



South Bay Salt Pond Restoration Project

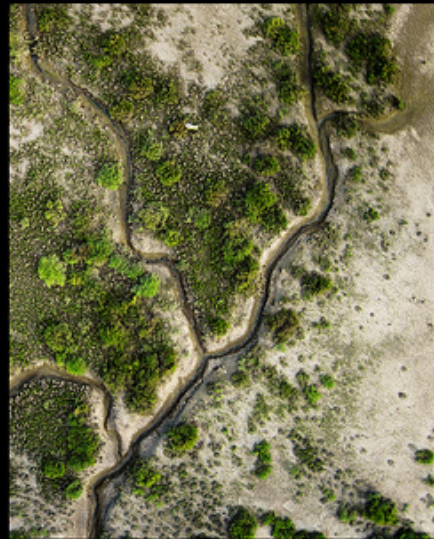
Restoring the Wild Heart of the South Bay



April 2008



September 2009



May 2010



October 2010

SALT POND A21 SOUTH BAY SALT POND RESTORATION PROJECT

Kite aerial photographs of a small channel in the northeast corner following the 2006 breach to tidal flow. Field of view is ~ 120 feet. . C. Benton

TAC Meeting, 1 August 2017

Today's Agenda

10:35 - Peer Review: Phase 1 Evaluation

12:15 - Lunch

1:00 - Input: Phase 2 Science Approach

3:50 - Summary, Looking Forward

Context for the Day

2003 Transfer: A Public/Private Partnership

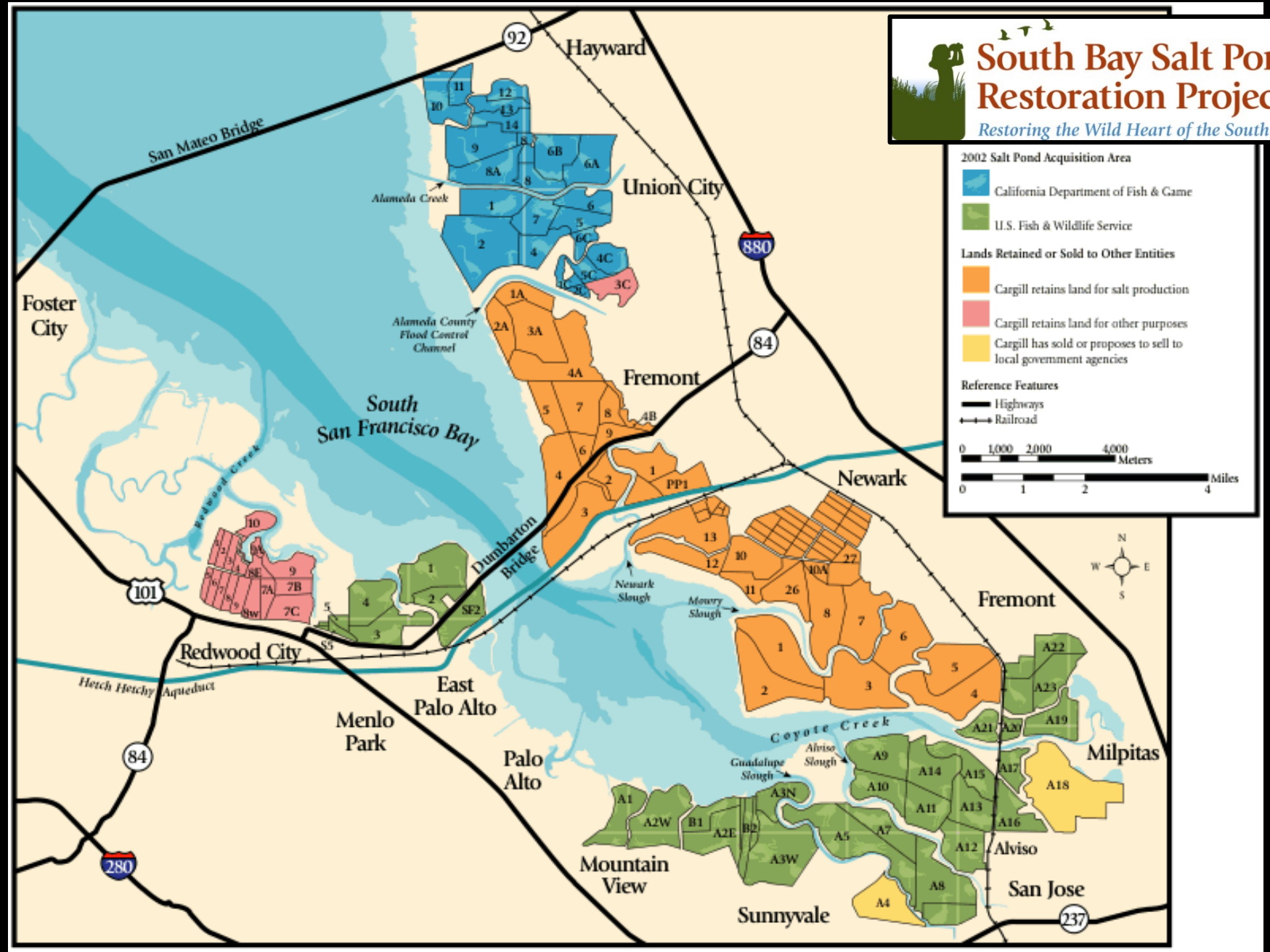
- 16,500 acres
 - 15,100 in South Bay
 - 1,400 along Napa River





South Bay Salt Pond Restoration Project

Restoring the Wild Heart of the South Bay





Key uncertainties

- ▣ Wildlife use of changing habitats
- ▣ Habitat evolution and sediment dynamics
- ▣ Mercury methylation
- ▣ Water quality
- ▣ Invasive species
- ▣ Public access
- ▣ Infrastructure support
- ▣ Sea level rise and climate change



Ecological Trade-offs

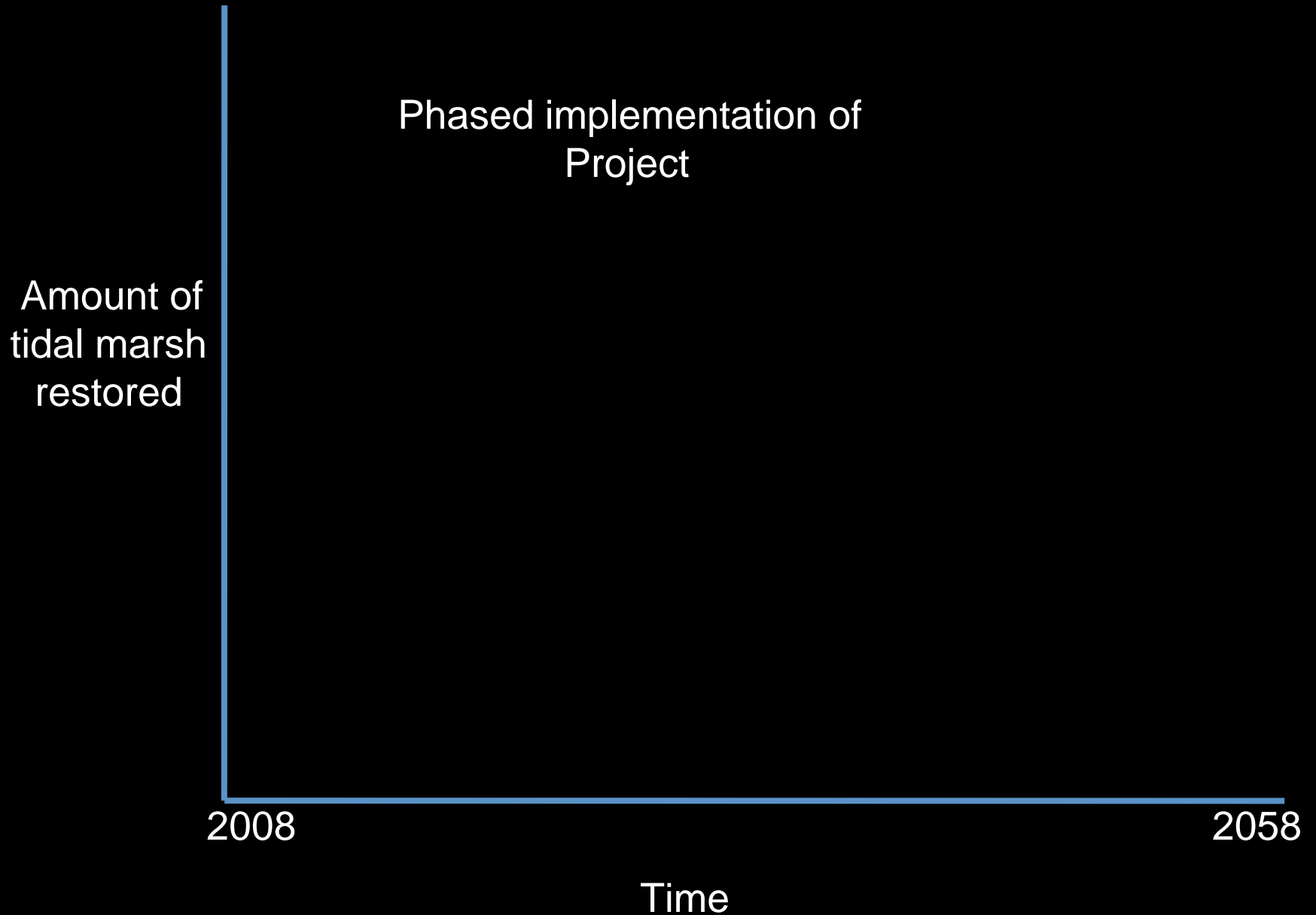
▣ Tidal Marsh species vs. Salt Pond species



