

# Southern California Steelhead Recovery and the Arroyo Seco

## National Marine Fisheries Service

Environmental Planning  
Landscape Arch 205

U.C. Berkeley

March 4, 2026

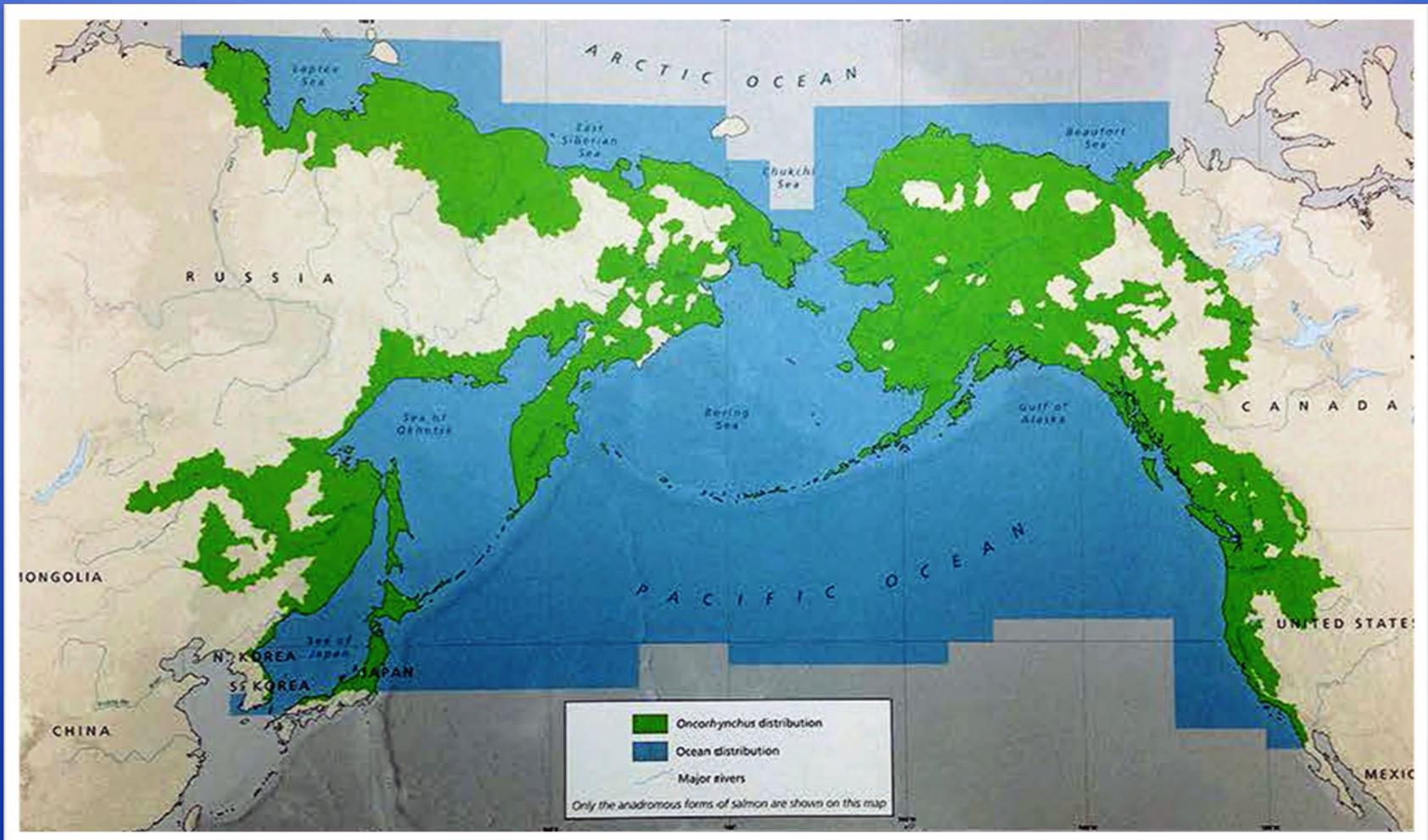
Mark H. Capelli  
South-Central/Southern California  
Steelhead Recovery Coordinator



