Parsons Slough Project

Elkhorn Slough
Tidal Wetland Project

Monterey Bay National Marine Sanctuary

December 10, 2009

Bryan Largay

Elkhorn Slough
National Estuarine
Research Reserve

Funding

- National Oceanic and Atmospheric Admin.
- David and Lucille Packard Foundation
- Resources Legacy Fund Foundation
- Environmental Protection Agency
- California Coastal Conservancy

ELKHORN SLOUGH
NATIONAL ESTUARINE RESEARCH RESERVE

NATIONAL
ESTUARINE
RESEARCH
RESERVE
SYSTEM

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH & GAME

Elkhorn Slough
Foundation

Estuaries are rare on the Pacific Coast

Elkhorn Slough is the only large estuary on the central California coast

Elkhorn Slough
An exceptional resource

750+ species of animals
50,000+ visitors each year
world class scientific research

Elkhorn Slough

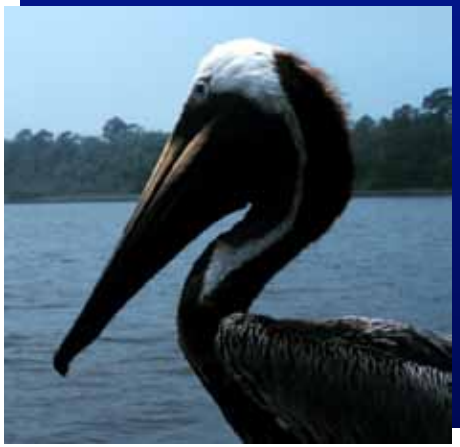
Aerial Photograph (color IR)

BRACKISH MARSH

SALT MARSH

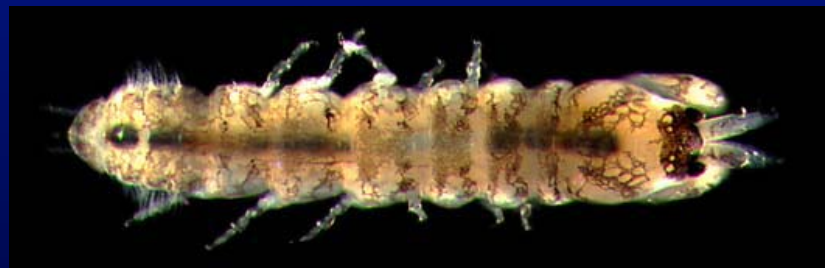
OPEN WATER

OPEN WATER



MUDFLATS

MUDFLAT COMMUNITIES



MUDFLAT COMMUNITIES

Problem Identification

Planning Process

MAJOR THREATS TO ELKHORN SLOUGH ECOSYSTEMS

--Hydrological alterations

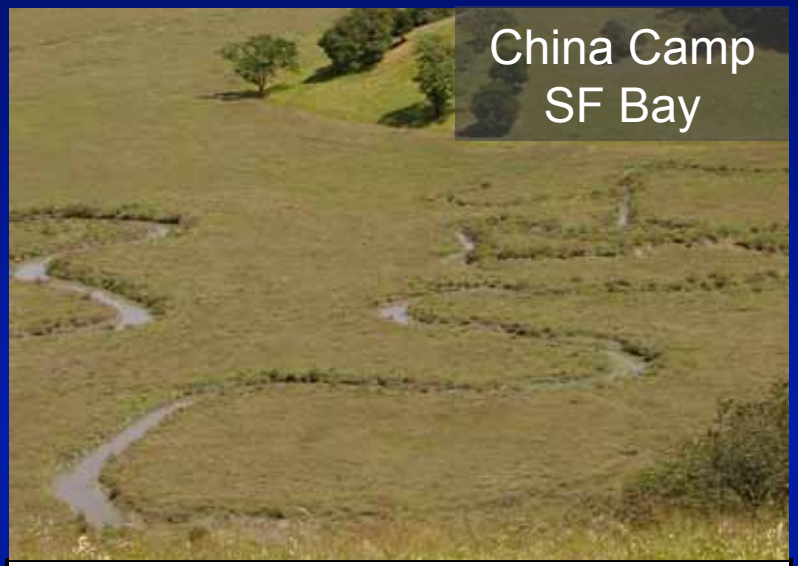
--Biological invasions

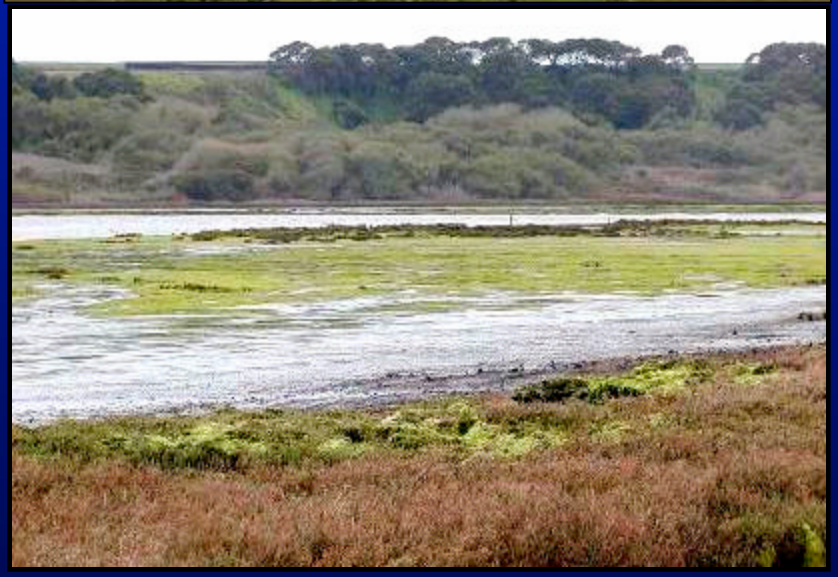
--Pollution

Elkhorn Slough is changing

Soft mud is scoured away

Marsh is dying back, Banks are eroding

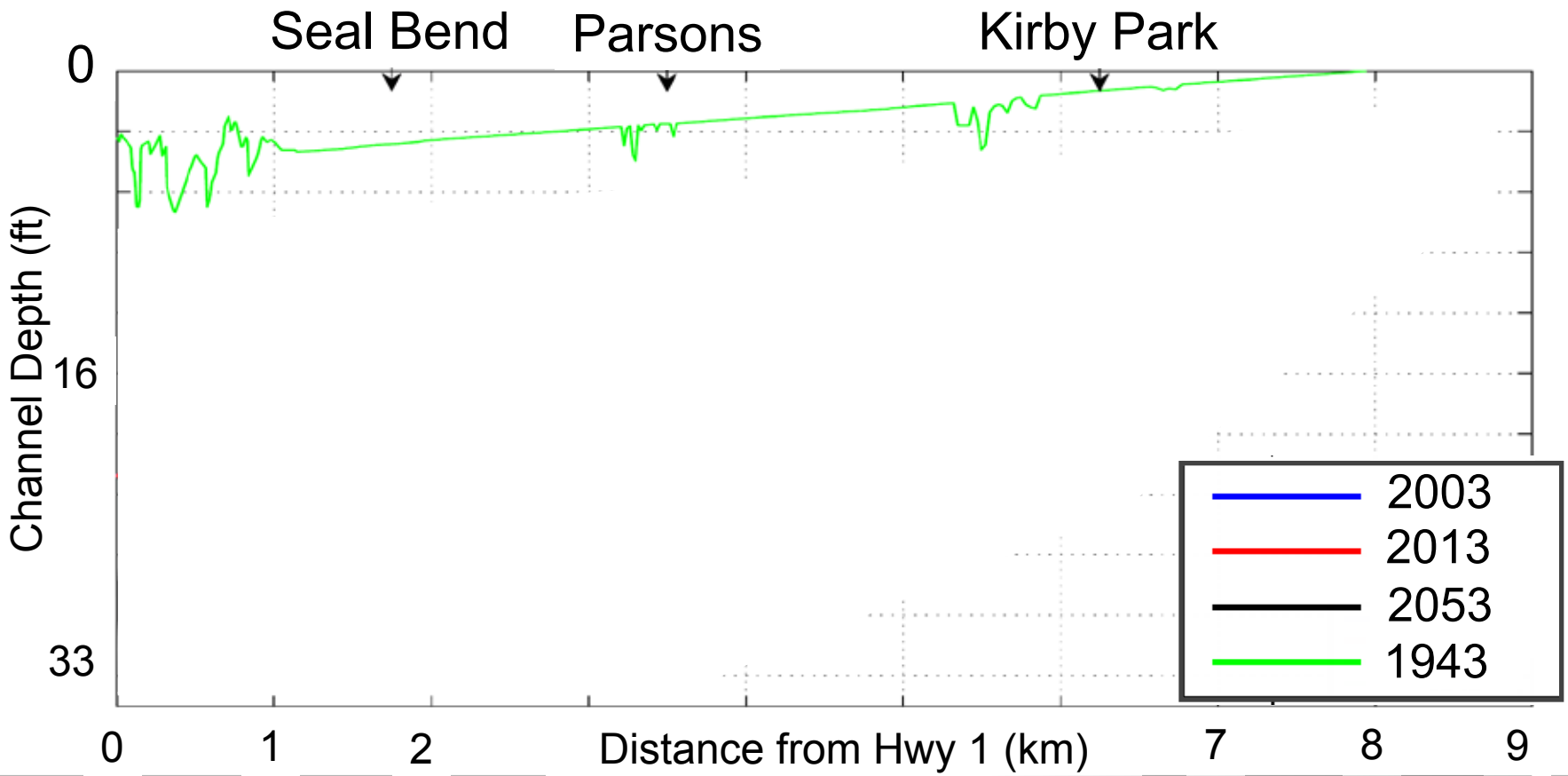




Marsh Loss

200 acres of marsh have died back
prediction: 550 acres more within 50 years

Erosion of soft mud: History and Predictions



Tidal scour: No Action

Figure 5–11
Elkhorn Slough Tidal Wetlands Restoration

Alt. 1 (No Action) Projected Thalweg Depths – Year 0, Year 10, and Year 50

PWA Ref# 1869

PWA

Strategic Planning Team

Role:
Primary decision-making body

STATE-FEDERAL PARTNERSHIP
- Elkhorn Slough National Estuarine Research Reserve (lead)

