

Regional Restoration Planning:

A Case Study in Collaborative Restoration
Science and Planning

Campbell Ingram, Executive Officer
NCER

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SACRAMENTO - SAN JOAQUIN
DELTA CONSERVANCY
A California State Agency

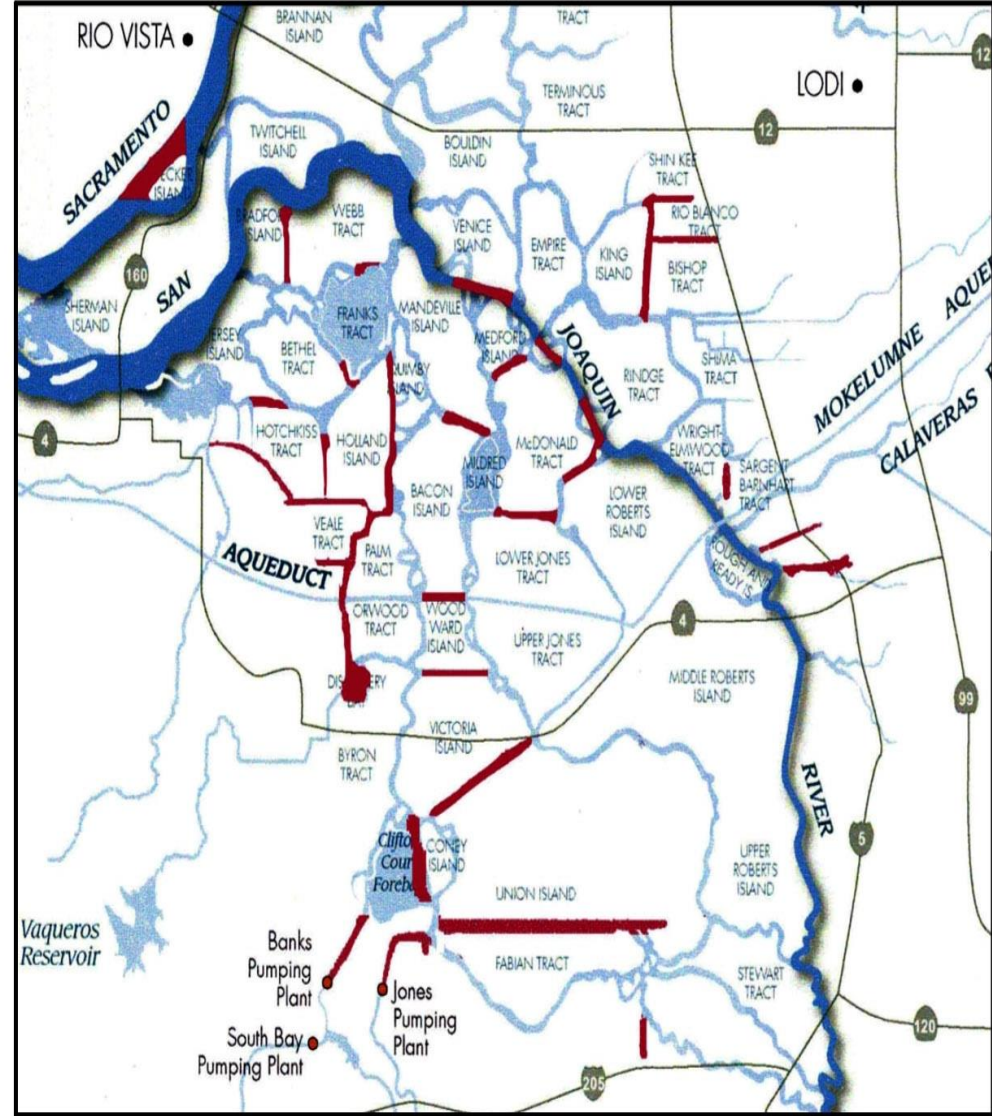
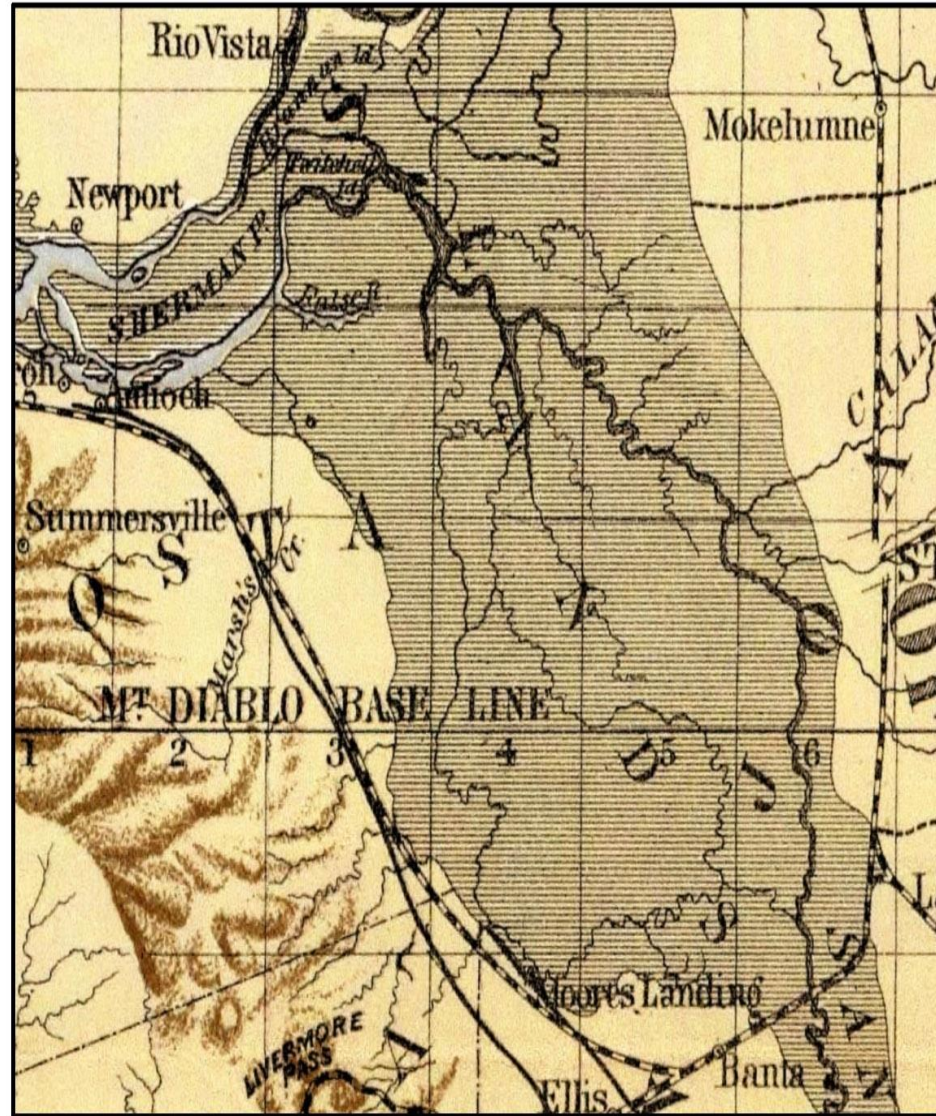
Co-Equal Responsibilities

- Act as a primary state agency to implement ecosystem restoration in the Delta, and
- Support efforts that advance environmental protection and the economic well-being of Delta residents



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Historic and Current Delta



- **How did the Delta function historically?**
- **How can we quantify that change?**
- **How to plan for a future resilient Delta ecosystem?**