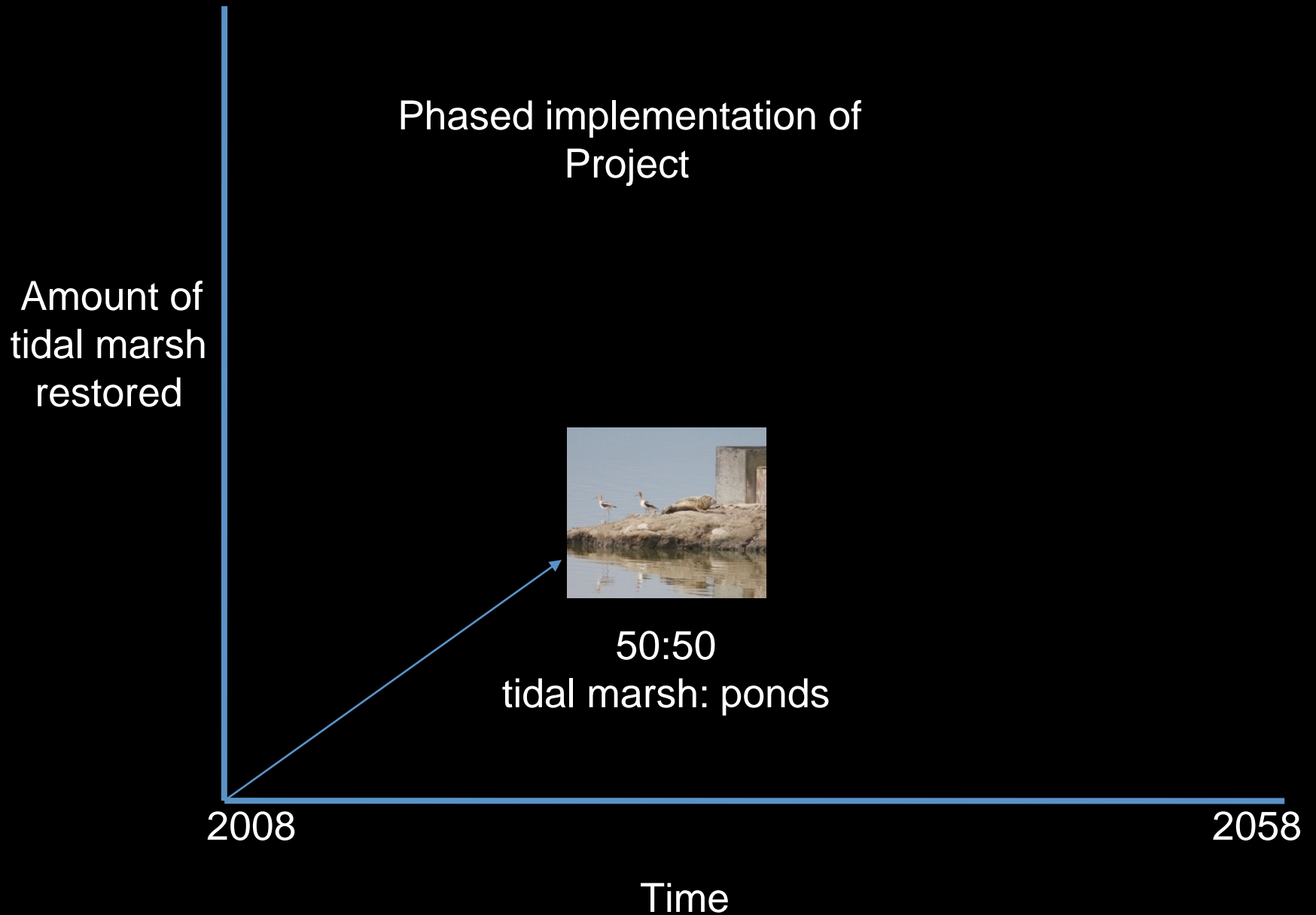


January
2006

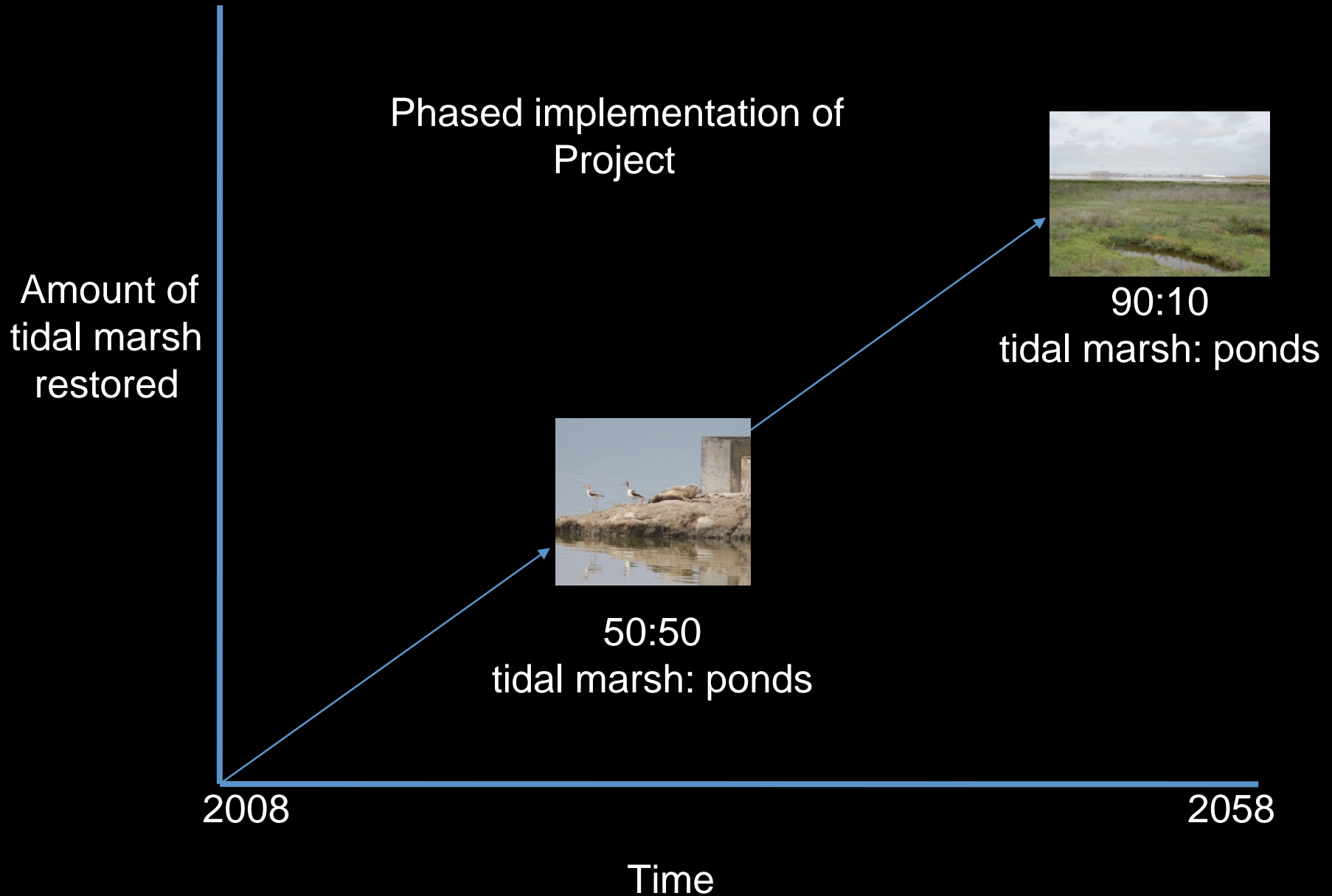
Adaptive Management Restoration

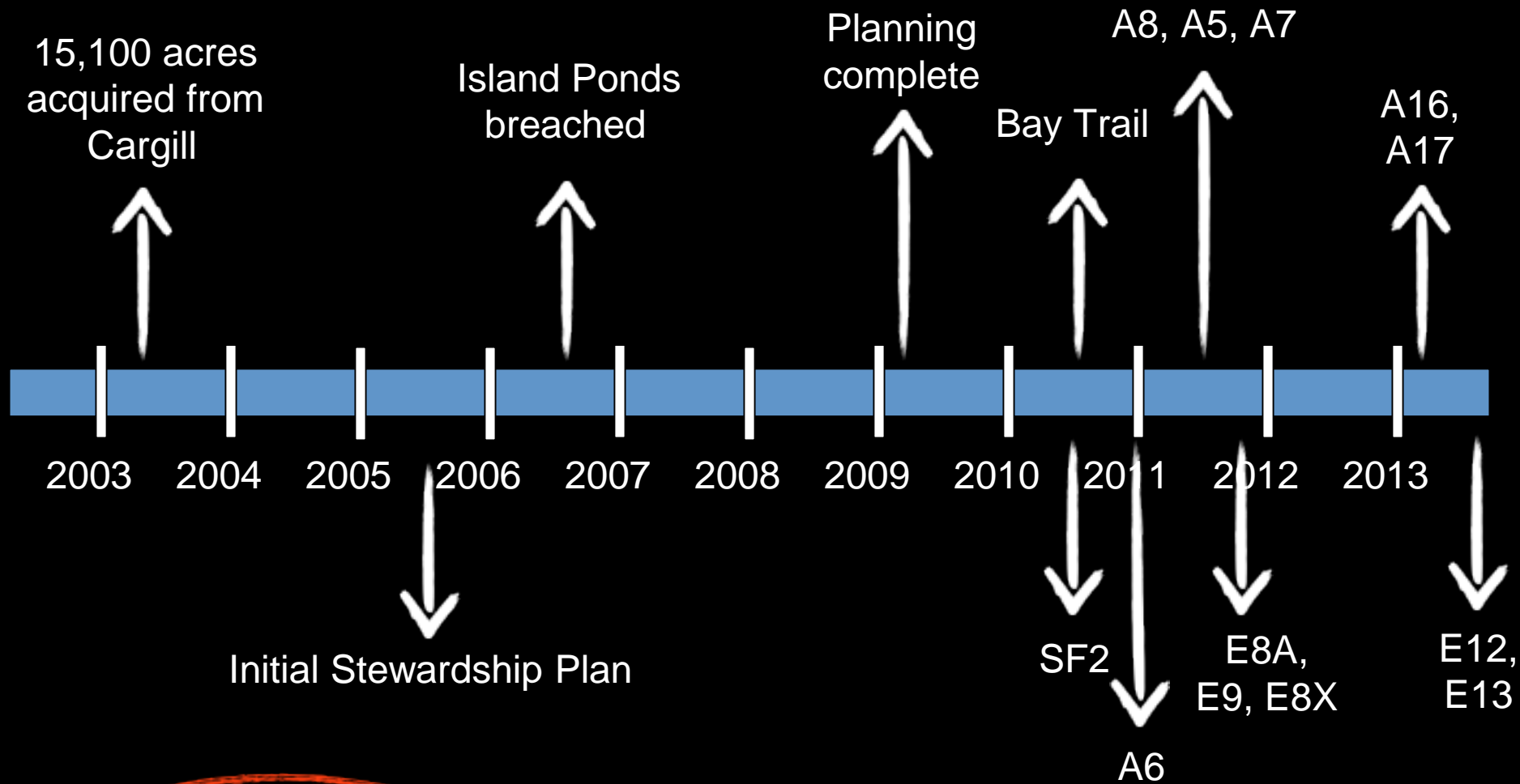


Adaptive Management Restoration



Adaptive Management Restoration





Restored to Date

Tidal: 1,600 ac

Muted Tidal: 1,440 ac

Reconfigured Ponds: 710 ac

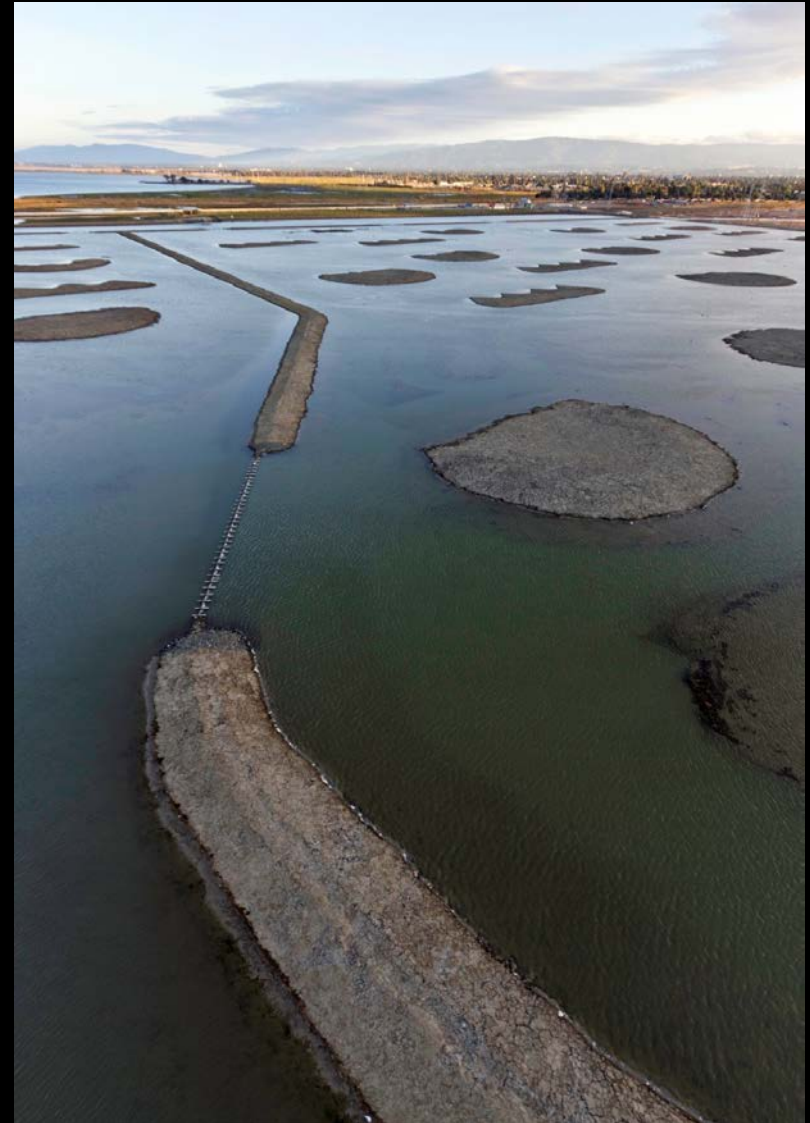
Total: 3,750 ac

New Trails: 7 miles



1,600 acres tidal restoration
1,440 acres muted tidal

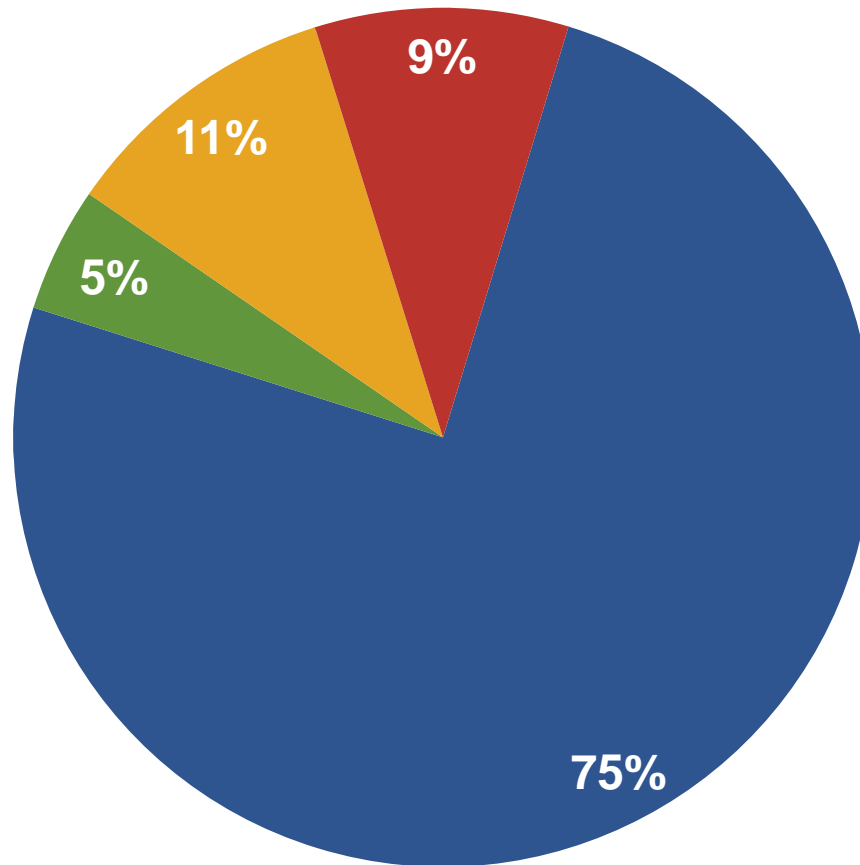
710 acres reconfigured ponds



7 miles of new trails



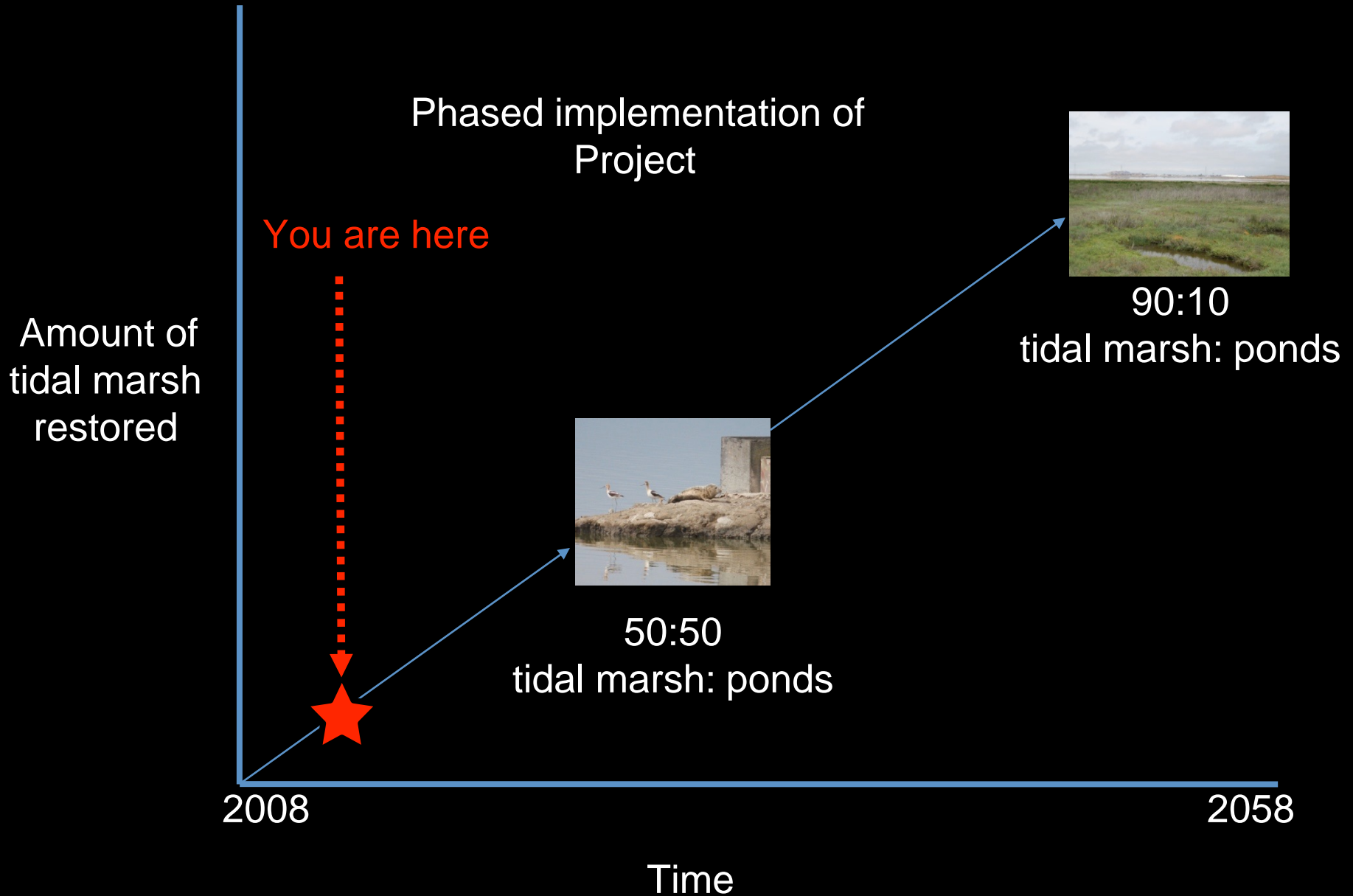
SBSPR Phase 1



■ Managed Ponds
■ Tidal Restoration

■ Reconfigured Ponds
■ Muted Tidal

Adaptive Management Restoration



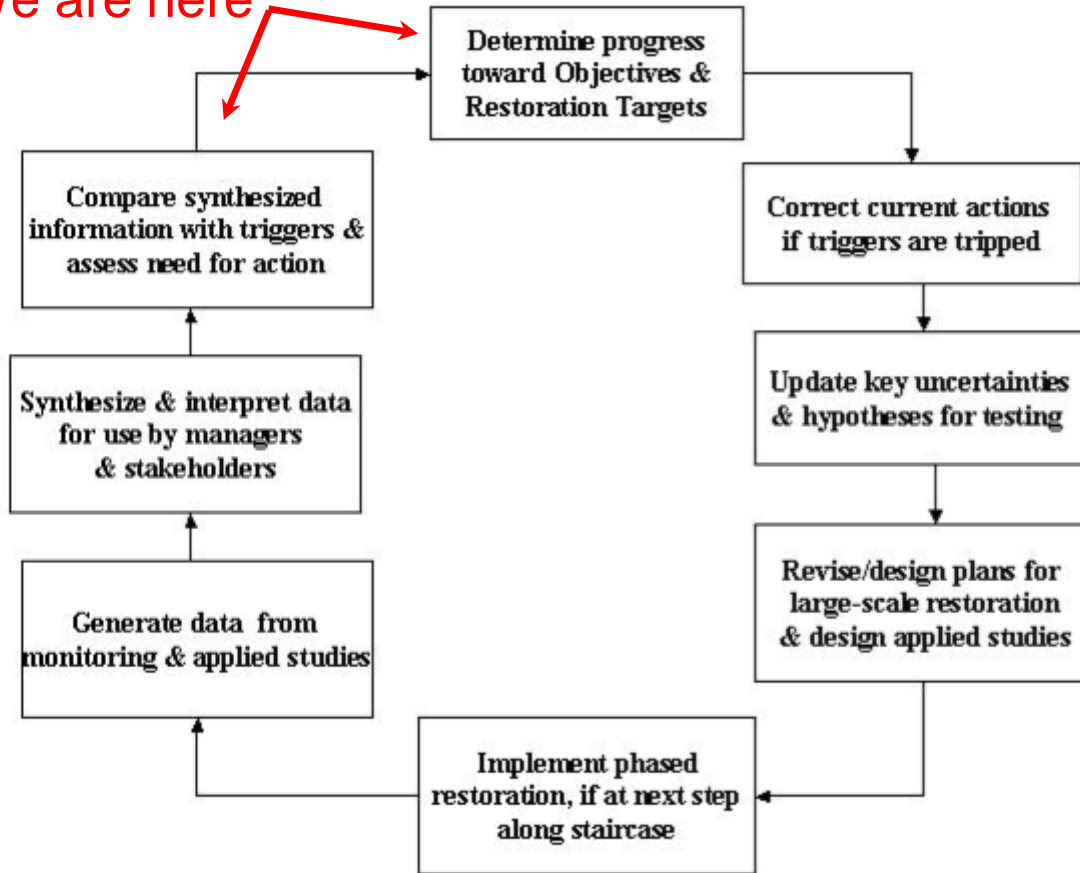
Phase 1 Review & Assessment

Draft Phase 1 Science Summary

- Your views on this approach for memorializing 10 years of science?
- Did we evaluate accurately?
- Any other suggestions?

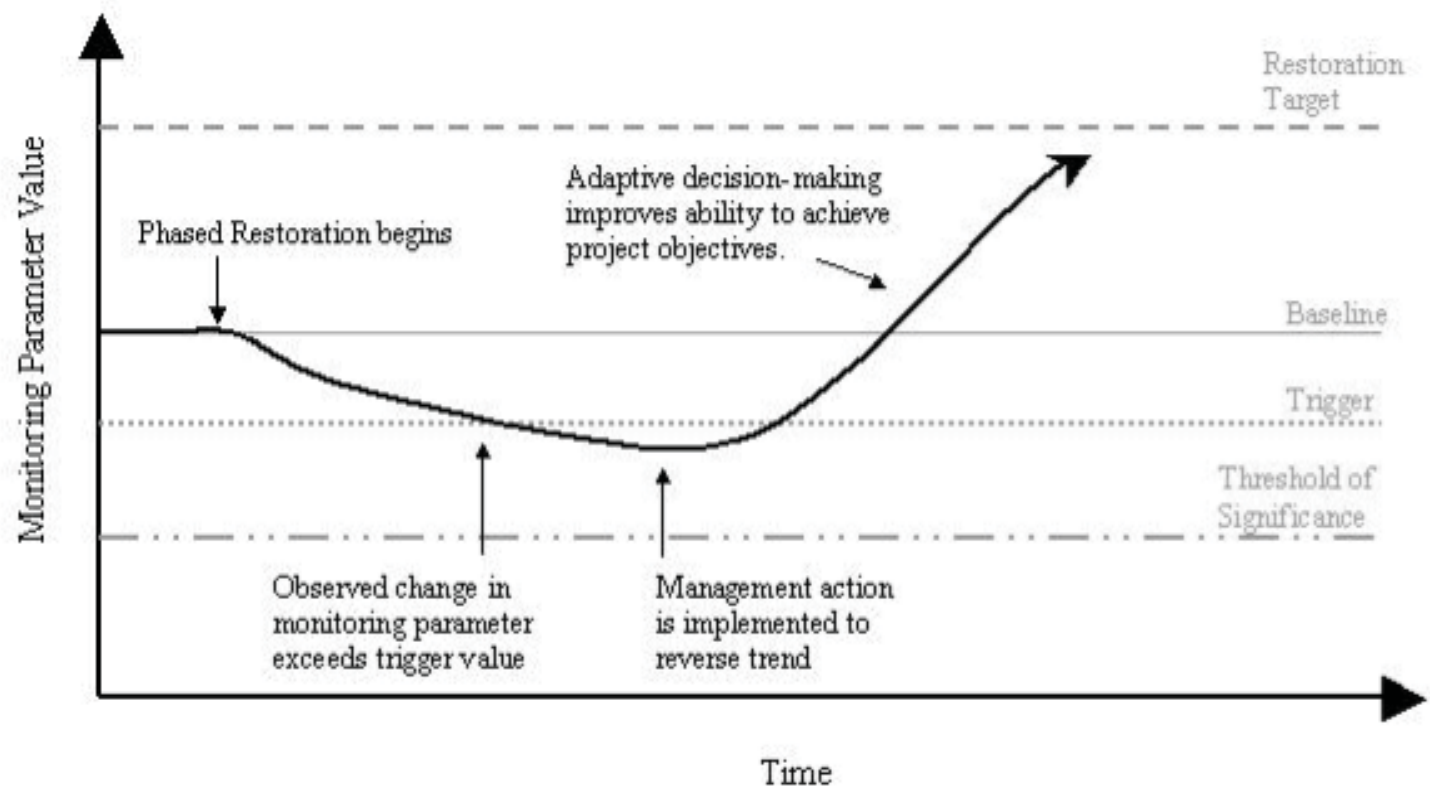
Phase 1 Stoplight Chart: Assessing Trends, Targets, Triggers

