Bay Delta Conservation Plan (BDCP): Restoration Goals and Assumptions for Tidal Wetland Linkages to Fish Productivity

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The Delta Then and Now

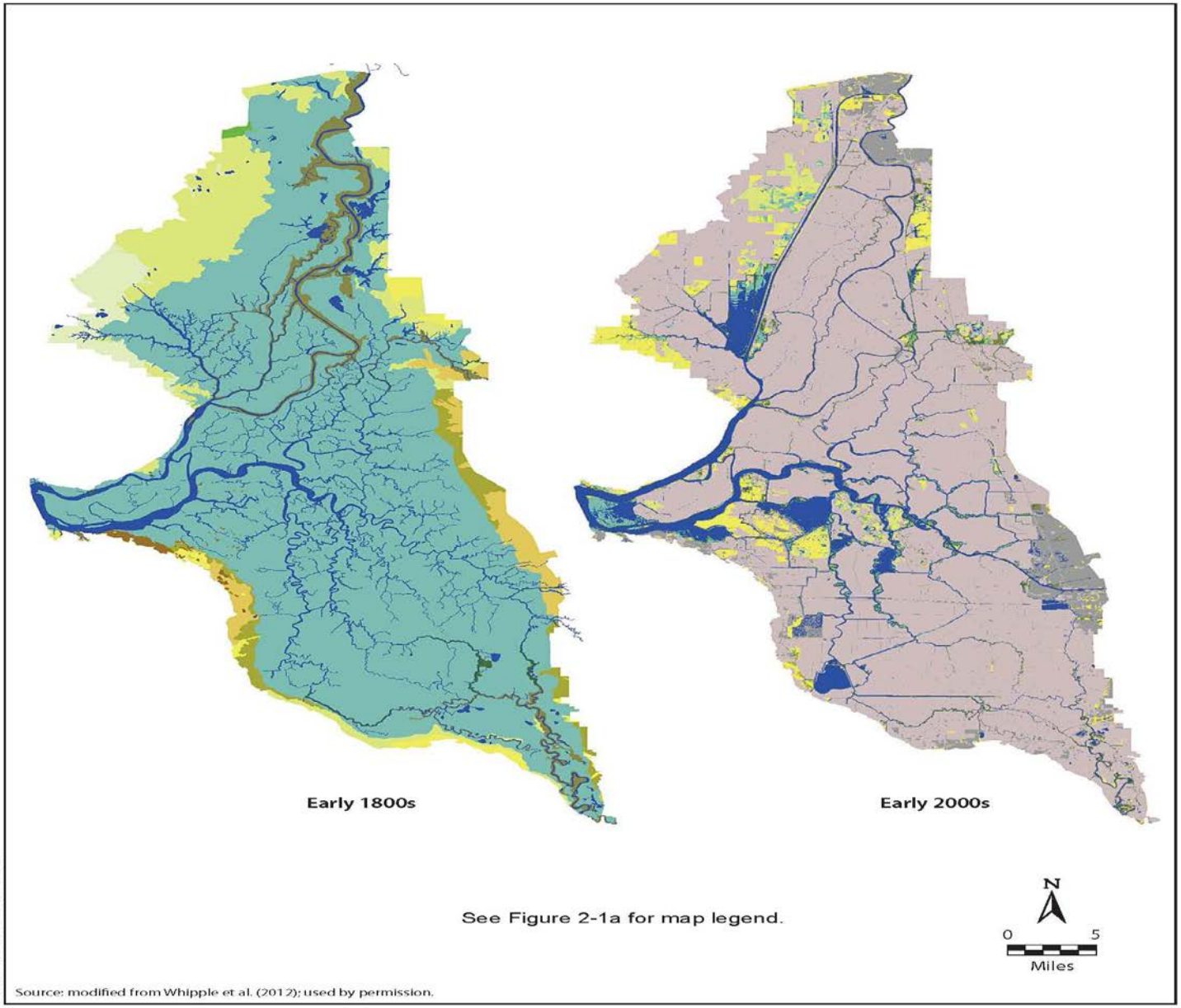


Figure 2-1b
Land Cover Change in the Delta between the Early 1800s and Early 2000s

Natural Communities Conservation Planning Act

- Focuses on conservation of natural communities as the vehicle for providing species Conservation: In this case “Restoration” or “Reconciliation” are the focus.
- For BDCP 14 aquatic and terrestrial Natural Communities have been identified within the planning area

Biological Goals and Objectives

- Landscape
  - Scale, connectivity, physical, biological and chemical processes
- Natural Community
  - Conserve communities within the plan area
- Species
  - Provide for the “conservation of “ within the Plan Area

Tidal Natural Communities

- Three are the focus of this presentation
  - Tidal Perennial Aquatic (includes mudflats)
  - Brackish Tidal Emergent
  - Freshwater Tidal Emergent

- All require active intervention to achieve Plan objectives.

