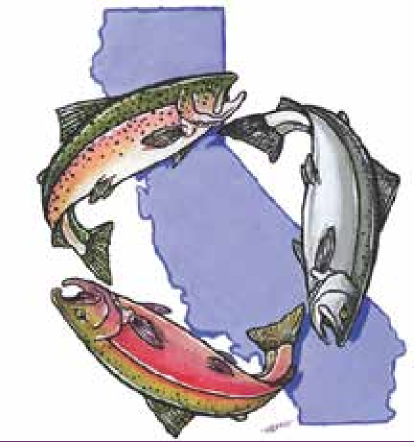


Swirling in Sediment and Slowing Fisheries Recovery

A Concurrent Session at the 35th Annual Salmonid Restoration Conference held in Davis, CA from March 29 – April 1, 2017.

Session Overview

- Session Coordinator:
  - Brain Cluer, Ph.D. and
    Michael Pollock, Ph.D.
    NOAA Fisheries

Presentations

(Slide 4) Clear and Simple Connections Between Dirt, Fish, Entrenchment, and Recovery
Mike Napolitano, San Francisco Bay Water Quality Control Board

(Slide 21) Sediment for Salmon in San Francisco Bay: What's Needed, What's Available, and What's Next?
Scott Dusterhoff, San Francisco Estuary Institute

(*Not provided*) Mechanical Scarification of Gravel Beds to Increase Chinook Salmon Spawning Success – Field Experience in Lower Putah Creek
Ken W. Davis, Wildlife Survey & Photo Service

Clear and Simple Connections: Dirt, Fish, Entrenchment, and Recovery

Lagunitas Creek in the Tocaloma Reach

Photo Credit: Stillwater Sciences

Mike Napolitano, Water Quality Board

March 31, 2017

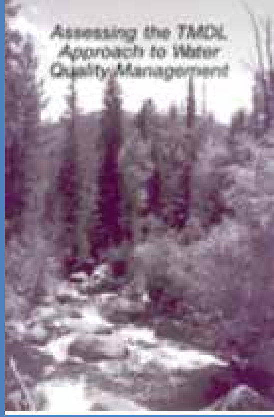
Cuyahoga River on fire:
Clean Water Act to the rescue

Swimmable, fishable, and drinkable

Congressional compromise adds obscure provision (Section 303d) to Clean Water Act

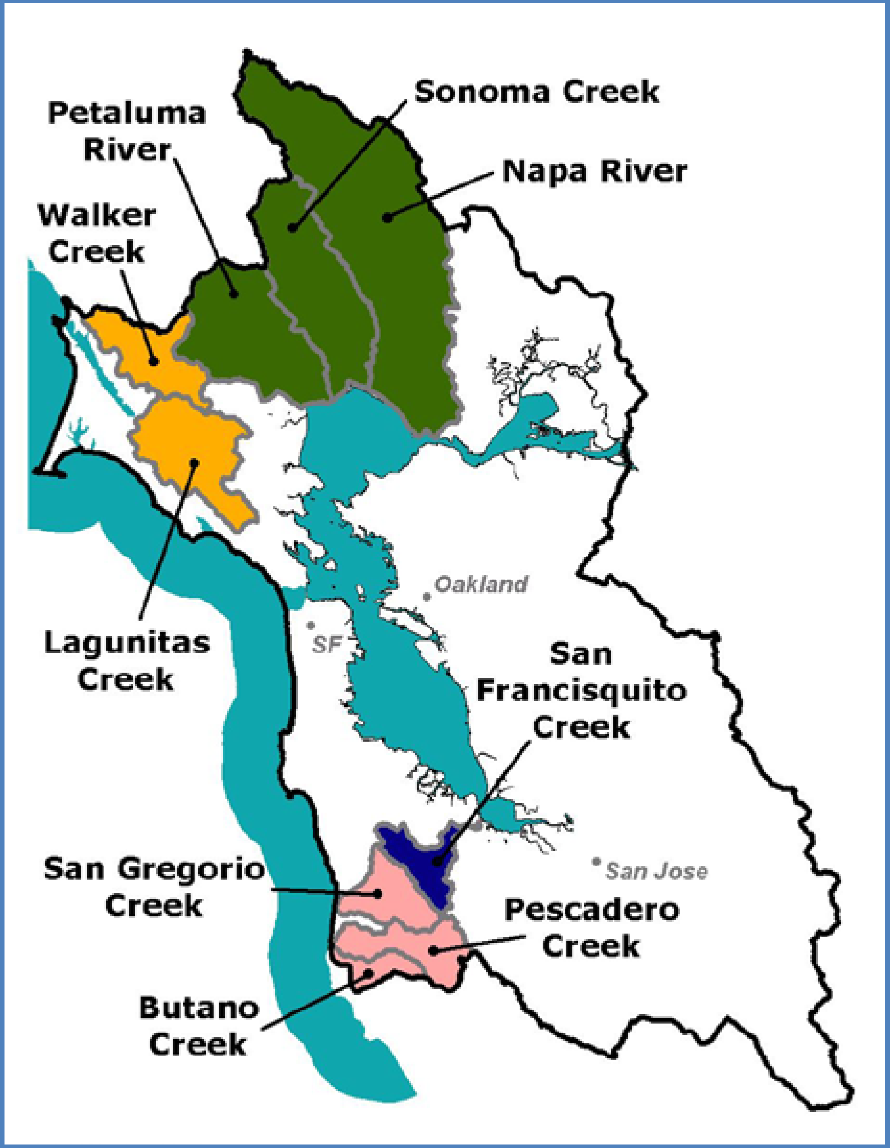
- Early 1970s – early 1990s: $$$public funds for sewage
- 303(d): not swimmable, fishable, and drinkable after treating sewage and cleaning up factory waste, list as “impaired”
- Hire a lawyer, go to court & win: EPA goes 0 for 28
- Late 1990s: EPA gets religion, “impaired” waters list has consequences, TMDL program is born

Clean Water Act:
Pollution and Pollutants



- “Pollutant” = substance added by humans or human activities
- “pollution” = man-induced alteration of chemical, physical, or biological integrity of water
- Sediment is a natural and essential element that shapes and maintains stream habitat.
- Sediment “impairment” results when human action adversely alter sediment delivery, transport, or storage process, and related habitat structure.

Sediment “Impaired” Streams in the Bay Area

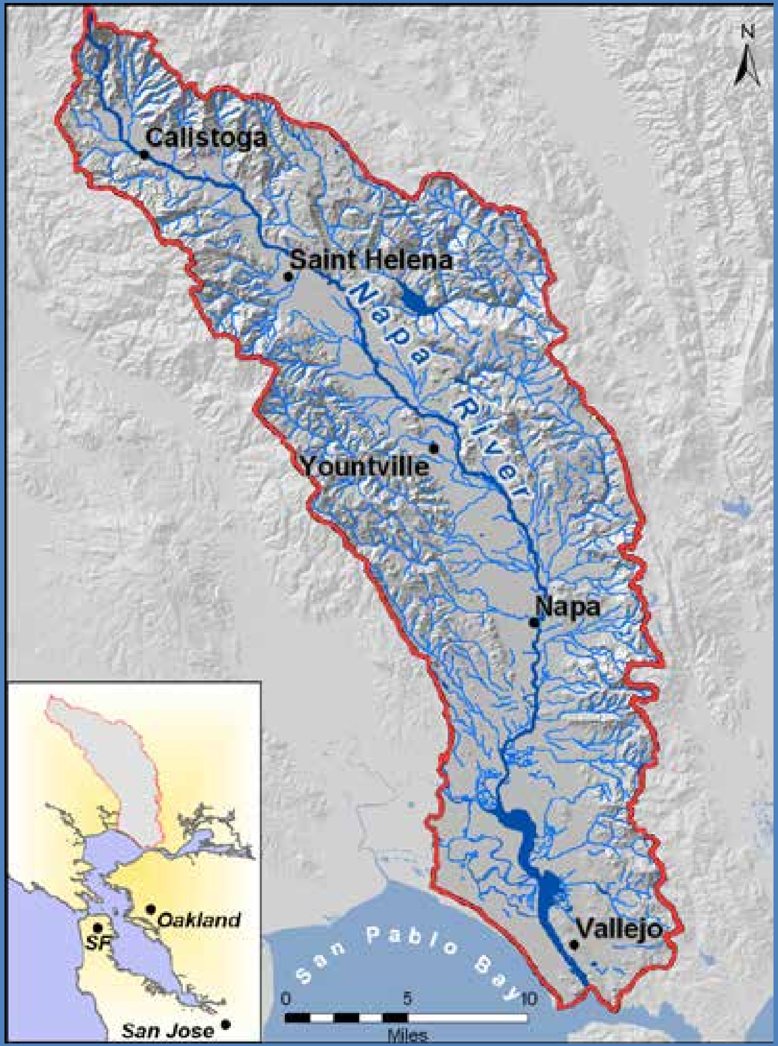


Fundamental alteration of sediment delivery, transport, and storage

Eight watersheds:1100 mi^2
25% of Bay Area region

Walk through the Napa River watershed today

- 55 miles of river
- Regionally significant steelhead and salmon runs
- Exceptionally diverse native fish assemblage

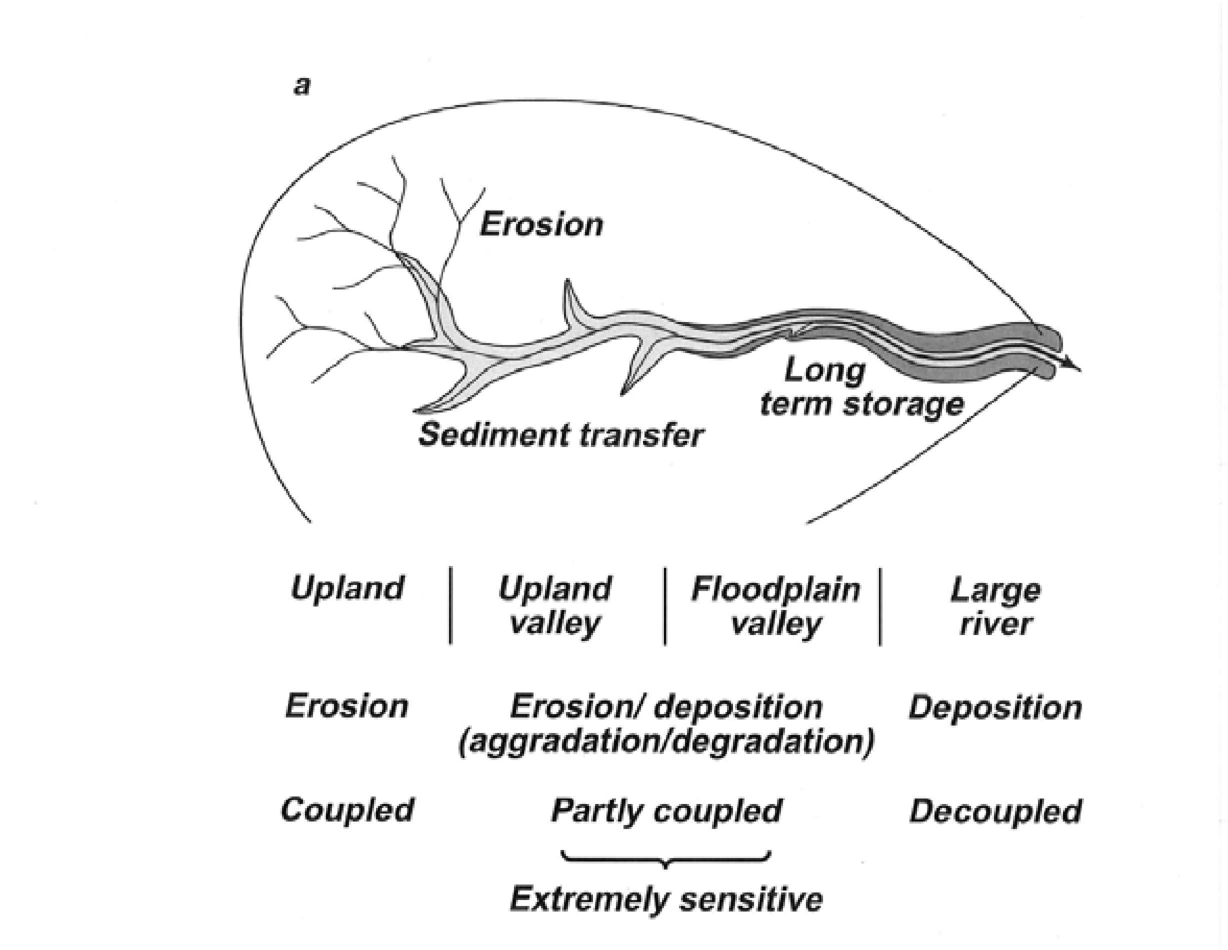


Pacific lamprey Photo credit: Dan Worth

Tule perch Photo credit: Dave Giordono

Hardhead Photo credit: Lisa C Thompson

Sediment is being evacuated from the valleys and from the hollows located in uplands



Source: Church (2002)