We are here



Start of Phase 1

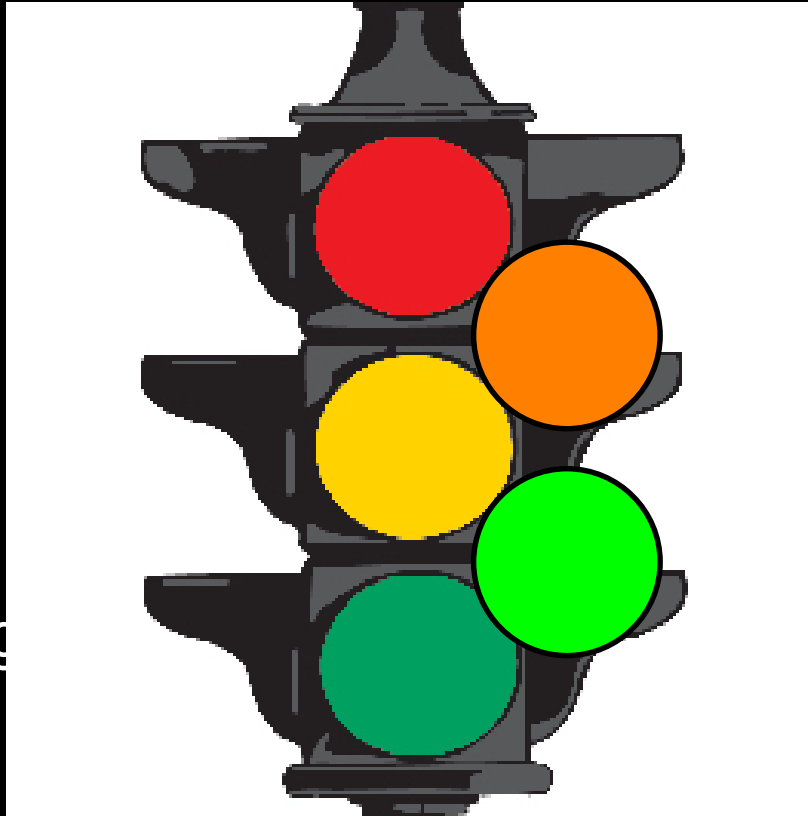




Not Meeting
Expectations

Uncertain

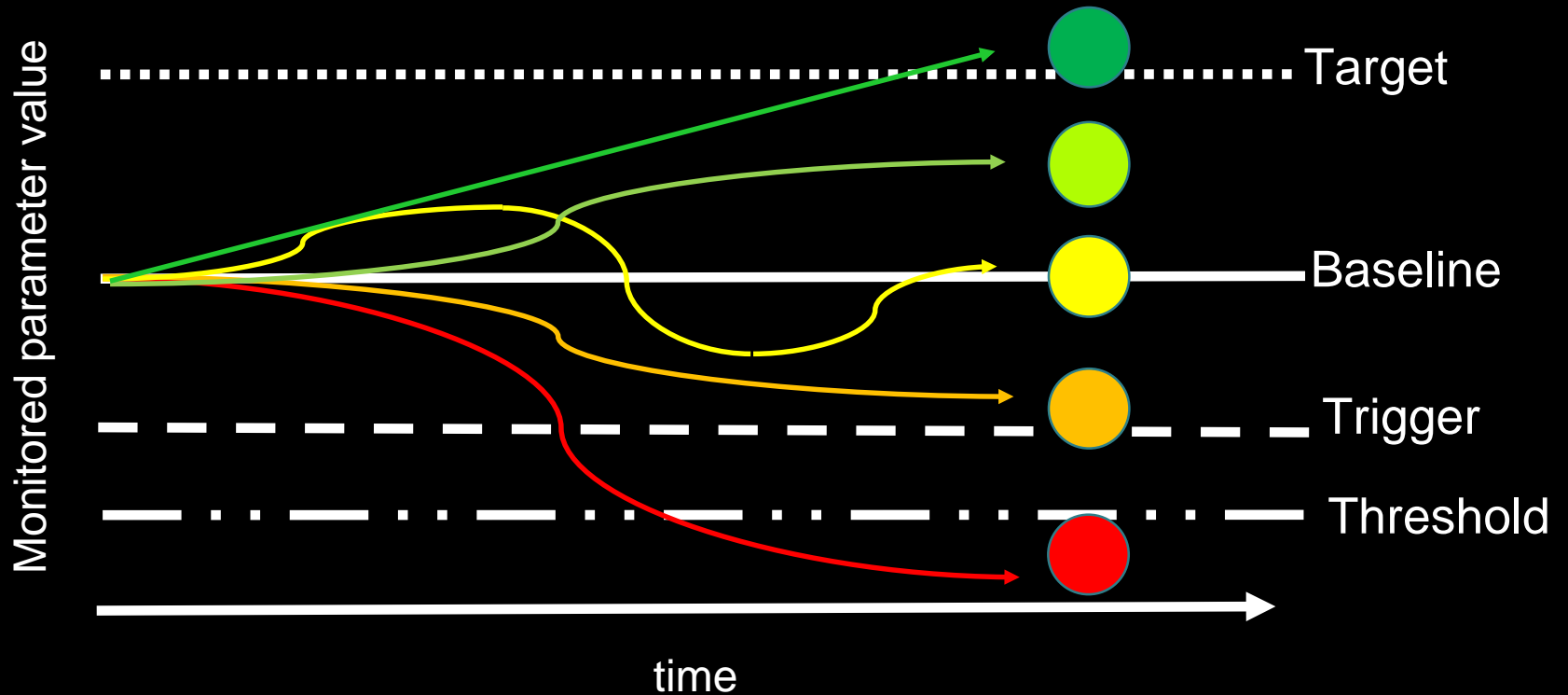
Meets/Exceeding
Expectations



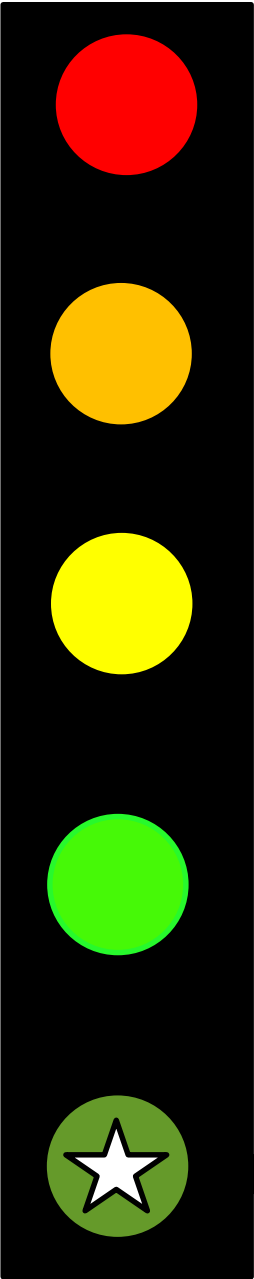
Trending Negative

Trending Positive

Expanded stoplight and triggers/targets

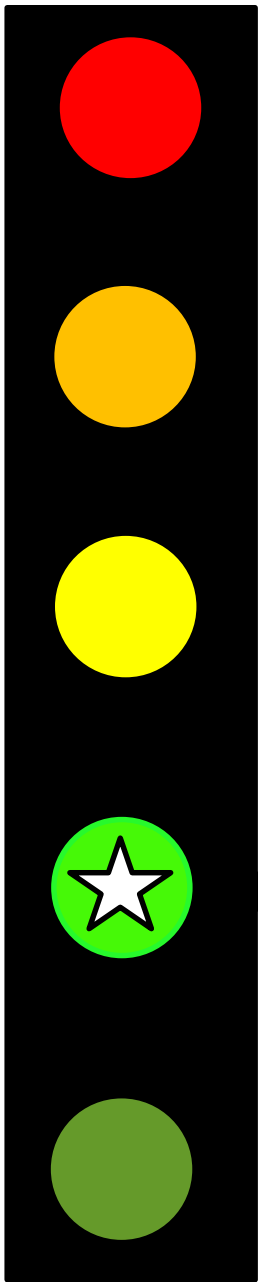


Meets/Exceeding Expectations



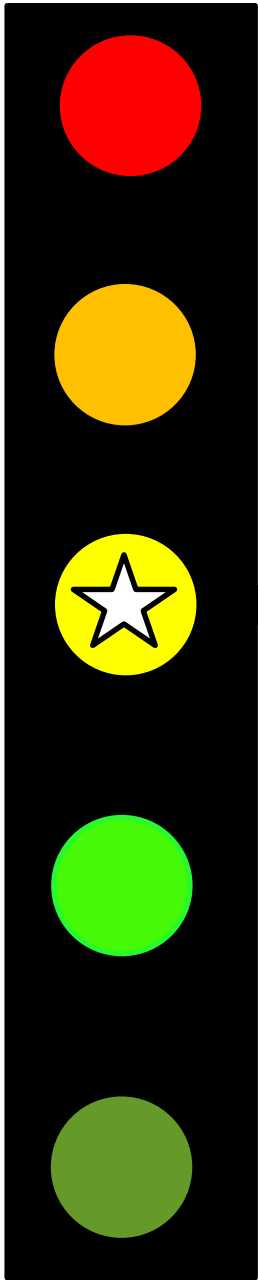
- Marsh Accretion Rates
- Snowy Plovers

Trending Positive



- Tidal Marsh Establishment
- Ridgway's Rail
- Salt Marsh Harvest Mouse
- Sediment to Support Marsh
- Sustaining Mudflats
- Long-term Hg Impacts from Pond Management
- Channel Scour and Hg
- Diving Ducks
- Ruddy Ducks
- Migratory Shorebirds
- Salt Pond Specialists
- Estuarine Fishes
- Harbor Seals
- Visitor Experience
- Species/Public Interactions

Uncertain



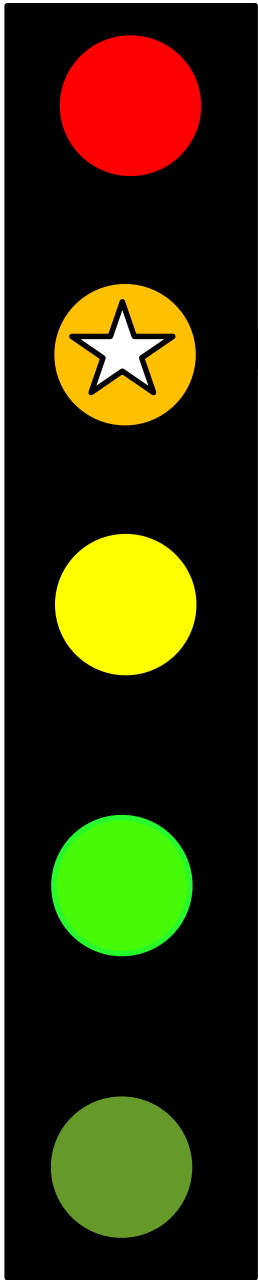
-California Gulls

-California Least Terns

-Water Quality: Regulatory Objectives

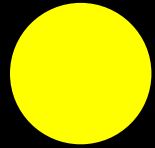
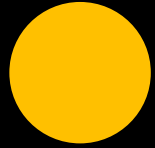
-Steelhead

Trending Negative



-Water Quality: Algal Composition

Not Meeting Expectations

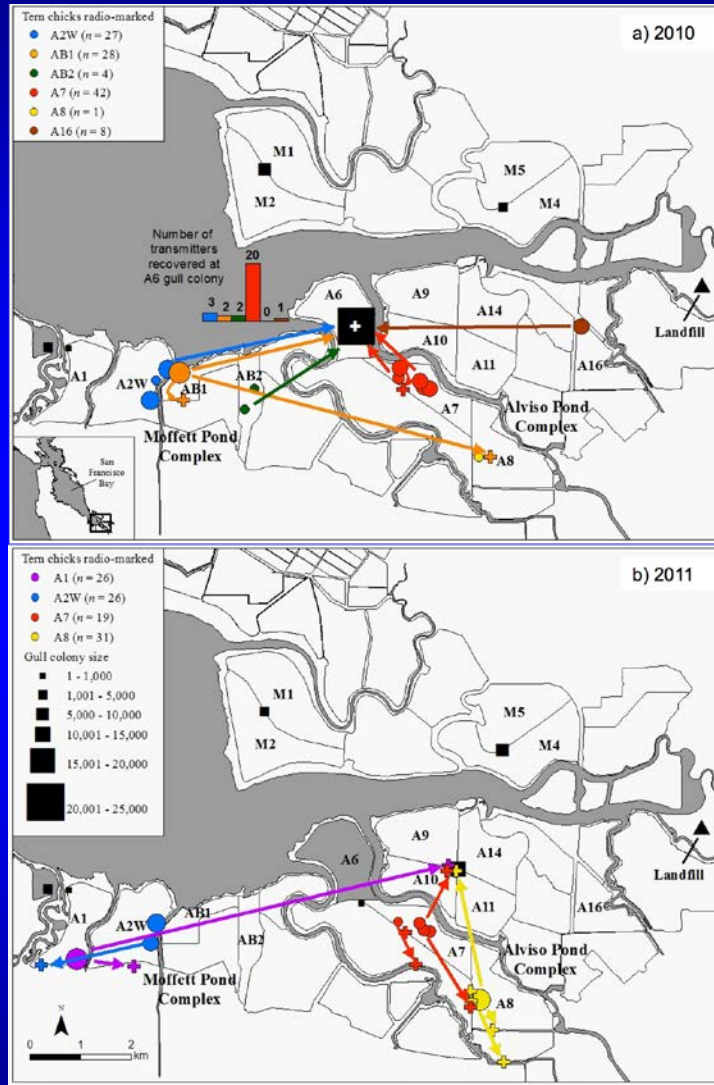


- Short-term/Construction Hg Effects
- Reconfigured Nesting Islands



Birds – CA Gull

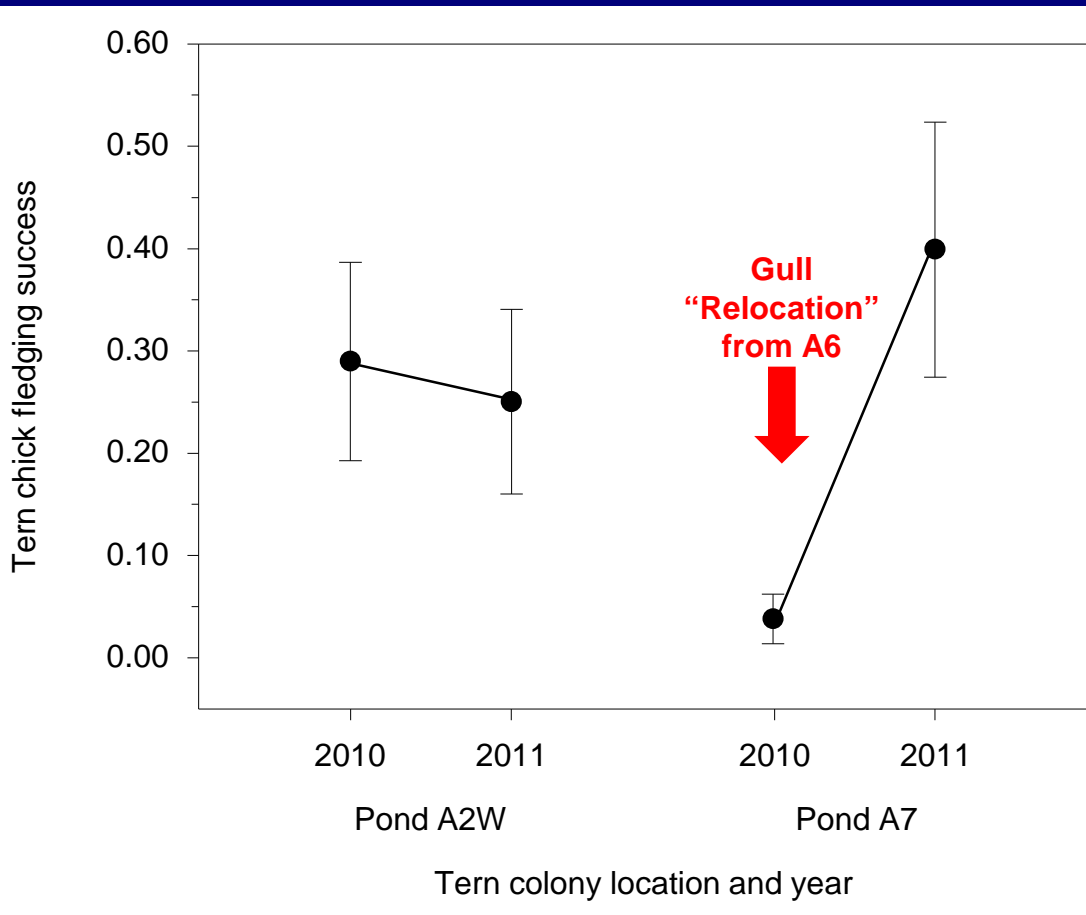
Will California gulls, ravens, and crows adversely affect (through predation and encroachment on nesting areas) nesting birds in managed ponds?