A DELTA RENEWED

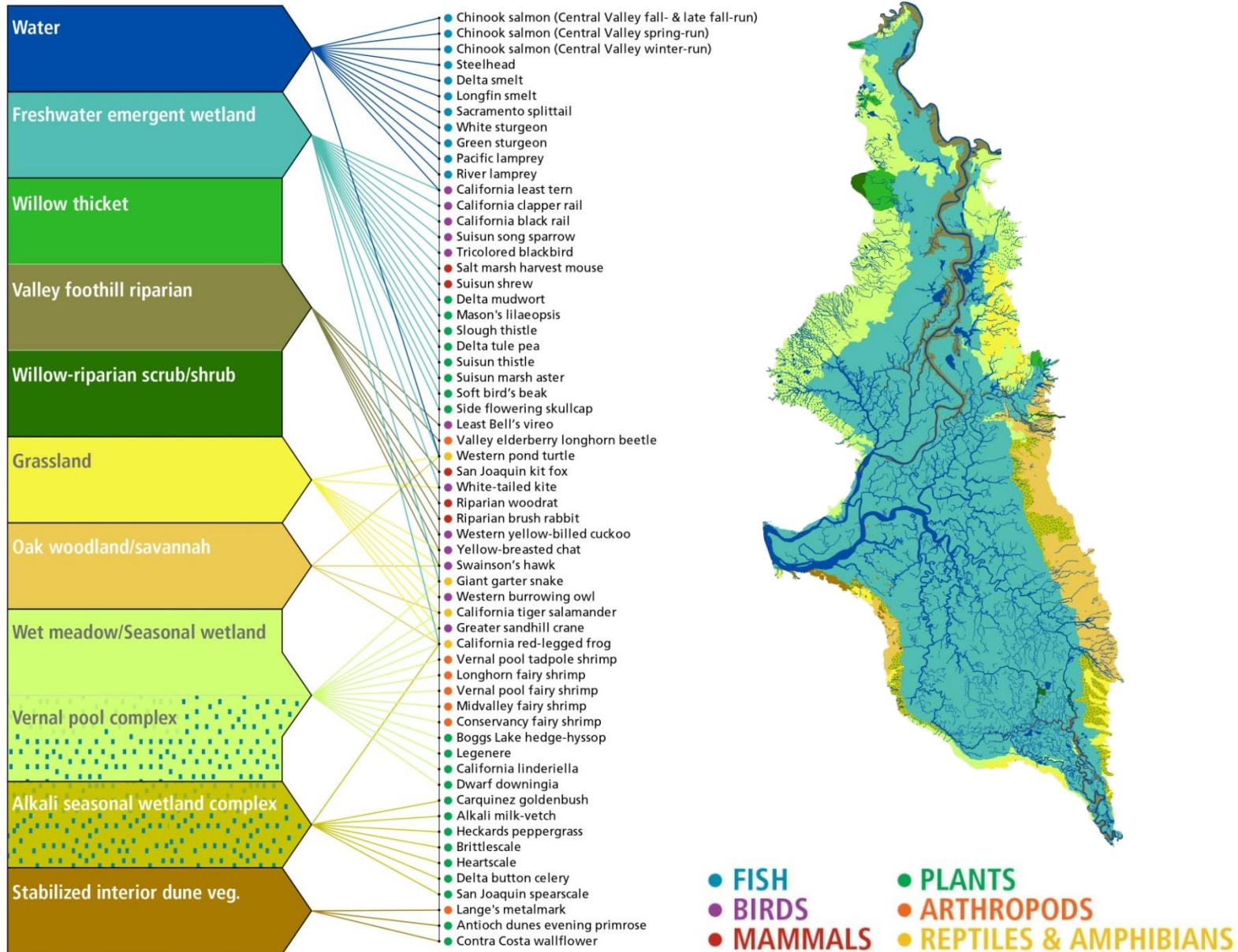
*A Guide to Science-Based
Ecological Restoration*

IN THE SACRAMENTO-SAN JOAQUIN DELTA

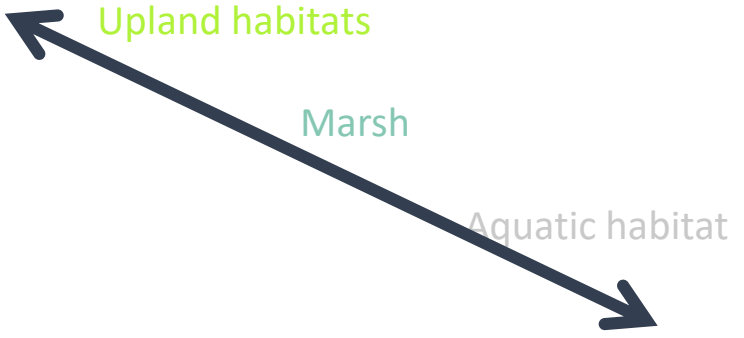
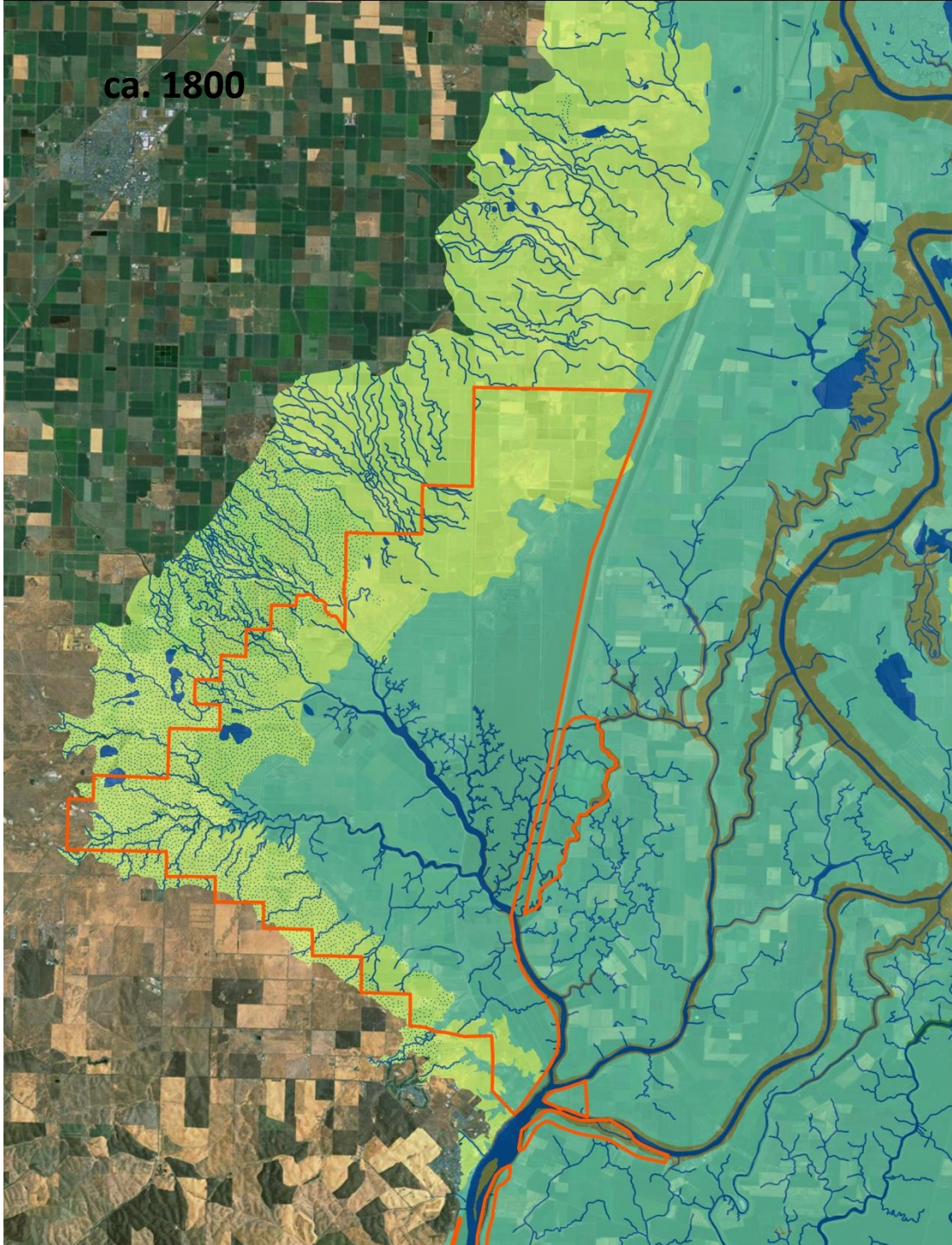


