

2nd Steelhead Summit

October 27 & 28, 2016 in San Luis Obispo, CA

+ Session Overview

- Sponsors:
 - California Trout
 - City of San Luis Obispo
 - Sustainable Conservation
 - California Conservation Corps
 - Cachuma Operation and Maintenance Board
 - Wildnote

The year's Summit agenda highlighted adaptive genomic variation, steelhead recovery planning, coastal monitoring status reports, fish passage planning, and water conservation efforts.

The full-day symposium was followed by concurrent field tours to restoration sites that showcase fish passage improvements and water conservation projects.

+ Presentations

Coastal Monitoring and Limiting Factors for Steelhead: Status, Challenges, and Opportunities

(Slide 4) Coastal Monitoring for Southern California Steelhead: Challenges and Opportunities

Kate McLaughlin, Environmental Scientist, California Department of Fish and Wildlife

(Slide 29) Severe Drought and Actions Taken to Save the Endangered Southern California Steelhead within the Santa Ynez River Basin

Timothy H. Robinson, Senior Resource Scientist, Cachuma Project Water Agencies

(not included) Evaluating Factors that Limit Recovery of Central California Coast Steelhead: Insights from Long-term Monitoring in the Scott Creek Watershed

Ann-Marie Osterback, Southwest Fisheries Science Center, NOAA Fisheries

(Slide 52) Conditional Smolting and the Response of Carmel River Steelhead to Two Decades of Conservation Efforts

David Boughton, Southwest Fisheries Science Center, NOAA Fisheries

Coastal Monitoring and Limiting Factors for Steelhead: Status, Challenges, and Opportunities



Kate McLaughlin

Coastal Monitoring ~~and Limiting~~ ~~Factors~~ for Steelhead: Status, Challenges, and Opportunities

**Coastal Monitoring ~~and Limiting~~
~~Factors~~ for Steelhead:
~~Status,~~ Challenges, and Opportunities**

**Coastal Monitoring ~~and Limiting~~
Factors for
Southern California Steelhead:
~~Status,~~ Challenges, and Opportunities**



S. Bankston, PSMFC

Southern CA Challenges

Steelhead

- Life history
- Morphology
- Behavior

Landscape

- Geology
- Climate
- Land Use

Best Methods

- Truest answer
- Cost effective
- Possible
- Fit with the conditions
- Meet study goals



Measured Water Conductivity (mS/cm)



Source: ESRI; CDFW; PSMFC; RCDSMM

Creek	Rescue Date	Temp. (°C)
Montecito Creek	05/30/14	17.0
San Antonio Creek	07/01/14	19.8
San Ysidro Creek	07/15/14	18.0
Santa Paula Creek	09/04/14	17.2
Santa Paula Creek	09/11/14	15.2
Sisar Creek	09/11/14	16.8
Arroyo Hondo Creek	10/07/14	17.1
Upper Matilija	04/01/15	22.8
Montecito Creek	05/22/15	14.2
Gobernador Creek	06/08/15	15.6
Arroyo Hondo Creek	06/18/15	14.9
Upper Matilija	06/23/15	19.4
Maria Ygnacio Creek	09/10/15	23.1
North Fork Matilija Creek	09/10/15	16.8
Upper North Fork Matilija	09/15/15	18.5
Arroyo Hondo	09/17/15	17.8
Sisar Creek	10/06/15	15.5



CDFW





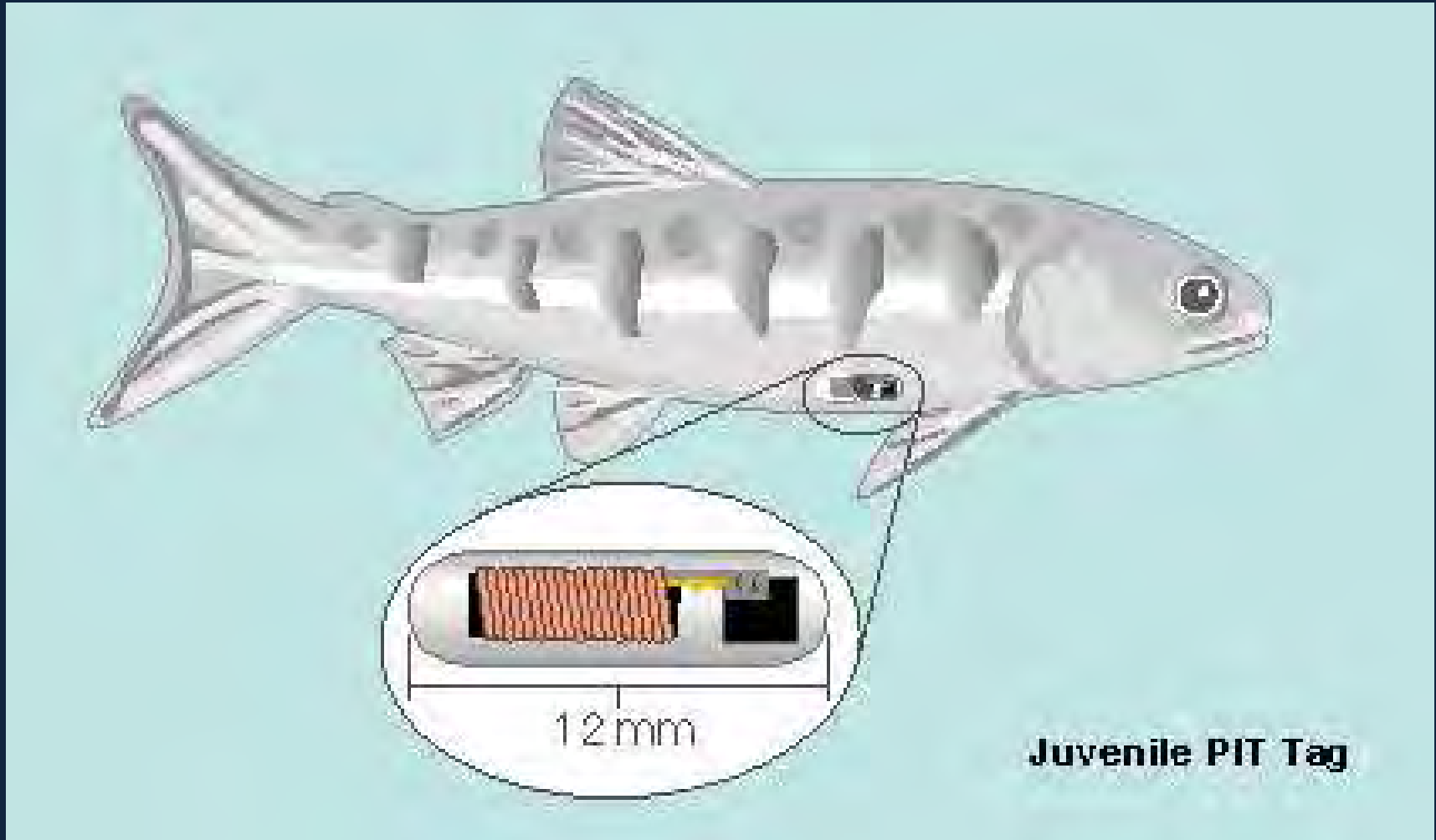






CDFW





<http://www.nwd.usace.army.mil/Portals/25/siteimages/pittag.jpg>

Measured Water Conductivity (mS/cm)

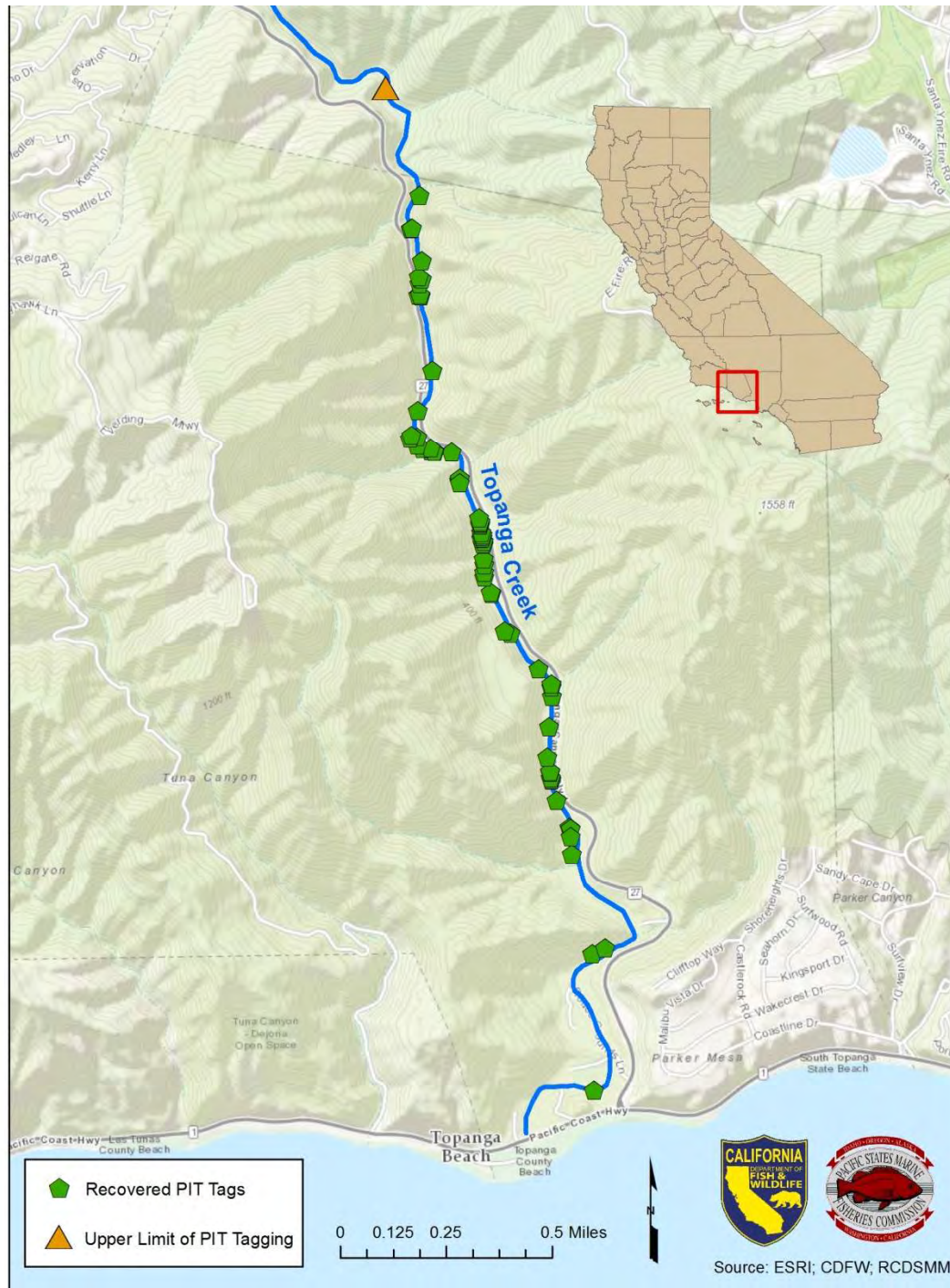


Source: ESRI; CDFW; PSMFC; RCDSMM











Kate McLaughlin
California Department of Fish & Wildlife

Best Methods

- Truest answer
- Cost effective
- Possible
- Fit with the conditions
- Meet study goals

Steelhead Summit

October 27-28, 2016

San Luis Obispo



Severe Drought and Actions Taken to Save the Endangered Southern California Steelhead within the Santa Ynez River Basin

