

Estuarine Functions and Fishery Management Issues in California Estuaries

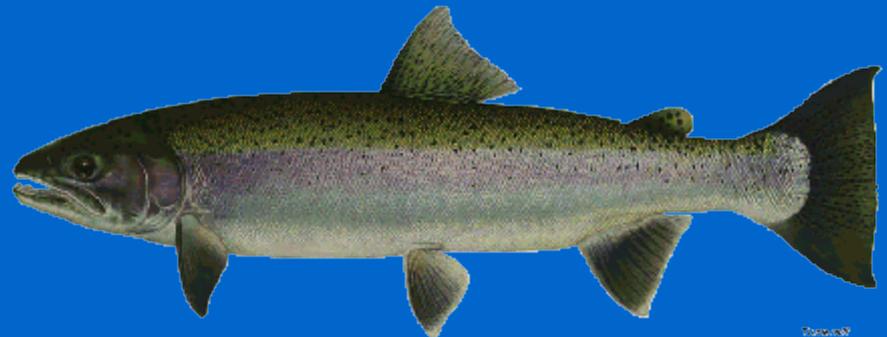
National Marine Fisheries Service



Southern California Coastal Water Research Project

**Costa Mesa, California
September 28, 2016**

Mark H. Capelli
Steelhead Recovery Coordinator



7/20/05/07



Estuarine Functions and Fishery Management

California
Estuarine
Biodiversity



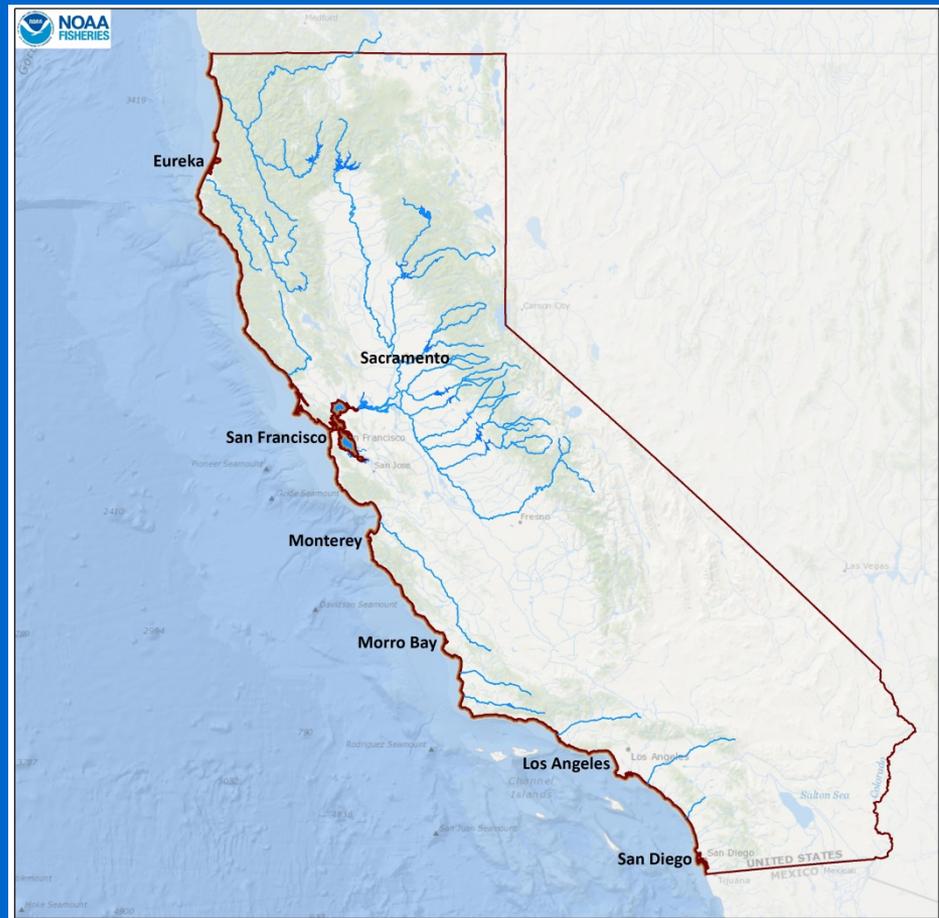
Courtesy: David K. Jacobs



Estuarine Functions and Fishery Management

Steelhead &
Tidewater Goby

Geographic Range
in California





Estuarine Functions and Fishery Management



Southern California Steelhead
Oncorhynchus mykiss



Northern Tidewater Goby
Eucyclogobius newberryi



Estuarine Functions and Fishery Management

Pacific salmon species (*Oncorhynchus* spp.)



