

## Introduction

In South San Francisco Bay approximately 15,100 acres of former salt evaporator pond are being restored to enhance habitat to:

-Promote restoration of native, special-status plants, animals that depend on South San Francisco Bay for all or part of their life cycle.

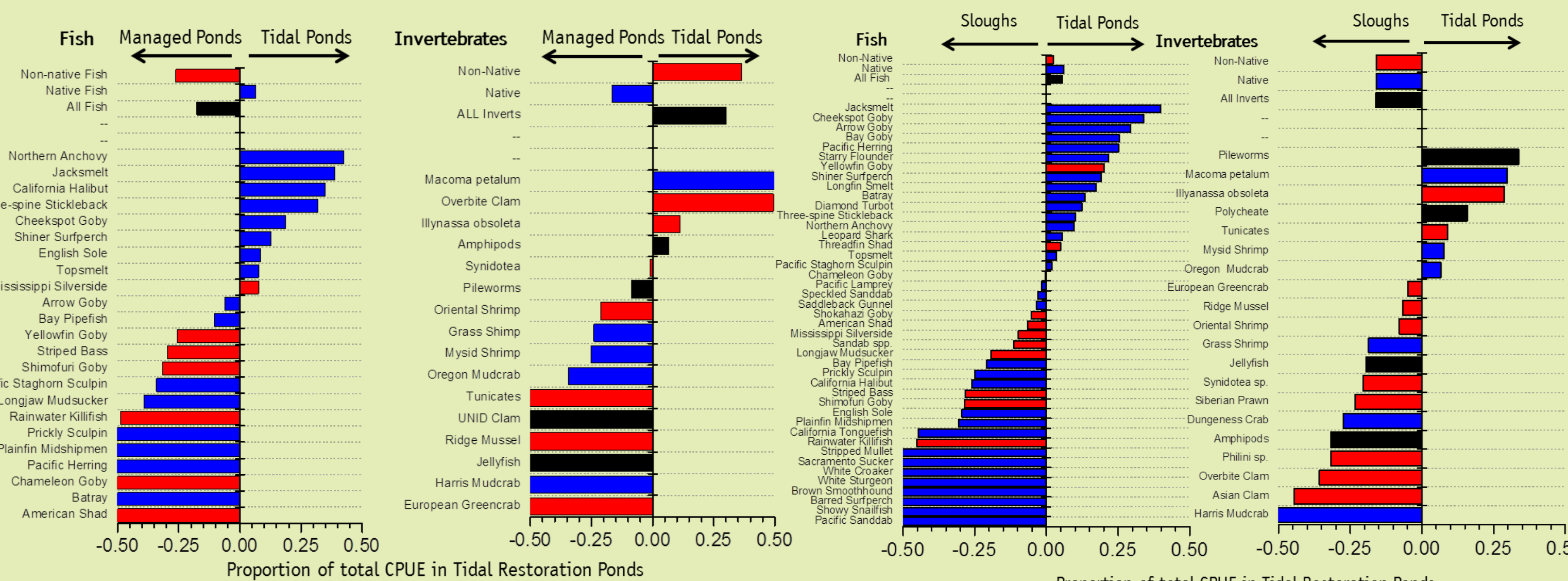
-Maintain current migratory bird species that utilize existing salt ponds and associated structures

-Support increased abundance and diversity of native species in South SF Bay aquatic, terrestrial ecosystems, including plants, invertebrates, fish, mammals, reptiles and amphibians.

Restoration is staking an adaptive management approach to provide the maximum benefit to the restoring a mosaic of habitats