Channels begin on hillslopes in hollows

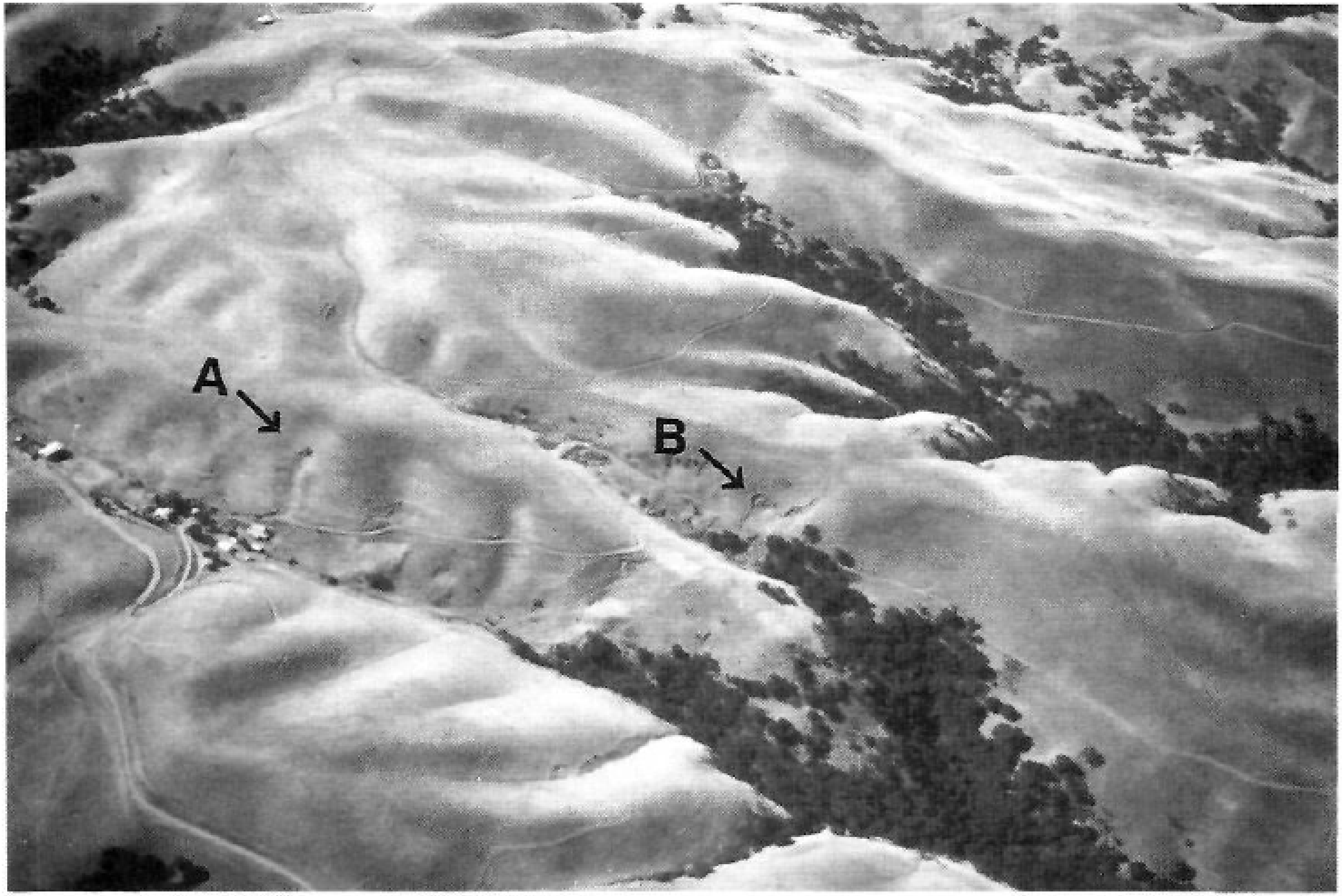
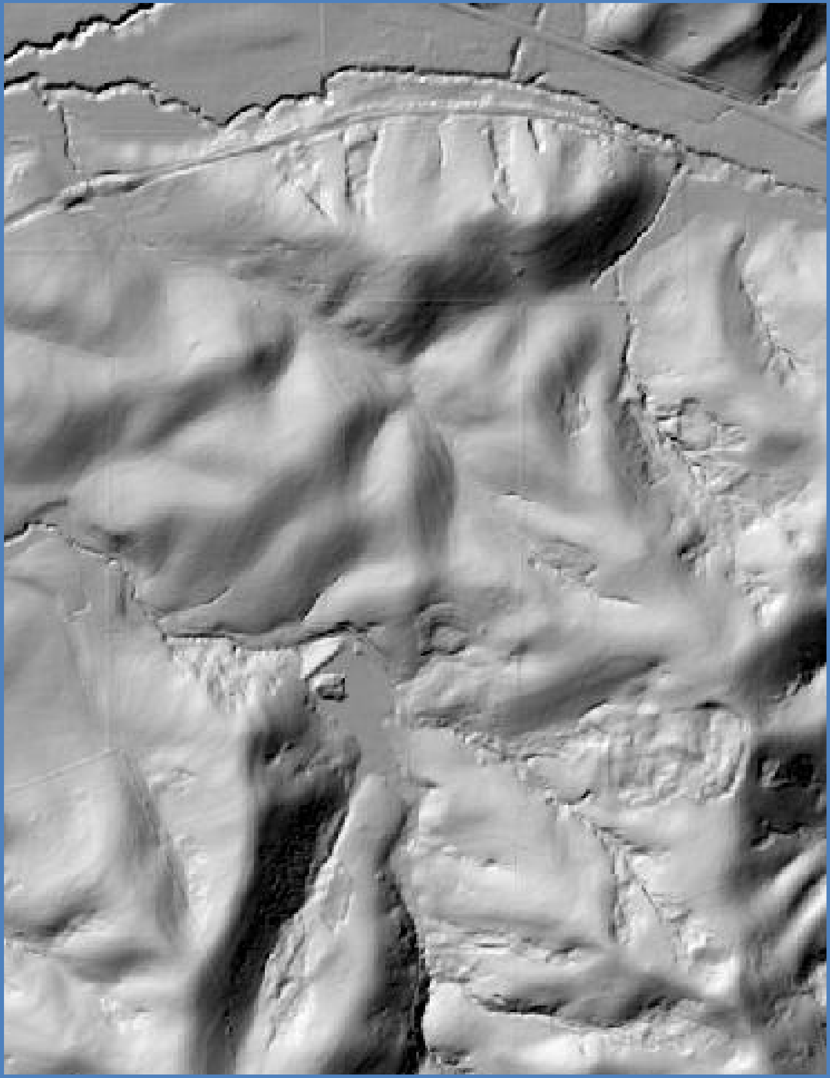


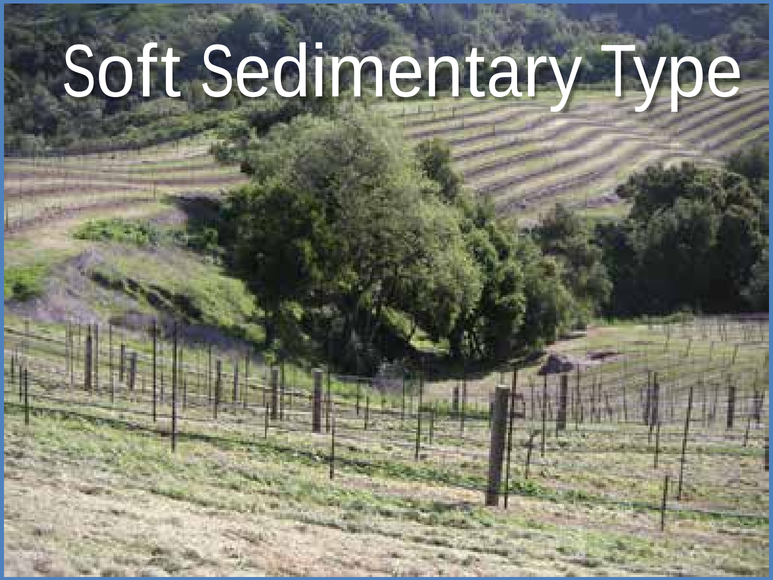
FIGURE 7.3 Unchanneled hillside swales draining directly to channels or to channel heads, northeastern Coast Range of California. Two of the swales (A) and (B) have recently been chanelled by debris avalanches

Source: Dunne and Dietrich (1993)

Land-uses interact with geology to cause/contribute to evacuation of sediment from hollows



Napa River watershed, Carneros Region


Soft Sedimentary Type

Concentrated runoff

Potential for significant reaction


Narrow, deep
and simple
Increases in runoff (examples)
Intensive grazing, logging old-growth redwoods,
Direct channel disturbances
LWD jam removal, Connecting naturally
disconnected tributaries, straightening
Channel reaches, levees, bank stabilization
Decreases in supply of gravel and coarser
Gravel mining at rates higher than replenishment,
Dam construction, dredging

Deeply incised: alternating between bar-pool and plane-bed

Lower Carneros Creek, tributary to Napa River

Photo credit: California Land Stewardship Institute (2011)


Fallen trees and bank erosion
are agents of restoration

Big changes in channels over short distances

Scale: upstream to downstream = about 1 mile

Rutherford Reach of Napa River

A

Complex channel reaches:
Bar-pool topography
Connected floodplain
Diverse/extensive riparian

B

Bowling alley reaches:
Lake-like pools dominate
Deep, narrow, disconnected
Simple/narrow riparian

Restoration tool kit

Channel Restoration

- Active reach-scale channel reconstruction
- Jump starting LWD recruitment
- Constructing natural LWD jams
- Passive restoration by bank erosion & natural LWD recruitment

Baseflow protection and enhancement

- Real-time dial-up gages to aid avoid dewatering
- Conversion to wet season off channel diversion/storage
- Enhanced infiltration in farms and rangelands
- Developing treated wastewater to reduce diversion and pumping

How to get more done

<u>More creative approaches to regulation</u>

- water rights reform
- water quality attainment strategies
- watershed permits

<u>Much more public education/outreach</u>

- Napa Living River and Wildcat Creek examples

<u>Much greater funding</u>

- AB 32 offsets (carbon farming, floodplain restoration)
- Napa County Measure A example
- Bay Area Measure AA

WE HAVE TO BECOME RESTORATION ADVOCATES

Sediment for Salmon in San Francisco Bay

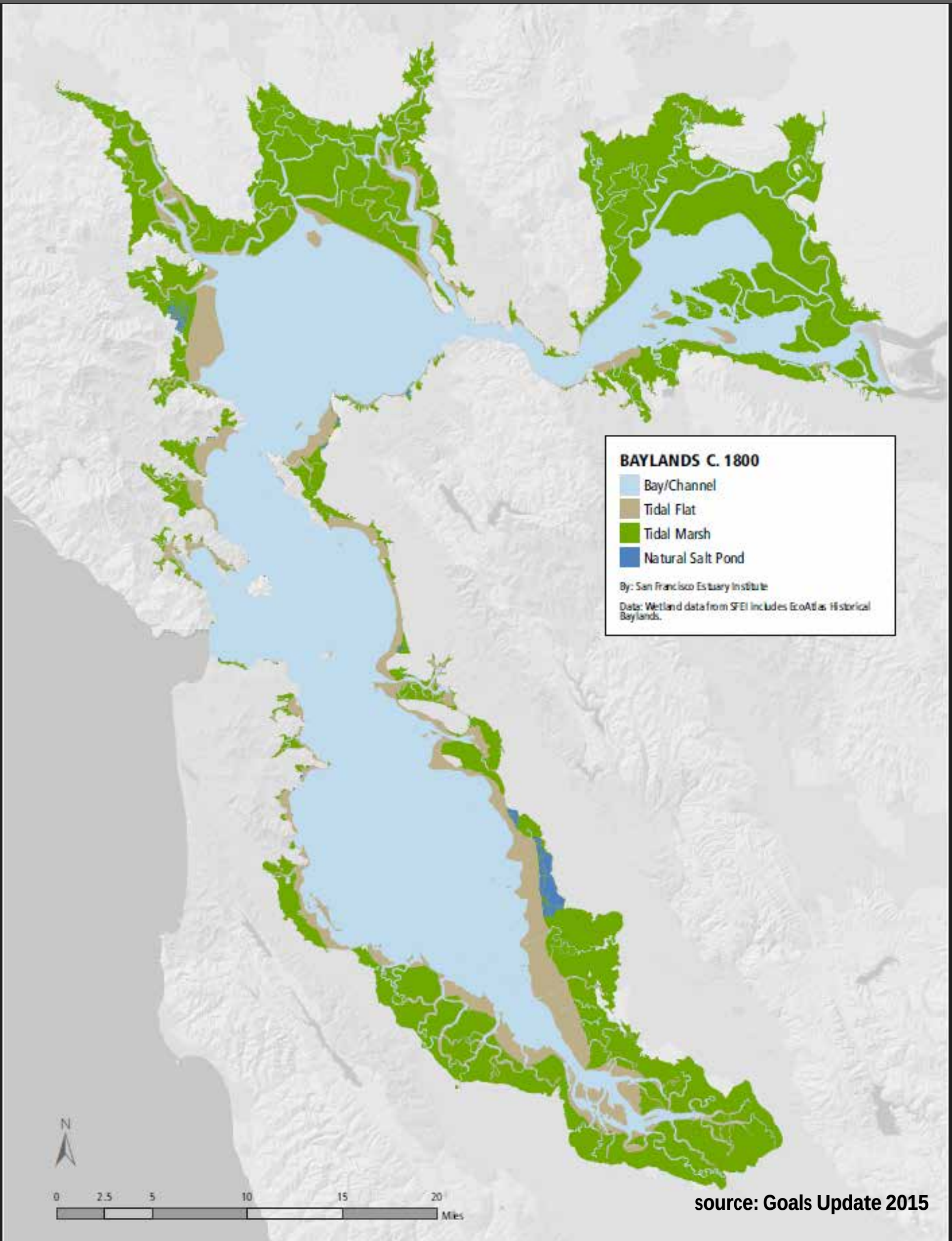
What's Needed? What's Available? What's Next?

Scott Dusterhoff, *Sarah Pearce, Lester McKee, Carolyn Doehring, Julie Beagle and Robin Grossinger*

San Francisco Estuary Institute • Resilient Landscapes Program

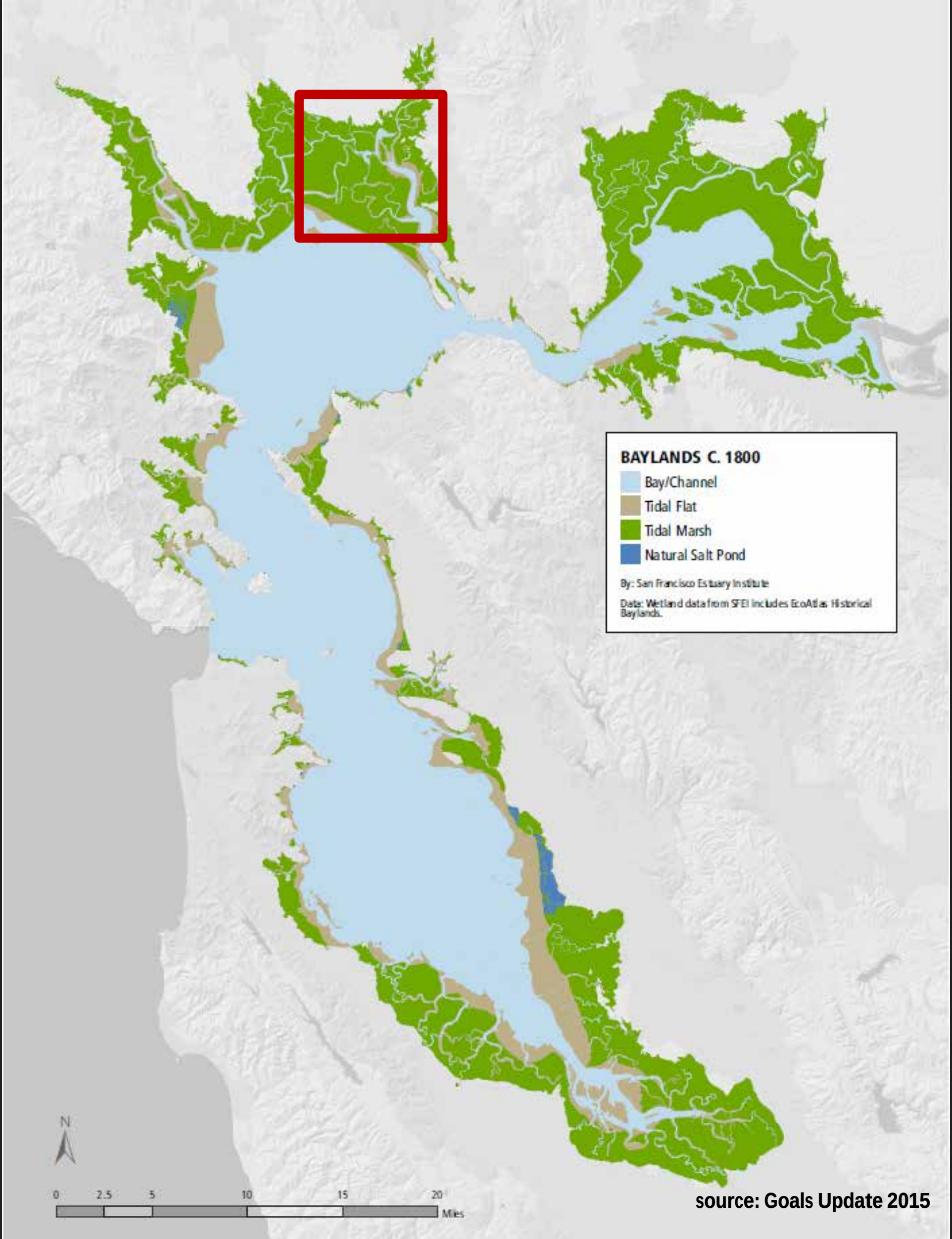
Swirling in Sediment and Slowing Fisheries Recovery • 2017 Salmonid Restoration Federation Conference