Timothy H. Robinson
Senior Resource Scientist
for
Cachuma Project Water Agencies

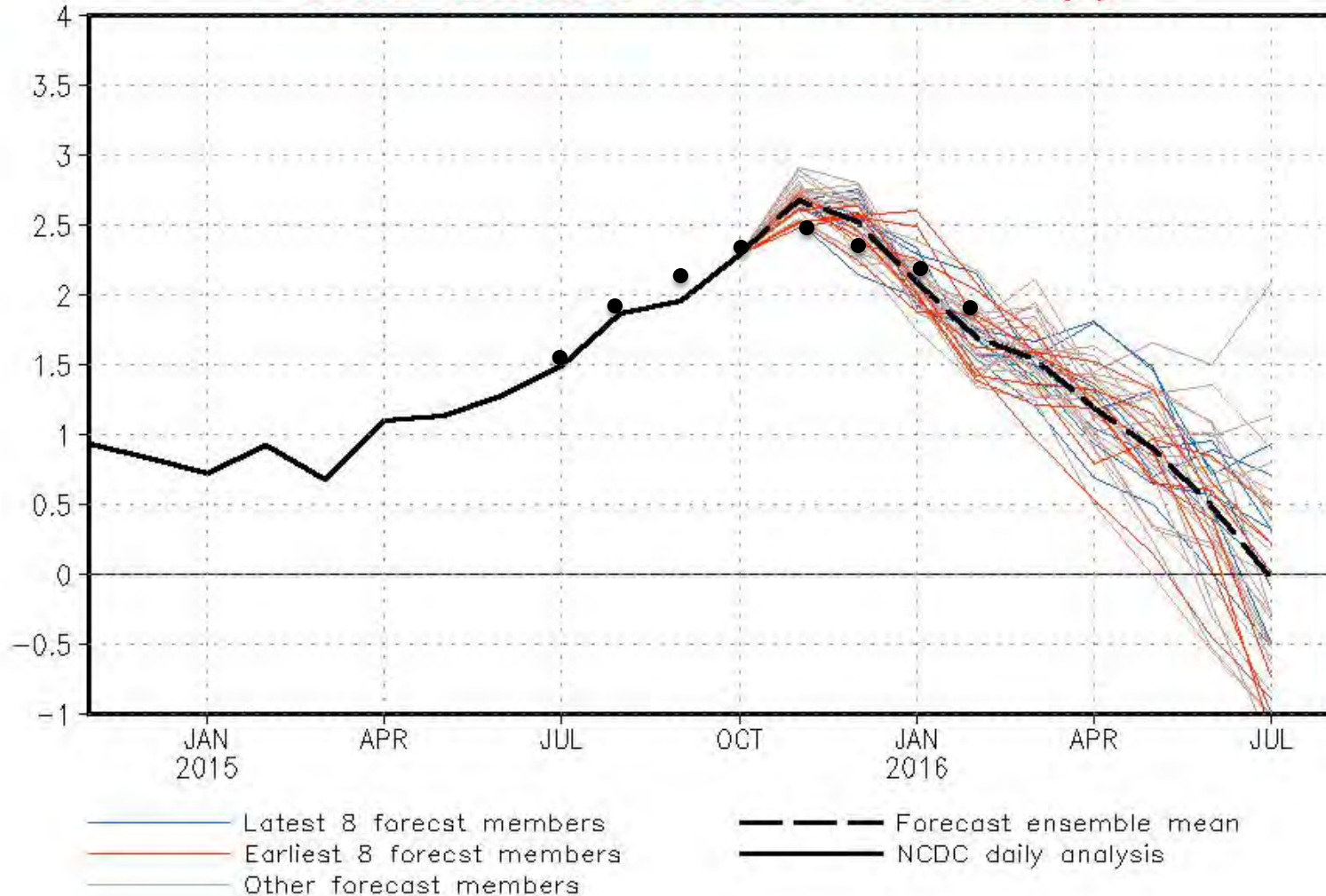
Drought 2012-2016



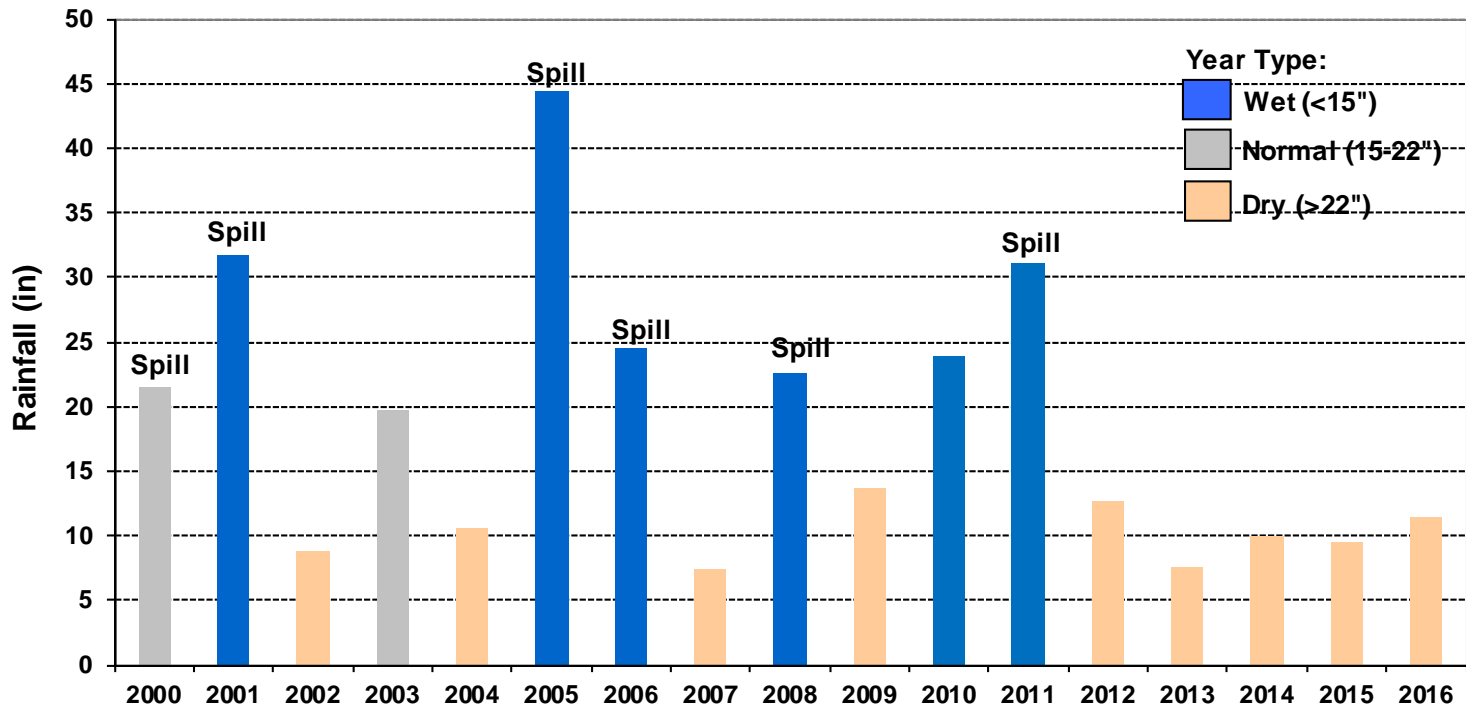
Lake Cachuma
February 2013



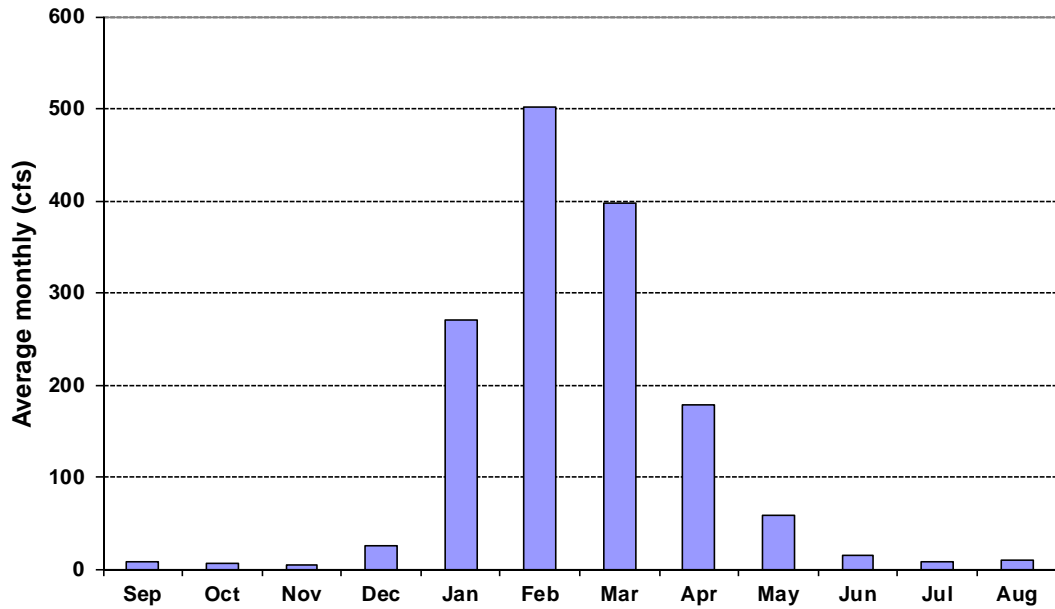
CFSv2 forecast Nino3.4 SST anomalies (K)



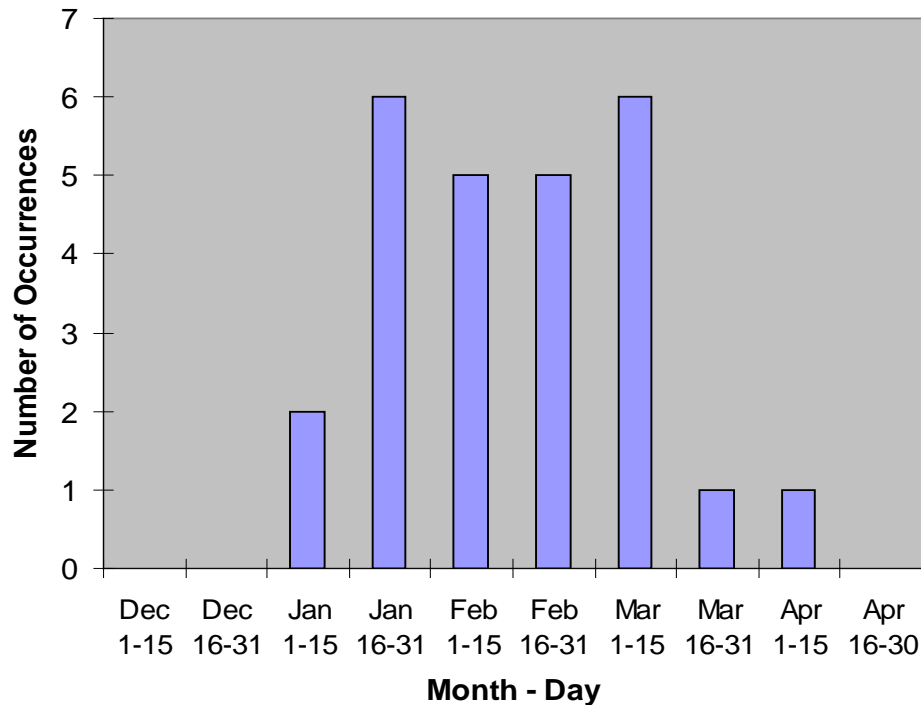
●●●● 1998



Month	Water Years:																
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Oct	0.00	2.64	0.62	0.00	0.00	6.38	0.48	0.16	0.34	0.15	2.20	2.24	0.47	0.12	0.34	0.00	0.30
Nov	1.62	0.00	3.27	2.50	1.20	0.33	1.64	0.20	0.06	3.39	0.00	1.42	2.82	1.34	1.14	0.87	0.73
Dec	0.00	0.09	2.66	6.73	2.03	13.25	0.73	1.59	2.39	2.46	3.00	9.48	0.35	2.95	0.18	5.88	1.12
Jan	1.94	8.40	0.87	0.06	0.32	10.30	7.82	1.30	16.57	0.65	10.34	1.84	1.58	1.75	0.02	0.82	4.03
Feb	10.37	5.71	0.24	3.56	6.52	9.22	3.06	3.03	2.33	5.70	4.92	3.36	0.43	0.40	4.11	0.51	1.65
Mar	2.76	13.44	0.79	2.40	0.48	3.08	4.31	0.15	0.46	0.85	0.26	11.85	3.63	0.80	3.52	0.08	3.02
Apr	4.73	1.35	0.13	2.15	0.00	1.27	4.89	0.81	0.06	0.19	3.15	0.14	3.21	0.19	0.65	0.36	0.24
May	0.01	0.06	0.12	2.33	0.00	0.51	1.56	0.00	0.38	0.00	0.05	0.42	0.02	0.02	0.00	0.26	0.36
Jun	0.04	0.00	0.00	0.02	0.00	0.04	0.00	0.00	0.00	0.16	0.00	0.34	0.00	0.00	0.00	0.42	0.00
Jul	0.00	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sept	0.00	0.00	0.08	0.00	0.00	0.03	0.00	0.17	0.00	0.08	0.00	0.00	0.18	0.00	0.00	0.32	0.00
Totals:	21.47	31.75	8.78	19.76	10.55	44.41	24.49	7.41	22.59	13.66	23.92	31.09	12.69	7.57	9.96	9.38	11.45

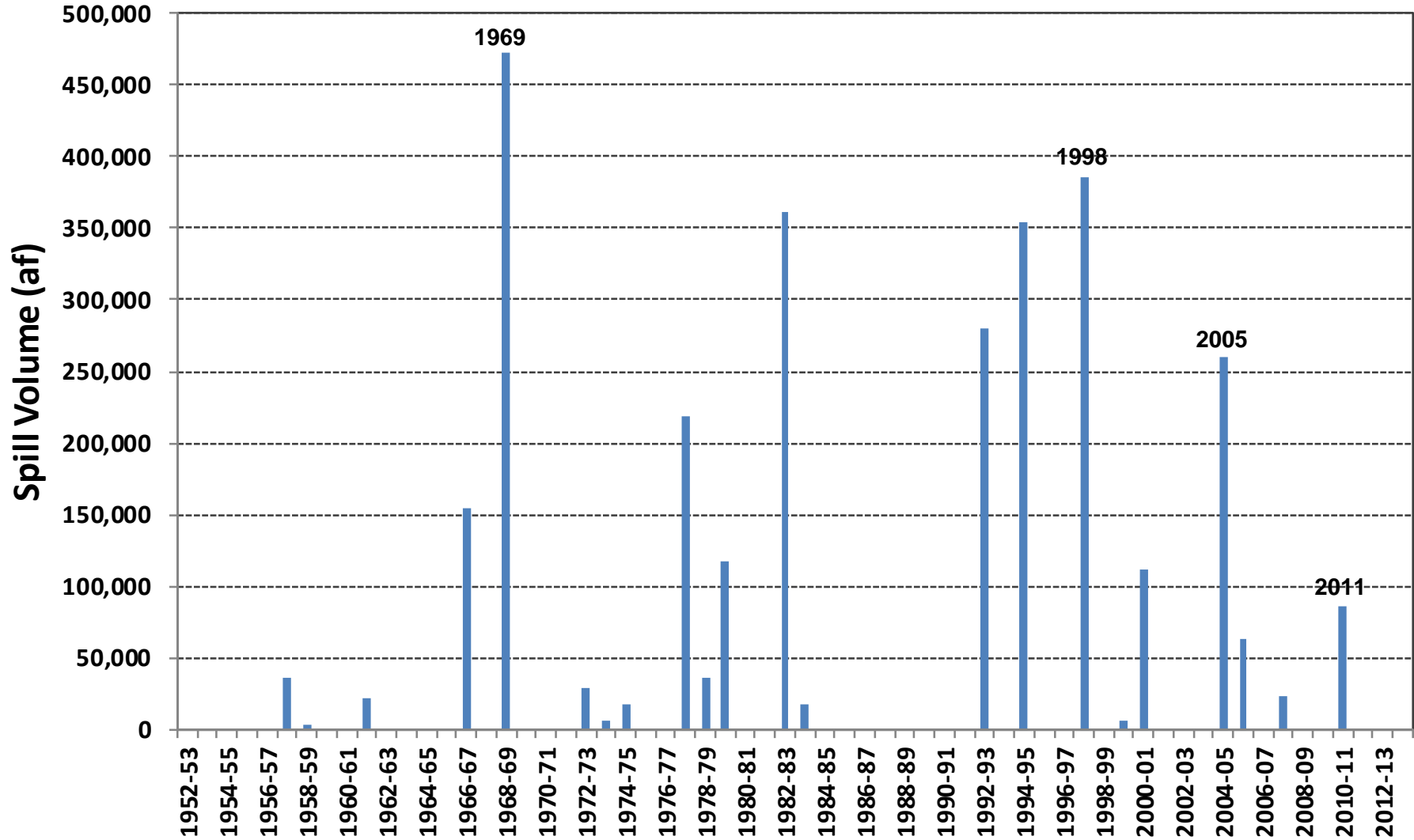


Average Monthly Runoff at Solvang (Alisal Bridge)



