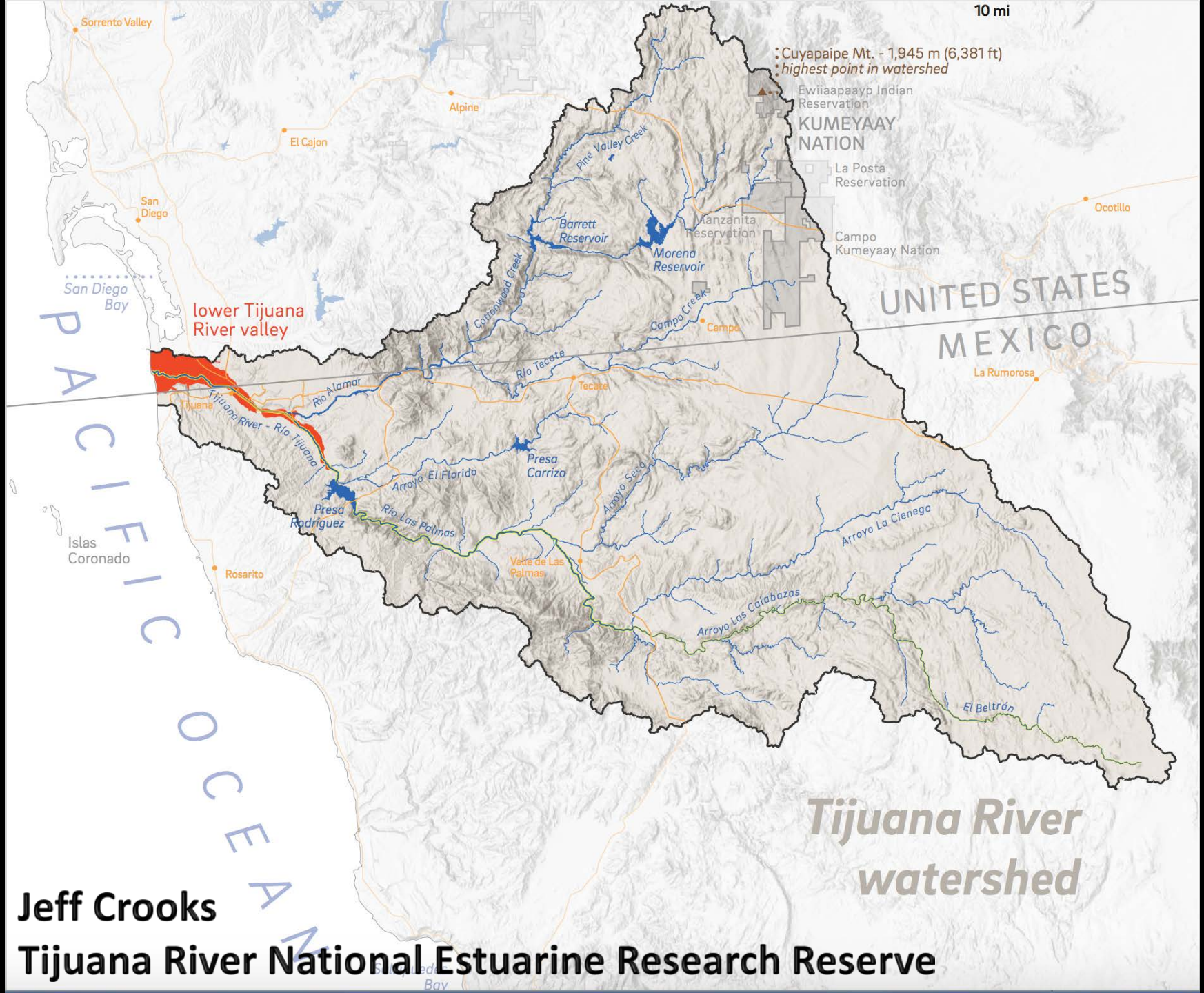
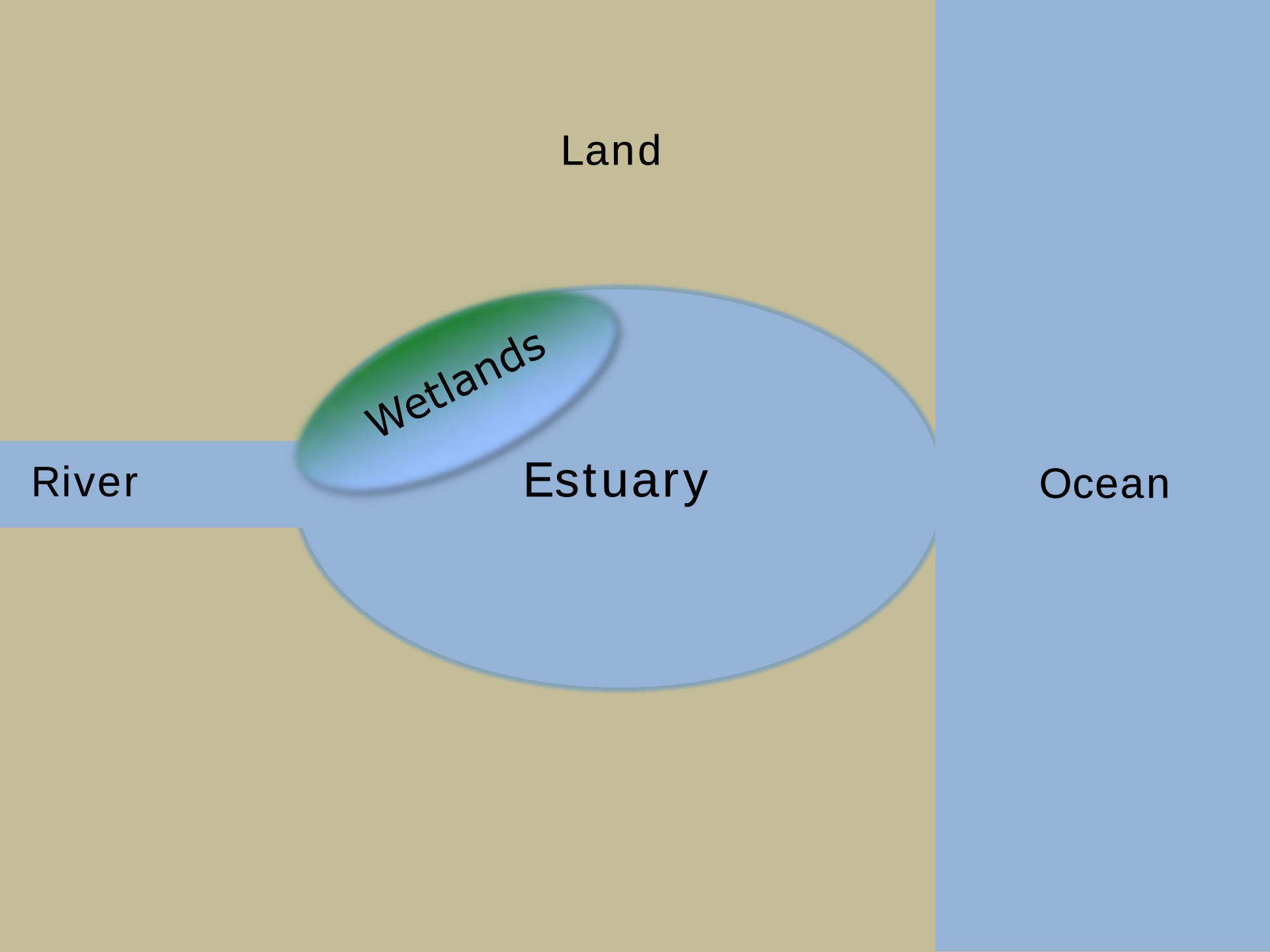