San Francisco Bay – Historical Baylands Habitats



source: Goals Update 2015

San Francisco Bay – Historical Baylands Habitats



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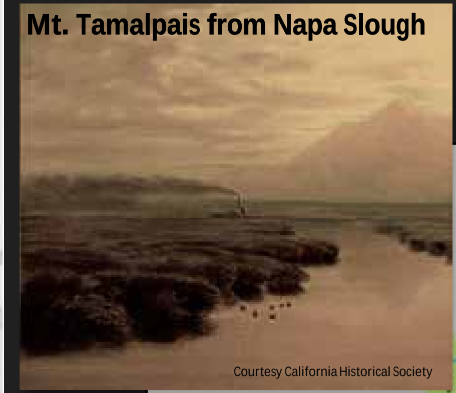
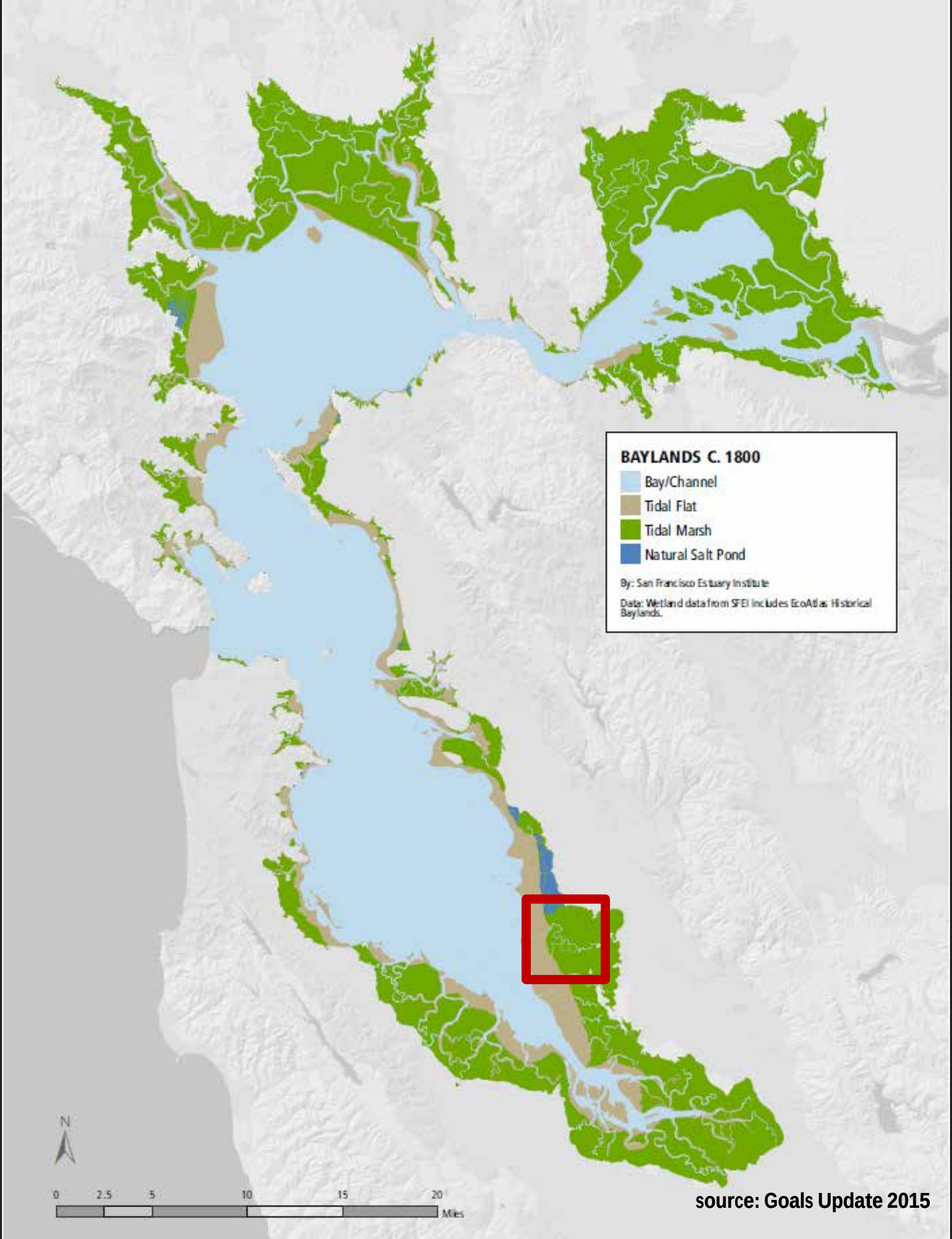


