ESA PWA

Russian River Estuary Management for Fish & Flooding

Matt Brennan, ESA mbrennan@esassoc.com
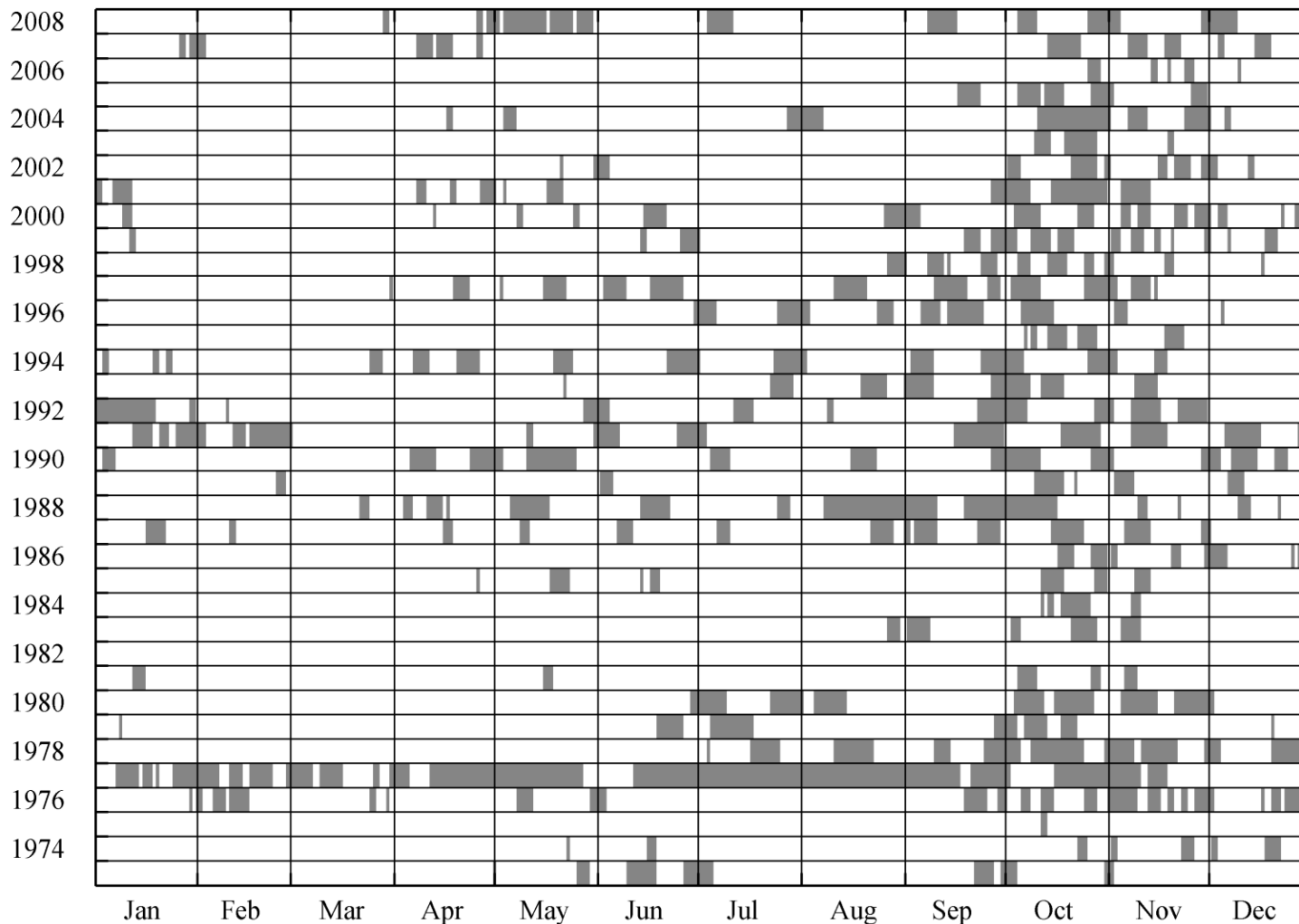
with Bob Battalio Dane Behrens

Chris Delaney, Jessica Martini-Lamb, SCWA

NMFS, CDFG, CSP, & UCD-BML

Multi-objective management
for fish & humans

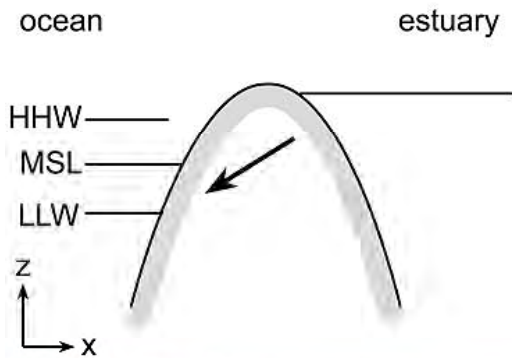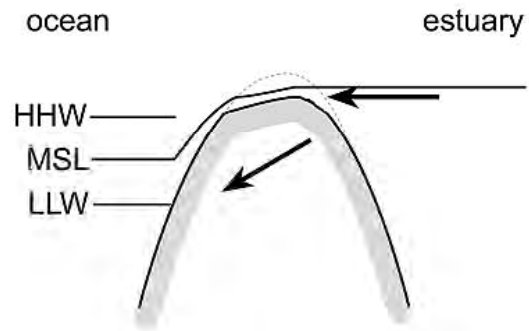# Historical inlet observations – 1973-2008

