Tijuana River Valley Recovery Team Update

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Tijuana River National Estuarine Research Reserve

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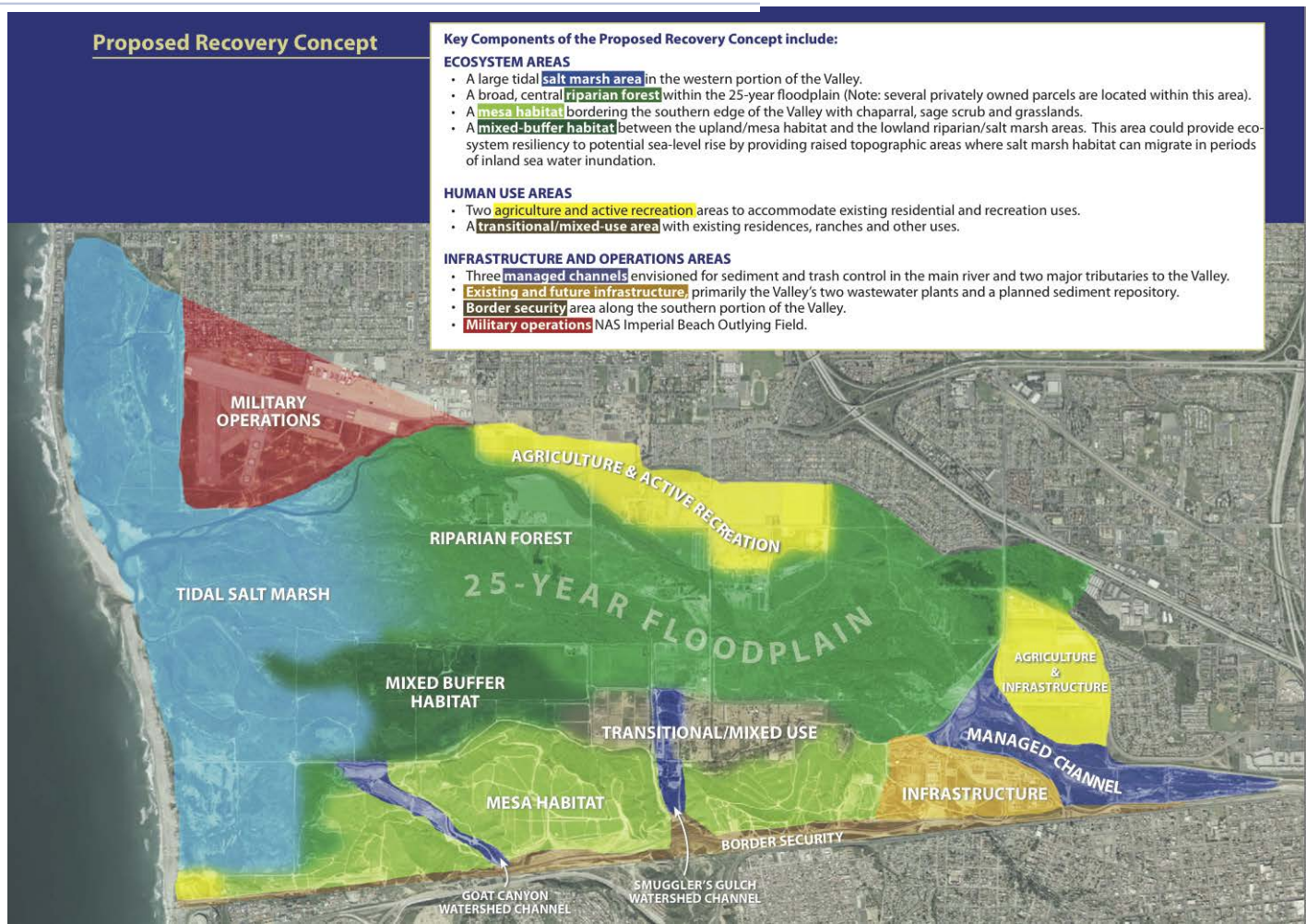
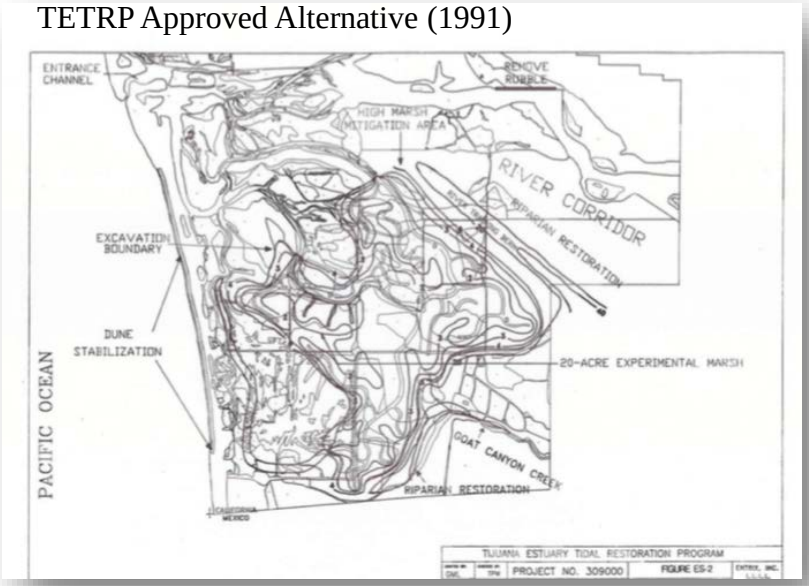
G. Protect and Enhance Natural Resources

20. Climate Change Analysis and Planning
21. Integrated Floodplain Management Alternatives Analysis
22. Restore River Hydrology
23. Restore Estuary
24. Implement the Tijuana River Valley Invasive Plant Control Program In Progress
25. Establish Native Plant Cover and Weed Control on Border Infrastructure System In Progress
26. Acquire Private Property from Willing Sellers In Progress
27. Agricultural Land Management Strategy

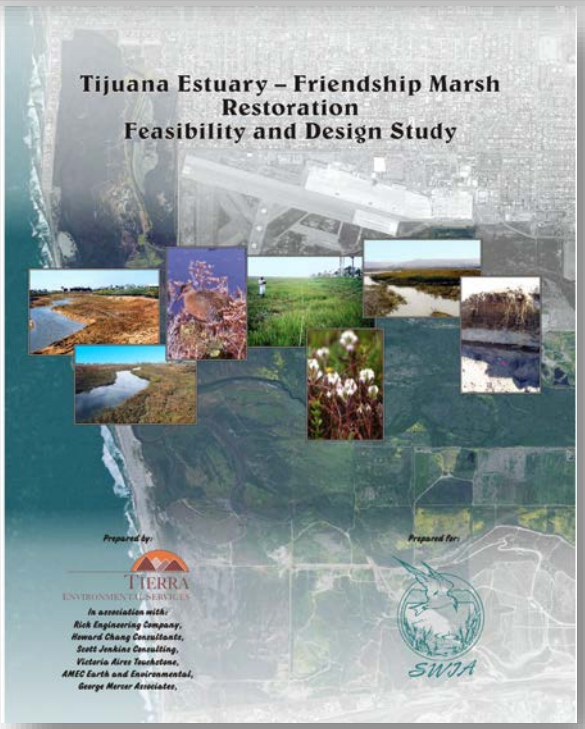
Tijuana River Valley Recovery Strategy (2012)



TETRP Approved Alternative (1991)



Tijuana Estuary Tidal Restoration Program (TETRP)



Feasibility and Design Study (2008)

Goal 1. Increase tidal prism.

Goal 2. Restore former salt marsh, tidal channel, and mudflat to the maximum extent possible.