7/20/05/87

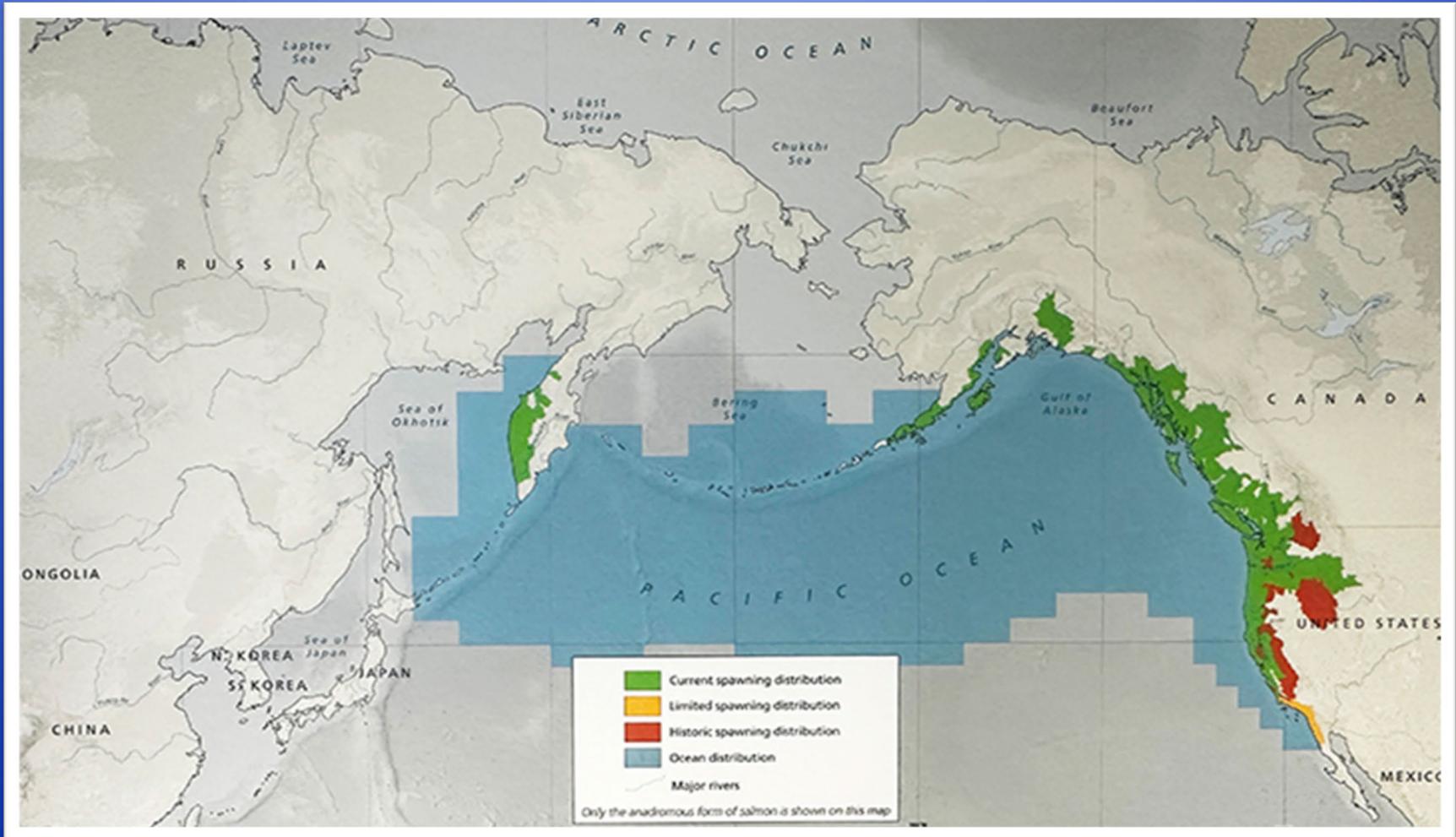


## Pacific Salmon Distribution





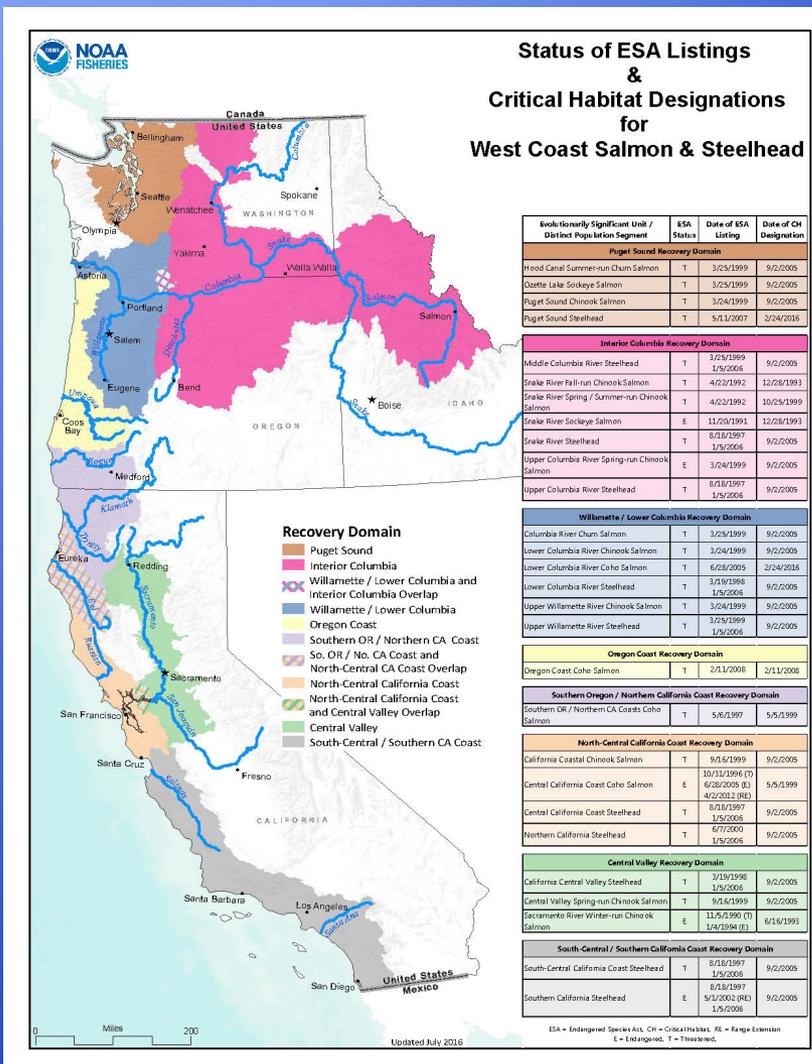
## Steelhead World Distribution





## Steelhead ESA Listing

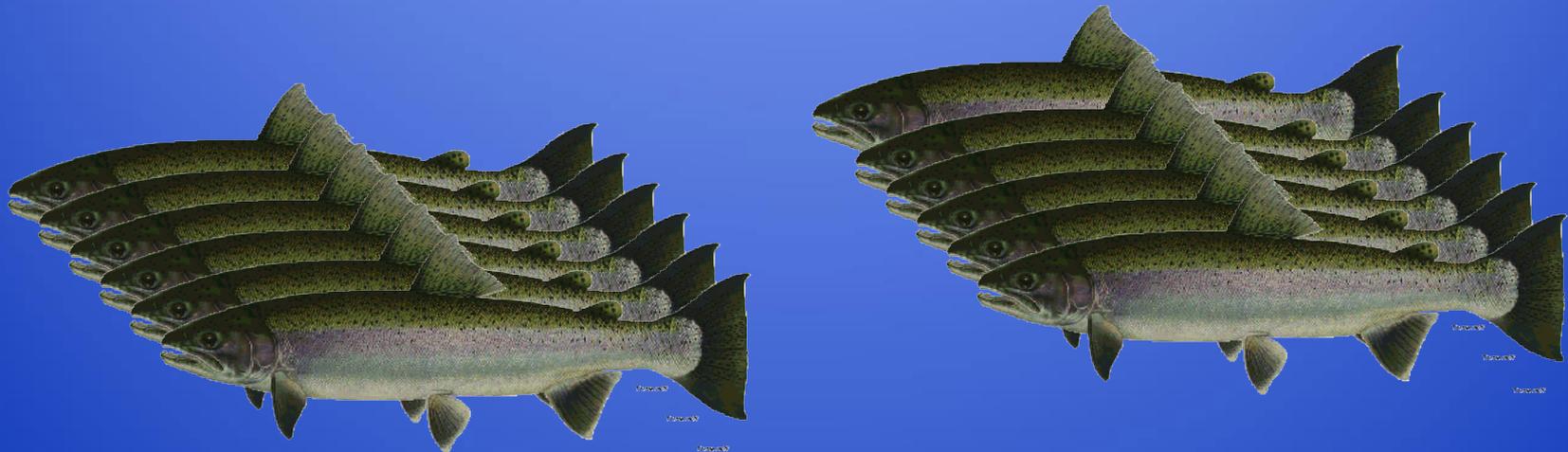
- NMFS 1997-1998 ESA Listings
- Pacific Salmon Steelhead





# Steelhead ESA Listing

How do you distinguish between populations of the same species?





