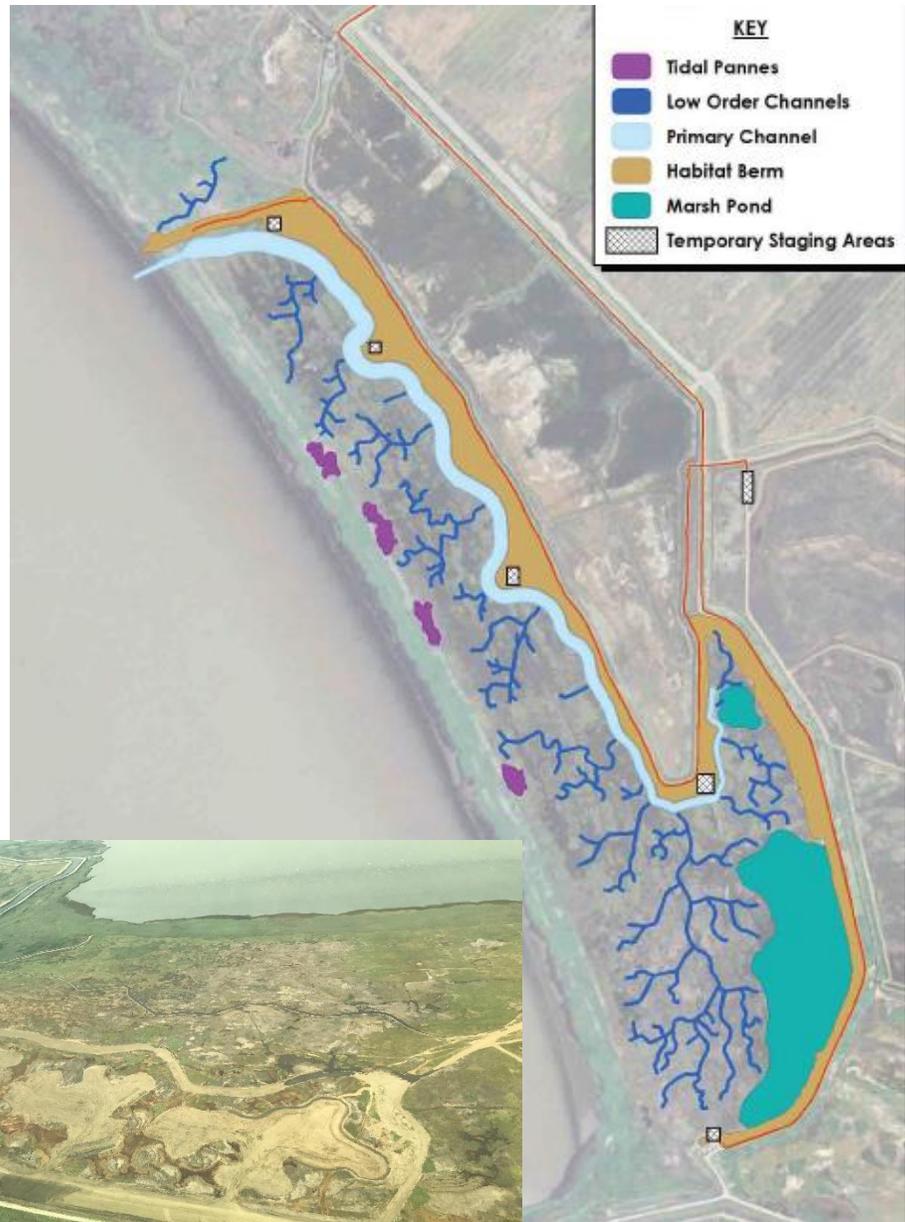


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# 2018 Construction



# 2018



## Monitoring for Adaptive Management

1. Verify the Project was implemented as designed and permitted, to meet regulatory requirements  
*Compliance monitoring*
2. Project had the expected effects  
*Effectiveness monitoring*
3. Monitor triggers for operations, stewardship and corrective responses  
*Management triggers*
4. Reduce uncertainties to guide restoration and adaptive management  
*Learn and adapt*

