Hybrid Approaches at Pajaro Dunes: Unique setting, thoughtful planning, better than expected outcomes

Two Projects:

- Watsonville Slough Lagoon Restoration
- Revetment: Dune Support and Home Protection

Charles Eadie, Eadie Consultants, Santa Cruz CA

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Spoiler Alert:

- Watsonville Slough restoration project: best option for natural environment turns out to provide major benefit for protection of built environment

- Pajaro Dunes rock revetment: Best option for protecting buildings and property has resulted in better beach and dunes

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WATSONVILLE SLOUGH LAGOON RESTORATION CAP 1135 FEASIBILITY STUDY

PAJARO DUNES UPDATE
21 APRIL 2023

South Pacific Division's Regional CAP Production Center
San Francisco District
Pajaro Storm Drain Maintenance District, Within Santa Cruz County

US Army Corps of Engineers

CONTINUING AUTHORITIES PROGRAM AND WATSONVILLE SLOUGH

- Continuing Authorities Program (CAP) projects are meant to plan, design and constructs projects of limited scope and complexity.
- For Watsonville Slough, this can be seen as one of the first steps in supporting the lower watershed's adaptation to current conditions and well as future impacts from sea level rise

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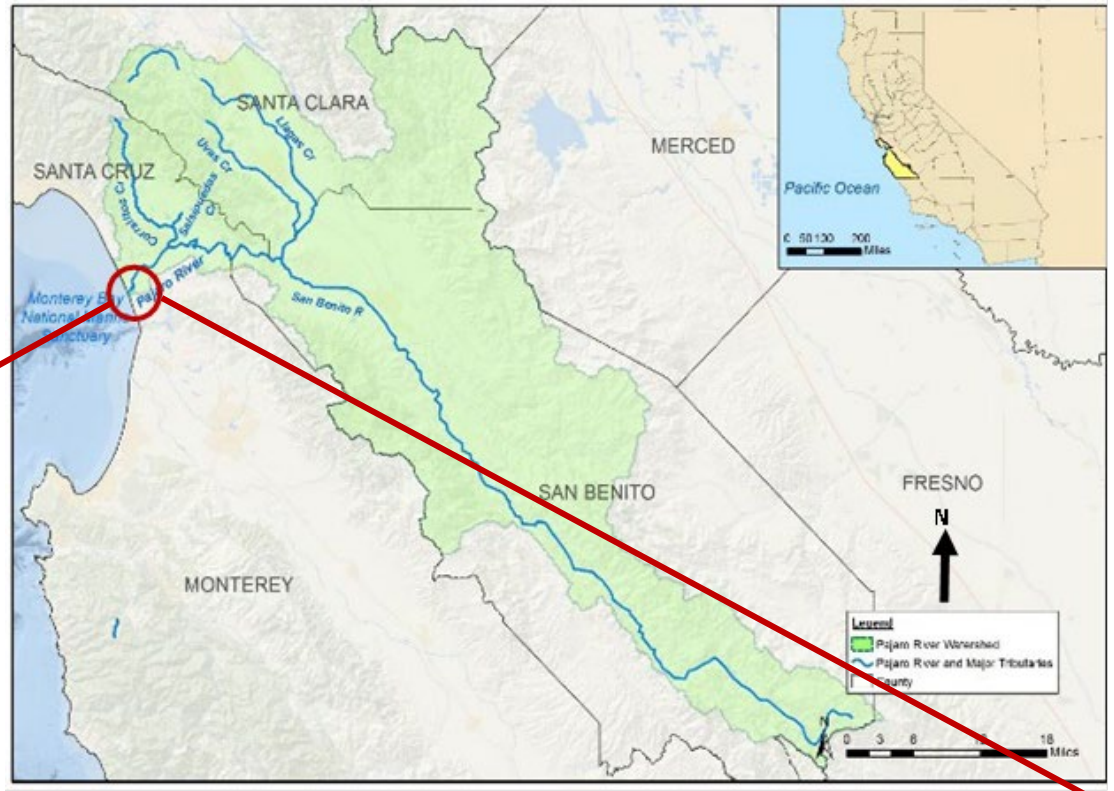
Study Area

- Watsonville Slough is in Santa Cruz County, CA. and at the mouth of the Pajaro River, where the Pajaro River discharges to the Pacific Ocean at the Pacific Ocean.
- The study area is on the inland side by farmland; while on the seaward side it is bordered immediately by the Pajaro Dunes Community and then the Pacific Ocean.



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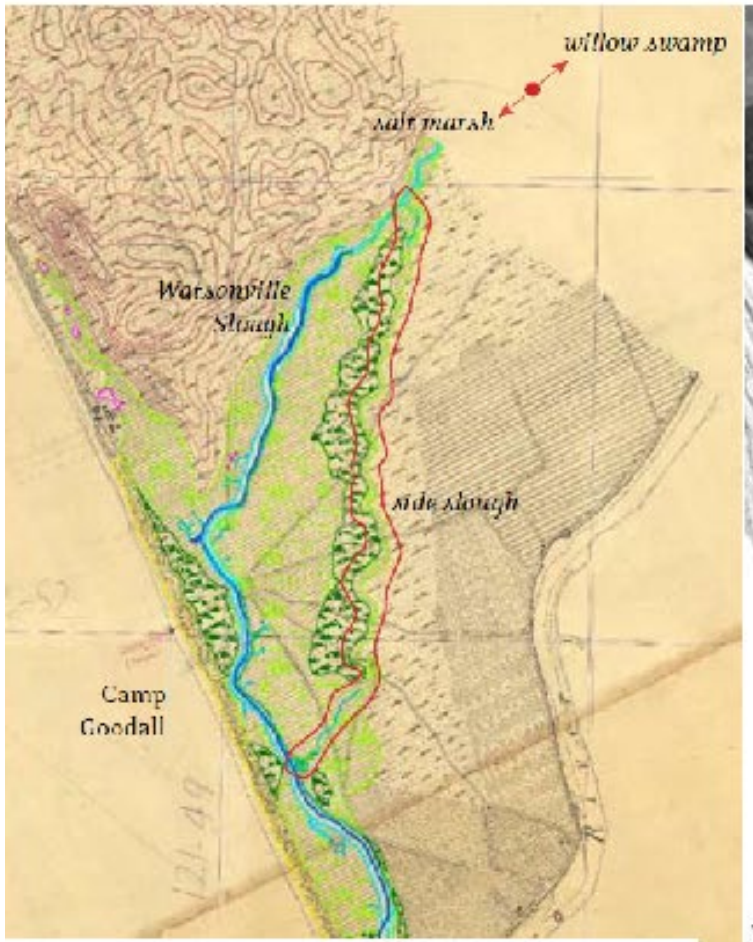
EXISTING CONDITION: REDUCED TIDAL MARSH AND COASTAL WETLAND HABITAT