## Steelhead ESA Listing



Dr. Jennifer L. Nielsen

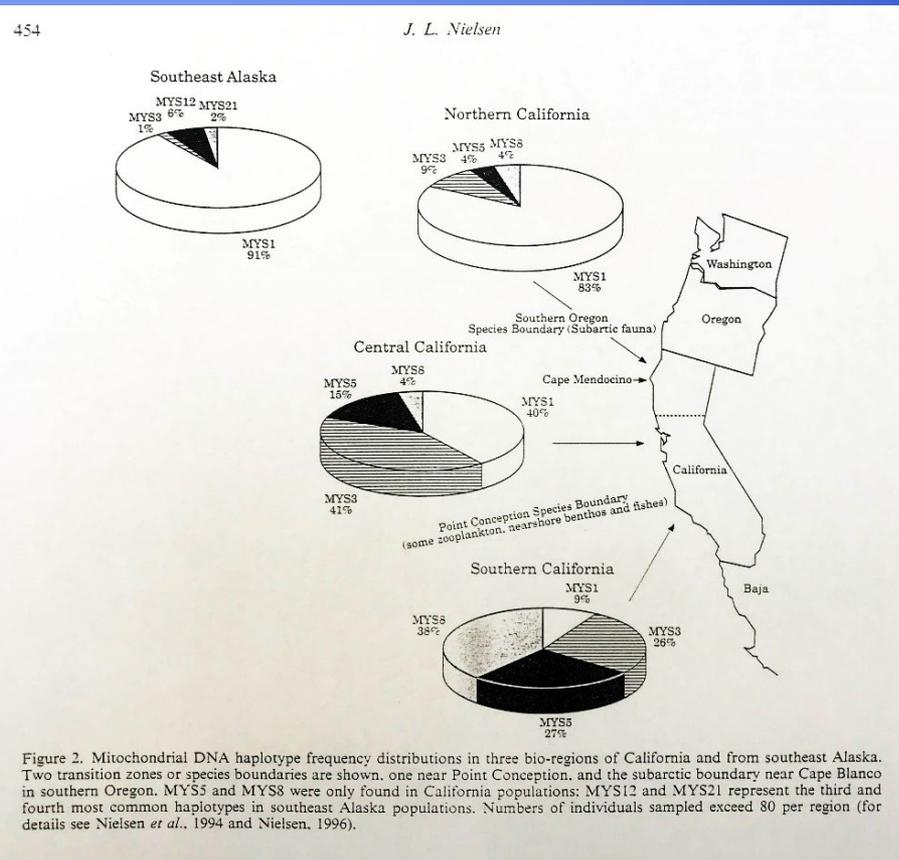
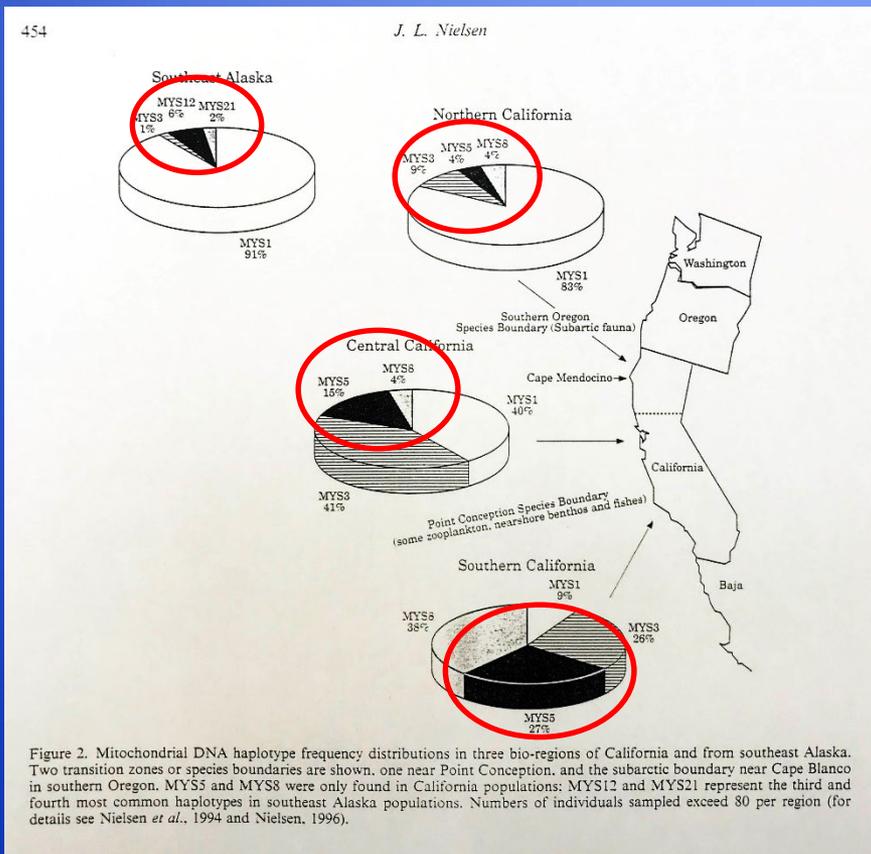


Figure 2. Mitochondrial DNA haplotype frequency distributions in three bio-regions of California and from southeast Alaska. Two transition zones or species boundaries are shown, one near Point Conception, and the subarctic boundary near Cape Blanco in southern Oregon. MYS5 and MYS8 were only found in California populations; MYS12 and MYS21 represent the third and fourth most common haplotypes in southeast Alaska populations. Numbers of individuals sampled exceed 80 per region (for details see Nielsen *et al.*, 1994 and Nielsen, 1996).