Pink
Humpback

Sockeye
*Red
Kokanee*

Chum
Dog

Coho
Silver

Chinook
King

Steelhead
(Rainbow)

© Robin Ade



Pacific lamprey
Entosphenus tridentatus



Delta smelt
Hypomesus transpacificus transpacificus



Estuarine Functions and Fishery Management

California Bay Gobies



Blind goby (*Typhlogobius californiensis*)



Banded tail goby
(*Evermannia zosterura*)



Delta mudsucker (*Gillichthys detrusus*) Longjaw mudsucker (*G. mirabilis*)



Tidewater goby (*Eucyclogobius newberryi*)



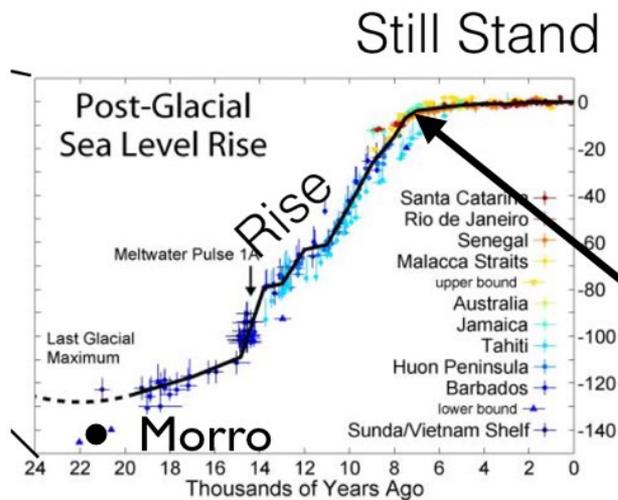
Guaymas goby (*Quietula guaymasiae*)

Courtesy: David J. Jacobs



Estuarine Functions and Fishery Management

7-8 Thousand Years ago Bays



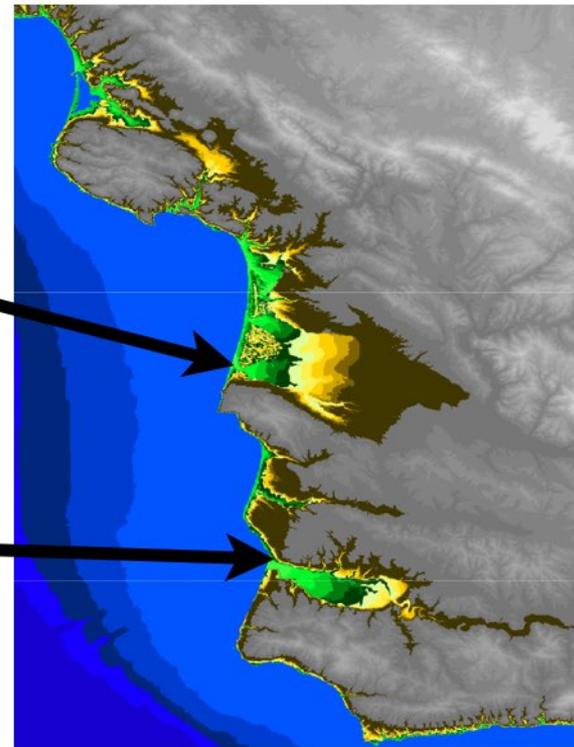
- Pismo/Arroyo Grande/Santa Maria

Courtesy: David K. Jacobs



Estuarine Functions and Fishery Management

Today closing systems - Santa Maria, Santa Ynez



Courtesy: David C. Jacobs



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Estuarine Functions and Fishery Management

North Coast



Big Lagoon



Humboldt Bay

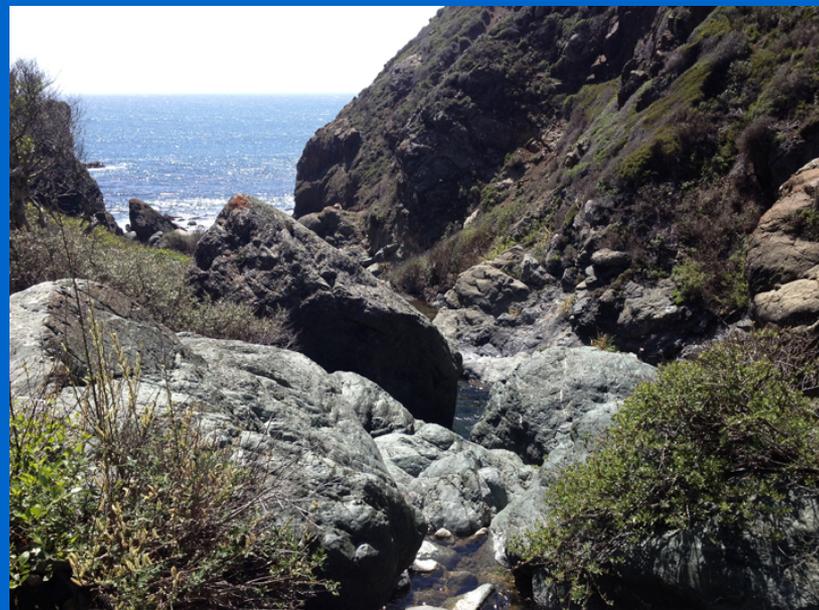


Estuarine Functions and Fishery Management

Big Sur Coast



Bixby Creek Estuary



Salmon Creek Estuary



Estuarine Functions and Fishery Management



Little Sur River Estuary



Ventura River Estuary



Estuarine Functions and Fishery Management

South Coast



San Juan Creek Estuary



Tijuana River Estuary



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Estuarine Functions and Fishery Management