Historical Conditions (from Whipple 2008)

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KEY FEATURES OF INTEREST

Closed Pajaro Lagoon at flood stage

- **Beach Road** – this road crossing experiences flooding during closed lagoon conditions. These floods trigger lagoon breaches.
- **Pajaro River Mouth** – controls the water levels within the project area.


Beach Road Crossing and Culverts


Beach Road Culverts

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EXISTING CONDITION: LOW INFRASTRUCTURE FORCES MECHANICAL BREACHING OF LAGOON DURING NATURAL CLOSURE EVENTS, IMPAIRING NATURAL HYDROLOGY AND QUALITY OF MARSH HABITAT

Project area includes high quality coastal wetland habitat

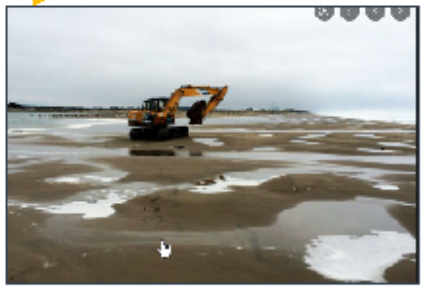
Low infrastructure

Lagoon closure + fluvial storm flow causes elevated water levels

High water levels cause flooding of low elevation infrastructure (road crossings)

Flooding of low elevation infrastructure (road crossings) causes safety problems

Flooding causes problems for emergency and public access



Mechanical breaching of lagoon necessary to restore emergency and public access

Planning hypothesis was that mechanical breaching of lagoon leaves some portions of the marsh "high and dry," a detriment to the ecosystem

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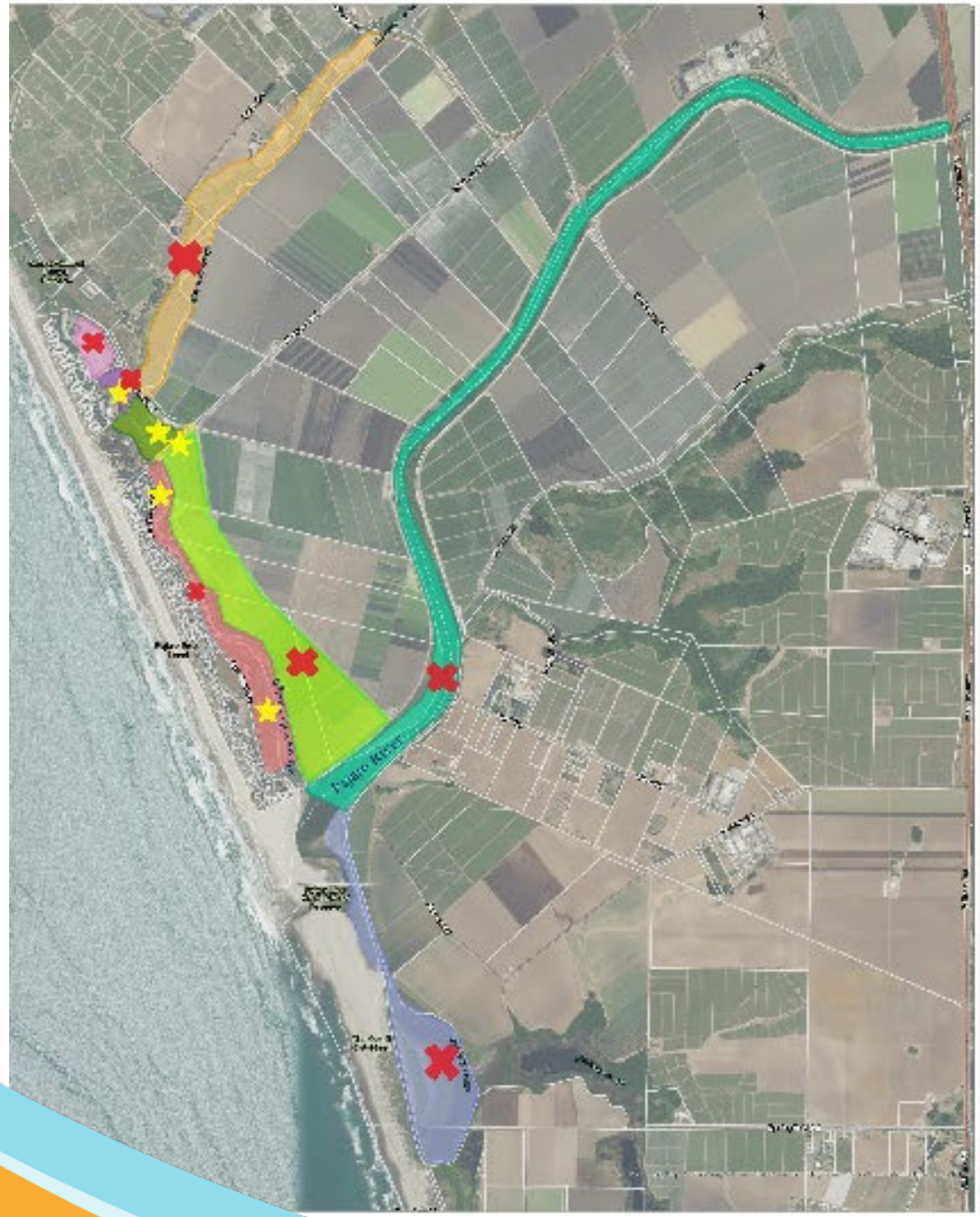