■ = inlet closed

Avg closure: 6 days / Avg time between closures: 43 days

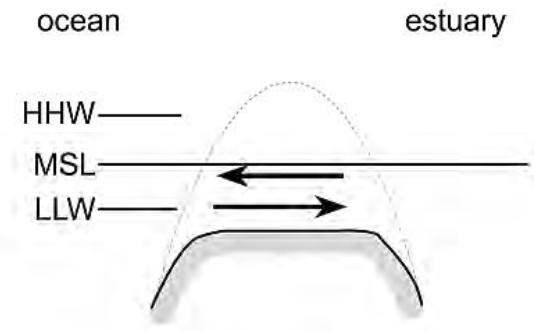# Estuarine Mouth / Inlet States

Closed lagoon

Perched outlet channel
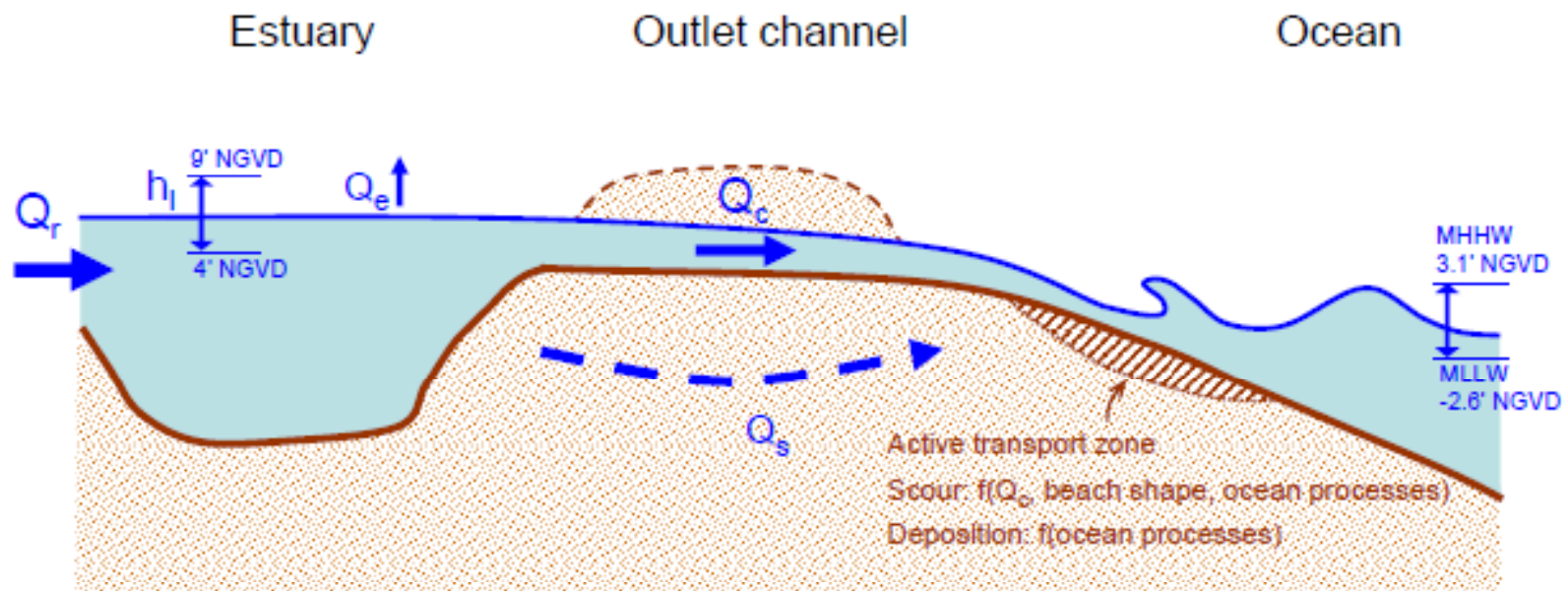
Tidal channel

16 May 2001

21 May 2001

22 May 2001

Lagoon Conceptual Model

Estuary Outlet channel Ocean

Parameters
h_l = lagoon water level
Q_r = river discharge
Q_c = outlet channel discharge
Q_s = seepage discharge
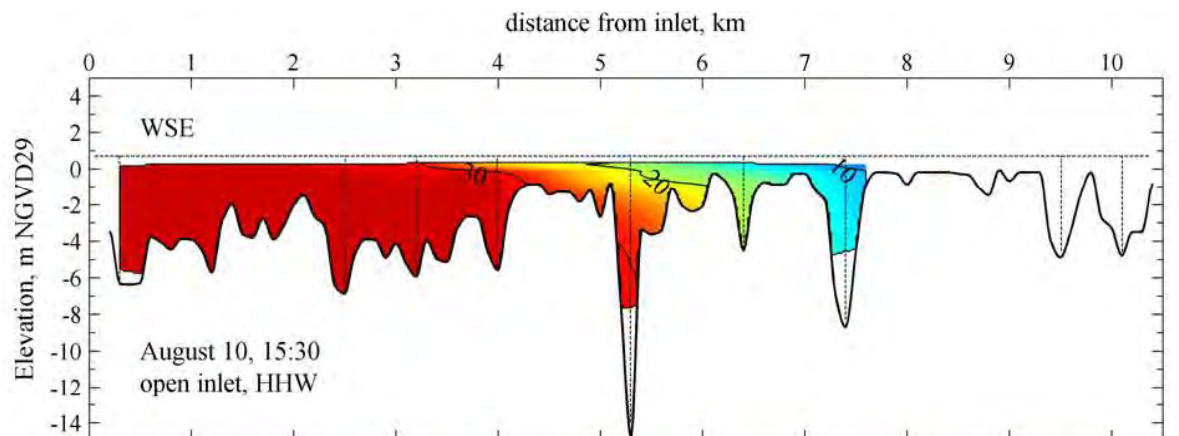Q_e = evaporation from lagoon