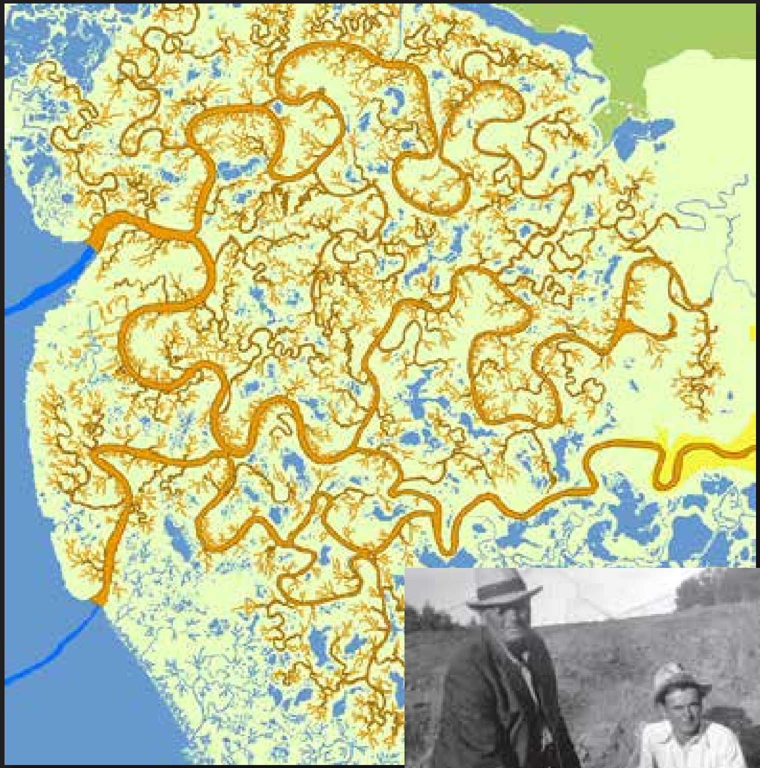
Napa River

San Francisco Bay – Historical Baylands Habitats



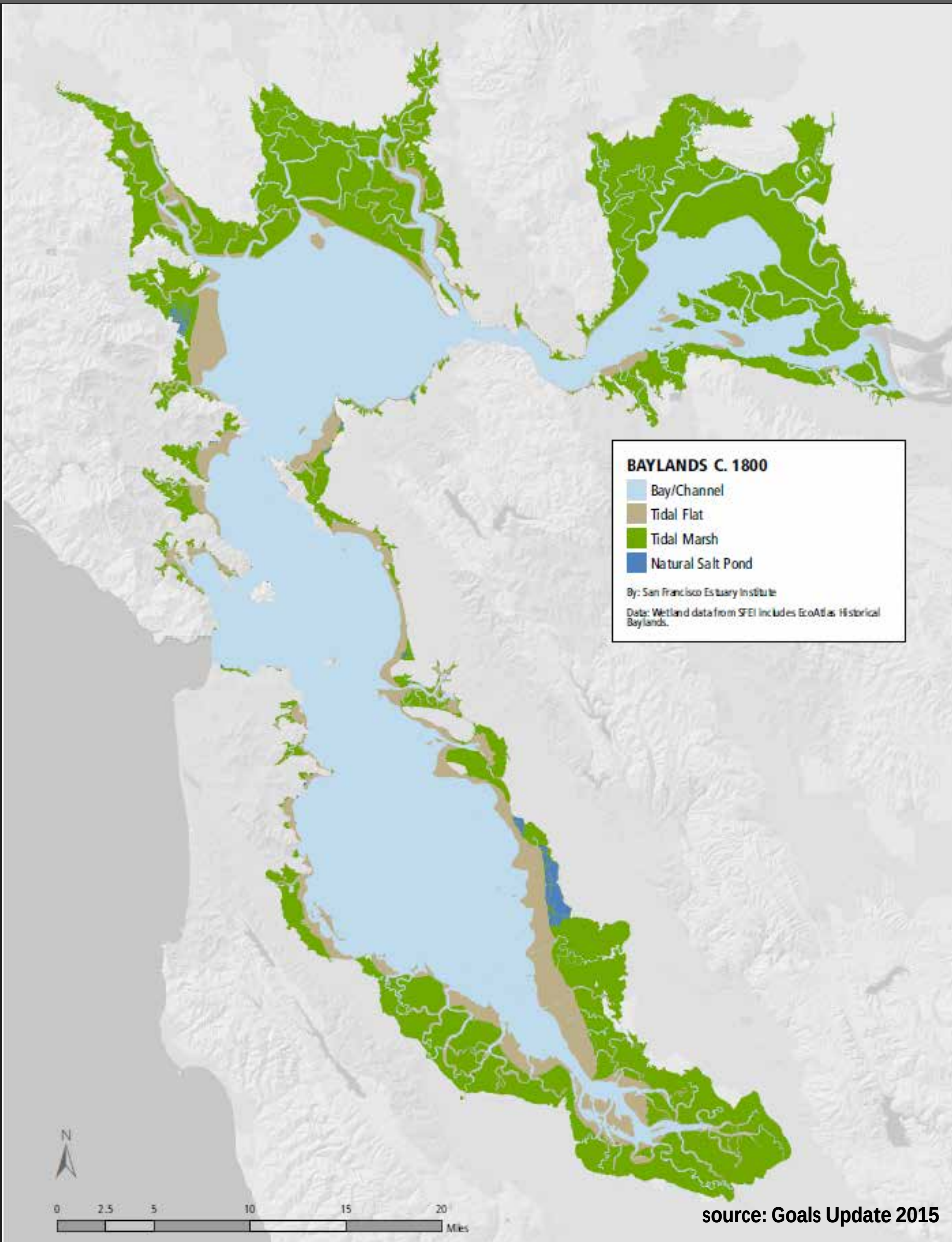
source: Goals Update 2015

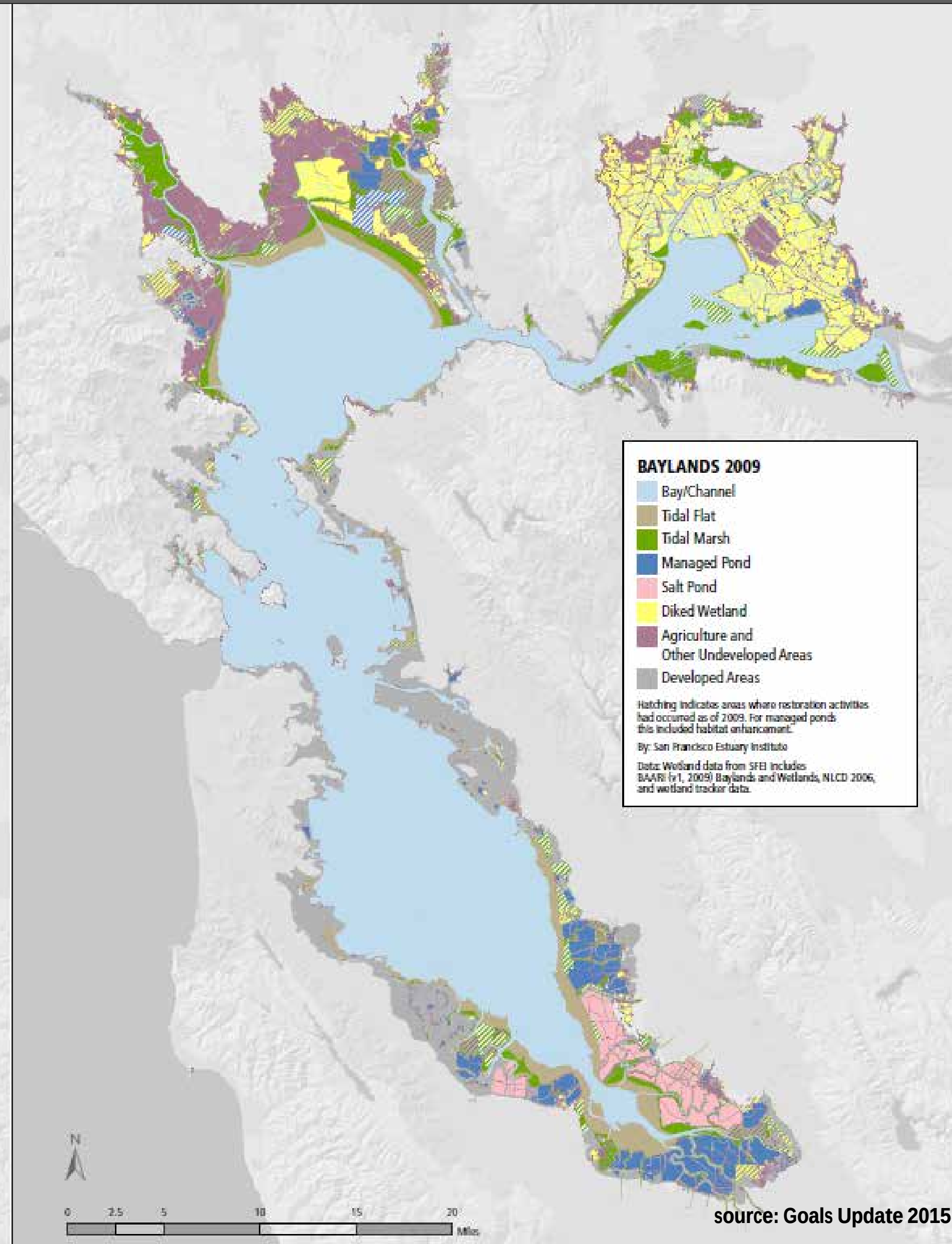
Alameda Creek



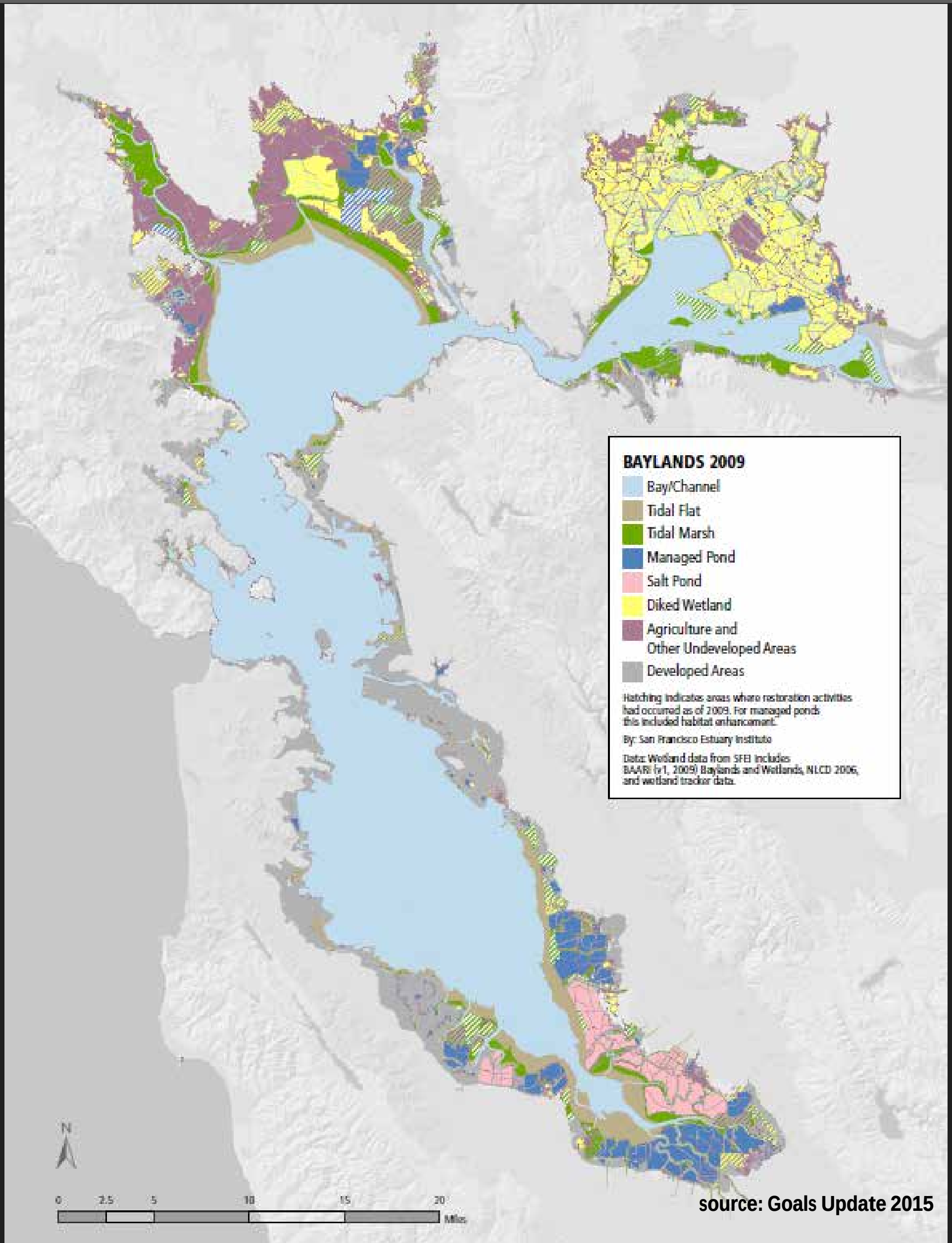
Steelhead with SFWD surveyors (1935)

San Francisco Bay – Historical Baylands Habitats





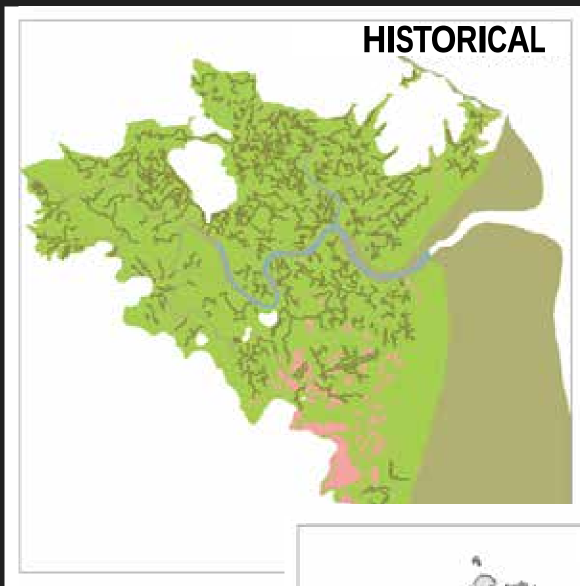
San Francisco Bay – Modern Baylands Habitats