FEDERAL
- Monterey Bay National Marine Sanctuary
- National Marine Protected Areas
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

STATE
- CA Coastal Commission
- CA Coastal Conservancy
- CA Department of Fish and Game
- Regional Water Quality Control Board

LOCAL
- Monterey County
- Moss Landing Harbor District

NONPROFIT, ACADEMIC, CORPORTATE
- Moss Landing Marine Laboratories
- CA State University Monterey Bay
- Elkhorn Slough Foundation
- San Francisco Estuary Institute
- The Nature Conservancy
- The Ocean Conservancy
- University of San Francisco
- Union Pacific Railroad

Technical Guidance: Science Panel

Role
- Provide and review scientific information for the Strategic Planning Team

Who
- Biologists, hydrologists, geologists, marine chemists

Over 80 members

U.S. Geological Survey
Stanford University
Moss Landing Marine Laboratories
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
University of California Santa Cruz
University of California Davis

Monterey Bay Aquarium Research Institute
California State University Monterey Bay
Monterey Bay National Marine Sanctuary
Point Reyes Bird Observatory
ES National Estuarine Research Reserve
San Francisco State University
California Department of Fish and Game

Causes:
Salt Marsh Dieback and Tidal Scour

Root causes of change: Moss Landing Harbor 1947

Root causes of change:
Parsons Slough - diking, draining and breaching

After subsidence the land has dropped 3 to 5 feet
- Parsons Slough is 15% of the land of Elkhorn Slough
- When opened Elkhorn Slough tidal exchange increased 50%

Management Recommendation

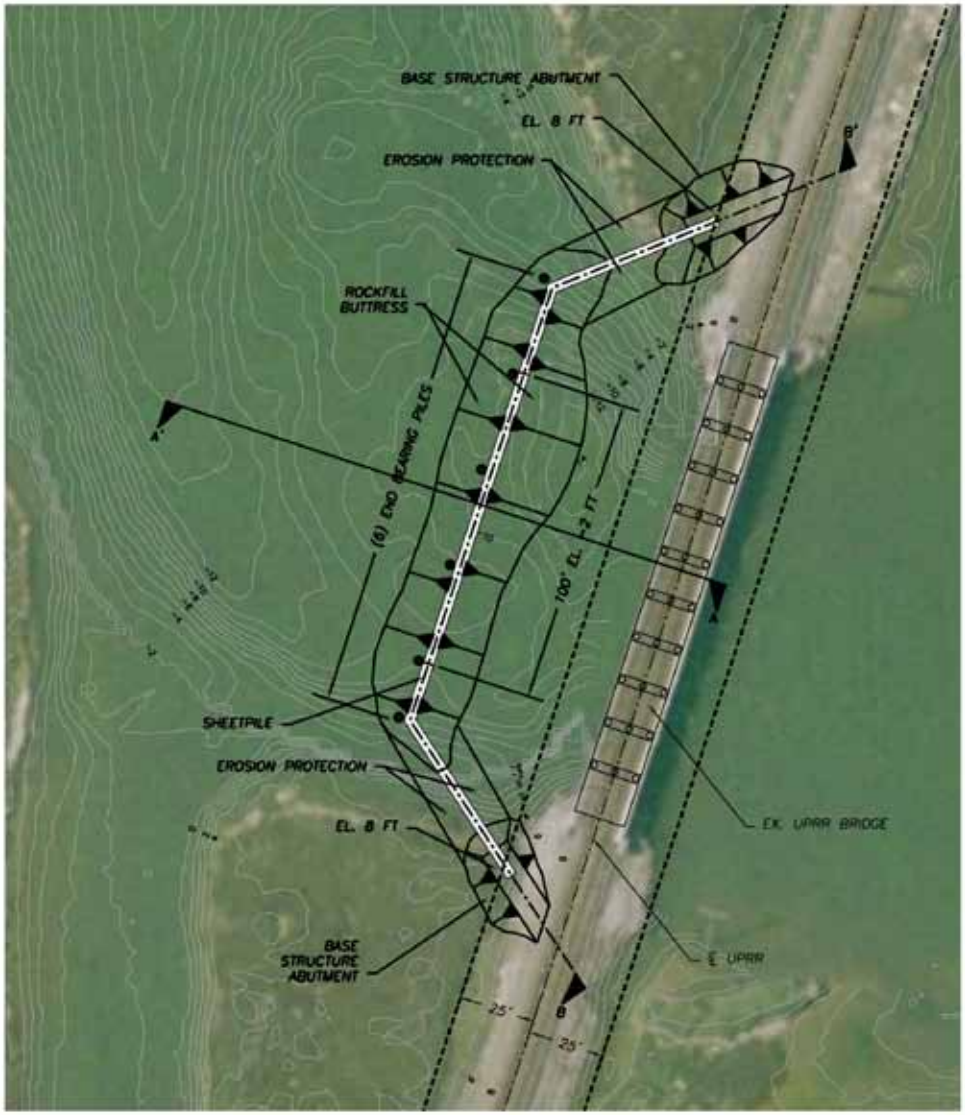
and

Structure Design

Elkhorn Slough

Project Location

Project site



PLAN

50' 0 50' 100'

SCALE: 1"= 50'

Plan View of the Structure

Sheet Piles and Round Piles

Rock buttressing at base

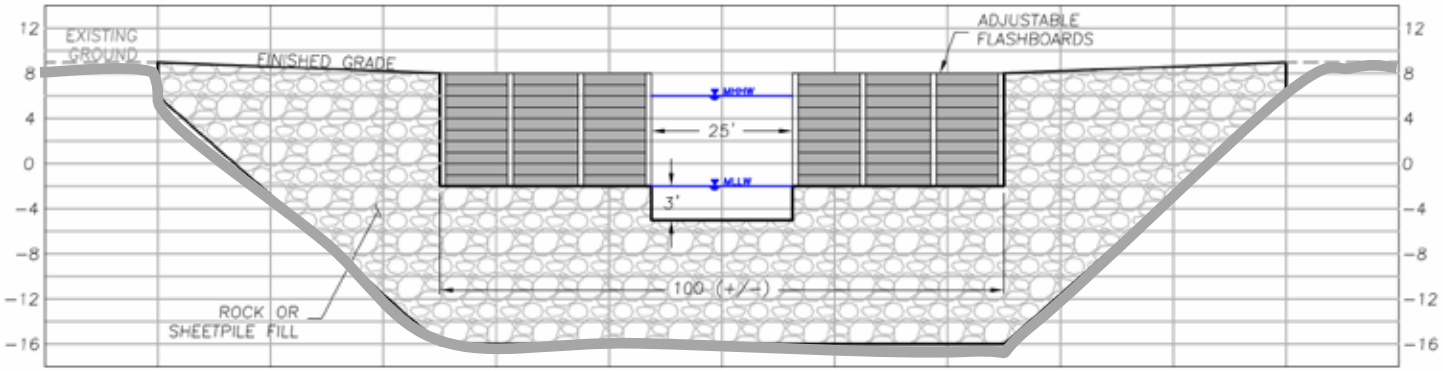
DUCKS UNLIMITED INC.
WESTERN REGIONAL OFFICE