Adult and Juvenile Steelhead Estuarine Use





Estuarine Functions and Fishery Management

Scott Creek: Juvenile *O. Mykiss* Growth

Freshwater Growth: 0.01% per day

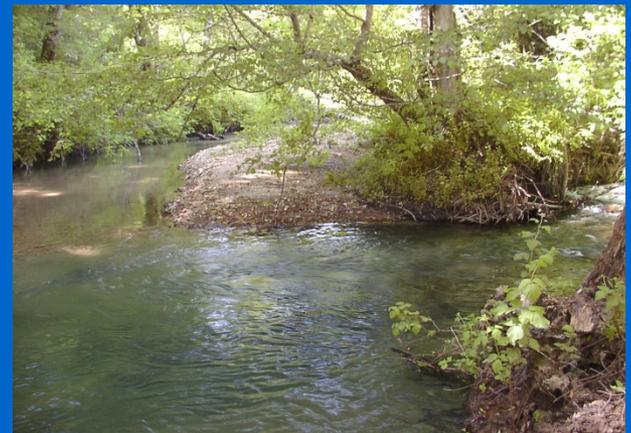
Estuarine Growth: 0.2 - 0.8% per day

- Majority of ocean entry *O. mykiss* were **estuary** reared
- Freshwater reared fish took several years to reach ocean entry size

(Hayes, *et al.* 2008)



Scott Creek Estuary



Upper Scott Creek



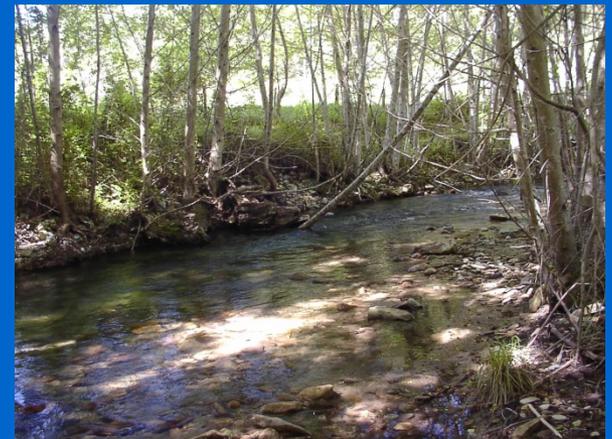
Estuarine Functions and Fishery Management

Scott Creek: *O. Mykiss* Smolt Movement

- **Estuarine rearing smolts moved upstream in response to poor estuarine conditions**
 - > salinity
 - > water temperature
- **Summer rearing smolts migrated downstream several times before entering the ocean**
- **Smolts making multiple instream migrations entered the ocean at larger sizes (> 190 mm)**