MEASURE SCREENING

Screening Criteria Considered:

- **Effectiveness**
  - Does it meet objectives
- **Efficiency**
  - Cost-efficiency
- **Acceptability**
  - Is it legal/permittable?
- **Real Estate Availability**
  - Are there willing landowners?
- **Scope of Project**
  - Total project cost approx. $14M or less)
- **Environmental Impacts**
  - Are there unavoidable env impacts?

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RETAINED MEASURES

	Final Array of Measures
	County Owned Land
	State Park Owned Land
	Lower Mile
	Road Raise: Shell Road

TENTATIVELY SELECTED PLAN: ALT 6

The PDT identified Alternative 6 as the NER Plan and the plan that reasonably maximizes comprehensive benefits

Alternative 6 costs $4,200,000 and is implementable within the CAP limits.

Alternative 6 has no known "show stoppers" for real estate, though the State parcels will require NSE.

Alternative 6 does not require a policy waiver and is supported by the NFS

- The Beach Road raise is designed with open-bottom culvert to facilitate fisheries benefits now and in the future.
- The Beach Road raise will change the lagoon breaching threshold from 8ft NAVD to 9.2ft NAVD, allowing higher and longer lagoon closure events that contribute to the natural hydrology of the marsh.
- The change in hydrology will return 2.7 acres of the 4.8-ac County Parcel that had been "high and dry" to marsh hydrology, affecting 56% of parcel. It will return 5.5 acres of the 13.4-ac State Parks parcel from "high and dry" to marsh hydrology, affecting 40% of parcel.
- Exotic and xeric plants will be removed from the marsh plain and the formerly "high and dry" areas will be planted with native marsh species.

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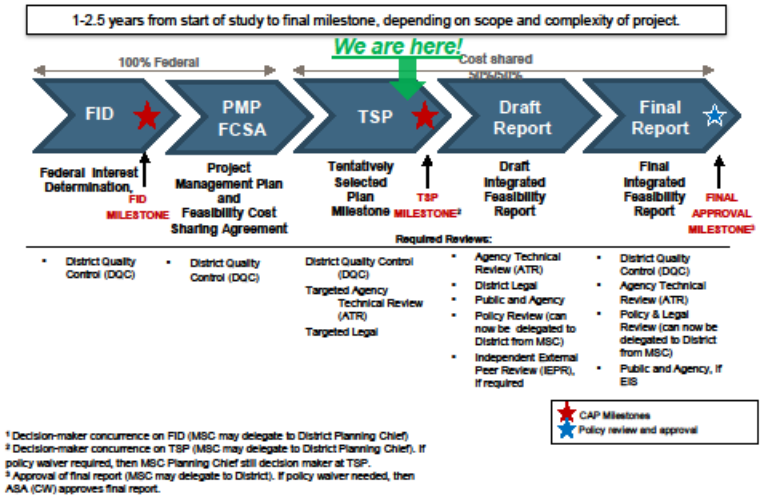
CONCEPTUAL TIMELINE OF CAP PROCESS



¹ Decision-maker concurrence on FID (MSC may delegate to District Planning Chief)
² Decision-maker concurrence on TSP (MSC may delegate to District Planning Chief). If policy waiver required, then MSC Planning Chief still decision maker at TSP.
³ Approval of final report (MSC may delegate to District). If policy waiver needed, then ASA (CW) approves final report.

CAP Project's Two-Phased Process

Phase 1: Feasibility ← ***Currently in the phase***

- Cost-shared 50/50 with non-Federal partner
- Access the problem; develop objectives and constraints
- Formulate measures, alternatives
- Evaluate and compare alternatives
- Agency, public, stakeholder, Tribal coordination
- Determine the "tentatively selected plan" (TSP)
- Final report includes selected plan, environmental compliance, preliminary design
- Generally, produces 20-35% designs

Phase 2: Design and Implementation ← ***Hope to be in this phase in 2024/2025***

- Cost-shared 75/25 with non-Federal partner
- Develop 100% designs; construction, monitoring, adaptive management
- Sponsor is responsible for obtaining necessary lands, easements, rights, of way, etc.
- Once complete, project turned over and non-federal sponsor responsible for operation and maintenance

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Beach Road Crossing

Figure 9. Beach Road Crossing at Watsonville Slough – view

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Pajaro Dunes Hybrid Approach: Improving dunes and beach; protecting homes