Knowledge Base

- Historical Ecology (Whipple, et.al. 2012)
- Tidal Marsh Reviews (Brown 2003, Kratville and Clipperton, in prep.)
- BREACH 3
- Few Extant reference sites
- Ecosystem Restoration Workshop Panel Report, CALFED Science Program December 16, 2009
- Kneib R, Simenstad C, Nobriga M, Talley D. 2008. Tidal marsh conceptual model. Sacramento (CA): Delta Regional Ecosystem Restoration Implementation Plan

Perspective on large-scale restoration of tidal aquatic habitat

- Adds to overall delta habitat complexity.
- Likely to produce services (e.g., food, shelter…) for many species.
- Currently trophic linkages to the smelts are uncertain.
- Water and its correlates and affects on transport, productivity, turbidity and salinity gradient, still the strongest influence on smelt abundance.

Benefits provided by tidal marsh habitat

Productivity

In upper San Francisco estuary, tidal marshes have the highest phytoplankton concentrations and support the greatest zooplankton growth rate.

Fish Use

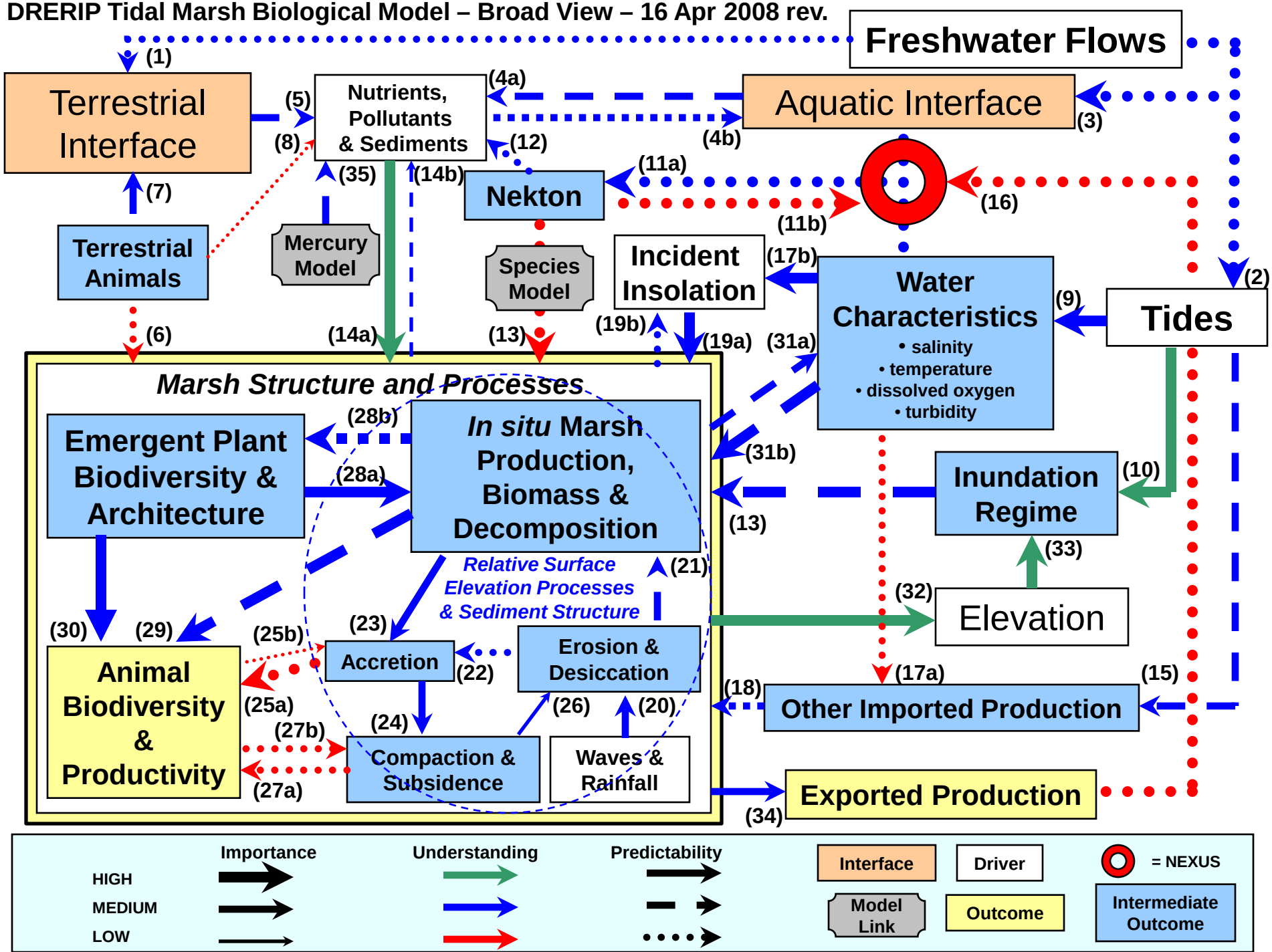
Foraging success and growth rate - In many estuaries, fish with access to tidal marsh habitats have been shown to consume much more food and grow much faster than those without access.