SAN FRANCISCO ESTUARY INSTITUTE **SFEI**
AQUATIC SCIENCE CENTER **A+S+C**

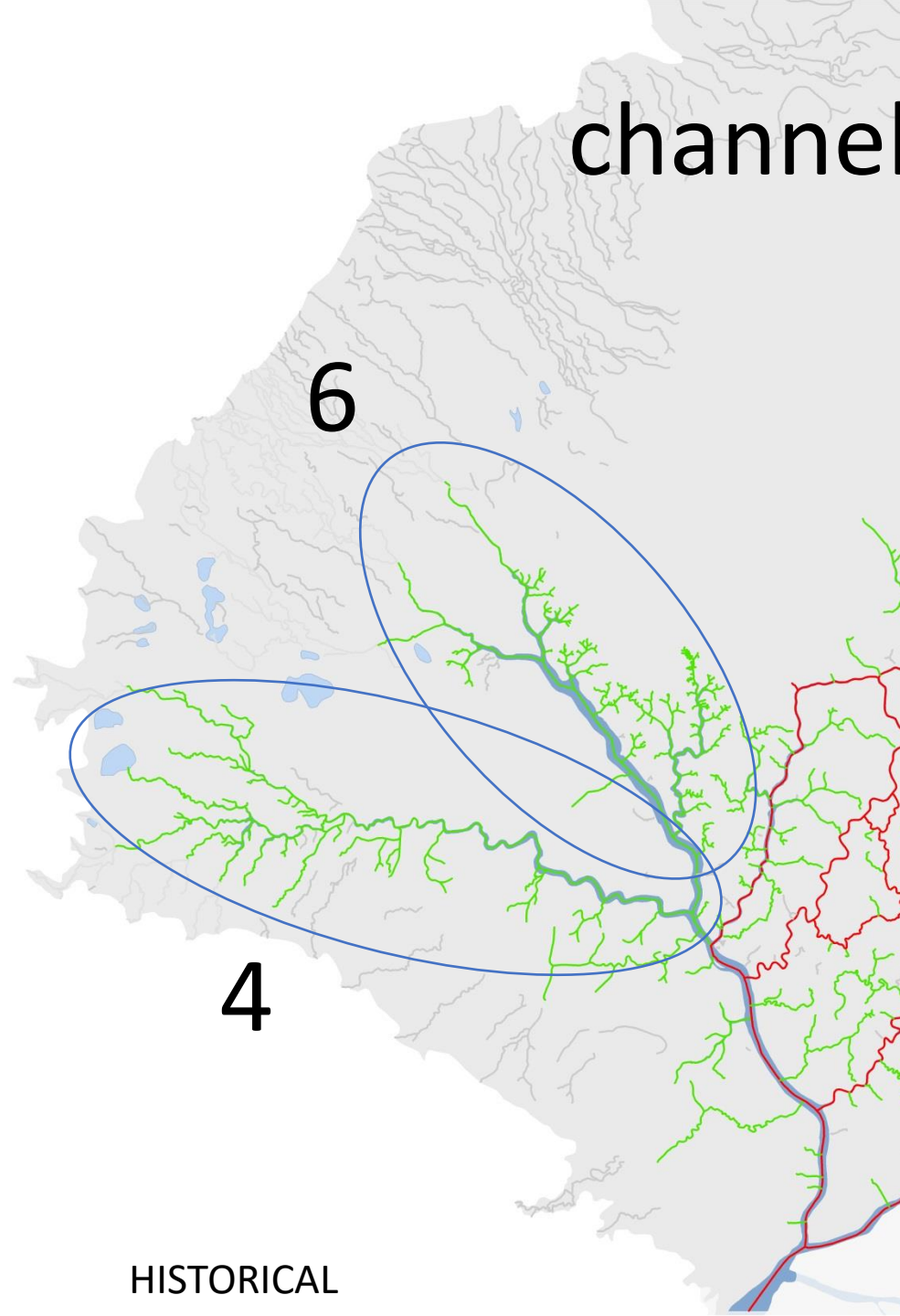
The Delta's habitats supported a web of diverse species.