Processes
- $Q_r = Q_c + Q_e + Q_s$ (averaged over days)
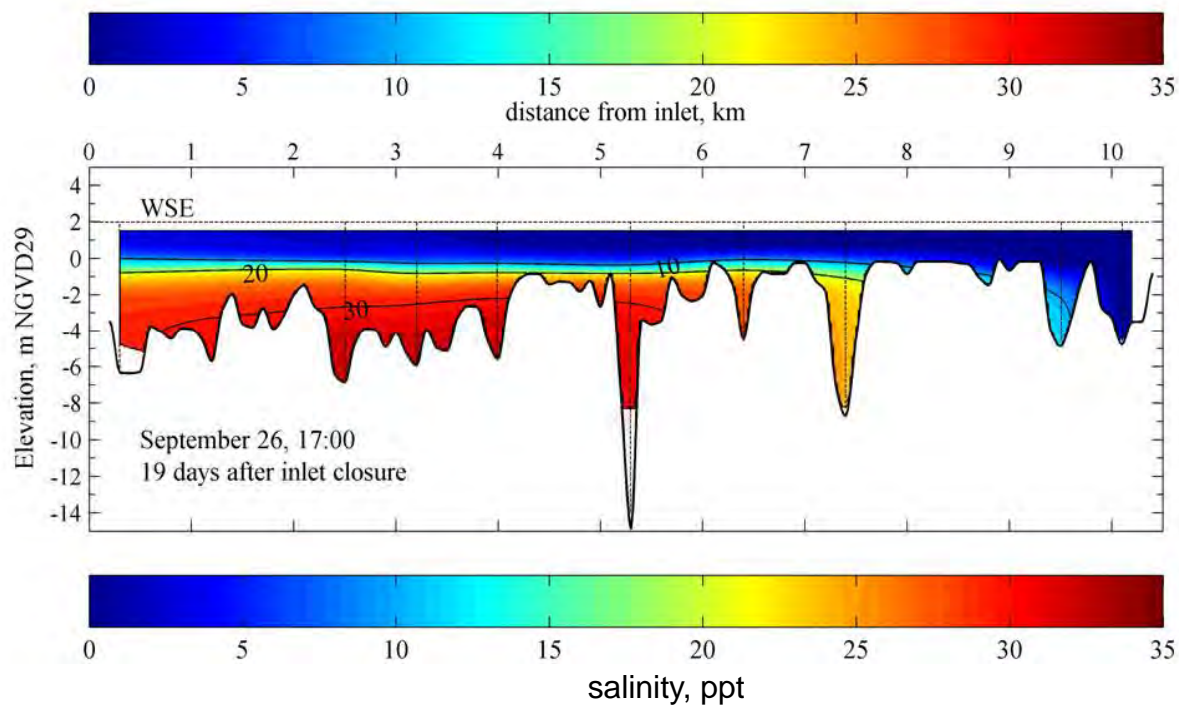- No sediment transport within outlet channel
- Active sediment transport outside outlet channel

Closure Conditions: Salt

Open inlet, tidal conditions

Closed inlet, lagoon conditions

Source: Bodega Marine Lab

NMFS Biological Opinion Performance Criteria

- Estuary water levels - May 15 to October 15
  - Target: 7 feet NGVD
  - Less than 9 ft NGVD flood stage
  - Greater than 4 ft NGVD for habitat benefit
