

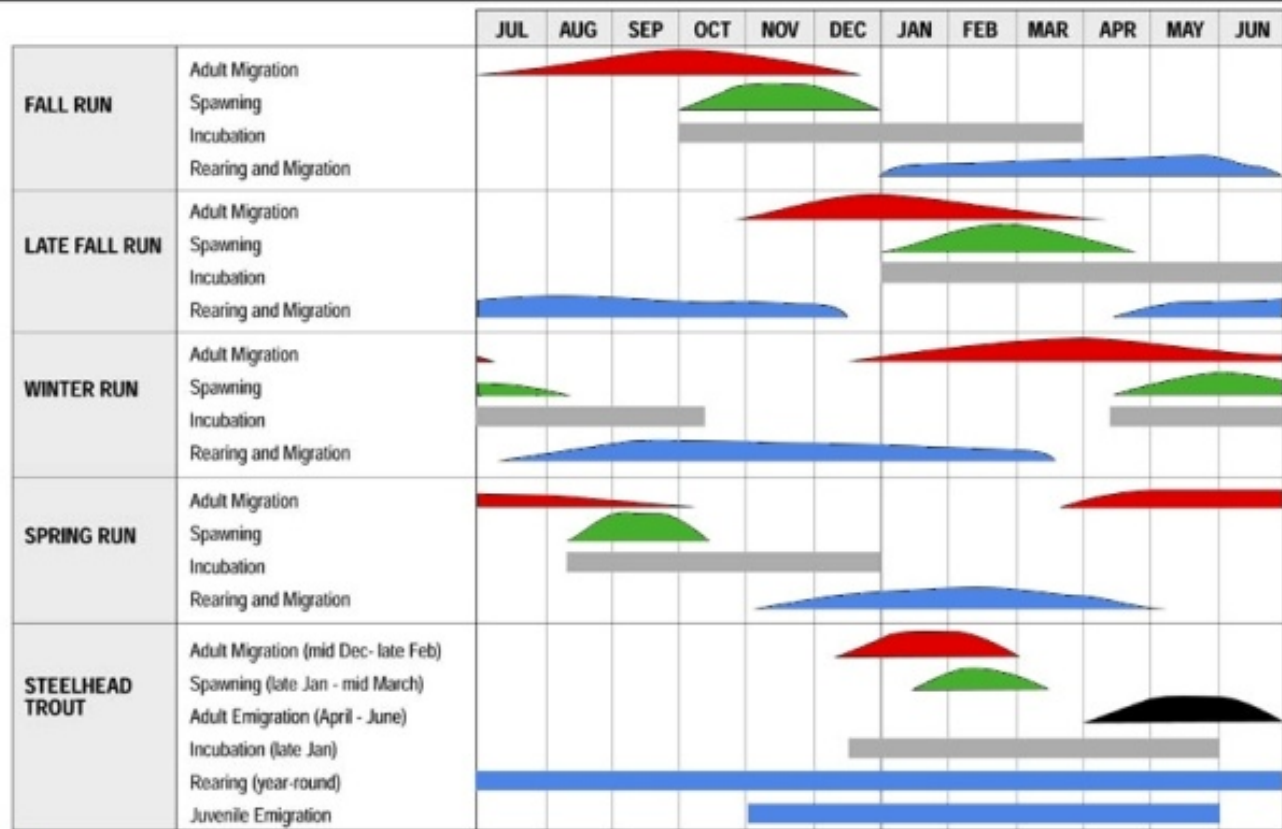


# American River Biology Overview (Salmonids)

## Brainstorming Workshop



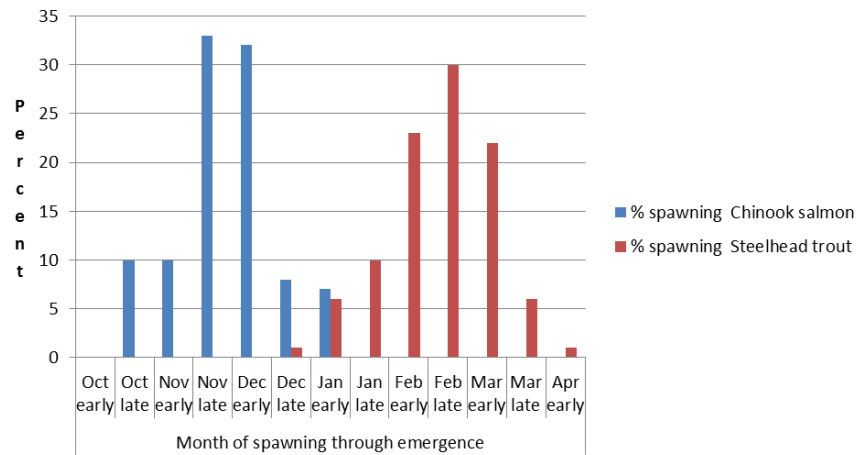
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Vogel