•90 tern chicks dead in gull colonies

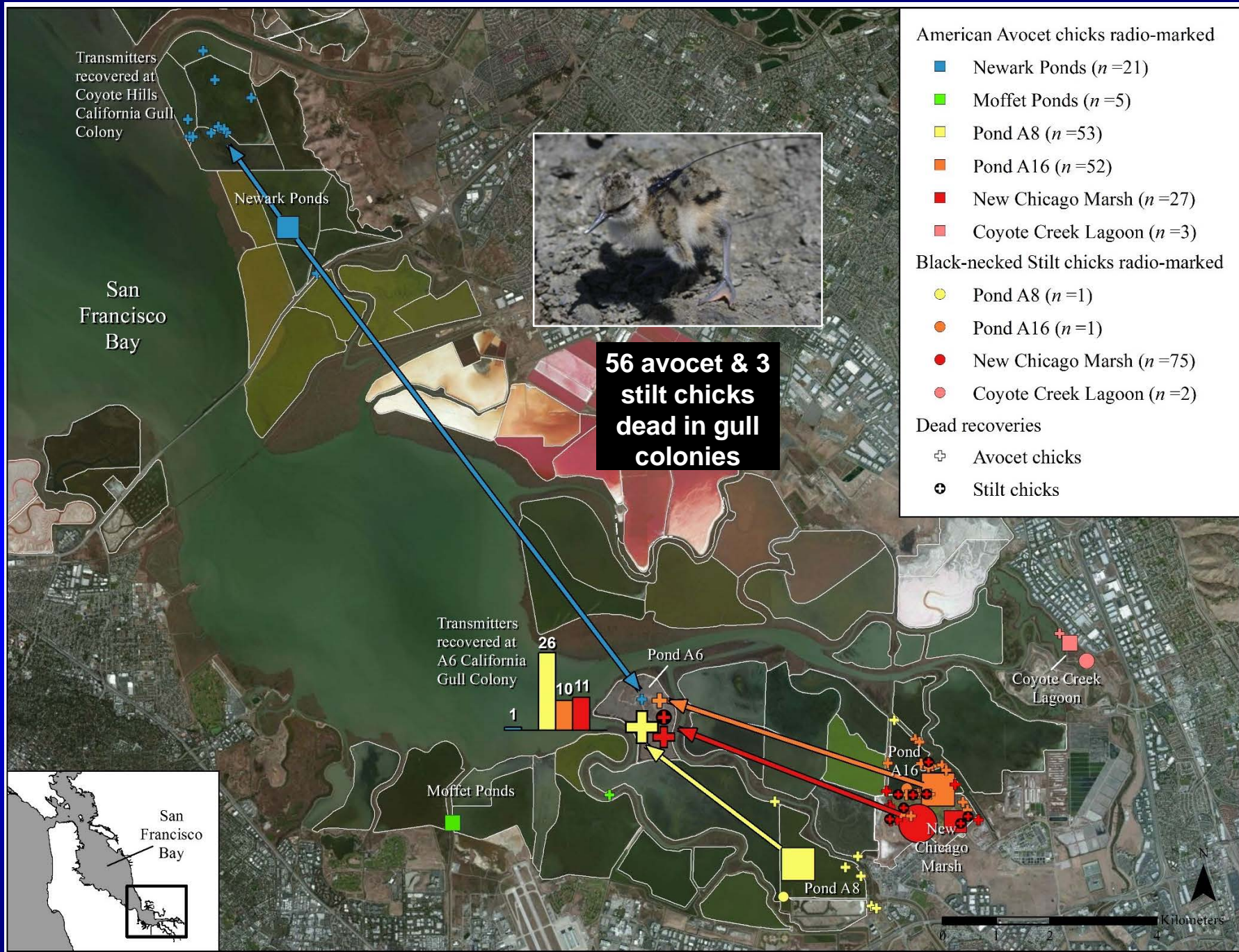
•54% of tern chick deaths caused by gulls

• Tern chick survival to fledging was 22%, which is higher than avocets (6%) but much lower than that stilts (40%)



**900%
increase
in chick
survival**





- There were 1.8 times more avocet than stilt nests, BUT stilts fledged 3.3 times more chicks
- Greater production by stilts than avocets caused by greater chick survival (avocet: 6%; stilt: 40%), and not differences in clutch size (avocet: 3.84; stilt: 3.77), nest survival (avocet: 44%; stilt: 35%), or egg hatching success (avocet: 90%; stilt: 92%)
- Gulls caused 55% of avocet chick deaths, but only 15% of stilt chick deaths
- Differential use of micro-habitats reduced stilt chick's vulnerability to gull predation, because stilts nested in vegetation 2.7 times more often than avocets and vegetation height was 65% taller at stilt nests compared with avocet nests

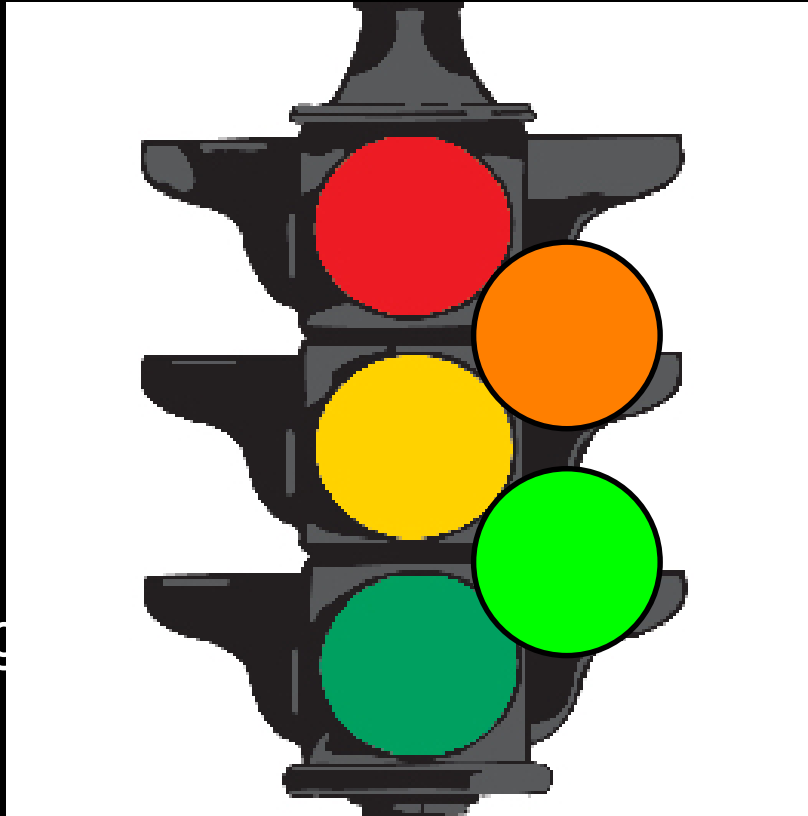
Will California gulls, ravens, and crows adversely affect (through predation and encroachment on nesting areas) nesting birds in managed ponds?

- Yes, gulls are voracious predators of waterbird chicks and eggs
- Gulls also displace birds from preferred nesting sites

Not Meeting
Expectations

Uncertain

Meets/Exceeding
Expectations



Trending Negative

Trending Positive



Birds – Western Snowy Plover

Will shallowly flooded ponds or ponds constructed with islands or furrows provide breeding habitat to support **sustainable densities of snowy plovers** while providing foraging and roosting habitat for migratory shorebirds?



photo by Vivek Khanzodé



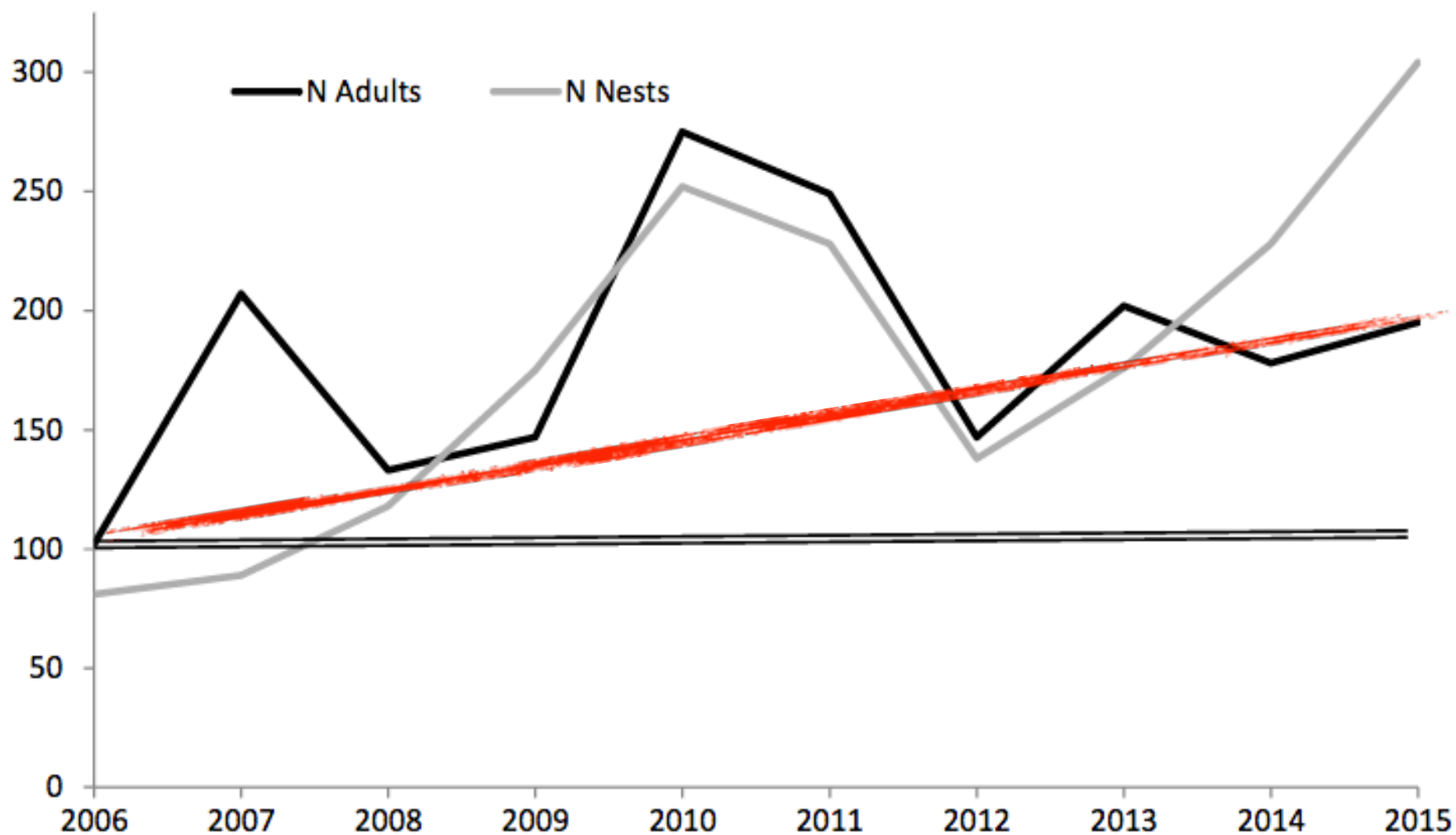


Figure 18. The total number of Snowy Plover adults counted during the breeding window survey and the total number of Snowy Plover nests counted during the season in all regularly monitored Recovery Unit 3 (RU3) areas, San Francisco Bay, from 2006-2015. The double line indicates the South Bay Salt Pond Restoration Project NEPA/CEQA baseline of 113 breeding adults in RU3, established from the average number of breeding birds from 2004-2006.

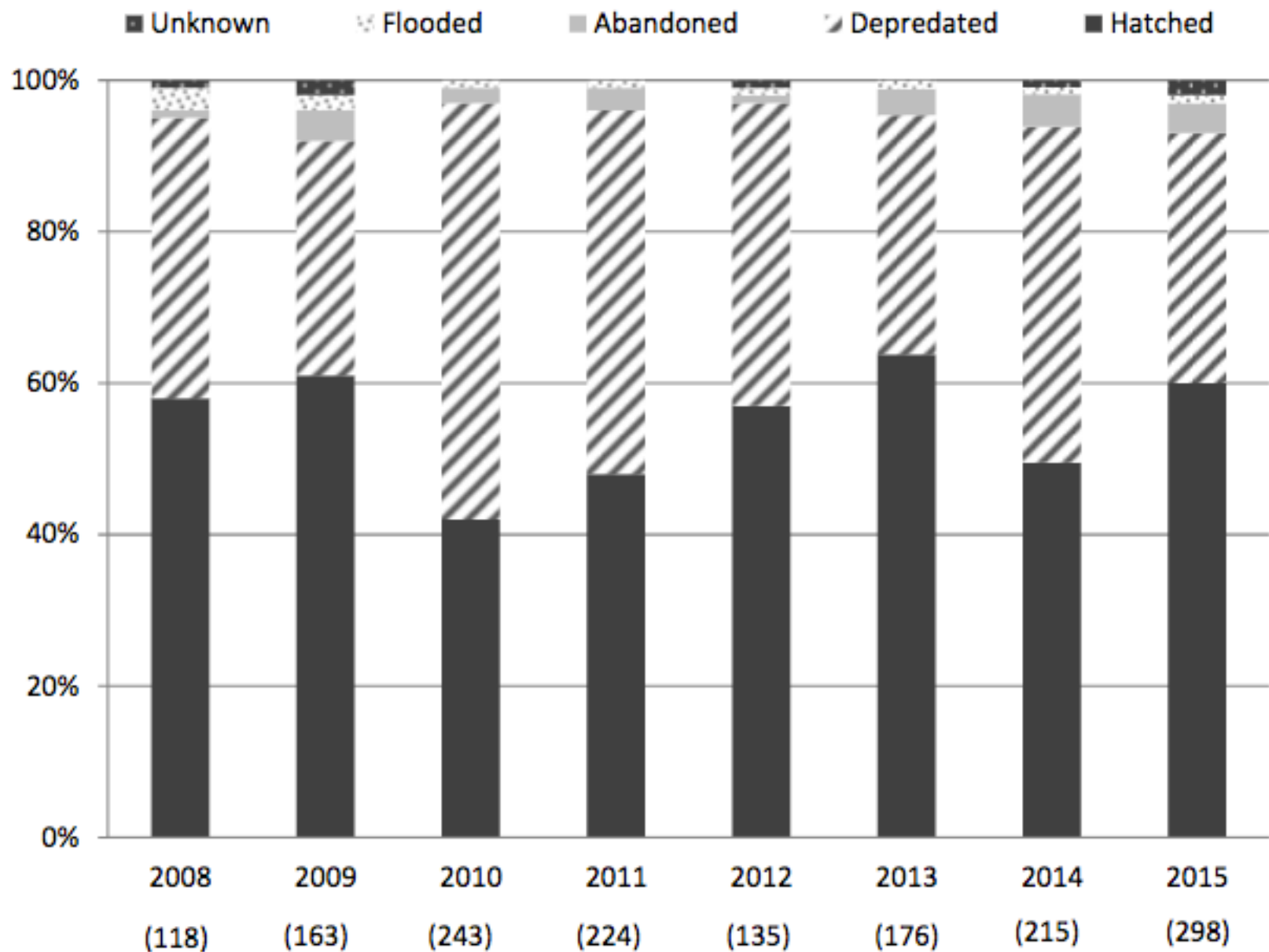


Figure 10. Annual apparent Snowy Plover nest fates in the South San Francisco Bay, California, 2008-2015. The number of nests monitored is indicated in parentheses beneath the year.

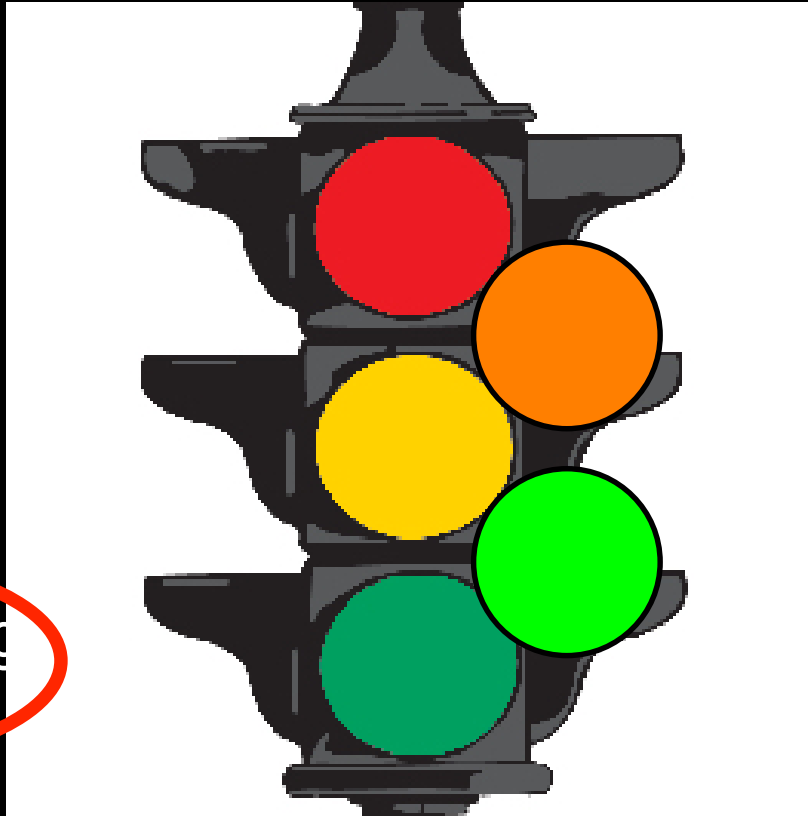
Habitat Enhancements



Not Meeting
Expectations

Uncertain

Meets/Exceeding
Expectations



Trending Negative

Trending Positive

Mercury

Will mercury be mobilized into the food web of the South Bay and beyond at a greater rate than prior to restoration?

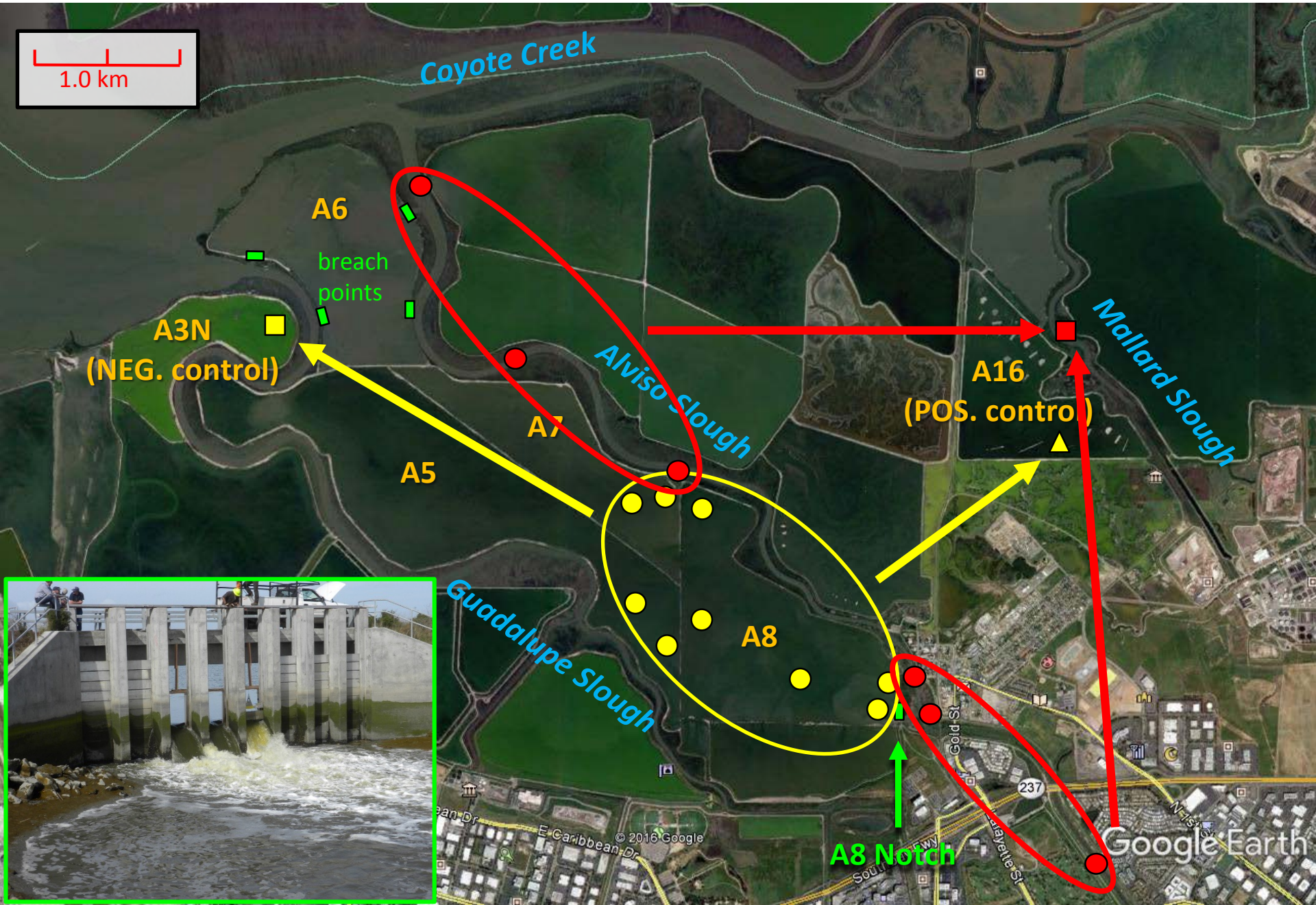
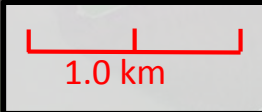


Mercury–
Within ponds

Will pond management increase MeHg levels in ponds and pond-associated sentinel species?