Refuge from predators - Large piscivorous fish are rare in tidal marshes and low order tidal channels compared to deeper water habitats.

Life history diversity - Tidal marsh restoration in the Salmon River estuary has recovered life history diversity in Chinook salmon.

Reviewed in: Clipperton, N.W. & D.W. Kratville. 2009. Assessing the potential benefits of tidal marsh restoration in the Delta and Suisun. Manuscript submitted for publication.

DRERIP Tidal Marsh Biological Model – Broad View – 16 Apr 2008 rev.



BDCP Goals and Objectives: expanding tidal natural communities in the Plan Area, hypothesized to:

- Increase and *improve* spawning and rearing habitat area for Delta and longfin smelt, and rearing habitat Chinook salmon, splittail, sturgeon, and possibly steelhead.,
- Increase the local production of food to meet life history requirements of covered species by exporting organic material via tidal flow between intertidal and open water habitats.

Goals and Objectives (con't)

- Provide linkage between current and future upstream restored habitat (floodplain), such as Yolo Bypass with Cache Slough, Western Delta and Suisun Marsh.

- Improve water quality

Goals and Objectives (con't)

- Provide tidal habitat for covered fish species (Delta and Longfin smelt rearing) within the future eastward position of the biologically important low-salinity zone of the estuary anticipated with sea level rise (West Delta).

Restoration of 65,000 acres

- Restored tidally influenced natural communities must include:
  - at least 3,000 acres of tidal brackish emergent wetland natural community,
  - 13,900 acres of tidal freshwater emergent wetland natural community,
  - 10,000 acres of tidal perennial aquatic natural community;
  - remaining 28,100 acres may consist of a combination of any of these three natural communities.
  - Areas to accommodate sea level rise