- Temporary sand channel
- Minimize artificial breaching
- Economic feasibility
- Public safety
- Comply with existing regulatory permits
  - Up to 2,000 yd^3 of excavation

1) July 7th, 2010: Closed lagoon

2) July 8th, 2010: Channel excavation

3) July 8th, 2010: Excavation complete

4) July 8th, 2010: Excavation complete

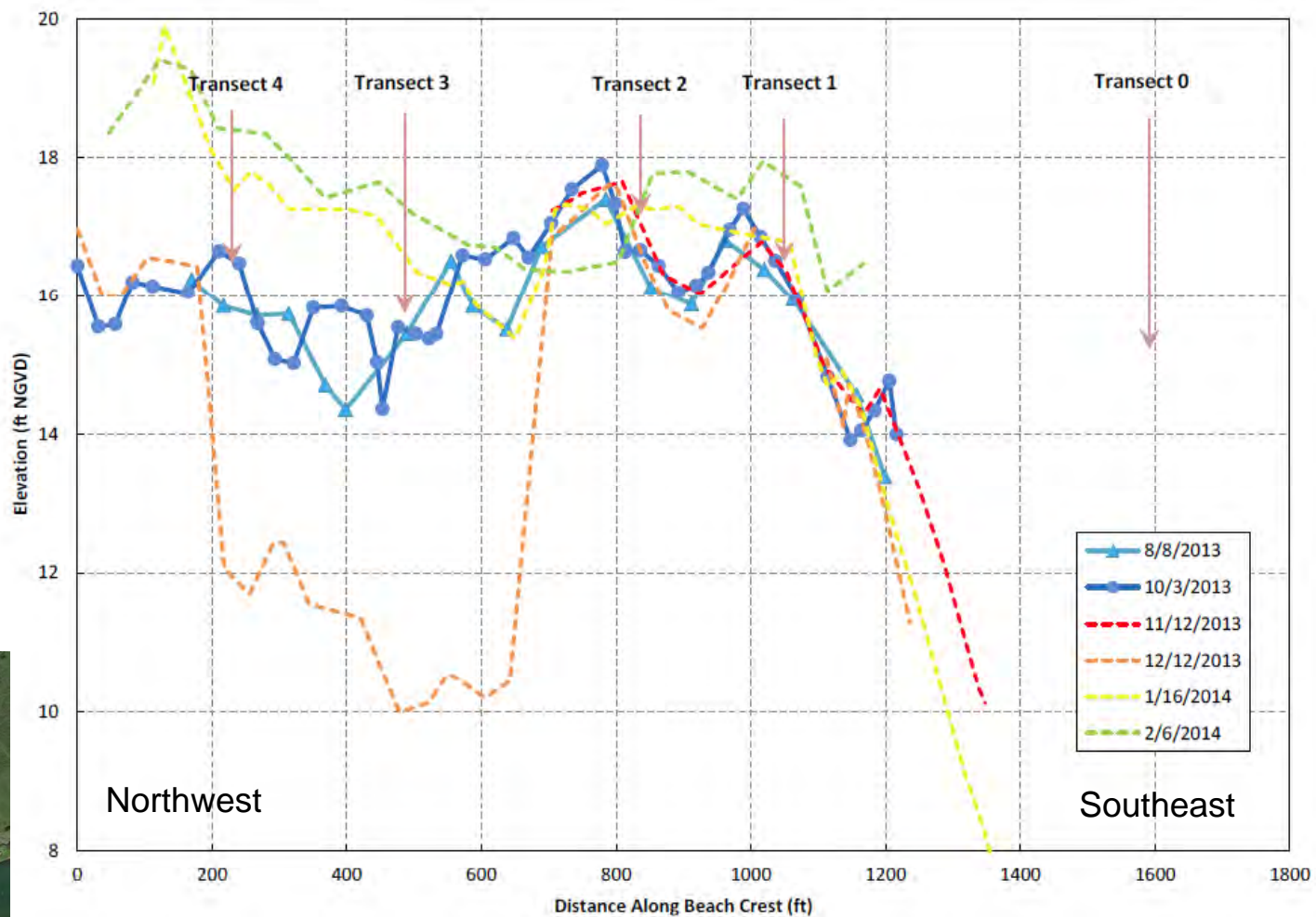1) June 29th, 2010: Natural outlet channel
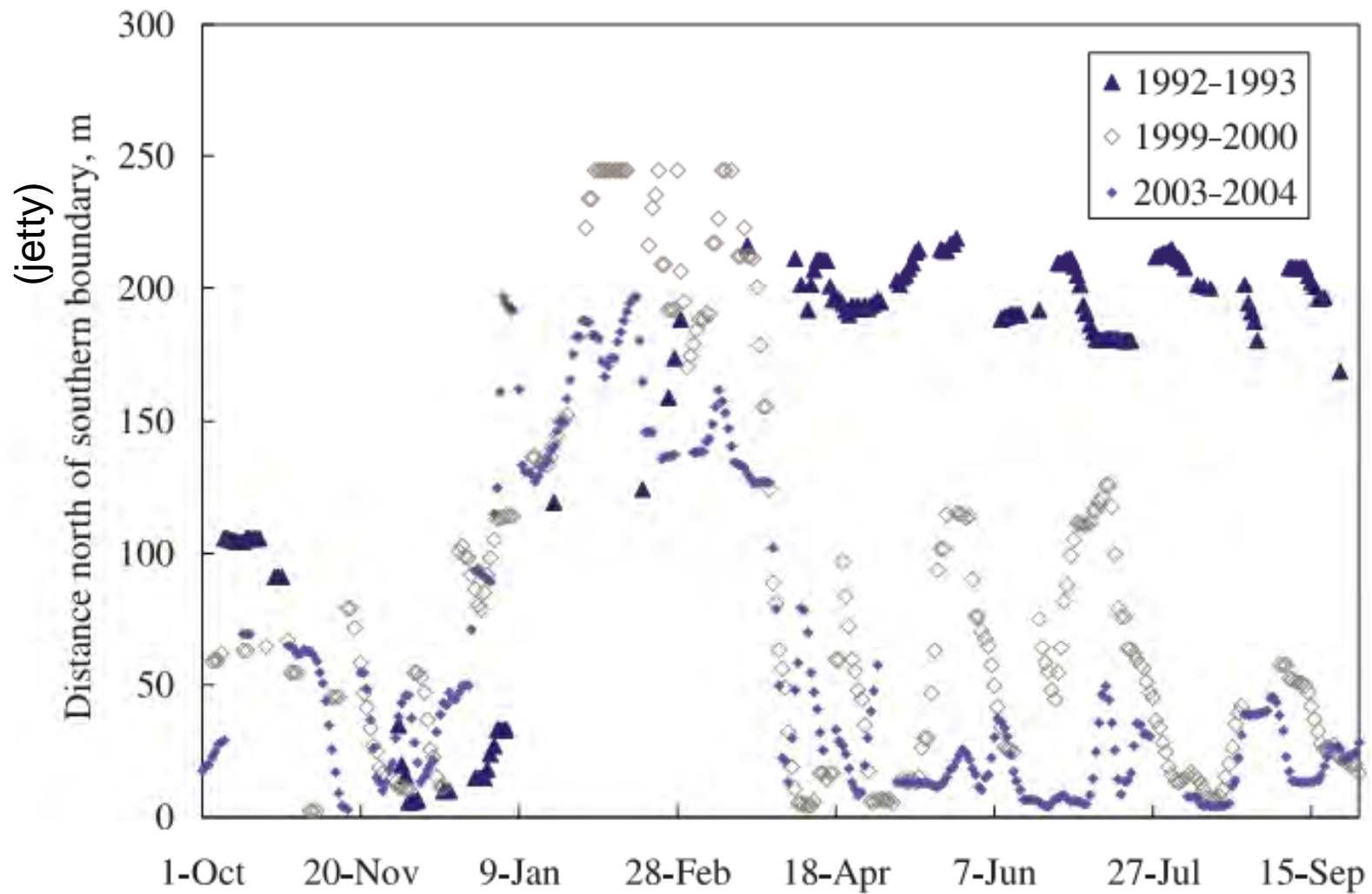
2) July 8th, 2010: Excavated outlet channel