Annual Peak Flows >10,000 cfs at the Narrows (85 years)

Lake Cachuma Spill Volume (Water Year: Oct-Sept)



Lake Storage: 193,305 acre-feet

Bradbury Dam 3/21/11 (20,200 cfs)



Refugio Road Bridge



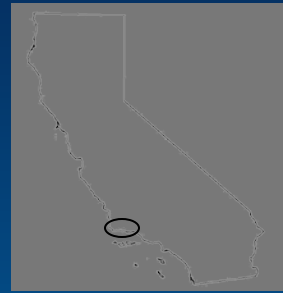
Alisal Road Bridge 3/20/11



Alisal Road Bridge 7/10/11



Santa Ynez River Watershed Overview



~900 sq. miles
~90 river miles to the ocean
Mediterranean climate
3 Reservoirs

Lake Cachuma and Bradbury Dam



Storage loss: 9.8%

- Capacity: 193,305 af
- Annual entitlement: 25,714 af

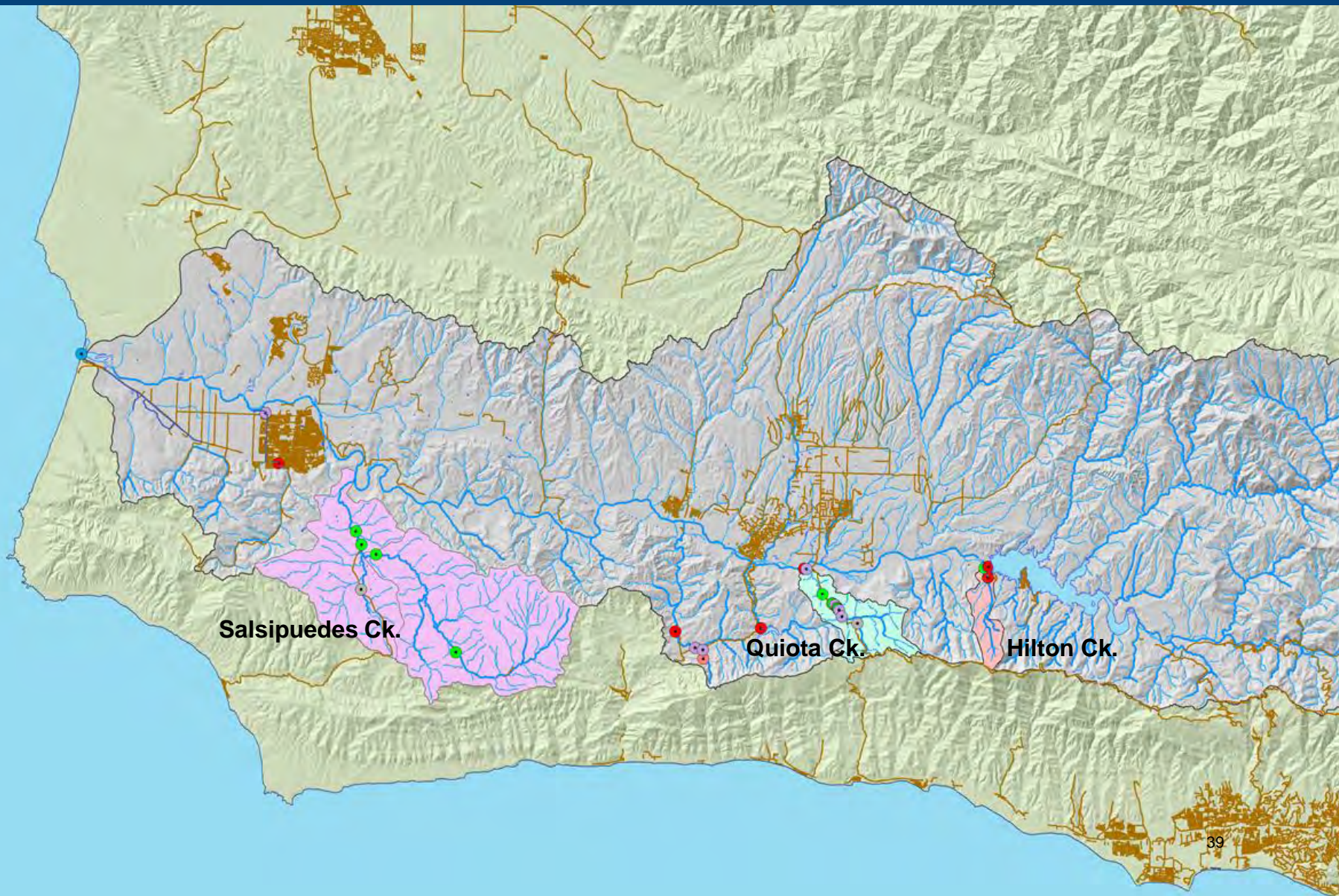
Current Lake Condition

- Max Storage – 193,305 af
- Max Elevation – 753 ft
- Current* Elevation – 646.5 ft
- Current Storage – 14,095 af
- Current Capacity – 7.3%
- Minimum Pool – 12,000 af
- Elevation Below Spill – 106.5 ft
- Annual entitlement = 25,715 af

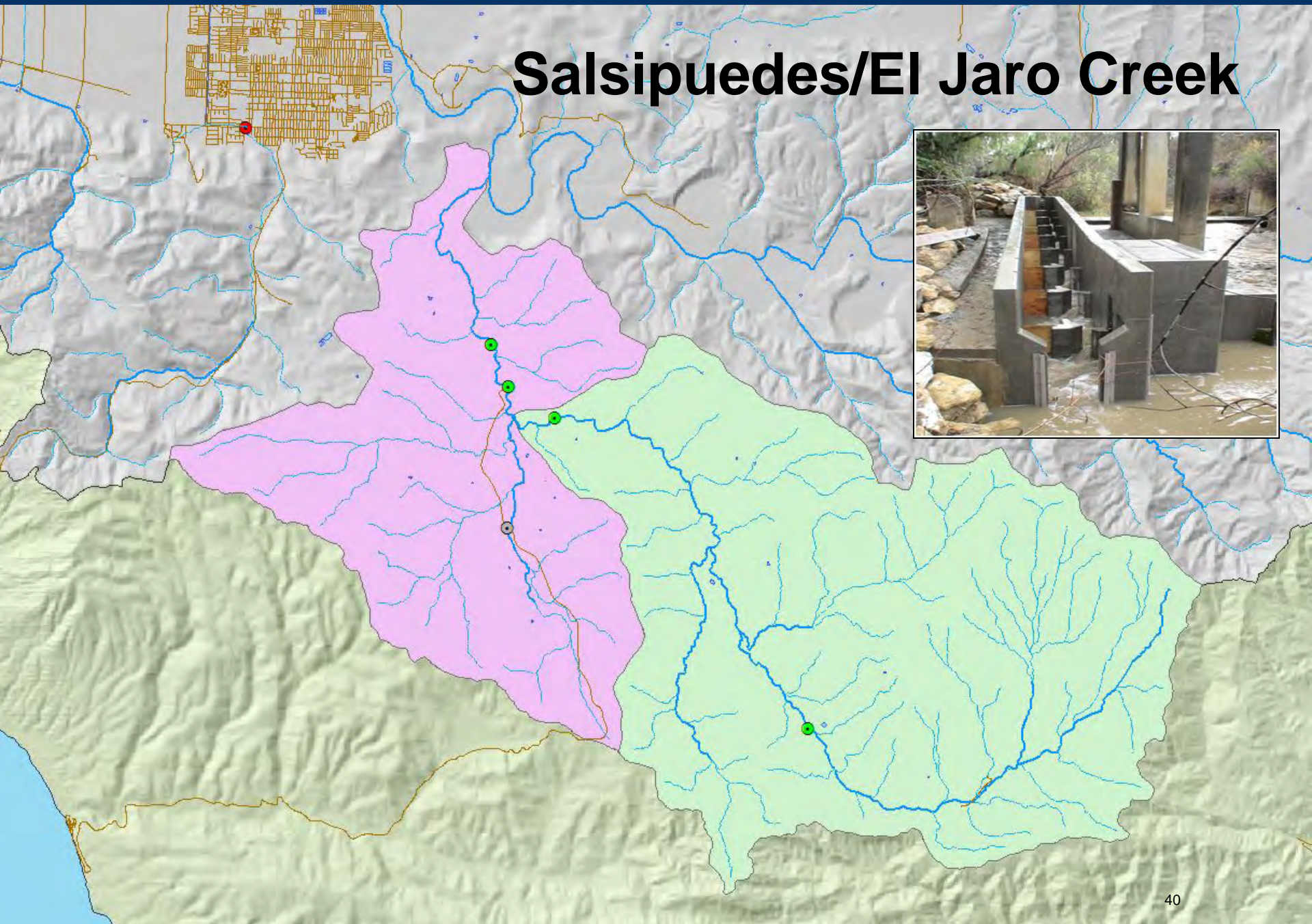


*10/26/16

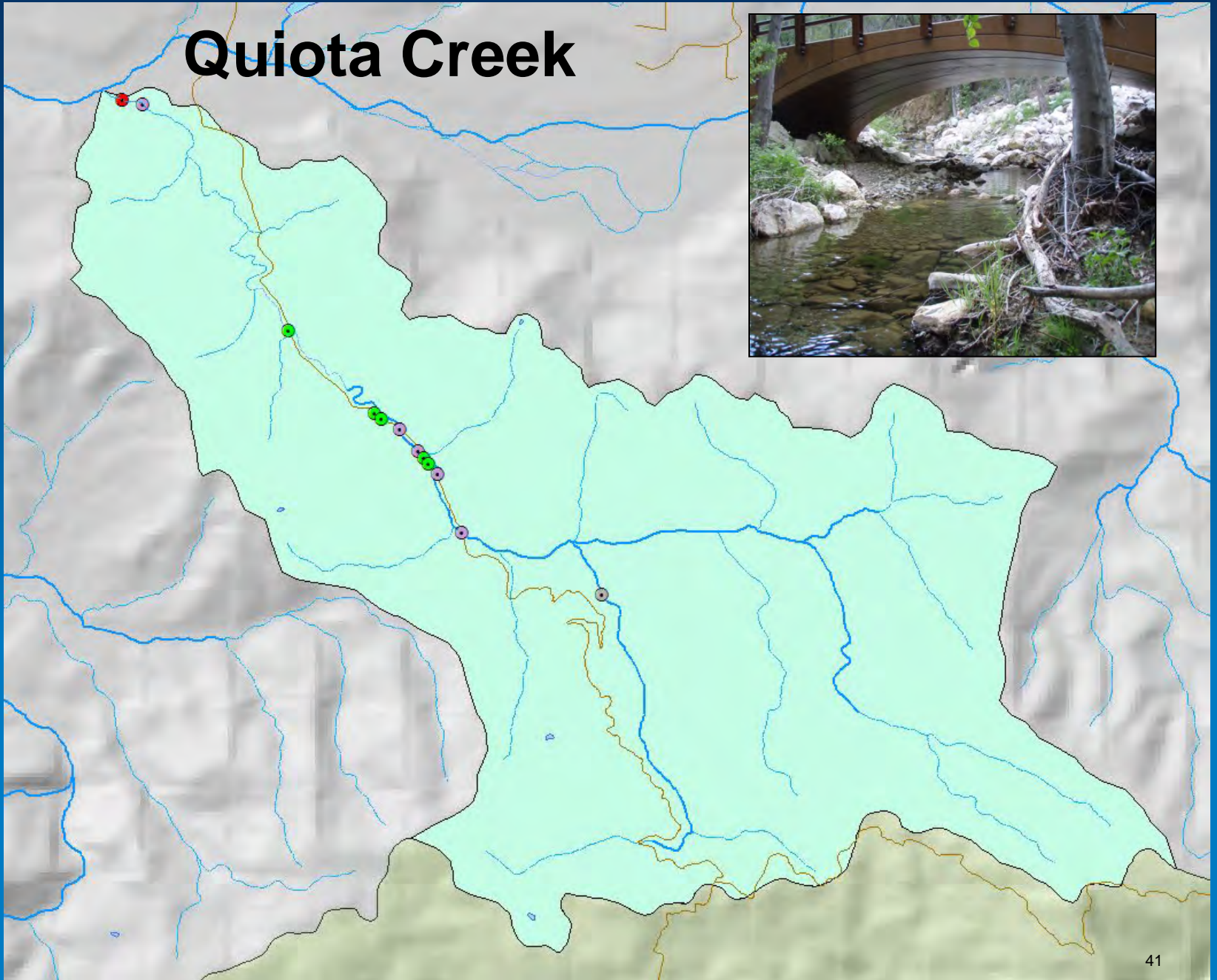
Remaining *O. Mykiss* in the Santa Ynez River Watershed