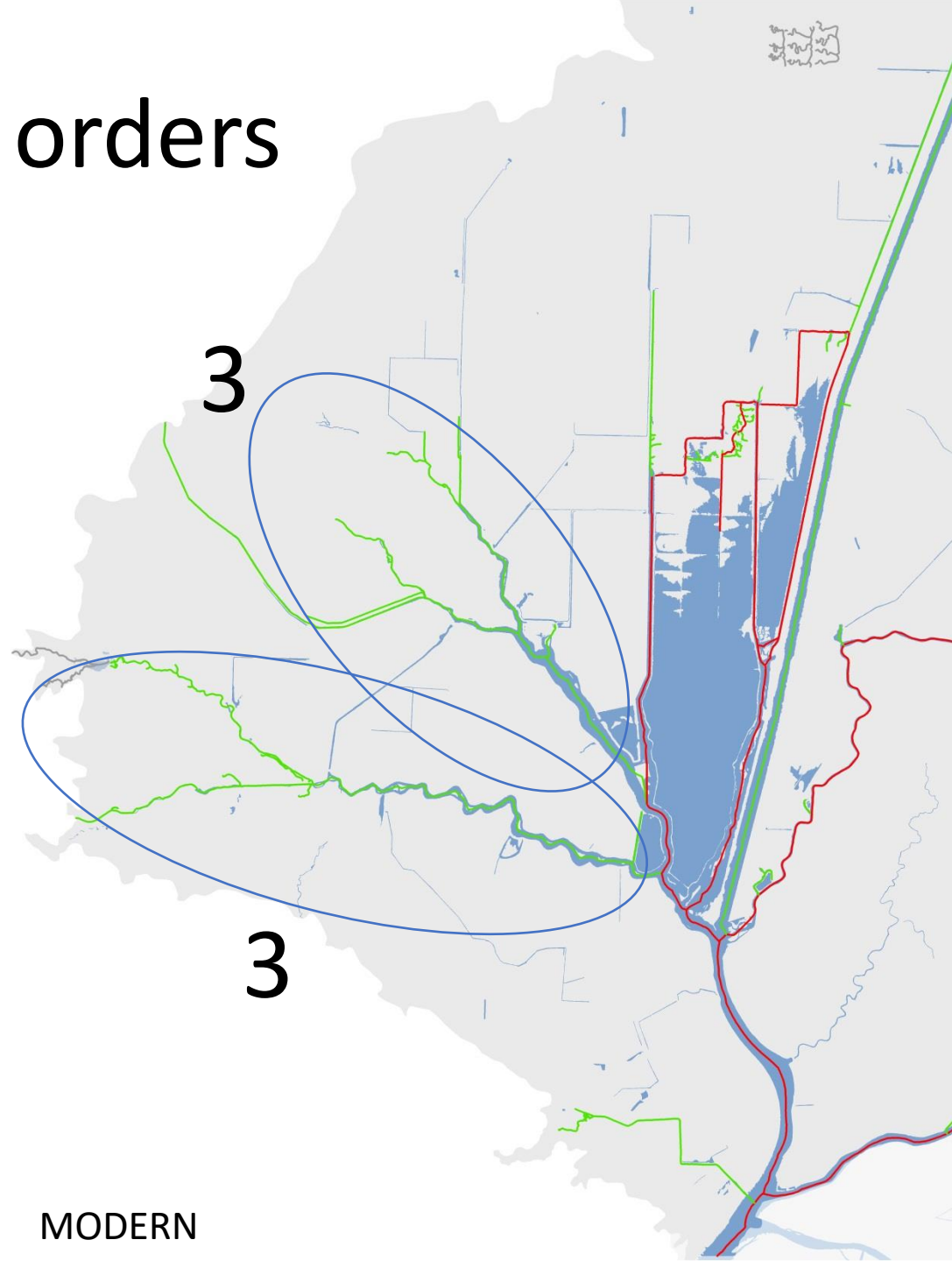
ca. 1800



channel orders



HISTORICAL



MODERN

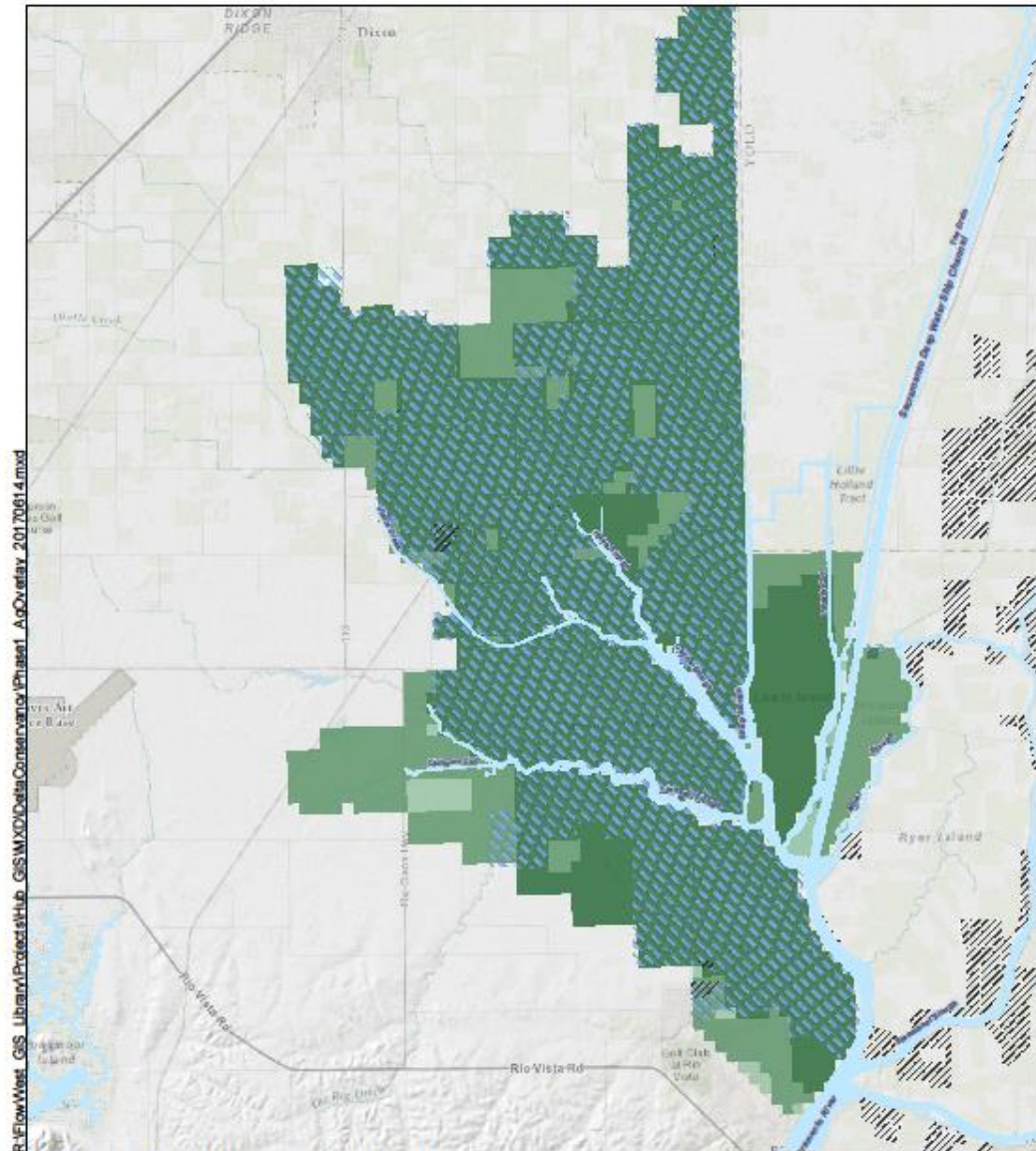
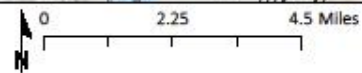


Figure Ag-1: Agricultural Overlay

- Irrigated Lands
- Permanent Crops

LESA Scores at 1000-ft Pixel Scale

- < 40 (Low)
- 40 - 65 (Moderate)
- 65 - 80 (High)
- > 80 (Very High)



Data Sources
 Irrigated Lands - Land IQ, FlowWest 2017
 Permanent Crops - Land IQ, FlowWest 2015
 LESAs - Solano County, NRCS, FlowWest 2017