3) July 9th, 2010: Closed lagoon

Beach Crest Profiles

Historic Inlet Alignment

Behrens et al., 2009

Wave Interactions with Jetty

Source: SCWA

Source: BML

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DRAFT

FEASIBILITY OF ALTERNATIVES TO THE GOAT ROCK STATE BEACH JETTY FOR MANAGING LAGOON WATER SURFACE ELEVATIONS:

Existing Conditions

Prepared for
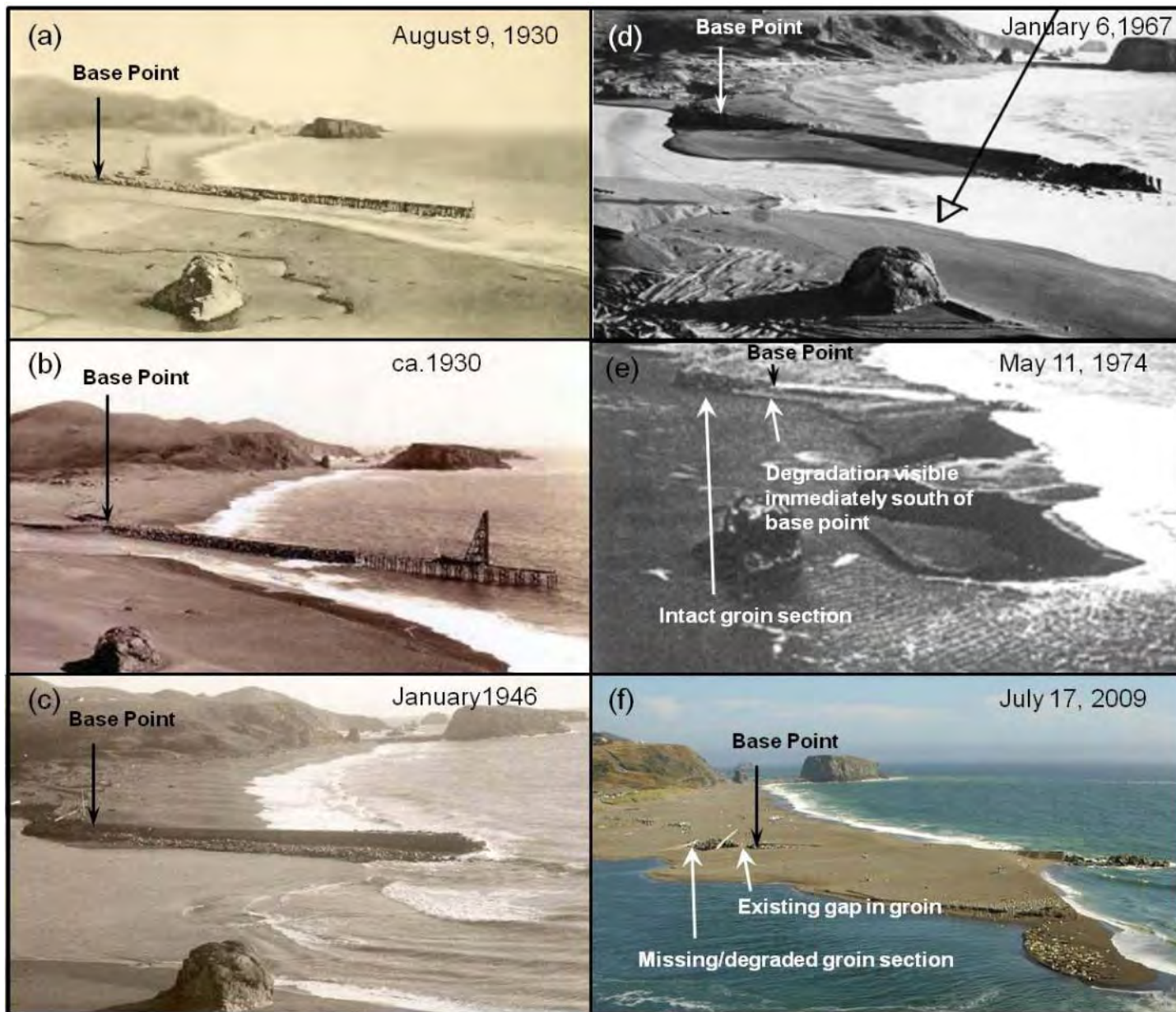Sonoma County Water Agency
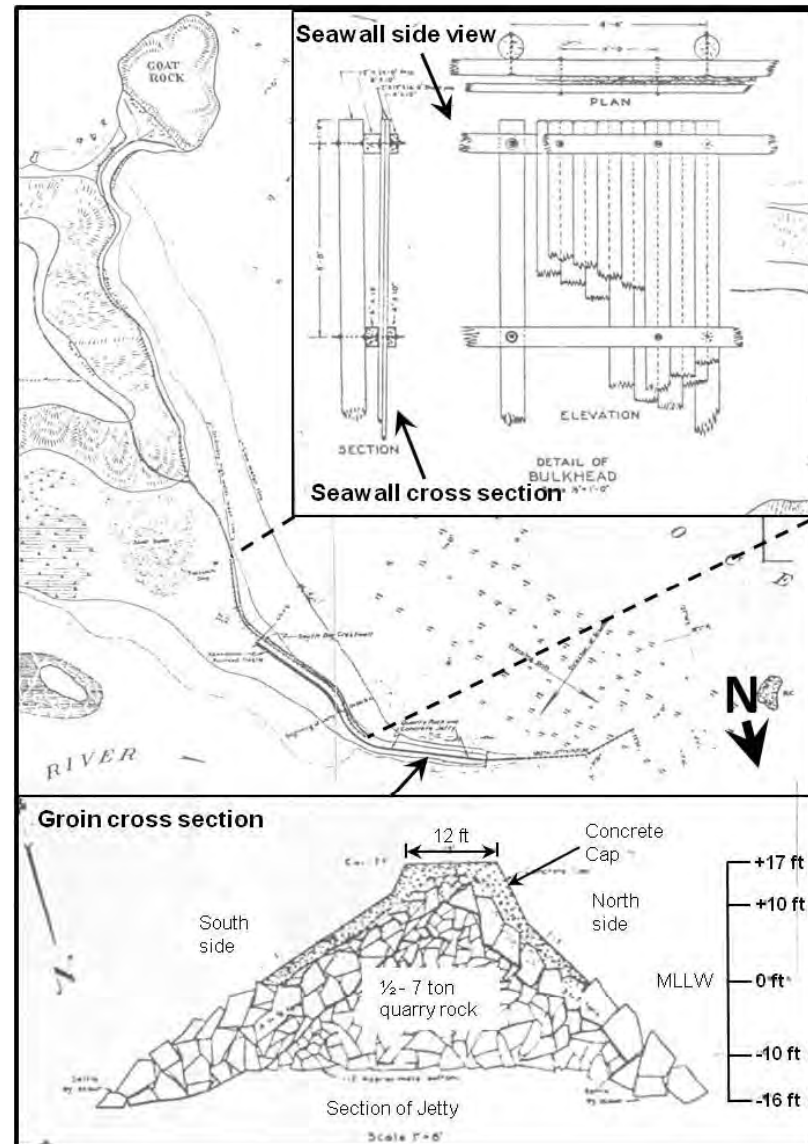
December 31, 2012