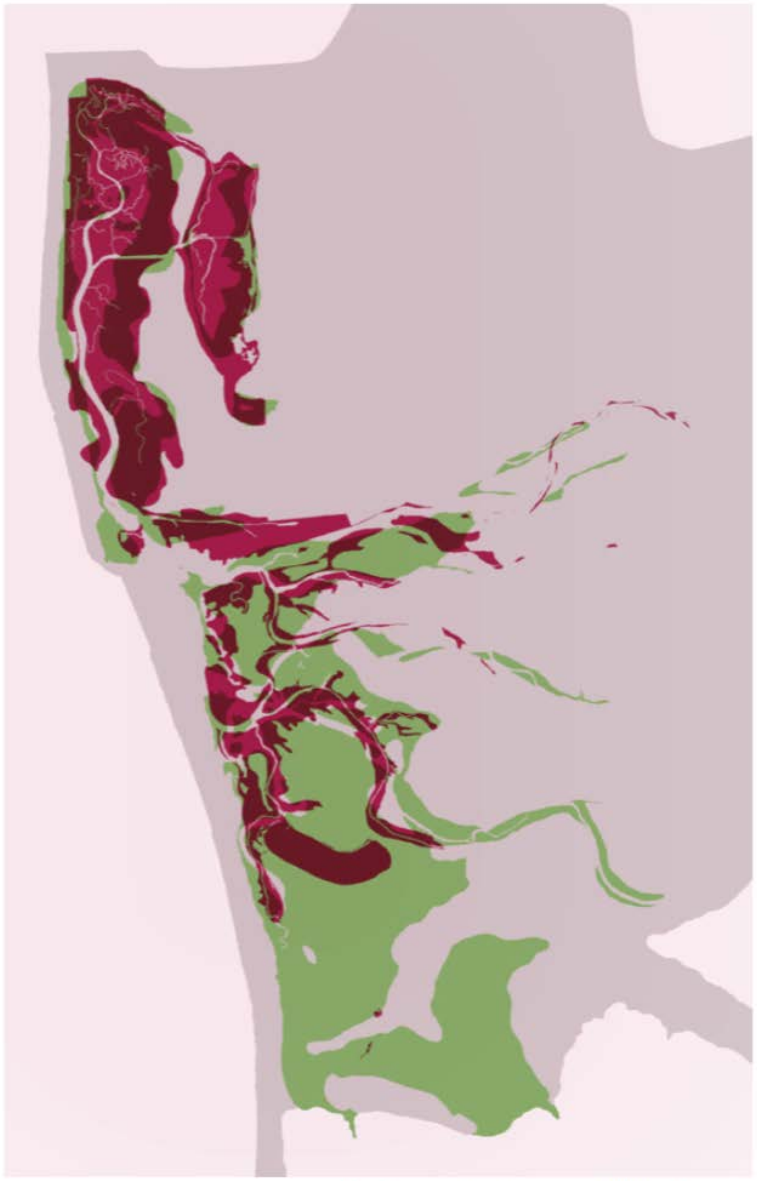
Goal 3. Increase area of undisturbed transition zone.

Goal 4. Restore barrier beach and dunes.

Goal 5. Increase habitat for endangered species.

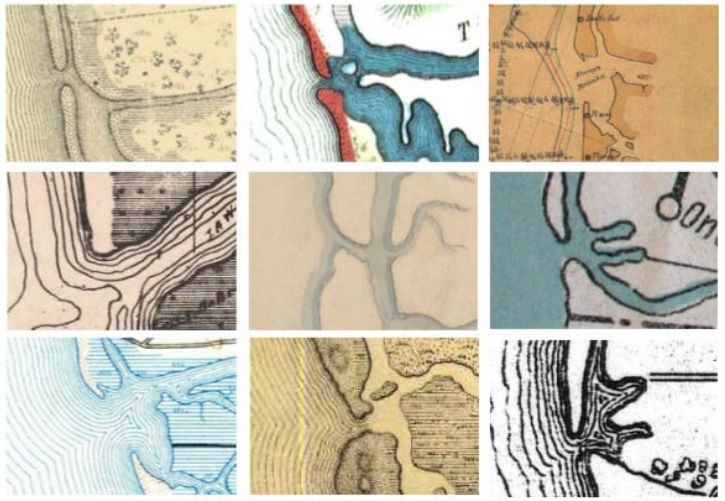
Goal 6. Incorporate research and adaptive management.

Historical Ecology Study (2017)



Distribution of salt marsh ca. 1850 and today.

Reduction in Tidal Prism: 55 – 85%



Consistently Open Mouth

River Valley

Habitat type	Area- USA (ha) ca. 1850	ca. 2012	Net change	Percent change
Dune	22	19	-3	-13%
Subtidal water + Mud flat / Sand flat	82	41	-41	-50%
Salt marsh	248	142	-105	-42%
Salt flat / Open water	17	20	3	19%
River channel	61	10	-51	-83%
River wash / Riparian scrub	730	161	-569	-78%
Alkali meadow complex / High marsh transition zone	761	131	-630	-83%
Grassland / Coastal sage scrub	976	462	-514	-53%
Pond	4	6	2	62%
Vernal pool	8		-8	-100%
Perennial freshwater wetland	4	11	7	188%
Riparian forest		293	293	+INF
Concrete channel				
Agriculture		171	171	+INF
Developed / Disturbed		1,434	1,434	+INF

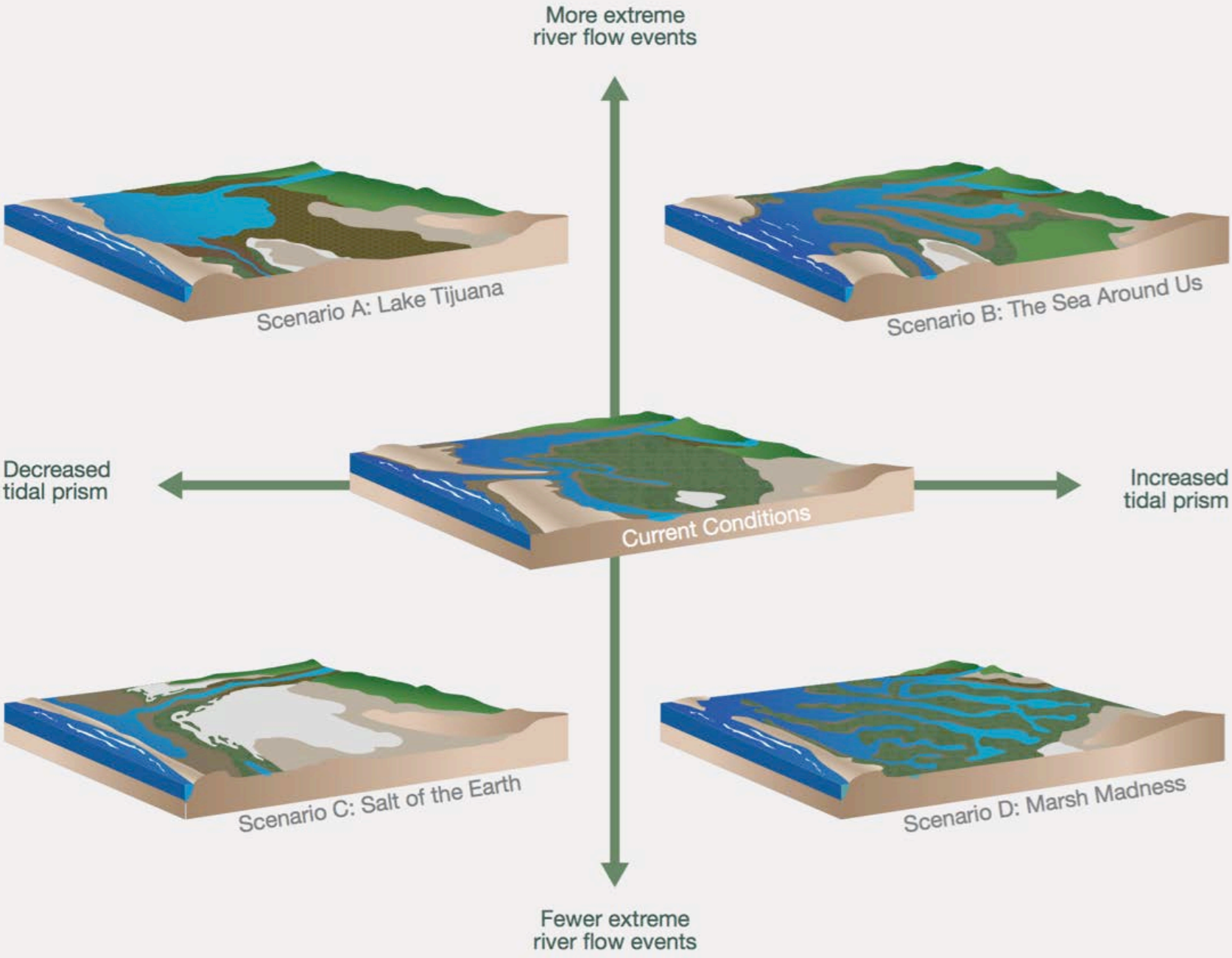
Climate Understanding & Resilience in the River Valley

Conduct Vulnerability Assessment

Develop Climate Adaptation Strategy

Focus on:

- **Sea Level Rise / Effects on Tidal Prism**
- **Riverine Flooding**


More extreme
river flow events
Scenario A: Lake Tijuana
Scenario B: The Sea Around Us
Decreased
tidal prism
Current Conditions
Increased
tidal prism
Scenario C: Salt of the Earth
Scenario D: Marsh Madness
Fewer extreme
river flow events

Scenario A: Lake Tijuana

Increased extreme river flow events
Decreased tidal prism

A river mouth that remains mostly closed limits the exchange of water between the river and the sea, and tends to form a large lake in the lower valley. With nowhere to go, water and sediment entering from upstream collects and can cause severe flooding in the upper valley. Extreme events temporarily open the mouth and flush the collected water. Sea level rise impacts are limited as sedimentation helps the land rise quicker than the sea. However, beachfront areas are still affected, and when sea level rise is coupled with riverine flooding the results can be extremely destructive.