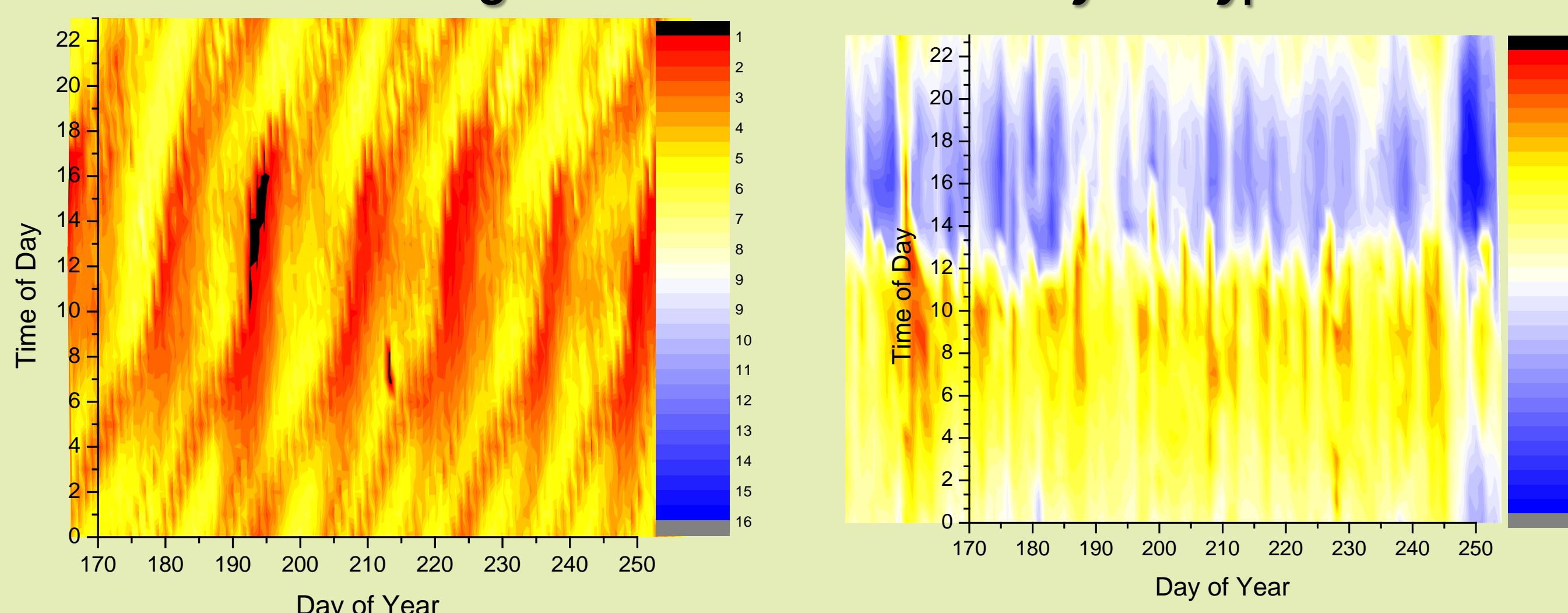
## Managed Ponds Or Tidal Ponds?

### Managed Ponds Promote Non-Native Species



The proportion of CPUE for each species captured in Sloughs and Bay habitats and Tidal Restored Ponds (A19-A21) in the Alviso Marsh from July 2010-Oct 2015. The proportion of CPUE for each species captures in Managed Ponds (A8 complex and A16) and Tidal Restored Ponds (A19-A21) in the Alviso Marsh from July 2010-Oct 2015.