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Jetty Study Components

- Jetty Structure

- Groundwater Permeability

- Ocean Wave Conditions

- Beach Morphology

- Inlet Morphology

- Flood Risk
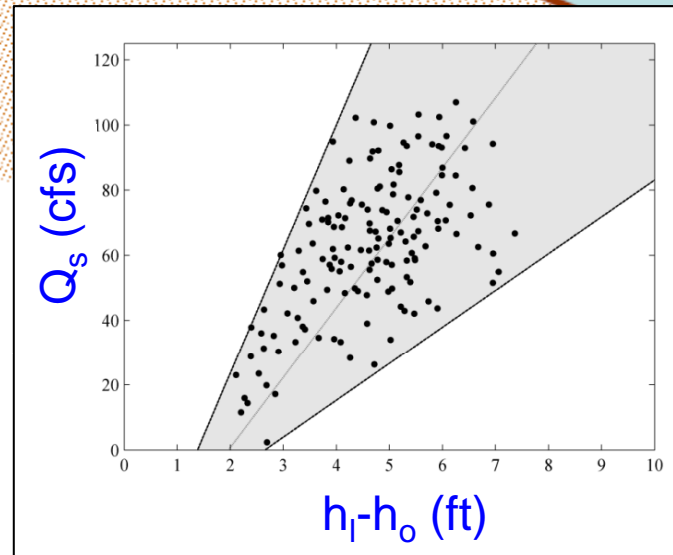
- Develop Alternatives

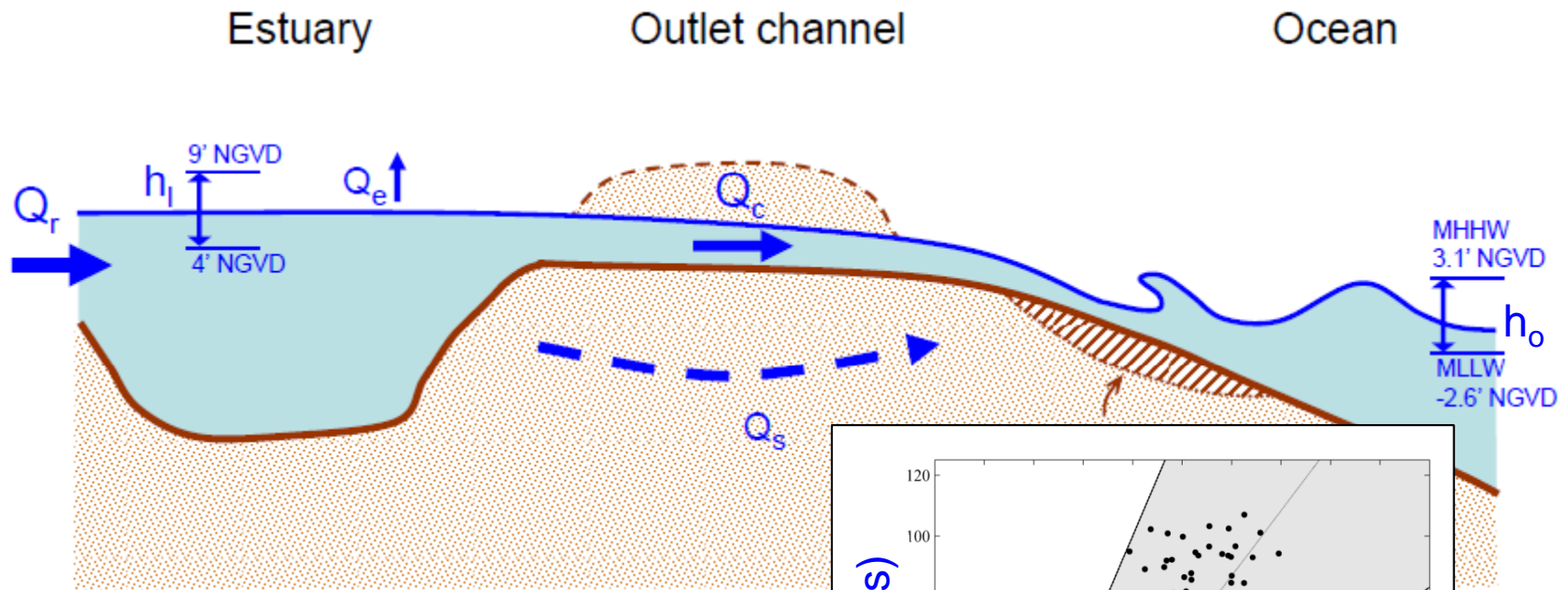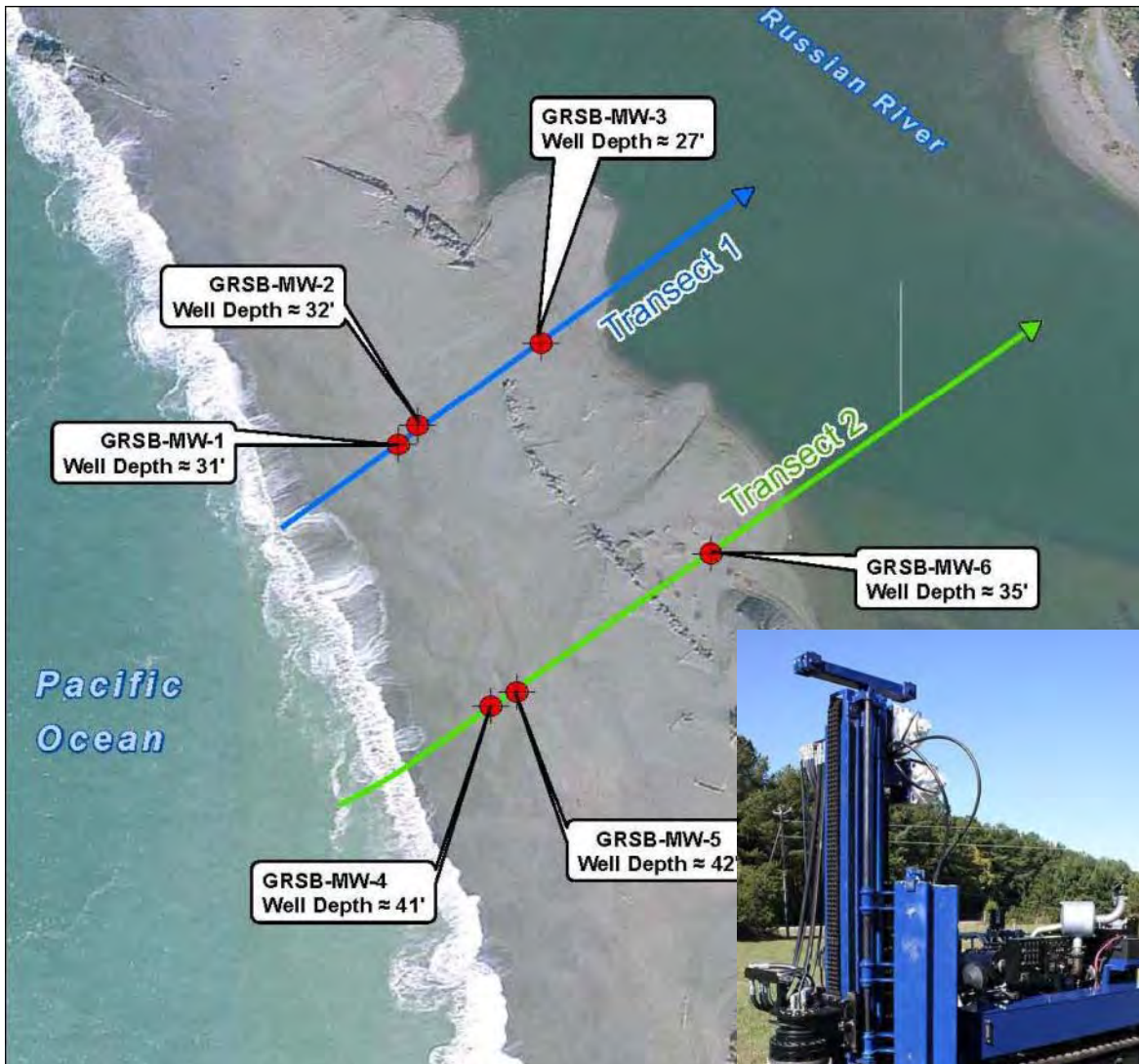- Evaluate Alternatives