and Marine, 1991; Hollock, 1983; CDFG, 1993

FIGURE APPROX. SACRA THE CALI

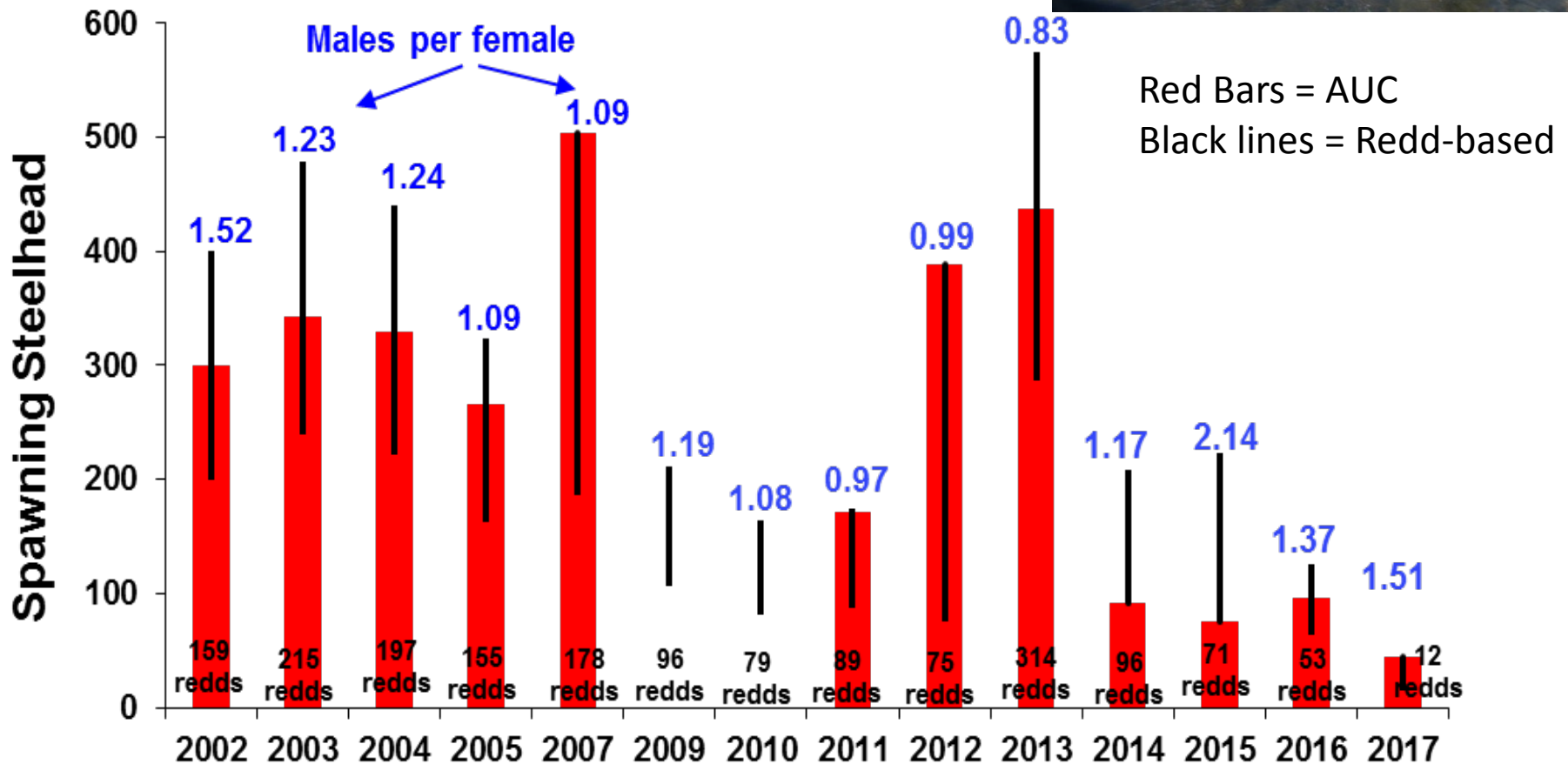
Lower American River Average Spawning timing