Changes to the Physical Environment

River-Ocean Connection & Water Residence Time
The river mouth is mostly closed, trapping water in the system for long periods of time. The mouth is opened periodically during storm events that create extreme river flows and flush the system.

Flooding, Inundation, & Sediment Dynamics
Severe riverine flooding impacts the entire valley as extreme river flow events increase freshwater inputs and water ponds behind the closed river mouth. There is potential for dramatic restructuring of the valley as new river channels are created during storms and other channels filled in due to sedimentation.

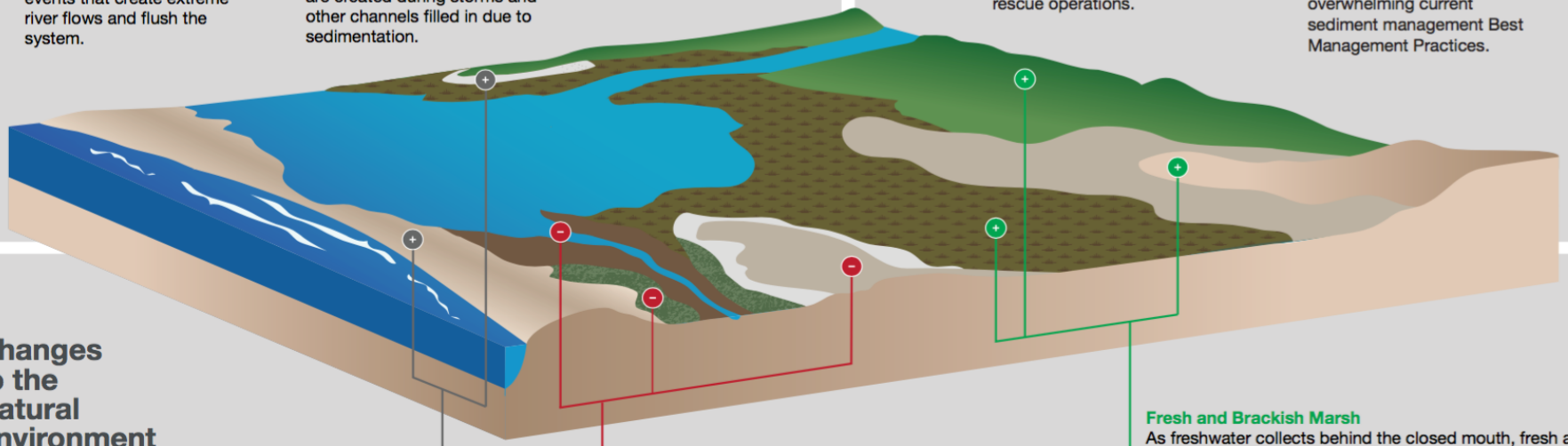
Surface- & Ground-Water Salinity
There is an increased freshwater influence with variable conditions experienced during periods of mouth closure.

Example Management Challenges

Relating to Increased Extreme River Flow Events

Transportation
Access in the valley is frequently impaired by excess sediment and flooding, obstructing emergency evacuation routes, roads, bridges, and trails. This may lead to a need for more resources for emergency rescue operations.

Sediment Management
Large amount of sediment transport during extreme river flow events possibly overwhelming current sediment management Best Management Practices.



Changes to the Natural Environment

Beaches, Sand Dunes, & Salt Flats
Slight increase.

Open Tidal Channels & Mudflats
Limited saltwater influence and rising elevations due to sediment aggradation result in large decreases in habitat.

Salt Marsh
Limited saltwater influence and an increase in freshwater inputs result in large decreases in habitat area.

Wetland-Upland Transition
Increased freshwater inputs cause a large decrease in these habitats as they transition into fresh and brackish marsh.

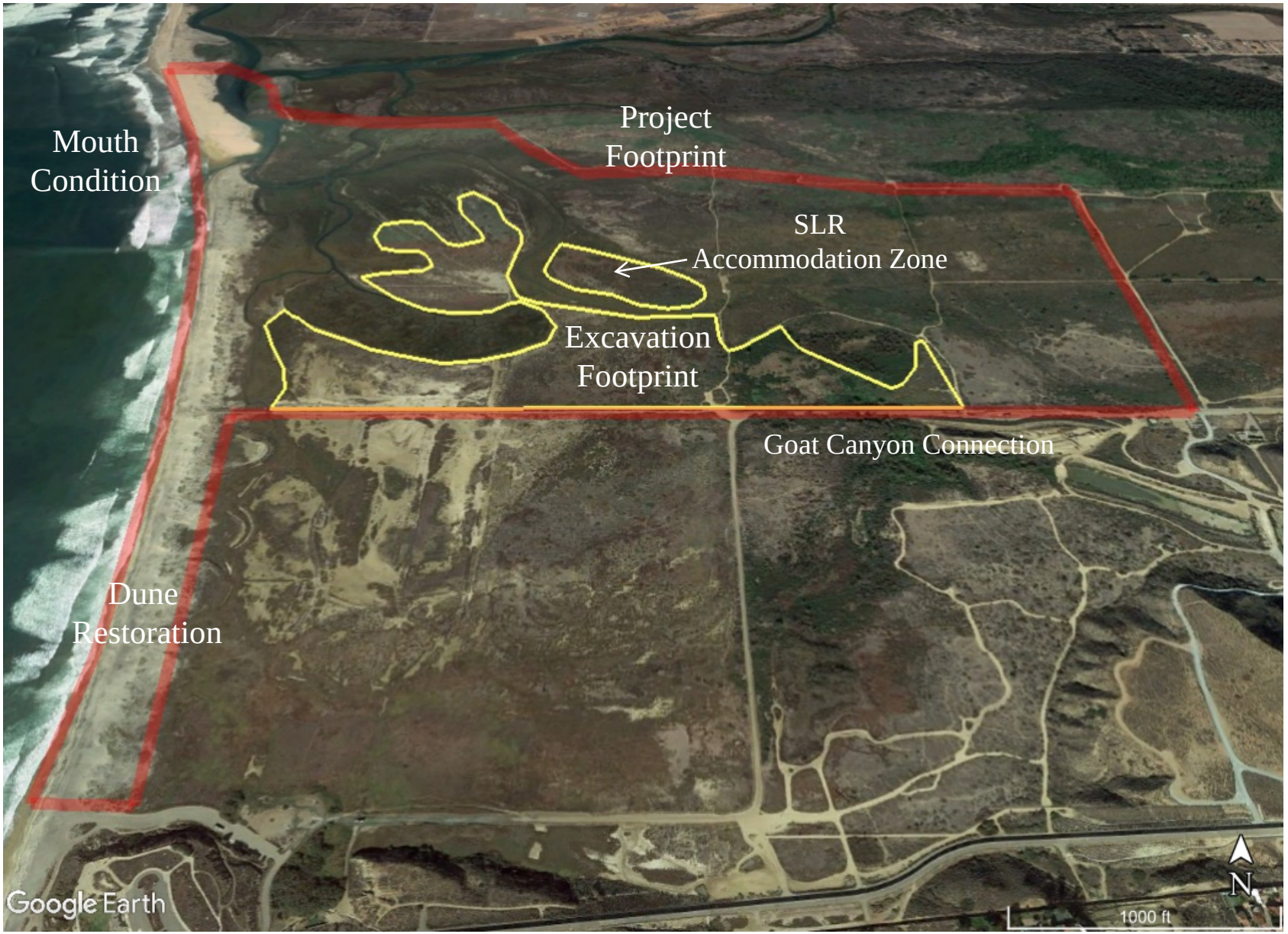
Fresh and Brackish Marsh
As freshwater collects behind the closed mouth, fresh and brackish marsh areas increase in size.

Upland
Sediment aggradation outpaces sea level rise causing a large increase of upland areas in the lower valley.

Riparan
Increased freshwater inputs from extreme river events in the upper valley result in large increases in riparian areas.

Scenarios are not predictions but are alternative representations of how the future may unfold in response to potential climate and environmental changes. For more details visit: http://www.trnerr.com/currv/.