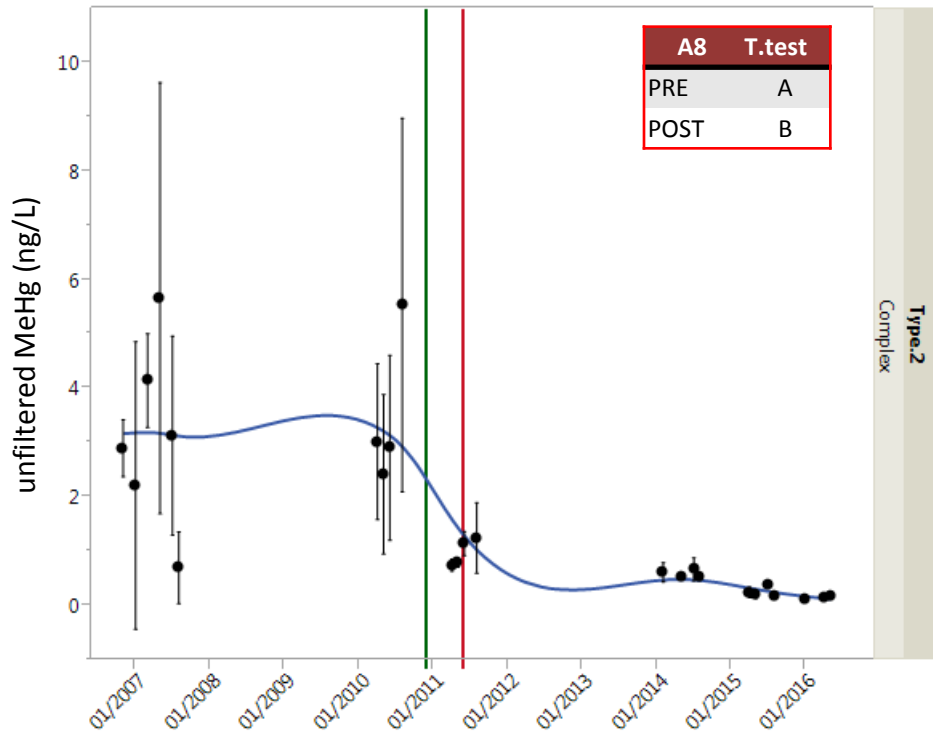
Mercury–
In sloughs

Will tidal habitat restoration and associated channel scour increase MeHg levels in marsh and bay-associated sentinel species?



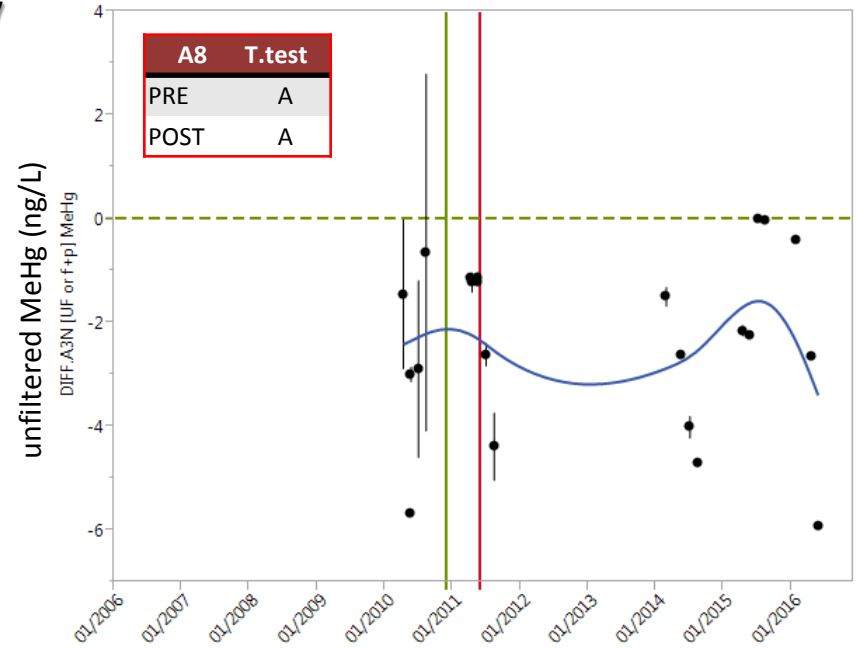
Surface Water Unfiltered (uf or f+p) Methylmercury A5/A7/A8 Complex

Time Series (Nov. 2006 – May 2016)

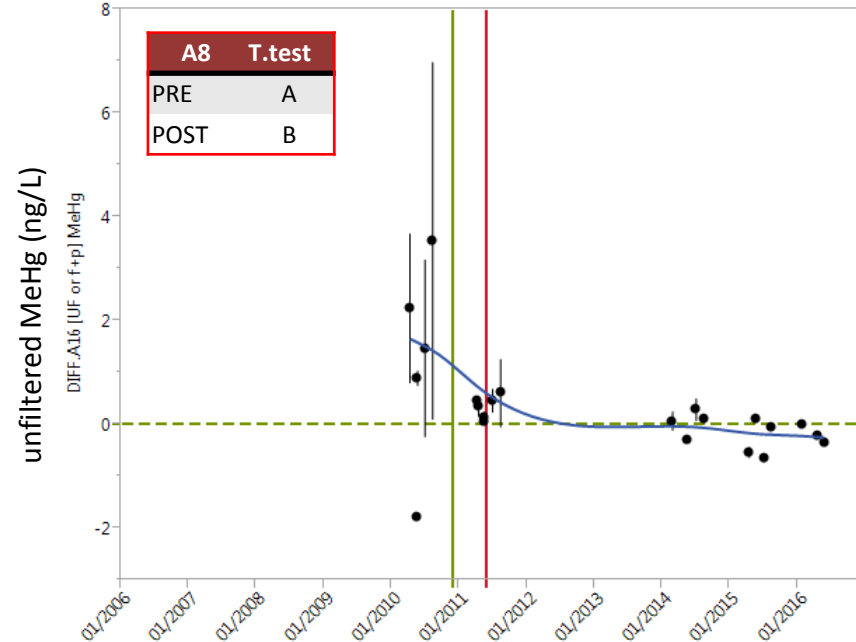


- High variability prior to Notch opening
- [MeHg] Complex < [MeHg] NEG. control
- [MeHg] Complex = [MeHg] POS. control (post Notch)

DIFF A3N (2010 – 2016)

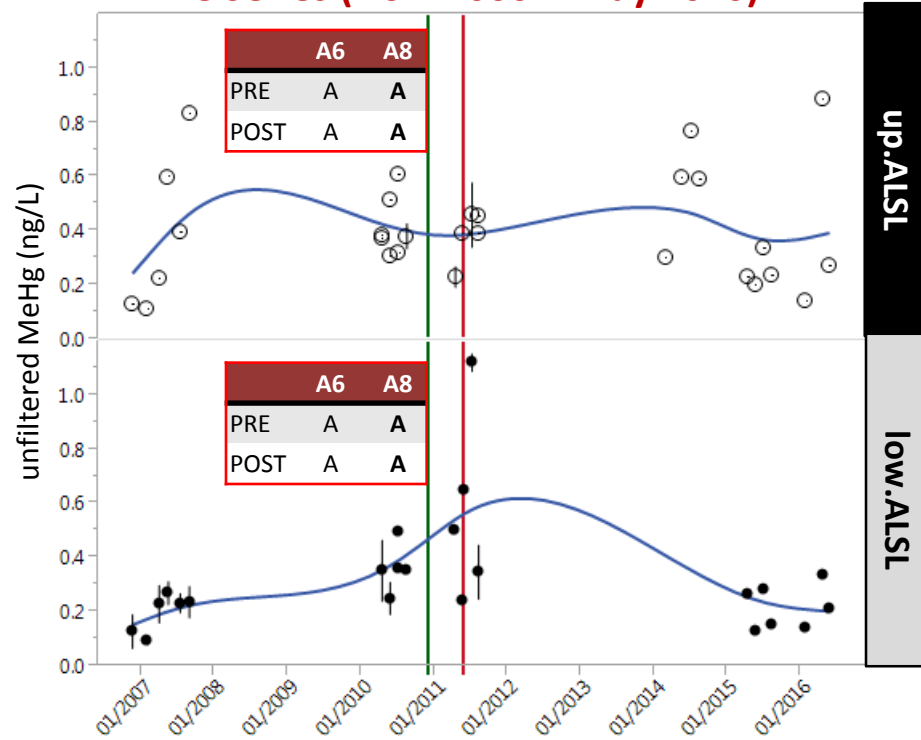


DIFF A16 (2010 – 2016)

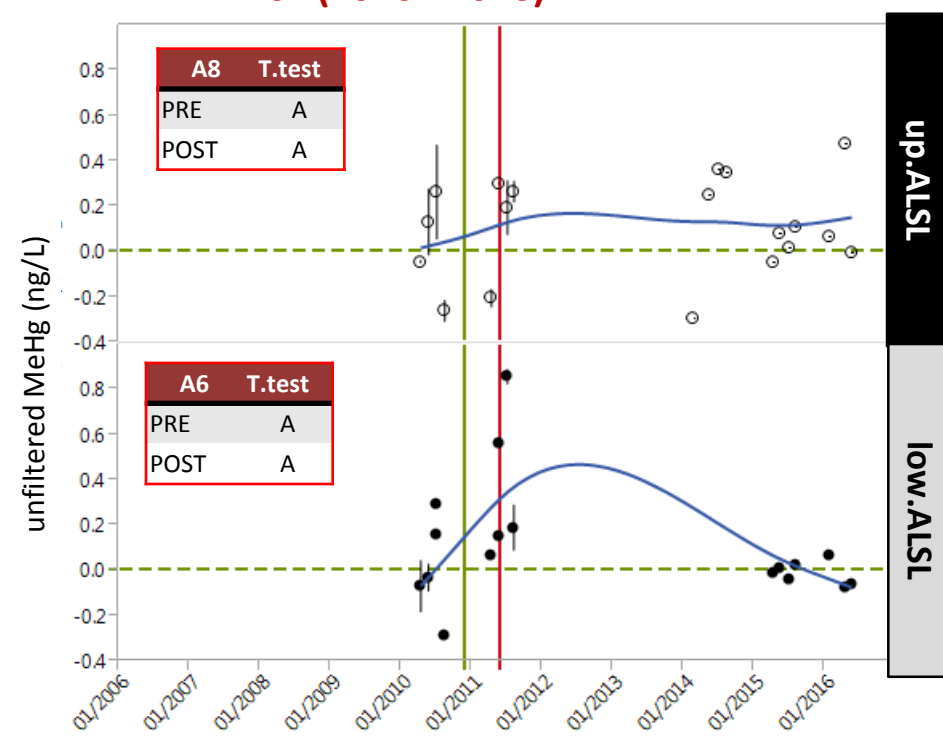


Surface Water Unfiltered (uf or f+p) Methylmercury Alviso Slough

Time Series (Nov. 2006 – May 2016)



DIFF MASL (2010 – 2016)



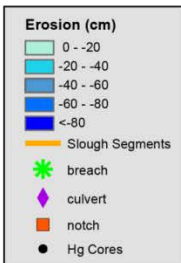
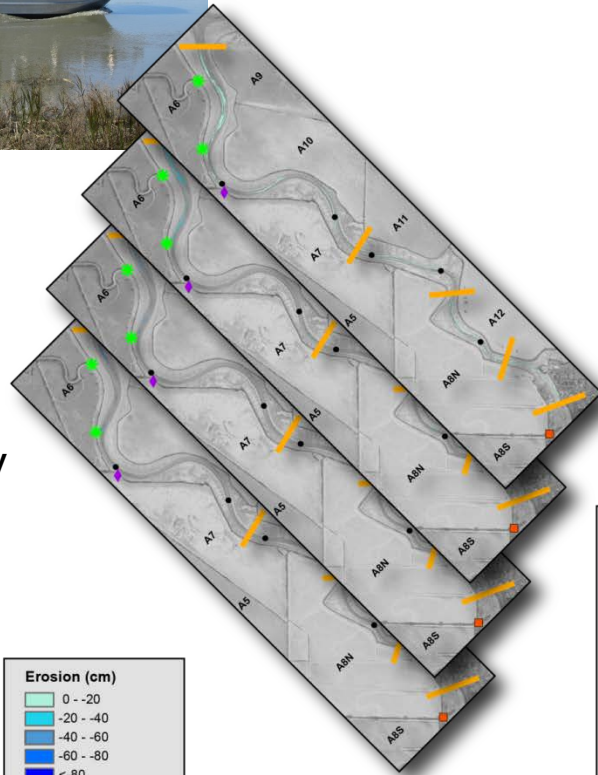
- Big initial spike in [MeHg] following initial A8-Notch opening (related?)
- Back to pre-breach levels the following month.

Estimating Hg Remobilization Through Bathymetric Scour

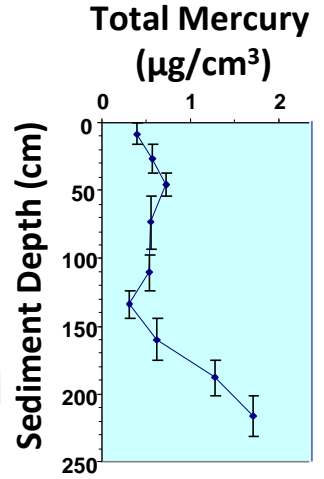
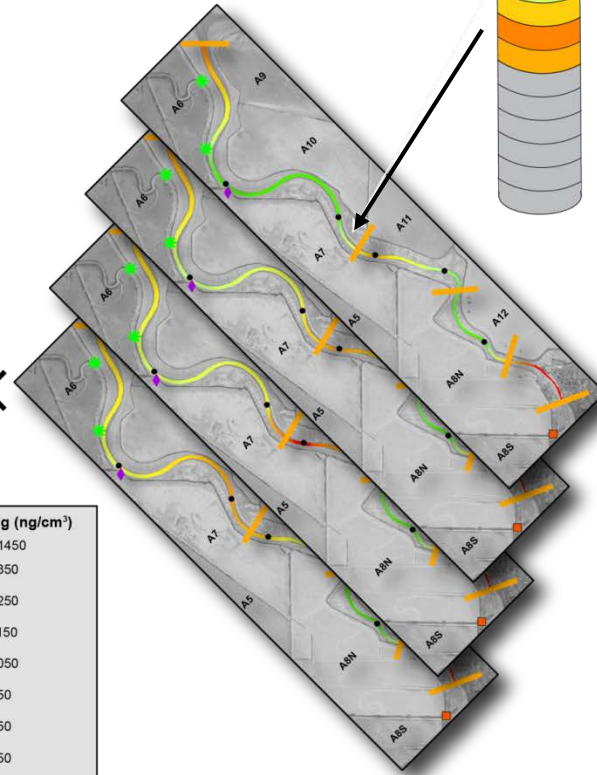
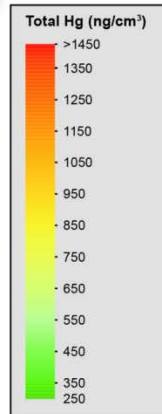
Using measured amounts of sediment scour from bathymetric surveys in combination with Hg concentration data from 12 sediment cores