Evolution of the Jetty Structure

Jetty Components

Groundwater Seepage

Beach & Jetty Groundwater Monitoring

GRSB-MW-3
Well Depth ≈ 27'

GRSB-MW-2
Well Depth ≈ 32'

GRSB-MW-1
Well Depth ≈ 31'

GRSB-MW-6
Well Depth ≈ 35'

GRSB-MW-5
Well Depth ≈ 42'

GRSB-MW-4
Well Depth ≈ 41'

Russian River

Transect 1

Transect 2

Pacific Ocean

- **Why? To better understand:**
  - Size & composition of buried jetty sections
  - Thickness of sand & bedrock
  - Groundwater seepage through beach

- **How? Monitoring Wells:**
  - Up to 6 monitoring wells
  - 2" well casing
  - Top of well buried in sand
  - Wells to be instrumented
  - Monitored/maintained once per month
  - Public will have access to beach during construction
  - Restricted access in immediate vicinity of well construction
  - 2 to 4 days

Beach & Jetty Subsurface Monitoring

- How? Geophysical Surveys
  - Portable Equipment: No permanent installation required
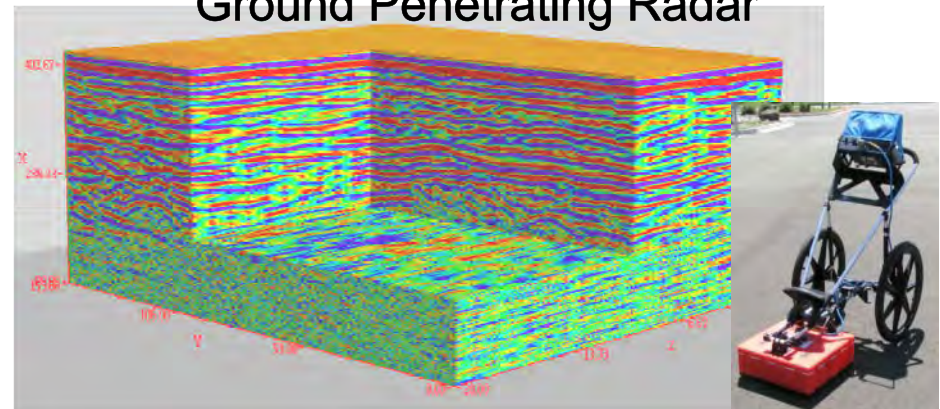 - Public will have access to beach
  - Restricted access in immediate vicinity of survey activity
  - 1 to 2 days per survey
  - Researchers:
    - Lawrence Berkeley National Lab
    - NorCal Geophysical