Scott Creek Estuary

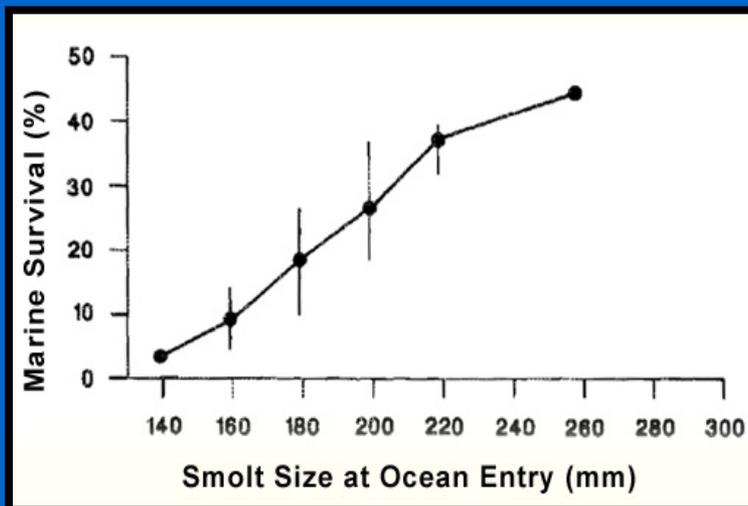


Upper Scott Creek

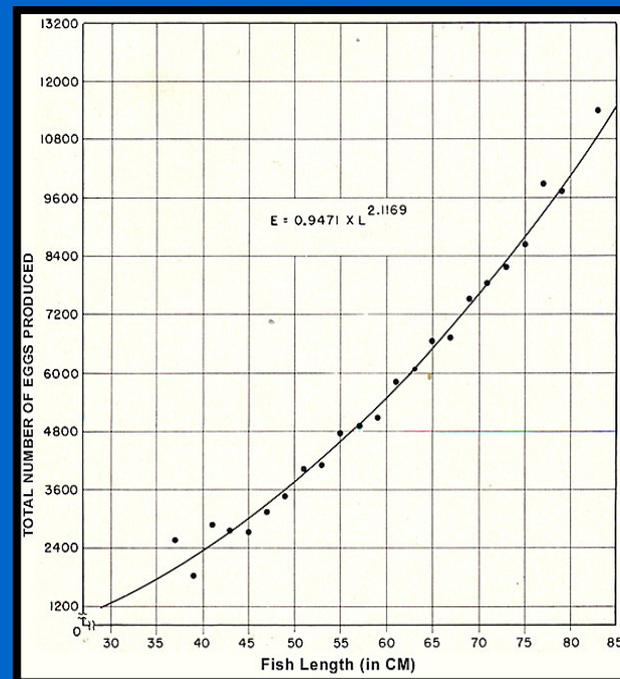


Estuarine Functions and Fishery Management

Marine Survival
vs Fish Size



Fecundity
vs. Fish Size



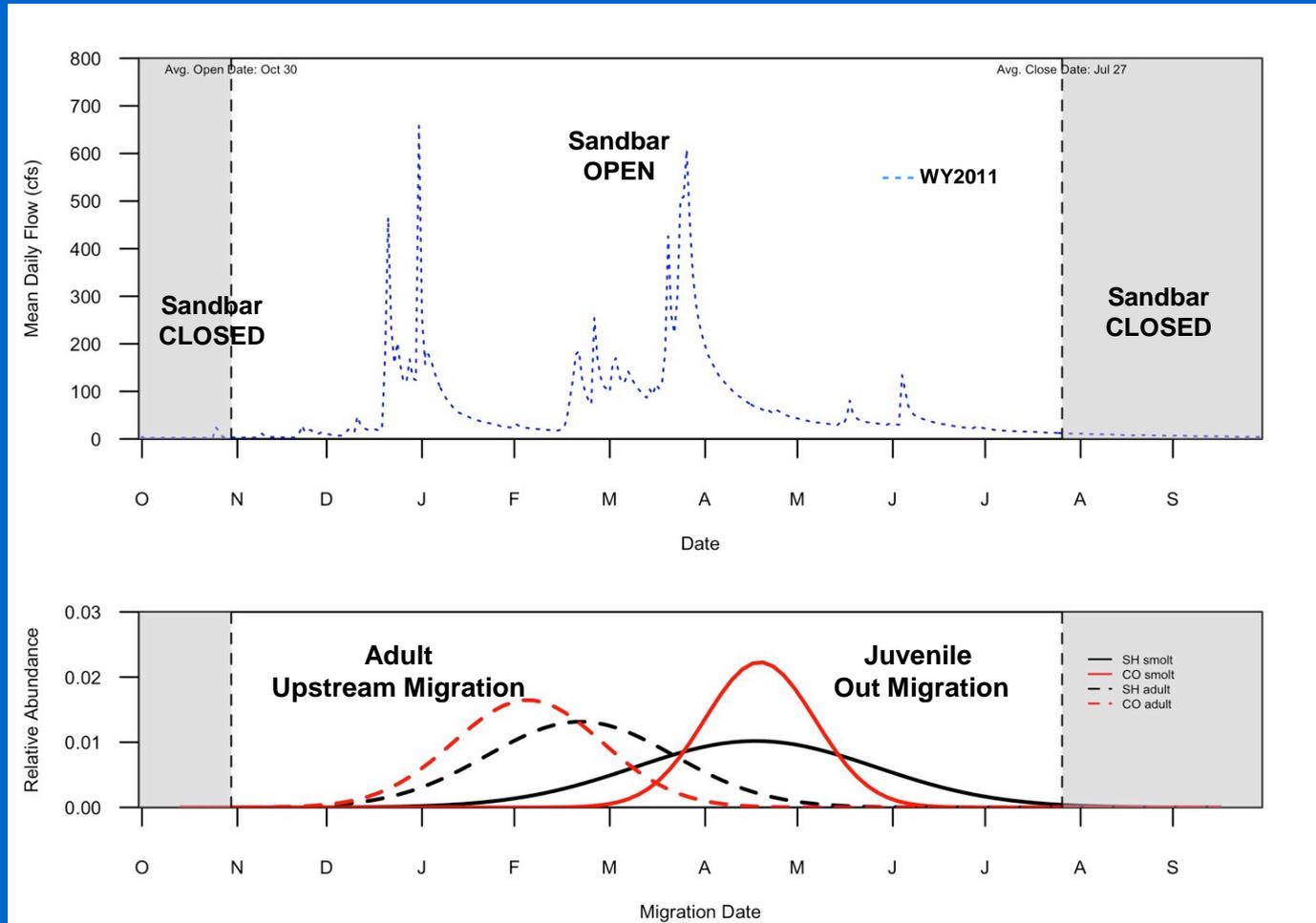


Estuarine Functions and Fishery Management

Scott Creek
Estuary

Steelhead and