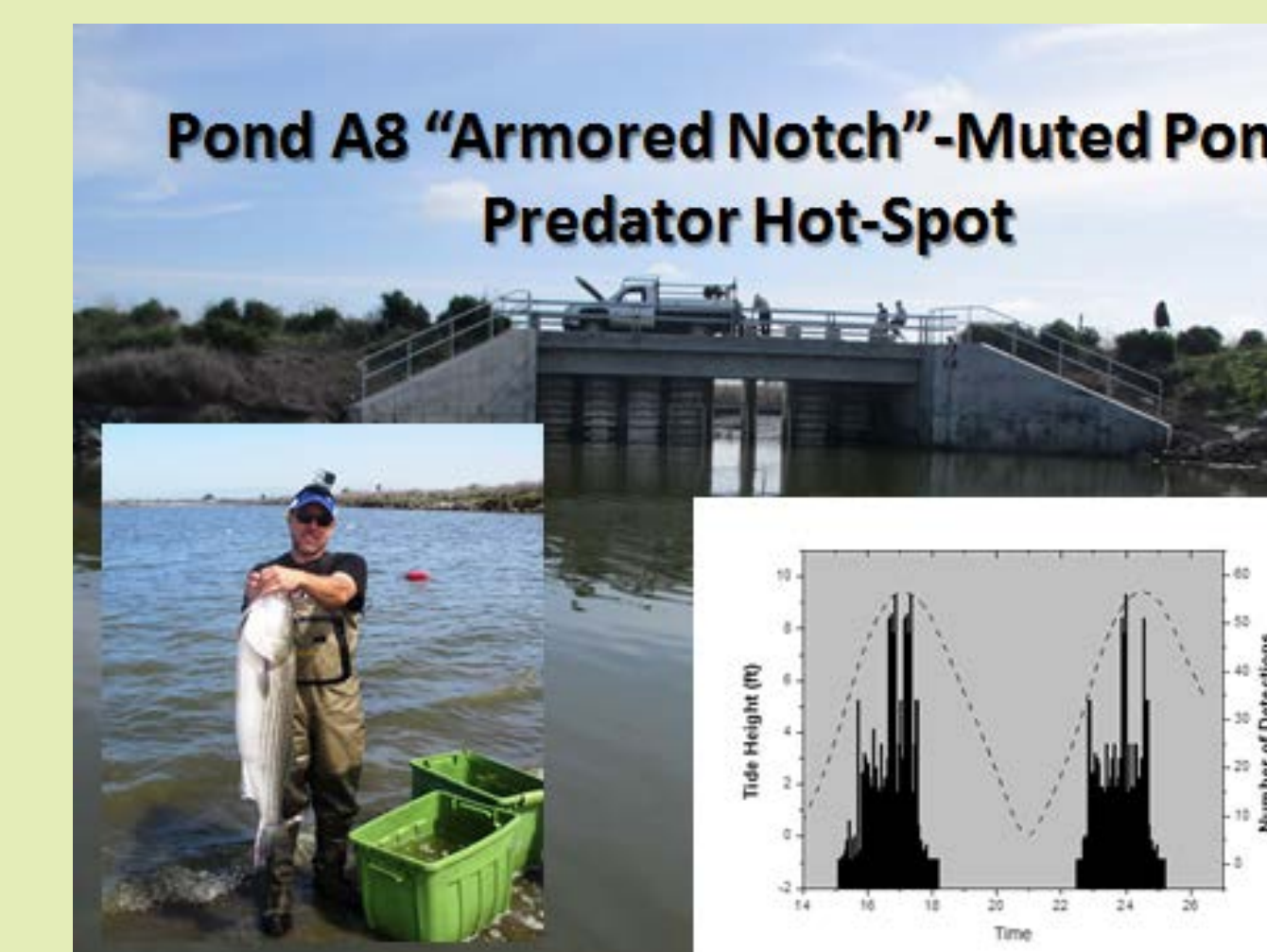
### Managed Ponds Promote Diel-Cyclic Hypoxia



(Left): From Upper Alviso Slough. Temporal DO fluctuations are mainly a result of tidal influence. DO typically bottoms out during low tide in the slough habitats and recovers as more oxygenated bay water pushes upstream on high tides. (Right): From Muted tidal pond A8. DO cycles on a diurnal cycle as opposed to tidally. Because the pond is cut off from tidal action, the pond responds diurnally with low tide in the morning and rising throughout the daylight hours.