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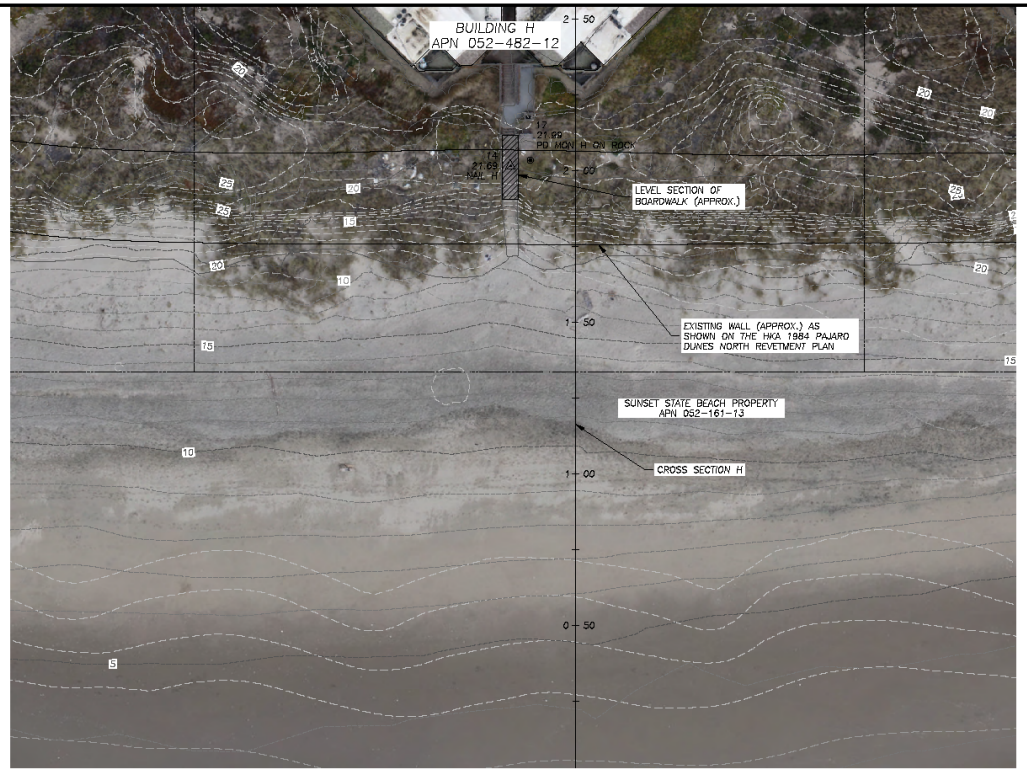
Photograph 1: Pajaro Dunes North Rip-rap Revetment Under Construction in 1983

Photograph 2: Pajaro Dunes North Rip-rap Revetment Under Construction in 1983

Pajaro Dunes North
101 Shell Road
Evaluation of Frontal Dunes and Coastal Hazards
27 May 2021

Photograph 3: Pajaro Dunes North Rip-rap Revetment Under Construction in 1983

Photograph 4: Pajaro Dunes North Rip-rap Revetment and Stairway Under Wave Impact after Construction in 1983

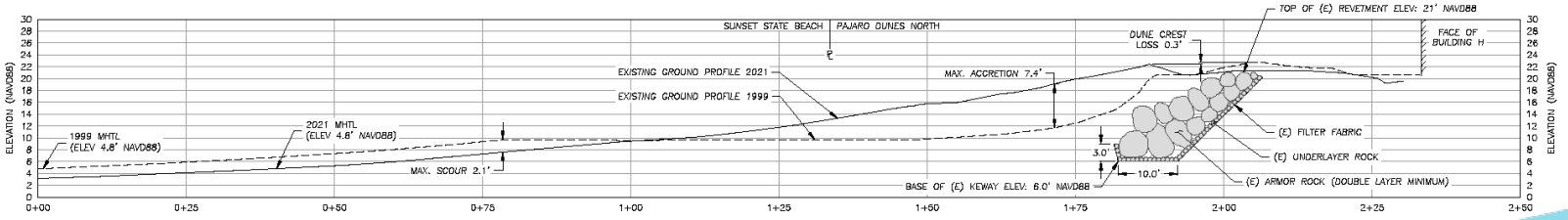


0 10 20 40
SCALE: 1" = 20'

BUILDING H SITE PLAN
SCALE: 1" = 20'

LEGEND

15 / 14	EXISTING CONTOURS 2021
15 / 14	EXISTING CONTOURS 1999
	PROPERTY LINE (APPROX.)
1 21.45 NAIL A	SURVEY CONTROL POINT (PT#, EL NAVD88, DESCR)
2 23.19 PD MON A	ROCK REVETMENT MONUMENT (PT#, EL NAVD88, DESCR)



PROFILE H
SCALE: 1" = 10'

DRAFT

DATE	REVISION	BY

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BUILDING H SITE PLAN AND PROFILE
PAJARO DUNES NORTH
EVALUATION OF FRONTAL DUNES AND COASTAL HAZARDS
SHORECREST CONDOMINIUMS
SHELL ROAD, WATSONVILLE, CA 95076

PROJECT: SC2361
DATE:

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After the Storms: 1998

higher elevations, likely with greater force, with less time for the dune to rebuild itself by dune sand deposition. Eventually, modifications to the revetment similar to those recommended in our 2000 report will be needed. Hopefully, the successful dune growth will postpone when that is needed.