URS

Project No. 26817594

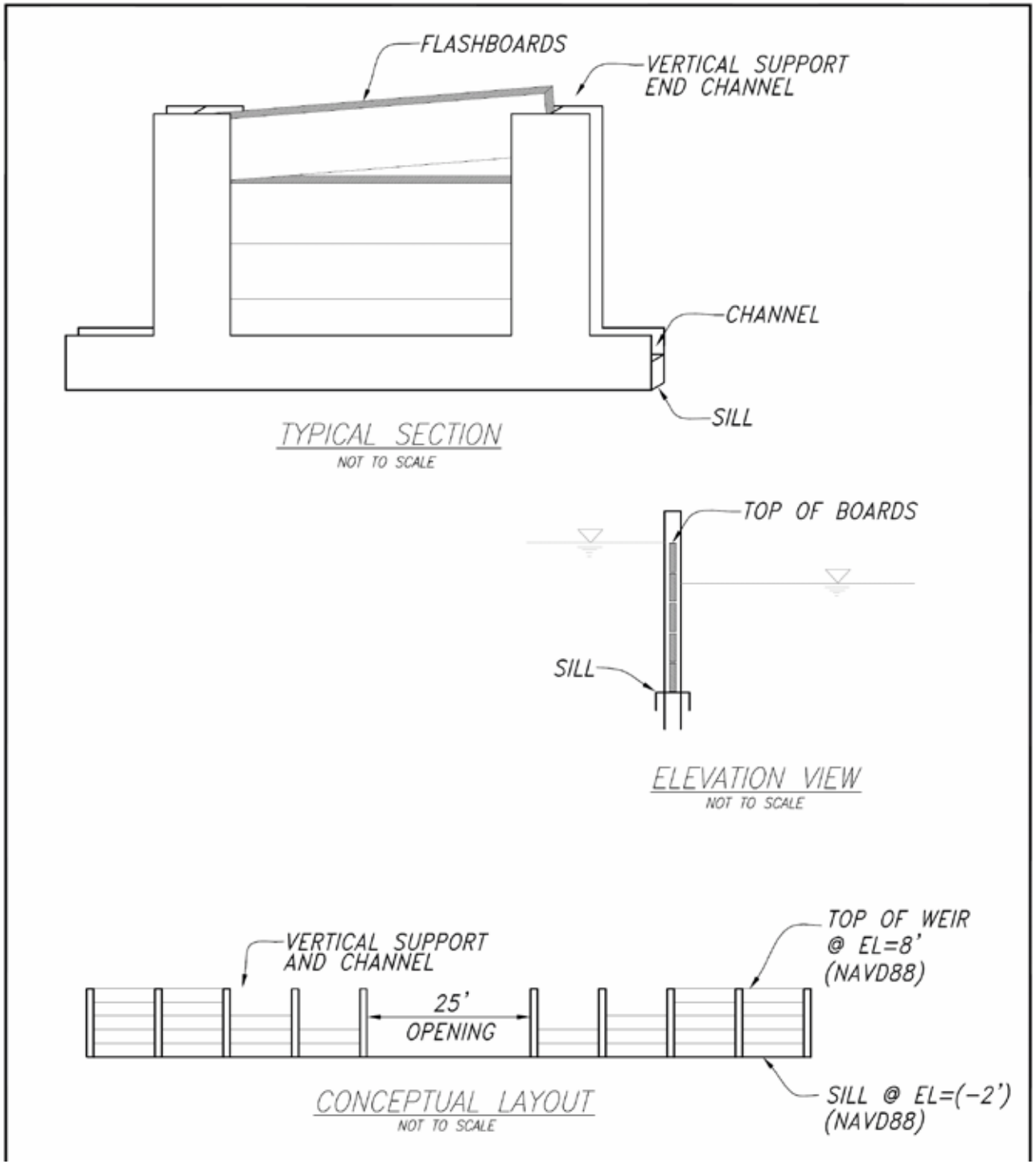
PARSONS SLOUGH SILL PROJECT

Conceptual Layout: Tidal Barrier



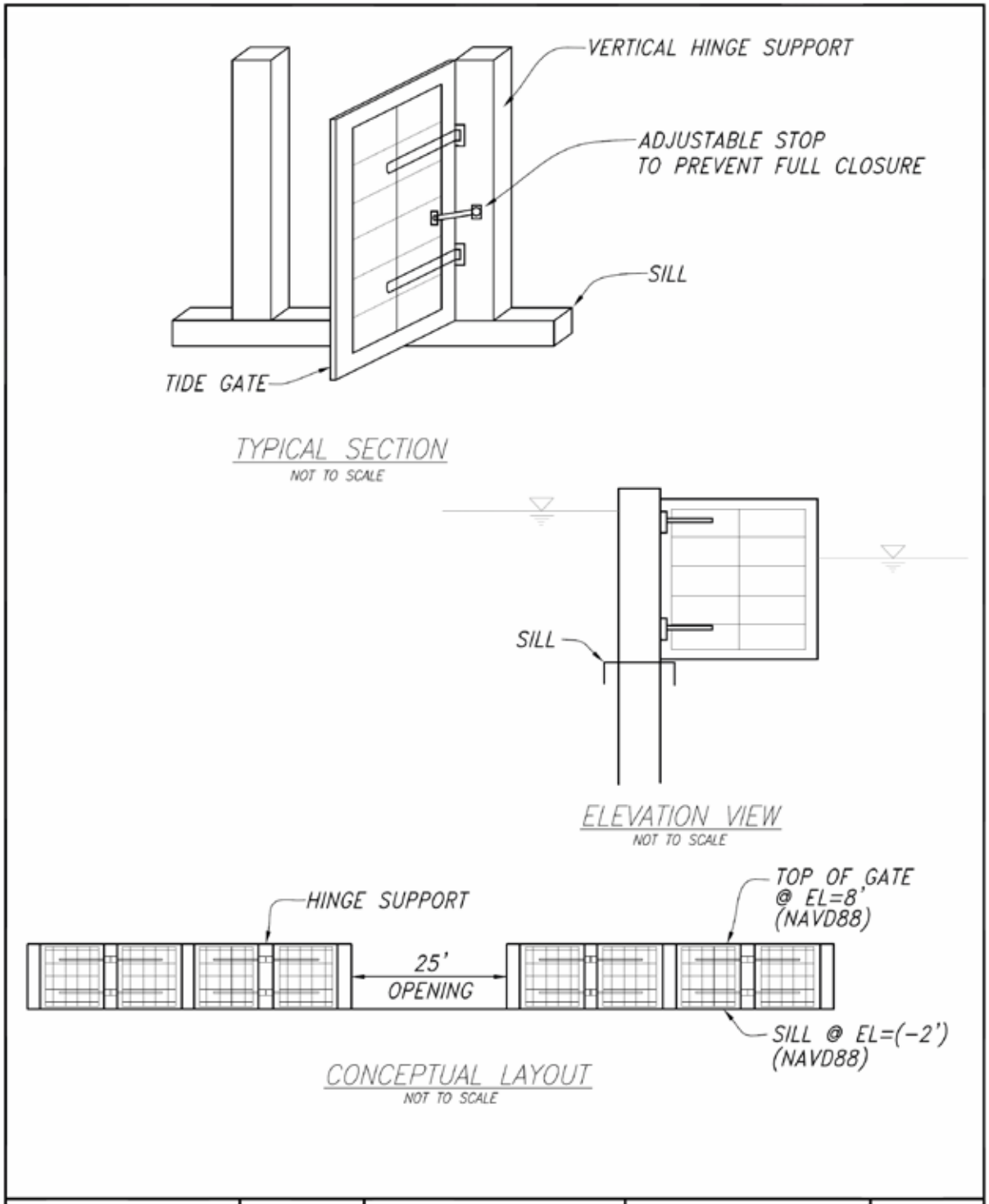
TYPICAL SECTION

DATUM = NAVD 88		PARSONS SLOUGH ADJUSTABLE SILL		DRAFT NOT FOR CONSTRUCTION	DATE: 5/10/09



Conceptual Layout

Flashboards



Conceptual Layout

Vertical Hinge Gates

Recovery Act Grant award
NOAA Restoration Center (June 30, 2009)

- Design, Permit, Build Parsons Slough Sill
- Implement Adaptive Management Process
- Integrate the community and stakeholders into the process

- Construction timeline: 12 months
- 24 month intensive monitoring period

Regulatory Compliance Process

Environmental Impact Report (EIR)

- Public Scoping Meeting in early February
- Public review draft in early April
- 30-day Comment period

Regulatory Review

- Army Corps of Engineers
- US Fish and Wildlife Service
- Department of Fish and Game
- Monterey County
- Coastal Commission
- Moss Landing Harbor District
- Mosquito Abatement District

Existing Conditions

Existing habitat at mid-tide

Effects of the Project

Direct effects of the structure

Construction

- Noise, machinery
- Staging area disturbance

Direct effects

- Physical barrier – partially adjustable
- Velocity barrier – partially adjustable
- Footprint: Hard substrate – not adjustable

Adaptive Management Approach

Minimizing Unintended Consequences

Indirect effects of the structure

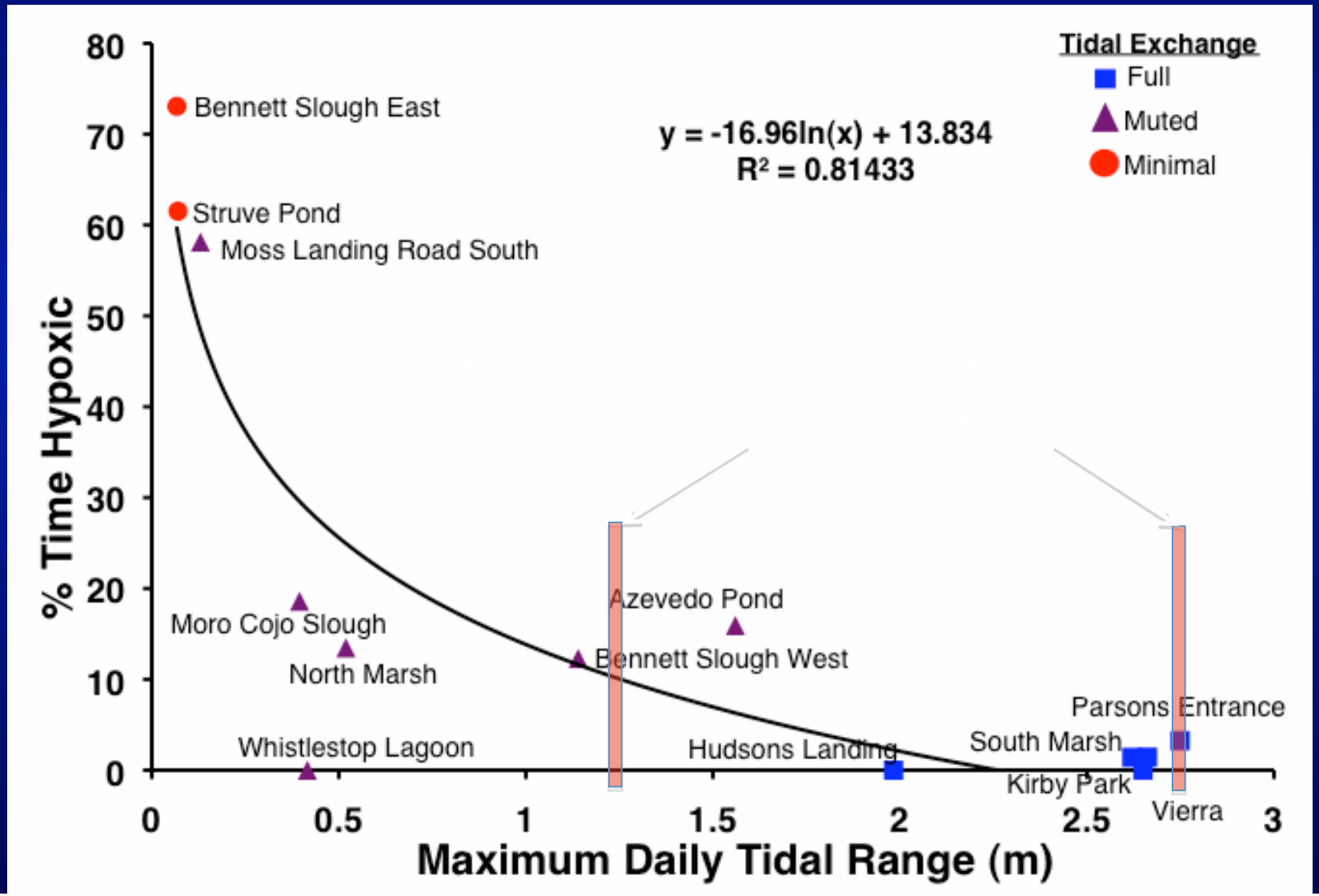
Indirect Effects: Habitat changes

- Shift mudflat to open water – adjustable
- Shift mudflat to salt marsh – adjustable