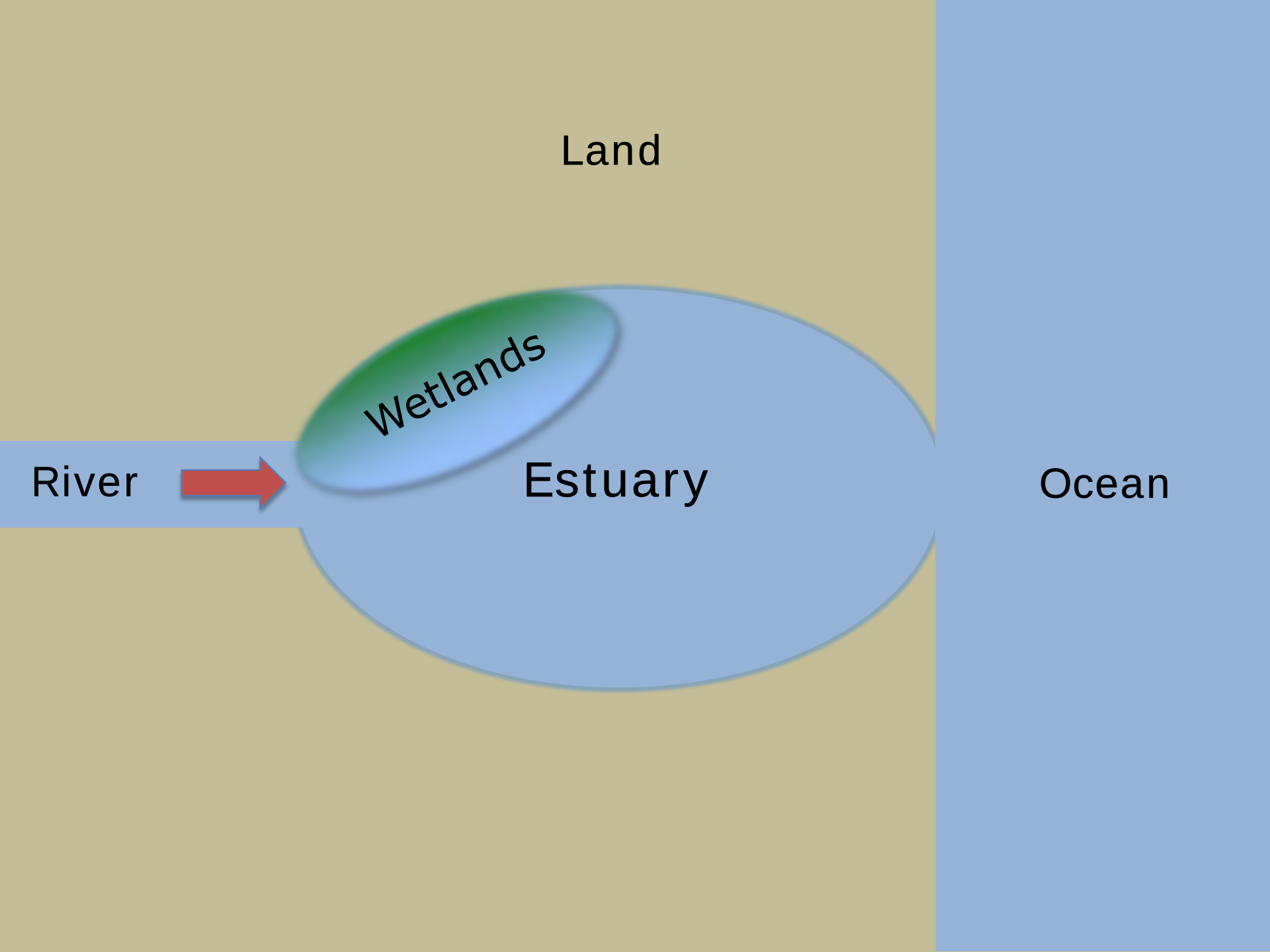