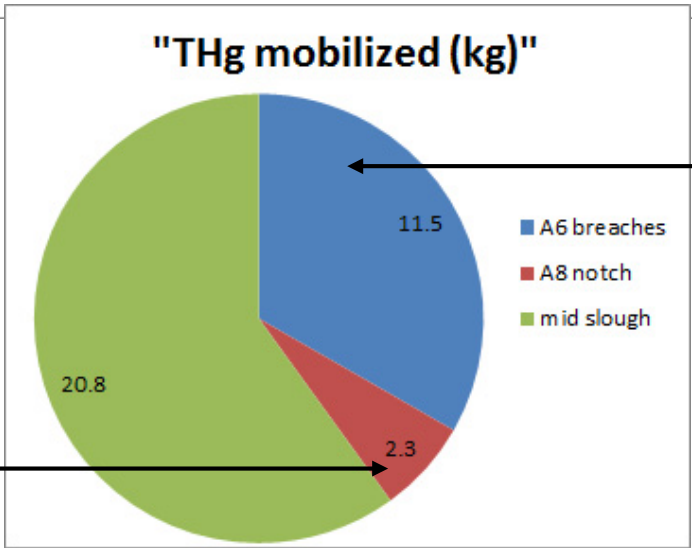
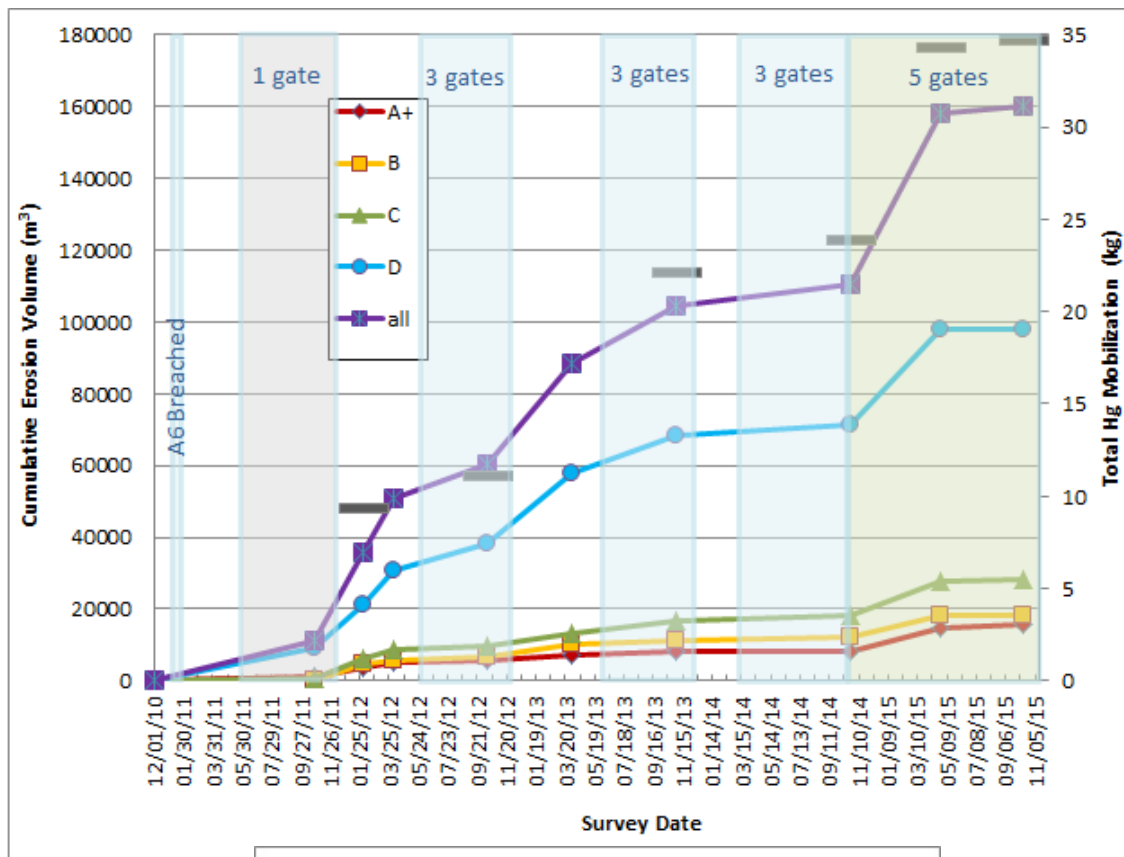
Repeat
Bathymetry
Surveys



×

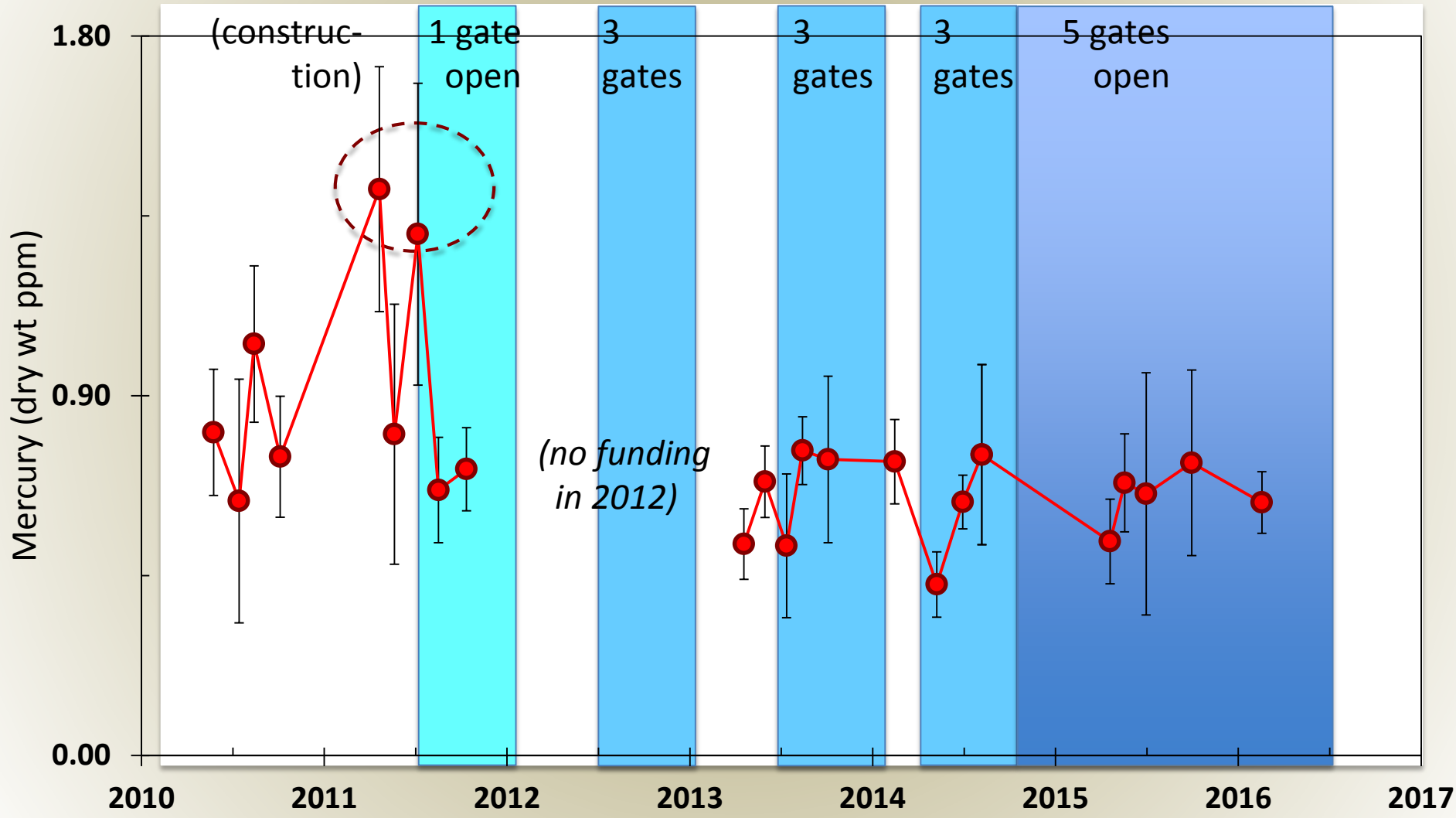


Total [Hg]
from 12
Sediment
Cores

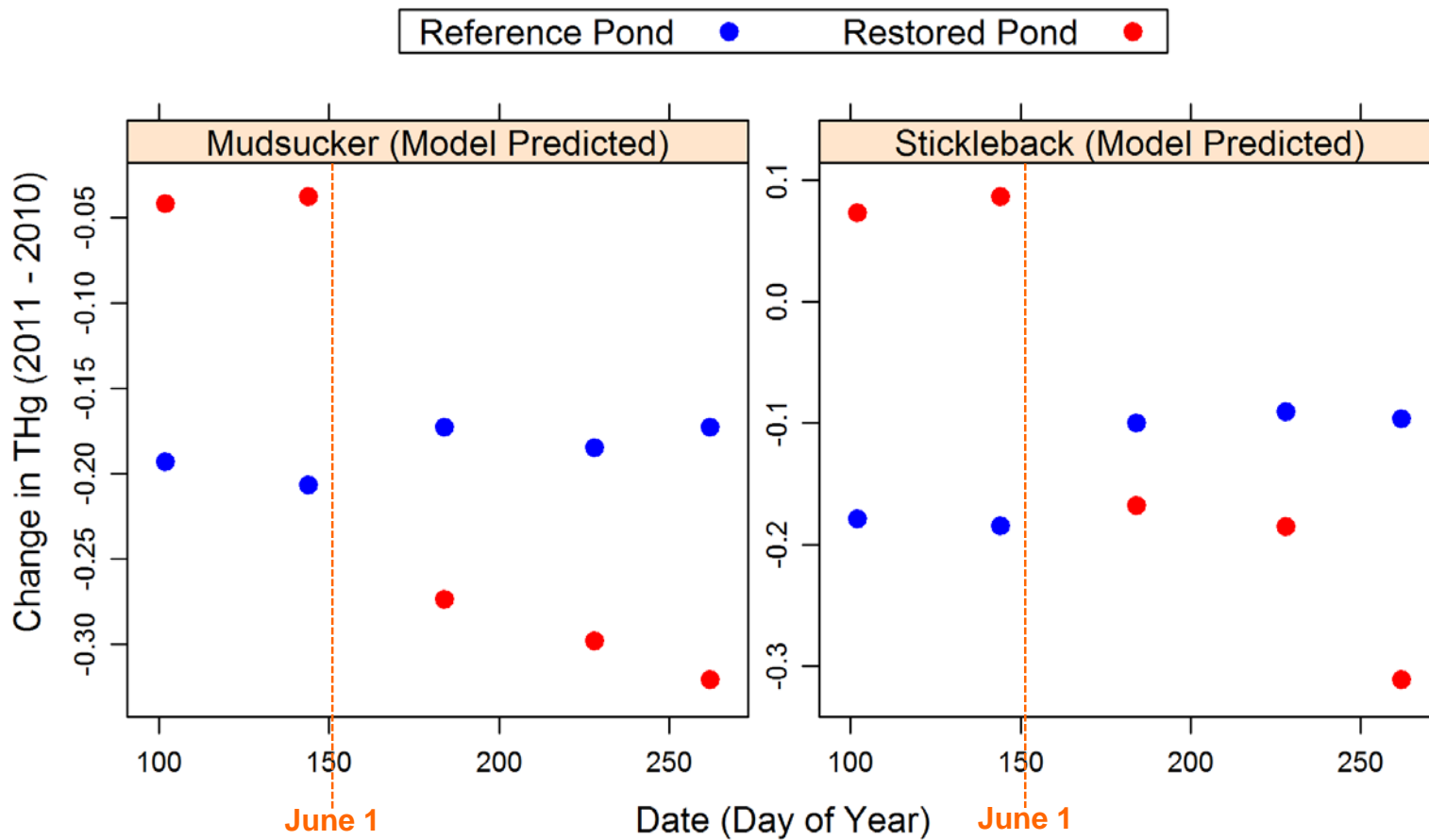




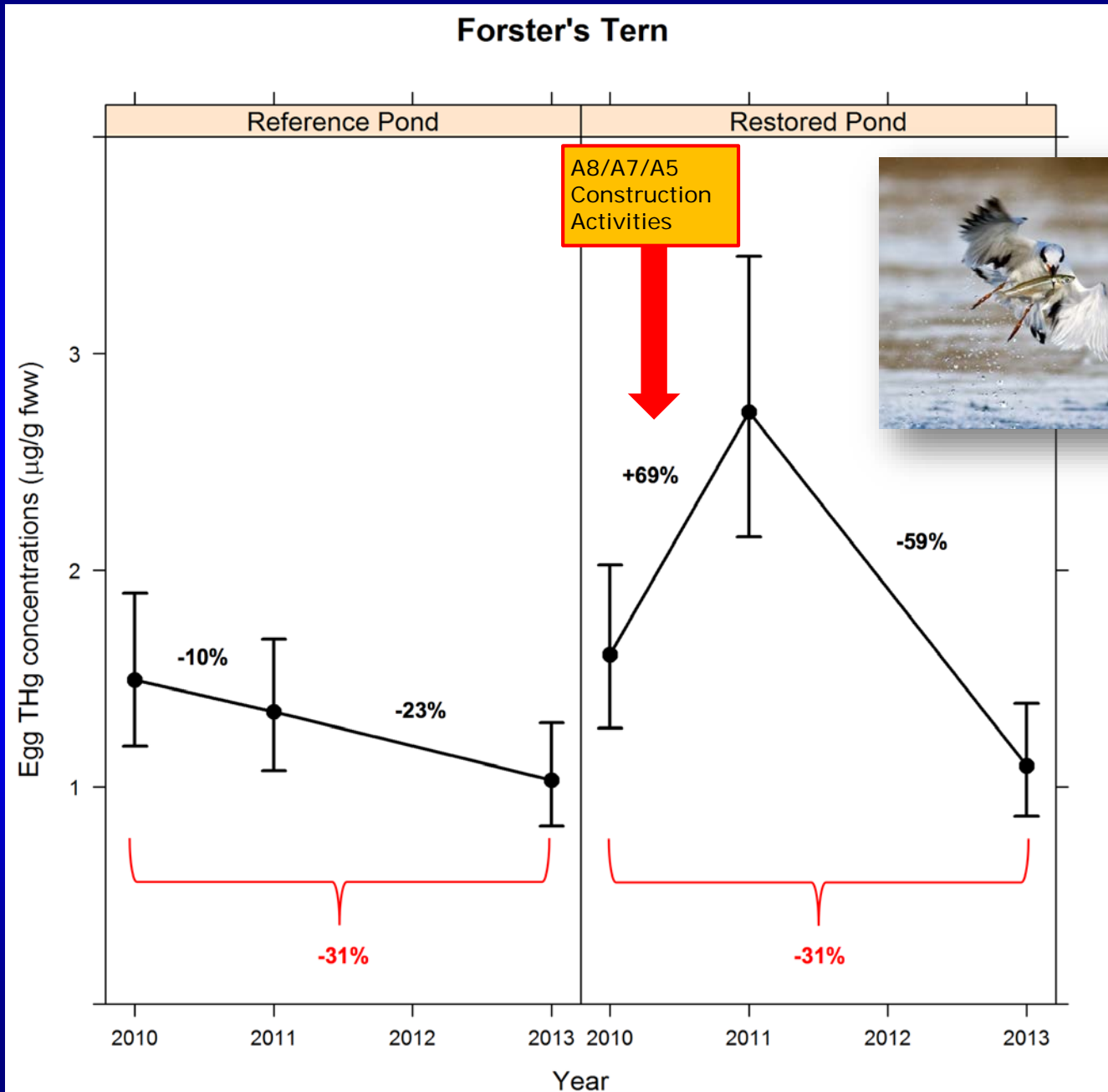
Alviso Slough Mississippi Silverside Mercury in Relation to Pond A8 Notch Openings – Notch Site – Through February 2016



Fish Mercury Response to Wetland Restoration



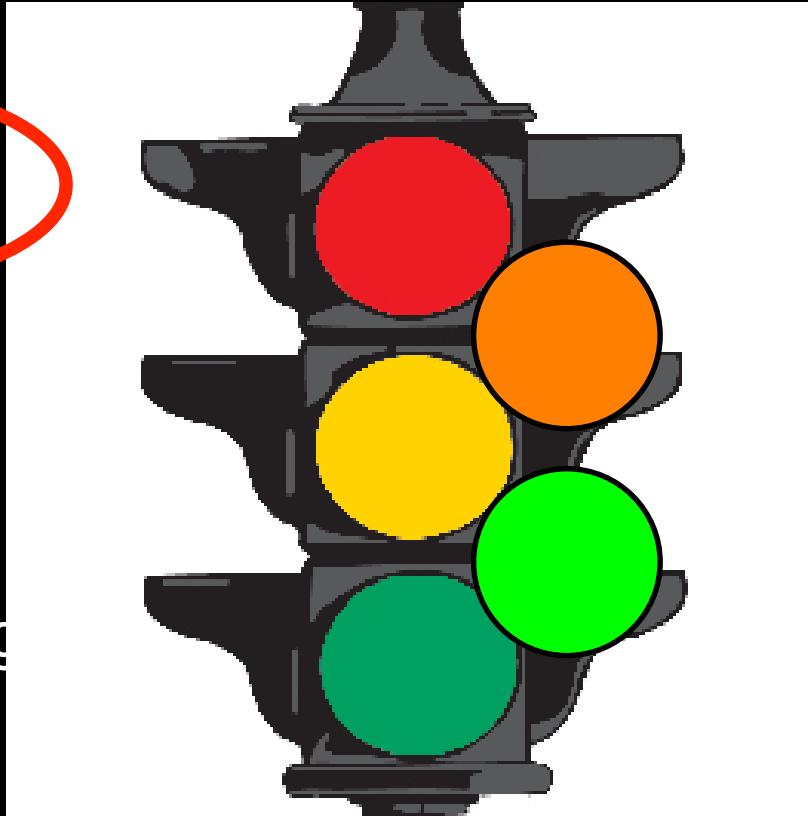
Bird Egg Mercury Response to Wetland Restoration



Not Meeting
Expectations

Uncertain

Meets/Exceeding
Expectations



Trending Negative

Trending Positive

Phase 1 Stoplight Chart:

- Your take on specific self-evaluations?
- Suggested changes?