Indirect Effects: Water quality

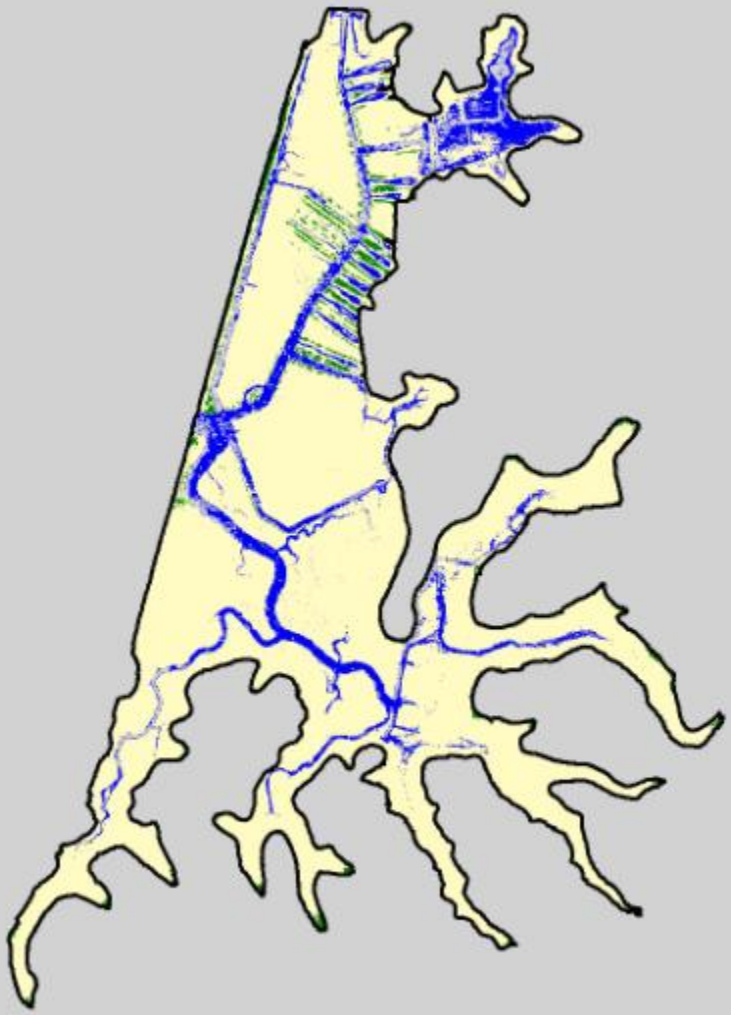
- Increased residence time – adjustable
- Shallower, less oxygen available – partially adjustable