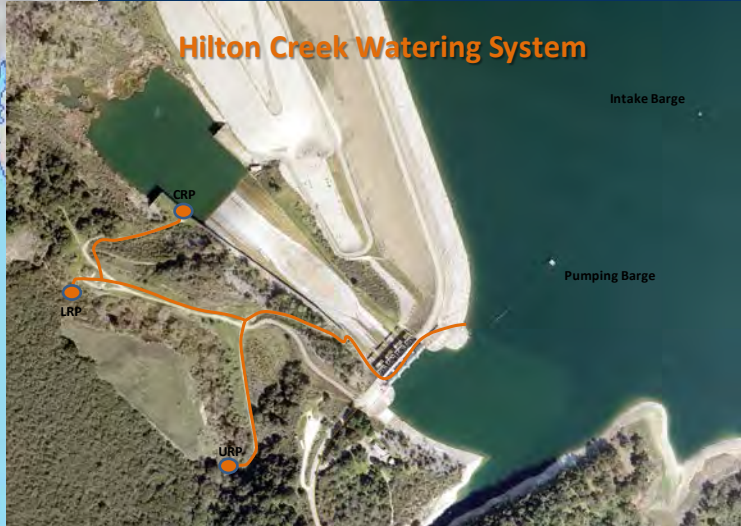
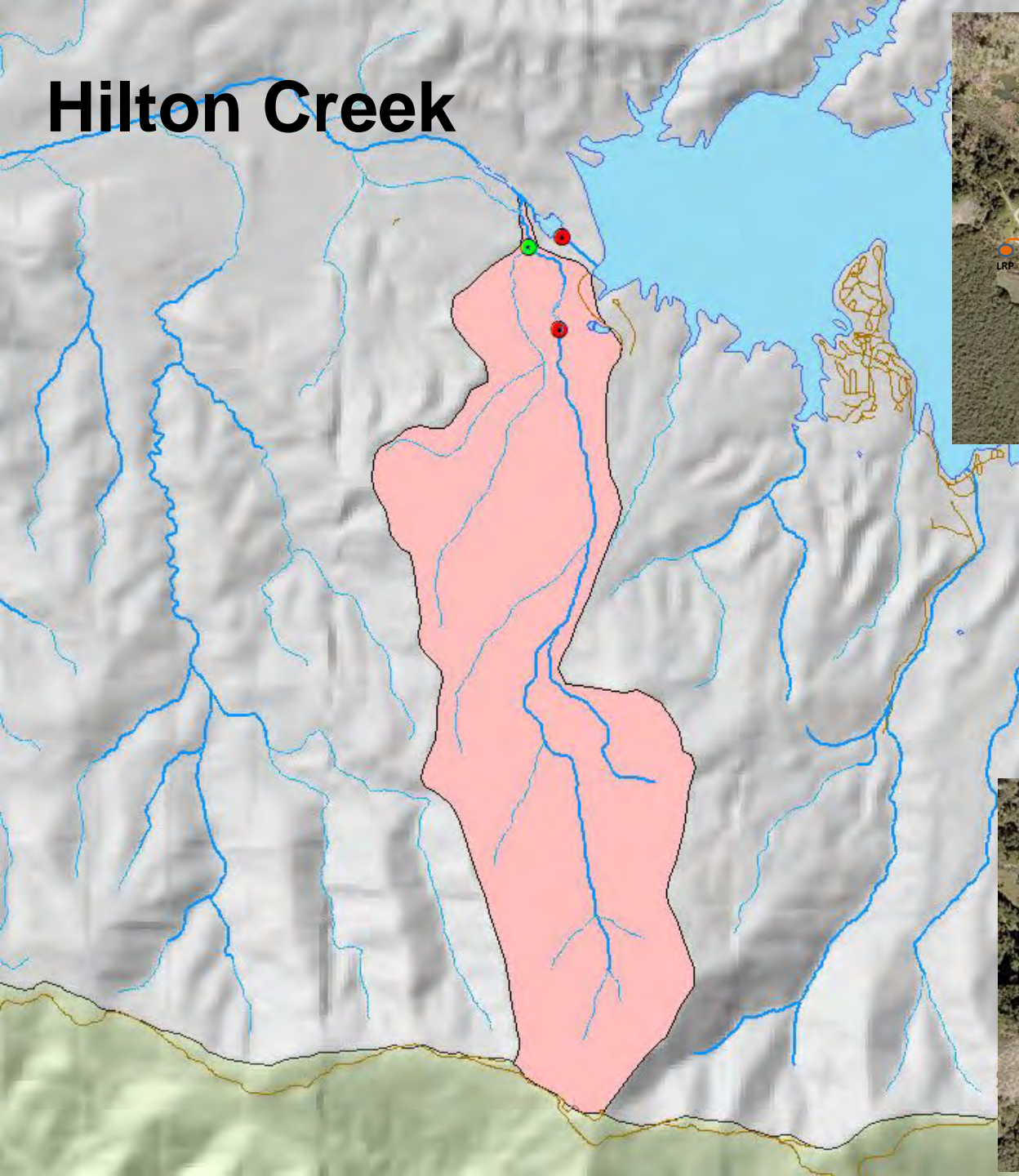
Salsipuedes/El Jaro Creek



Quiota Creek



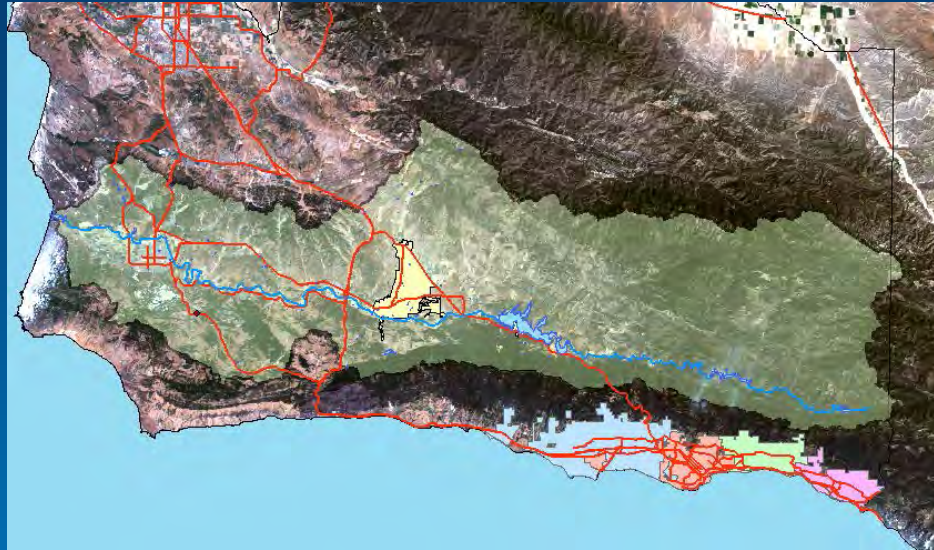
Hilton Creek



The Cachuma Project USBR and O. Mykiss



1953



USBR
COMB
5 Member Units
Parent District
Cities
Agriculture

1993

Beginning of the Fisheries Program at COMB

1997

Listing

1999

Biological Assessment for Cachuma Project Operations

2000

Cachuma Project Biological Opinion (BO, NMFS to USBR)

2000

LSYR Fish Management Plan (FMP)

2004

EIR/EIS for BO and FMP LSYR Fish Management Plan

2016

New draft State Water Resources Control Board Order (WR-2016-?)

2016?

New draft Cachuma Project Biological Opinion

Actions Taken to Save *O. Mykiss* in the LSYR Basin under Severe Drought

General:

- Monitoring and Reporting
- Fish Passage Improvement Projects (10 with 2 more soon)
- Habitat Enhancement Projects (4)
- Programmed Fish Releases (Fish Passage Supplementation + target flows)
- Outreach

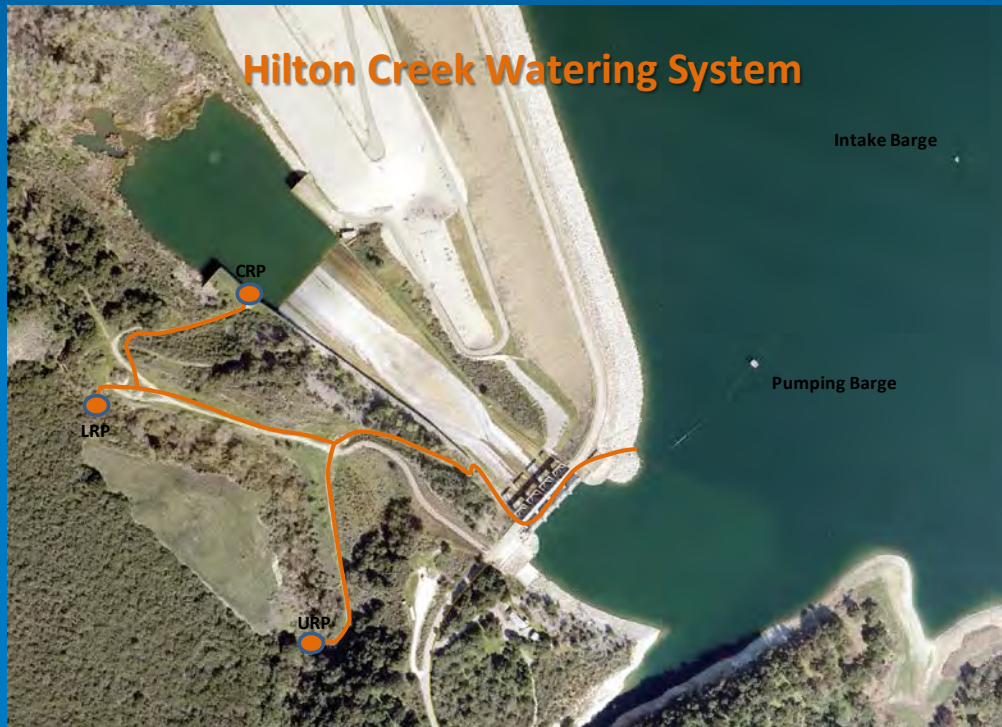


Hilton Creek and LSYSR Hwy 154 Reach

Hilton Creek and the Hwy 154 Reach under Critical Drought:

- Hilton Creek Watering System (gravity - > pumping; > 4 cfs)
- Upper Release Point to Lower Release Point (2-3 cfs)
- Hilton Creek Emergency Backup System (gravity and pumping; < 1 cfs)
- Hilton Creek Watering Tanks with Truck Delivery (~0.04 cfs)
- Stilling Basin to Hilton Creek by Submersible pump (~0.03 cfs)
- Future: ? (pray for rain)

Hilton Creek Watering System



Hilton Creek Emergency Backup System





LSYR Long Pool

10/7/16



10/12/16



10/18/16



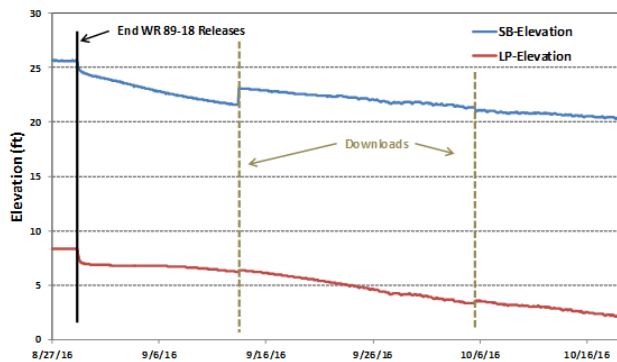
10/19/16



10/20/16



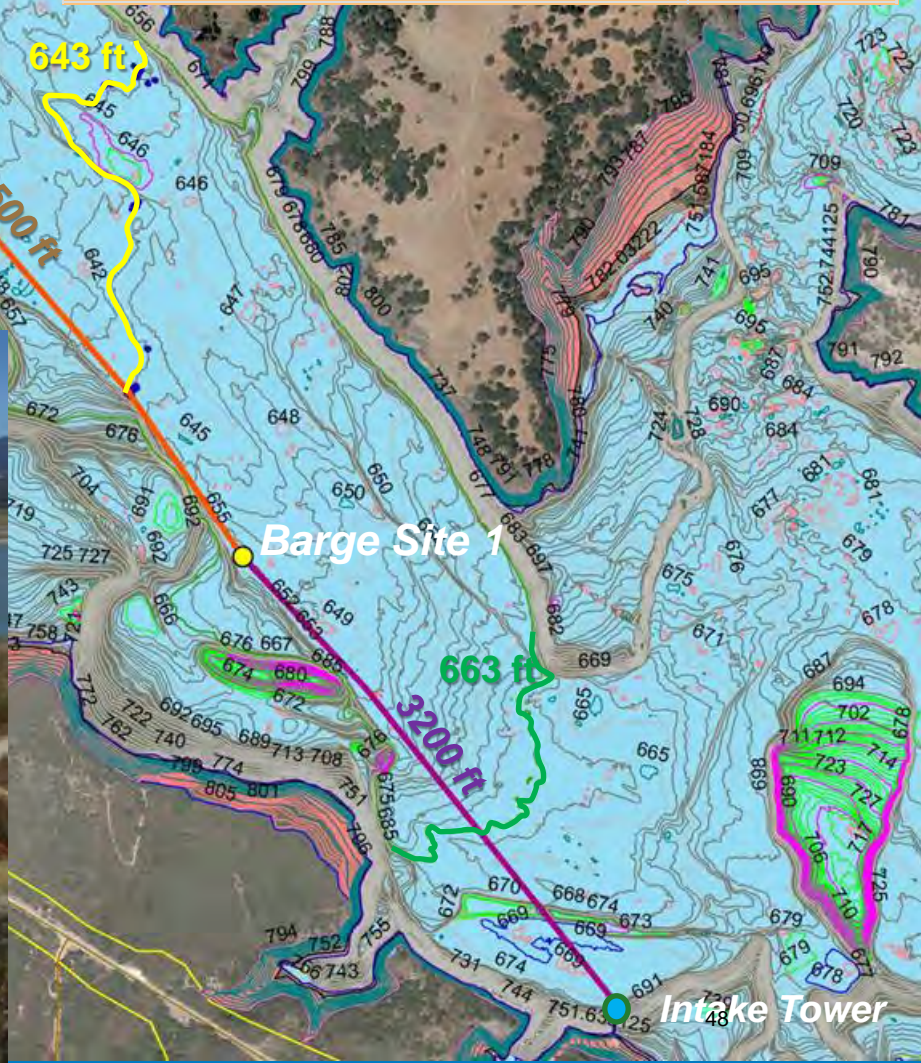
10/26/16





	Lake Elevation (ft)
Barge Site 1 - minimum pumping depth (no dredging)	663
Barge Site 1 - minimum pumping depth (with dredging)	658
Lake elevation to move barge to Site 2	658
Dead/Minimum Pool	643
Minimum pumping depth at Dead/Minimum Pool*	631

* Barge operational pumping depth is 12 feet, hence minimum depth to pump down to Dead/Minimum Pool is 631 (643-12).