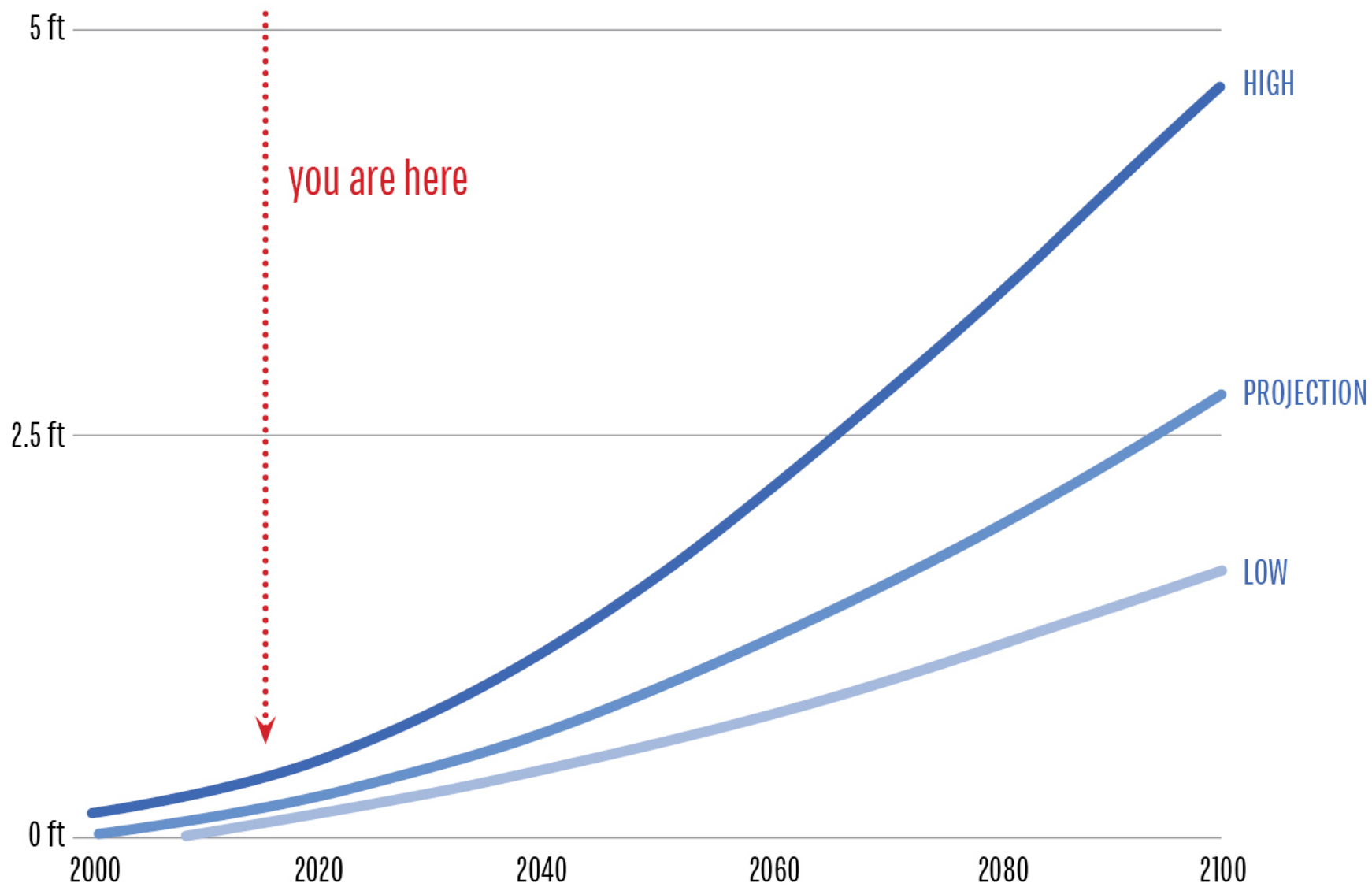
Phase 1: Lessons Learned

- What lessons to take into consideration as we move forward into Phase 2?

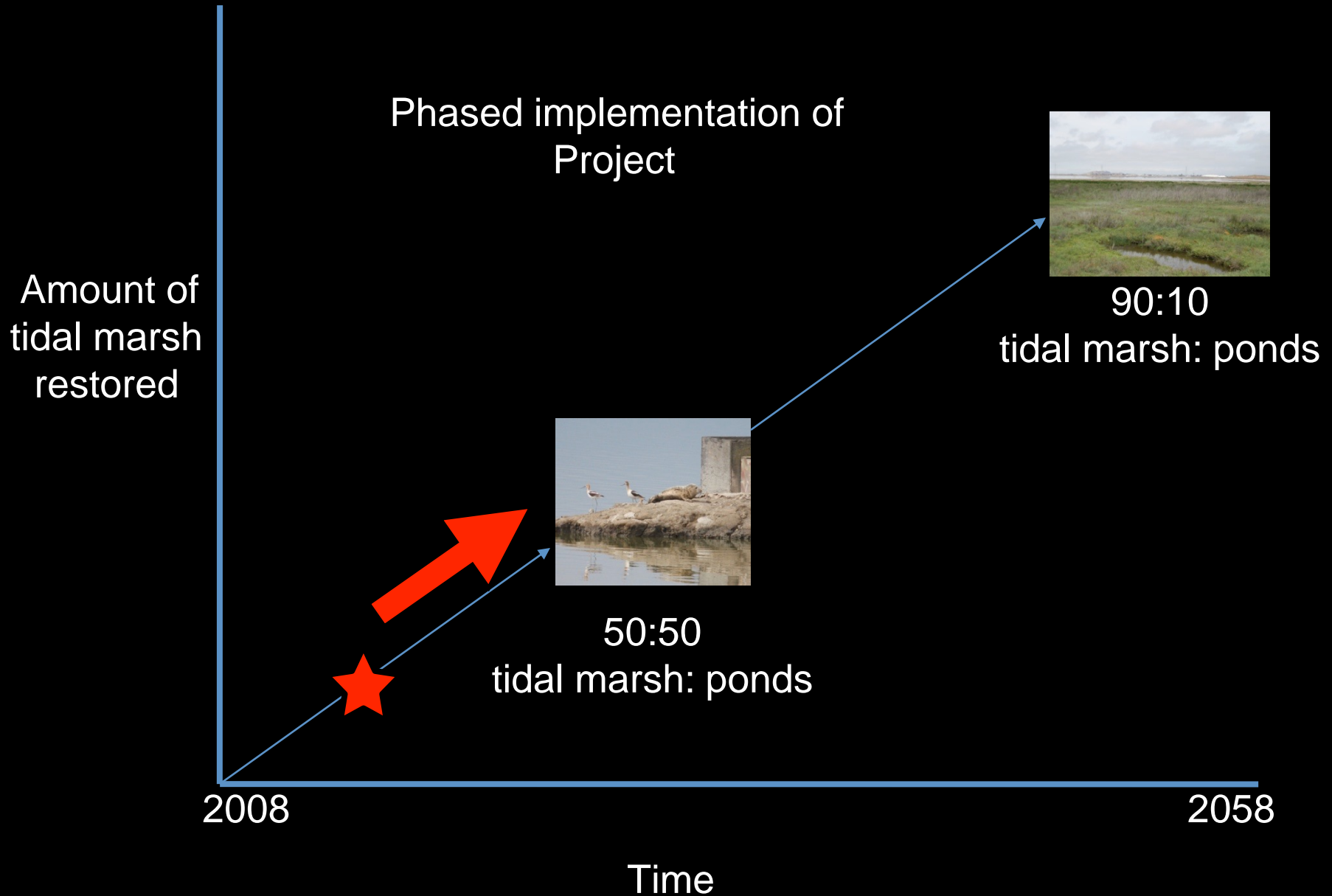
Phase 2

SEA LEVEL *rise* FOR CALIFORNIA

Courtesy NRC 2012



Adaptive Management Restoration



THE
Baylands
AND
Climate Change

WHAT WE CAN DO

BAYLANDS ECOSYSTEM HABITAT GOALS
SCIENCE UPDATE 2015



State of California

Coastal Conservancy





WHAT WE CAN DO

- *Restore complete systems, including processes*
- *Restore soon, in areas marshes are likely to persist*
- *Plan for the Baylands to migrate*

Phase 2 Alternatives

- Alviso complex - 3 separate pond clusters
 - Island Ponds
 - A8 Ponds
 - Mountain View Ponds
- Ravenswood complex
 - 4 ponds in western half of complex

Island Ponds Preferred Alt

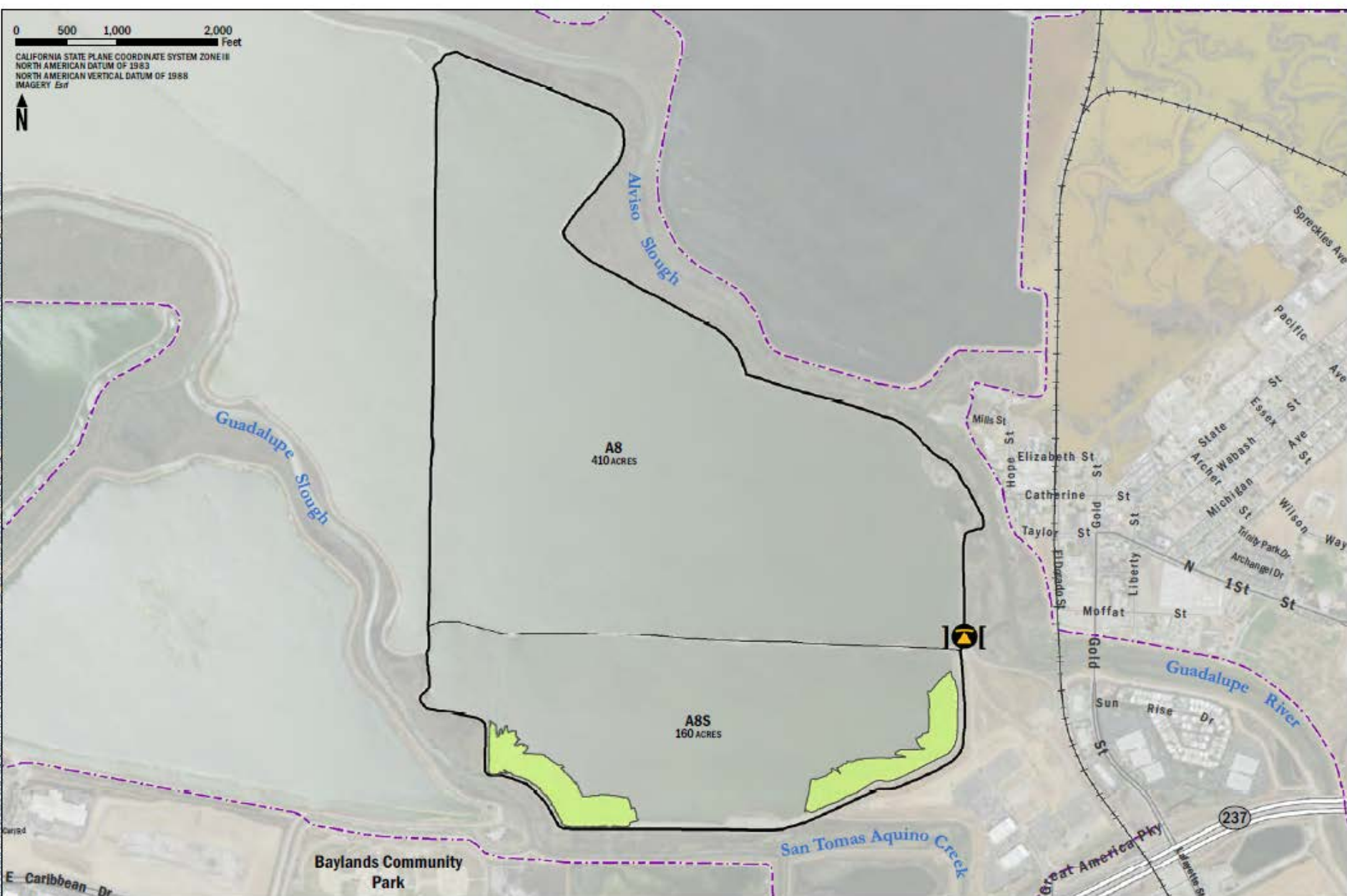
A8 Preferred Alt

0 500 1,000 2,000 Feet






CALIFORNIA STATE PLANE COORDINATE SYSTEM ZONE III
NORTH AMERICAN DATUM OF 1983
NORTH AMERICAN VERTICAL DATUM OF 1988
IMAGERY Ext



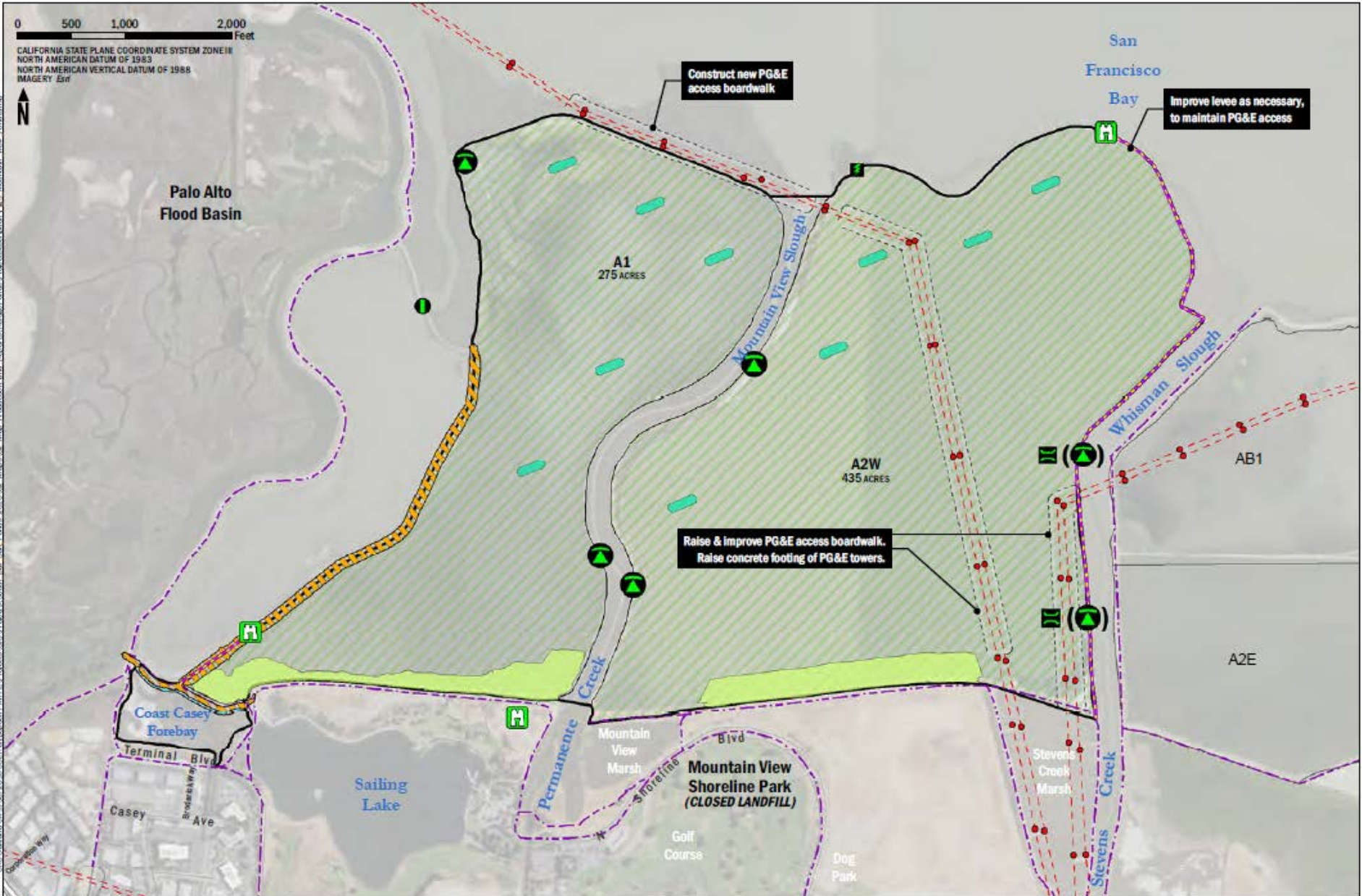
\\us01-cv\arcad\CA_9_00\2014\1428P_46\p0000\PARTIAL\PROJECT\GIS\PROJECT\GIS_Pond\A8_South_Bay_Sat_2014.mxd
\\us01-cv\arcad\CA_9_00\2014\1428P_46\p0000\PARTIAL\PROJECT\GIS\PROJECT\GIS_Pond\A8_South_Bay_Sat_2014.mxd



LEGEND

-  Existing reversible armored notch
-  Railroad
-  Habitat Transition Zone
-  Existing trail
-  Pond boundary

Mtn View Preferred Alt



0 500 1,000 2,000 Feet
 CALIFORNIA STATE PLANE COORDINATE SYSTEM ZONE II
 NORTH AMERICAN DATUM OF 1983
 NORTH AMERICAN VERTICAL DATUM OF 1988
 IMAGERY Esri

USE OPERATOR'S MANUAL FOR INFORMATION ON HOW TO USE THIS MAP. For more information on the data sources used in this map, see the Esri website at www.esri.com.

LEGEND

Existing control gate	Proposed breach	Proposed armored breach (two sides)	PG&E turnaround	Viewing platform	PG&E tower	PG&E power line	Tidal marsh	Habitat Transition Zone
Proposed breach	Bridge	PG&E tower	PG&E power line	Levee Improvement	Levee Lowering	Pond Boundary	Levee Improvement	Habitat Island
		Phase 2 trail	Existing trail					

Ravenswood Preferred Alt

0 500 1,000 2,000 Feet

CALIFORNIA STATE PLANE COORDINATE SYSTEM ZONE 18
NORTH AMERICAN DATUM OF 1983
NORTH AMERICAN VERTICAL DATUM OF 1988
IMAGERY 254



San Francisco Bay

Greco Island

Flood Slough

Bedwell Bayfront Park
(CLOSED LANDFILL)

Gate & Sign

R4
295 ACRES

R5
30 ACRES

S5
7 ACRES

S5
30 ACRES

All-American Canal

R3
270 ACRES

Gate & Sign

Fence

Cargill pipeline and 10-ft wide fee ownership strip

R1

R2

SF2

114

84

84

Huron Ave

Independence Dr

Scott Dr

Bohannon Dr

Commonwealth Dr

Jefferson Ct

Chilco St

Network Cir

To Dumbarton Bridge

University Ave



On Deck:

- Phase 2 at Eden Landing
- Shoreline Study

Phase 2

Proposed Approach to Science

SBSP Phase II Studies: Thoughts On A More Holistic Science Strategy

M. Marvin-DiPasquale, USGS

I. Reflections On Phase 1 Studies

- Lots of great science / monitoring (bird habitat use, sediment dynamics, Hg, etc...)
- Moderate coordination of efforts
- Moderate integration of results from discrete studies and Working Group integration
- Multiple 'final' products still pending