Coho

Typical
Migration
Opportunities



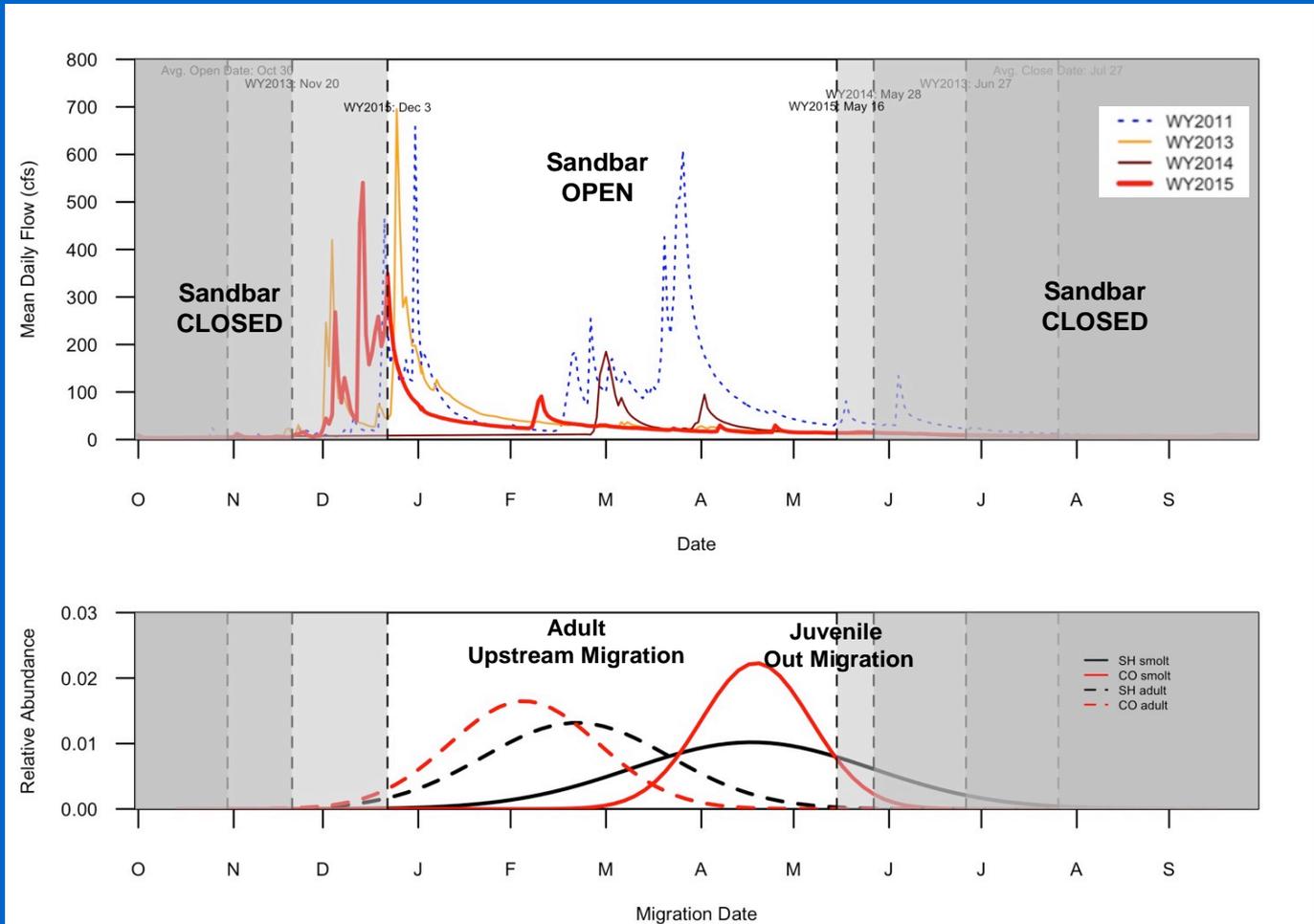


Estuarine Functions and Fishery Management

Scott Creek
Estuary

Steelhead and
Coho

Migration
Opportunities:
2011 – 2015



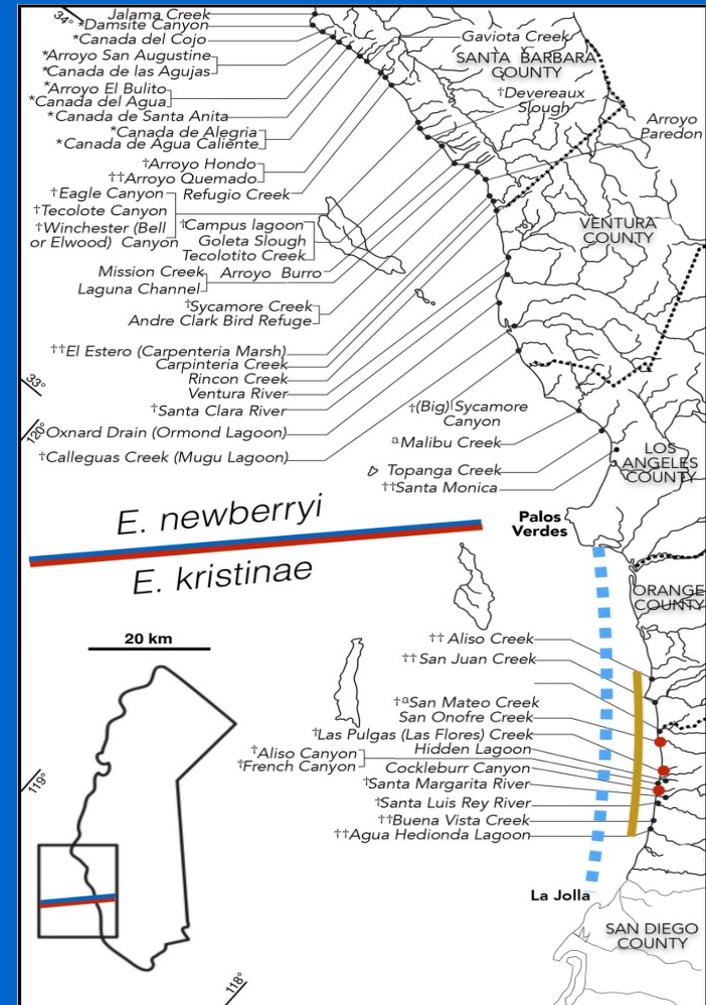


Estuarine Functions and Fishery Management

New Species of Tidewater Goby
(*Eucyclogobius kristinae*)