5/2015



State Pipeline

Chumash Hwy 154

Forest Route 100

San Marcos Pass Rd

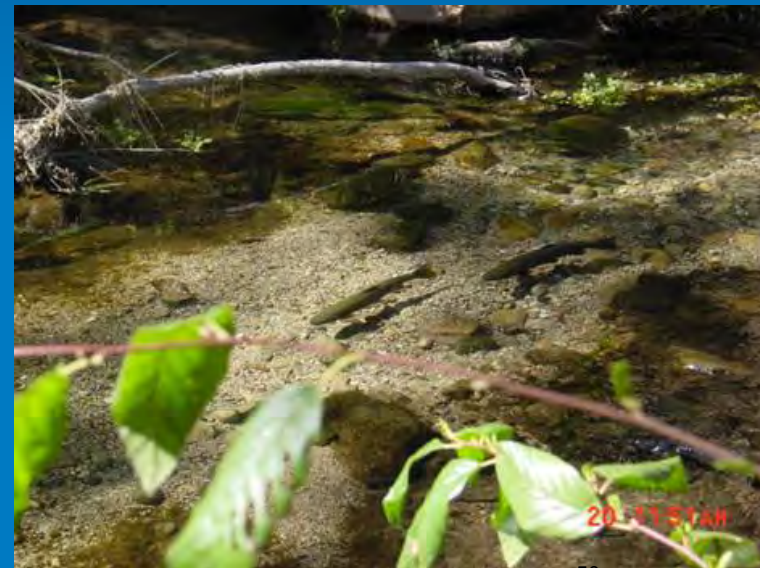
Image © 2016 DigitalGlobe

Google earth

Conclusions

- Southern California Steelhead are on the edge
- WY2011 was a long time ago
- Drought could continue
- Human cry is loud and fish lack advocates
- Climate change: expect extremes (the new norm)
- Human consumption: reduce, update, reclaim and be creative
- Future: conserve and think-act dry

Alisal Road Bridge 3/20/11

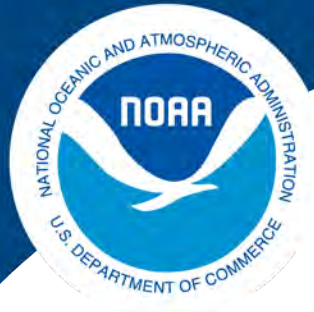


Questions

Salsipuedes Creek Upstream
701 mm = 27.6 Inches
February 5th, 2008
***Largest Steelhead Ever Captured On Project**



Thanks for your attention!



NOAA
FISHERIES

SW Fisheries
Science
Center

Conditional Smolting and the Response of Carmel River Steelhead to Two Decades of Conservation Efforts

David Boughton

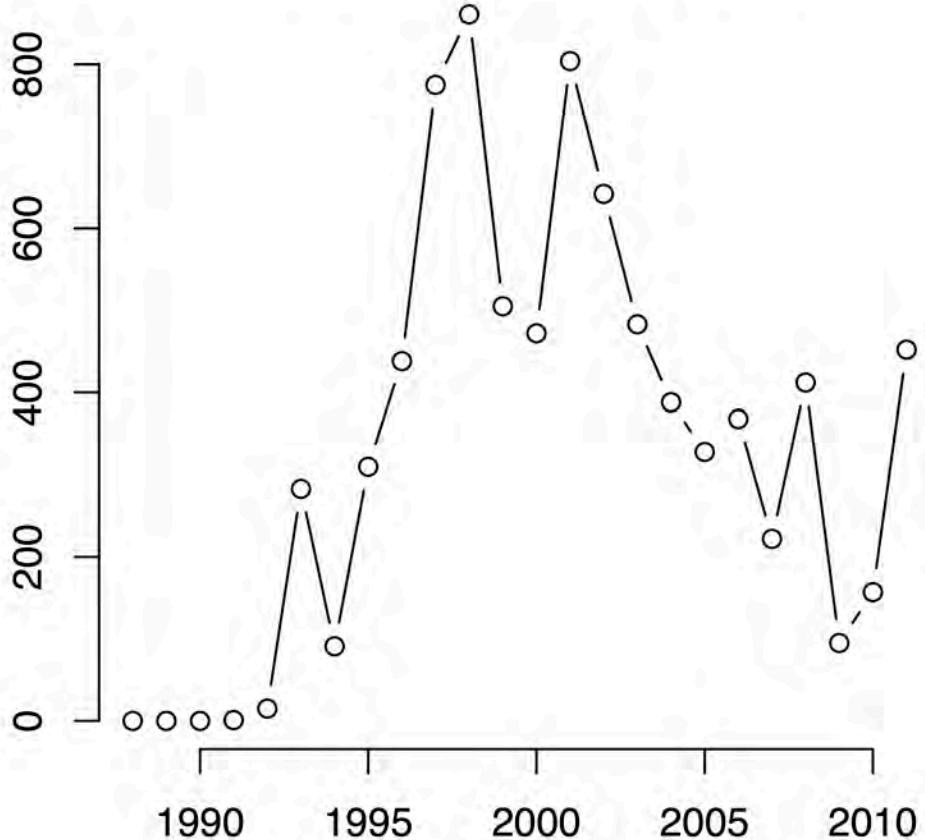
Collaborators:

Juan Arriaza, Kevan Urquhart, Marc Mangel

27 October 2016

Carmel River Steelhead

Adult Steelhead per Year

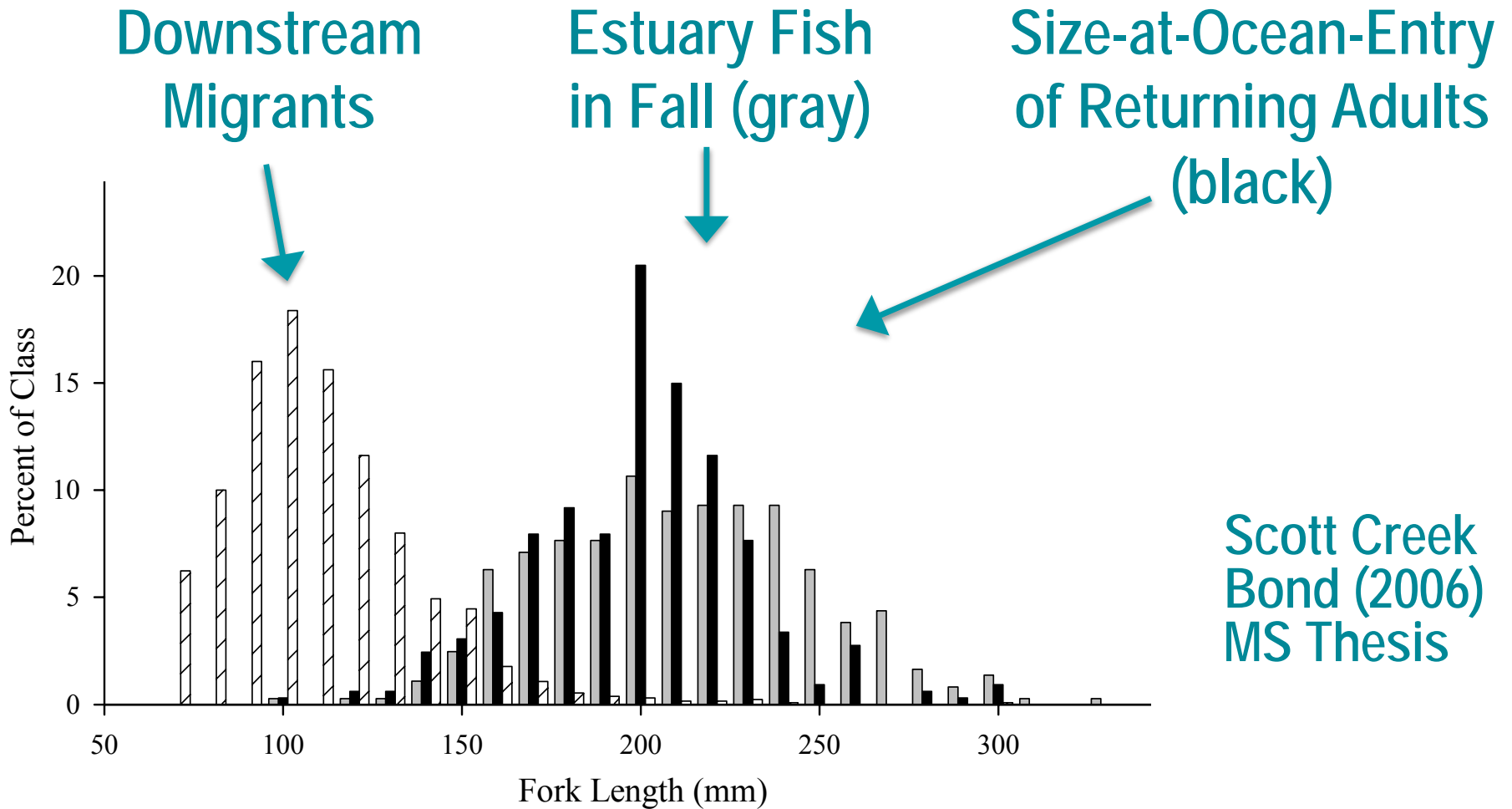


Since late 1990s:

- Habitat Restoration
- Captive rearing
- Relocations

Why has the population declined since 2000?

Size-Conditional Smolting and Survival



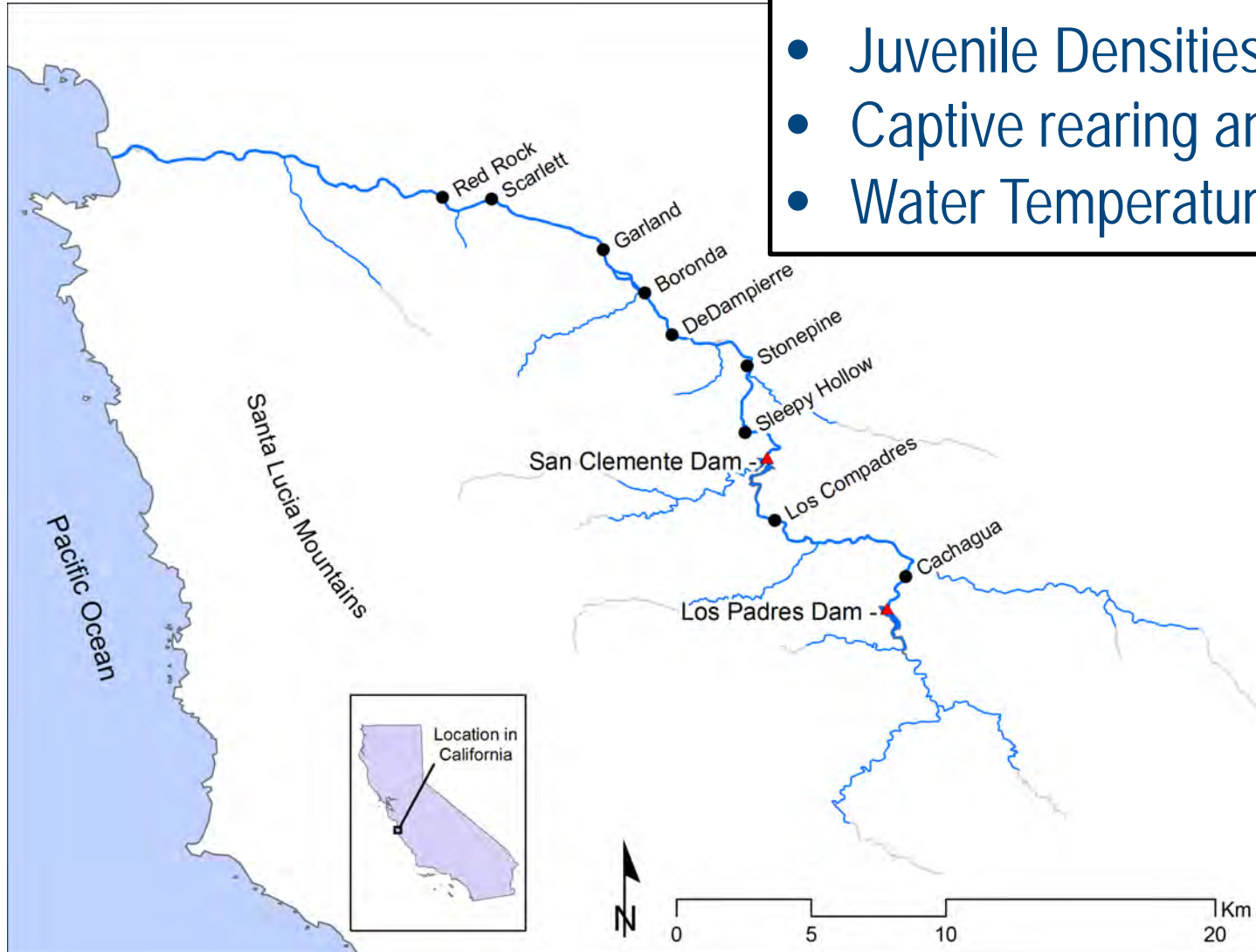
Questions

- What explains the Adult Decline?
 - Changes in Juvenile Abundance?
 - Changes in Juvenile Growth and Conditional Smolting?
- What is the role of Captive-Rearing?