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# American River Steelhead

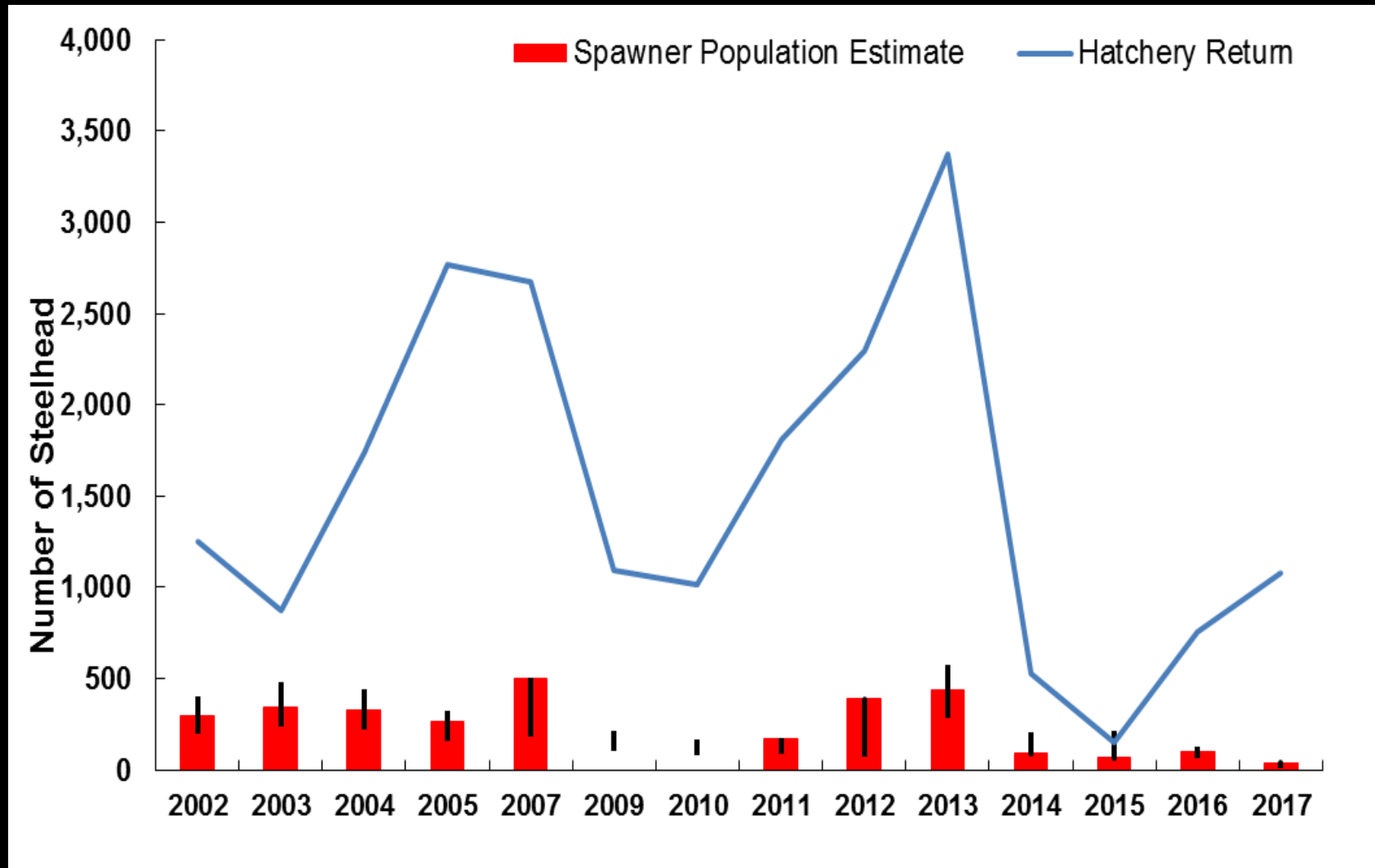
## In-river spawning estimates



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# American River Steelhead