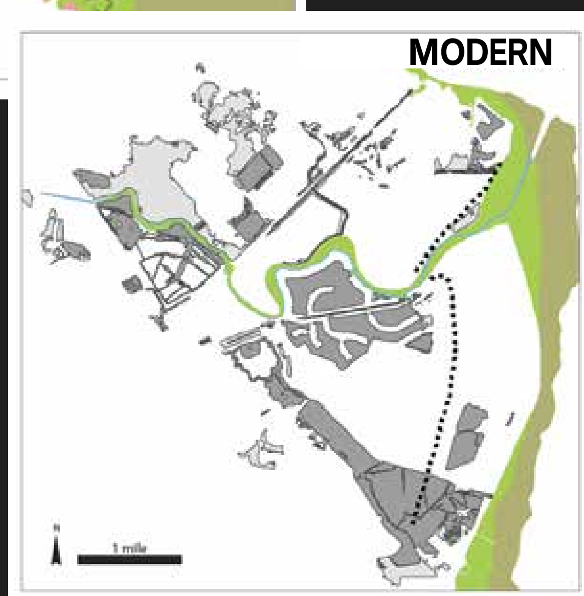


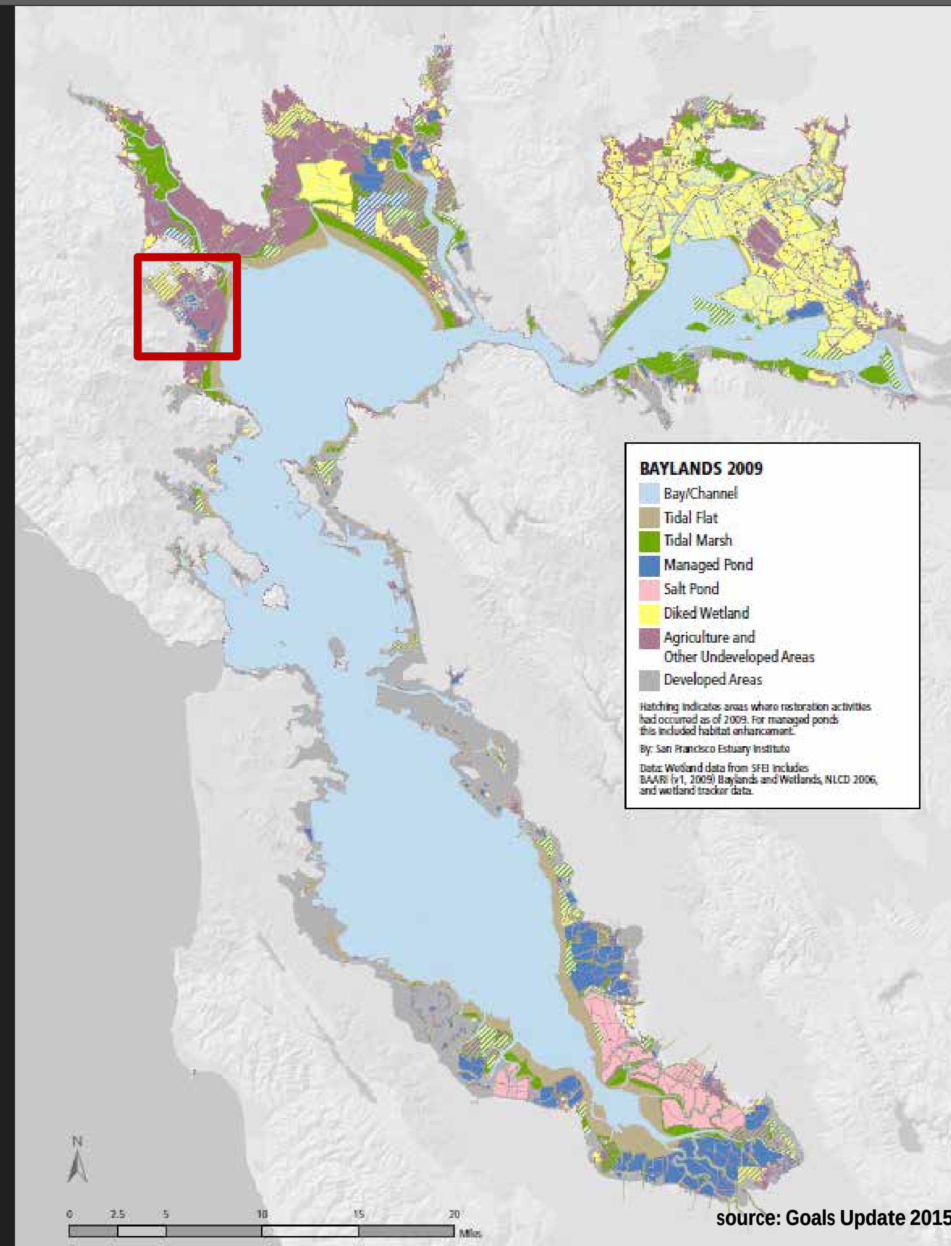
source: Goals Update 2015

San Francisco Bay – Modern Baylands Habitats

Novato Creek



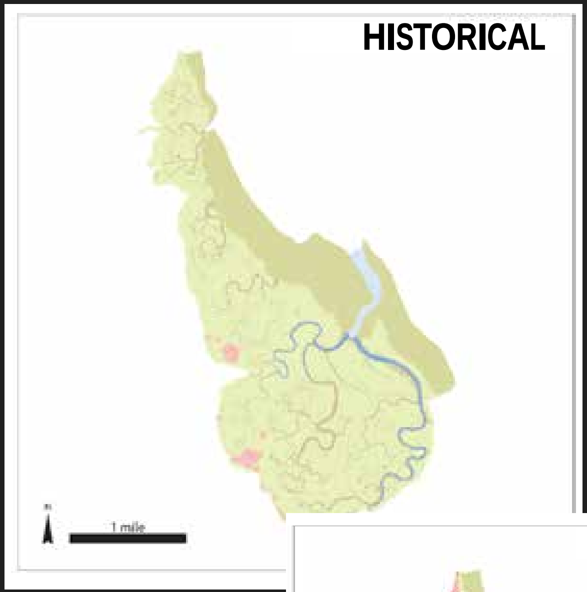


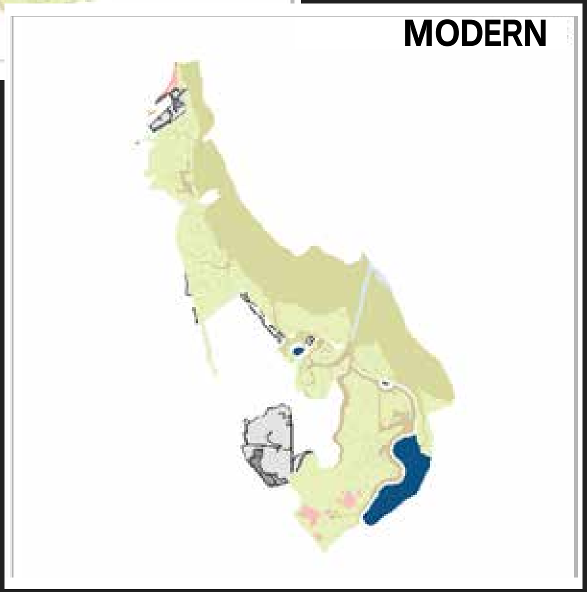


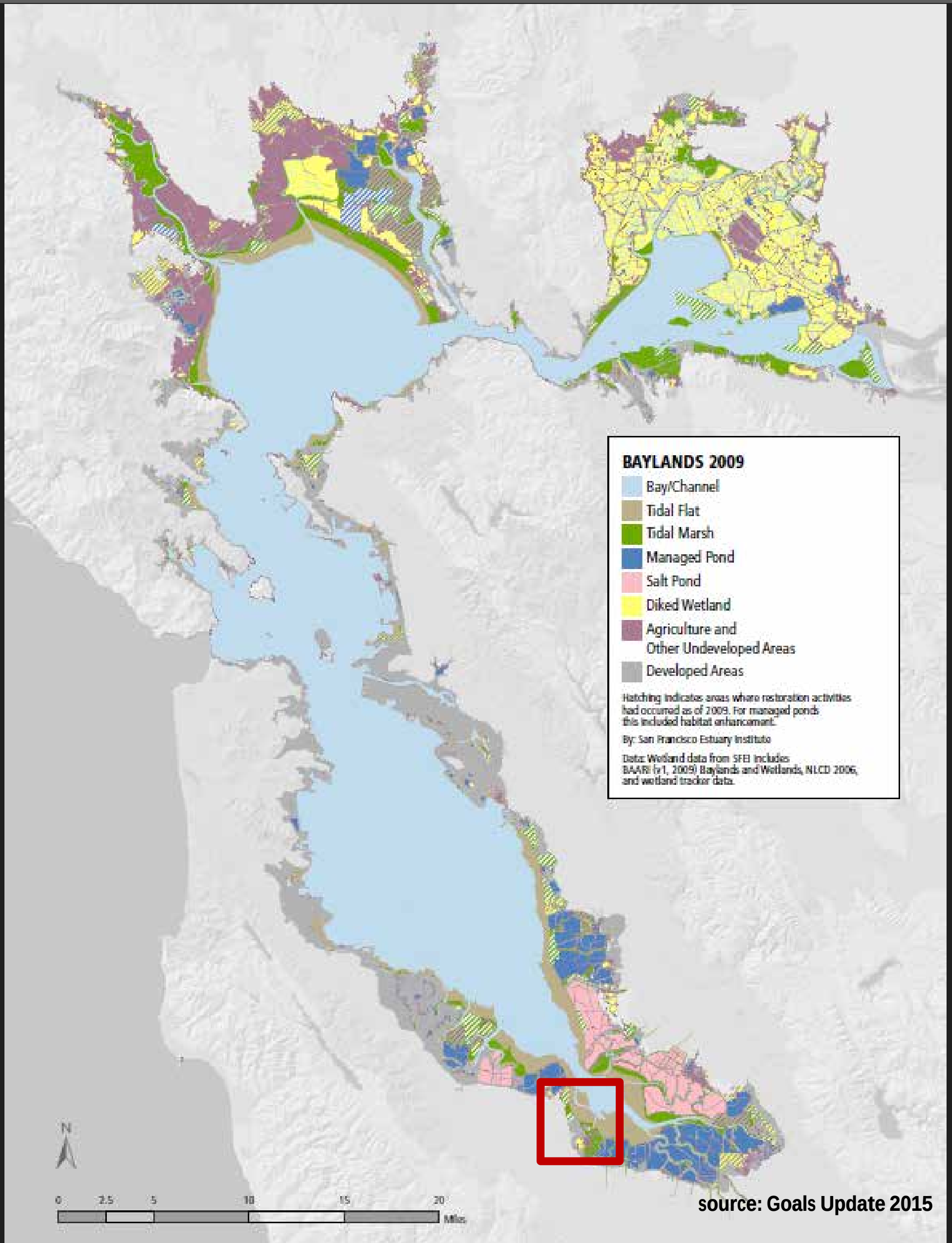
source: Goals Update 2015

San Francisco Bay – Modern Baylands Habitats

San Francisquito Creek







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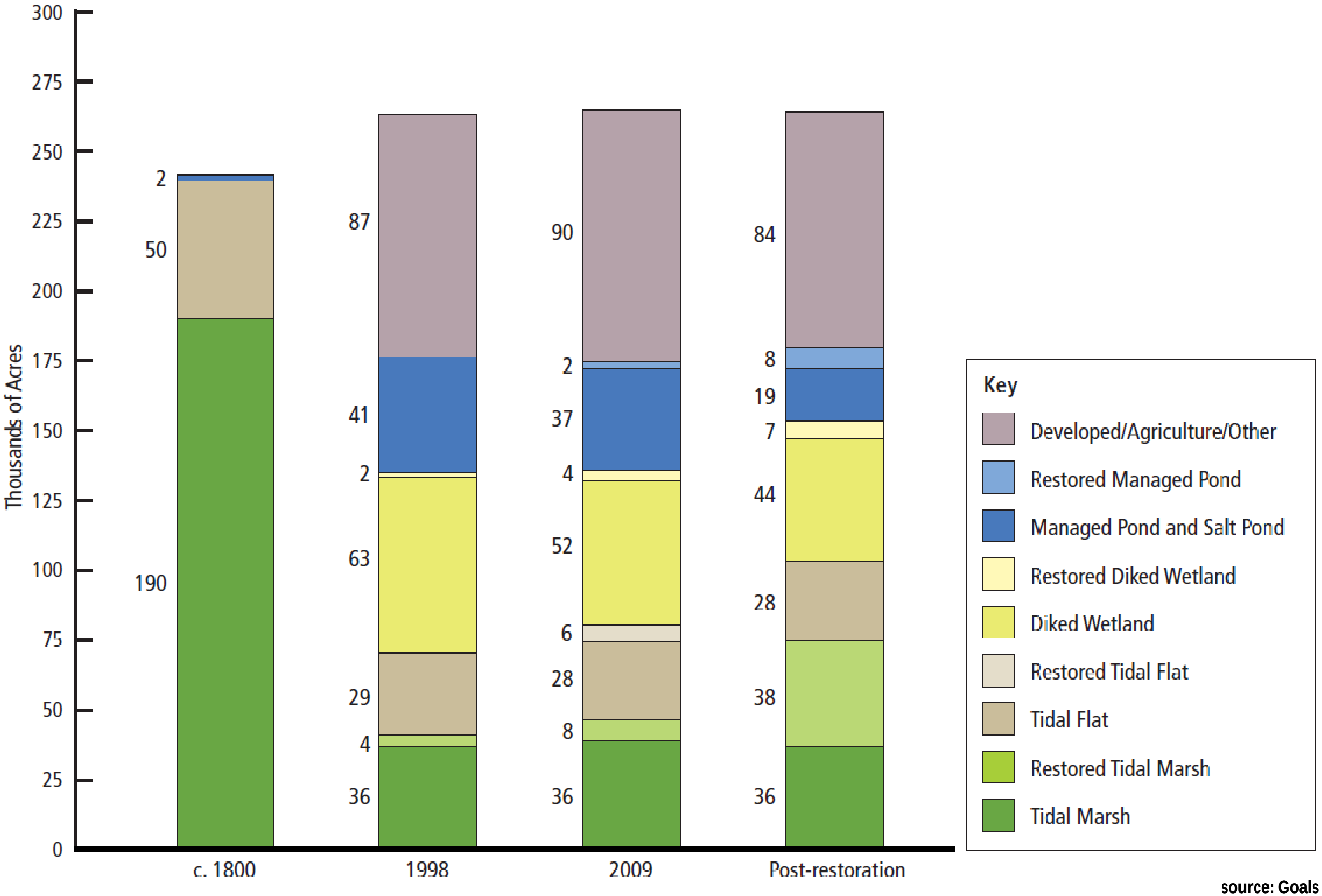

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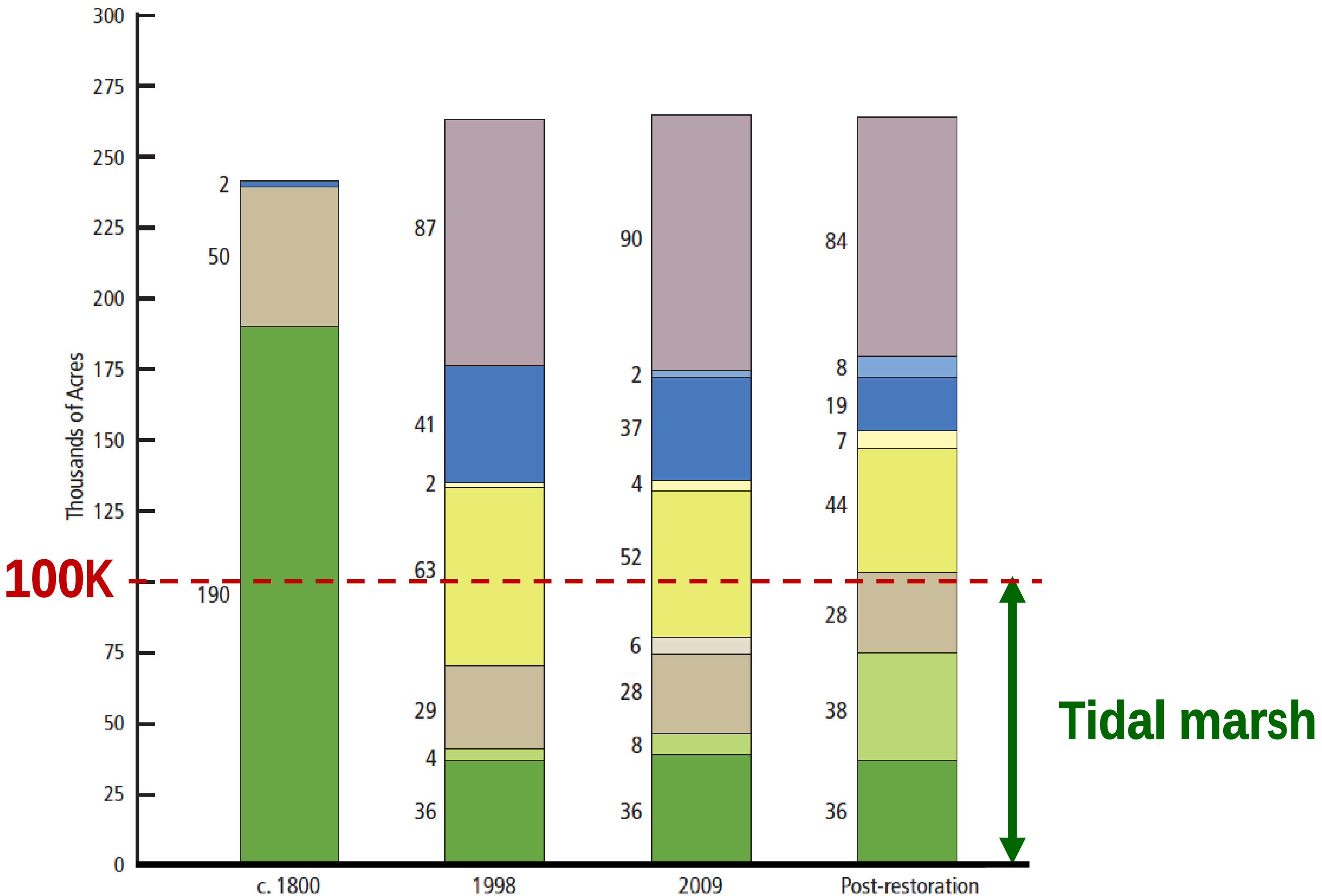
San Francisco Bay – Baylands Habitats



source: Goals Update 2015

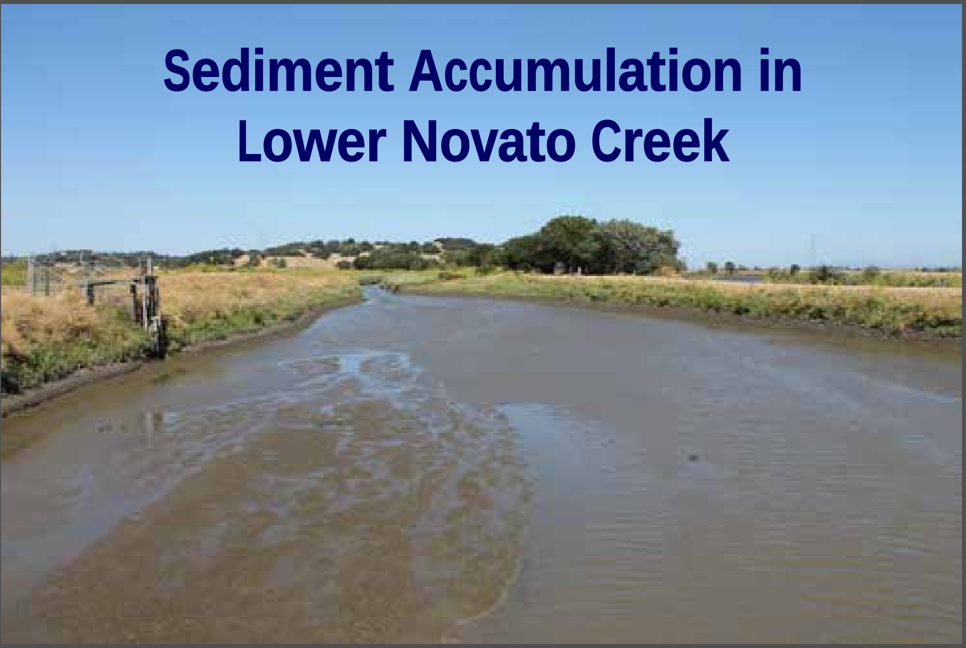
SF BAY SEDIMENT NEEDS

SFEI | AQUATIC SCIENCE CENTER

Where will we get the sediment needed to *restore baylands*?

Where will we get the sediment needed to *sustain baylands*?