Jeff Crooks

Tijuana River National Estuarine Research Reserve


Land
Wetlands
River
Estuary
Ocean


Land
Wetlands
River
Estuary
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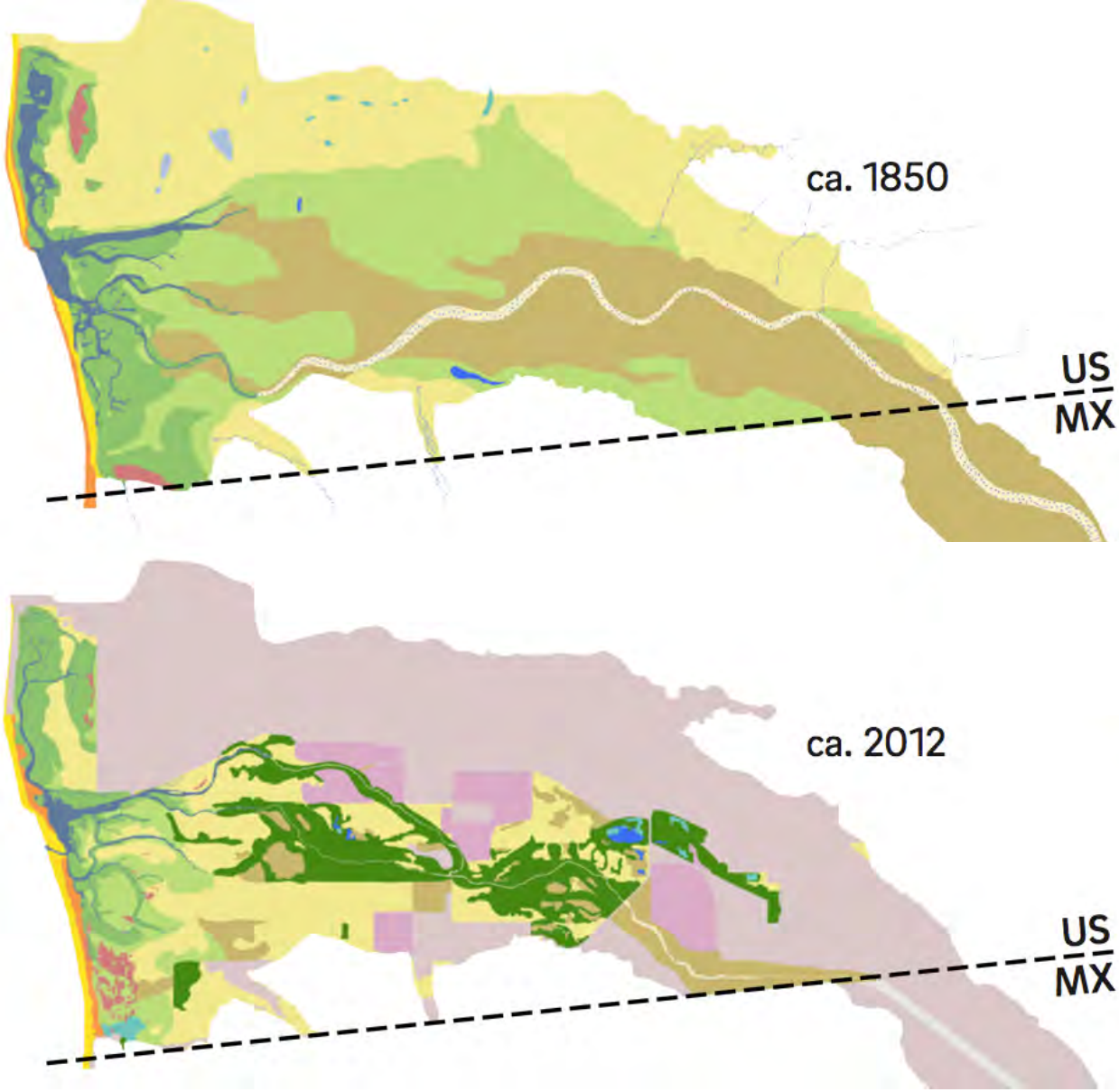

ca. 1850
US
MX
ca. 2012
US
MX
Alkali Meadow Complex / High Marsh T-Zone
Grassland / Coastal Sage Scrub
Pond
Vernal Pool
Perennial Freshwater Wetland
Dune
Subtidal Water & Mudflat/Sandflat
Salt Marsh
Salt Flat / Open Water
River Channel
River Wash / Riparian Scrub
Riparian Forest
Concrete Channel
Agriculture
Developed/Disturbed
2 km
2 mi
N

SFEI 2017

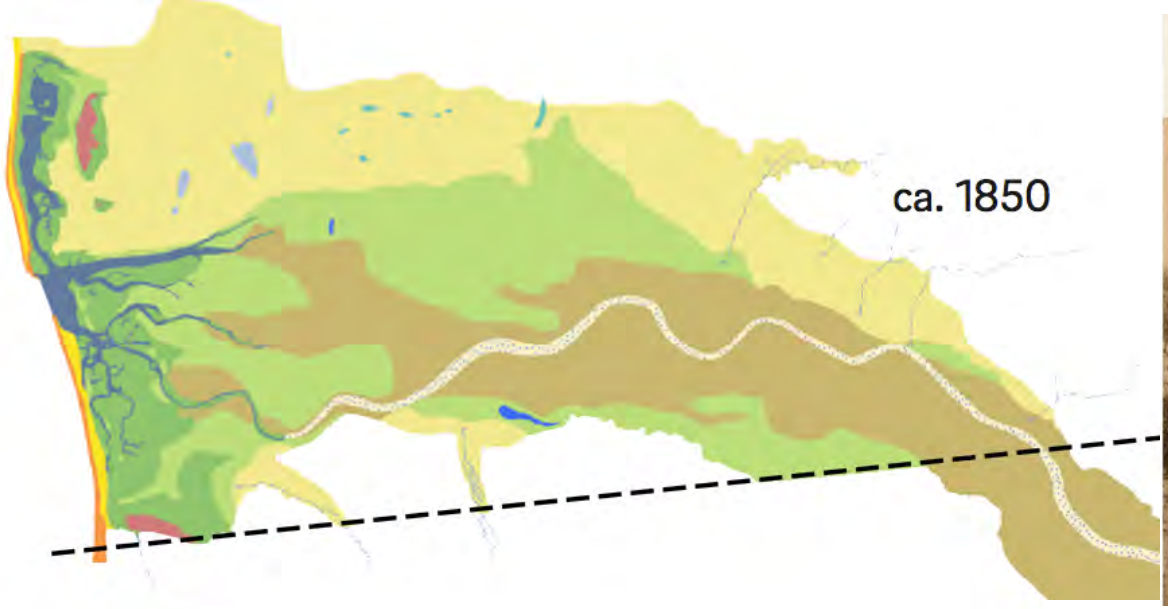
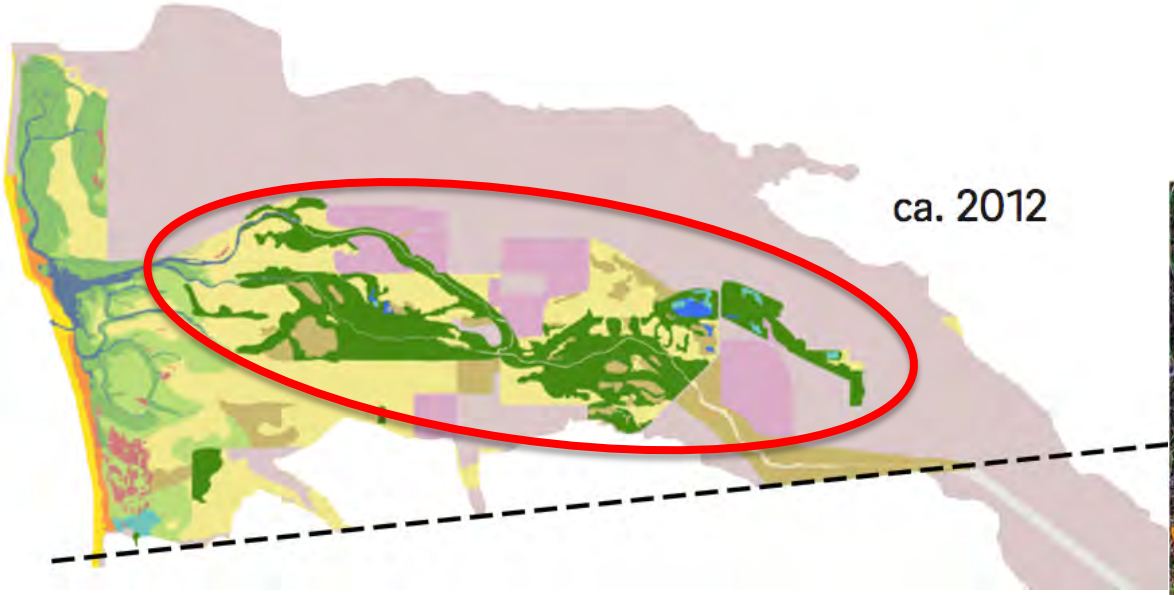