Beach Access Stairs

It is more likely that the beach access stairs will be damaged than the revetment, since they extend further seaward than the revetment and thus are more vulnerable. Photos of historical damage are shown below:

Photograph 6: February 12, 1998 Photograph at Building H Stairway

After the Storms: 2023

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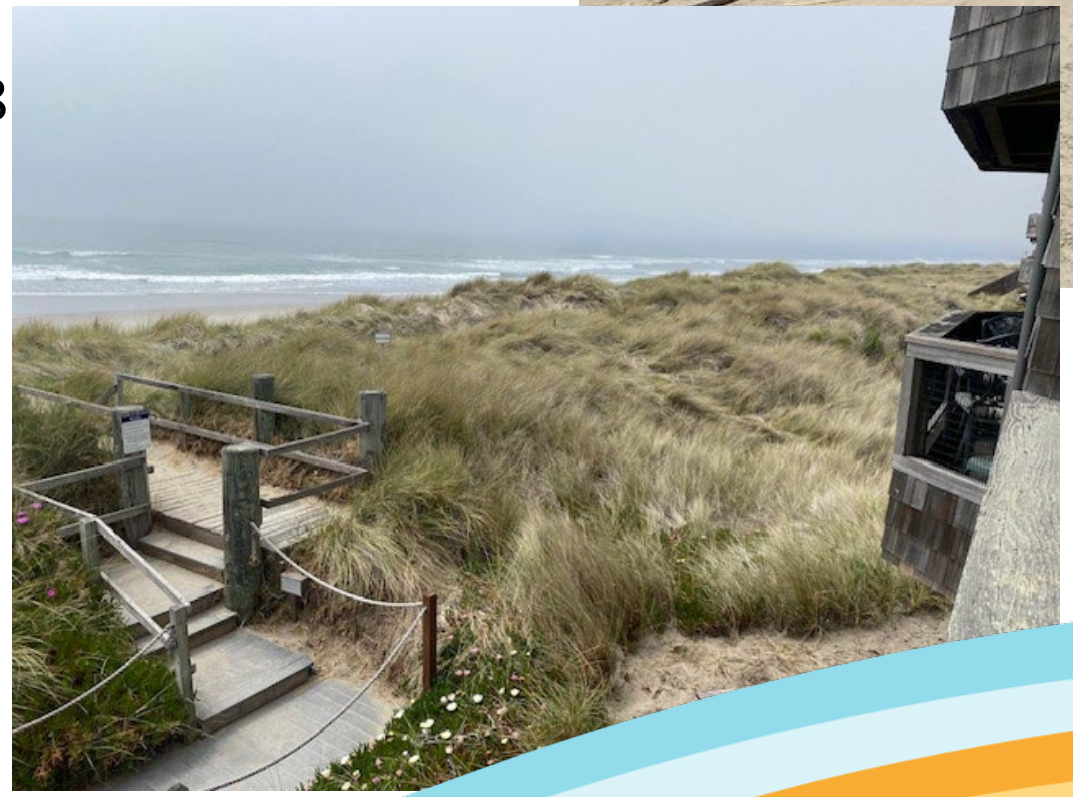
Pajaro Dunes Sand Accretion: Stewardship in tune with nature

- Net change in sand volume was an increase of 26,882 cubic yards between 1998 and 2021
- Net accretion of 12.13 cy per linear foot of oceanfront
- Annual average of 14.24 cubic feet



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Sea Level Rise: Context and Perspective

Pajaro Dunes: Historic sea level rise

West Cliff Dr (Santa Cruz): Variable storm impacts

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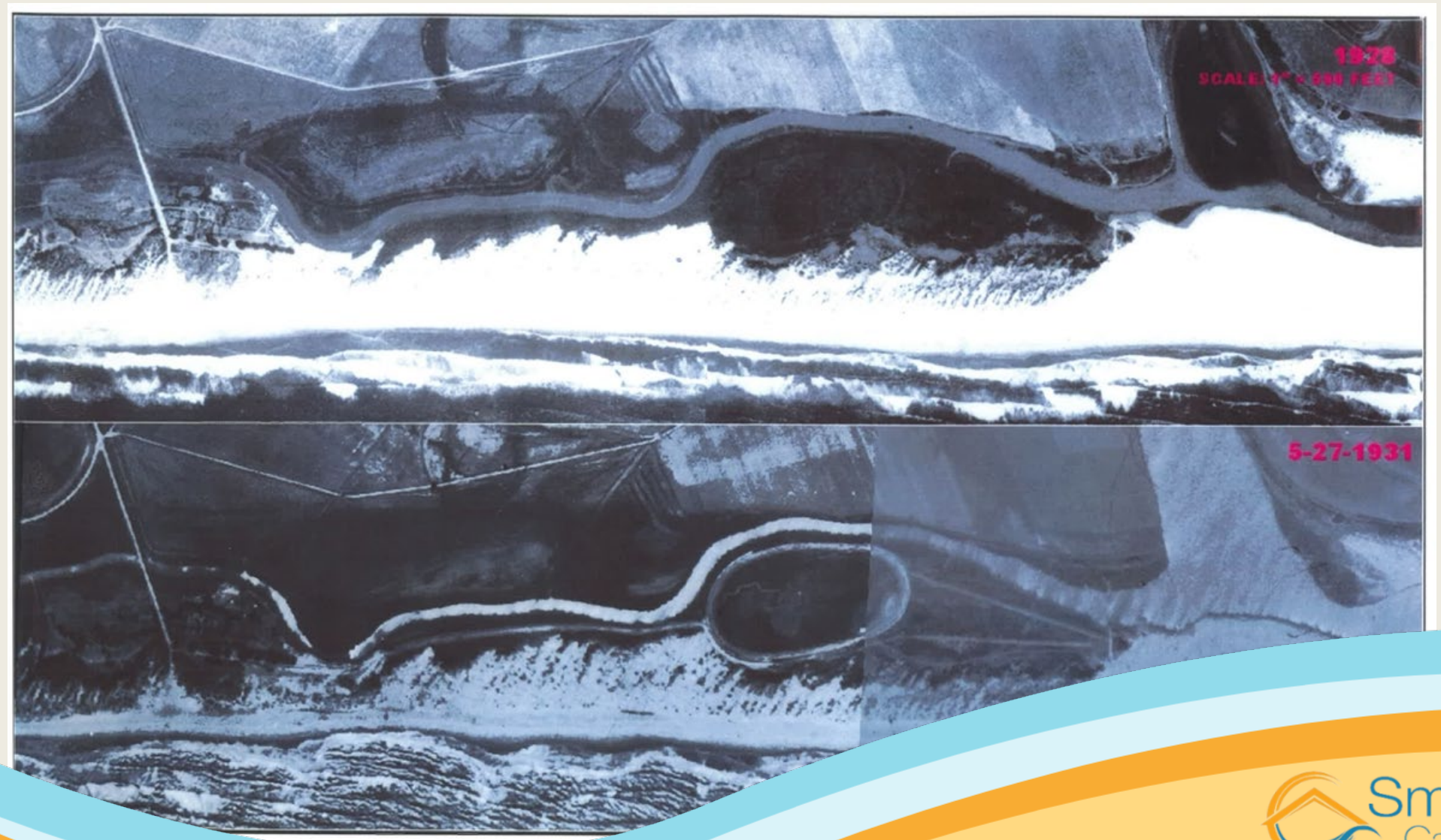
Time Series: 1928-1931