Endemic to Southern California

Palos Verdes – La Jolla

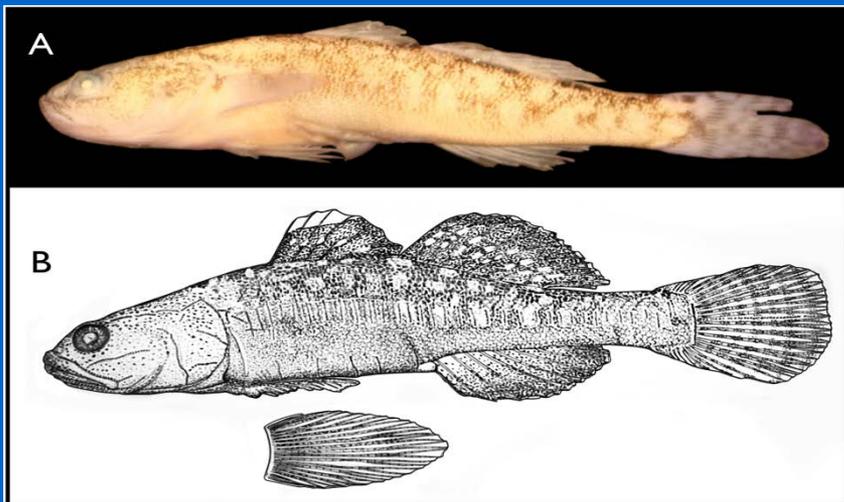


Swift, Spies, Ellingson and Jacobs (2016)



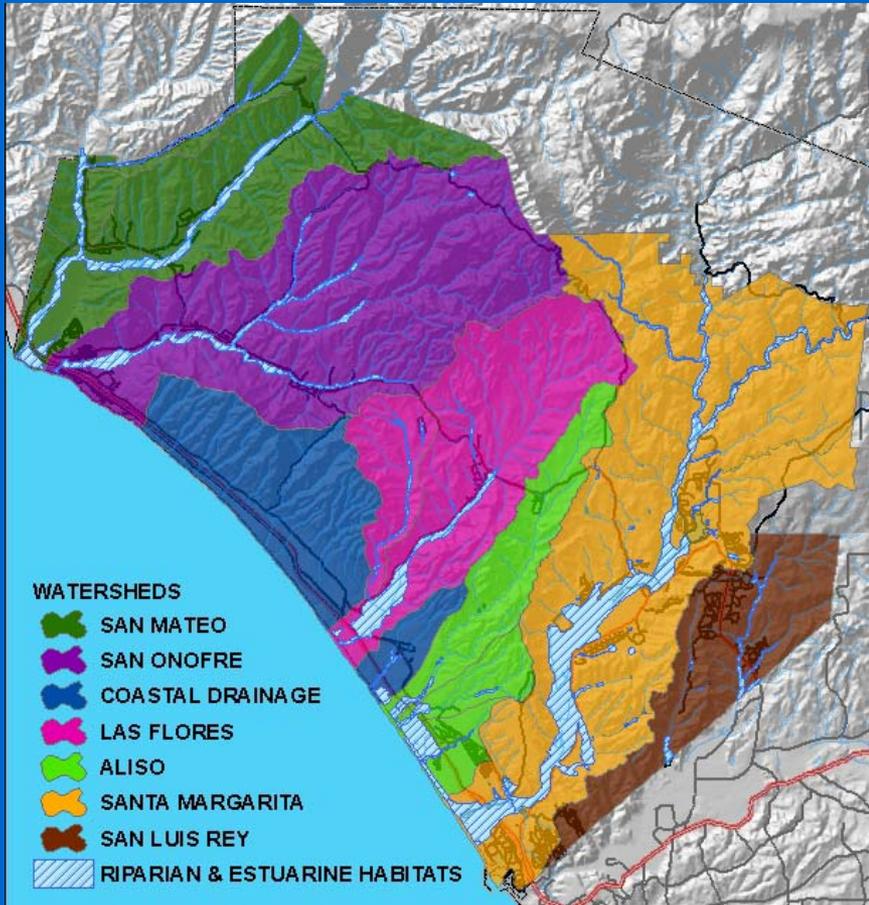
Estuarine Functions and Fishery Management

Southern Tidewater Goby (*Eucyclogobius kristinae*)





Estuarine Functions and Fishery Management



Camp Pendleton



San Onofre Creek



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Estuarine Functions and Fishery Management