## California Steelhead Distribution

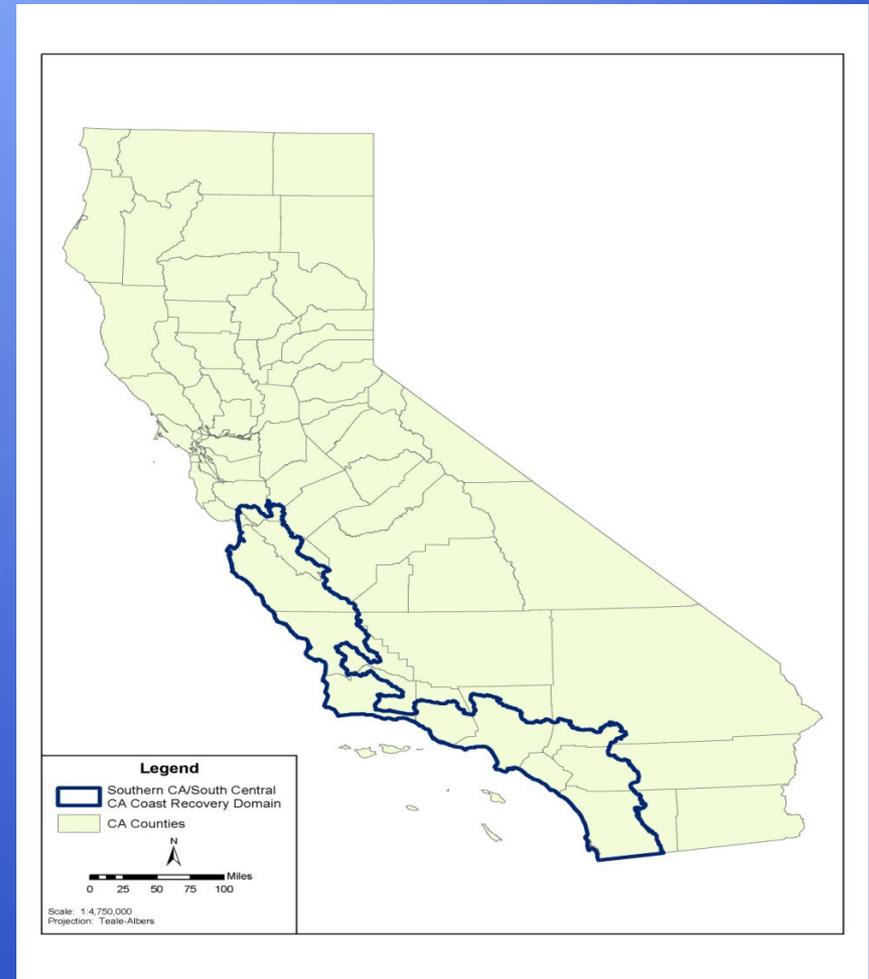




# California Steelhead Distribution

## Southern Steelhead

- South-Central California
- Southern California

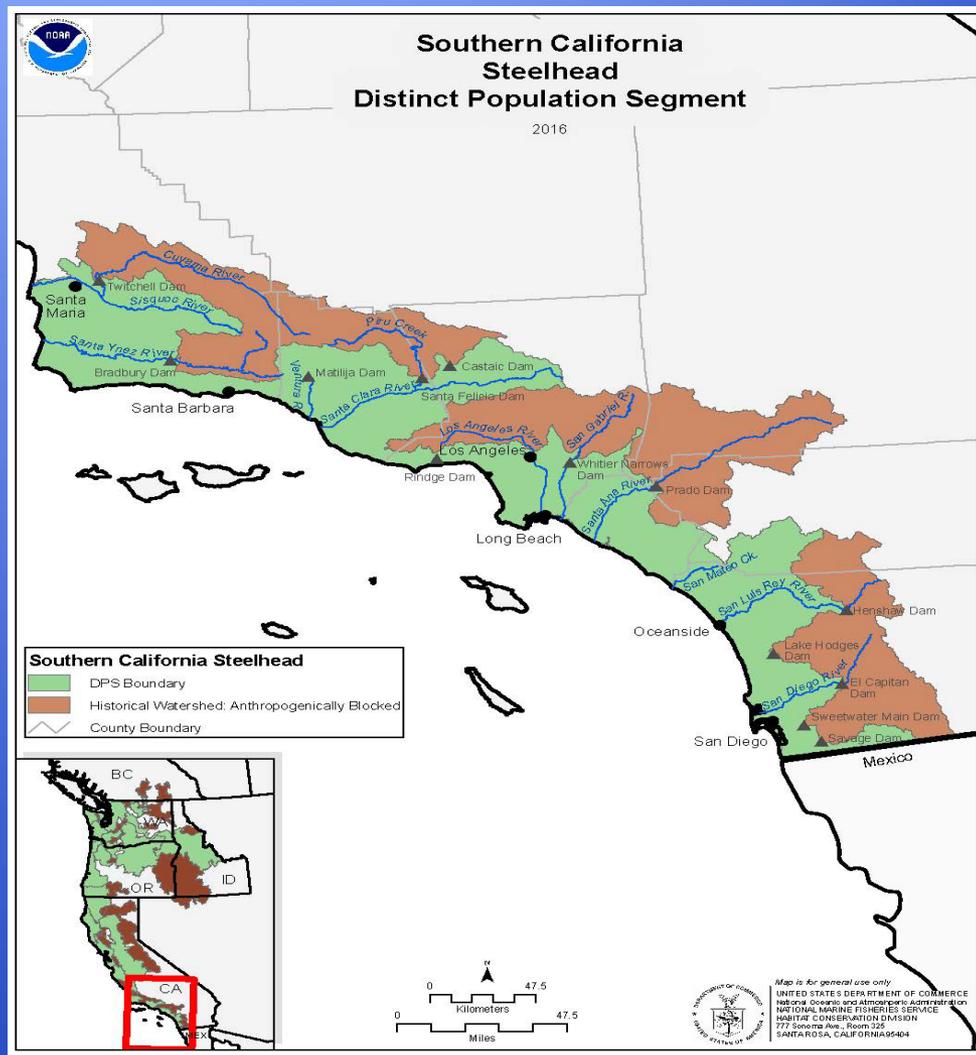


South-Central and Southern California



# Southern California Steelhead Recovery Area

## Southern California Steelhead Distinct Population Segment (DPS)



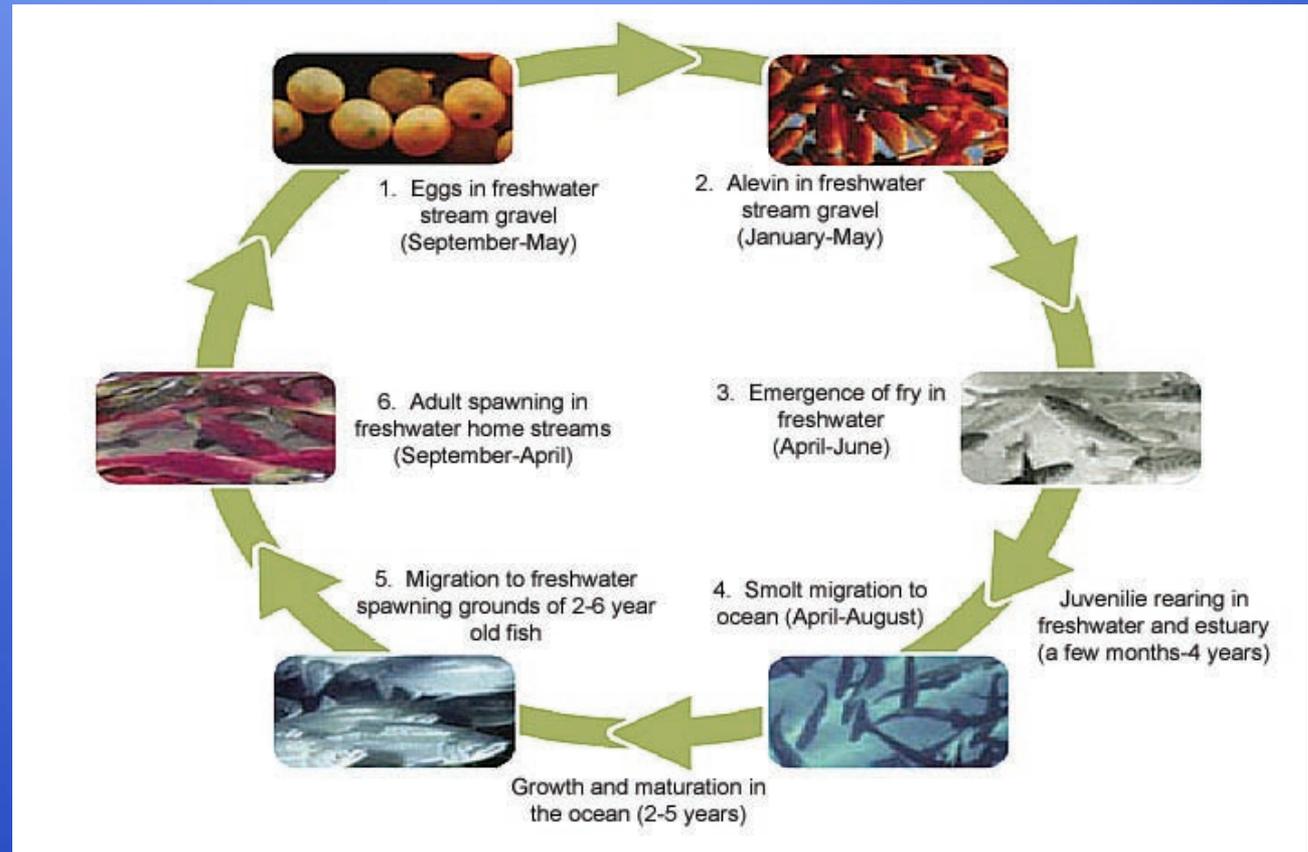


## Steelhead Life-Cycle

Anadromous  
Life History:

Uniform

Unidirectional





# Southern California Steelhead Life-Cycle

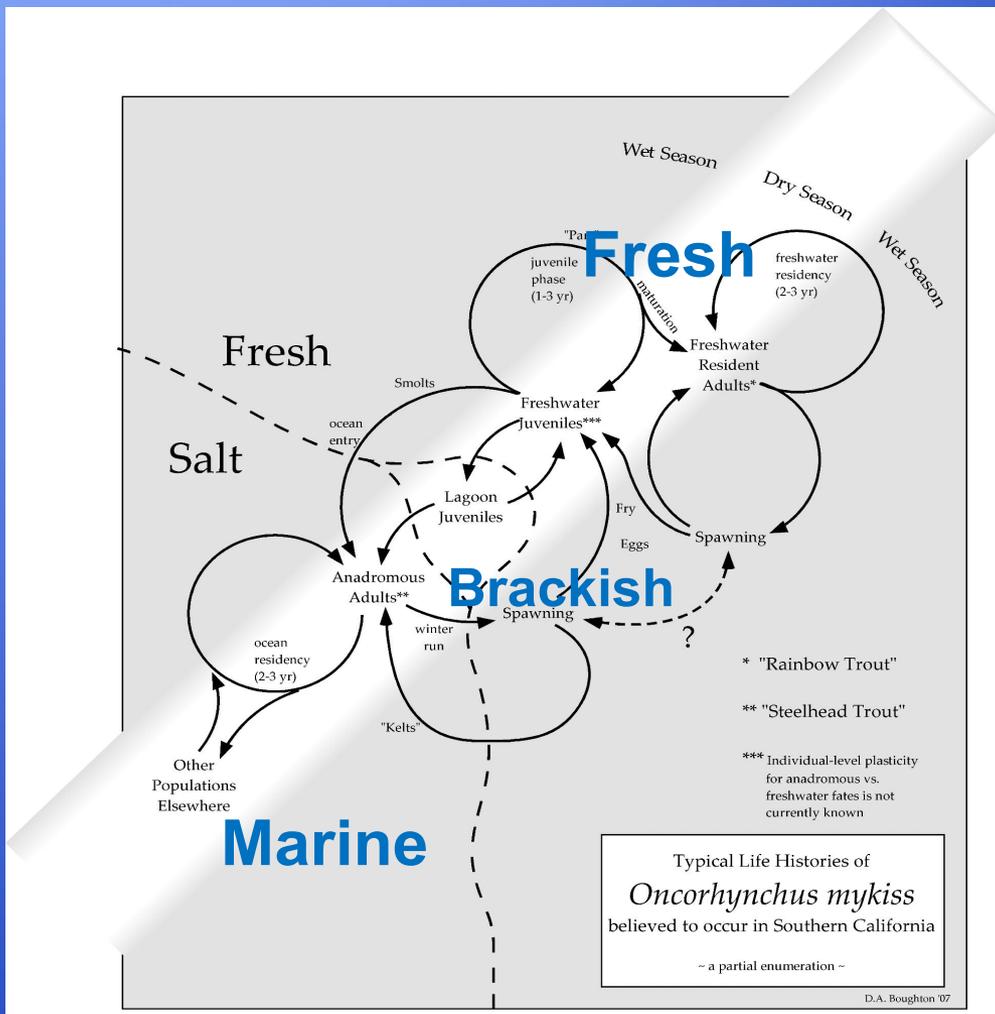
## Variable Life-Histories:

Anadromous

Fresh-Water

Lagoon-Anadromous

Variations





## Phase I : Technical Recovery Team

### Phase I: Scientific Framework

1. TRT appointed by Regional Administrator and chaired by Dr. David Boughton, NOAA Fisheries Santa Cruz Laboratory

- |                       |                      |
|-----------------------|----------------------|
| Dr. David A. Boughton | Dr. .Peter A. Adams  |
| Dr. Eric Anderson     | Dr. Craig Fusaro     |
| Dr. Edward Keller     | Dr. Elise Kelley     |
| Leo Lentsch           | Dr. Jennifer Nielsen |
| Katie Perry (DFG)     | Dr. Helen Regan      |
| Dr. Jerry Smith       | Dr. Camm Swift       |
| Dr. Lisa Thompson     | Dr. Fred Watson      |



2. TRT consists of 12 scientists including a representative from the Department of Fish and Game



# National Marine Fisheries Service

## Phase I : Population Characterization

NOAA Technical Memorandum NMFS



OCTOBER 2007

NOAA Technical Memorandum NMFS



### STEELHEAD OF THE SOUTH-CENTRAL/SOUTHERN CALIFORNIA COAST: POPULATION CHARACTERIZATION FOR RECOVERY PLANNING

David A. Boughton  
Peter B. Adams  
Eric Anderson  
Craig Fusaro  
Edward Keller  
Elise Kelley  
Leo Lentsch  
Jennifer Nielsen  
Katie Perry  
Helen Regan  
Jerry Smith  
Camm Swift  
Lisa Thompson  
Fred Watson

NOAA-TM-NMFS-SWFSC-394

U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Southwest Fisheries Science Center

### SOME RESEARCH QUESTIONS ON RECOVERY OF STEELHEAD ON THE SOUTH-CENTRAL AND SOUTHERN CALIFORNIA COAST

David A. Boughton

NOAA-TM-NMFS-SWFSC-467

U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Southwest Fisheries Science Center

NOAA Technical Memorandum NMFS



JULY 2007

### VIABILITY CRITERIA FOR STEELHEAD OF THE SOUTH-CENTRAL AND SOUTHERN CALIFORNIA COAST

David A. Boughton  
Peter B. Adams  
Eric Anderson  
Craig Fusaro  
Edward Keller  
Elise Kelley  
Leo Lentsch  
Jennifer Nielsen  
Katie Perry  
Helen Regan  
Jerry Smith  
Camm Swift  
Lisa Thompson  
Fred Watson

NOAA-TM-NMFS-SWFSC-407

U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Southwest Fisheries Science Center



# Principal Findings: Population Characterization

- *Historic* distribution of *O. mykiss* widespread throughout coastal watersheds
- *Current* distribution of *O. mykiss* is still widespread



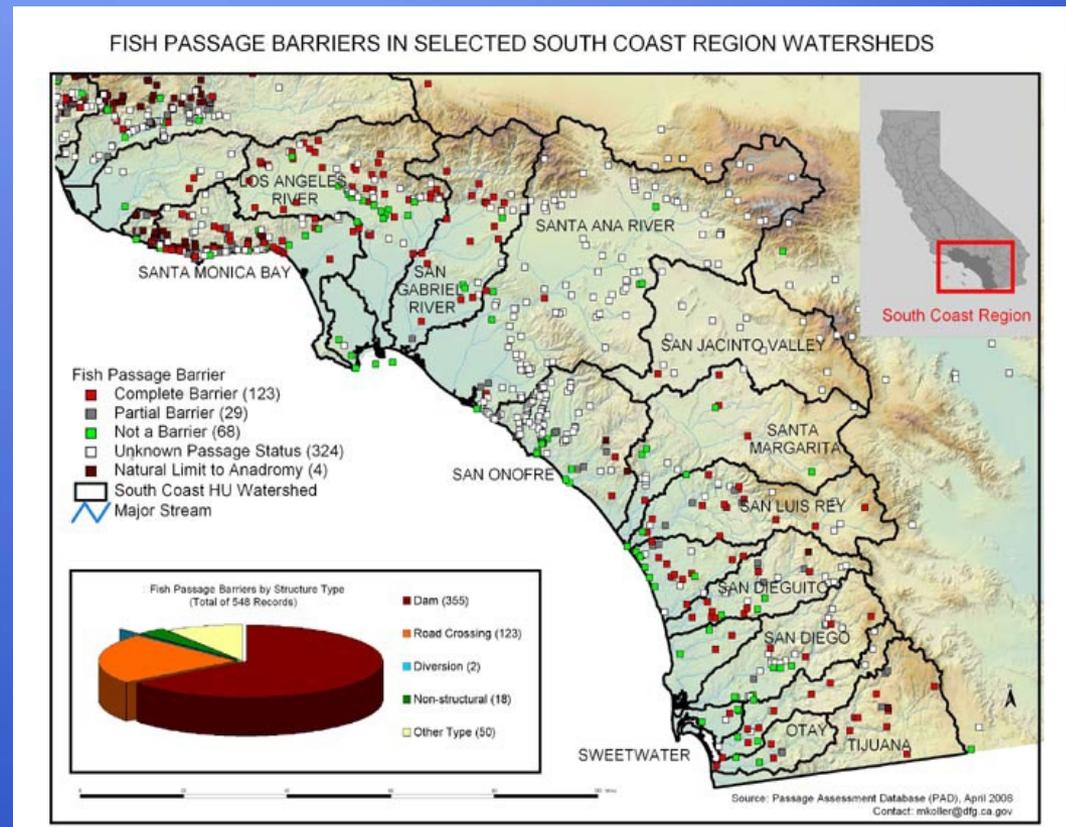
1947



2008

## Principal Findings: Population Characterization

- Steelhead nearly *eliminated* from about one-third of the watersheds
- Steelhead severely *reduced* in the remaining occupied watersheds