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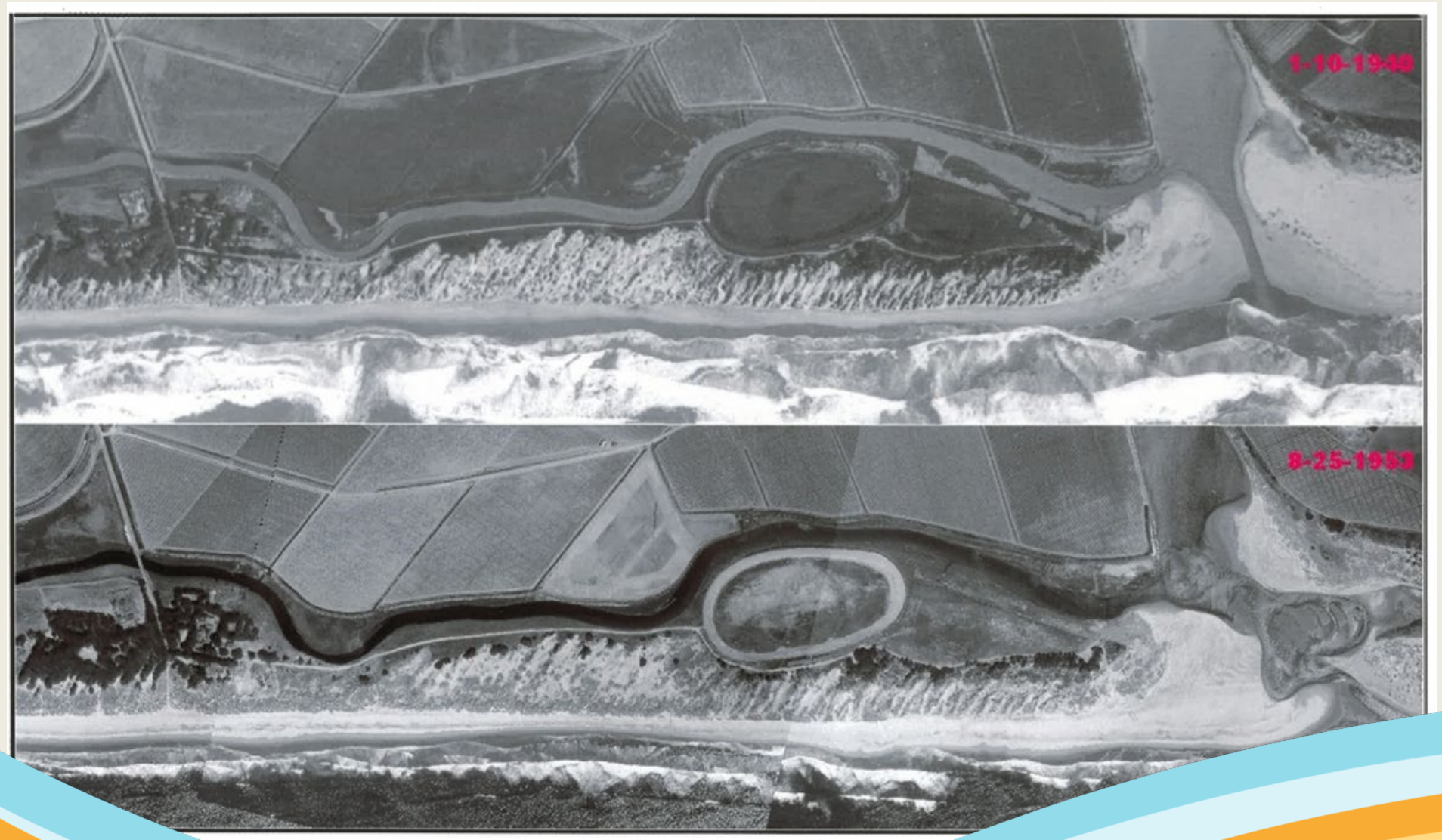
Time Series 1940-1953