TETRP


Mouth
Condition
Project
Footprint
SLR
Accommodation Zone
Excavation
Footprint
Goat Canyon Connection
Dune
Restoration
Google Earth
N
1000 ft

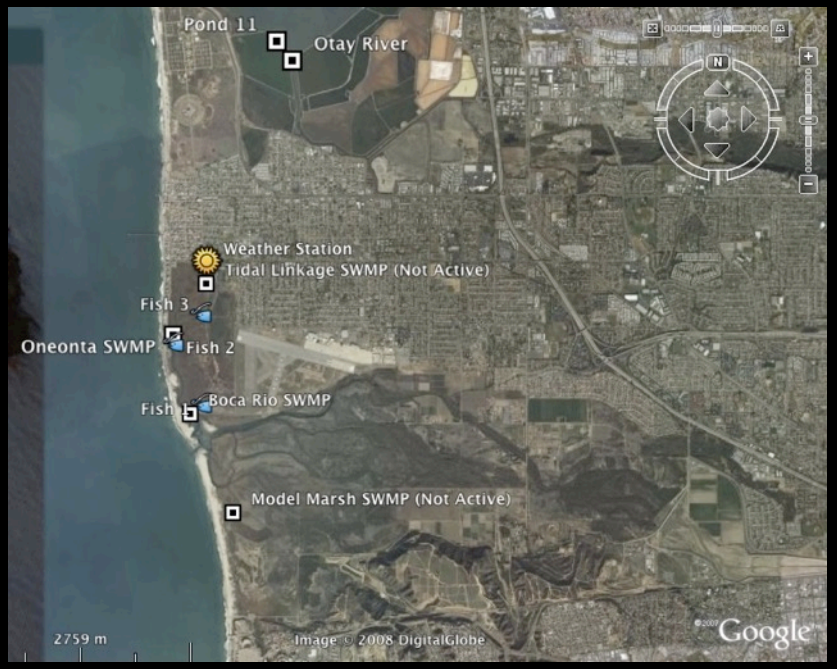
Ecosystem Monitoring:

Assessing “Vital Signs” and Fostering Adaptive Management

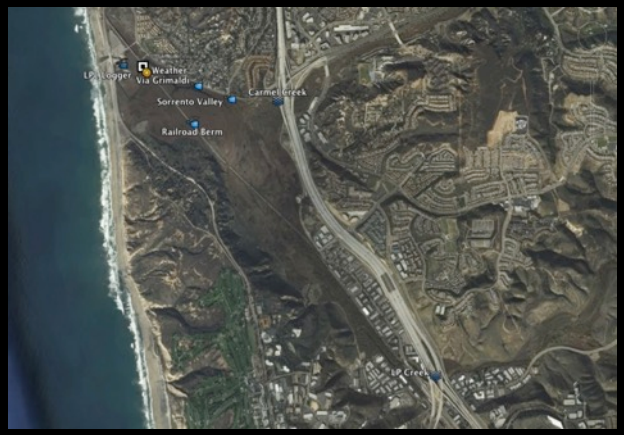
PERL and TRNERR

- Water parameters -Temperature, Salinity, Dissolved Oxygen, Turbidity, pH, depth
- Nutrients / Chlorophyll a
- Topography
- Soil salinities
- Vegetation
- Invertebrates
- Fish
- Birds