Figure 5.31. "Channel of Tia Juana," ca. 1920. A view of the sandy, sparsely vegetated Tijuana River channel showing the riparian plant community typical of river wash habitat. The river wash in the foreground grades into areas of denser riparian scrub in the background. Location unknown. *(LIPP, Box 85, Photo #3069, courtesy Water Resources Collections and Archives, UC Riverside)*



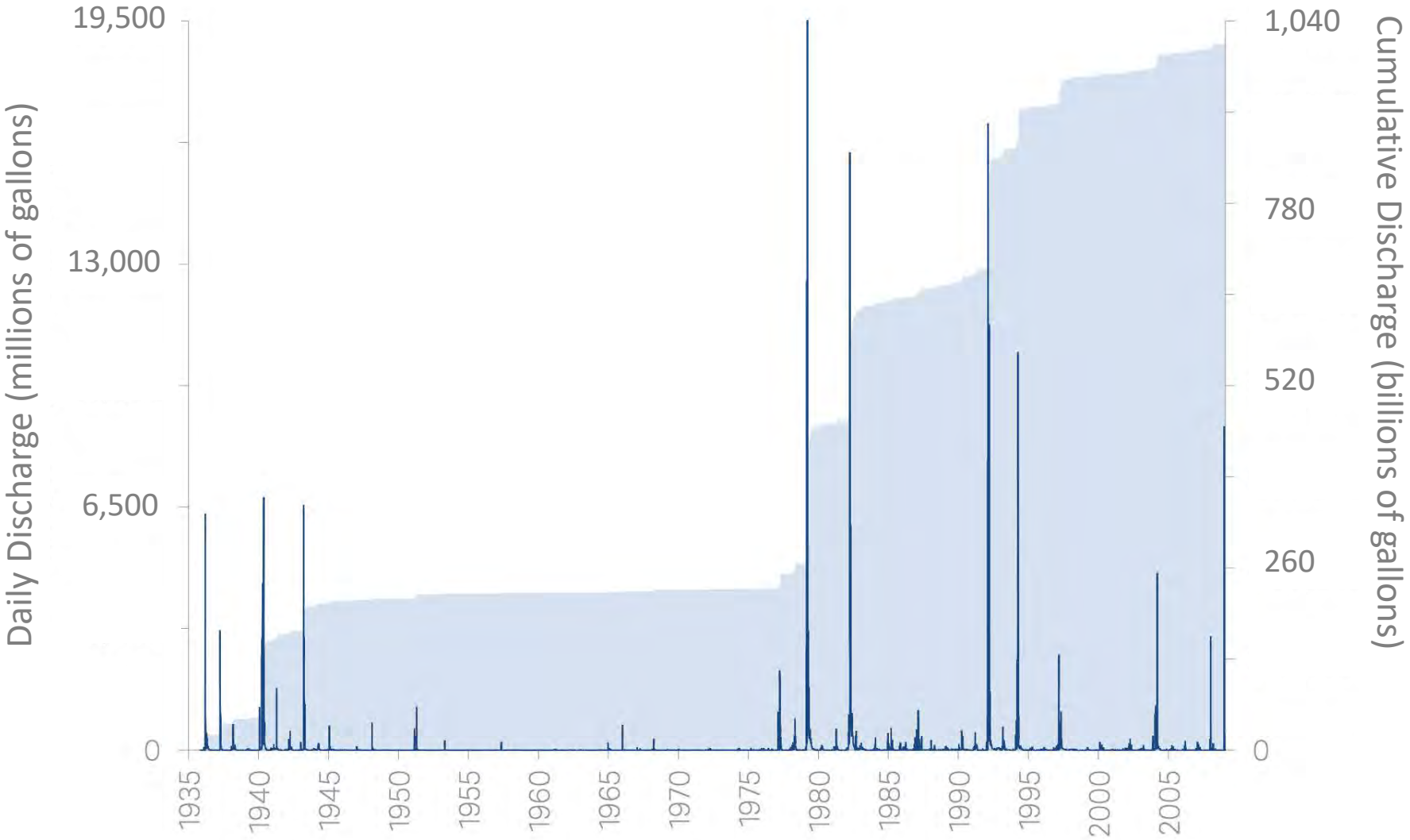
River Channel

River Wash / Riparian Scrub

Riparian Forest

SFEI 2017

Tijuana River Flow



Tijuana River Flow

Daily Discharge (millions of gallons)