# Recovery Planning Strategy

- Above artificial barrier  
*O. mykiss* are an *integral* component of anadromous populations
- Above artificial barrier  
*O. mykiss* populations have the potential to *resume* an anadromous life-history

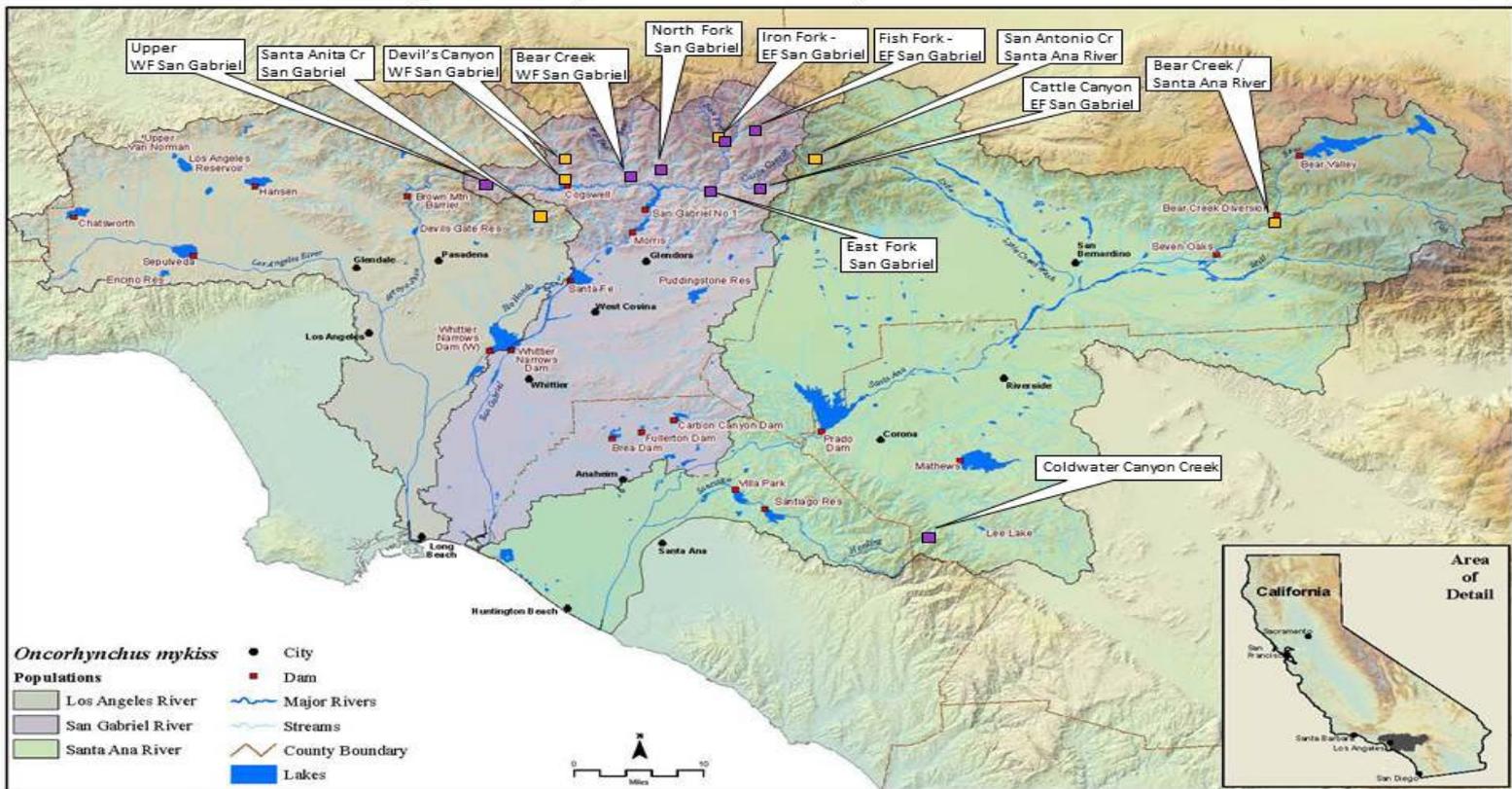


Mission Creek: Anadromous & Resident



## Steelhead Genetics

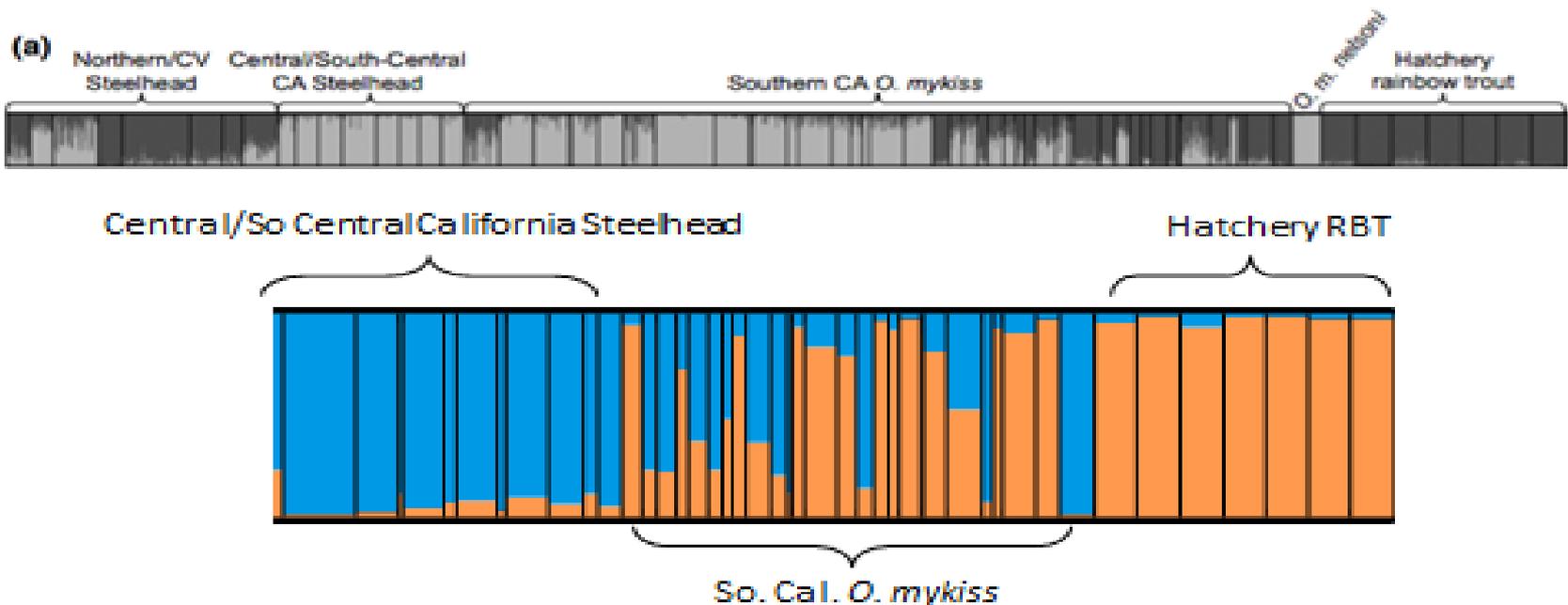
Middle Section of Southern California RT Genetics Study Area (Mojave Rim BPG):  
Los Angeles River, San Gabriel River, Santa Ana River



Map generated by Hunt and Associates for the 2008 Southern California Coast Steelhead Recovery Planning Area report for NOAA / NMFS (Mark Capelli, lead) and annotated to show results of Southern California rainbow trout tissue genetic analysis (Dr. Carlos Garza lab, NOAA Southwest Fisheries Science Center) for Trout Unlimited –San Diego study funded by Cal. Dept. of Fish and Wildlife, Grant Agreement P0950015.