Santa Margarita
River
Estuary





Estuarine Functions and Fishery Management

Estuarine Management Issues

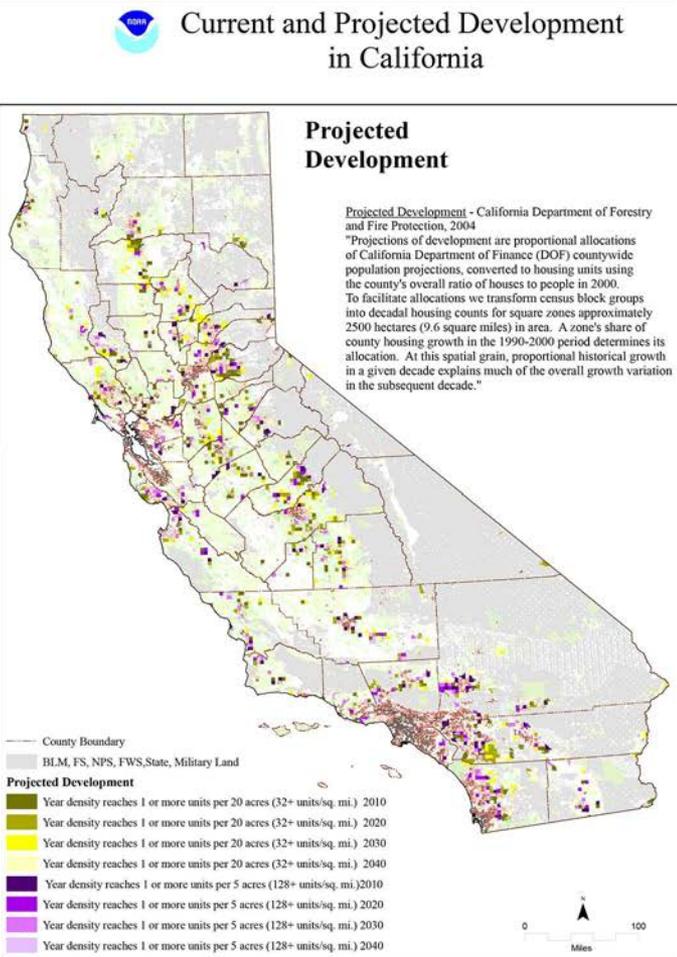
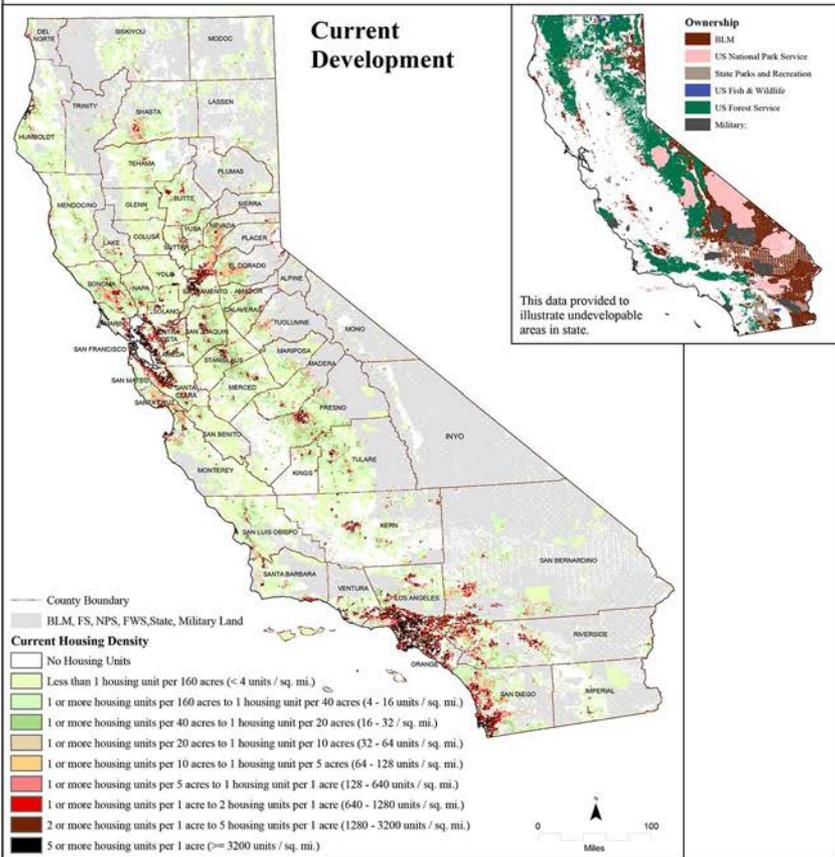
- Modification of Freshwater & Sediment Inflow
- Fill and Dredging
- Degradation of Water Quality
- Introduction of Exotic Species
- Artificial Sandbar Breaching



National Marine Fisheries Service

Estuarine Functions and Fishery Management

Current Development Data - California Department of Forestry and Fire Protection, 2005
 "This data layer is an attempt to spatially define the 'footprint of development', which includes both residential and commercial development. FRAP has thoroughly analyzed various data layers to determine the preferred method for capturing development, especially the difficult task of identifying commercial development. Data sources include 2000 Census block data for housing, 2000 land ownership data for identifying uninhabited public lands, 1990's USGS National Land Cover Data (NLCD), and 2000 Census Urbanized Area data."