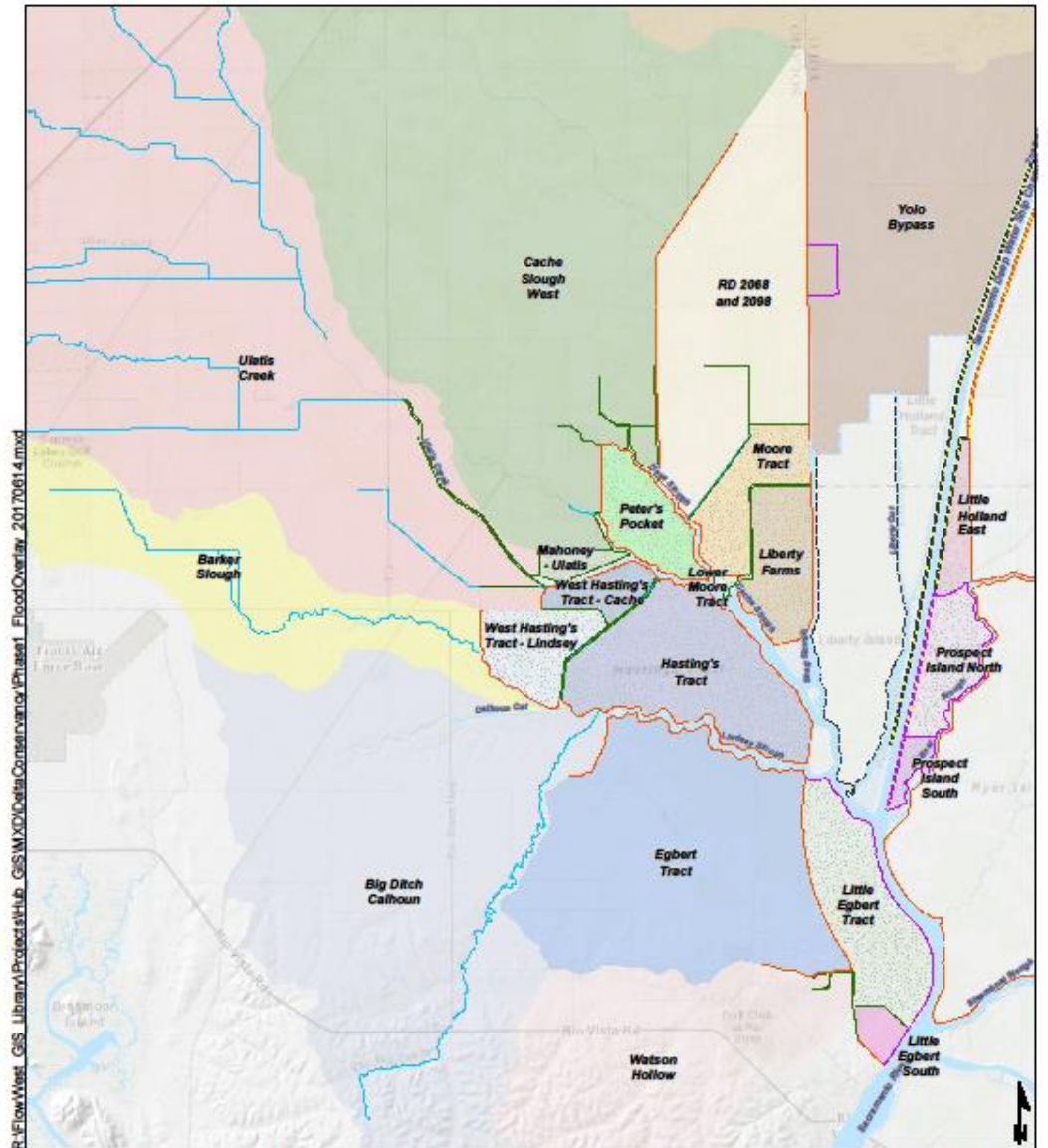
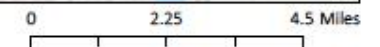


Figure FI-1: Flood Management Overlay

- Primary Waterbody
- Watersheds
- Project Levees**
- Significant Levee Remnant
- Federal Project
- Federal Project and Navigation

Non-Project Levees

- Non-Project
- Non-Project - Navigation
- Non-Project Restricted Height
- Non-Project Restricted Height - Navigation



Data Sources
 Watersheds - WWR 2013
 Levees - Stillwater, WWR 2013; FlowWest 2017

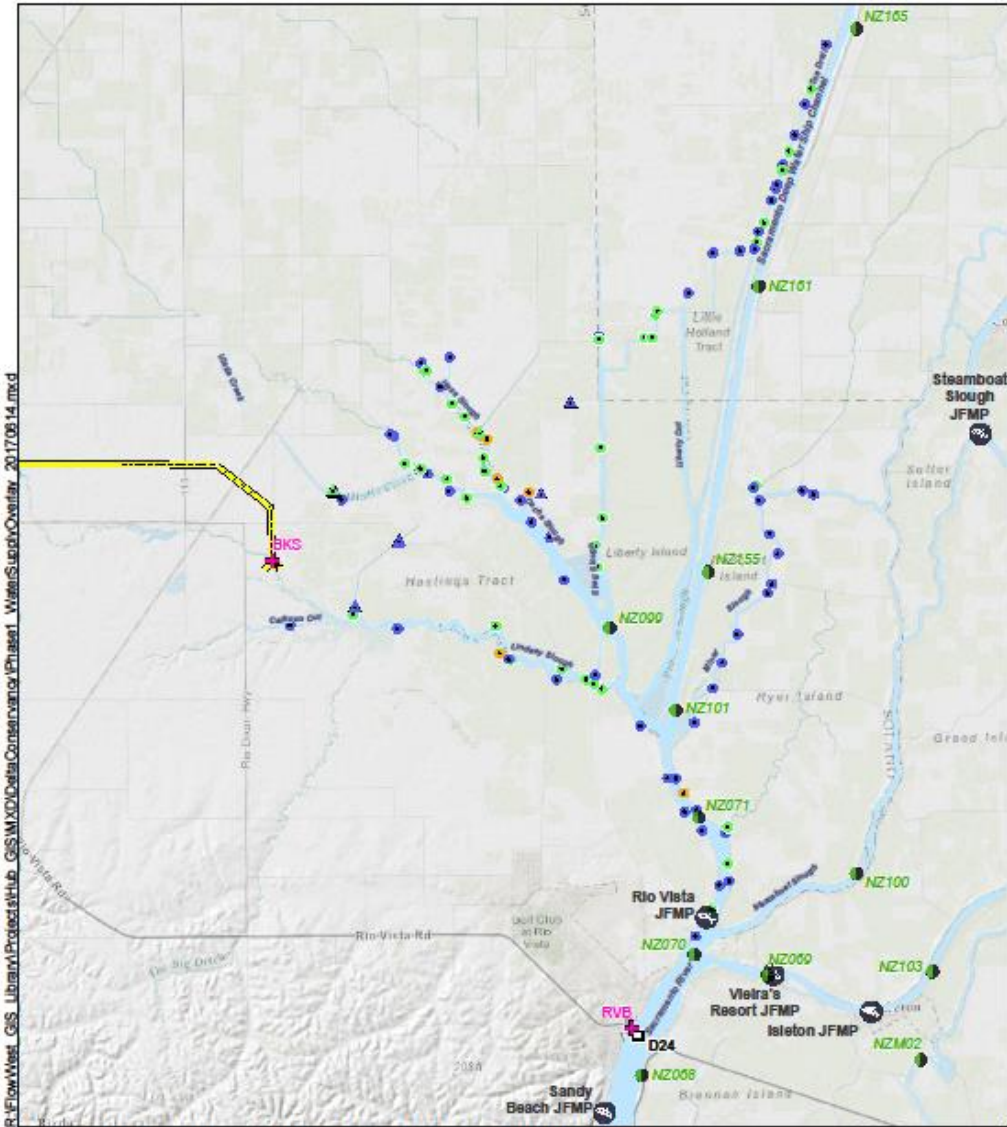


Figure WS-1: Water Supply and Water Quality Overlay

<ul style="list-style-type: none"> Historic Zooplankton Monitoring Juvenile Fish Monitoring (JFMP) CDEC Water Quality Historic EMP WQ Station 	<ul style="list-style-type: none"> Municipal/Industrial Intake Drain Intake Dual Interior Intake Interior Drain North Bay Aqueduct
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0 2.25 4.5 Miles

Data Sources
 Plankton Monitoring - CDWR IEP 2017
 JFMP Locations - USFWS 2017
 CDEC Locations - CDWR 2017
 EMP Discrete Water Quality - CDWR 2017
 North Bay Aqueduct - Stillwater, WWR 2013
 Intakes and Drains - Stillwater, WWR 2013; FlowWest 2017