6,500

0

1,040

780

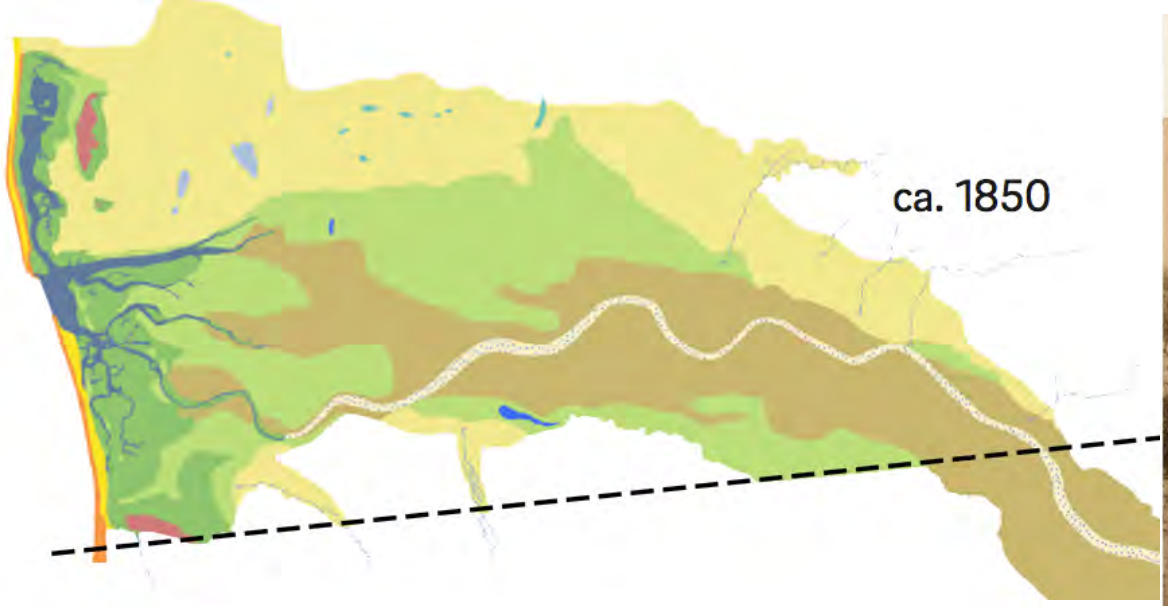
520

260

0

Cumulative Discharge (billions of gallons)

1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005



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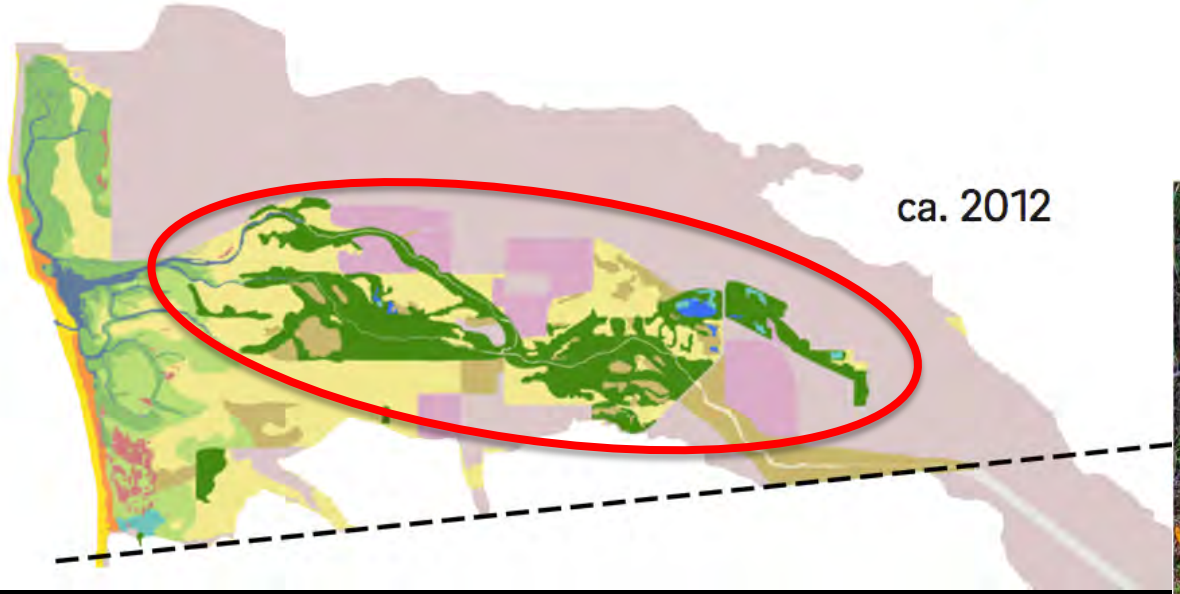


River Channel

River Wash / Riparian Scrub

Riparian Forest

Tijuana River Historical Ecology Study
San Francisco Estuary Institute

SAN DIEGO WEEKLY

Reader

DEADLY MOSQUITOES BREED IN OUR URBAN DROOL

A few days after an autumn picnic near Los Peñasquitos Lagoon, a local grade-schooler comes down with the flu. Fever, chills, headache, and he can't bring himself to get out of bed. His mother worries, but since it's flu season...