Water quality:
Operating range of the structure

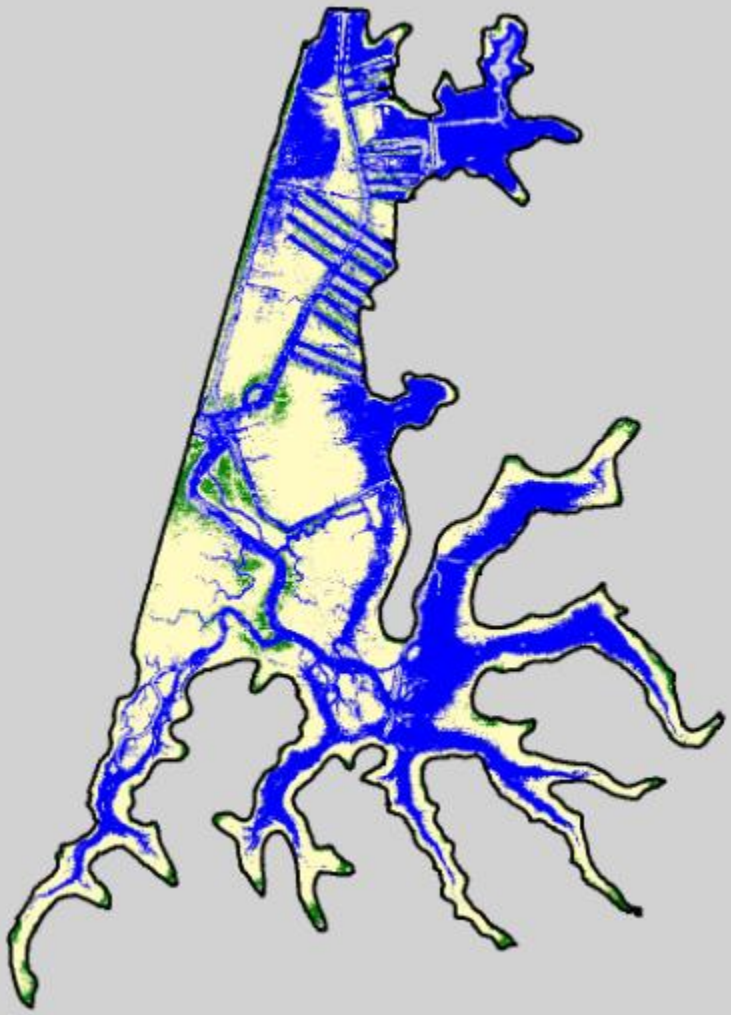


Changes to Habitats

Existing conditions

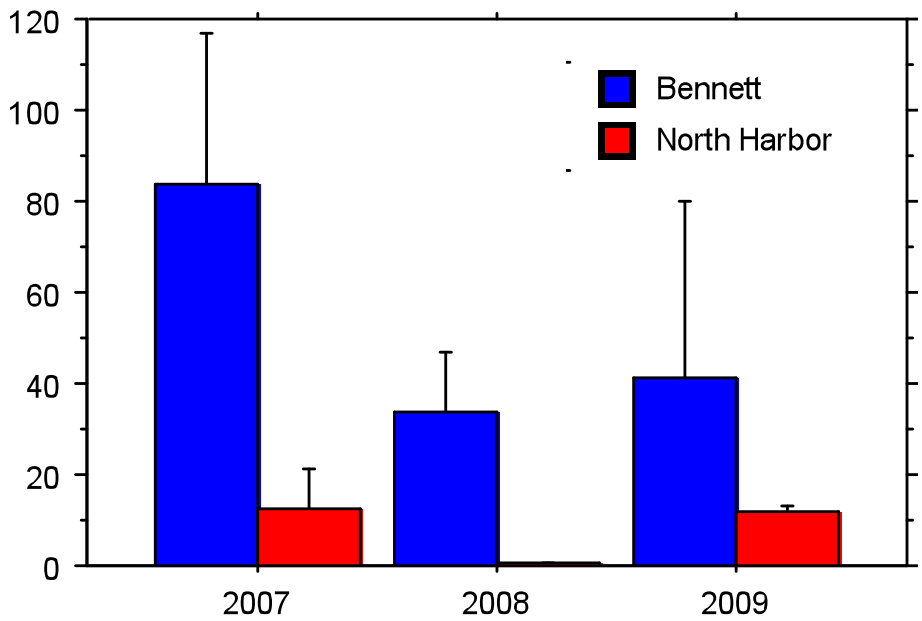


Fully restricted structure

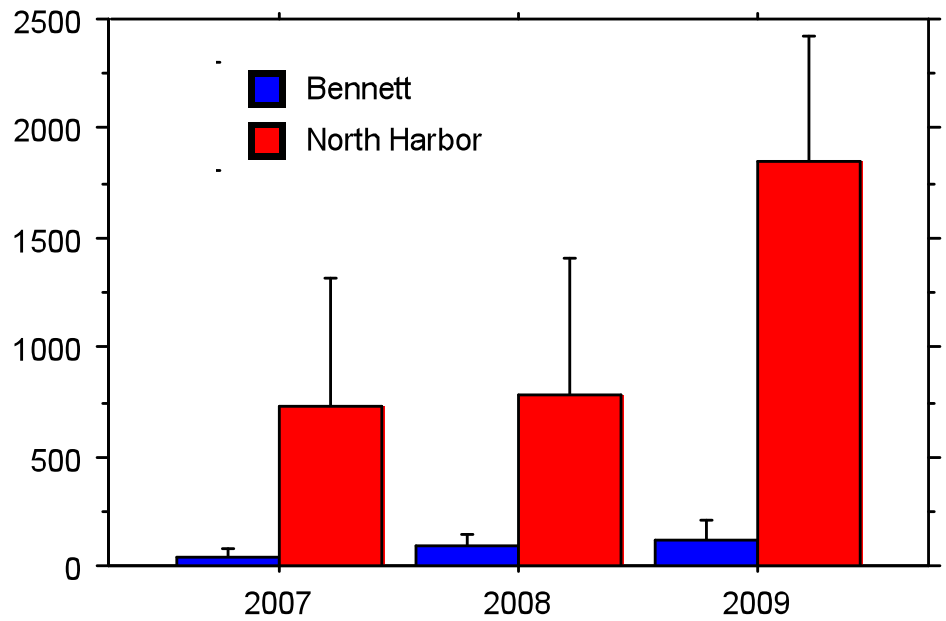


WATERBIRDS at Muted and fully tidal sites

Waterfowl are more common in muted
Shorebirds in full tidal exchange



Waterfowl abundance



Shorebird abundance

Elkhorn Slough Tidal Wetland Project

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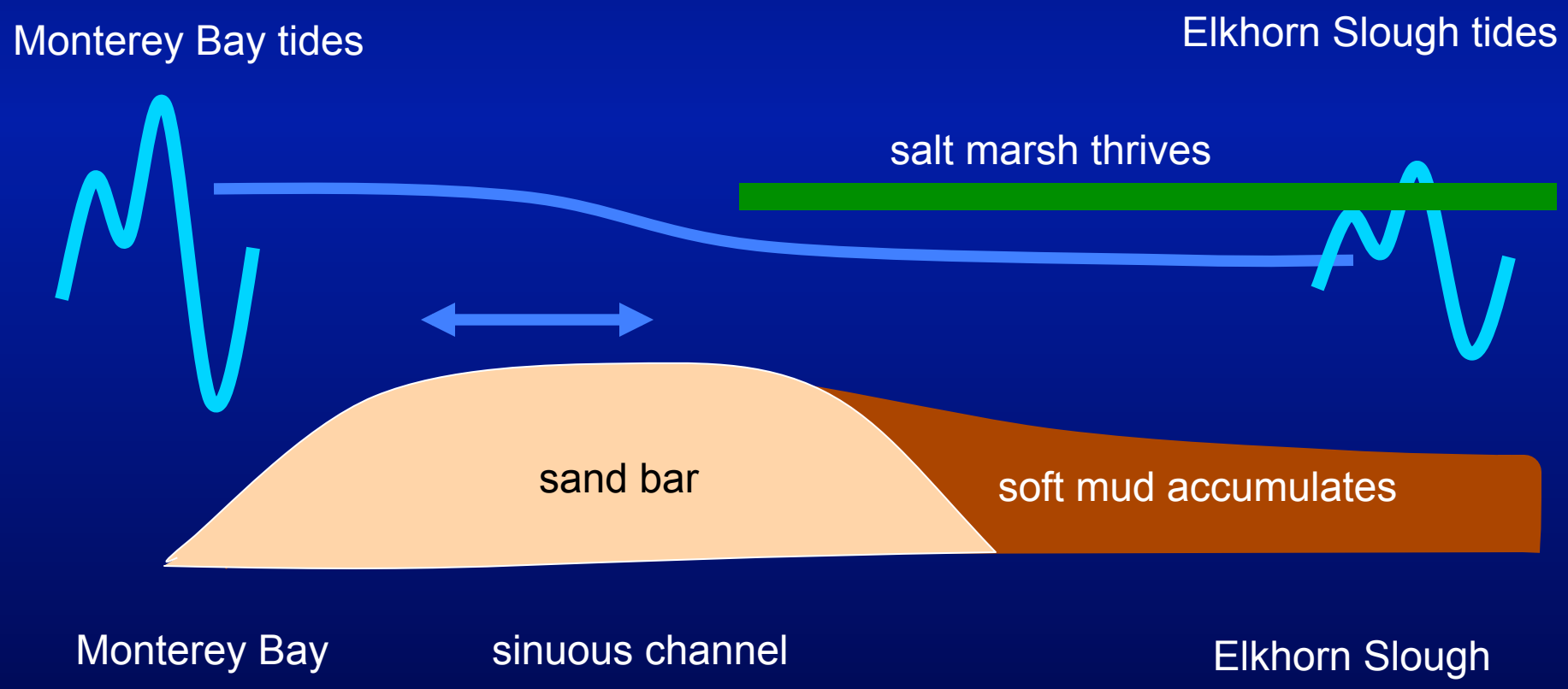
www.elkhornslough.org

Causes:
Salt Marsh Dieback and Tidal Scour

Root causes of change: Moss Landing Harbor 1947

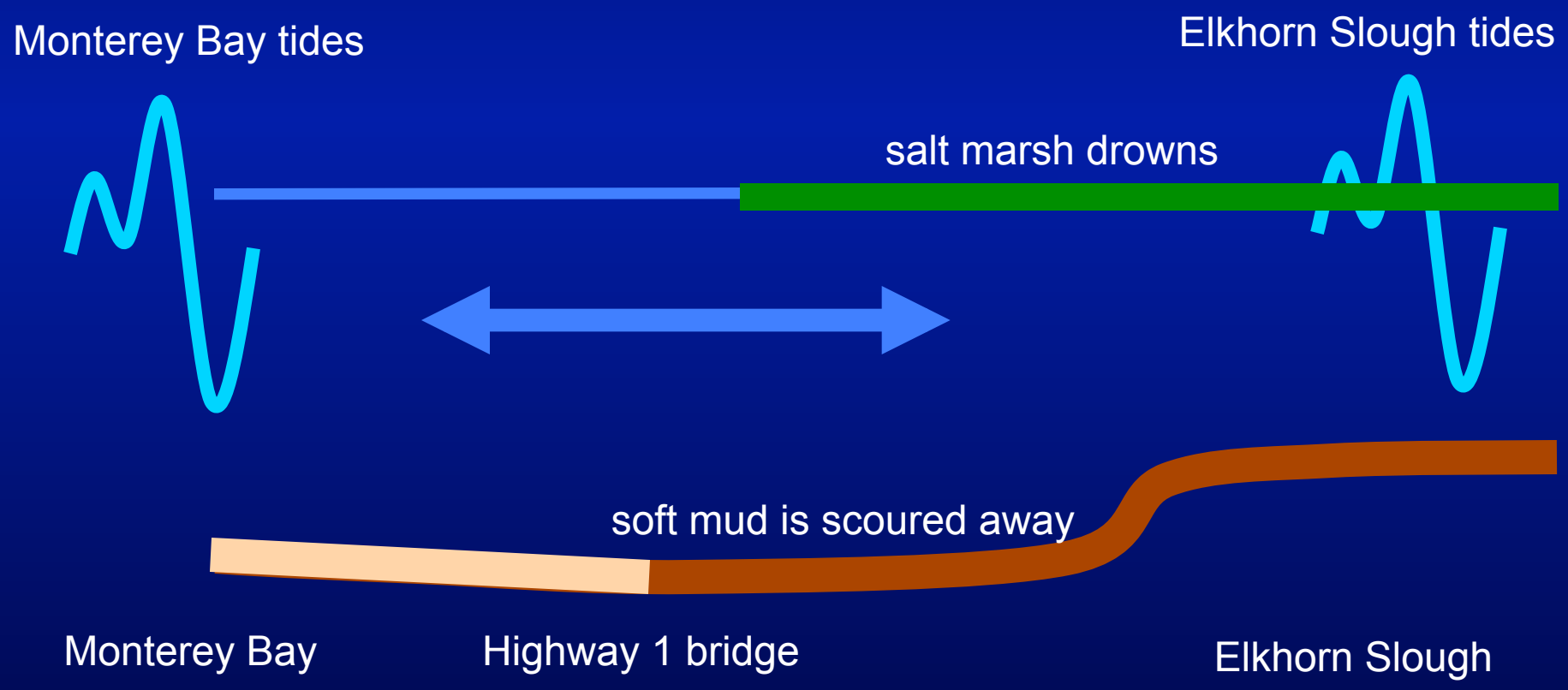
Conceptual model of change

Before Moss Landing Harbor:
the sand bar at the mouth
dissipated the energy of Monterey Bay tides



Present conditions

After Moss Landing Harbor:
The deep channel transmits
the ocean's energy into the slough

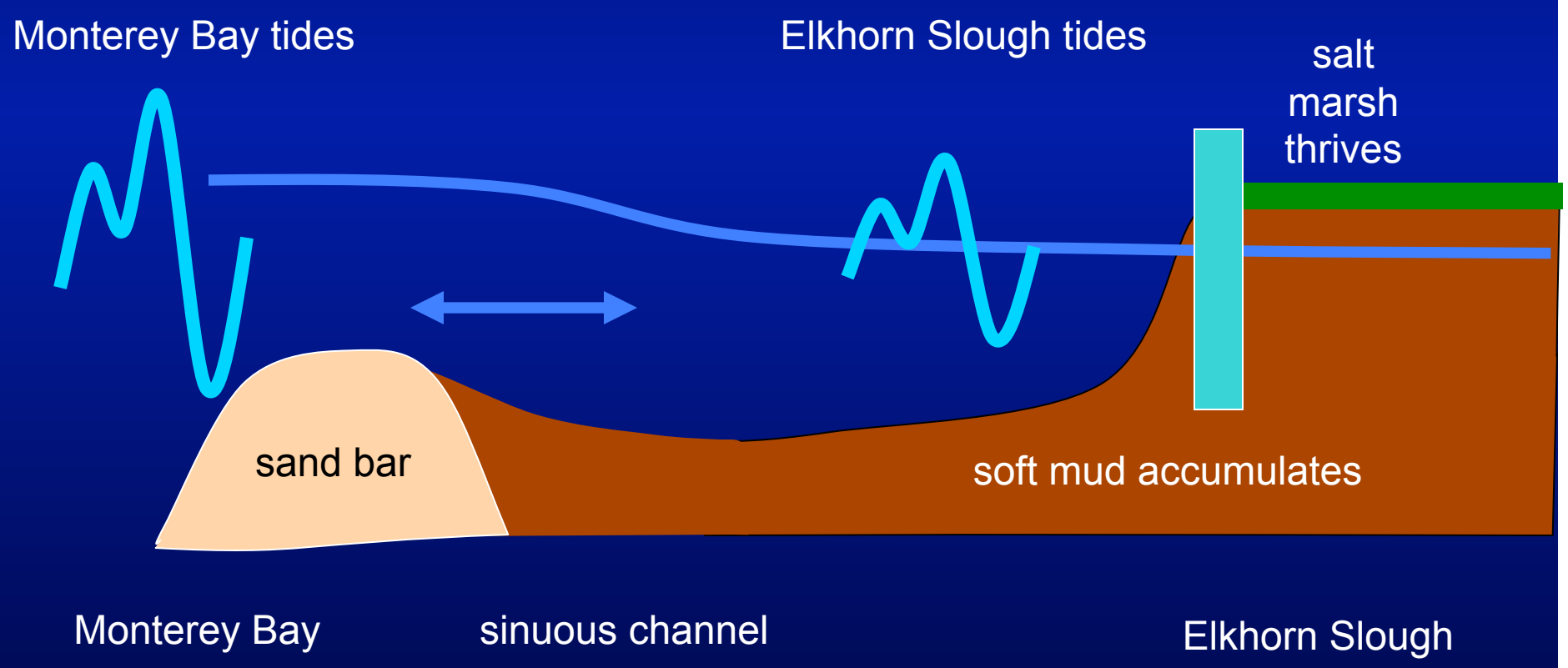


Root causes of change:
Parsons Slough - diking, draining and breaching

After subsidence the land has dropped 3 to 5 feet
It covers just 15% of the land of Elkhorn Slough
When opened daily tidal exchange increased by 50%