## In-river Spawners and Hatchery Return



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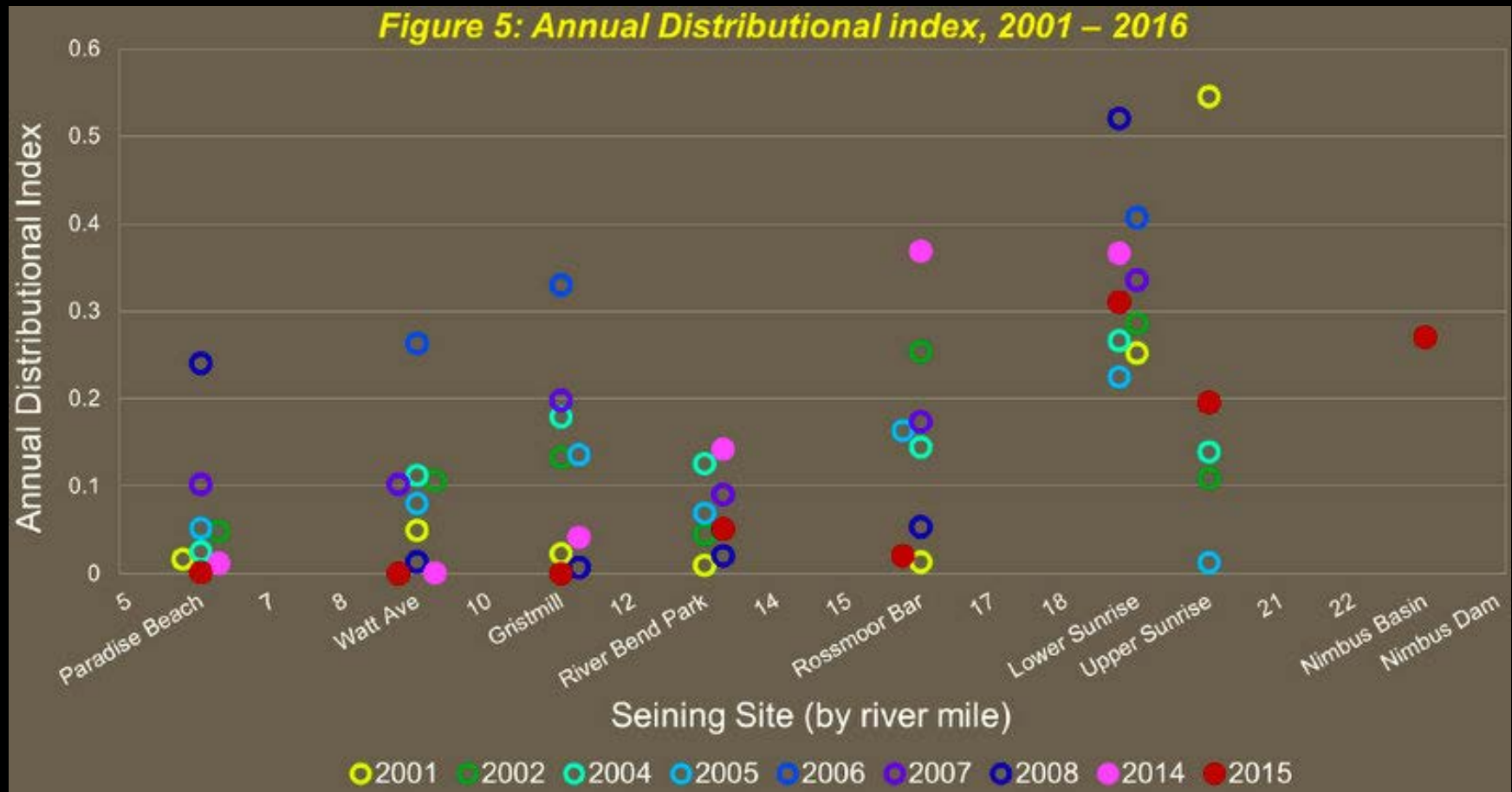
# Proportion of Steelhead Unclipped = naturally spawned