## Managed Ponds Fish Passage

### Managed Ponds Cause Predation "Hotspots"

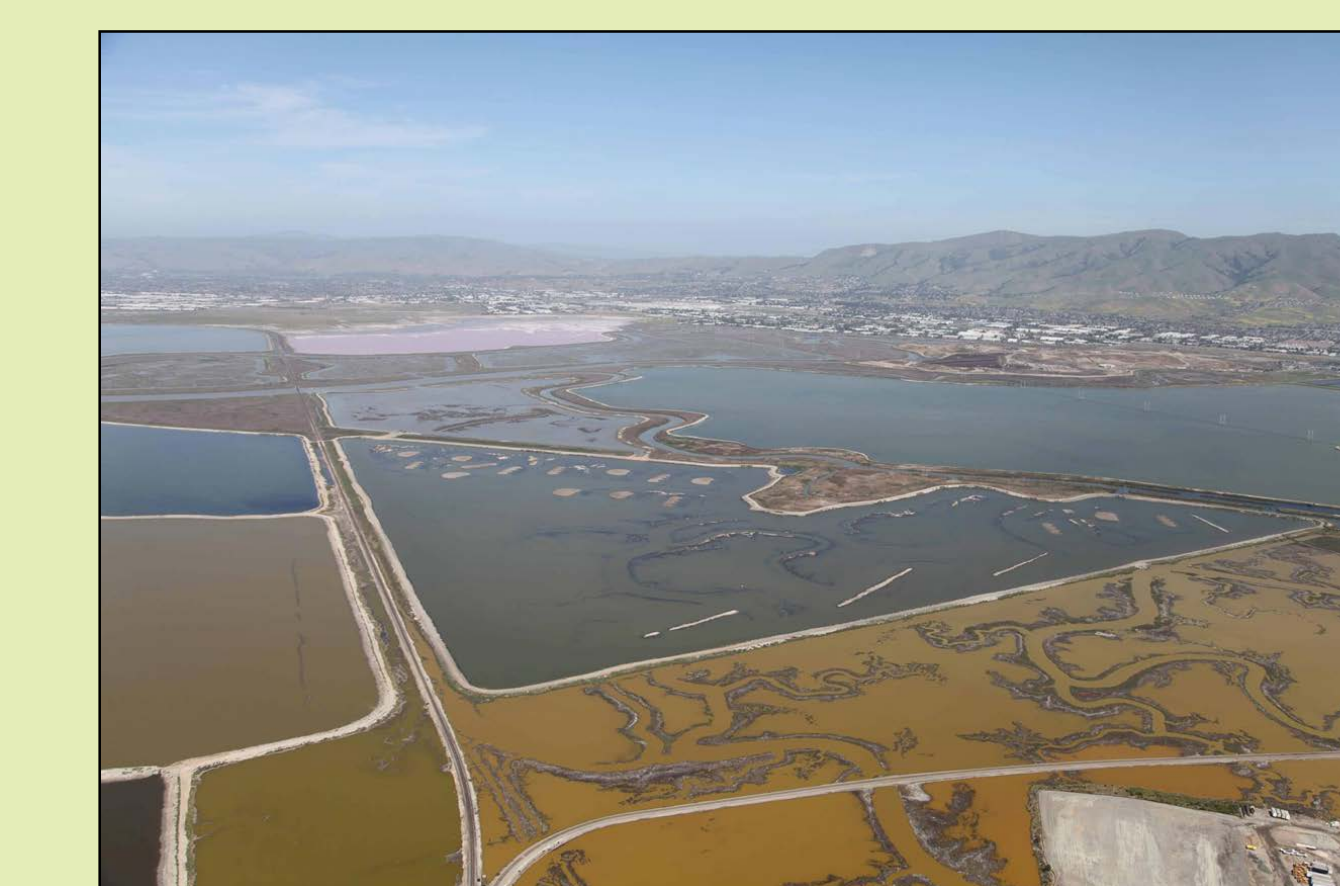


PIT tag detections of striped bass tagged in Pond A8 in 2014. 54 striped bass (10-20lbs) were tagged near the notch. We Detected 7 individuals over 9 months = 14,000 detections. Striped bass are voracious piscivores and would likely prey upon steelhead smolts or other species entering the pond