Carmel River

Datasets 1996 - 2013

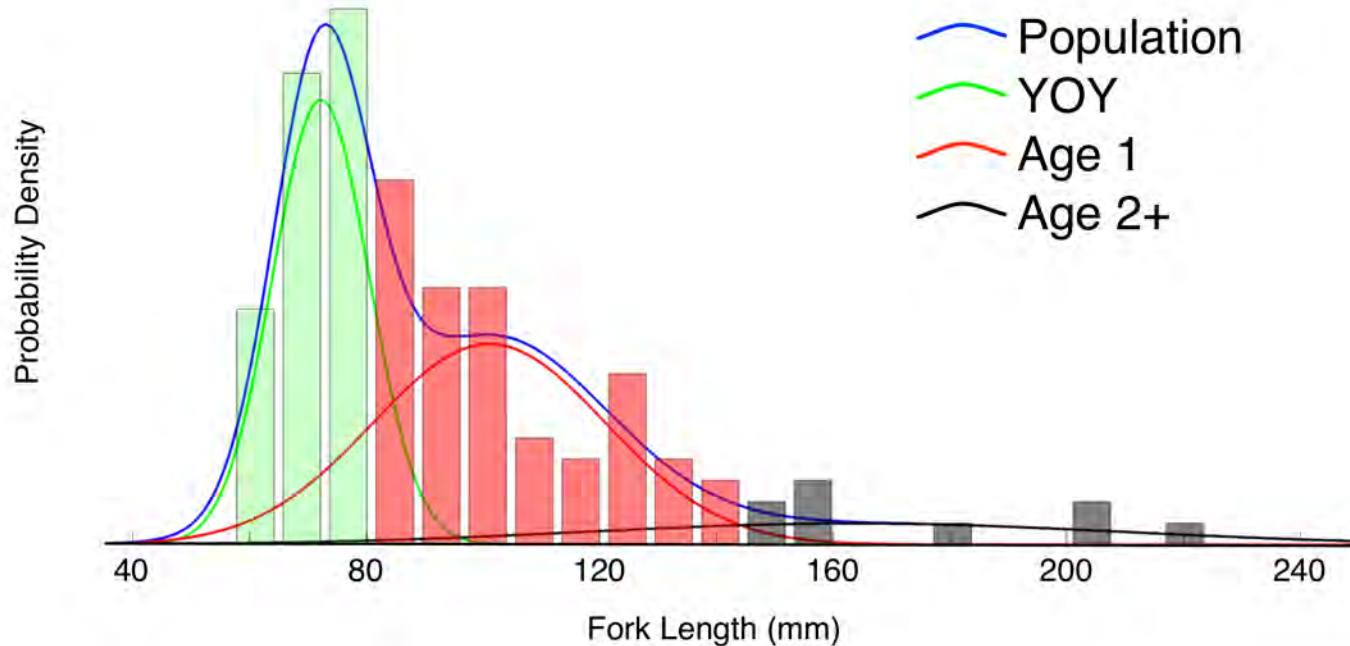
- Adult Counts at Dams
- Juvenile Densities at 9 Sites
- Captive rearing and relocations
- Water Temperature



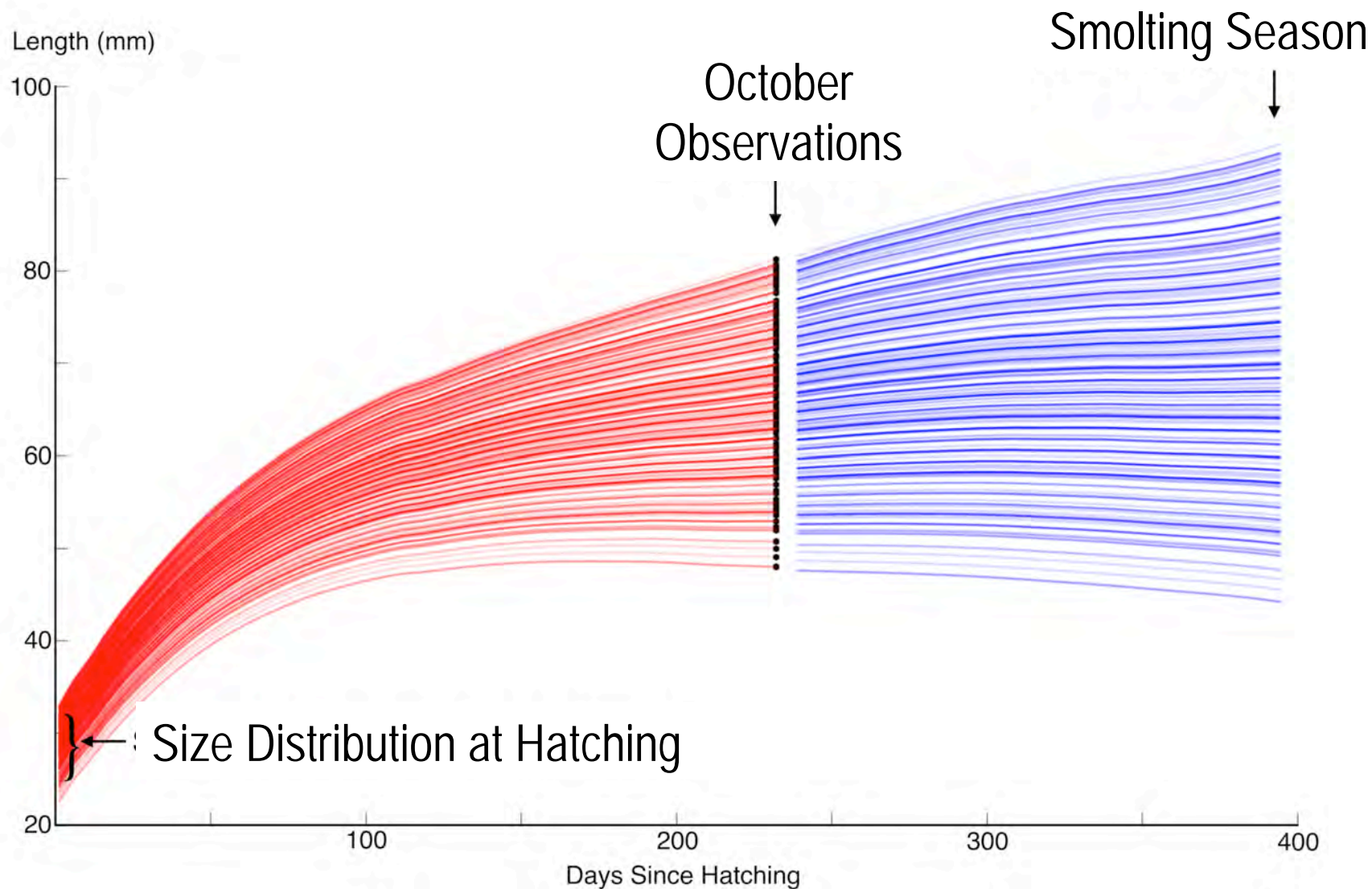
Methods

- ① Estimate YOY abundance and sizes from October data
- ② Project growth forward to smolting season (April), using temperature data, bioenergetic model.
- ③ Predict numbers of returning adults, using smolting and survival curves from other sites
- ④ Formal statistical comparison of:
Juvenile-abundance model, versus
Conditional-smolting model

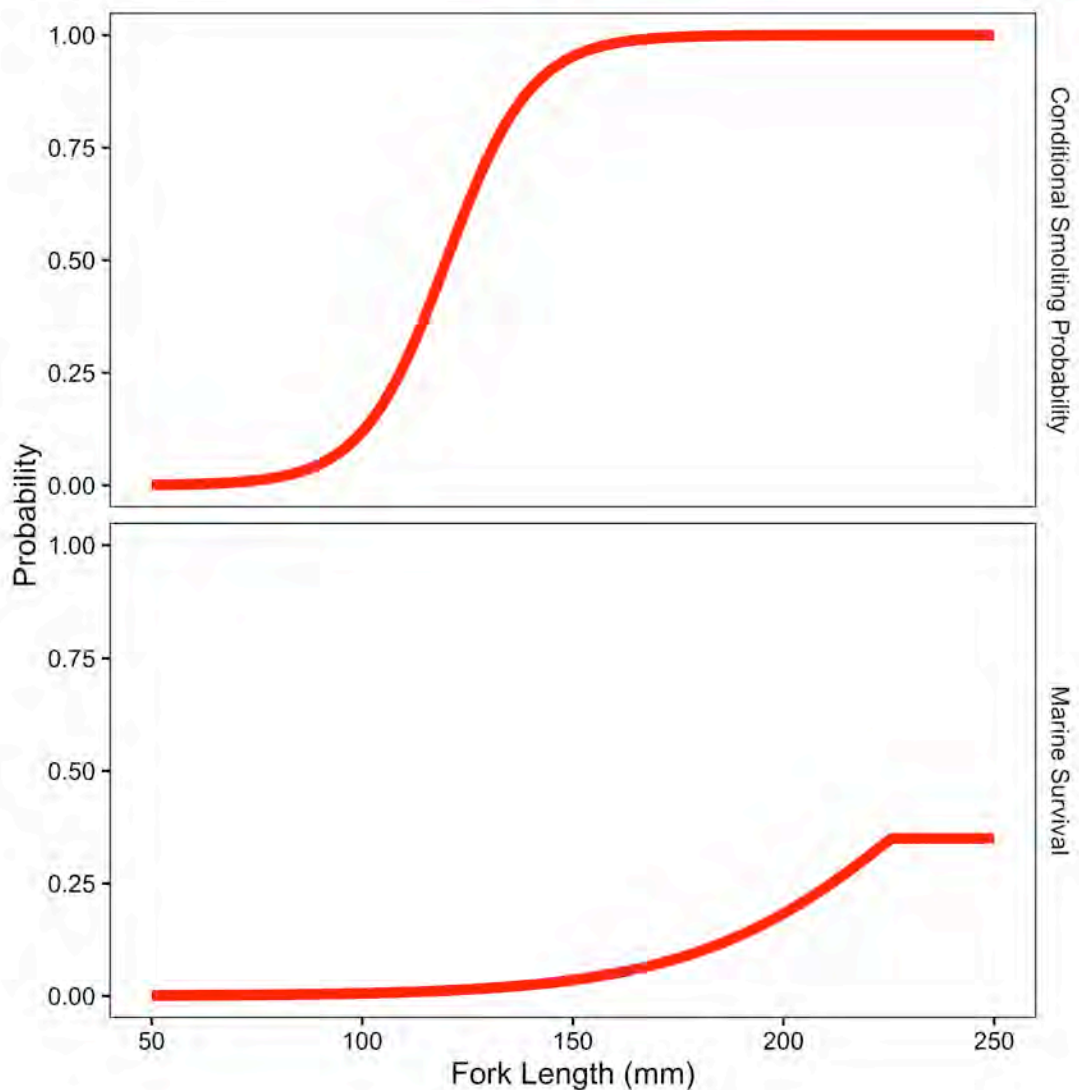
① Estimate YOY abundance and sizes from October data



② Project growth forward to smolting season



③ Predict numbers of returning adults



Conditional Smolting Probability

Beakes et al. (2010)
Doctor et al. (2014)

Marine Survival

Satterthwaite et al. (2009)
Bond et al. (2008)
Shapovalov (1967)

④ Formal Statistical Comparison of Models

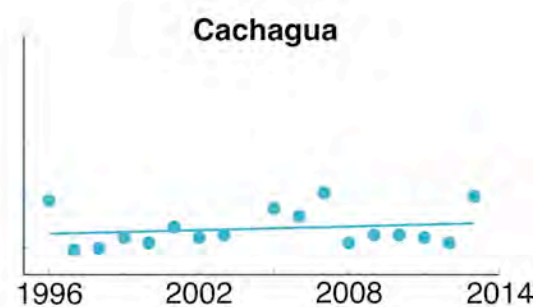
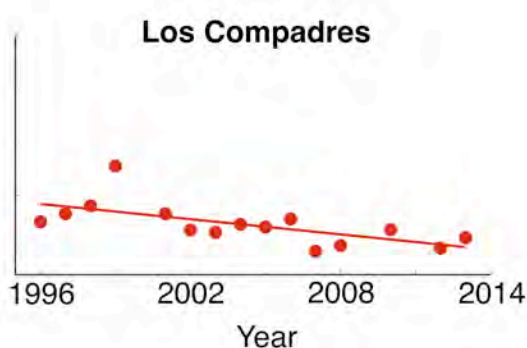
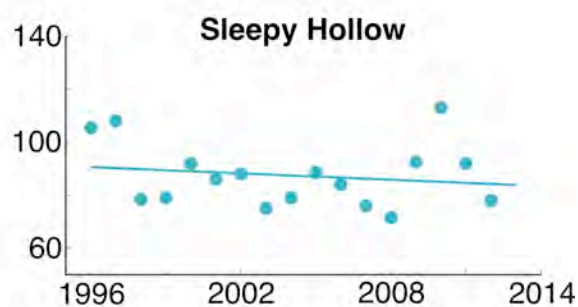
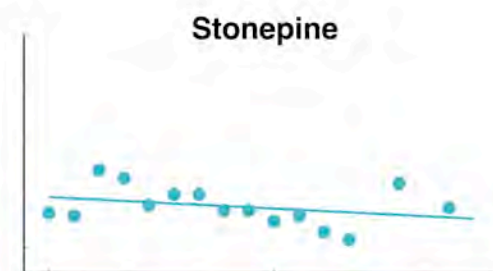
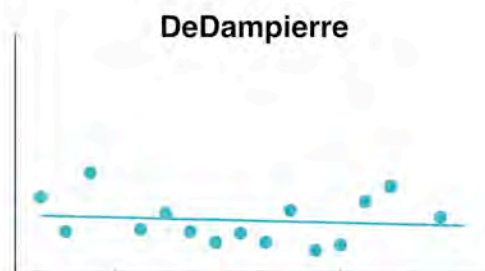
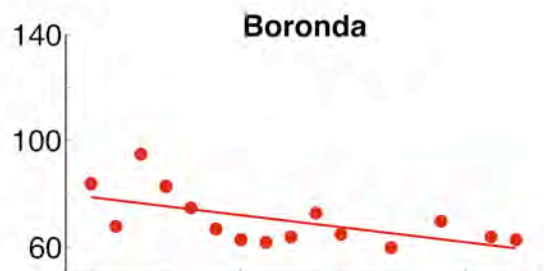
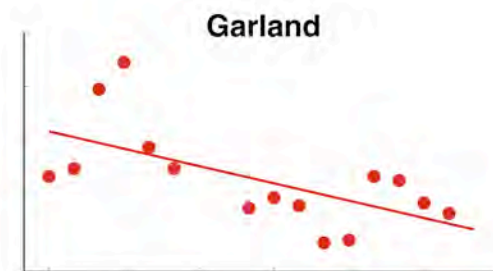
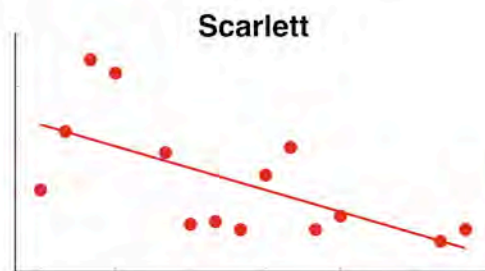
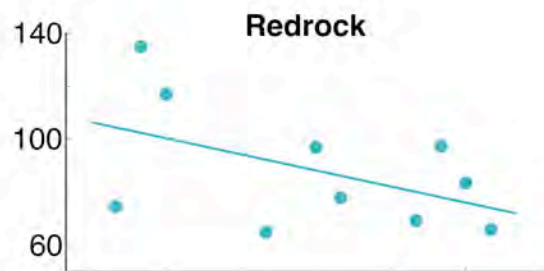
Model	AICc*	Delta	Model Weight
Conditional Smolting	202.53	0.00	0.81
Juvenile Abundance	205.41	2.88	0.19