<b>Year</b>	<b>Adult Steelhead entering hatchery</b>	<b>Number unclipped (naturally spawned)</b>	<b>Percent unclipped (naturally spawned)</b>
<b>2001</b>	2,877	50	1.7%
<b>2002</b>	1,253	69	5.5%
<b>2003</b>	873	27	3.1%
<b>2004</b>	1,741	17	1.0%
<b>2005</b>	2,772	118	4.3%
<b>2007</b>	2,673	116	4.3%
<b>2008</b>	758	47	6.2%
<b>2009</b>	1,095	58	5.3%
<b>2010</b>	1,015	34	3.3%
<b>2011</b>	1,811	34	1.9%
<b>2012</b>	2,294	41	1.8%
<b>2013</b>	3,371	57	1.6%
<b>2014</b>	527	13	2.5%
<b>2015</b>	154	4	2.6%
<b>2016</b>	756	11	1.4%
<b>2017</b>	1,082	44	4.1%

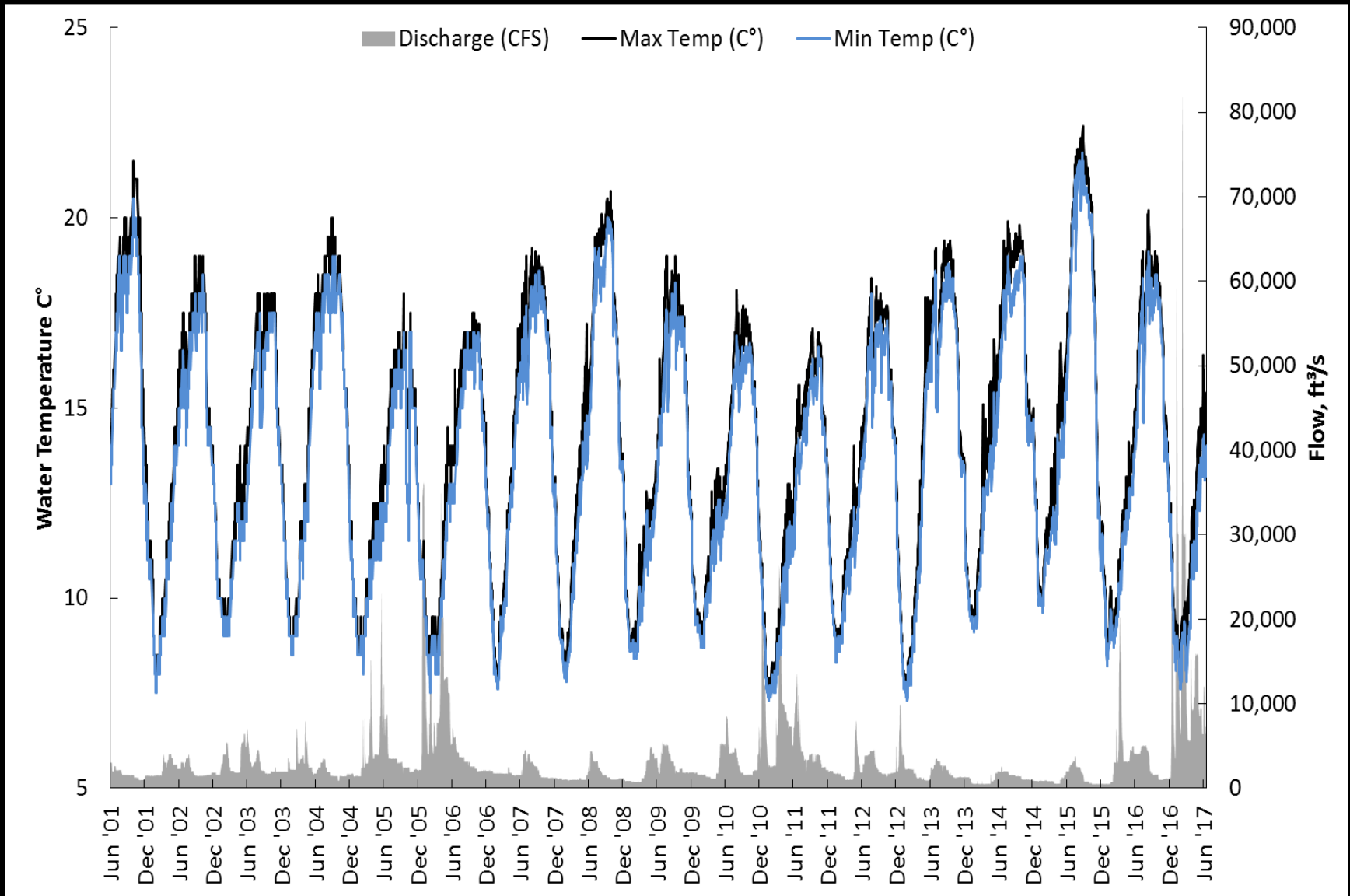
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# American River Steelhead Seining Surveys, Rearing Distribution 2001 - 2016