BDCP Planning Area and Restoration Opportunity Areas for Tidal Natural Habitats

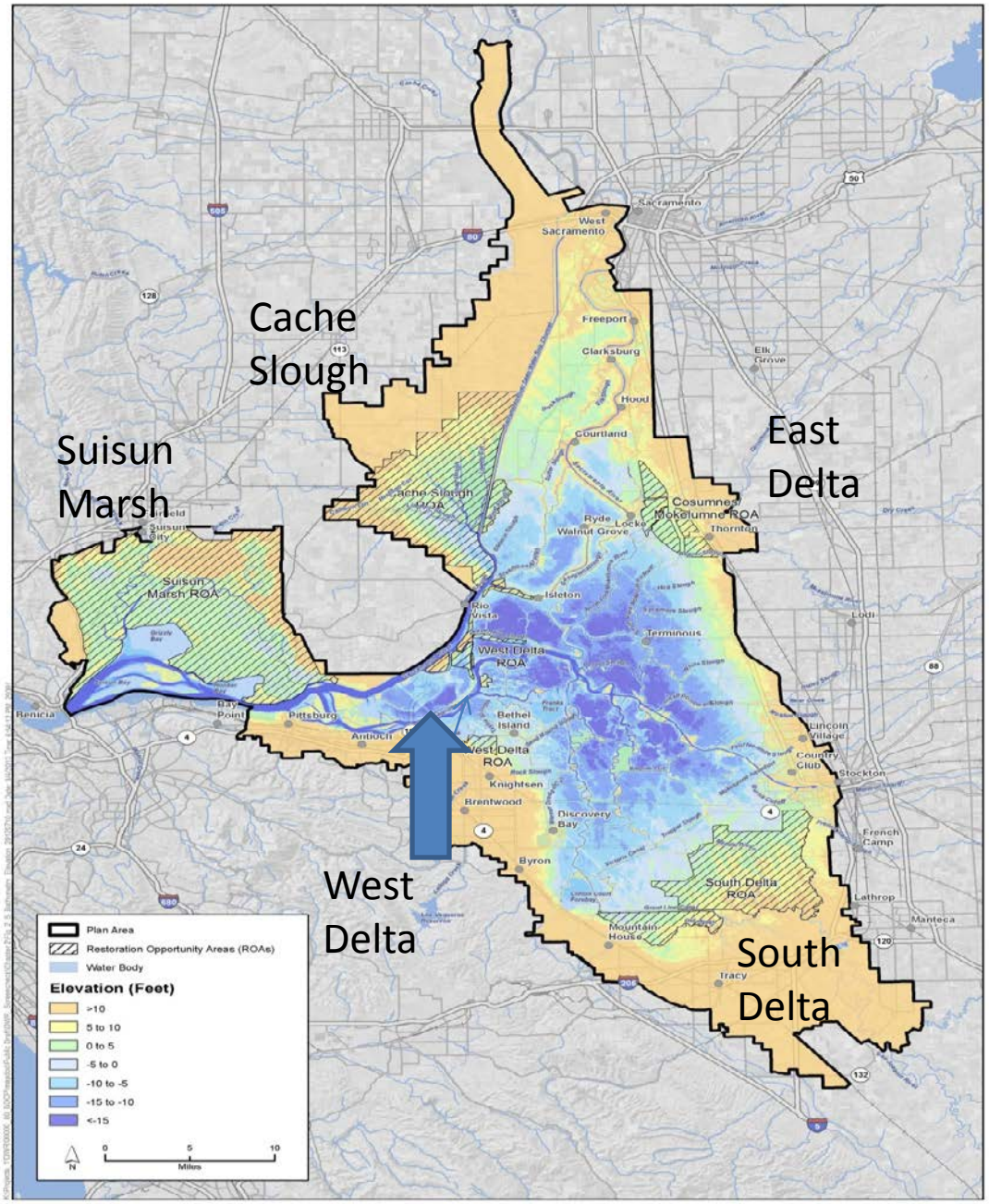


Figure 2-5
Bathymetry and Elevation Data

- While a portion of the 55,000 acres will consist of tidal perennial aquatic areas (subtidal), these areas are expected to be a byproduct of the tidal restoration and not the primary restoration goal.
- Restoration will be designed to maximize tidal emergent wetlands and minimize subtidal areas.
- **Should we be concerned about creating tidal perennial aquatic habitat if it functions appropriately?**

Tidal Perennial Aquatic

- 86,000 acres
- Shallow subtidal Mean Lower Low Water (MLLW) to -10 feet (3 meters)
- Deep subtidal, below -10 MLLW (3 meters)
- Includes Mudflats which are limited in fresher areas of the Delta due to ability of vegetation to invade

Brackish Tidal Emergent

- Suisun Marsh
- Reduced by 87% from historic levels

Freshwater Tidal Emergent

- Approximately 3 percent remains
- Best examples Sherman Lake and Cache Slough

Critical linkages

- Transitional uplands
- Fluvial connections, (multiple estuaries)
- Flow
- Bay’s, Major Channels, and Sloughs

Area of active process, sediment deposition- re-suspension, wind wave, action, higher turbidity, active tidal circulation

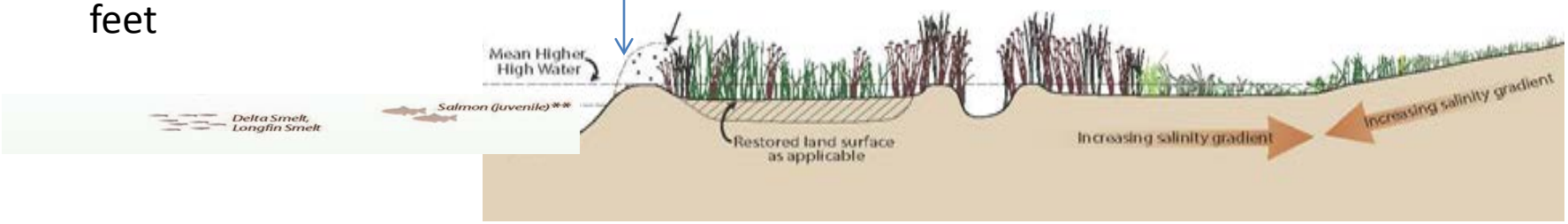
Primary production, carbon export, habitat for inverts and fish on high tides, residence time, refugia.