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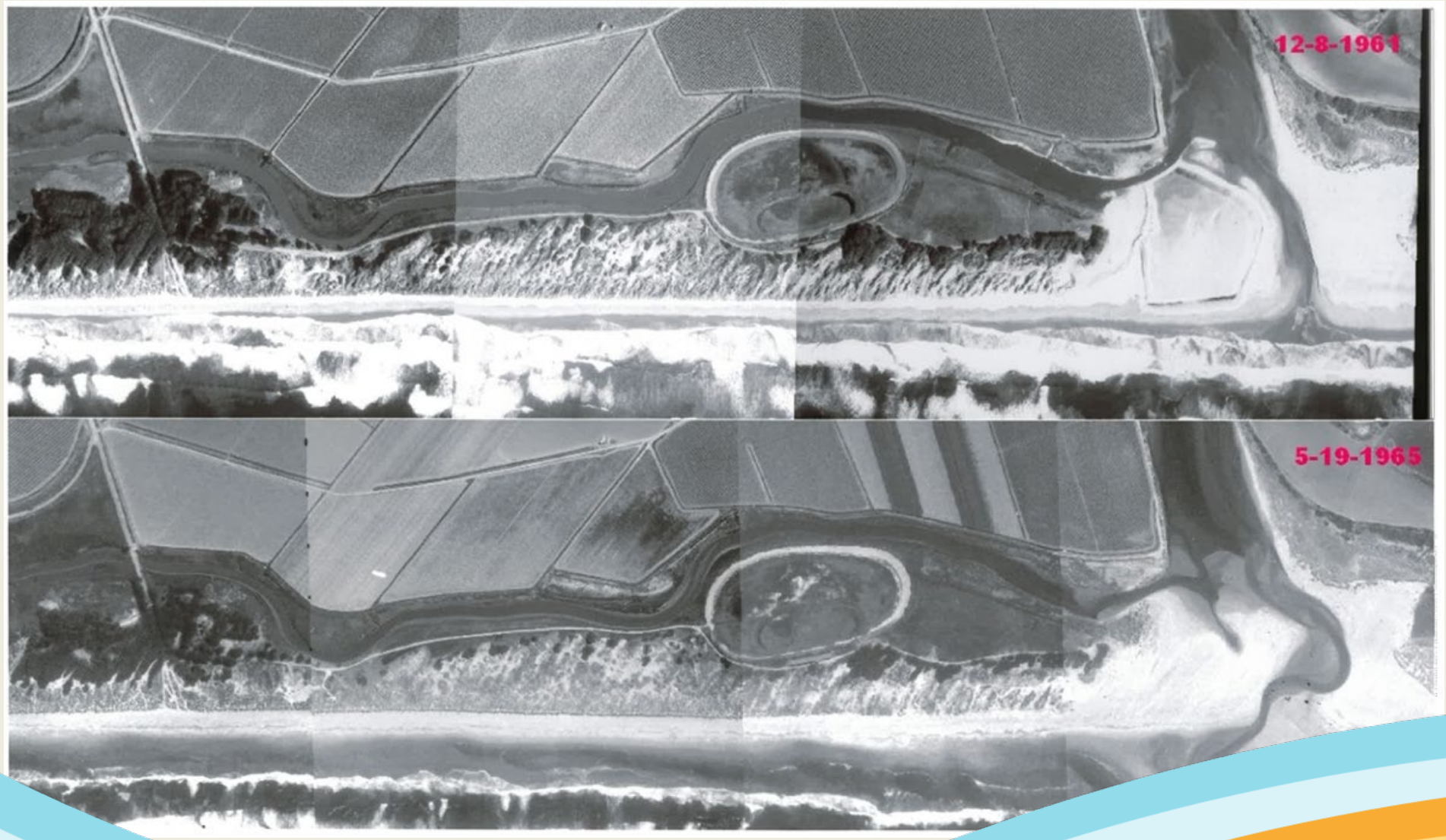
Time Series: 1961-1965



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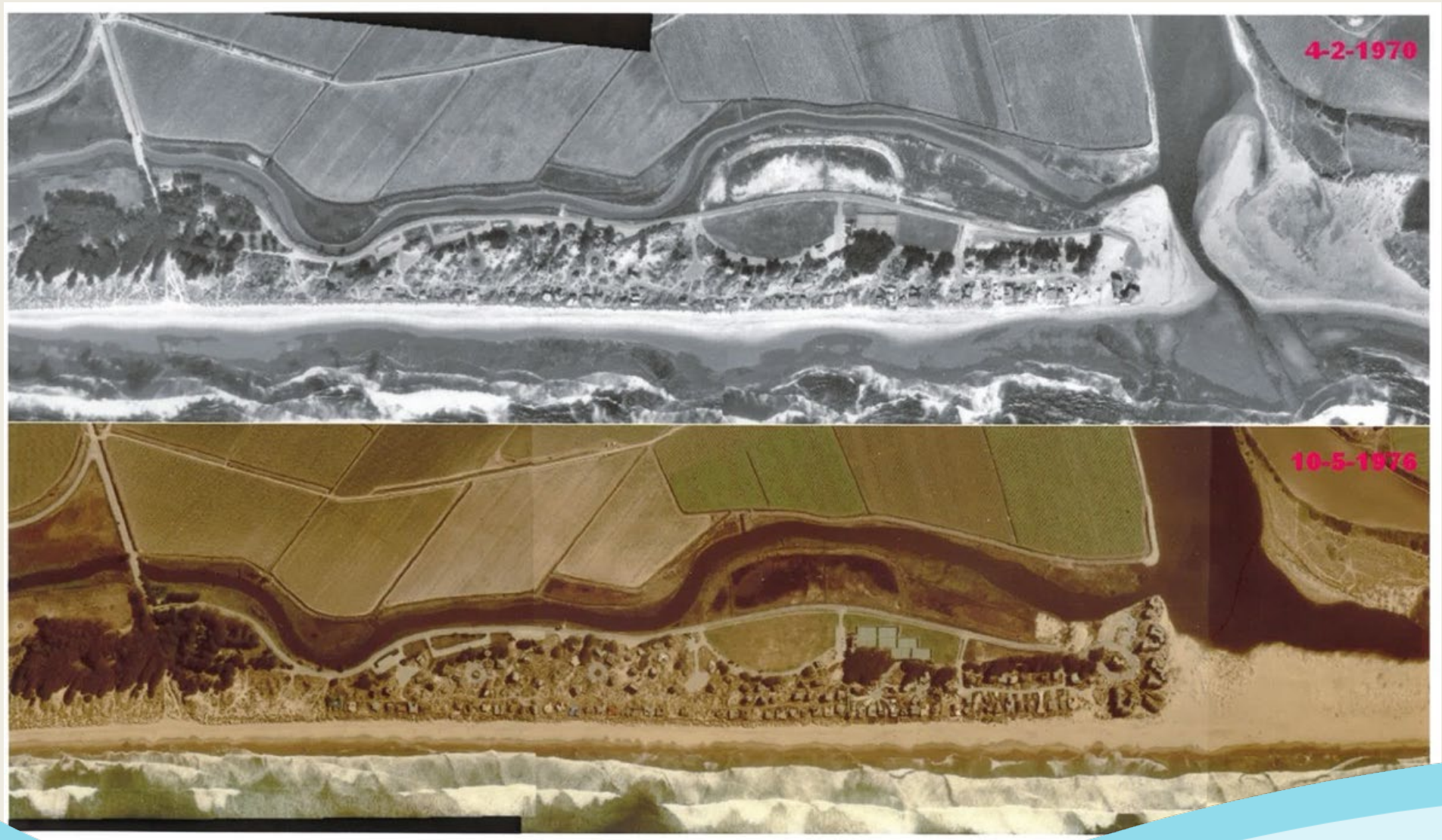
Time Series: 1970-1976