STORY CONTINUES ON PAGE 20

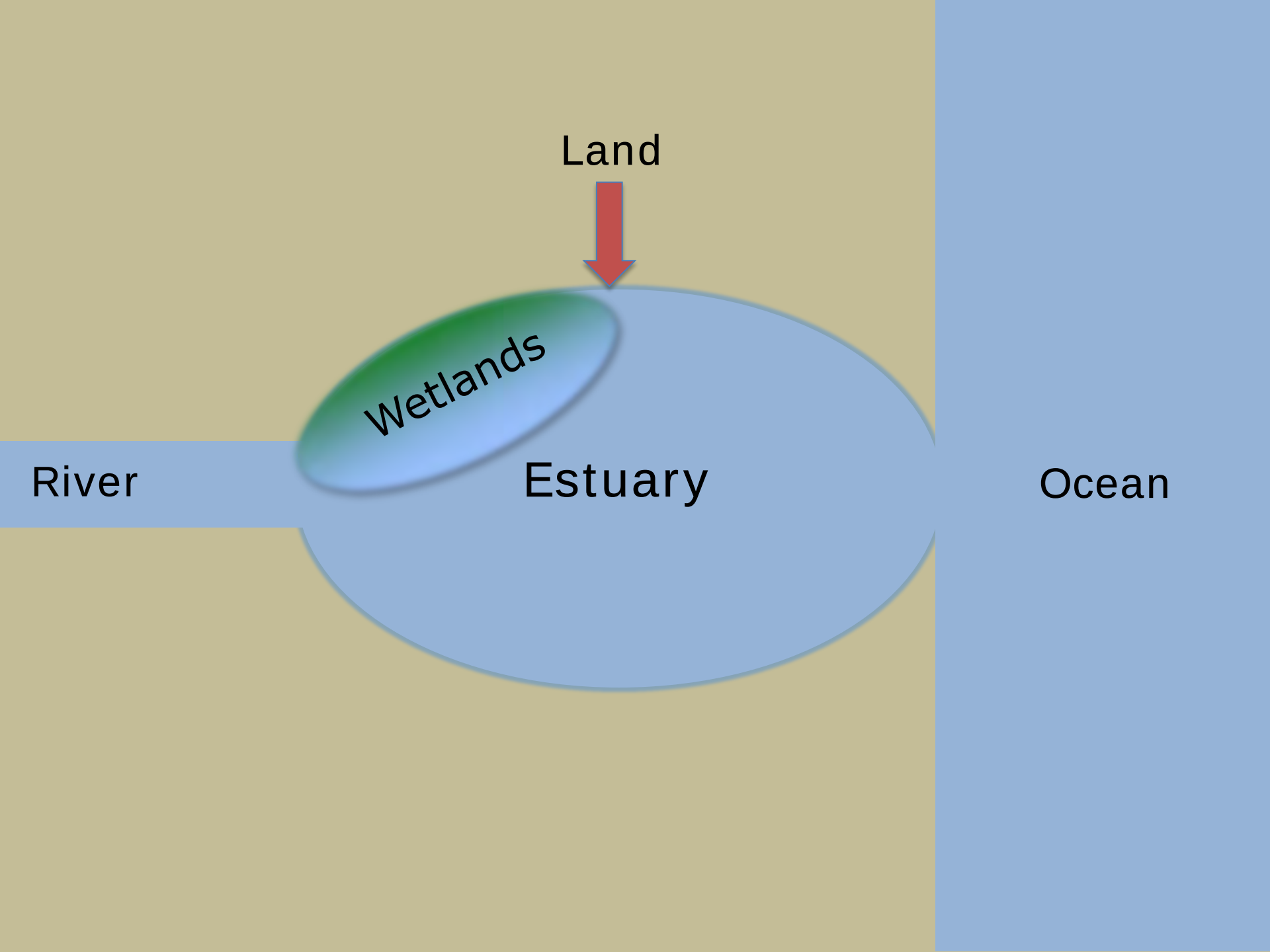
Environmental Health

MENU PAY ONLINE CONTACT US DISASTER PREP

Invasive Aedes Mosquitoes

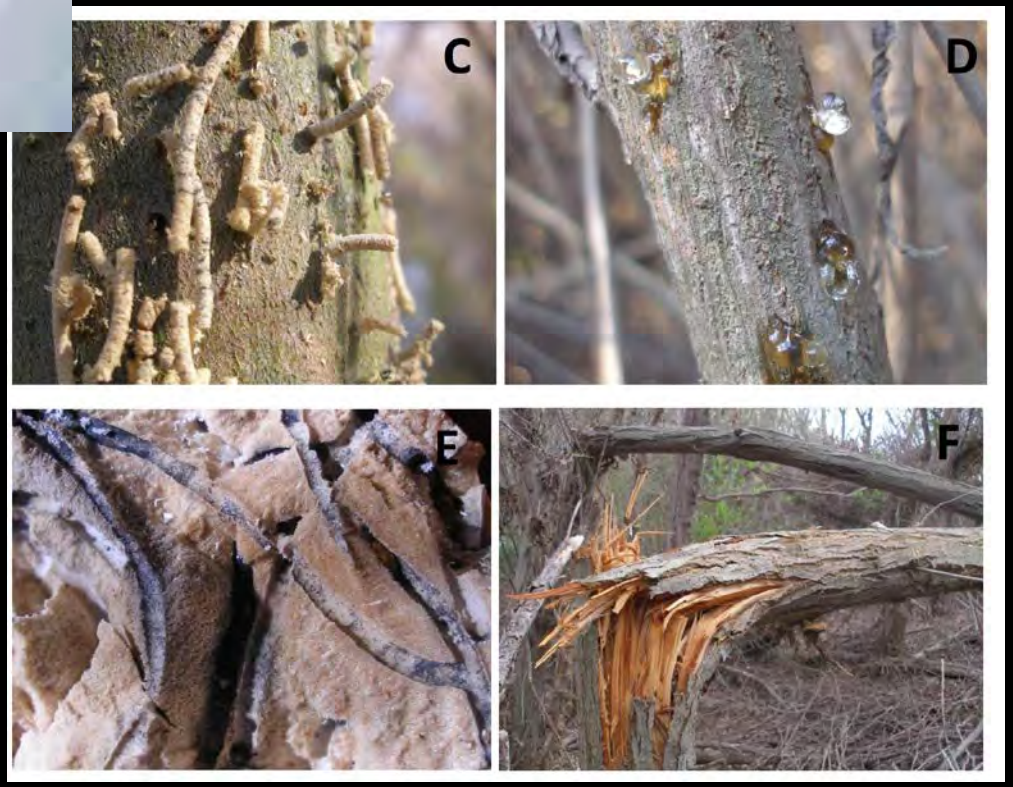
Aedes aegypti (the yellow fever mosquito) and *Aedes albopictus* (the Asian tiger mosquito) have been detected in the County of San Diego. These mosquitoes are not native to California and can transmit the viruses that cause Zika, dengue, chikungunya, and yellow fever. There have been no recent cases of these viruses being transmitted locally in California.

Critical Habitat for Endangered Least Bell's Vireo


Land
Wetlands
River
Estuary
Ocean

Shot-Hole Borer
(Ambrosia beetles from Asia)