Flood Control Channels – Vital Sediment Source

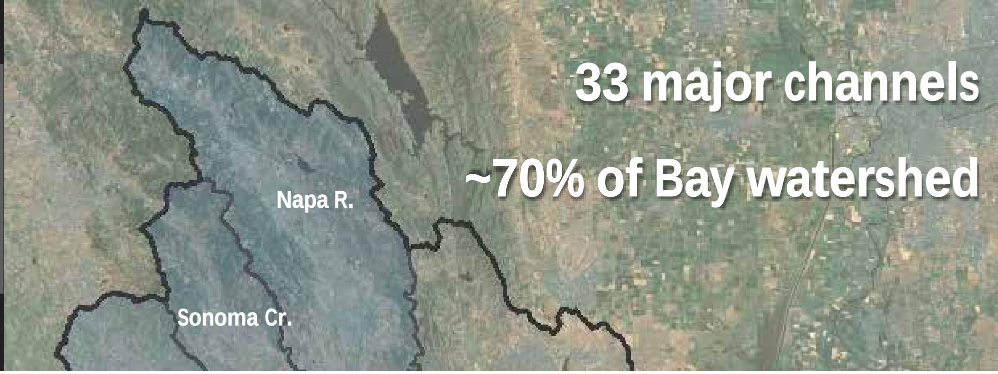


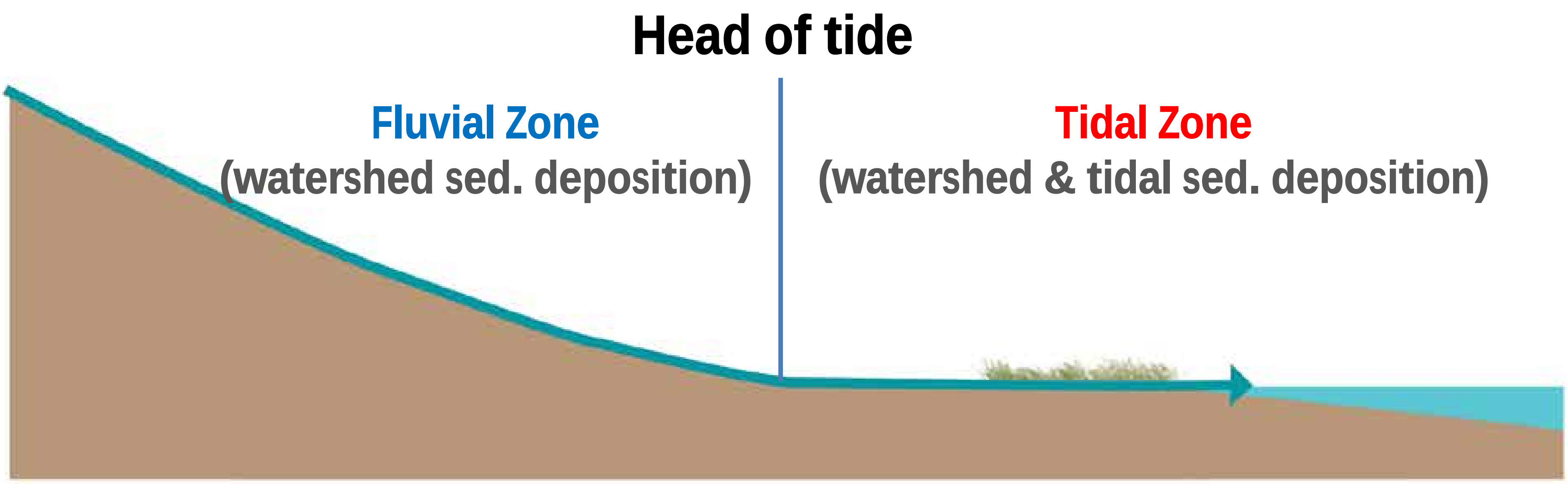
Flood Control Channels – Vital Sediment Source

Key management questions regarding sediment supply

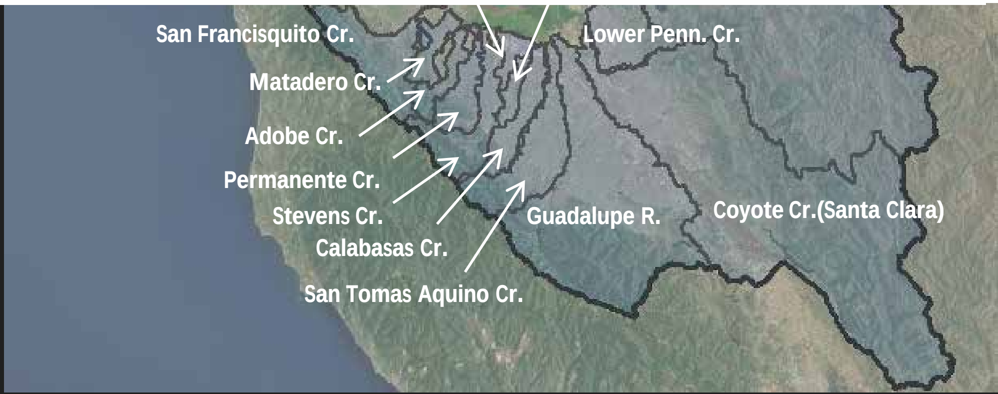
- How much watershed sediment enters flood control channels?
- How variable is the watershed sediment supply?
- How much sediment is removed and at what frequency?
- Where along the major flood control channels is sediment being stored and removed?

Regional Sediment Dynamics





- Compiled removal *location, volume, frequency*, grain size, and cost data
- Time period: 1957-2013



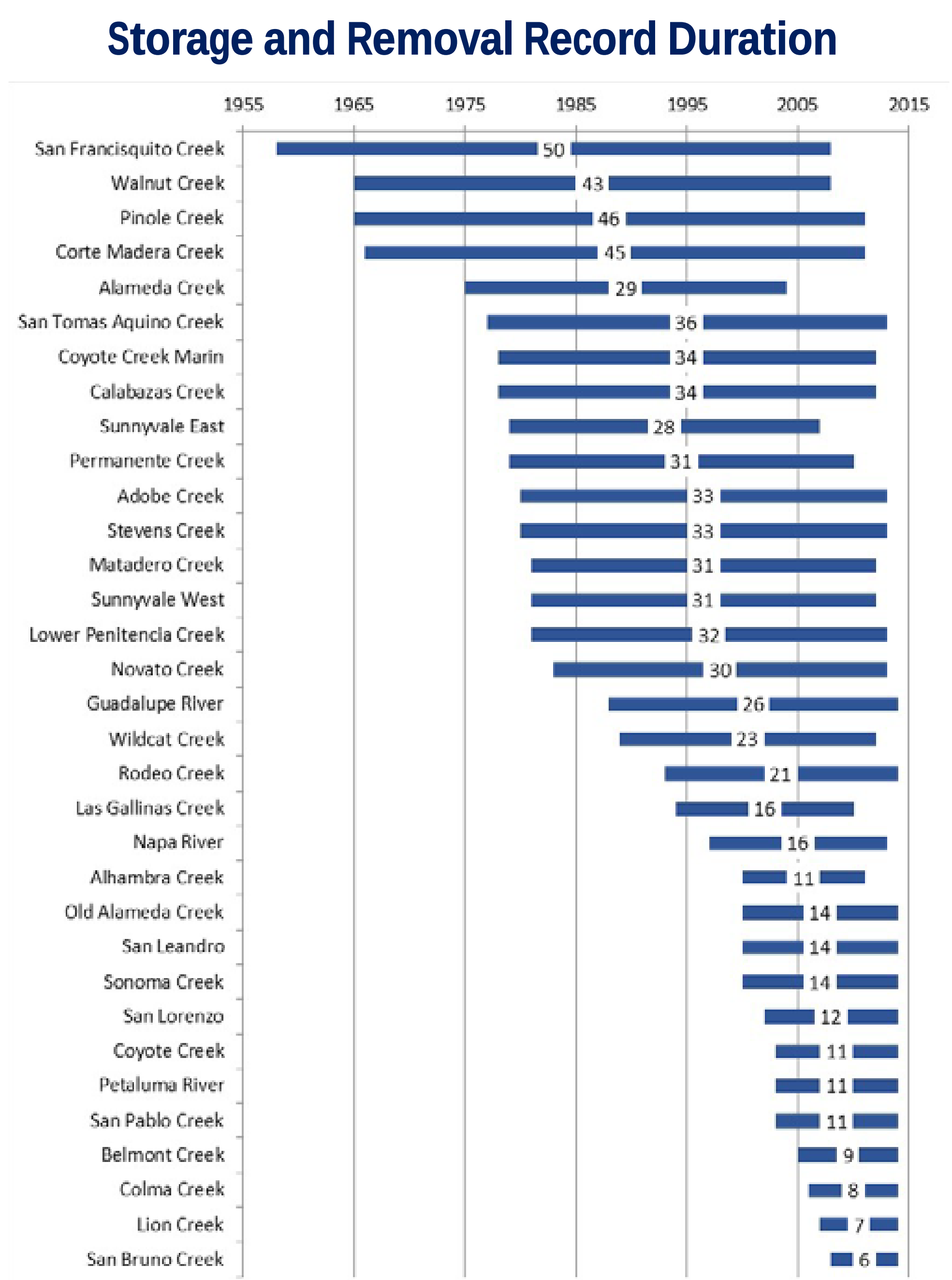
Regional Sediment Dynamics

Watershed Sediment Supply

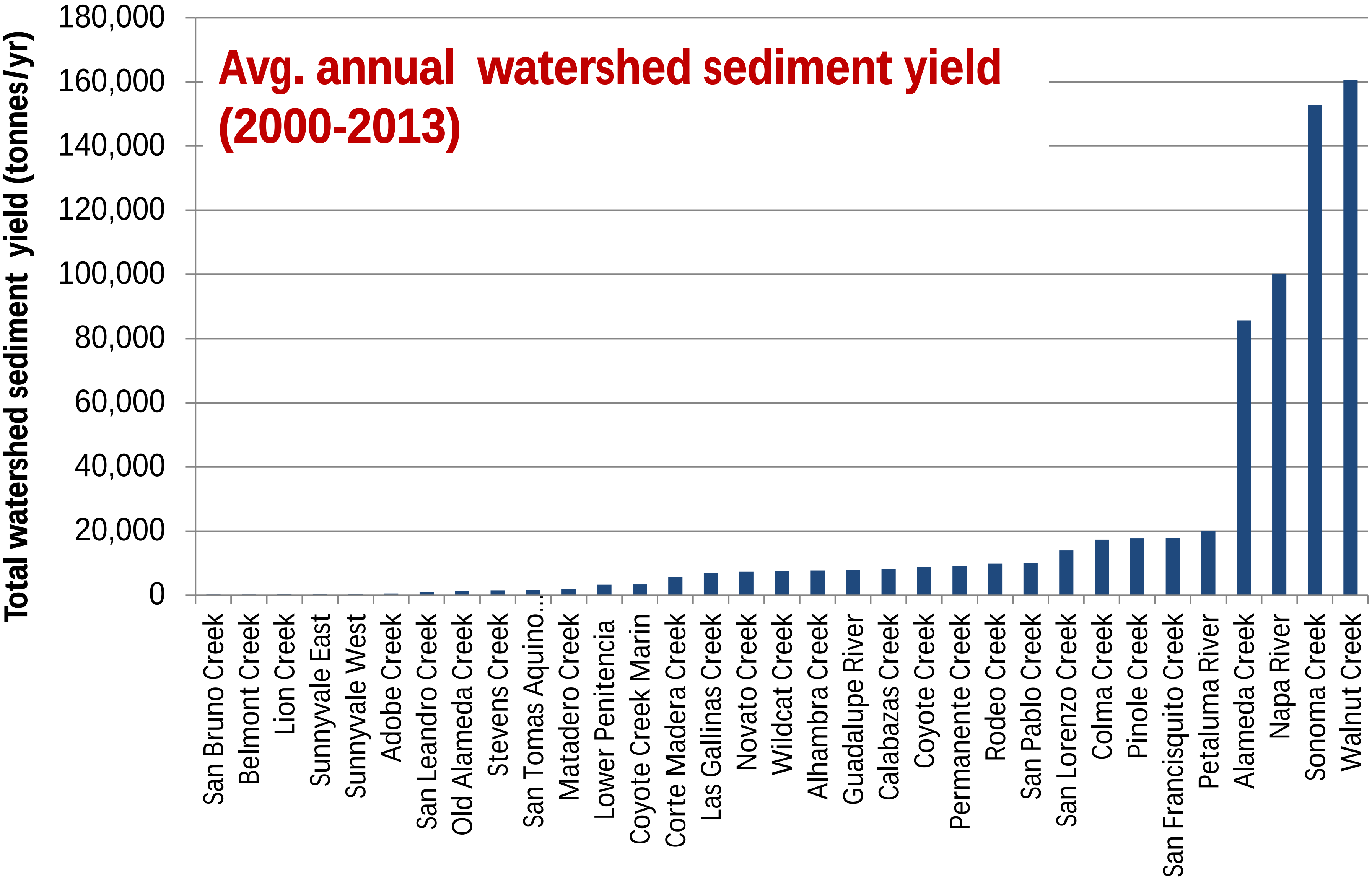
- Collated local USGS gage data
- Developed regional regressions
- Time period: 2000-2013

Sediment Storage and Removal

- Interviewed flood control agencies, cities, & counties
- Compiled removal *location, volume, frequency*, grain size, and cost data
- Time period: 1957-2013

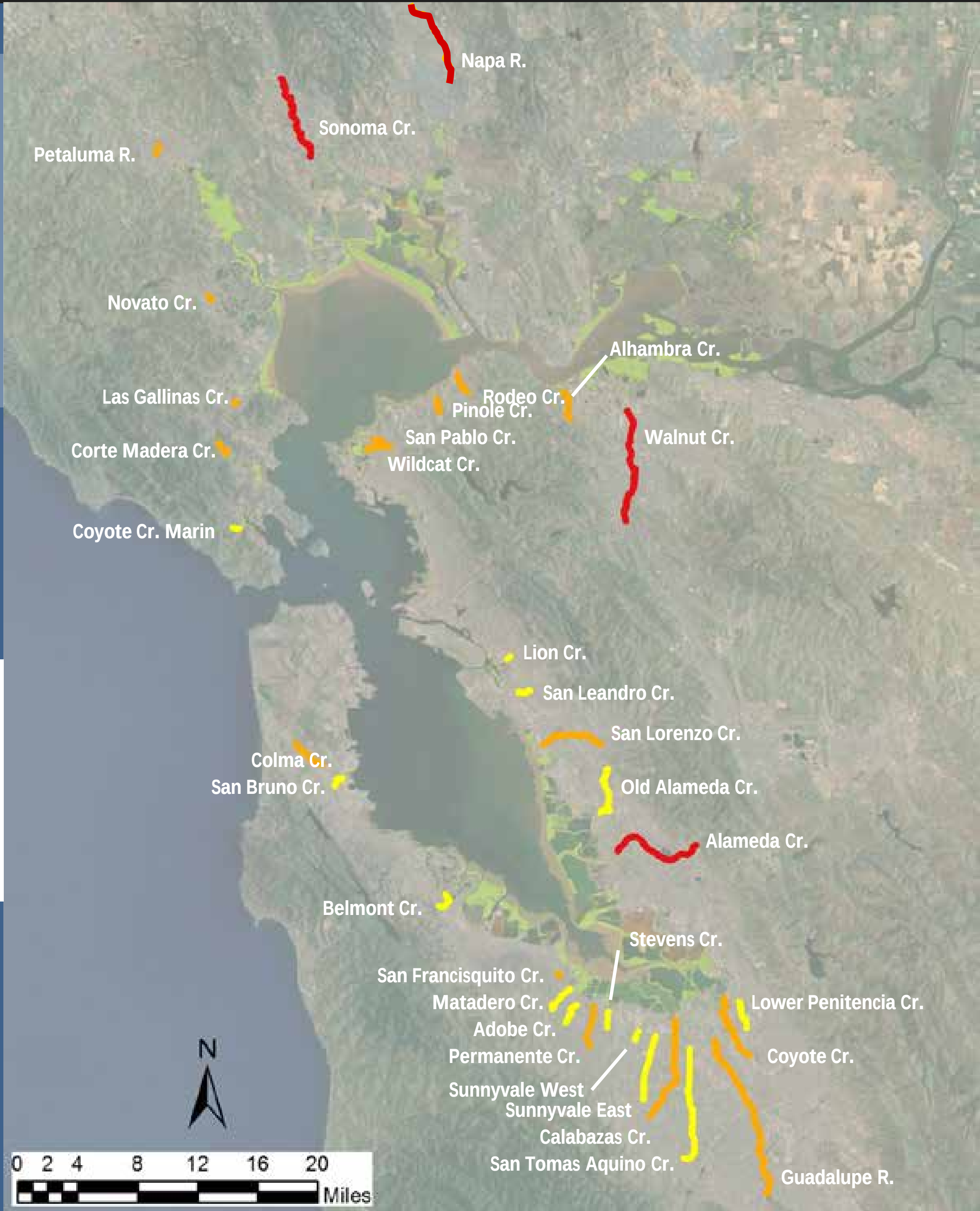


Watershed Sediment Supply



Total Watershed Sediment Yield: 2000-2013 (tonnes/yr)