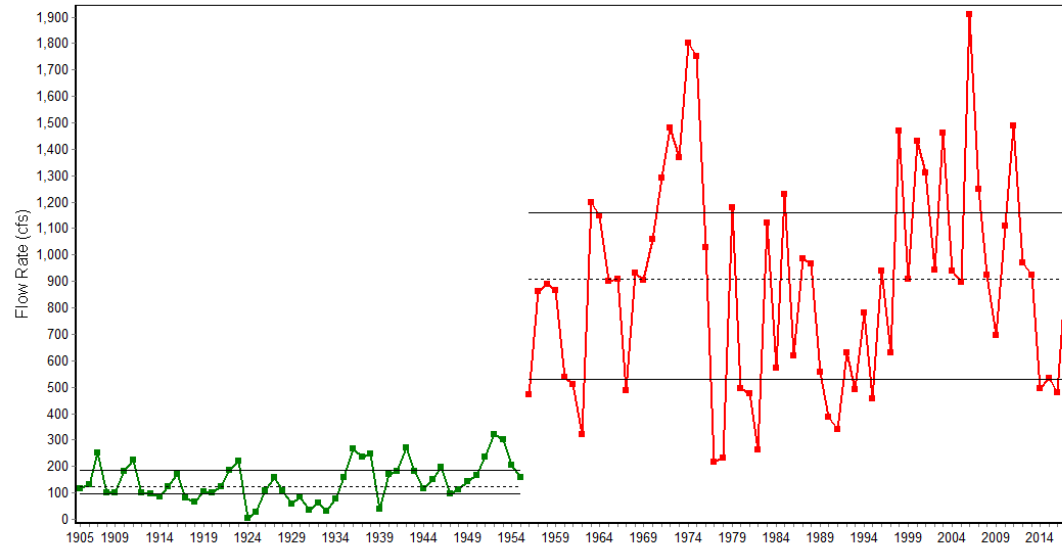


# Environment Affects Local Adaptation

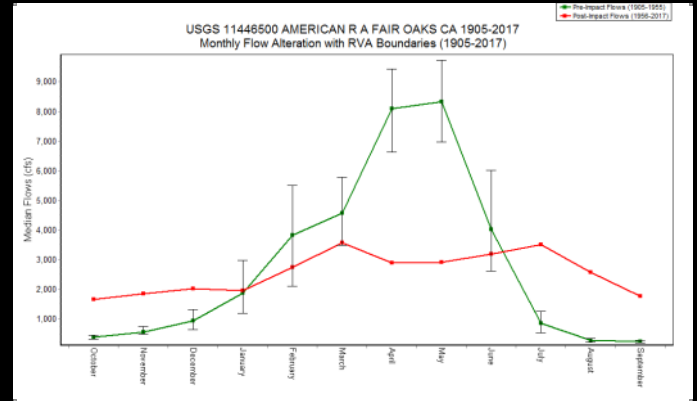


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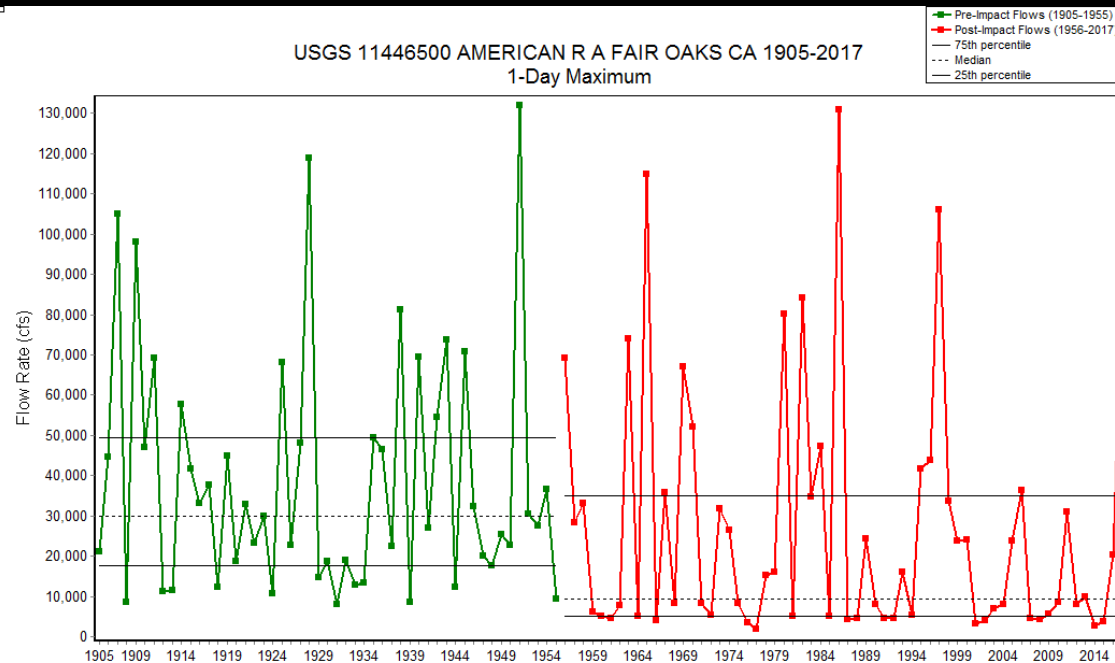
USGS 11446500 AMERICAN R A FAIR OAKS CA 1905-2017  
1-Day Minimum



USGS 11446500 AMERICAN R A FAIR OAKS CA 1905-2017  
Monthly Flow Alteration with RVA Boundaries (1905-2017)