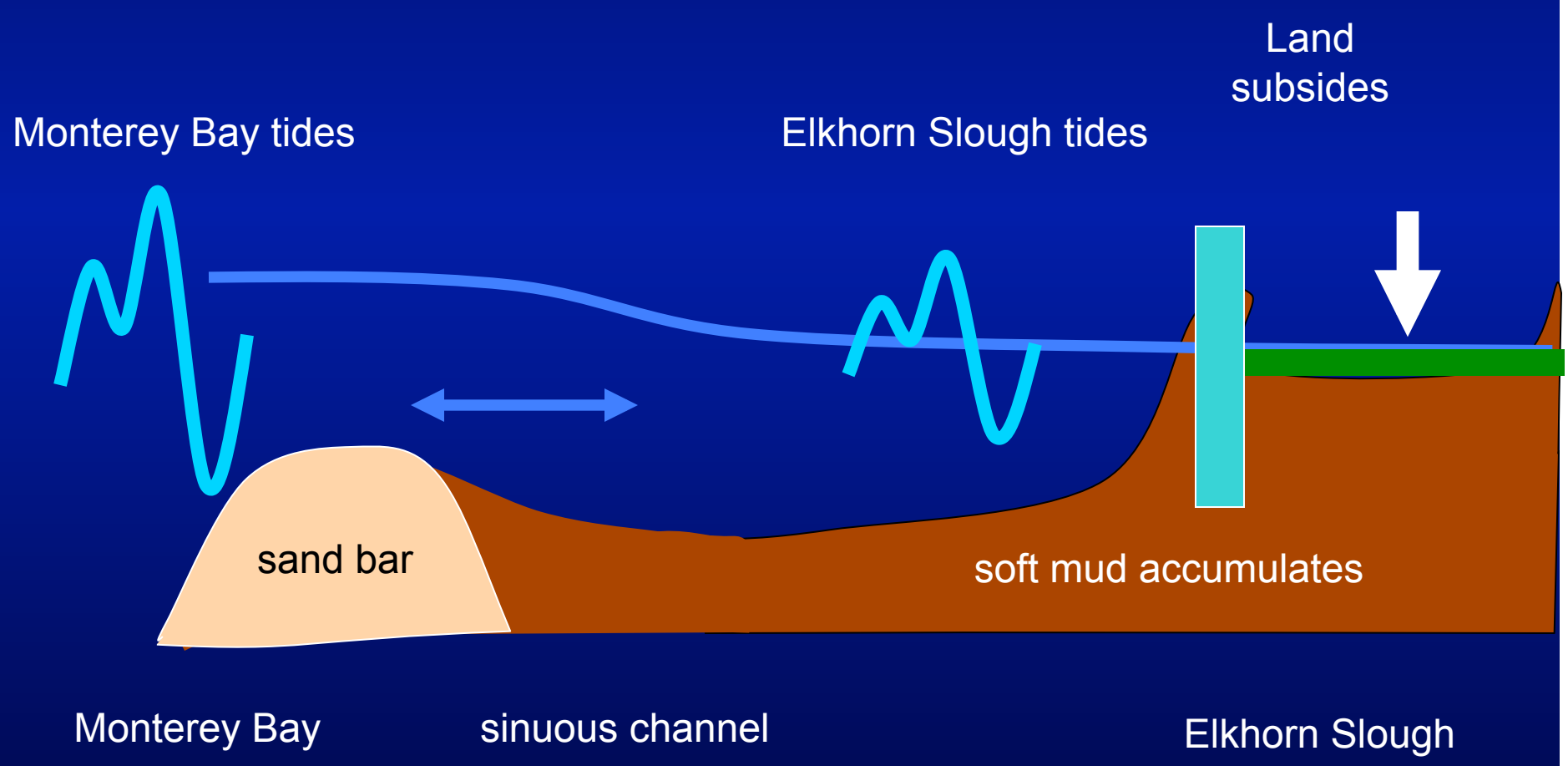
Root causes of change: Subsidence of drained lands