- **LOW** (<5,000)
- **MEDIUM** (5,000-50,000)
- **HIGH** (>50,000)



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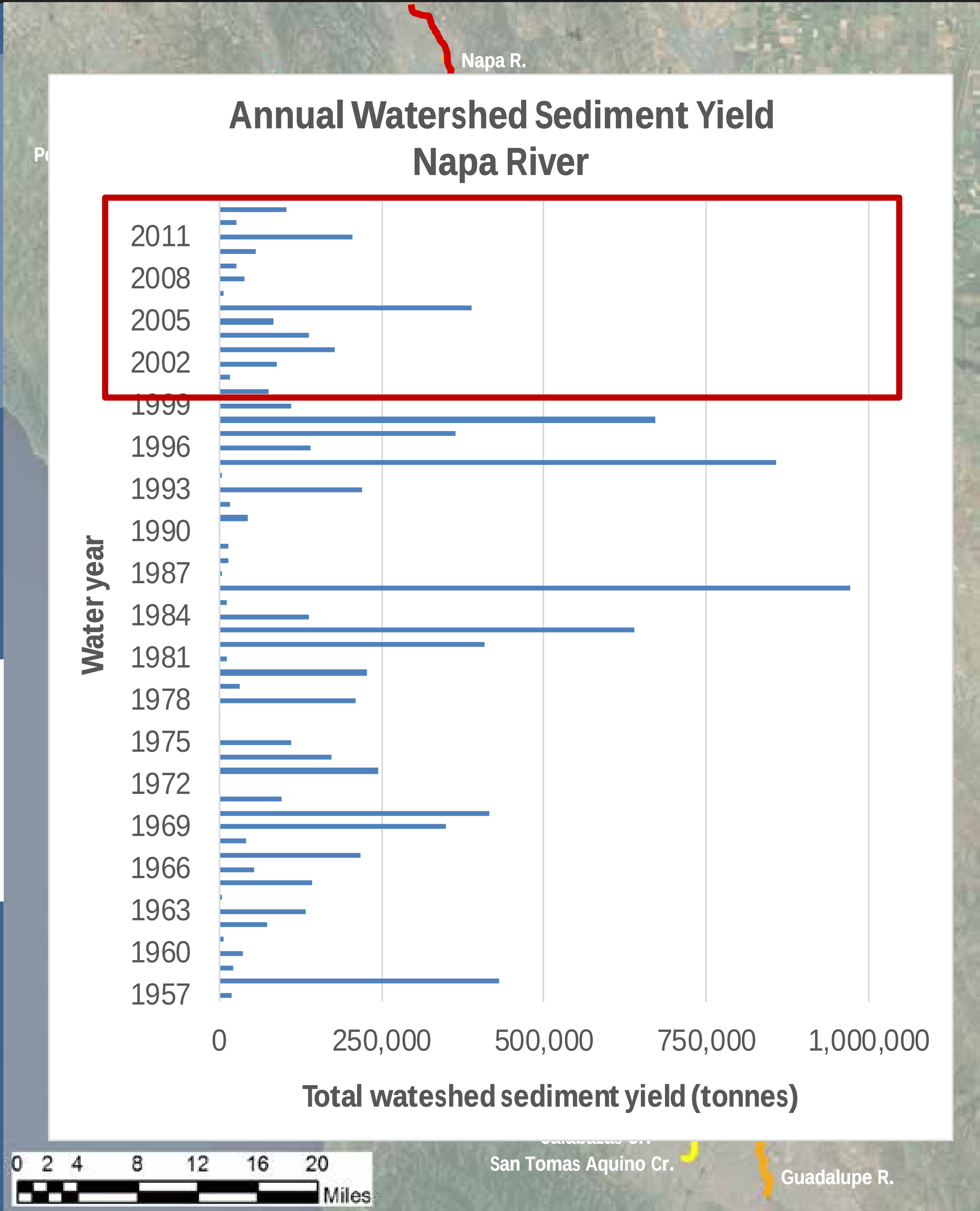


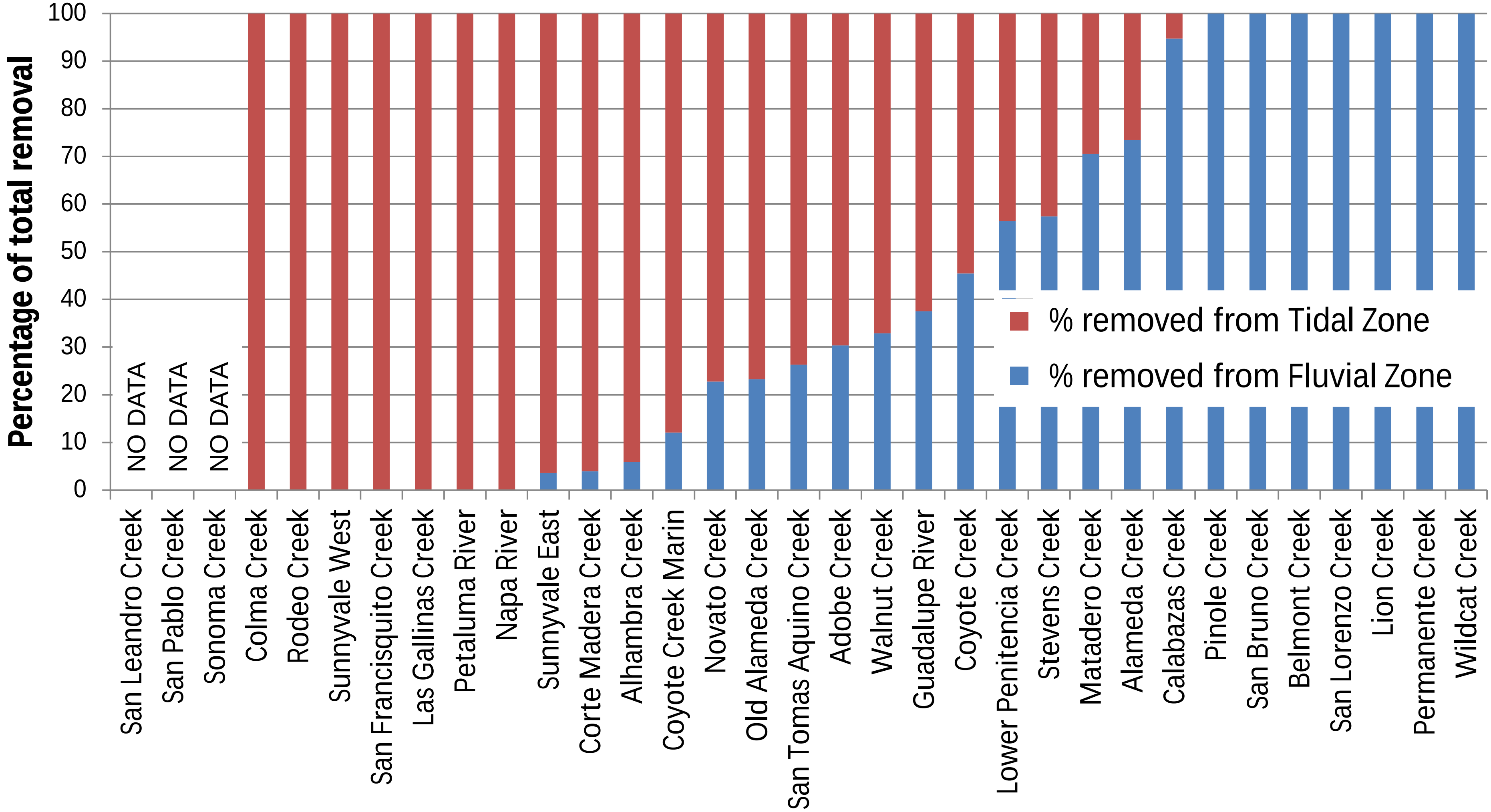
LOW (<5,000)

MEDIUM (5,000-50,000)

HIGH (>50,000)

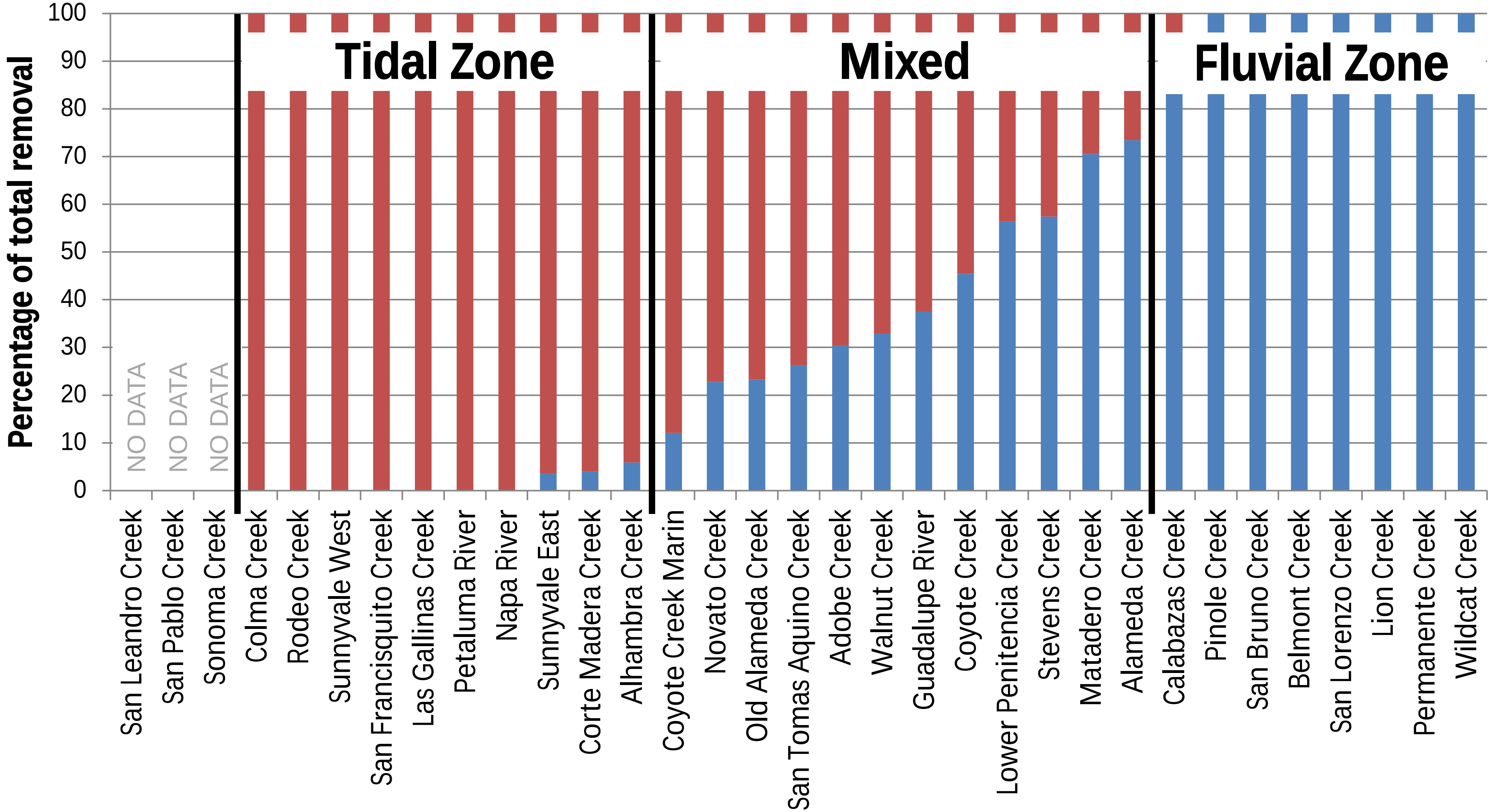
Sediment Storage & Removal

Tidal vs. Fluvial Zone Sediment Removal (1973-2013)



Sediment Storage & Removal

Tidal vs. Fluvial Zone Sediment Removal (1973-2013)



Sediment Removal by Zone: 1973-2013

Channel Zone

TIDAL

FLUVIAL

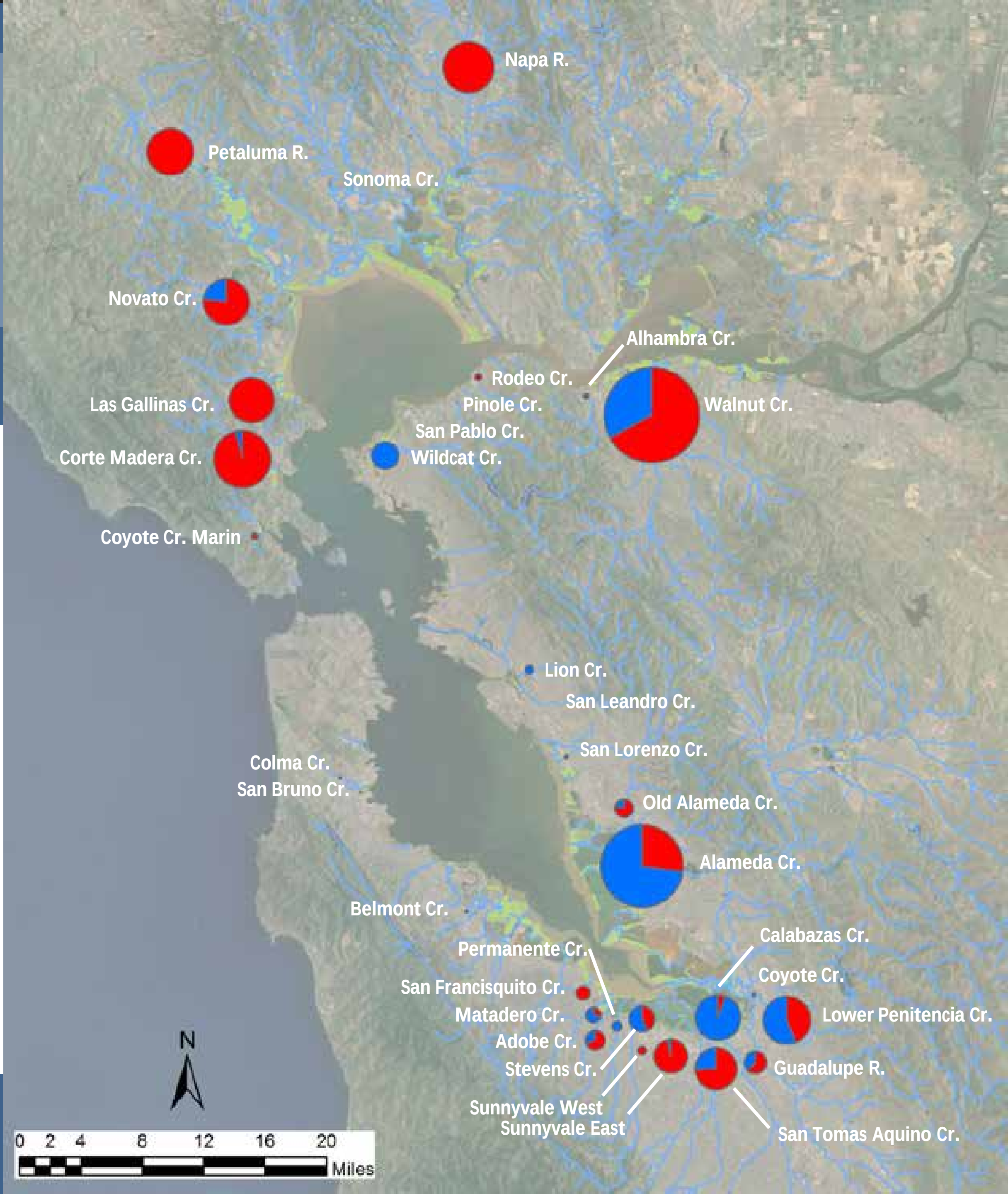
Sediment Removal (CY)