# Steelhead Genetics

## Mixed up *O. mykiss* in Southern California

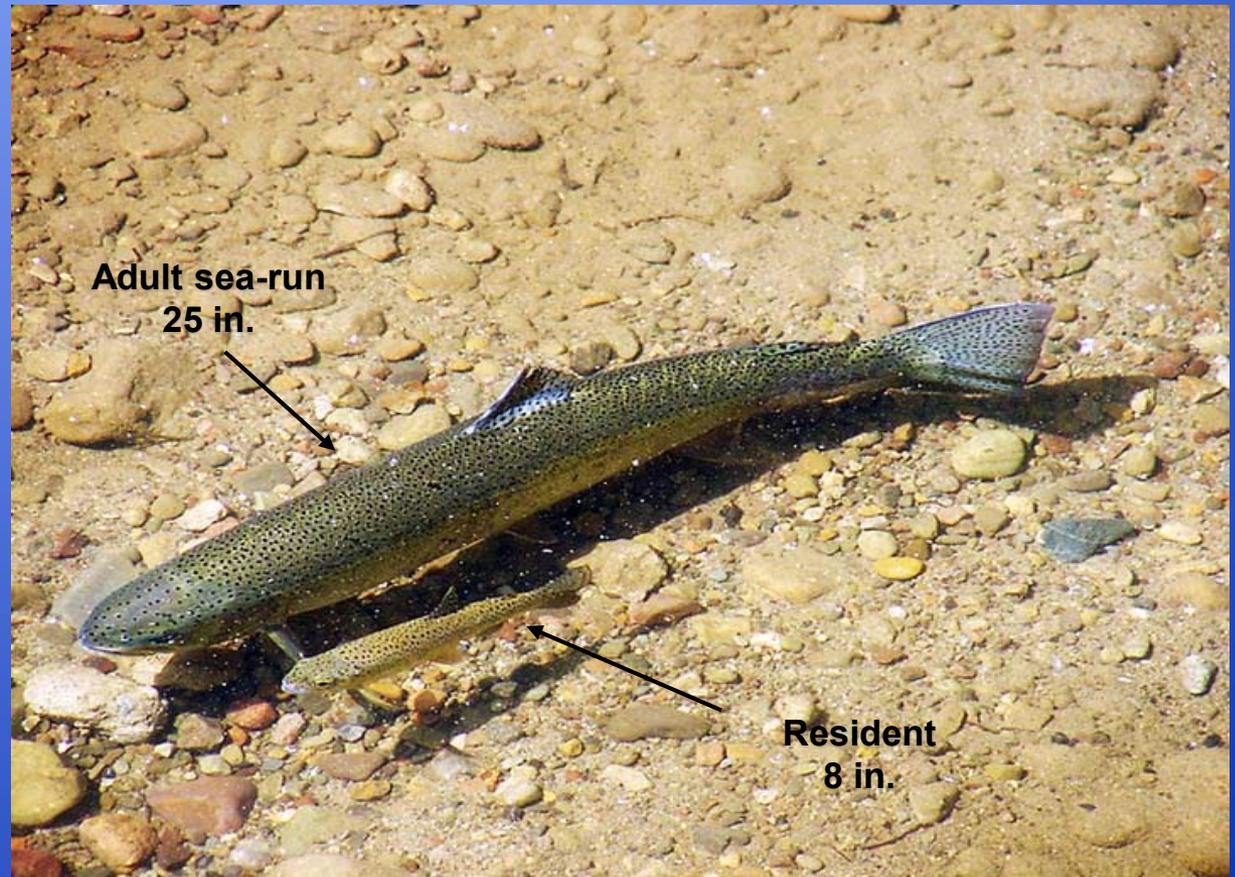


From Abadía-Cardoso et al. 2016



# Genomic Basis of Anadromy/Residency: Omy5

Southern California  
Steelhead/Resident  
Rainbow Trout

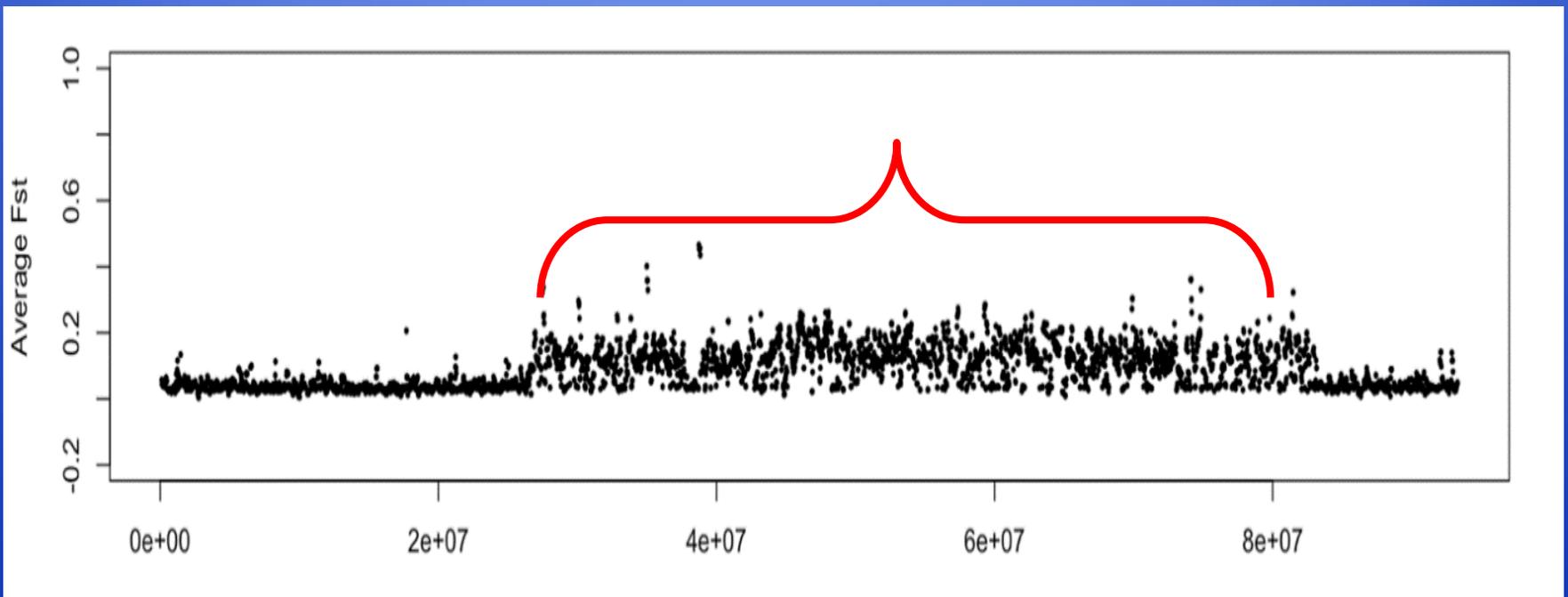


Maria Ygnacio Creek, Santa Barbara Co. 2017



# Steelhead Genetics

Genomic Basis of Anadromy/Residency: Omy5  
Migration Associated Region



Massive double inversion complex of chromosome Omy5 > 50 million DNA base pairs, > 1000 genes. This complex acts as single locus, or supergene (adapted from Pearse, *et al.* 2019).



National Marine Fisheries Service

# Southern California Steelhead Recovery Plan

Phase II: Recovery Plan

## SOUTHERN CALIFORNIA STEELHEAD RECOVERY PLAN



Southwest Regional Office  
National Marine Fisheries Service  
Long Beach, CA

January 2012



# Viabale Salmonid Population (VSP)

Abundance

Biological Productivity



Biological Diversity

Spatial Distribution



# Southern California Steelhead Recovery Planning

## Los Angeles River Watershed





# Southern California Steelhead Recovery Planning

## Arroyo Seco

Watershed Area: 45 sq. mi.