Before Moss Landing Harbor (1870s)
Before Parsons was drained



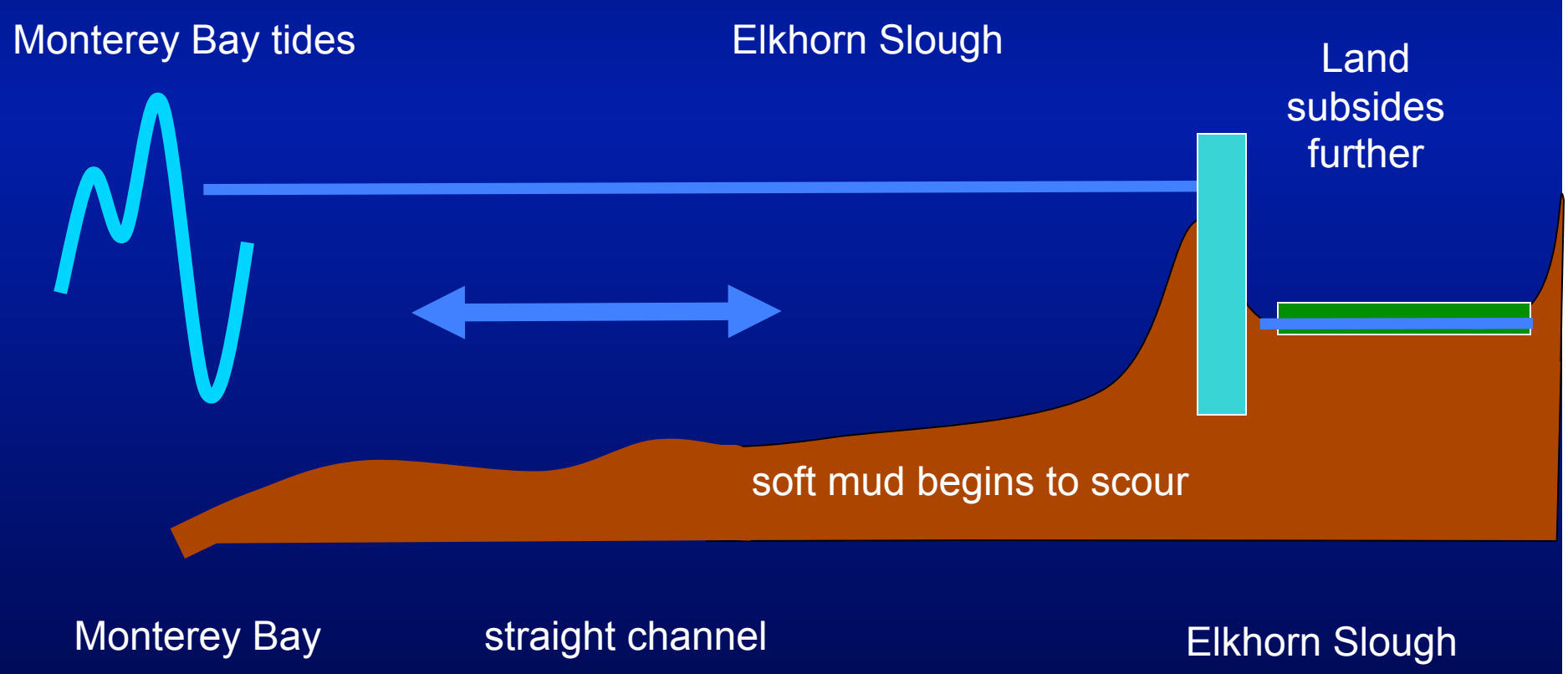
Historical condition ~1931

Before Moss Landing Harbor
After Parsons was drained



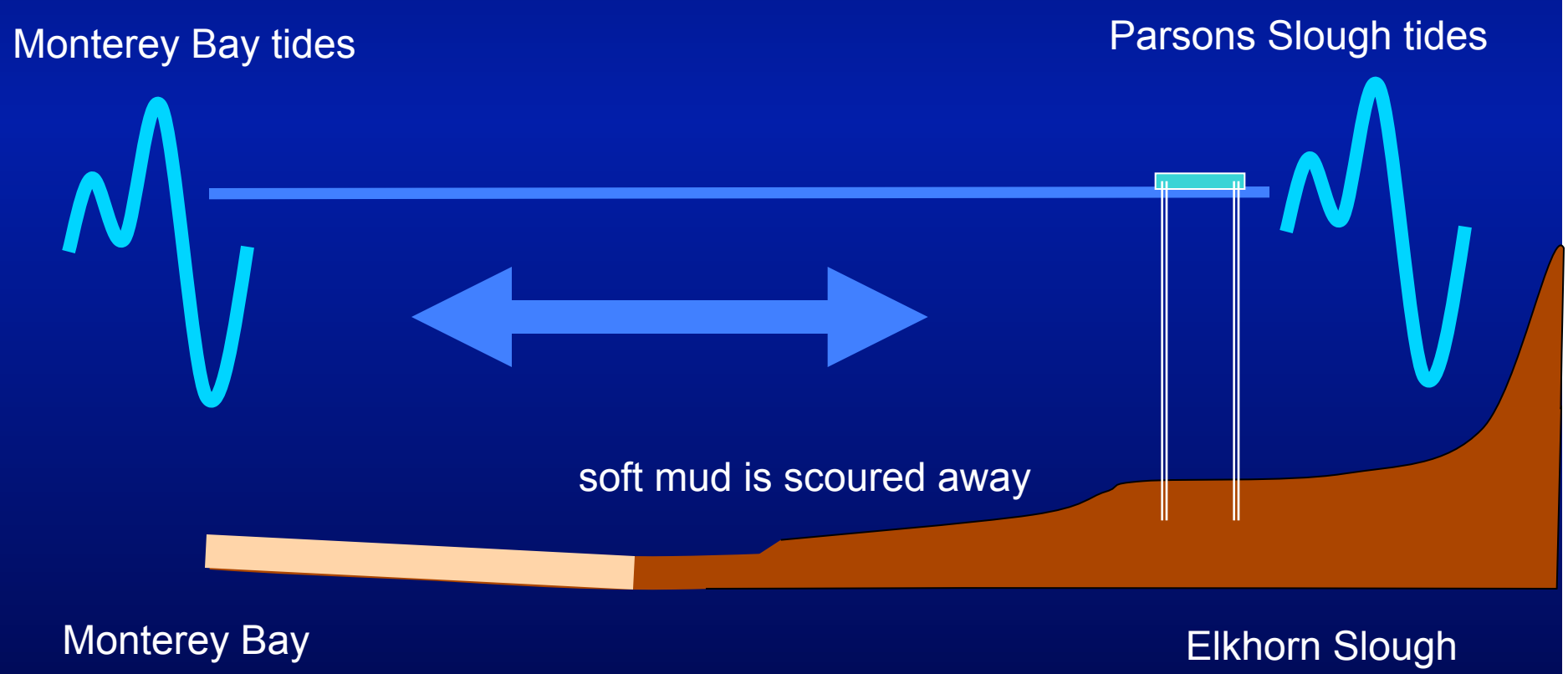
After the harbor was opened ~1955

Moss Landing Harbor is opened
Tidal scour begins

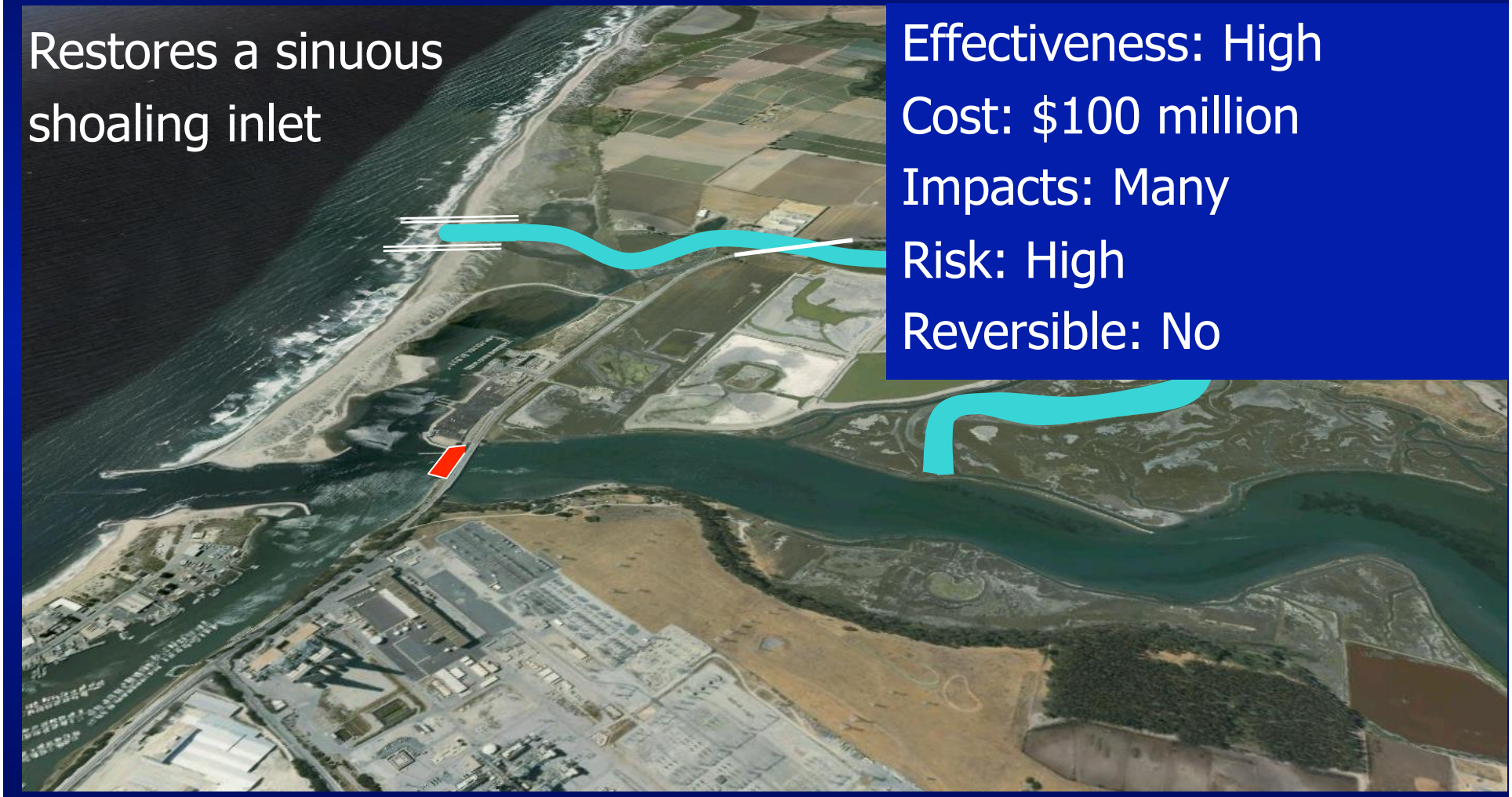


Parsons Slough opened to the tides ~1985

Parsons Slough is opened
Tidal scour accelerates



Management alternative: New Ocean Inlet



Effectiveness: High

Cost: $100 million

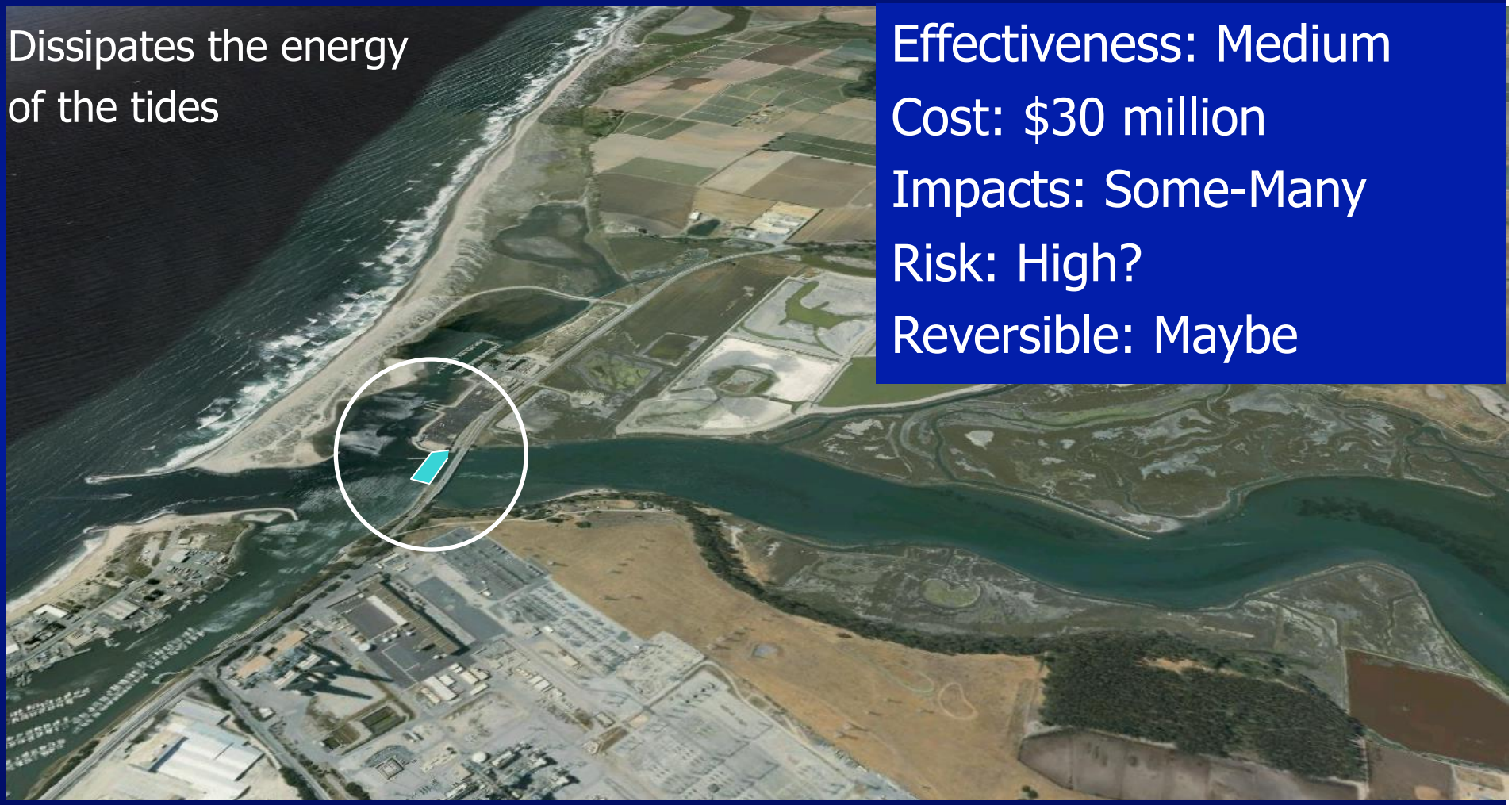
Impacts: Many

Risk: High

Reversible: No

Image: Google Earth

Management alternative: Sill at Highway 1



Effectiveness: Medium

Cost: $30 million

Impacts: Some-Many

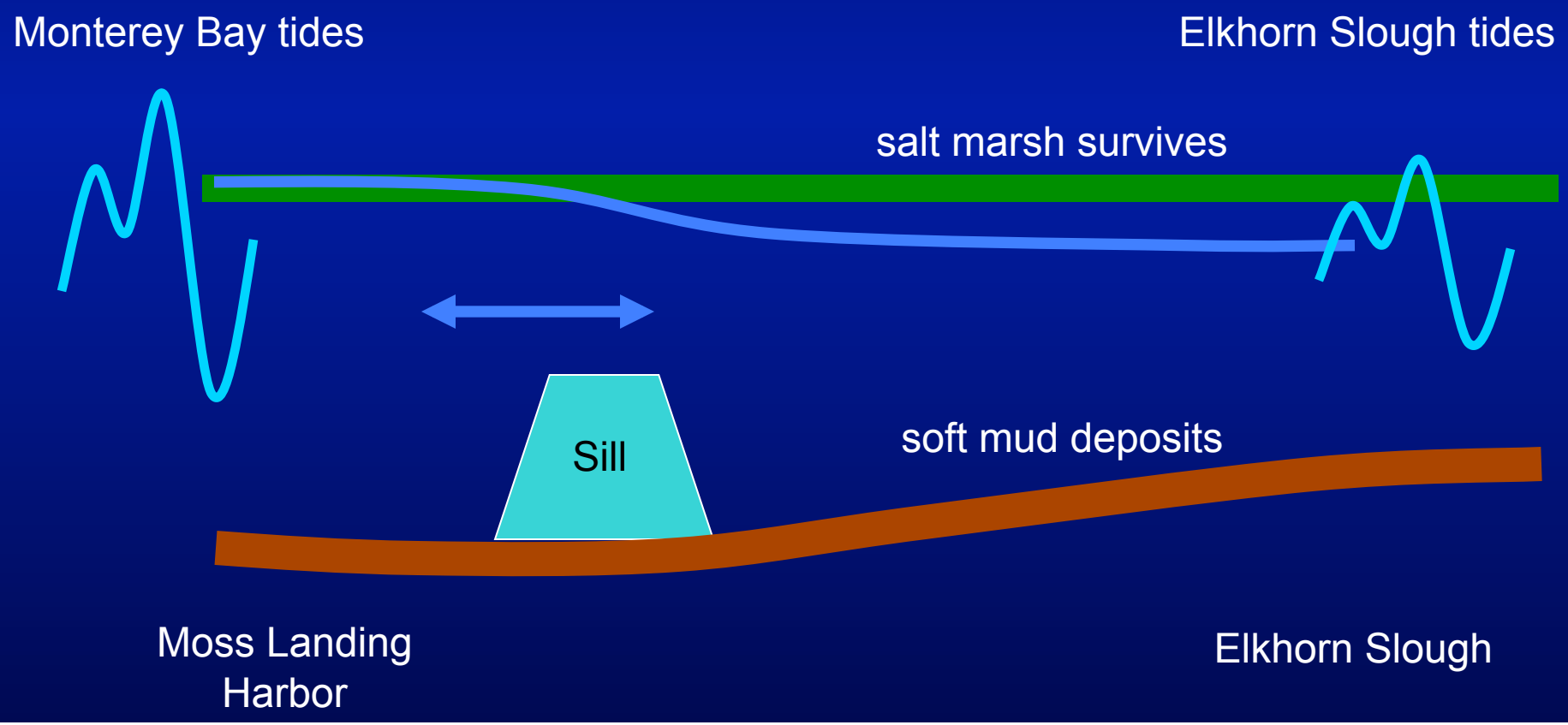
Risk: High?

Reversible: Maybe

Image: Google Earth