Estuarine Functions and Fishery Management

- Modification of freshwater & Sediment Inflow



San Clemente Dam – Carmel River



Rindge Dam – Malibu Creek



Seven Oaks Dam – Santa Ana River



Estuarine Functions and Fishery Management

- Modification of freshwater & Sediment Inflow



San Clemente Dam – Carmel River



Rindge Dam – Malibu Creek



Seven Oaks Dam – Santa Ana River



Estuarine Functions and Fishery Management

- Fill and Dredging



Malibu Creek Estuary



Arroyo Sequit Estuary



San Dieguito River Estuary



San Luis Rey River Estuary



Estuarine Functions and Fishery Management

- Fill and Dredging



Malibu Creek Estuary



Arroyo Sequit Estuary



San Dieguito River Estuary



San Luis Rey River Estuary



Estuarine Functions and Fishery Management

- Degradation of Water Quality



Pismo Creek Estuary



Big Sycamore Canyon Estuary

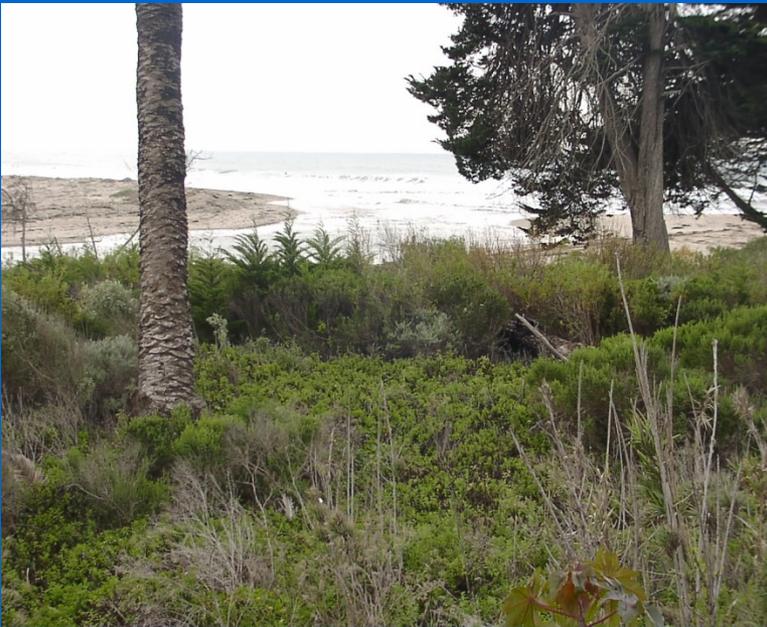


Santa Maria River Estuary



Estuarine Functions and Fishery Management

- Introduction of Exotic Species



Non-Natives - Ventura River Estuary



Carp - Santa Clara River Estuary



Estuarine Functions and Fishery Management

- Artificial Sandbar Breaching



Carmel River Estuary



Estuarine Functions and Fishery Management

- Artificial Sandbar Breaching



Goleta Slough

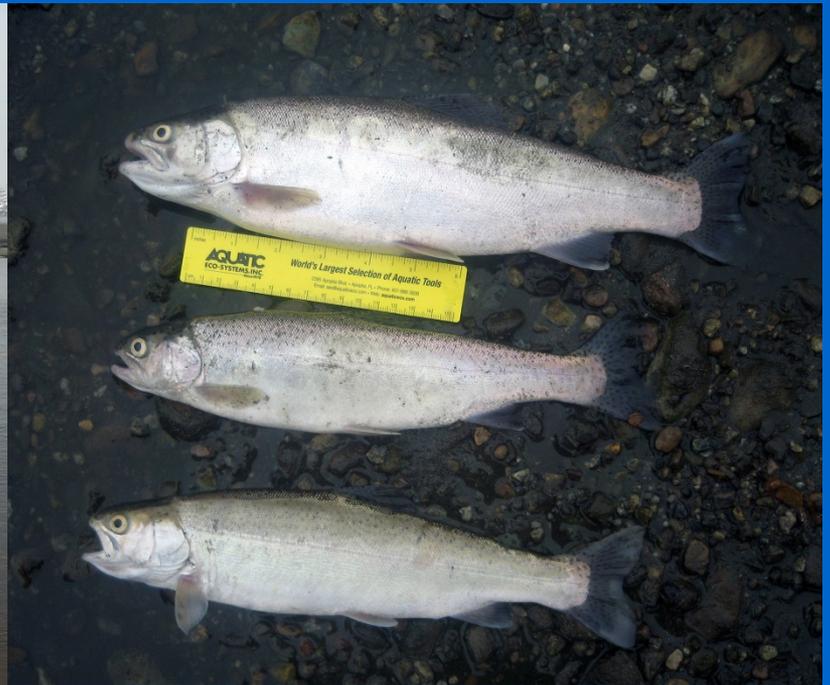


Atascadero Creek Steelhead (2013)



Estuarine Functions and Fishery Management

- Artificial Sandbar Breaching



Santa Clara River Estuary

Steelhead Smolts (2010)

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