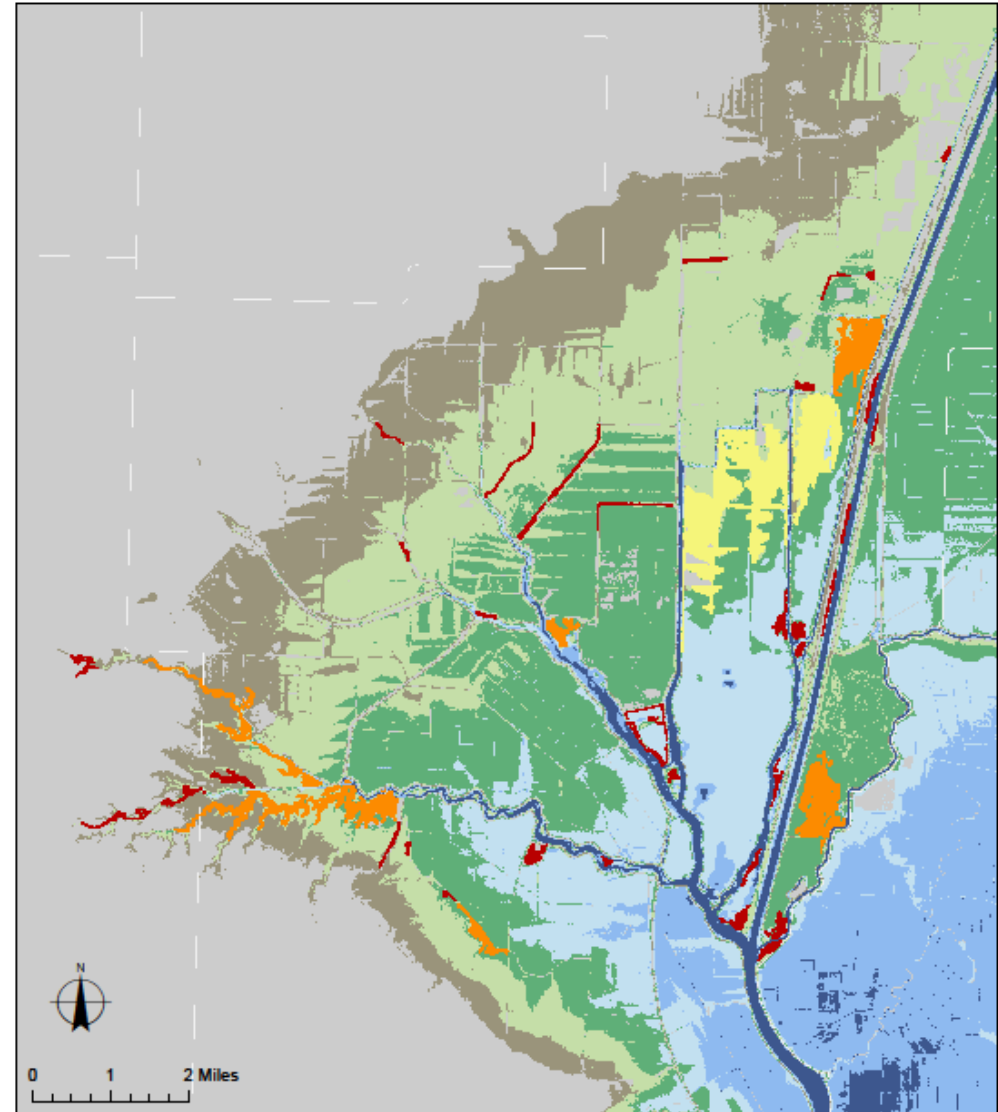


Figure Eco-1: Ecosystem Overlay

SF Bay and Delta DEM (continuous 10m topo-bathy)

- Deep subtidal elevation: >10 ft below MLLW (<-7.9 ft NAVD88)
- Mid subtidal elevation: 5-10 ft below MLLW (-2.9 to -7.9 ft NAVD88)
- Shallow subtidal elevation: 0-5 ft below MLLW (2.1 to -2.9 ft NAVD88)
- Intertidal elevation: MLLW to MHHW (2.1 to 6.4 ft NAVD88)
- SLR zone (Current upland; future intertidal): 0-5 ft above MHHW (6.4 to 11.4 ft NAVD88)
- Upland elevation: 5-10 ft above MHHW (11.4 to 16.4 ft NAVD88)

Marsh patch size class (ha)

- 0-10
- 10-100
- 100-1,000

Yolo Bypass/Cache Slough Partnership

- Partnership Formed in 2015
- 15 Agencies Include: USBR, USFWS, NMFS, USACE, CNRA, CDFW, DWR, CVFPB, State Water Boards, and LS/DN Region
- MOU Executed in May 2016

Steps to Successful Integration

Step 1

- Start with input from local organizations, landowners, and government entities

Step 2

- Empower local agencies with funding support

Step 3

- Conduct public outreach (the real kind, not “check the box”)

Step 4

- Develop an inclusive governance entity for planning and implementation

Step 5

- Compromise, then use adaptive management to build on success

Step 6

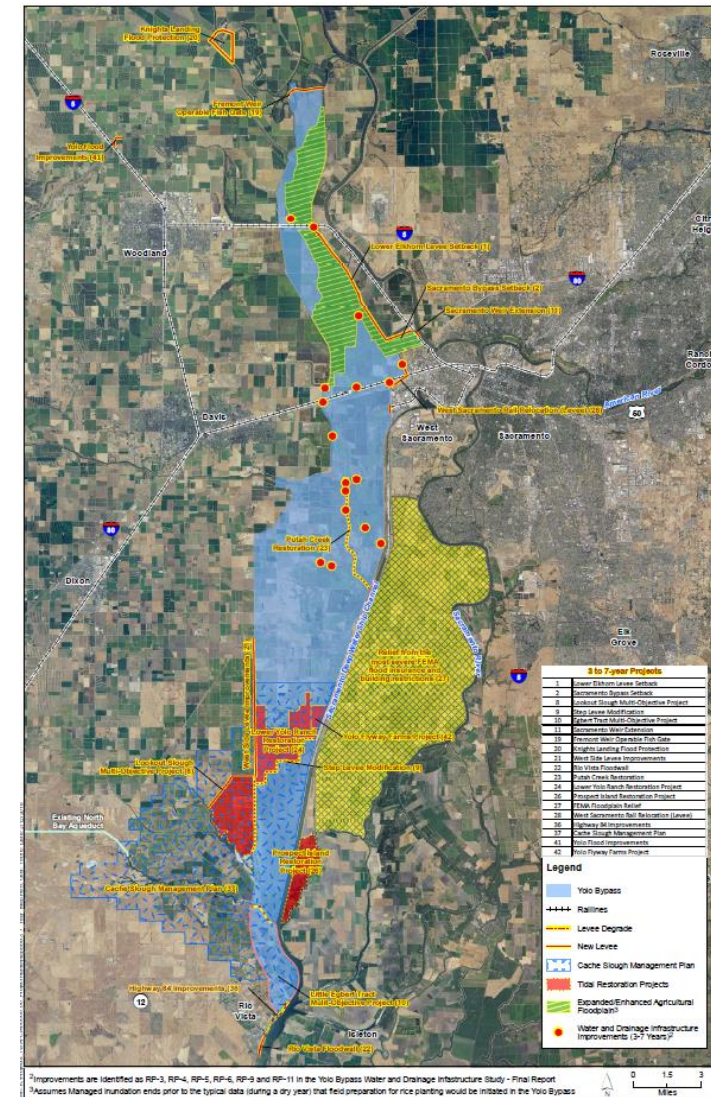
- Mitigate for impacts, including economic impacts

Step 7

- Provide net benefits to local entities (all boats must rise)