And can lead to fish kills during low-DO events

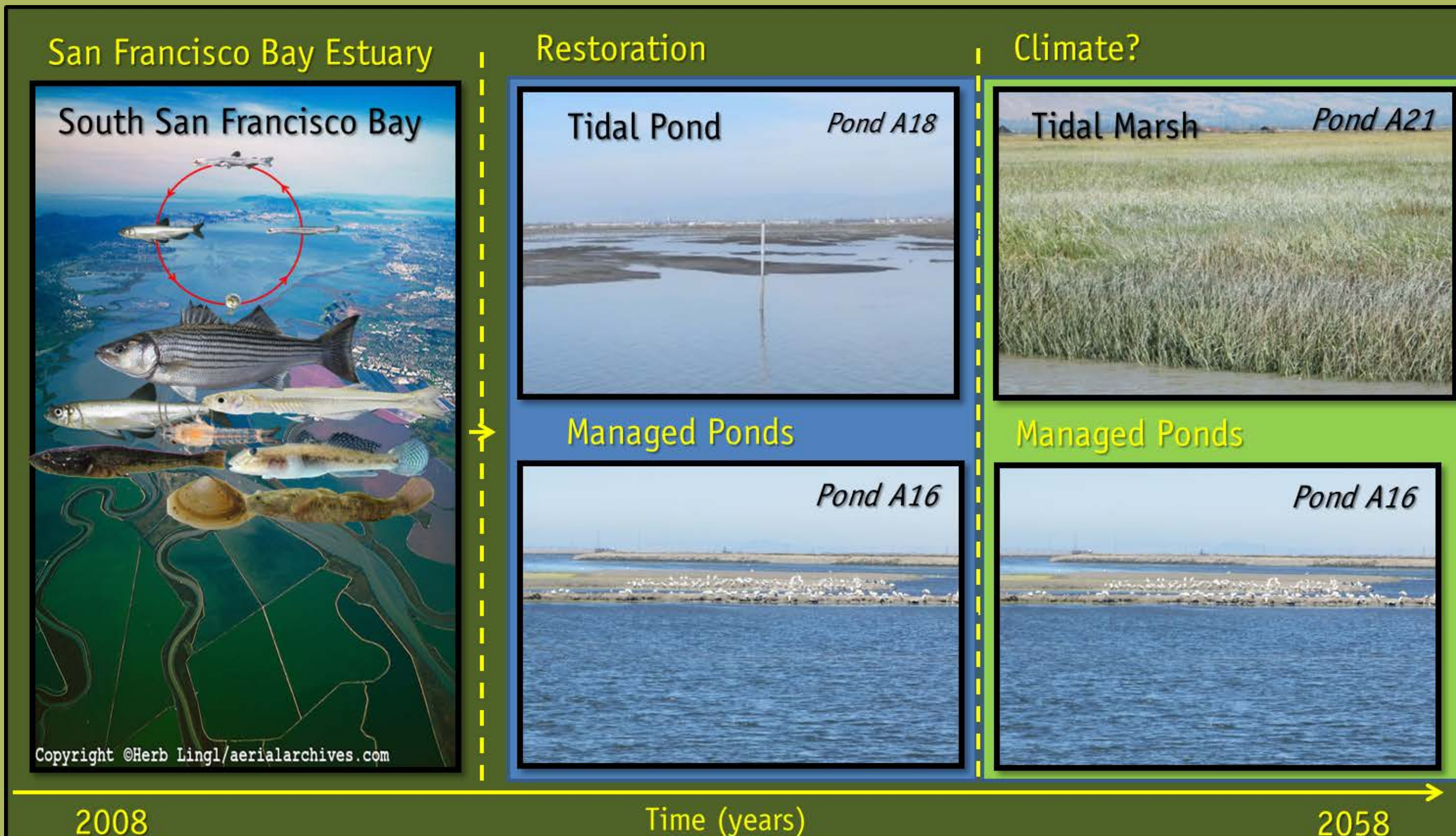


Dead striped bass found in pond A18 during a severe hypoxic event in late summer 2014.