Tidal Perennial Aquatic MLLW to > -10 feet

Mudflat MLLW to @0.0 NAVD

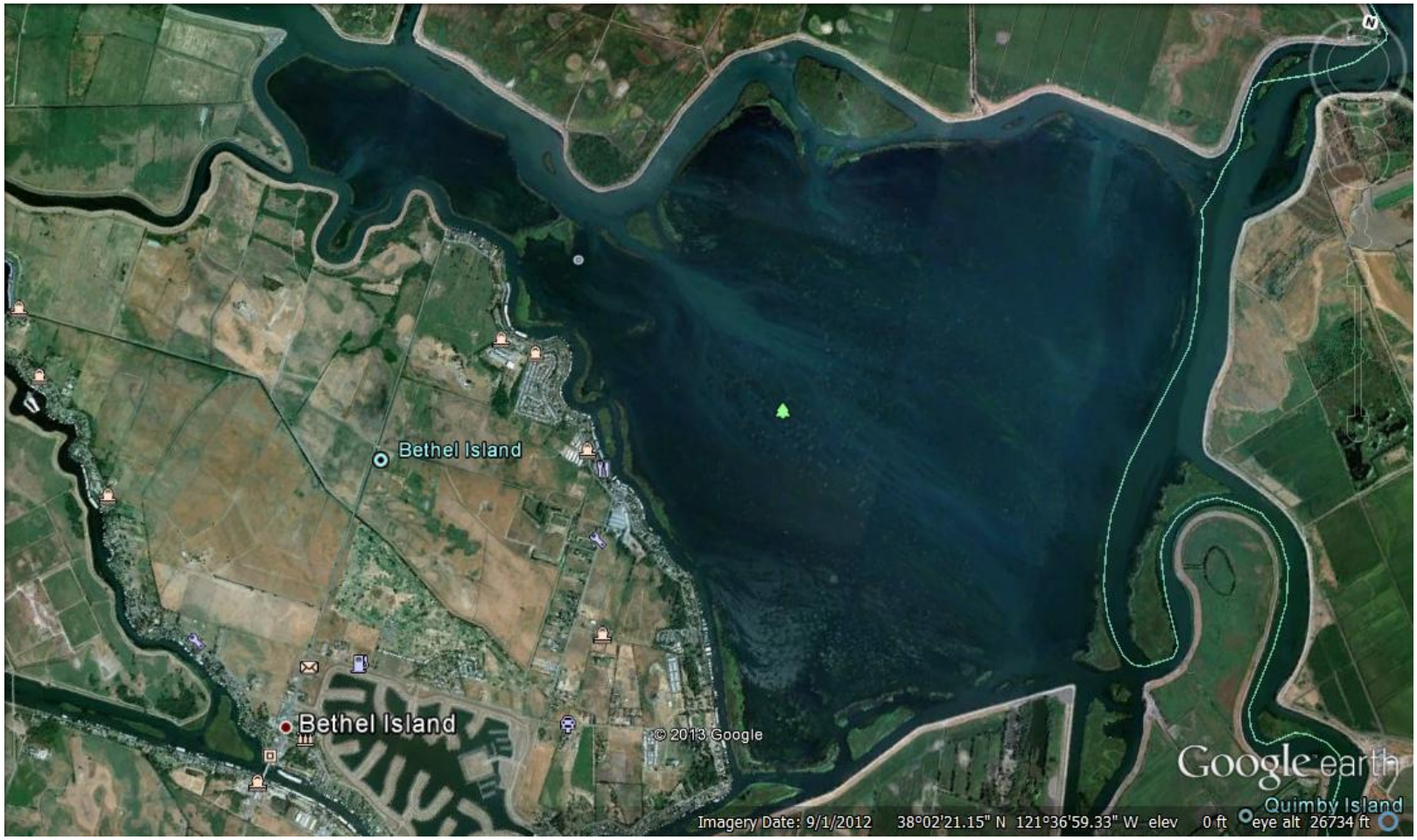
Tidal Marsh Plain @ 0.0 NAVD to Extreme High Water @+6.0 and subtidal channels.