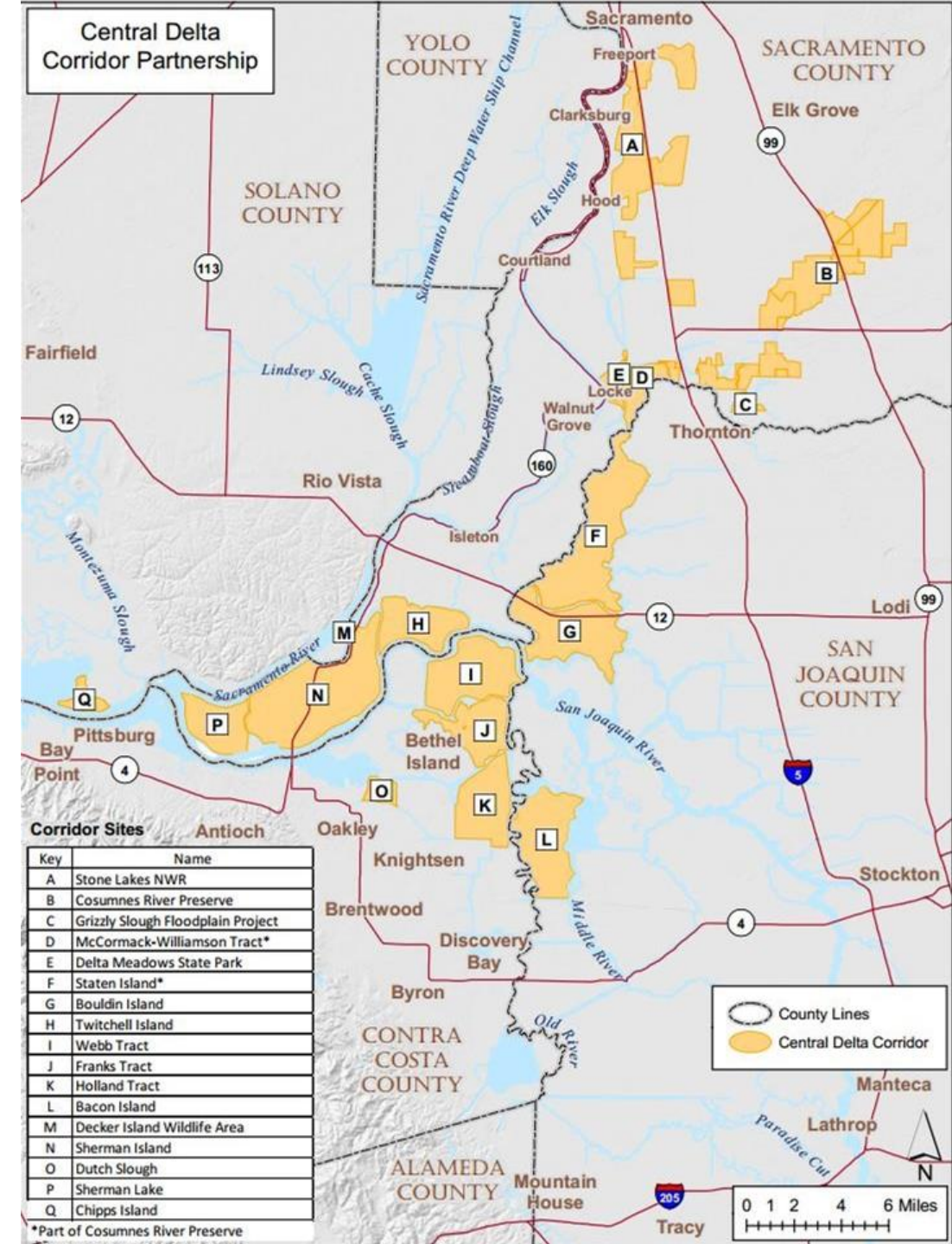
3 to 7 Year Projects

- Lower Elkhorn Levee Setback
- Sacramento Bypass Setback
- Lookout Slough Multi-Objective Project
- Step Levee Modification
- Egbert Tract Multi-Objective Project
- Sacramento Weir Extension
- Fremont Weir Operable Fish Gate
- Knights Landing Flood Protection
- West Side Levee Improvements
- Rio Vista Floodwall
- Putah Creek Restoration
- Lower Yolo Ranch Restoration Project
- Prospect Island Restoration Project
- FEMA Floodplain Relief
- West Sacramento Rail Relocation
- Highway 84 Improvements
- Cache Slough Management Plan
- Yolo Flood Improvements
- Yolo Flyway Farms Project



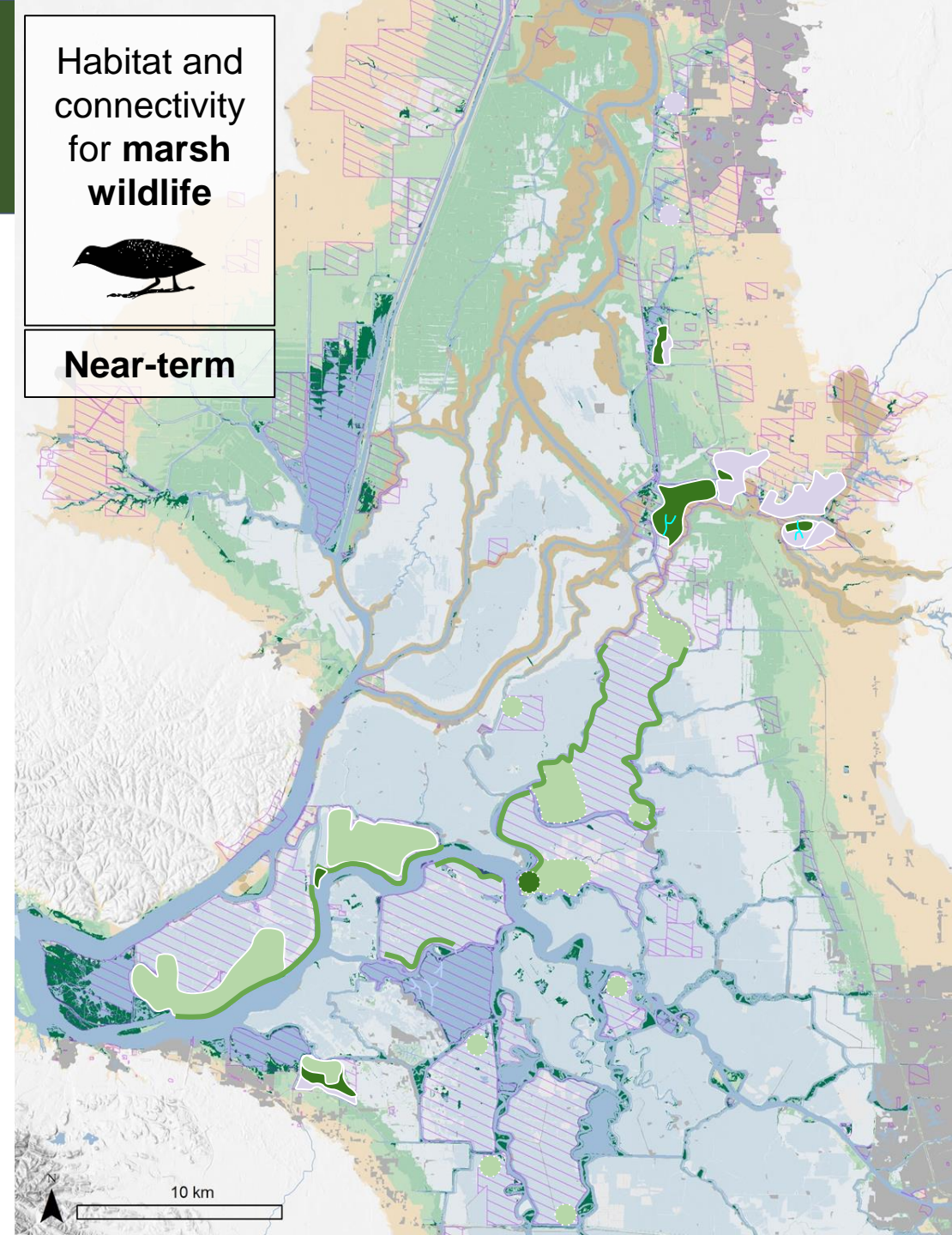
Central Delta Corridor Opportunity

- Significant ecological corridor with the majority of lands currently in public ownership
- Unique opportunity to more readily achieve ecological restoration objectives without taking lands out of private ownership
- Review concepts in relation to agricultural sustainability, flood protection, and other needs
- Integrate concepts into a corridor strategy



Developing example visions

1. What are key **ecological functions** we should try to support along Corridor?
1. What are generalized **guiding principles** for supporting these functions?
1. What can potentially be done on **public lands** (over near-term and over long term)?