South San Diego Bay

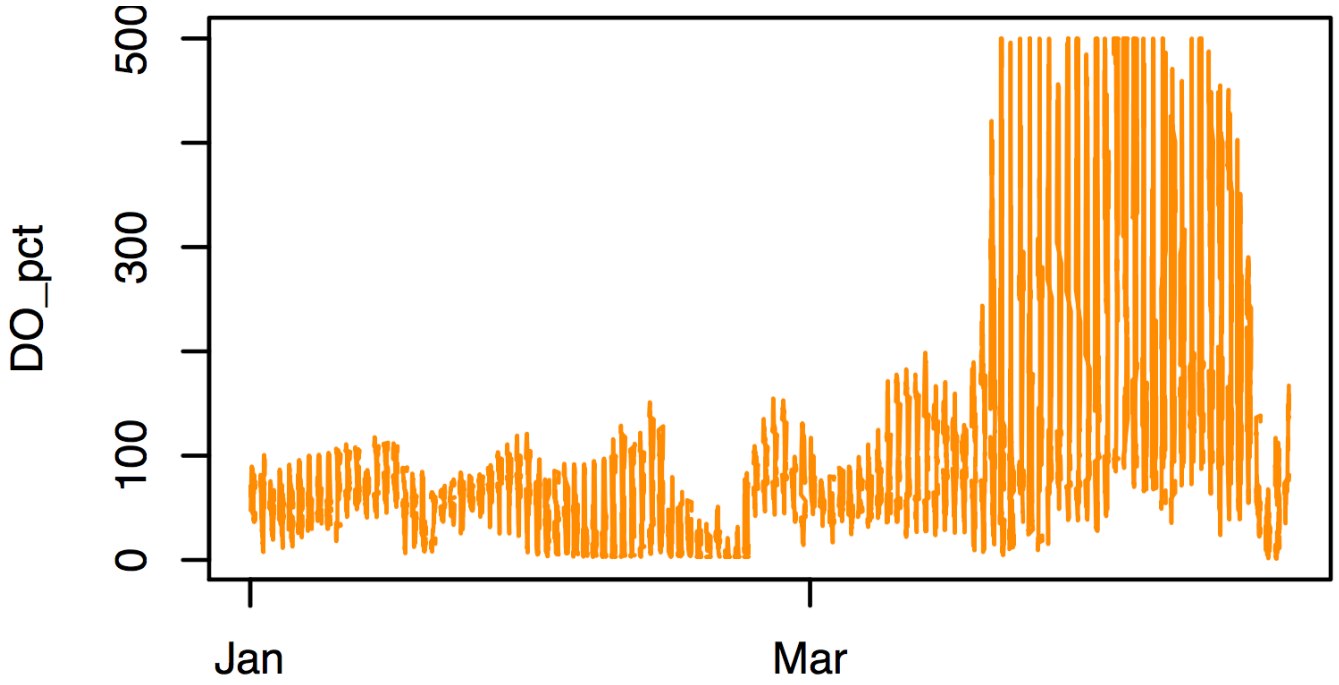


Tijuana River Estuary

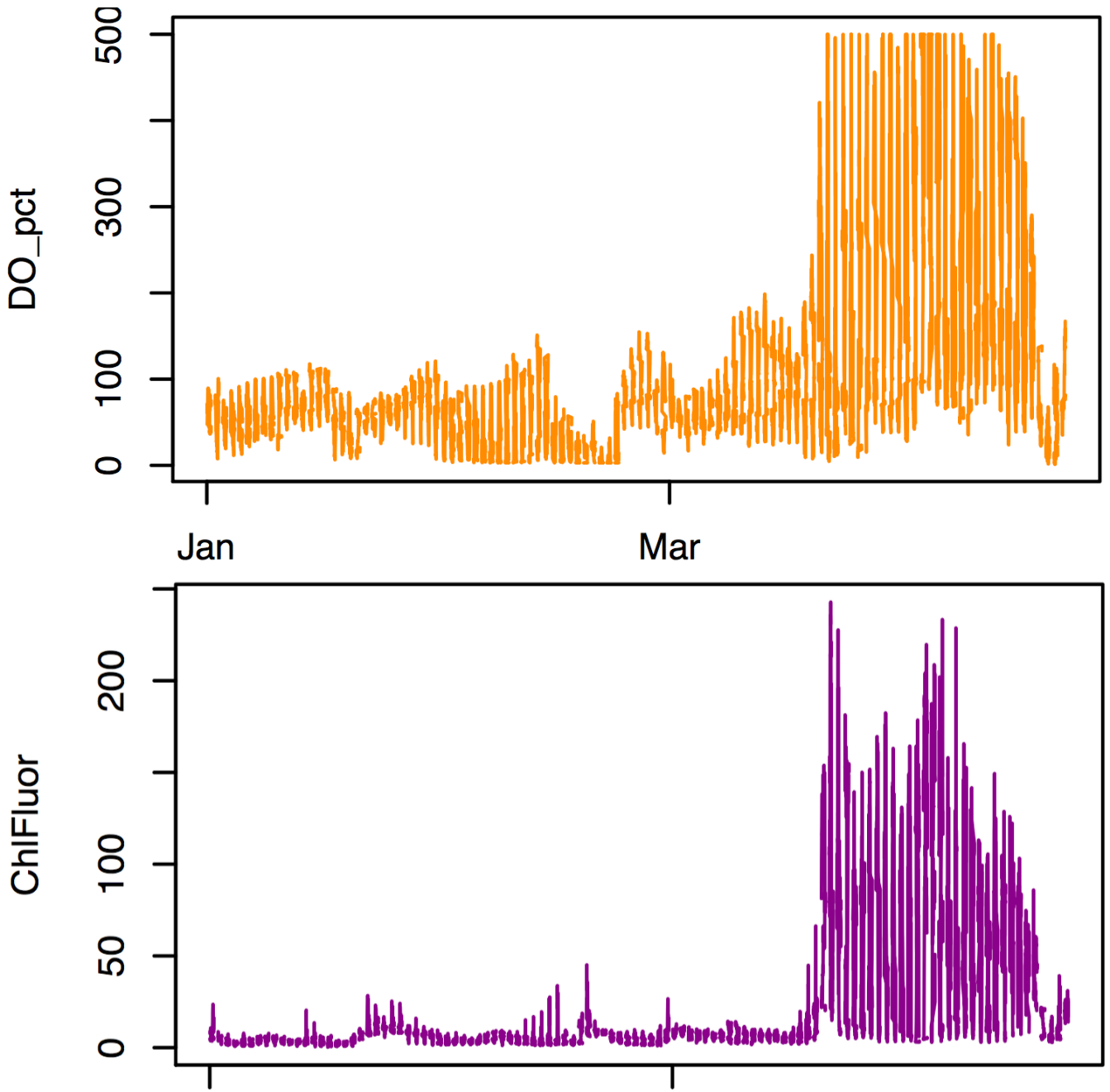


Los Peñasquitos Lagoon

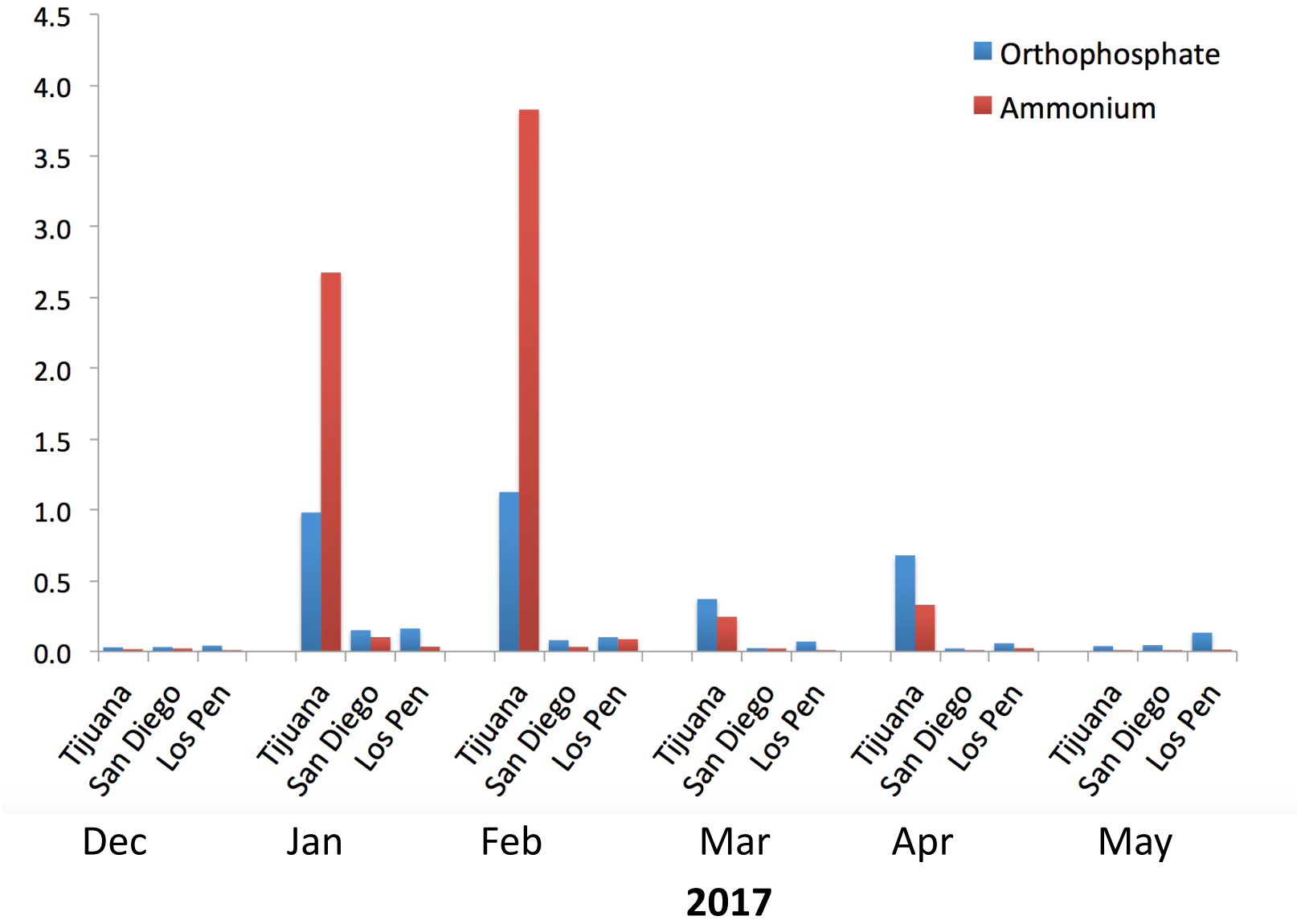
High Dissolved Oxygen



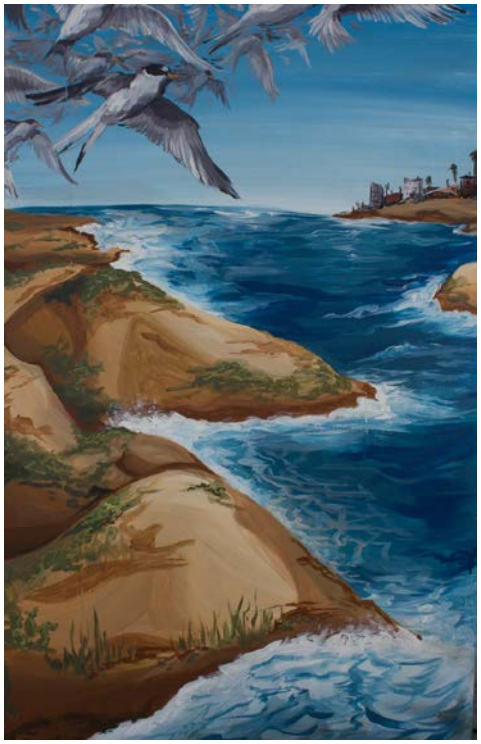
High Dissolved Oxygen / Phytoplankton



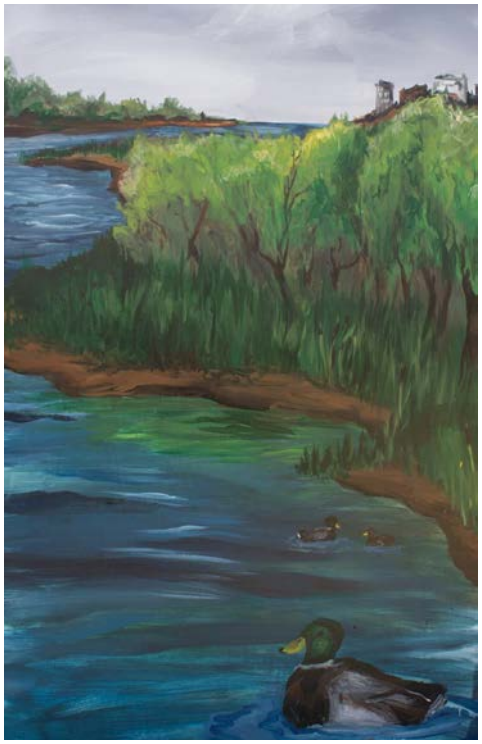
High Nutrients



Marsh Madness



The Sea Around Us



Lake Tijuana

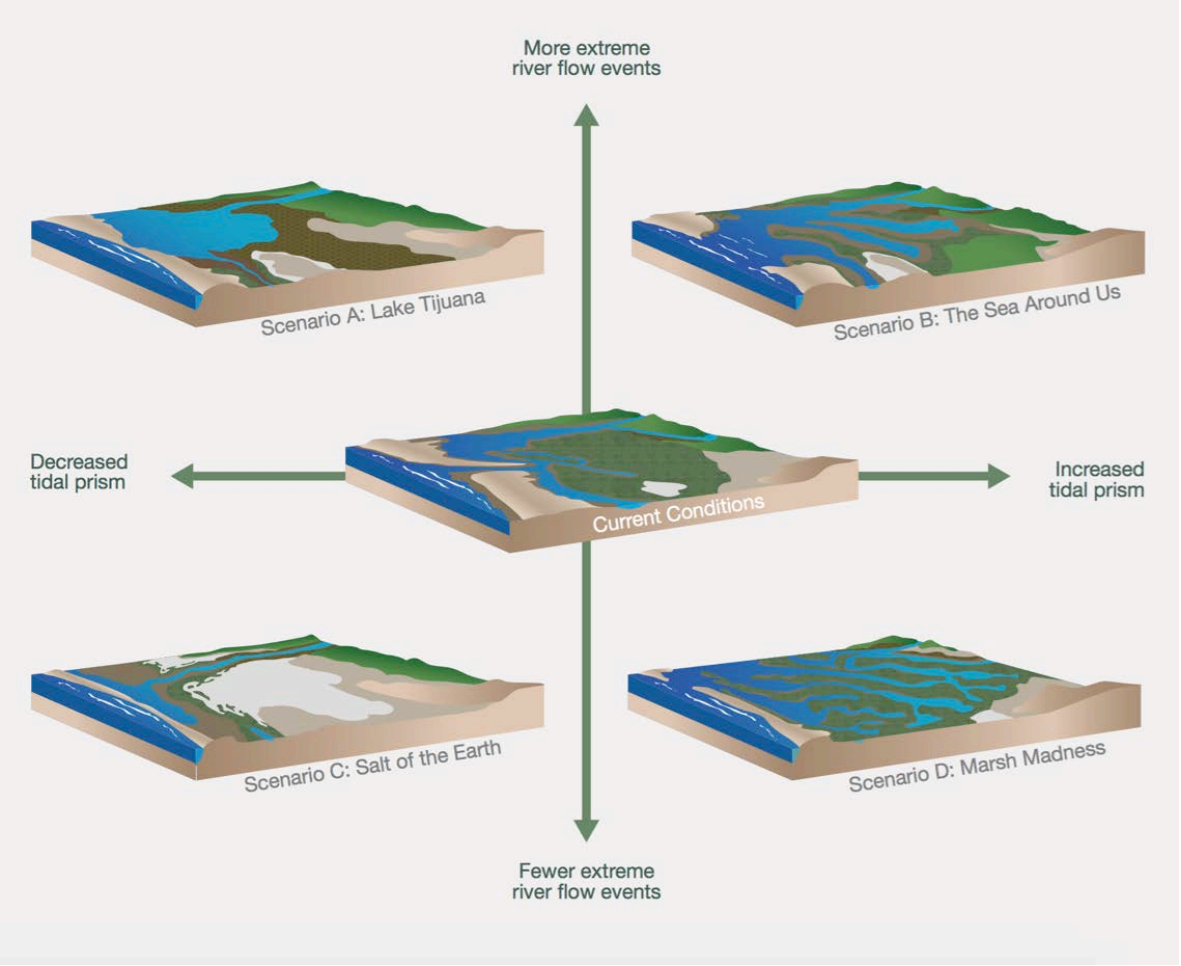
Salt of the Earth

Exhibit includes four mural paintings and several watercolors.

Learn more: trnerr.org/visualizing-the-future

Art is how Audrey Carver interprets the world around her. When she was only two years old, the artist within blossomed, as she colored pieces of paper, the walls, the floor and even her feet- all potential