Seismic Refraction

Electrical Resistance Tomography

Ground Penetrating Radar
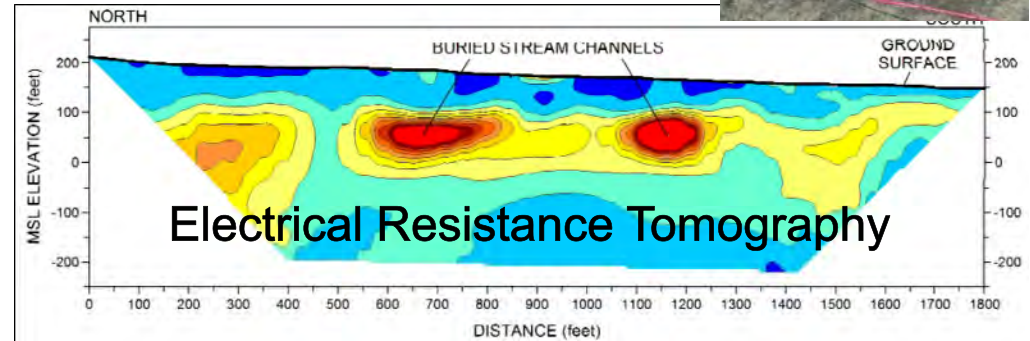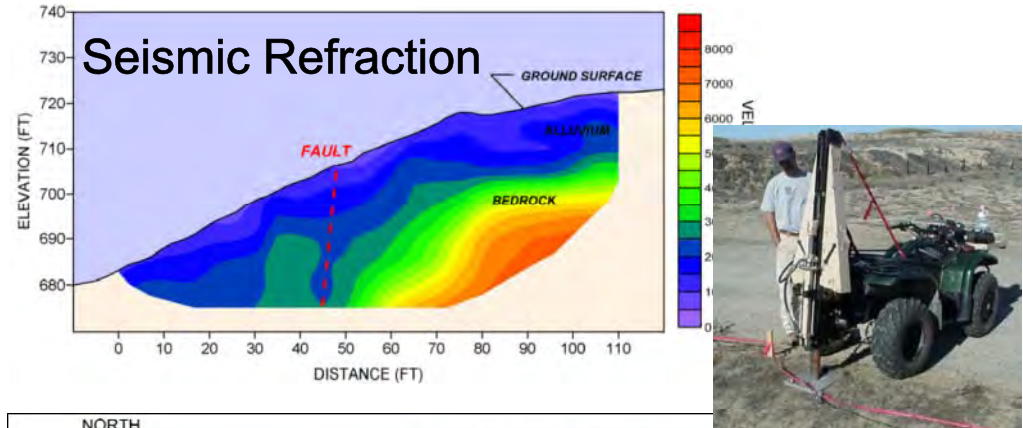
Electromagnetic Monitoring
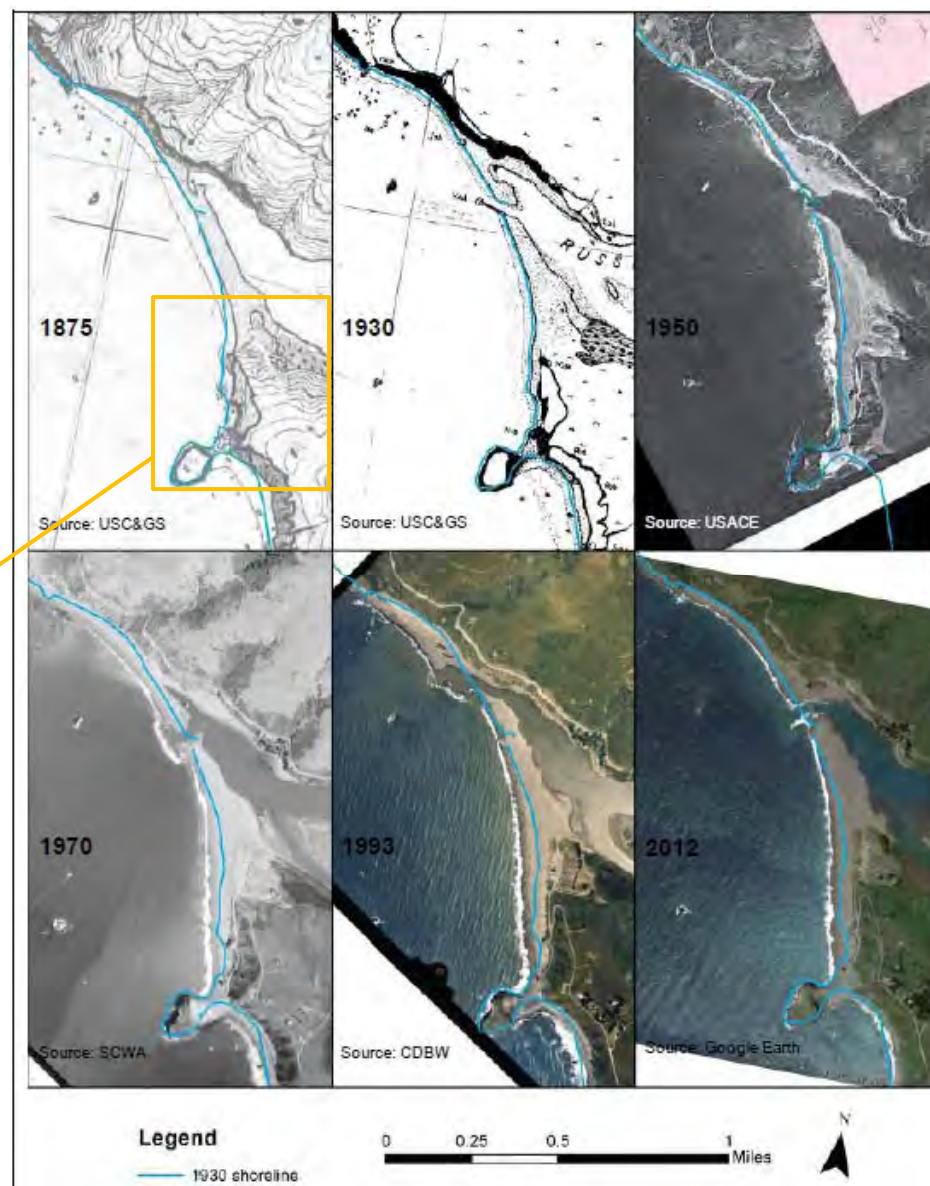
Beach Morphology: Influence of Adjacent Construction

- Historic maps indicate that Goat Rock was only connected to the shore by a tombolo (low-lying sand spit) prior to jetty construction.

- Shoreline *accretion* of 1.5 ft/yr on GRSB since 1930.

- Shoreline *erosion* of 0.8 ft/yr at neighboring beach to the south since 1930.

Inlet Morphology

Flood Risk Assessment

Table 7-5. Summary of potential flood stages in the Estuary resulting from the three flood scenarios described above.

Scenario	Estimation Method	Estuary Flood Stage at Shoreline (ft NGVD)
Scenario 1 (Dry-season flood)	• Gumbel Dist. of Jenner peak stages during closures[1]	14.8
	• Beach topographic data used for crest height reference	14.5-17.5
	• Runup estimated for extreme wind waves	1.5-3.7
	Total:	16.0-21.2
Scenario 2 (Wet-season flood)	FEMA (2008) BFE Comparison with limited lagoon stage data during recent floods	13.4
Scenario 3 (Wave transmission and runup)	• Assumed MHHW tidal level in the Estuary	7.1
	• Estimated depth-limited wave transmission cutoff height	6
	• Runup on estuary shorelines using Hunt (1959)	3.9-18.0
	Total[2]:	11.0-25.1

[1] Only peak stages prior to natural breach events were used.

[2] Estimated as MHHW + runup.

March 25, 1986
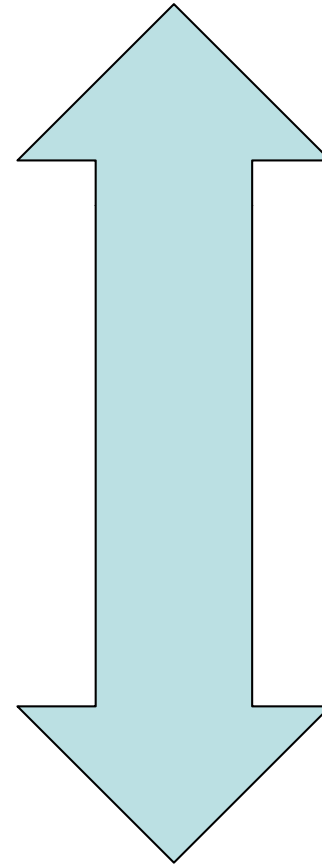
Jenner WL gage

October 24, 2009

Jenner WL gage

- Wet-season (fluvial) flood may pose less flood risk than dry-season (inlet closure) flood event
- Flood risk uncertain from wave transmission

Jetty Alternatives

- No Action

- Notch Jetty

- Demolish In-Place

- Remove Access Elements

- Remove Groin

- Remove Full Jetty

Less change

↑↓

More change

Jetty Alternatives

(a) No Action
(b) Notch Jetty
(c) Demolish in Place
(d) Remove Groin
(e) Remove Access Elements
(f) Remove Full Jetty