What are key **ecological functions** we should try to support along Corridor?



Marsh wildlife

Provides habitat and connectivity for native marsh wildlife



Riparian wildlife

Provides habitat and connectivity for native riparian wildlife



Fish

Provides habitat and connectivity for native fish



Waterbirds


Provides habitat and connectivity for native waterbirds




Edge wildlife


Provides habitat and connectivity for native edge wildlife

Protected areas


 Protected areas (CPAD 2017 + CCED 2016)


Existing land cover

 Freshwater marsh

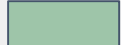
 Urban development


Elevation-based zones

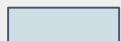
 Natural levees

 Supratidal zone

 Sea-level rise zone

 Intertidal zone

 Minimally subsided zone


 Deeply subsided zone

Near-term


Habitat and connectivity for native fish


Restore complex floodplains and flood basins


- *Expand floodplains along Mokelumne and Cosumnes*
- *Consider managing Stone Lakes as intermittently flooded basins*


 Restore large marshes at regular intervals along movement corridors


- *“Gap” in coverage between Twitchell and MWT*

 To allow for tidal marsh restoration in subsided areas, create managed wetlands for reverse subsidence/carbon farming

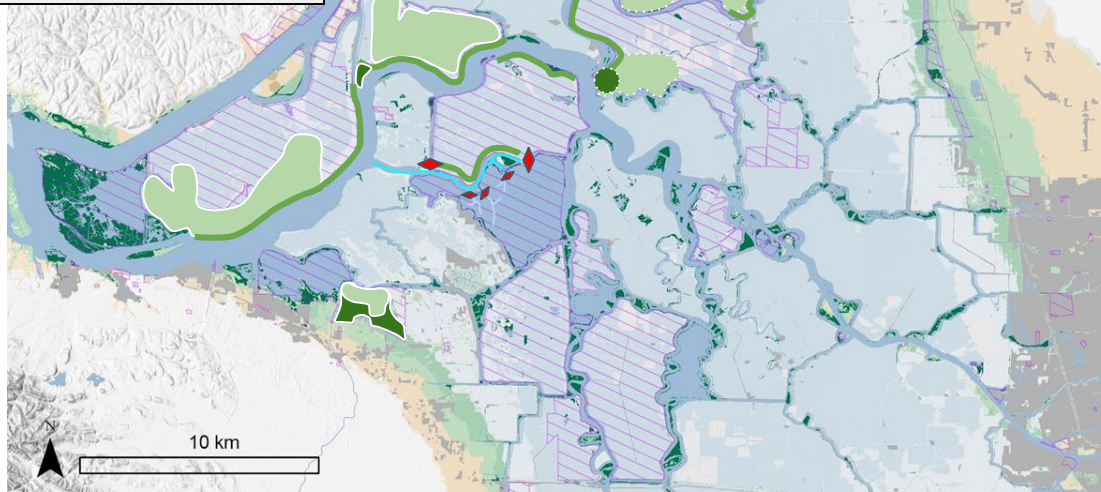
 Create more natural vegetated channel edges via levee modifications (e.g. planting benches)

 Evaluate potential to restore long blind/dendritic channels elsewhere through reconfiguration of channel cuts


 Restore continuous, hydrologically connected woody riparian habitats in appropriate locations

 Where process-based woody riparian restoration not feasible, consider more novel/engineered options (e.g., *vegetated benches on levees*)


NOTE: Draft consultant work product for discussion purposes only. Not endorsed by

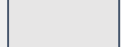


Protected areas


 Protected areas (CPAD 2017 + CCED 2016)


Existing land cover

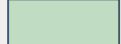
 Freshwater marsh

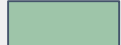
 Urban development


Elevation-based zones

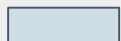
 Natural levees

 Supratidal zone

 Sea-level rise zone

 Intertidal zone

 Minimally subsided zone


 Deeply subsided zone

Long-term


Habitat and connectivity for native fish


Restore complex floodplains and flood basins


- *Expand floodplains along Mokelumne and Cosumnes*
- *Consider managing Stone Lakes as intermittently flooded basins*


 Restore large marshes at regular intervals along movement corridors


- *“Gap” in coverage between Twitchell and MWT*

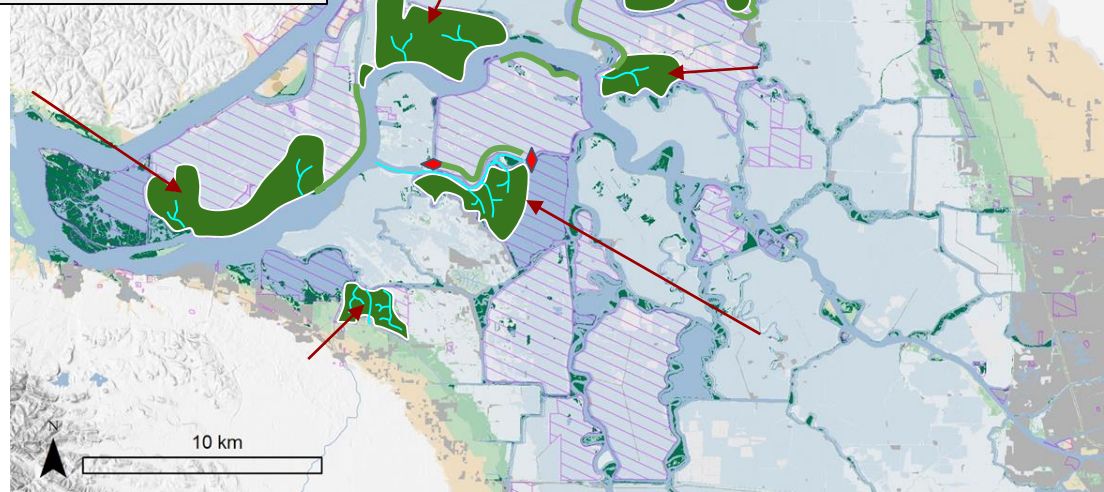
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High-Level Strategies – West and Central

- **Stop Subsidence**
 - Change crops (rice, alfalfa)
 - Managed wetlands
- **Landside Conservation**
 - Managed wetlands
 - Willow groves
 - Wildlife friendly agriculture
- **Recreation**
 - Access – fishing, boating, birding, windsurfing
 - Supporting services/development
- **Levee Stability**
 - Levee migration
- **Channel-side Conservation**
 - Setbacks/benches
 - Channel island protection
 - Margin enhancement
 - Sediment impoundment
- **Economic Viability**
 - Agriculture
 - Recreation
 - Carbon
 - Incentives

Take Homes

- Creating space and time for collaboration with representation of all interests
- Utilizing tools of the day
- Understanding fears – but never call them fears!
- Optimal isn't reality, so work within the confines
- Know that it is important and valuable no matter how challenging