Total Stream Miles: 96 mi.

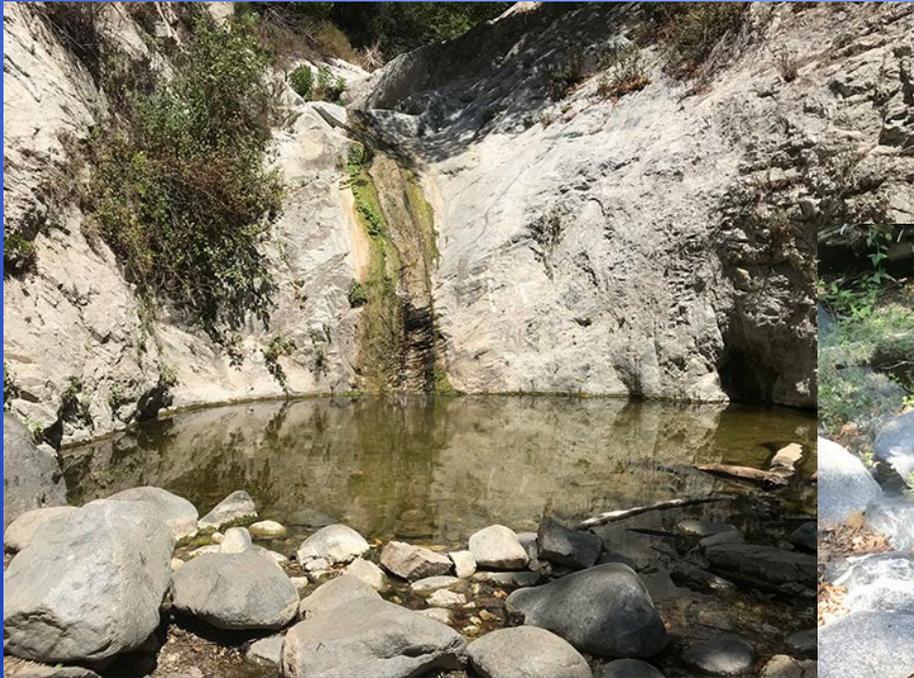
Intrinsic Potential Miles: 22.8





National Marine Fisheries Service

# Southern California Steelhead Recovery Planning



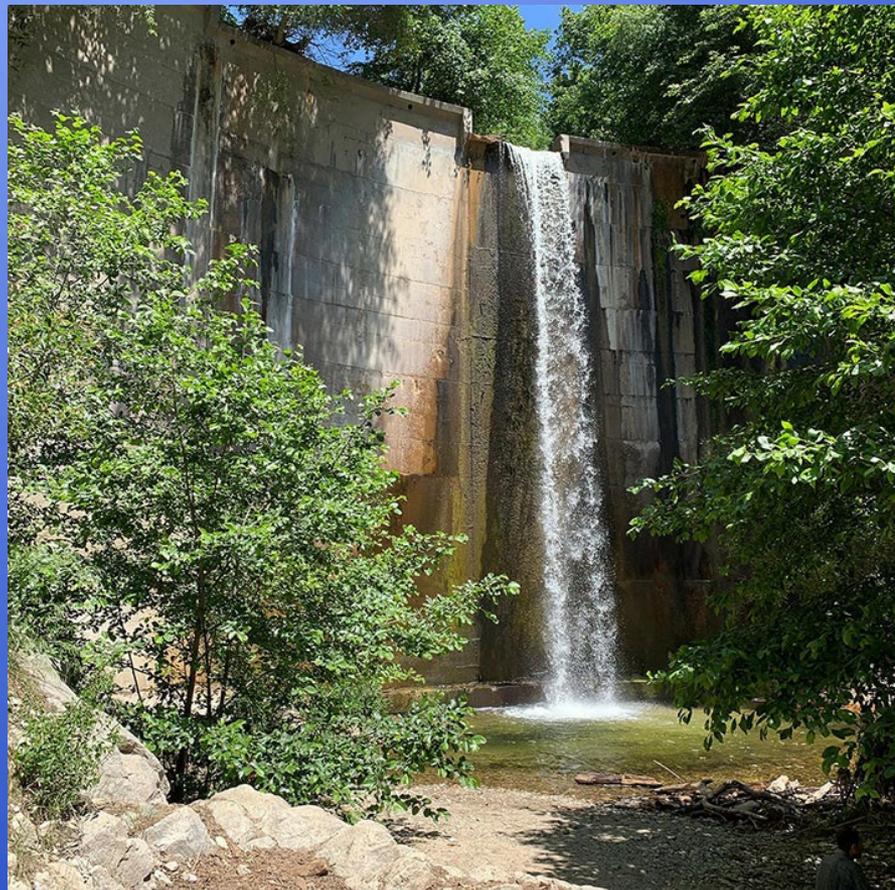
Upper Arroyo Seco



National Marine Fisheries Service

# Southern California Steelhead Recovery Planning

Brown Mountain Dam  
– Arroyo Seco





# Southern California Steelhead Recovery Planning

## Threats

- Dams
- Flood Control
- Levees
- Urban Development

Mojave Rim BPG Component Watersheds								
Threat Sources	Los Angeles River mainstem	Arroyo Seco	San Gabriel River mainstem	West Fork San Gabriel River	East Fork San Gabriel River	Santa Ana River mainstem	Lytle Creek	Mill Creek
Dams and Surface Water Diversions	Red	Yellow	Red	Red	Red	Red	Green	Red
Flood Control Maintenance	Red	Red	Red	Green	Green	Red	Red	Green
Groundwater Extraction	Red	Yellow	Green	Green	Green	Red	Red	Red
Levees and Channelization	Red	Red	Red	Green	Green	Red	Red	Green
Urban Development	Red	Red	Red	Green	Green	Red	Red	Green
Recreational Facilities	Green	Green	Green	Green	Green	Blue	Green	Green
Culverts and Road Crossings	Yellow	Light Green	Red	Green	Green	Blue	Green	Green
Agricultural Development	Green	Green	Green	Green	Green	Blue	Green	Green
Upslope/Upstream Development	Yellow	Yellow	Yellow	Green	Green	Blue	Yellow	Yellow
Wildfires*	Green	Green	Red	Red	Red	Red	Red	Red

**Key:** Red = Very High threat; Yellow = High threat; Light green = Medium threat; Dark green = Low threat (Threat cell colors represent threat rating from CAP Workbook)



# Southern California Steelhead Recovery

## Basic Goals

- Preserve over-all **species diversity** (genetic, phenotypic, life-history)
- Protect species from extinction due to **catastrophic disturbance** (wildfires, flooding, droughts)

Note: 1000-year time horizon



# Southern California Steelhead Recovery

## Basic Strategy

- Minimum number viable in each Biogeographic Population Group
- Occupy watersheds with drought refugia
- Minimum geographic separation (wildland fire analysis)
- Exhibit life history diversity



< 5% extinction risk in 1000 years



## High Priority Recovery Actions

- Fish passage
- Flow management
- Flood control management
- Riparian corridor restoration
- Sediment management
- Non-native species control
- Estuary restoration



Los Angeles River Steelhead  
C. 1940



# Southern California Steelhead Recovery and the Arroyo Seco

## National Marine Fisheries Service

Environmental Planning  
Landscape Arch 205

U.C. Berkeley

March 4, 2026

Mark H. Capelli  
South-Central/Southern California  
Steelhead Recovery Coordinator



7/20/05/87