900,000

450,000

150,000

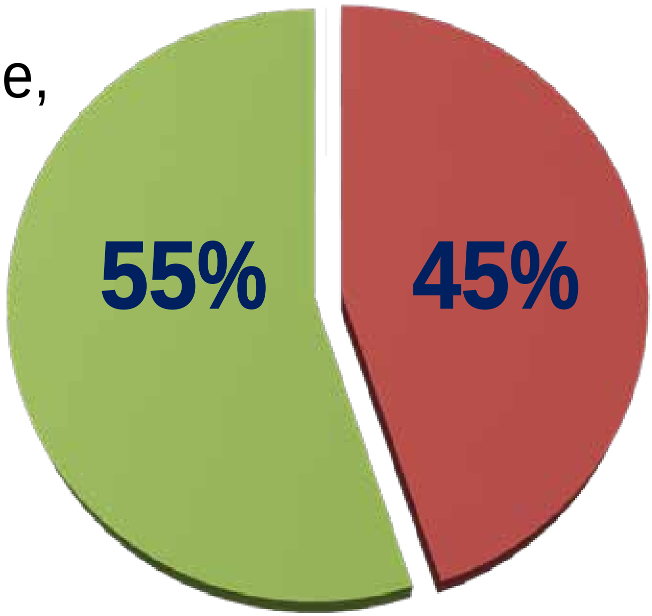
25,000



Sediment Storage & Removal: 1973-2013

Sediment Removal Frequency

Every 1 to 5 years
routine maintenance,
response to storms



Every 5 to 15 years
routine maintenance

So…What's Next?

Management approaches that get sediment to baylands

Natural processes
(channel reconnection)

Mechanical placement
(local beneficial re-use)

So...What's Next?

Management approaches that get sediment to baylands

Natural processes
(channel reconnection)

Mechanical placement
(local beneficial re-use)

Continued research into baylands sediment supply and demand

Flood Control 2.0 Online Toolbox Now Available!

floodcontrol.sfei.org

Flood Control 2.0 Online Toolbox Now Available!

FLOOD CONTROL 2.0

Toolbox | Who We Are

Toolbox

Flood Control 2.0 | Channel Analysis | Implementation Projects | Regulatory Analysis | Economic Analysis | Sedi-Match | Podcasts

Flood Control 2.0

Flood control managers and regulatory agencies are calling for a new overall approach for channel management with the recognition of environmental impacts associated with current flood risk management activities, the high cost of maintaining aging infrastructure, the challenges associated with maintaining flood conveyance in the face of a rising sea level, and the high value of dredged sediment.

Flood Control 2.0 is an innovative regional project that seeks to integrate habitat improvement and flood risk management at the Bay interface. The project focuses on helping flood control agencies and their partners create landscape designs that promote improved sediment transport through flood control channels, improved flood conveyance, and the restoration and creation of resilient bayland habitats. In addition, the project focuses on beneficial reuse options for dredged sediment from highly constrained flood control channels with limited restoration opportunities. Through a series of coordinated technical, economic, and regulatory analyses, Flood Control 2.0 addresses some of the major elements associated with multi-benefit channel design and management at the Bay interface and will provide critical information that can be used to develop long-term solutions that benefit people and habitats.

The project findings have been synthesized into this online "toolbox." The toolbox includes channel classifications and relevant management concepts (e.g., creek-bayland connection, beneficial reuse of sediment); multi-benefit landscape "visions" at the Bay interface for selected channels; a "marketplace" for baylands restoration practitioners to find available dredged sediment (SediMatch); regulatory guidance documents with case studies for the regulatory issues associated with flood control project elements (e.g., impacts to existing wetlands); and benefit-cost analyses of current flood management measures and proposed multi-benefit measures. In combination with other regional plans (e.g., Baylands Ecosystem Habitat Goals Science Update), this project provides information to flood control managers and the restoration community for planning sustainable, long-term, multi-benefit redesign projects given landscape, regulatory, and economic challenges.

Flood Control 2.0 was funded by the San Francisco Bay Water Quality Improvement Fund, EPA Region IX.

Flood Control 2.0 Online Toolbox Now Available!

A product of Flood Control 2.0

HOW CREEKS MEET THE BAY:

Current Sediment Dynamics

Click on the head of tide markers to view sediment information.

The transition zones between our watersheds and the Bay are often occupied by flood control channels that provide a variety of societal and environmental services but can require sediment removal to maintain flood conveyance capacity. The causes of sedimentation problems in these channels are often complex, driven in large part by a combination of high watershed sediment yield and excess tidal sediment accumulation due to decreased tidal scour. Here we provide key information on the supply of sediment to major flood control channels around the Bay and the amount of sediment storage and removal over the past 50+ years. This is the first time this information has been collated and made readily available, and thus we provide new insights into a number of key questions:

- How much watershed sediment is delivered to each flood control channel?
- How variable is the watershed sediment load during different time periods?
- Where is watershed and tidal sediment being stored or removed from each flood control channel?
- How much, and at what frequency is sediment removed from each flood control channel?

This information is intended to help clarify the amount of sediment trapped in flood control channels that could be used to restore baylands and support long-term bayland resilience as sea level continues to rise.

To view details on the methods and some key results, click here. To download the complete dataset with additional information beyond that shown on the map, click here.

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A product of Flood Control 2.0

FLOOD CONTROL 2.0

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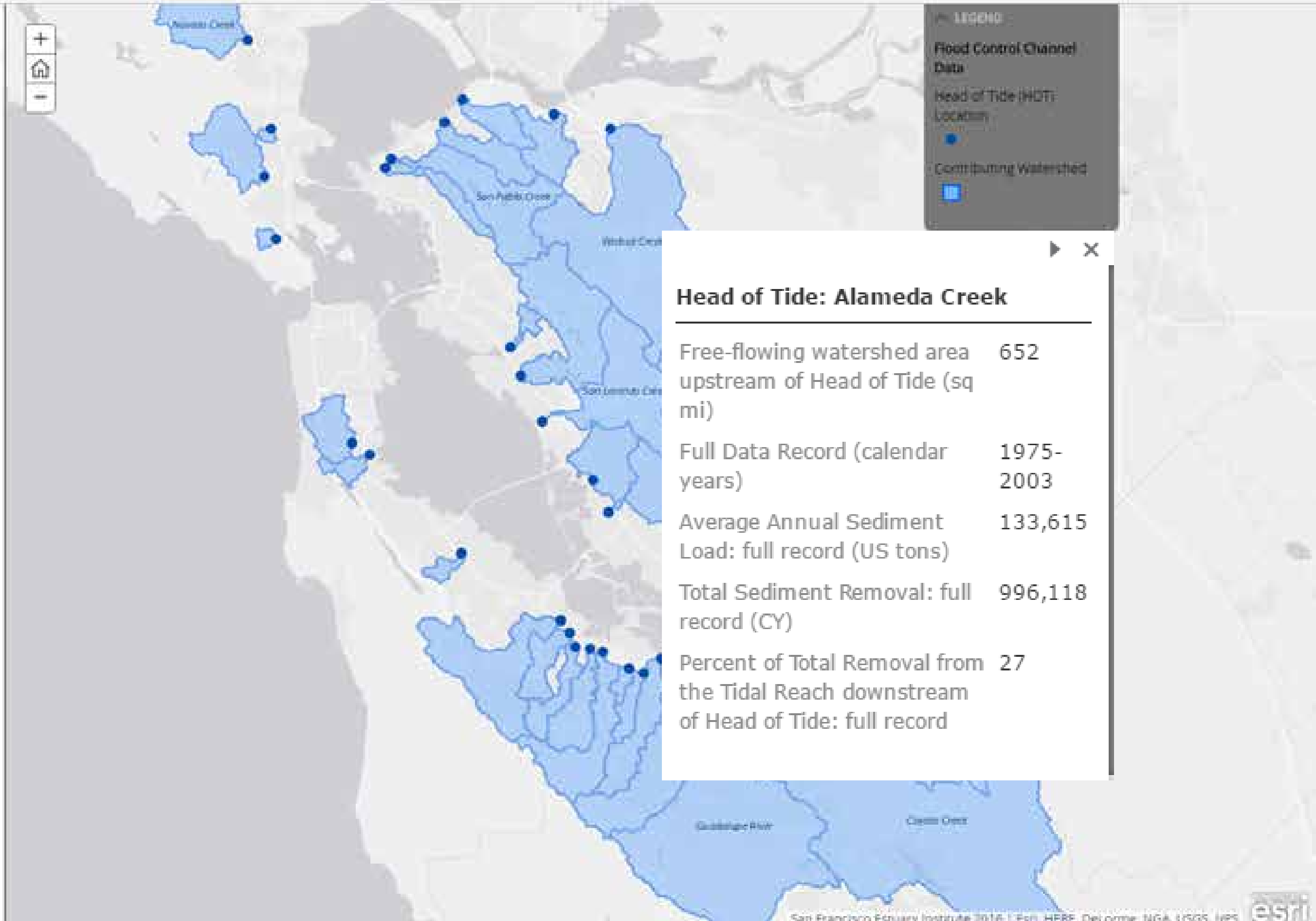
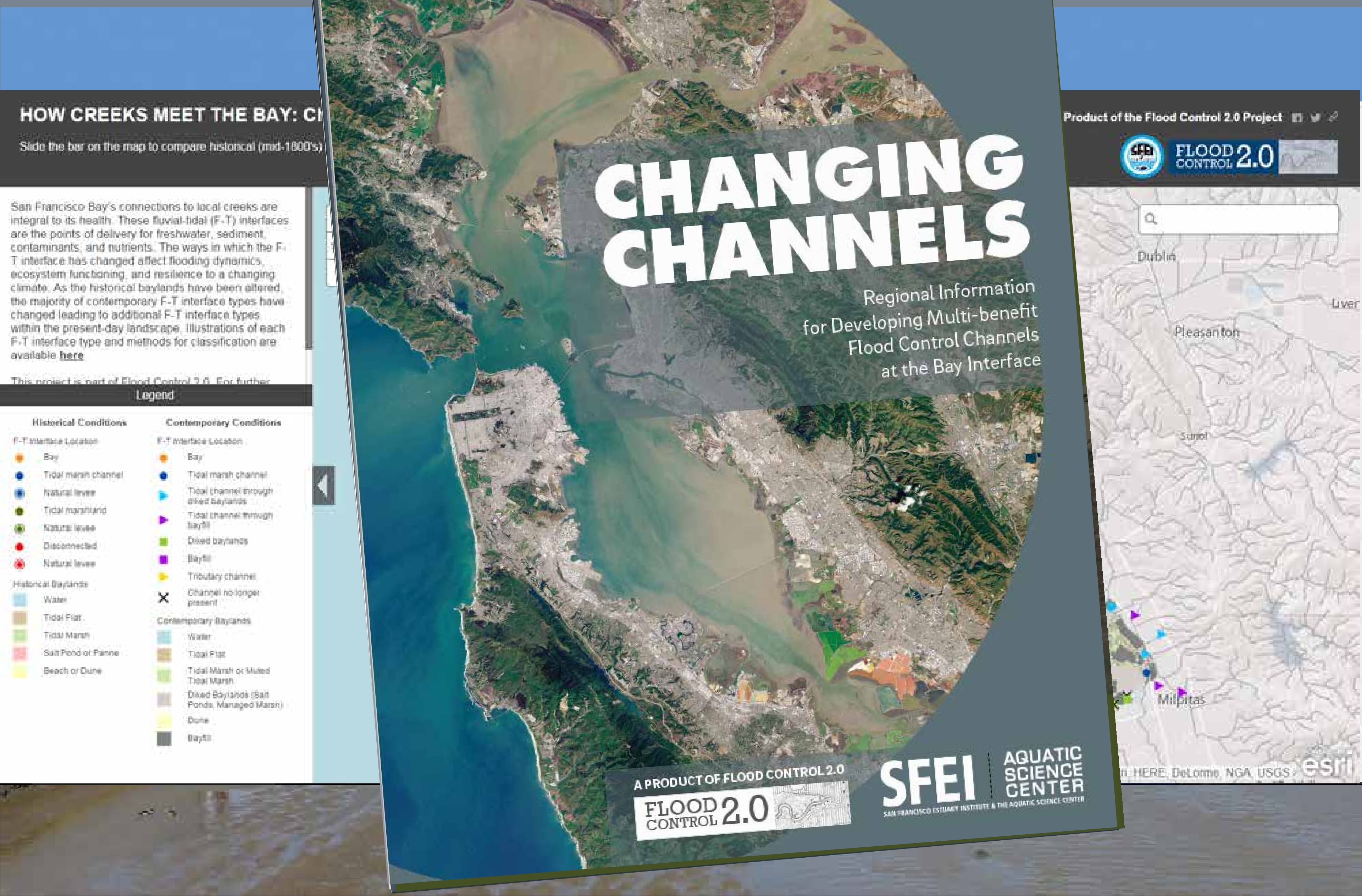


Flood Contr … ailable!



Flood Control 2.0 Online Toolbox Now Available!

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contact: scottd@sfei.org