masterpieces. Now, at 17, she attends the renowned Idyllwild Arts Academy. Through her paintings, she shares the beauty and drama of the natural world, and communicates the importance of respecting our environment to create a sustainable future.

*Special thanks to the **Climate Science Alliance – South Coast** for helping to make this exhibit possible through their Artists in Residence Program.*
Learn more: climatesciencealliance.org



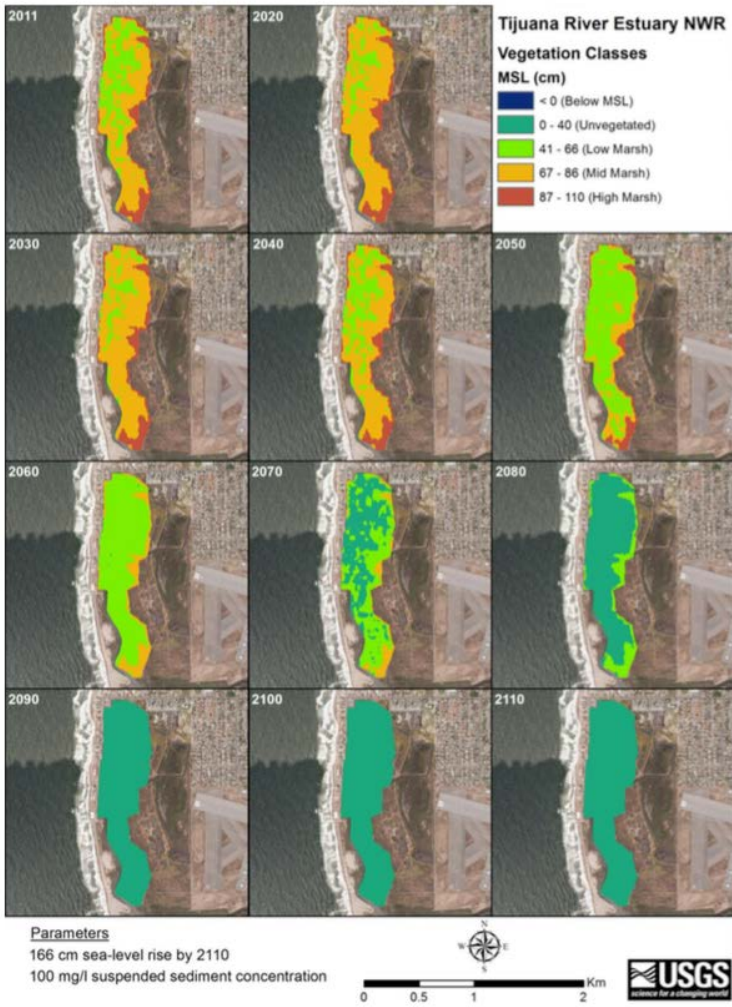
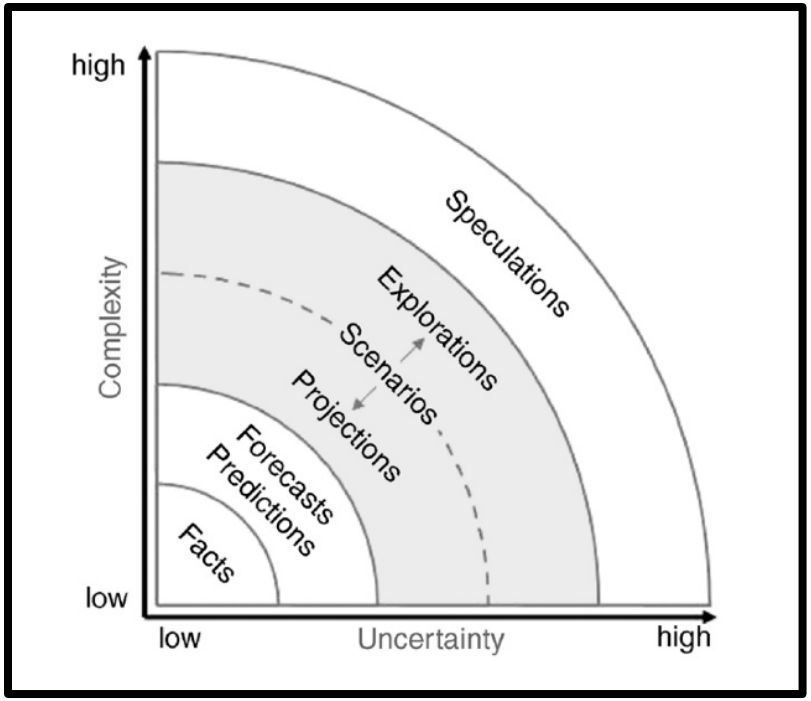


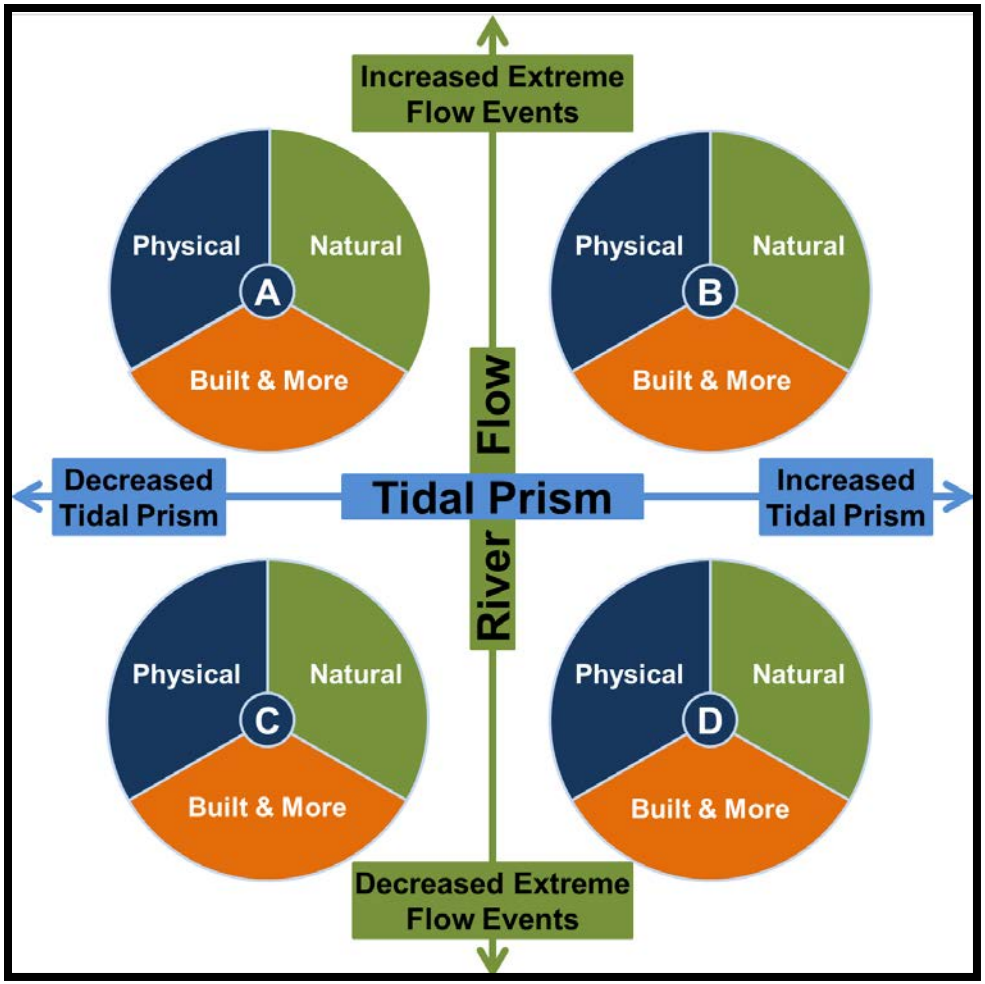
Figure 22. Results from the MEM sea level response model for the north arm marsh at Tijuana National Wildlife Refuge under the high (+166 cm by 2110) sea-level rise scenario with 100 mg/l mean annual suspended sediment concentration.