Fusarium Dieback



Over 100 Tree Species Affected

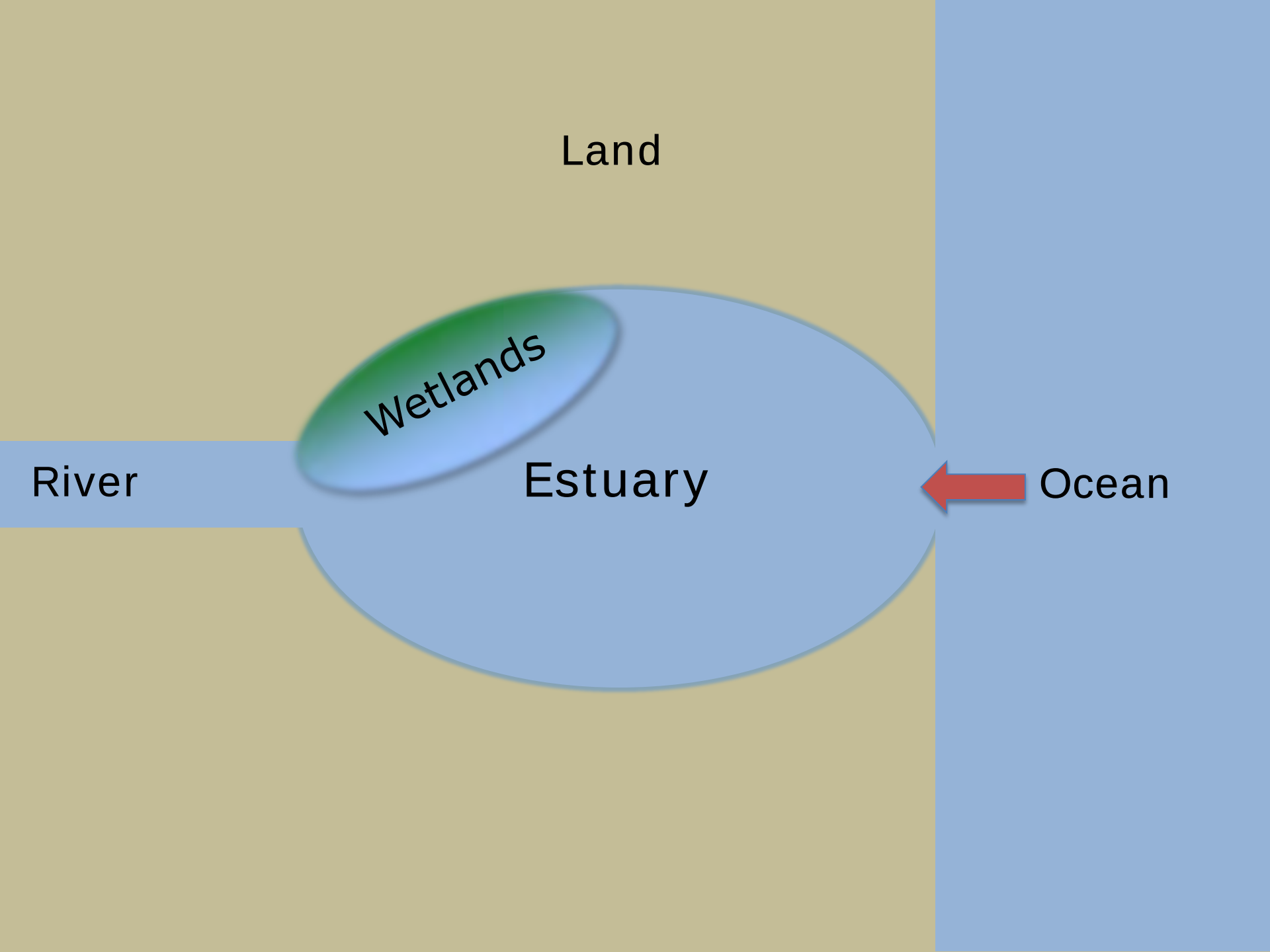
John Boland


May 2015


Feb 2016


Sep 2017


GIANT OYSTER


Land
Wetlands
River
Estuary
Ocean

Miyagi Oysters (*Crassostrea gigas*) on West Coast of North America

California and Pacific Northwest (PNW)

- Pre-WW II: Trial plantings
- Post-WWII: Intensive import and grow-out

PNW

- Important fishery resource and wild populations

Washington, USA edbookphoto.com

California

- Few instances of feral individuals (through 20th century)

“... oysters grown commercially in California do not reproduce in these waters ...” **(Barrett 1963)**

*“... it is almost certain that other bivalves will continue to be introduced into San Diego. Likely invaders are exotics already present on this coast, such as the Japanese clam (***Potamocorbula amurensis***), the gem clam (***Gemma gemma***), the ribbed mussel (***Arcuatula demmisa***), or the Manila clam (***Ruditapes phillipinarum***).”* **(Crooks 1998)**

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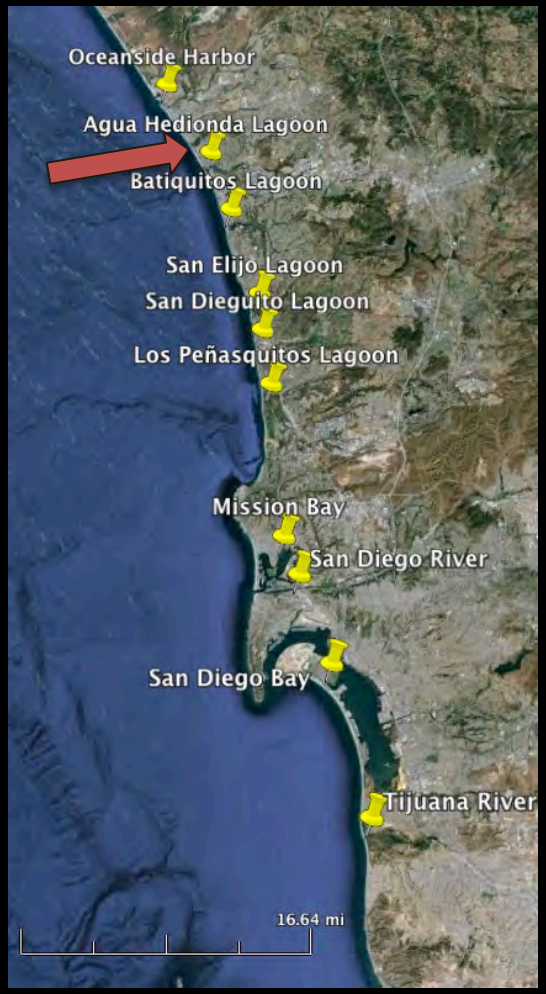
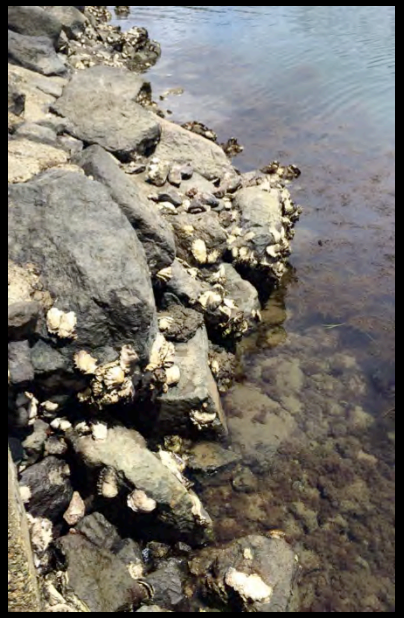
LAG TIMES - "... past performance of an exotic is a poor predictor of potential population growth, range expansion, and ecological impact ..." **(Crooks 1996)**

Expect the
Unexpected

Miyagi Oyster Invasion in San Diego
2000 - present



Los Penasquitos, 2015



San Diego Bay, 2014

Mission Bay, 2005

Miyagi Oyster Invasion
in Europe

Native Oyster Restoration

Miyagi Oyster Invasion in Europe

www.ecoshape.nl

Using oyster reefs to protect tidal flats in estuaries

NATURE'S ENGINEERS

Tidal flats provide a variety of ecosystem services. Driven by climate change and human activities, however, erosion is now a common phenomenon. Experiments in the Eastern Scheldt estuary show that oyster reefs can mitigate tidal flat erosion while creating new habitats.