Upland Transition > + 6.0



Proximity of Intertidal and Perennial Aquatic Habitat Key

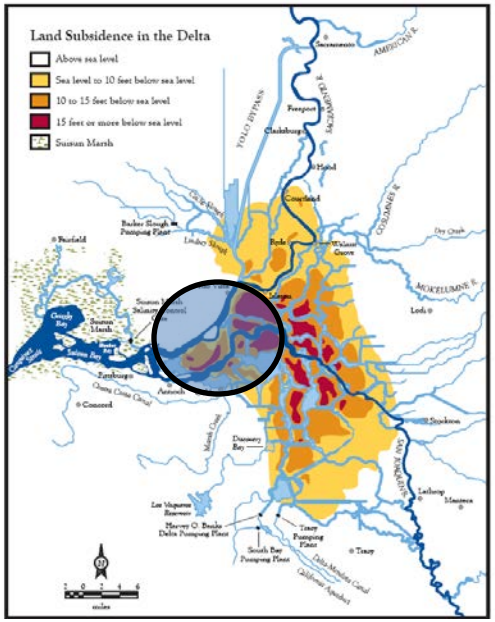
Undesirable Restoration



Desirable Restoration

What can BDCP do?

- Put the *delta smelt* habitat restoration where the *delta smelt* will be…



Nobriga and Herbold (2008), Bay-Delta Science Conference (pre-DRMS); embrace open-water in Sherman and Twitchell islands

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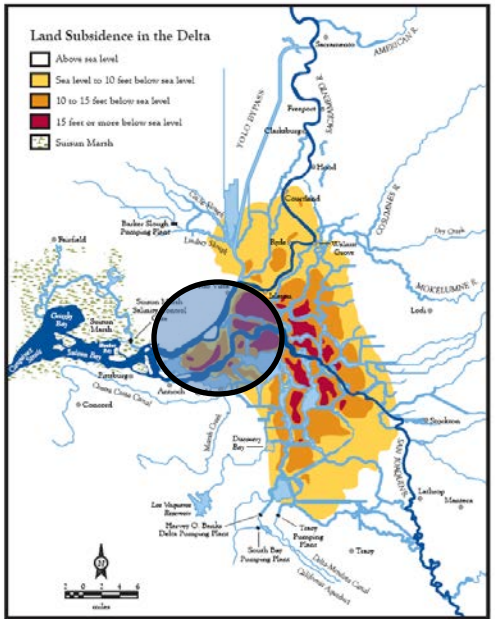

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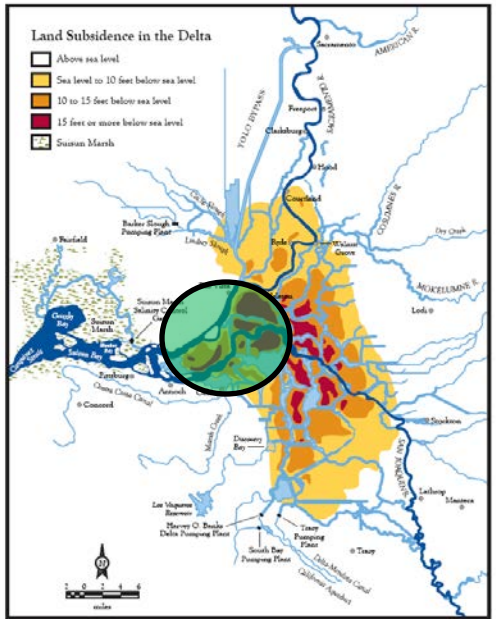

(2012) Put *fully connected tidal marsh* in Sherman and Twitchell islands?

Key Uncertainties

- How does tidal marsh restoration affect production of food suitable for covered fish species,
- Will restored tidal marsh natural communities generate sufficient productivity (zooplankton and insects) **to have** population-level benefits benefit covered fish species?
- Is there a scale dependence - e.g., a ratio between marsh surface area and open water surface area/volume?

Key Uncertainties (con't)

- Habitat use by native fish, particularly for rearing salmonids.
- How will tidal marsh restoration affecting the Low Salinity Zone? Particularly in Western Delta
- How will hydrodynamic changes associated with tidal restoration affected organic carbon export rates?
- How will nonnative species use restored tidal natural communities?

Key Uncertainties (con't)

- How will benthic invertebrate communities affect food production in and from restored tidelands?
- Effects on Predation + or -
- What is the benefit of restoration in the South Delta ROA?
- Should more emphasis be place on restoration in the Western Delta and Eastern Suisun?

Conceptual Design for Sherman Island Restoration Using Fill

NEXT STEPS

- Science Plan for addressing uncertainties related to intertidal habitat “establishment” and associated tidal perennial aquatic habitat.
- Restore some habitat of size and learn!