# Tule Red Adaptive Management and Monitoring Plan

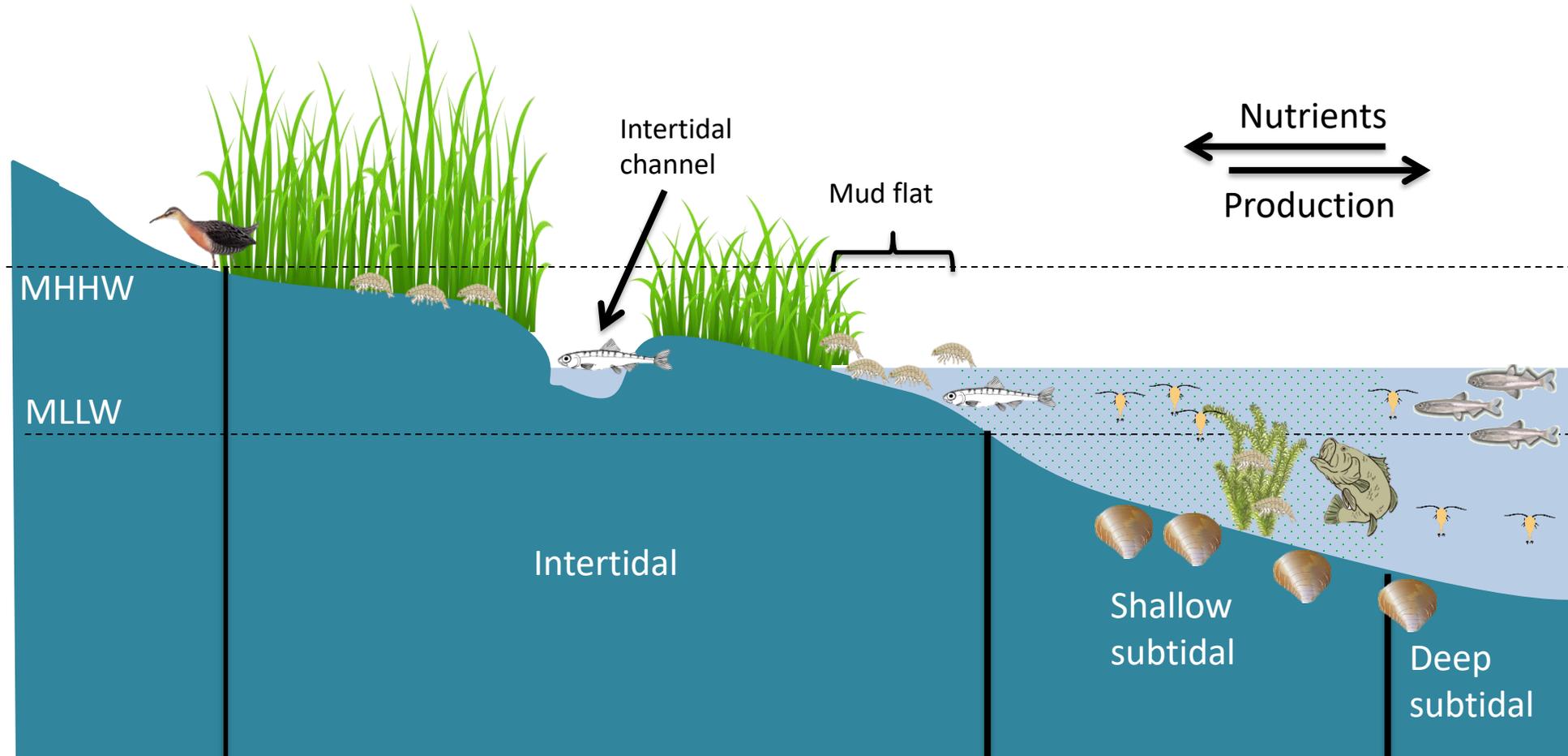
- Objective-based monitoring: Define indicators or parameters related to the Project's objectives
- IEP Tidal Wetlands Restoration Monitoring Framework provided methods for consistency and comparability
- CDFW FRP Monitoring team for sampling



R. Hartman CDFW



# TIDAL WETLAND BENEFITS



# Adaptive Management triggers

1. State expected outcomes defined for each objective
2. Select metrics, set goals and trigger levels
3. Identify potential management responses

## Objective - Enhance regional food web productivity and export

- Levee breach and channel will increase tidal exchange
- Productivity in ponds will be greater than in primary channel, and higher than bay.

## Potential adaptive management responses

- Remove obstruction from breach
- Adjust height of berm around ponds to hold water longer to boost productivity



# Lessons Learned

- **Several ways to achieve restoration**
  - By the State, By private entities, By responsible parties, and partnerships
- **Design will evolve with more information**
  - Modeling, studies
  - External technical review and science
- **Permitting takes time, and compromises**
- **Each project is an experiment**
  - Uncertainties and questions for each project
  - Adaptive management
  - Regional context and comparisons among projects
- **Leveraging resources and partners**
- **Construction requires site-specific expertise**



# Restoring 30,000 acres of California Delta Habitat

- Delta-wide Governance
- Delta-wide Science
- Regional Planning
- Regional Monitoring
- Individual Project implementation
- Adaptive Management



**CALIFORNIA  
ECO RESTORE**  
A STRONGER DELTA ECOSYSTEM.



# Go Team – Winning the Restoration Regatta



**IEP Tidal Wetlands  
Restoration Monitoring**

- Alice Low
- Stacy Sherman
- Rosemary Hartman
- Dave Contreras

**WES**

- Rob Capriola
- Hal Holland
- Kim Erickson
- Matt Gause
- Mark Young
- Chris Holland

**SFCWA**

- Byron Buck
- Bruce DiGennaro

**ESA**

- Gerrit Platenkamp, Ph.D.
- Priya Finnemore
- Rachel Brownsey

**NHC**

- Brad Hall
- Brian Wardman