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Time Series: 1984-2001

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Time Series: 2010-2021

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West Cliff Dr. storm damaged area: low point at Woodrow Ave.

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West Cliff Dr.

Temporary fix: planning underway

The other 2 plus miles: did fine and doing fine

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Other areas: stable for decades

Old fence on W. Cliff

UCSC Marine Science campus

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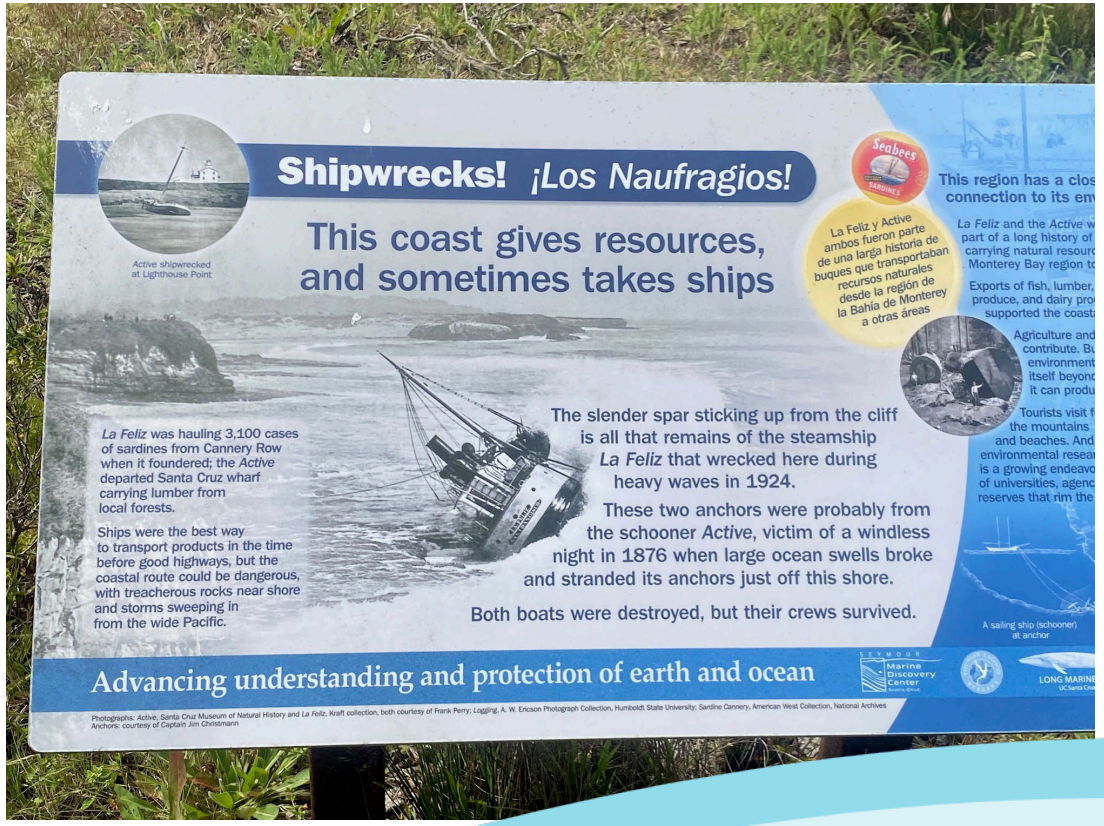
La Feliz mast: 99 years and counting



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Takeaways

- Doesn’t have to be a zero-sum game
- Keep perspective (avoid doom loop thinking)
- Focus in, localize
- Pragmatic solutions, not miracles

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Well, yes, to Smokey Robinson and The Miracles, for inspiration ….

“My momma told me….you better shop around!”

Life partnering with the coast:

- Start with awareness, knowledge
- Seek compatibility between built and natural environment; respect for both
- Be flexible/creative: responsive to change (phased approaches)

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PLANNING FOR BETTER OUTCOMES