Native Oyster Restoration

SAN DIEGO UNIFIED PORT DISTRICT

SAN DIEGO BAY NEARSHORE LINKAGES: LIVING SHORELINES OYSTER REEF PROJECT

Aquaculture

PMEL CARBON PROGRAM

Ocean Acidification's impact on oysters and other shellfish

The world's oceans are absorbing carbon dioxide at an unprecedented rate and the resulting acidification is transforming marine ecosystems. Hari Sreenivasan, of **PBS NewsHour** reports on how ocean acidification is already affecting oysters and other shellfish in the U.S.

PORT of SAN DIEGO

Press Release
portofsandiego.org

Port of San Diego Initiates Oyster Nursery Research Project

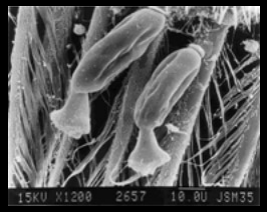
Print

PRESS RELEASE: Marketing & Communications (619) 686-6388 on December 14, 2016.

The Port has initiated an Oyster Nursery Research Project as part of efforts to explore new aquaculture and blue technology opportunities.

As the steward of San Diego Bay, the Port of San Diego has been a center for the Blue Economy in the San Diego region with its shipbuilding, commercial fishing, marine research and cruise and cargo business lines. Today, the Port is undertaking research to support and encourage investment in aquaculture projects.

Plants & Algae
13 species



Protists & Fungi
3 species

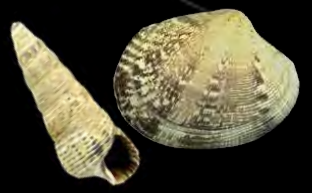
Kamptozoans
1 species

Sponges
3 species

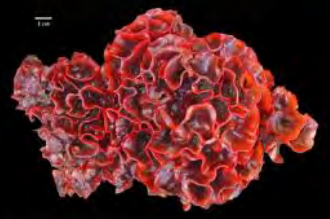
Cnidarians
7 species

Annelids
20 species

Arthropods
37 species



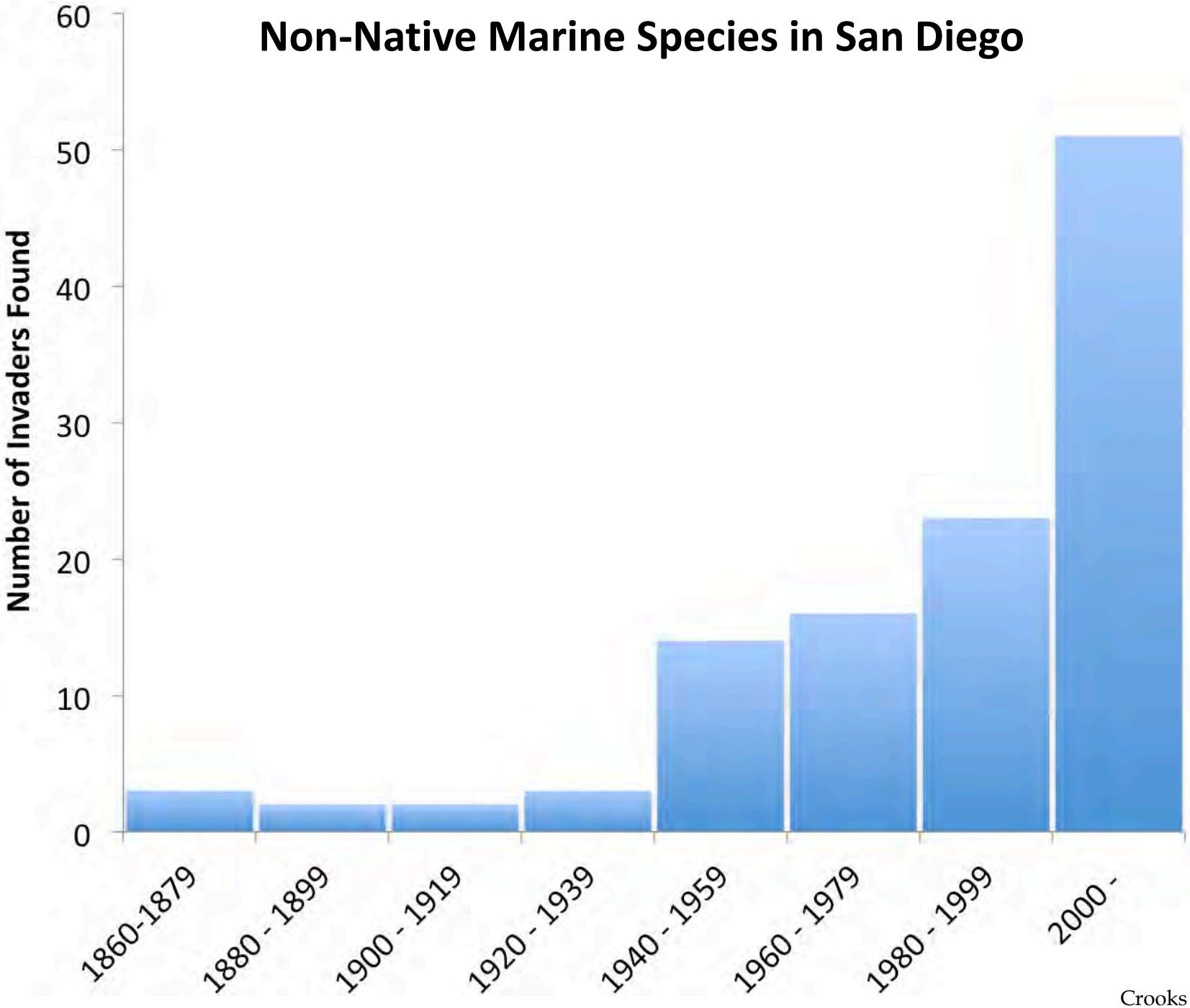
Molluscs
13 species



Bryozoans
11 species

Tunicates
19 species

Fish
4 species



Crooks unpub. data

Partners and Funders