* Formal score for explanatory power of each model

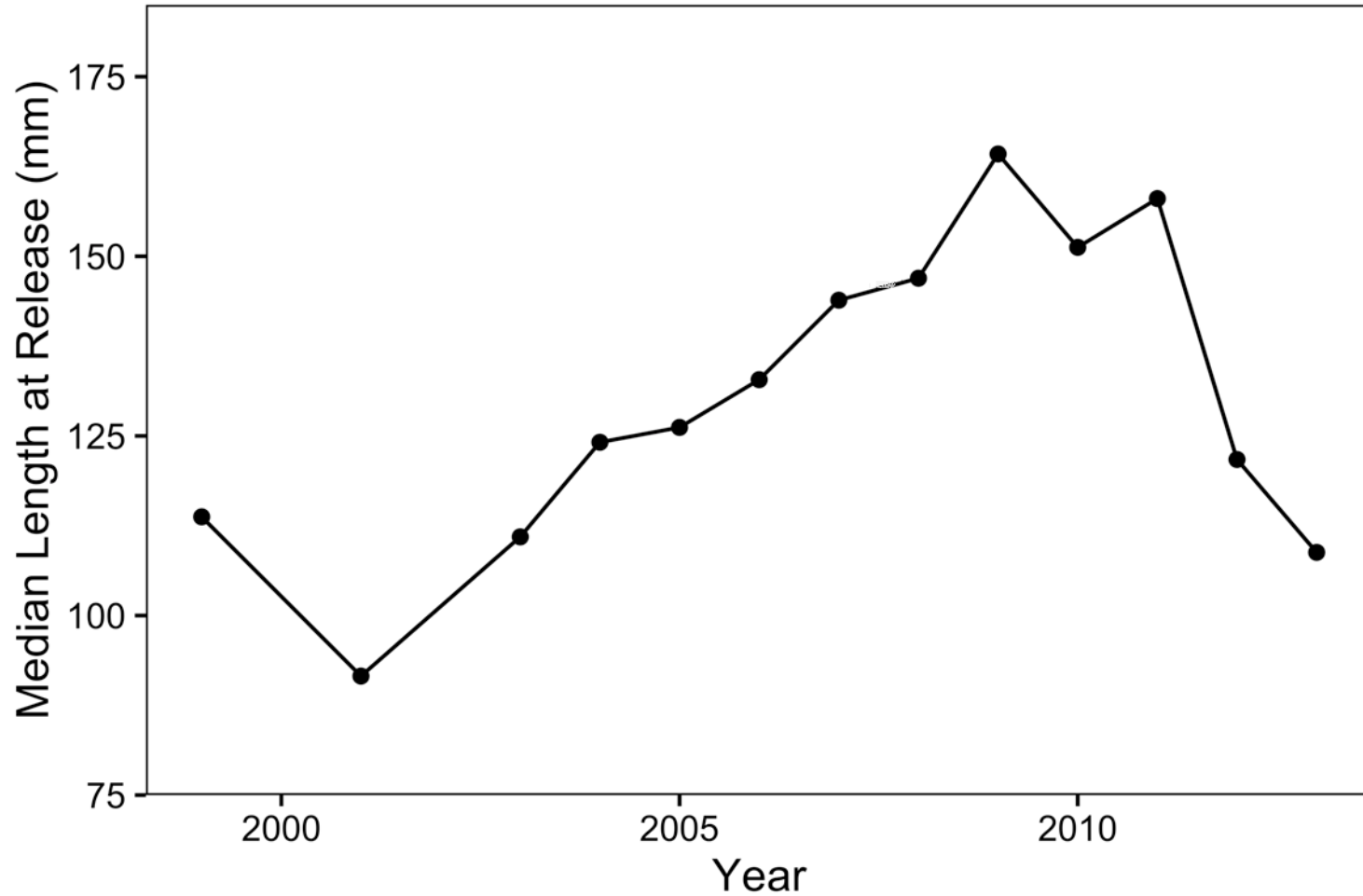
Adult Steelhead



Trends in YOY sizes at 9 river sites



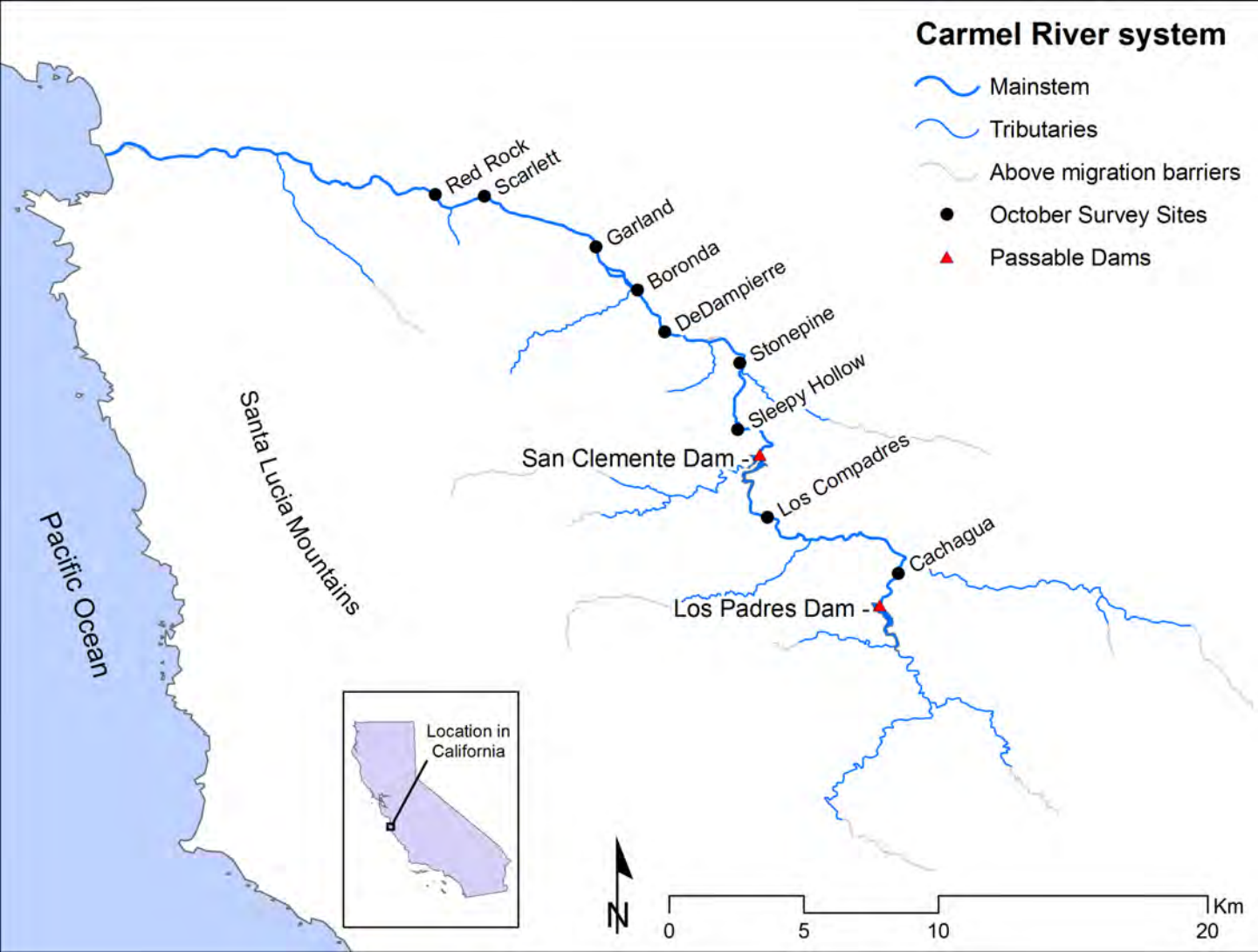
Lengths of Captively-Reared Juveniles



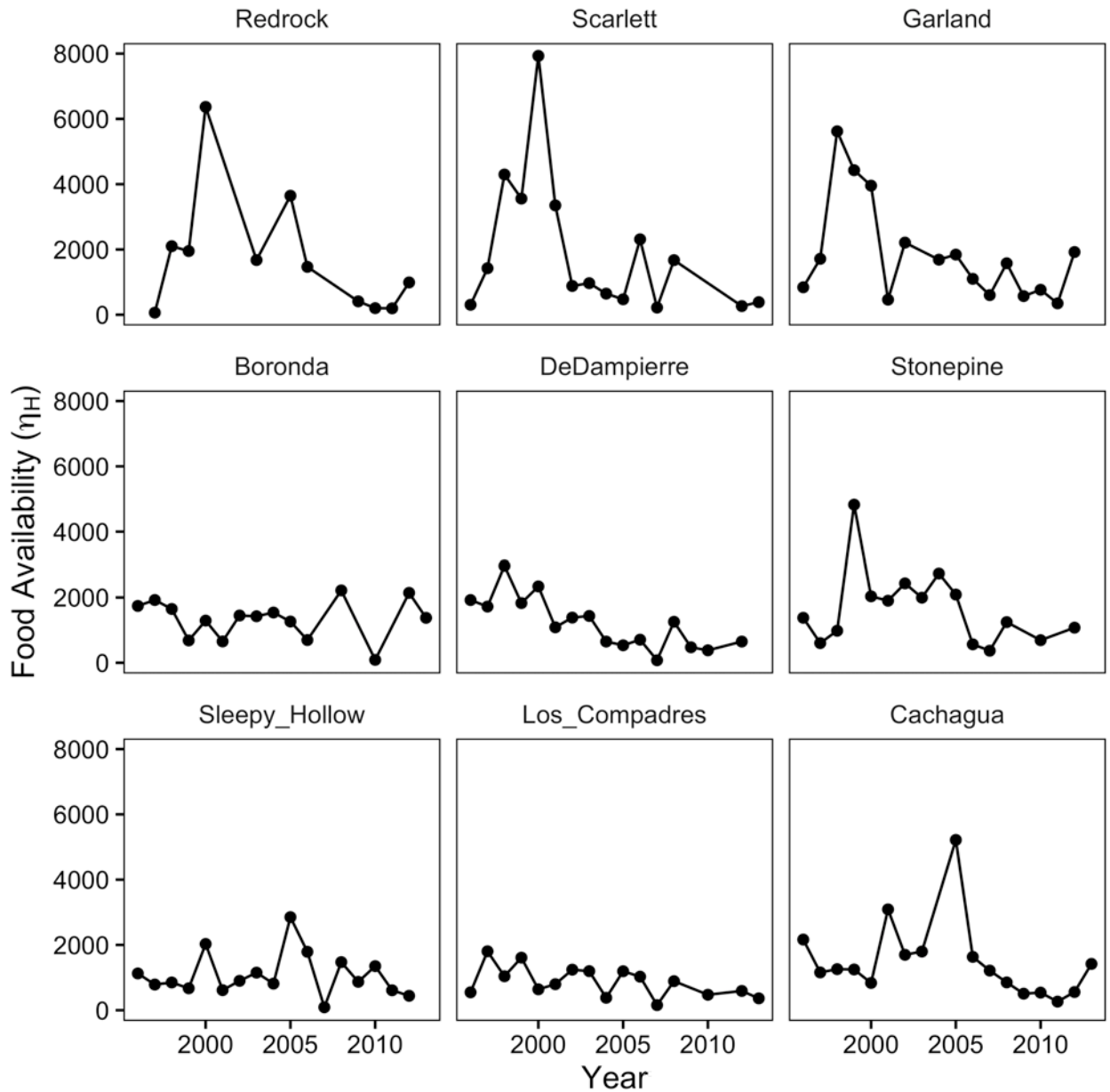
Conclusions

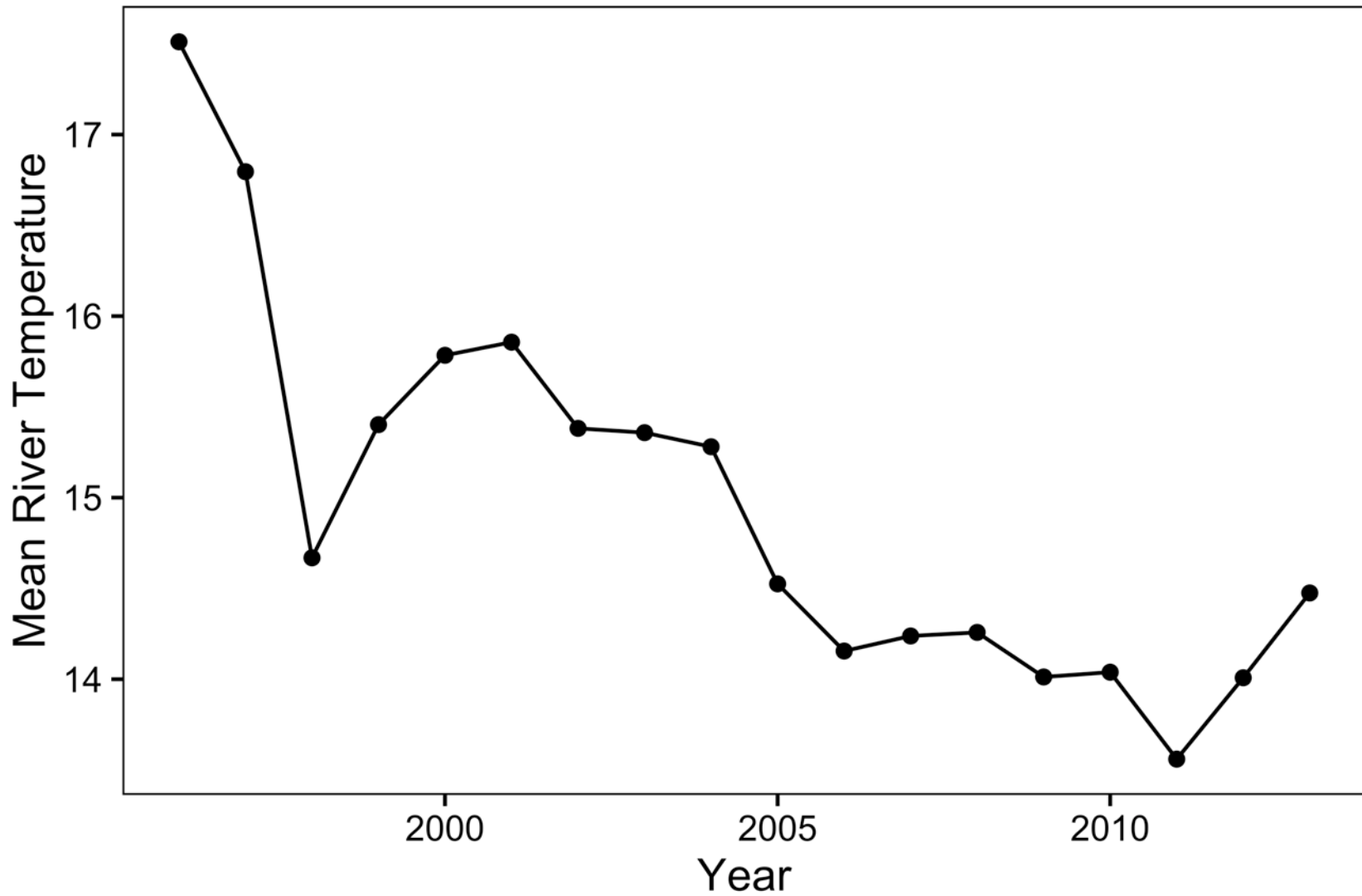
- Conditional-smolting model explains adult numbers better than juvenile-abundance model
- Wild YOY abundance is non-trending
- Wild YOY growth and size are trending downward!
- Especially in the lower river.
- Most adult production is now from captive rearing