Scenarios



Expand and challenge our thinking, while being plausible and internally-consistent

Identify key drivers and alternative ways the system can evolve



Tidal Linkage

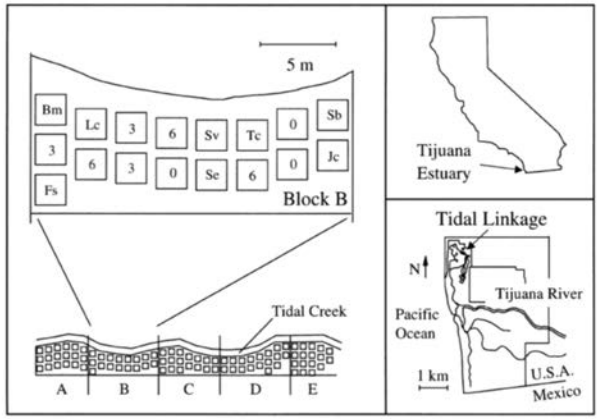
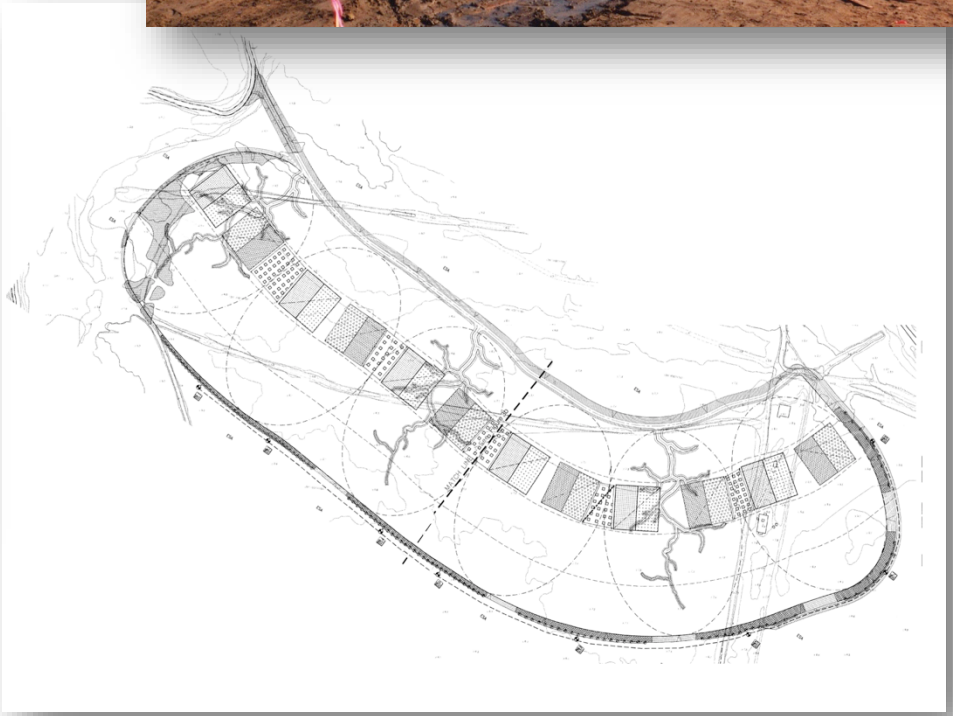
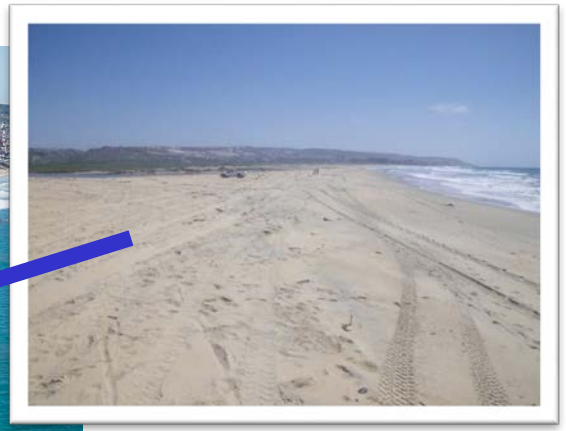
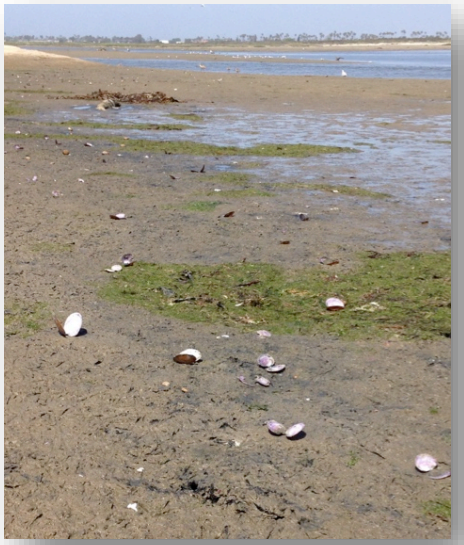


FIG. 1. Location of the Tidal Linkage and the layout of experimental plots. Blocks are indicated, and the random layout of one block is shown. Numbers identify unplanted (0), 3-species, and 6-species plots. Codes indicate the species planted in 1-species plots: Bm = *Batis maritime*, Fs = *Frankenia salina*, Jc = *Jaumea carnosa*, Lc = *Limonium californicum*, Sb = *Salicornia bigelovii*, Se = *Suaeda esteroa*, Sv = *Salicornia virginica*, and Tc = *Triglochin concinna*.