SBSP Phase II Studies: Thoughts On A More Holistic Science Strategy

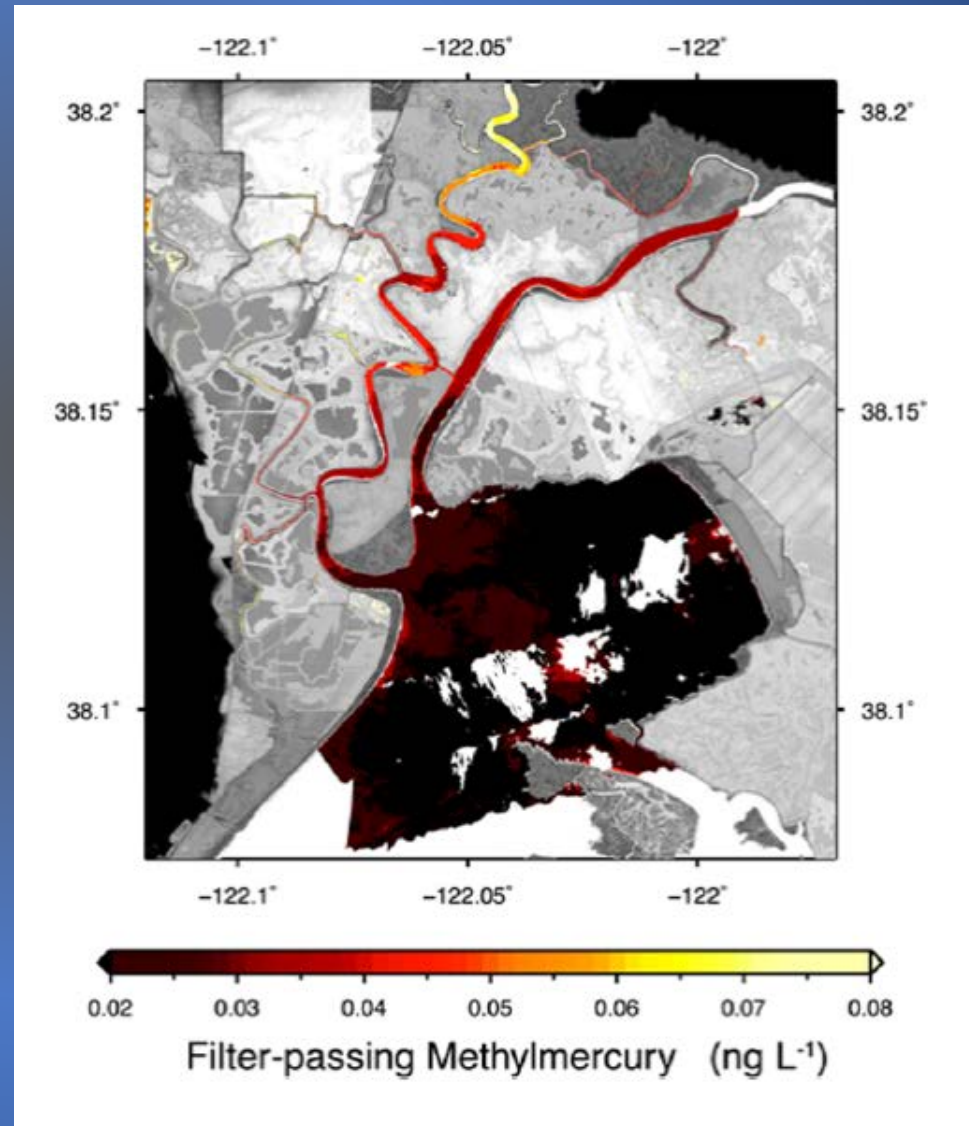
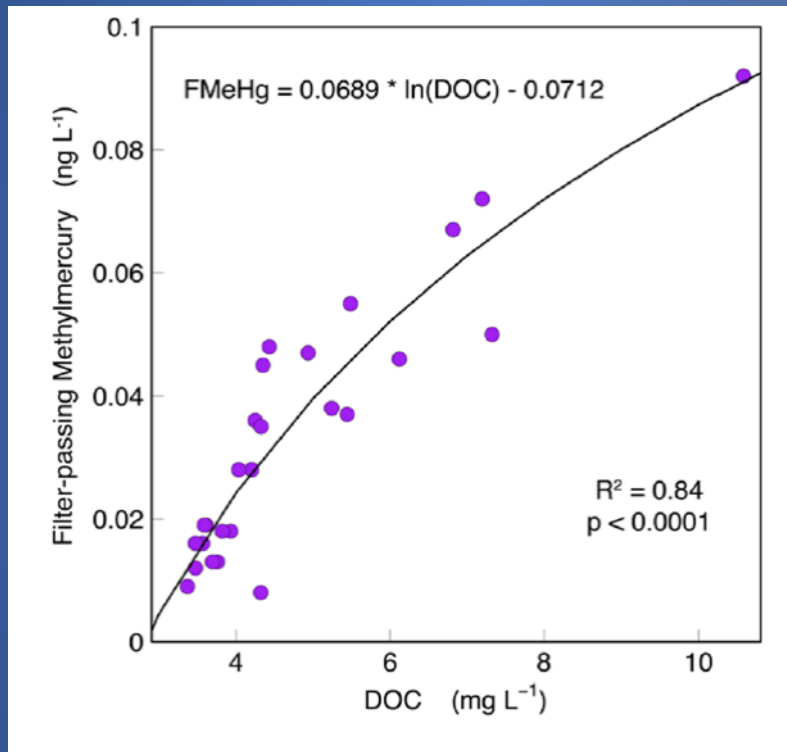
M. Marvin-DiPasquale, USGS

II. Phase 2 Studies – Building on Phase 1 Achievements

- Shift in focus toward ‘Integrated’ Studies (where practical)
- Further develop conceptual (and sampling) linkages between ‘Issues of Concern’
 - Bird habitat use + Hg bioaccumulation + Water Quality (generally)
 - Sediment and hydro- dynamics + Invasive species
- Strengthen coordination (sampling effort, data sharing) between working groups and stakeholders
- Leverage ‘remote sensing’ and unattended sampling/monitoring technologies
- Central Organizing Themes (e.g. evolving habitat) to focus science coordination
- Common study sandbox(s)? – (e.g. the next ‘Pond A6’ type breaching event)

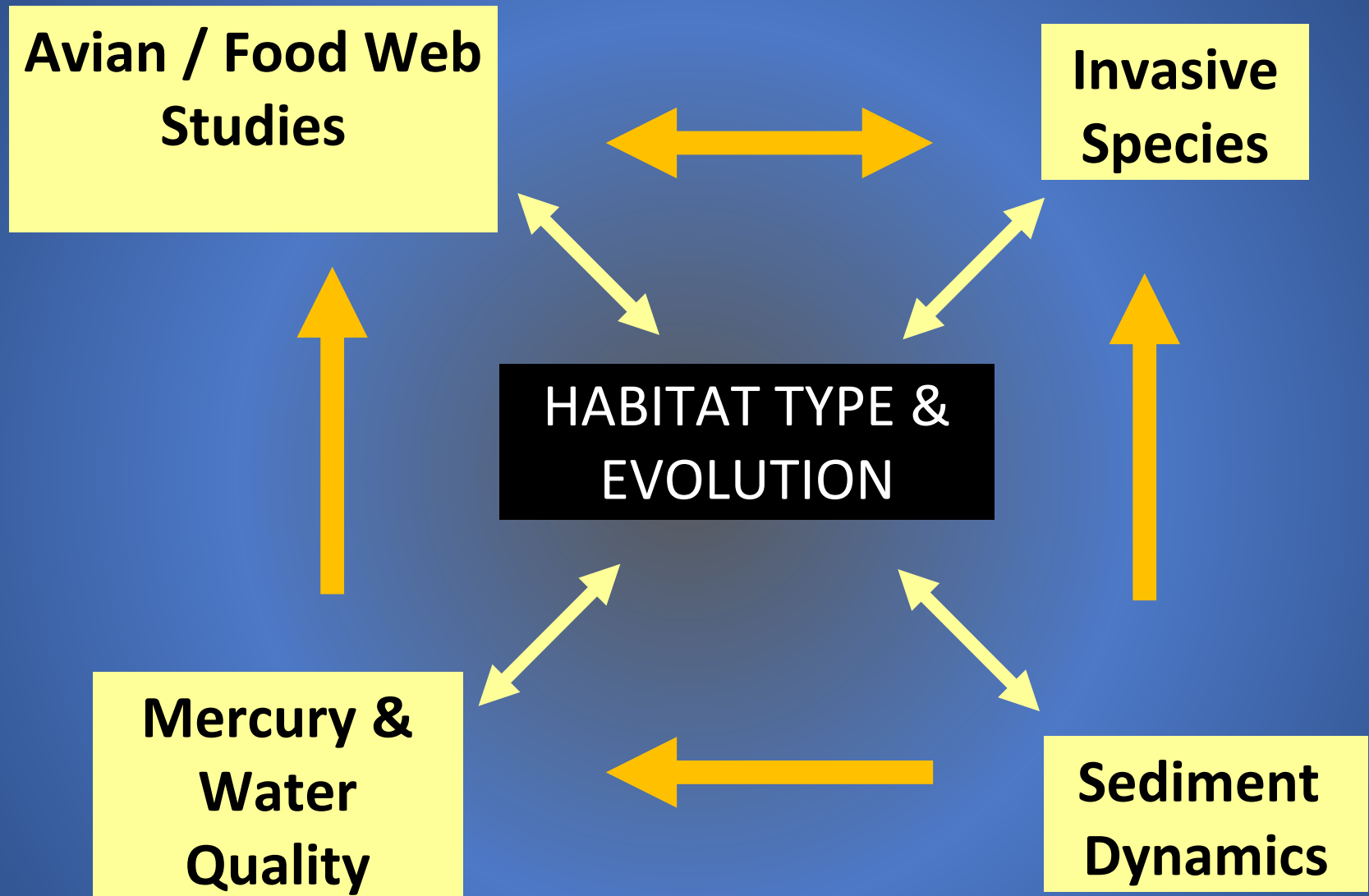
The Power of Remote Sensing

EXAMPLE: Suisun Marsh & Grizzly Bay - High-resolution ecosystem scale imaging of predicted dissolved MeHg



Fichot, C.G., Downing, B.D., Bergamaschi, B.A., Windham-Myers, L., Marvin-DiPasquale, M., Thompson, D.R., and Gierach, M.M., 2016, High-Resolution Remote Sensing of Water Quality in the San Francisco Bay-Delta Estuary: *Environ Sci Technol*, v. 50, no. 2, p. 573-583.

Central Organizing Theme



Are coordinated 'common sandbox' studies of value?

Practical Actions

I. Remote Sensing / Automated Sampling & Monitoring

- Develop (strengthen?) Working Group
- Outreach to experts in these areas (NASA-AMES, JPL, etc...)
- Educate SBSP researchers & stakeholders
 - Various Platforms - Remote sensing (Drones → Aircraft → Satellites); ISCO Sampler; In-situ continuous monitoring (EXO & fixed buoy stations); passive samplers; telemetry
 - What METRICS are available on which platforms (pro's and con's)?
- DISCUSS: Which platform(s) optimize information gathering beneficial across multiple SBSP Research Themes; Shared resource tying together the science.

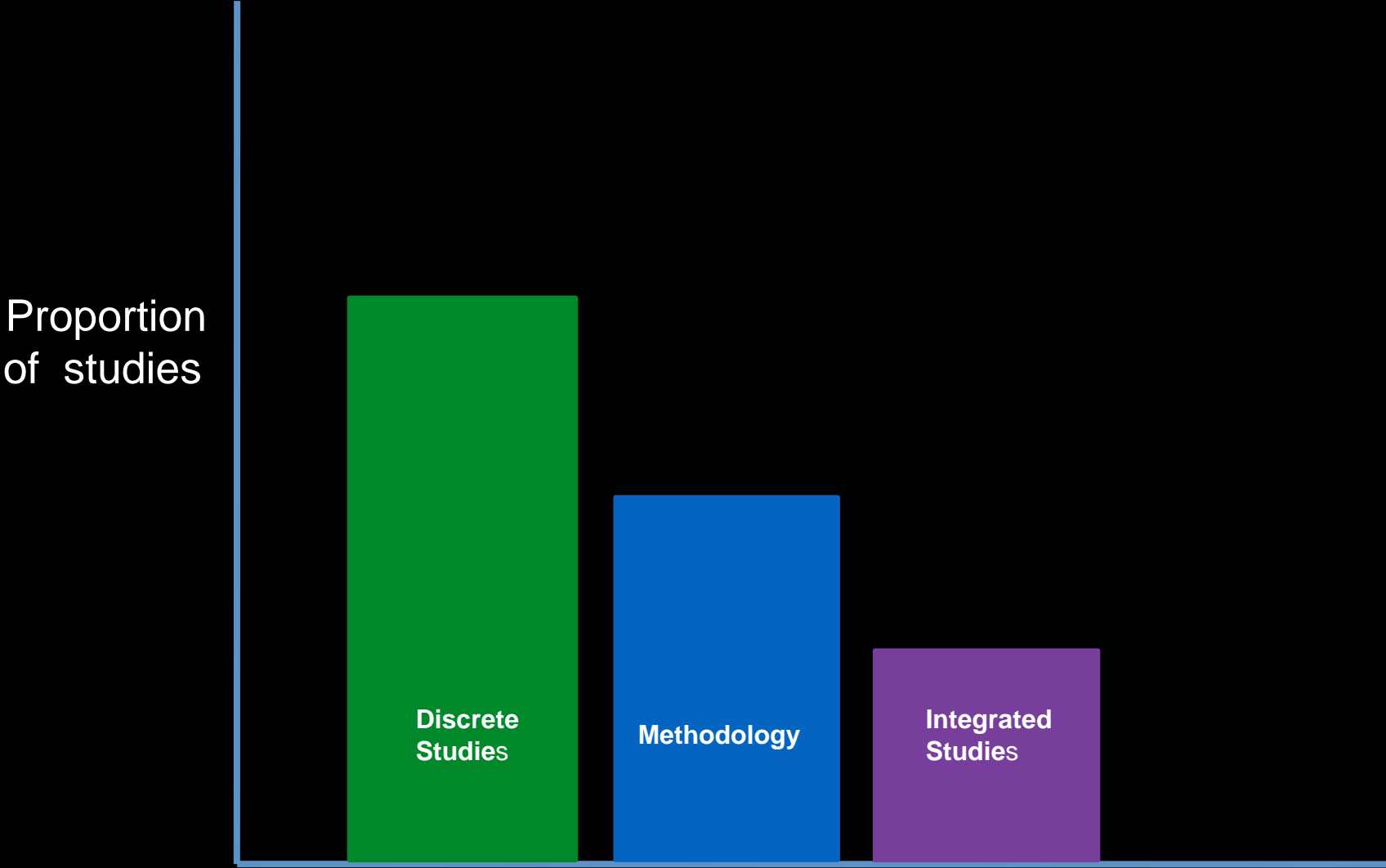
Practical Actions

II. Information Sharing / Coordinated Data Collection

- Develop a common e-space among SBSPR Project research & stakeholder community
- Sharing basic information related to:
 - Field sampling efforts / schedule / locations
 - Specific Data being collected
- FOCUS ON:
 - Strengthening linkages: collection efforts and questions being addressed
 - Logistics and resource / data sharing

Put 'VISION' ahead of resource constraints

Phase 2 Science Program Over Time

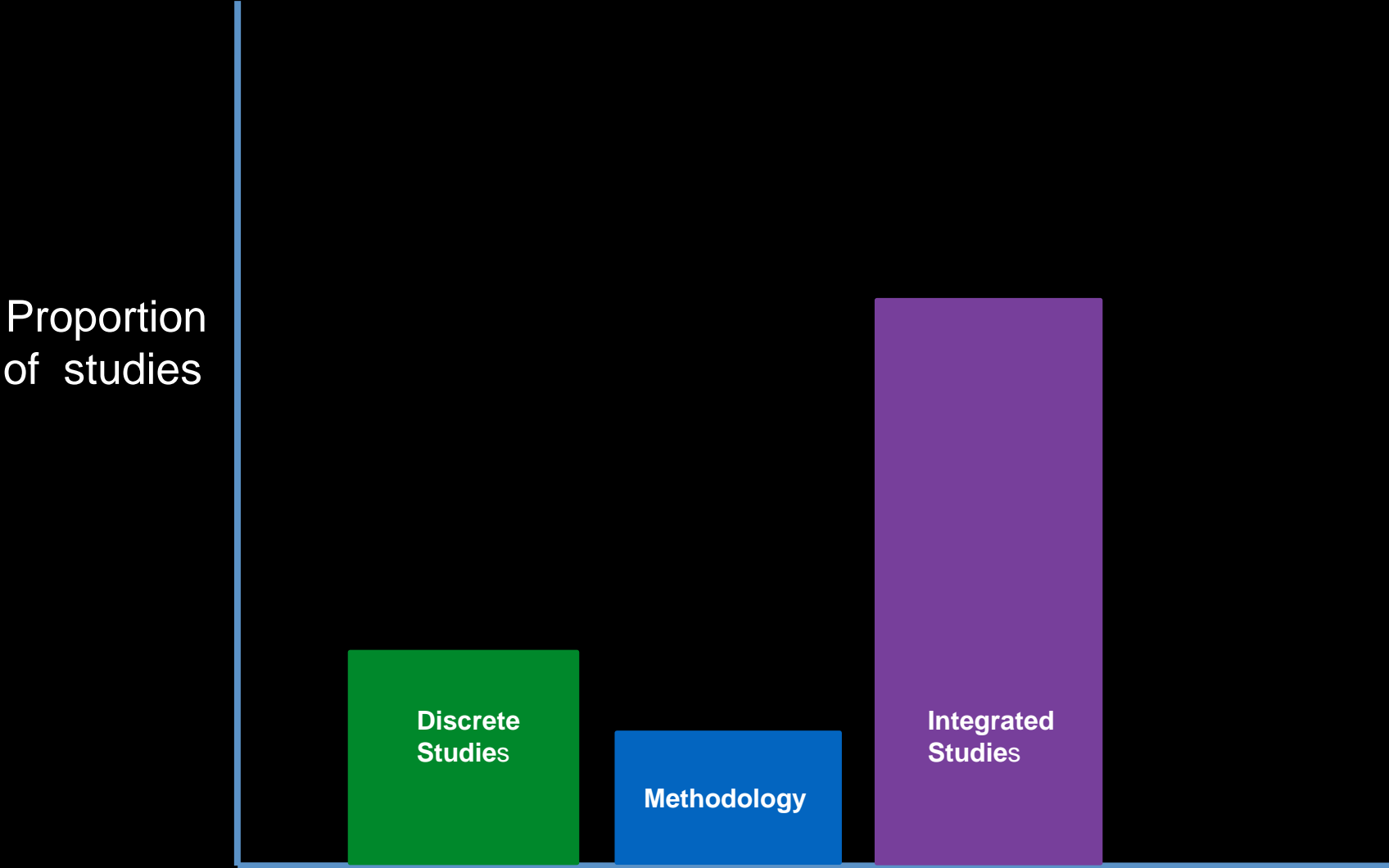


Phase 2 Science Program Over Time

Proportion
of studies



Phase 2 Science Program Over Time



Proposed Phase 2 Science Approach

- Does this overall approach make sense?
- If not, how would you revise?

Proposed Phase 2 Science Approach

- Thoughts on how to best execute this approach?

Proposed Phase 2 Science Approach

- Thoughts on priorities for discrete and/or integrated studies?

TAC Advice as Project Science Goes Forward

- Other input, suggestions for Project science going forward?

Summary, Action Items, Looking Forward

**Thank You
Technical Advisory
Committee!**



South Bay Salt Pond Restoration Project

Restoring the Wild Heart of the South Bay

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Name:
South Bay Salt
Pond Restoration
Project