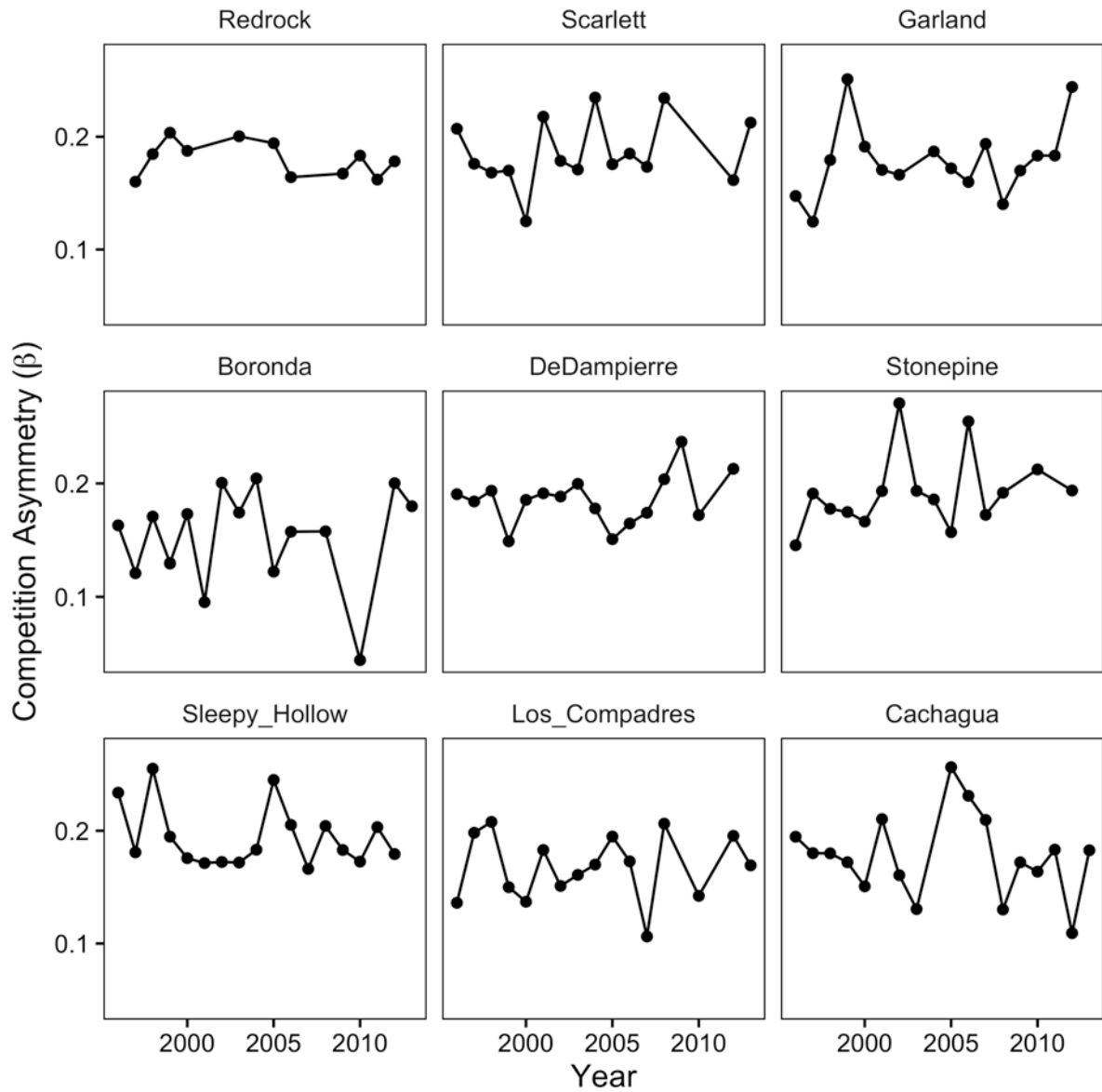
Carmel River

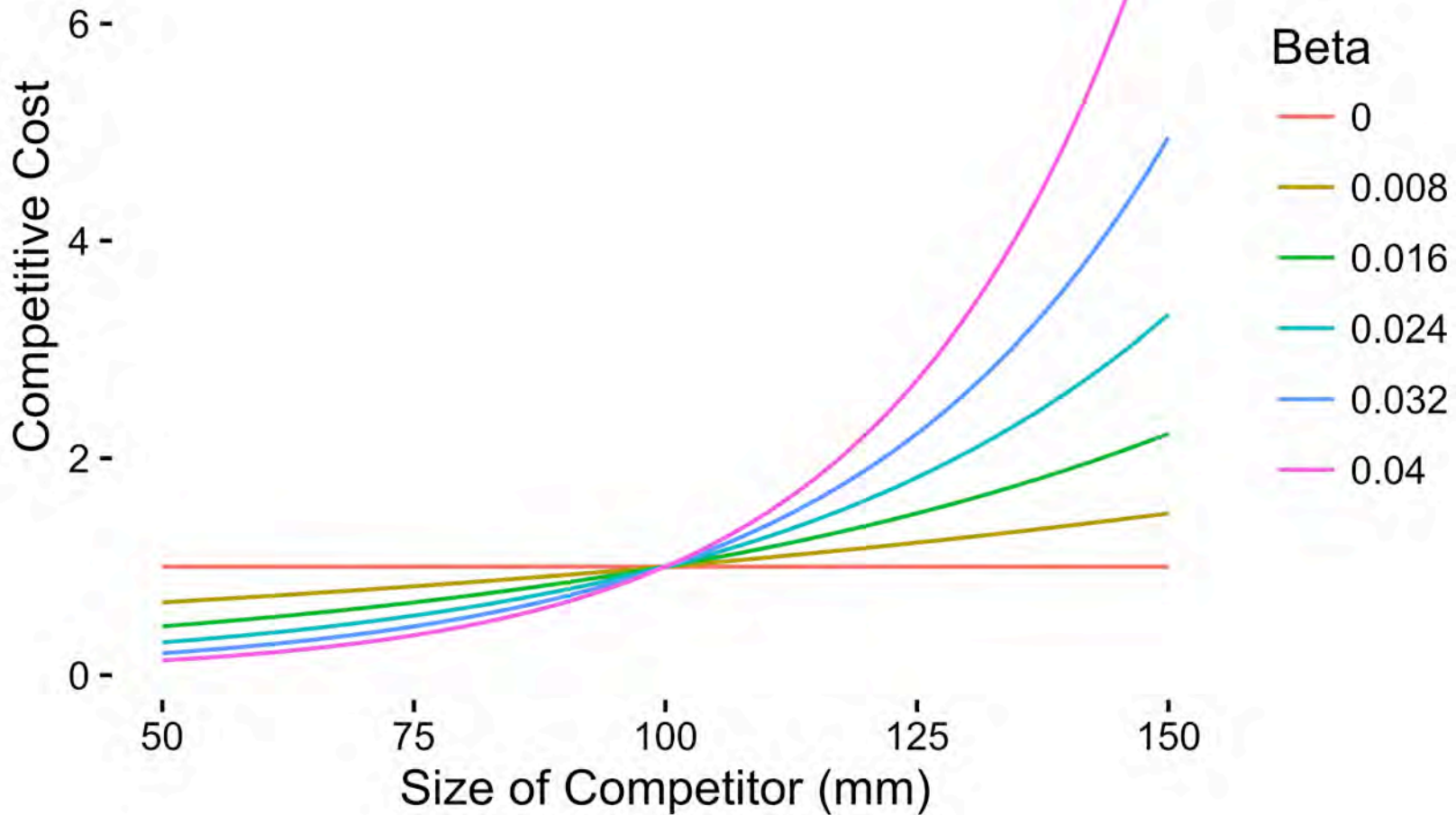


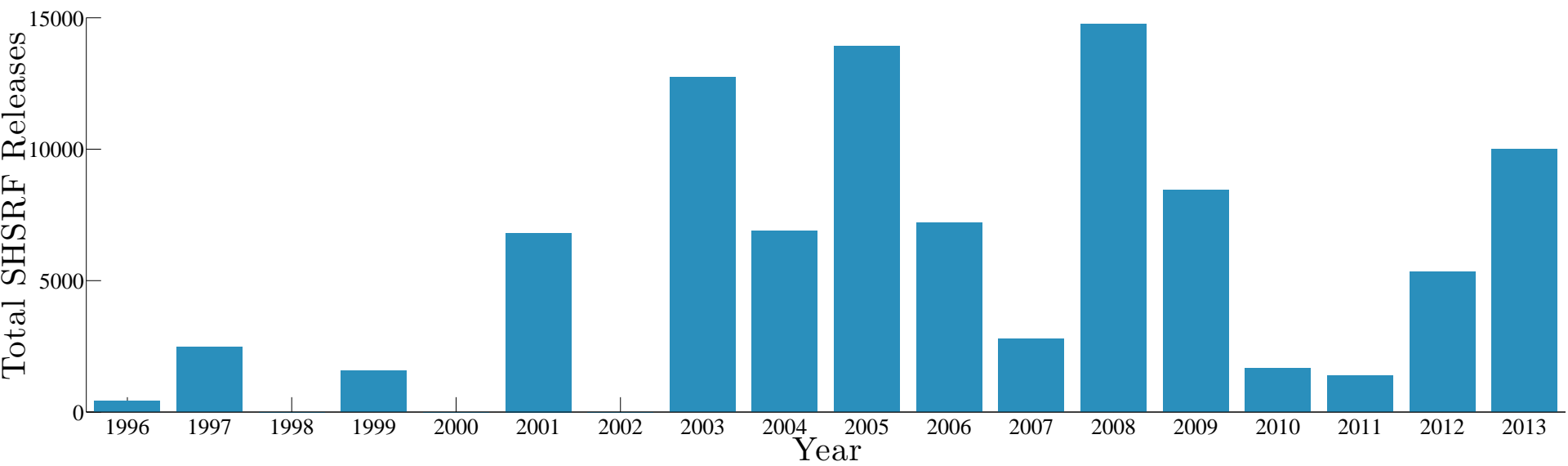
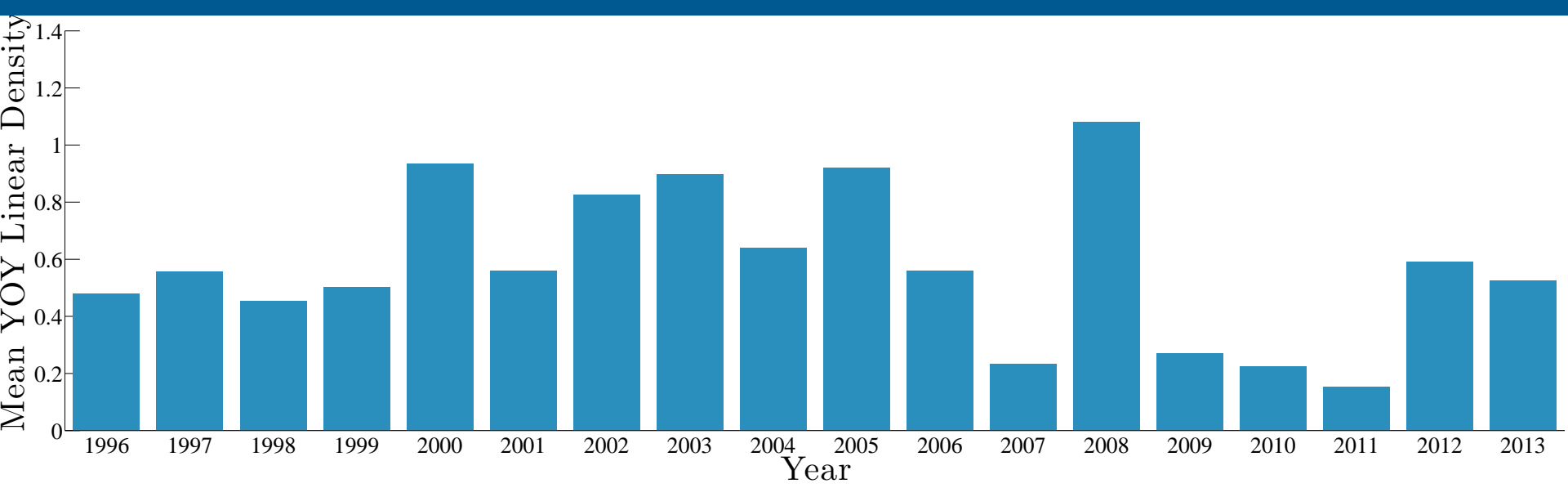
Additional Slides











Mainstem Ventura River - Moore 1980 Thesis

Experimental YOY planted in late June

Year	Weather	Summer Flow	YOY growth	Oct 15 Size
1977	Drought	Intermittent (0.15 – 0.10 cms)	17 mm / month	108 mm
1978	Drought	Intermittent (0.12 – 0.06 cms)	19 mm / month	112 mm
1979	Wet (2x avg rainfall) Channel Reworked by Flows	Continuous to Ocean (2.55 – 0.43 cms)	28 mm / month	144 mm