Model Marsh





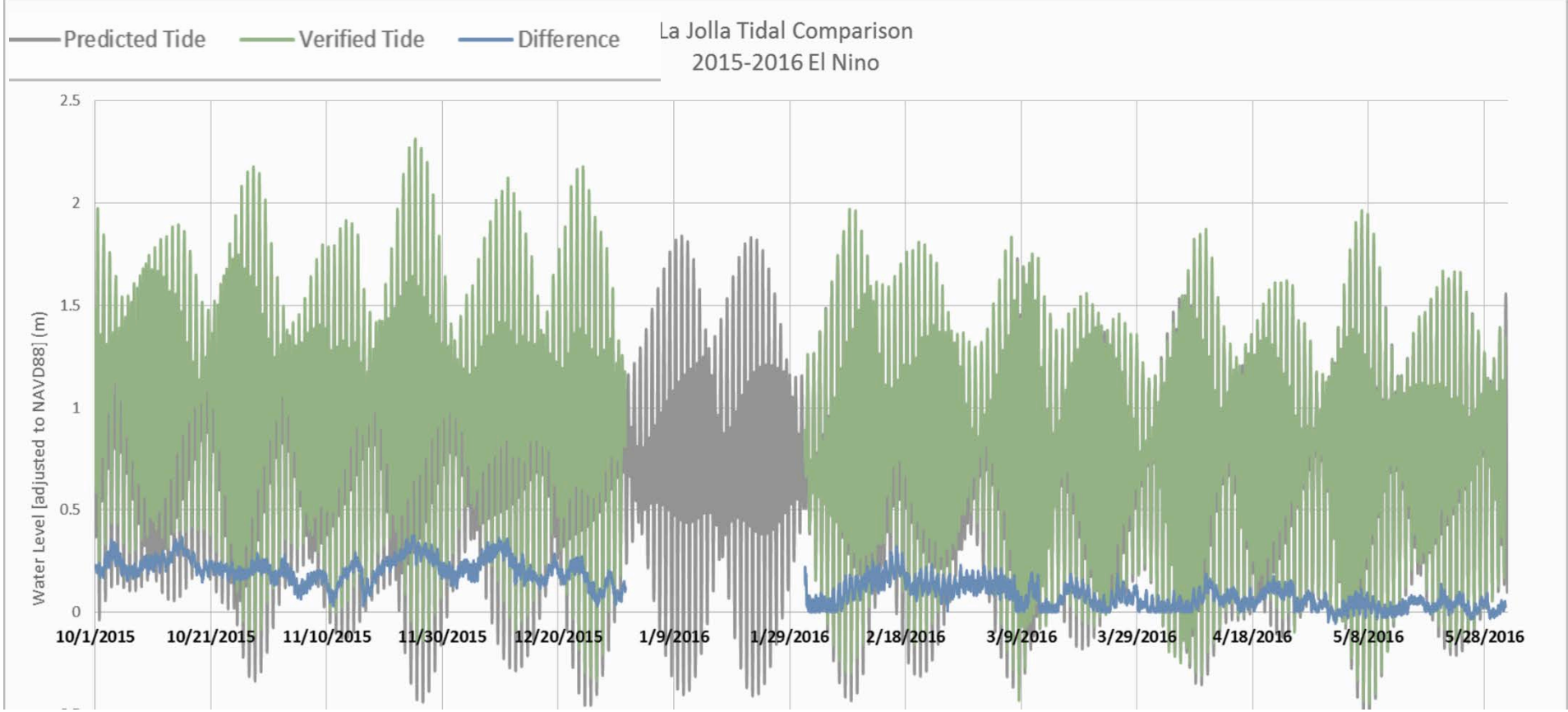
Purple varnish clams

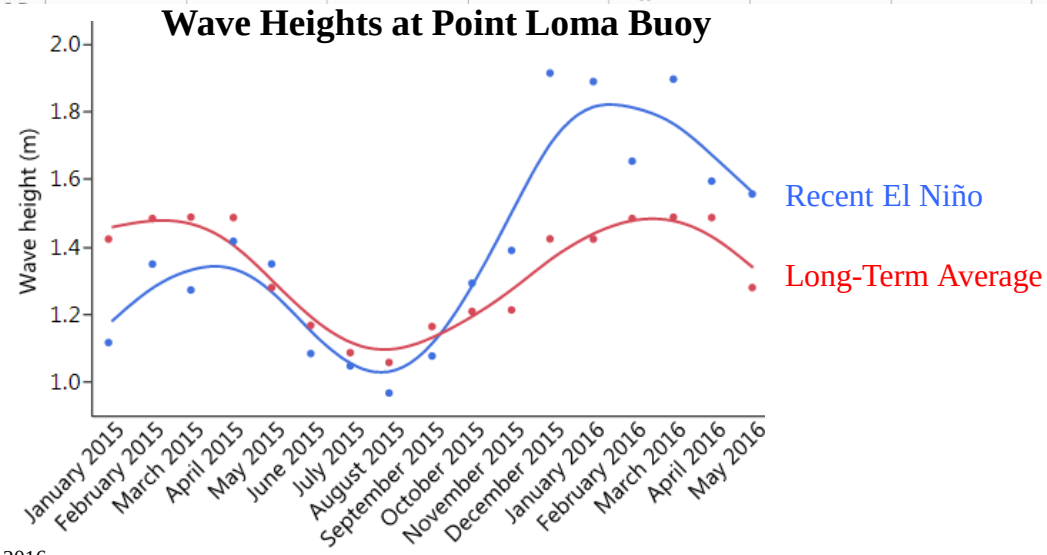
TJ river mouth reopened after flooding, shark deaths

El Niño conditions pushed enough sand into the mouth of the Tijuana River south of Imperial Beach to close off the flow of the river to the ocean. With the weekend rains water from the closed off estuary was backing up into Imperial Beach streets, forcing an emergency opening of the river mouth with heavy equipment Monday afternoon. After the water receded it became apparent that the oxygen depleted waters had been fatal to many leopard sharks, mollusks and other species that inhabit the area.

Sea gulls ate the remains of a leopard shark killed when the estuary was closed off from the ocean. — *John Gibbins / San Diego Union-Tribune*

Share Gallery



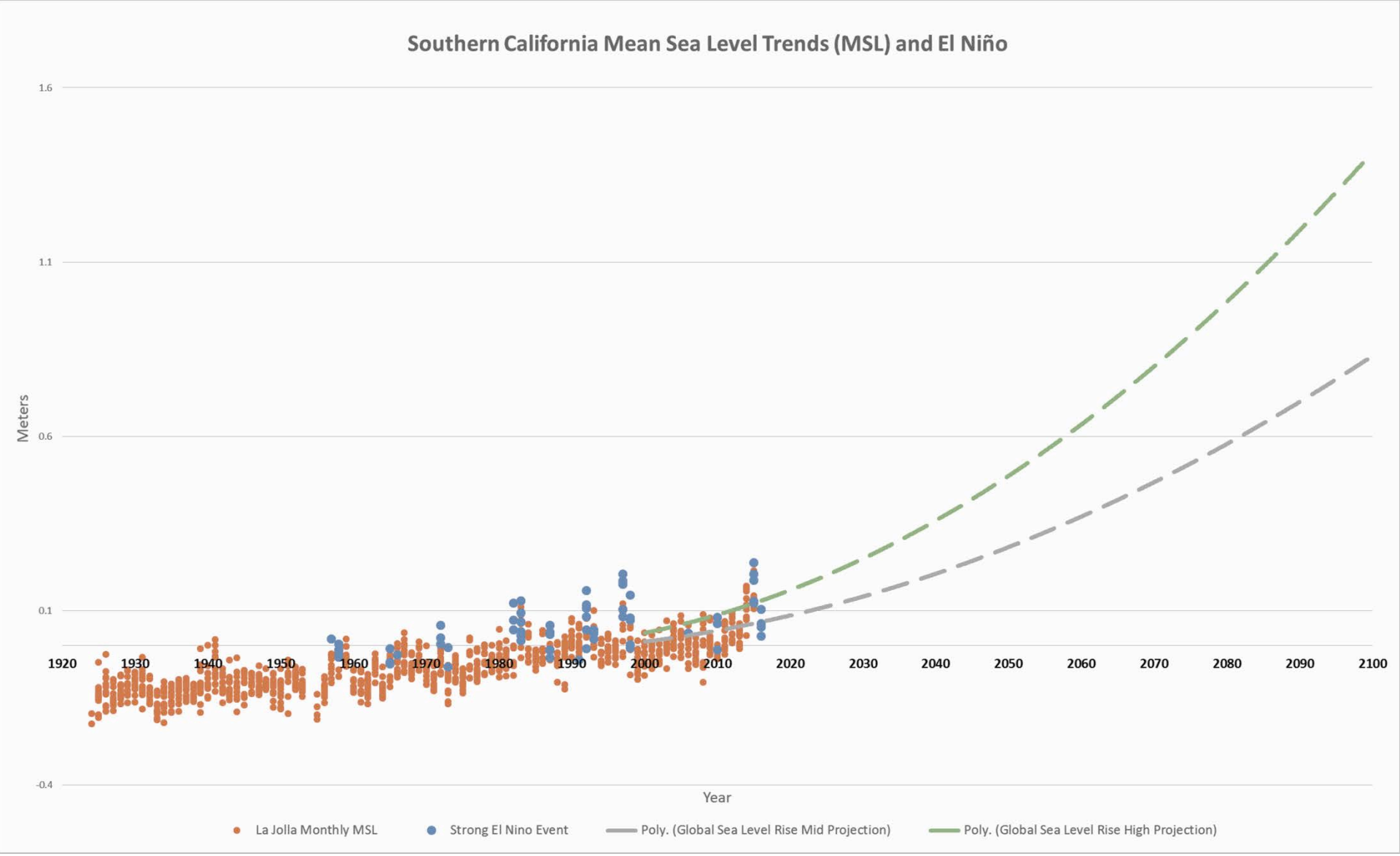


Recent El Niño

Long-Term Average

2015-2016 El Niño

Meltzer 2016



Meltzer 2016


Tidal Linkage
Old Sewage Ponds
Oneonta Slough
Tijuana River Slough / Main Channel
Northern Channel (1993)
River Mouth
Mid-Valley Slough
Old River Slough
Hollister Bridge
South Beach Slough
PERL site
Model Marsh
Old Model Airplane Field
Goat Canyon
Yogurt Canyon
Google Earth
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