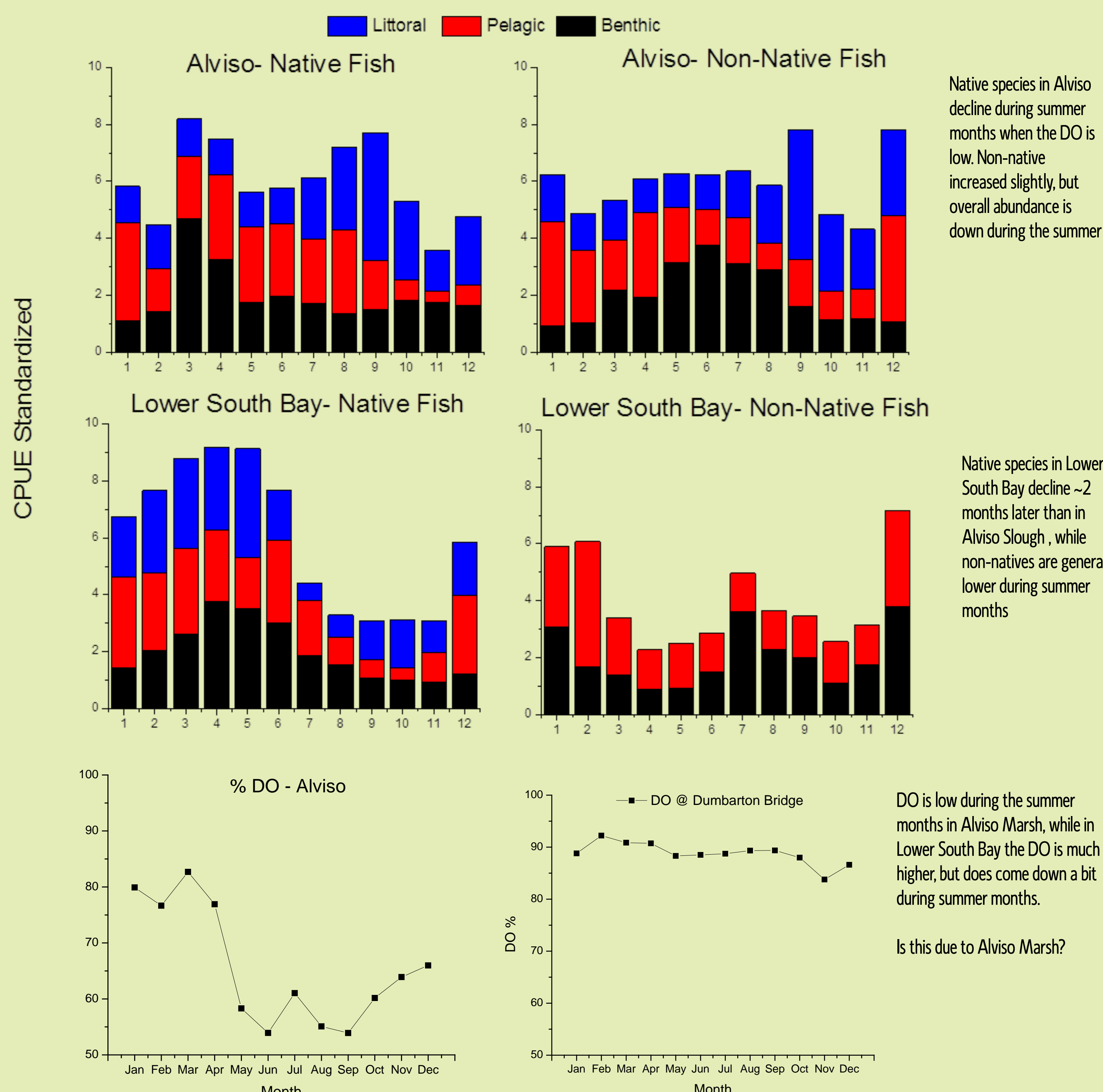


(Left): Photo of Managed Pond A16 in located adjacent to the San Jose-Santa Clara Wastewater facility and the Don Edwards Education Center in the Alviso Marsh. (Right) Fall 2013, 17 adult Chinook Salmon were trapped inside Pond A16. Fish entered the pond through the upstream outfall structure and could not find their way out. Attempts were made to rescue the fish, but most perished before they could be rescued

## Conceptual Model of Restoration



## Is Hypoxia Effecting Fish?



(A) CPUE of native fish from Alviso Marsh otter trawls UCD, (B) CPUE of non-native fish from Alviso Marsh Trawls UCD, (C) CPUE of native fish from Lower South Bay otter trawls San Francisco Bay Study, CDFW, (D) CPUE of non-native fish from Lower South Bay otter trawls San Francisco Bay Study, CDFW., (E) Monthly mean dissolved oxygen % saturation (DO) for Alviso Marsh Jul 2010-Oct 2015. (F) Monthly mean dissolved oxygen % saturation (DO) for Lower South Bay- data from continuous water quality sonde at Dumbarton Bridge-USGS from Oct 2007 to Oct 2015.

## Conclusions/Recommendations

- Managed ponds promote the production of non-native fish and invertebrates in the Alviso Marsh.
  - This is due to the physical and chemical attributes managed ponds provide. A more stable, less tidal system allows non-native organisms to outcompete native organisms, which are not adaptive to this type of habitat.
- Managed ponds promote diel-cyclic hypoxia conditions during the warm summer months.
  - This may result in additional stressors on biota inhabiting managed ponds and may further promote the production of non-native species
- Managed ponds create predation hotspots where native special-status species could be consumed, and results in considerable fish passed issues for many species.
- We recommend future management decisions move towards the 90:10 tidal restoration decision to avoid further impacts of managed ponds on the aquatic species in the Alviso Marsh.

Funding for this research provided by Resource Legacy Fund(RLF) Grant #2009-0080. We would also like to that the countless volunteers who have helped us complete the exhaustive fieldwork that made this poster possible. THANK YOU!