Management alternative: Sill at Highway 1

A submerged tidal barrier near the mouth of the slough dissipates tidal energy



Recommended alternative:
A tidal barrier at Parsons Slough

Moderate reduction of the tides in Parsons Slough

Slow currents throughout Elkhorn Slough

Effectiveness: Low-Medium

Cost: $2 million

Impacts: Few (relatively)

Risk: Low (relatively)

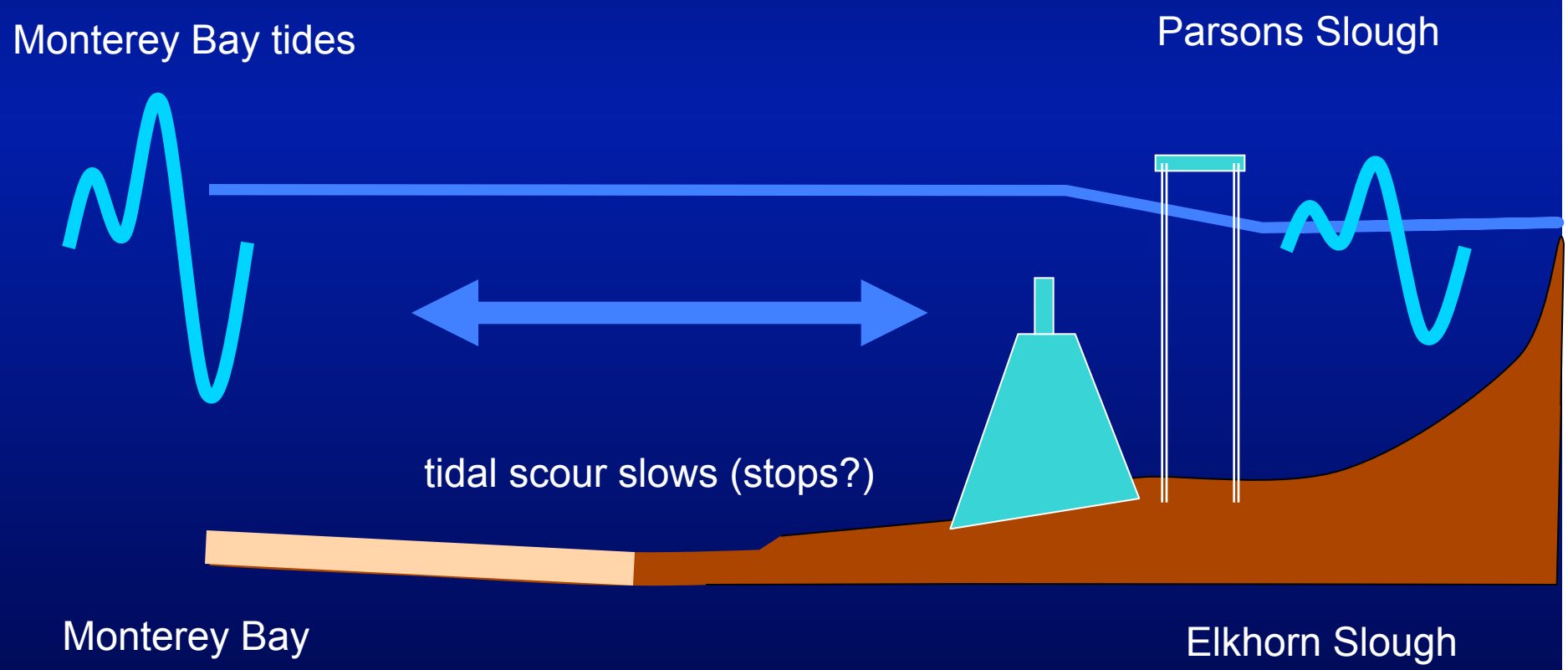
Reversible: Yes - Maybe

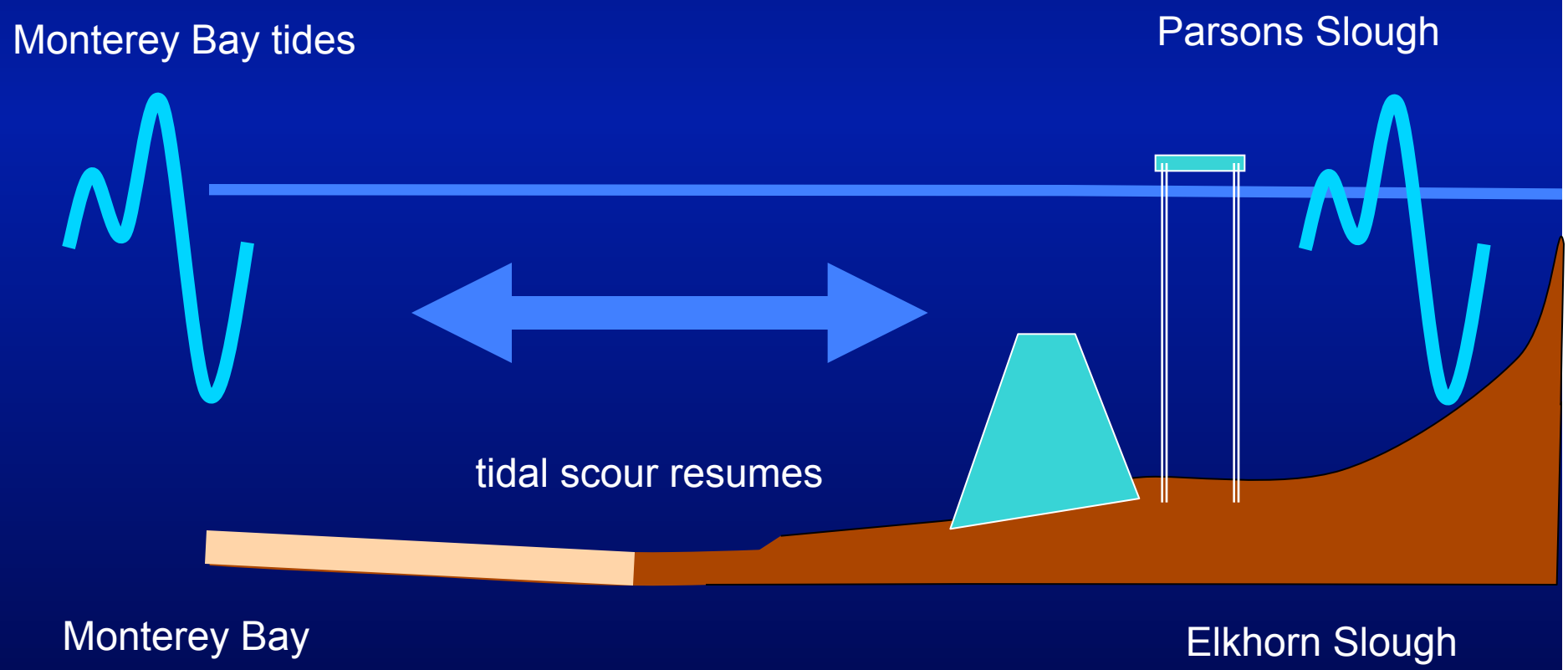
Approach

- An adjustable structure
- With detailed monitoring
- That triggers management actions
- To manage risk to water quality, fish and wildlife movement

Parsons Slough Sill: Restricted

Less tidal exchange
- Soft mud accumulates?
- Salt marsh recovers?



Parsons Slough Sill: Open

Full tidal exchange
- Maintains water quality
- Restores present habitat extent