USGS 11446500 AMERICAN R A FAIR OAKS CA 1905-2017  
1-Day Maximum

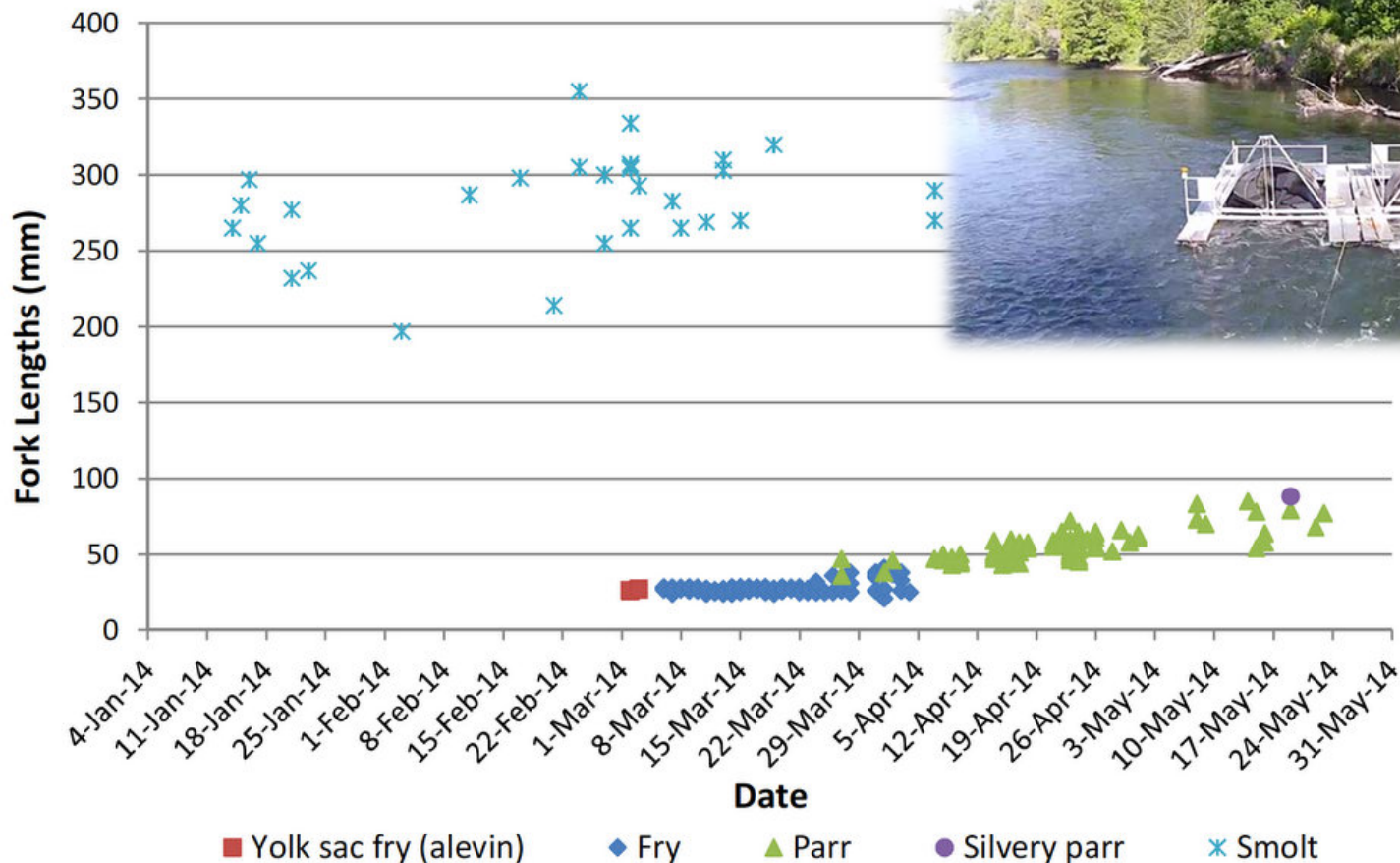


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# Steelhead Catch in LAR RST

Figure 10: Daily fork lengths for natural-origin *O. mykiss* during the 2014 lower American River rotary screw trap survey season.





# Upper American River Broodstock Study





# Genetics Results

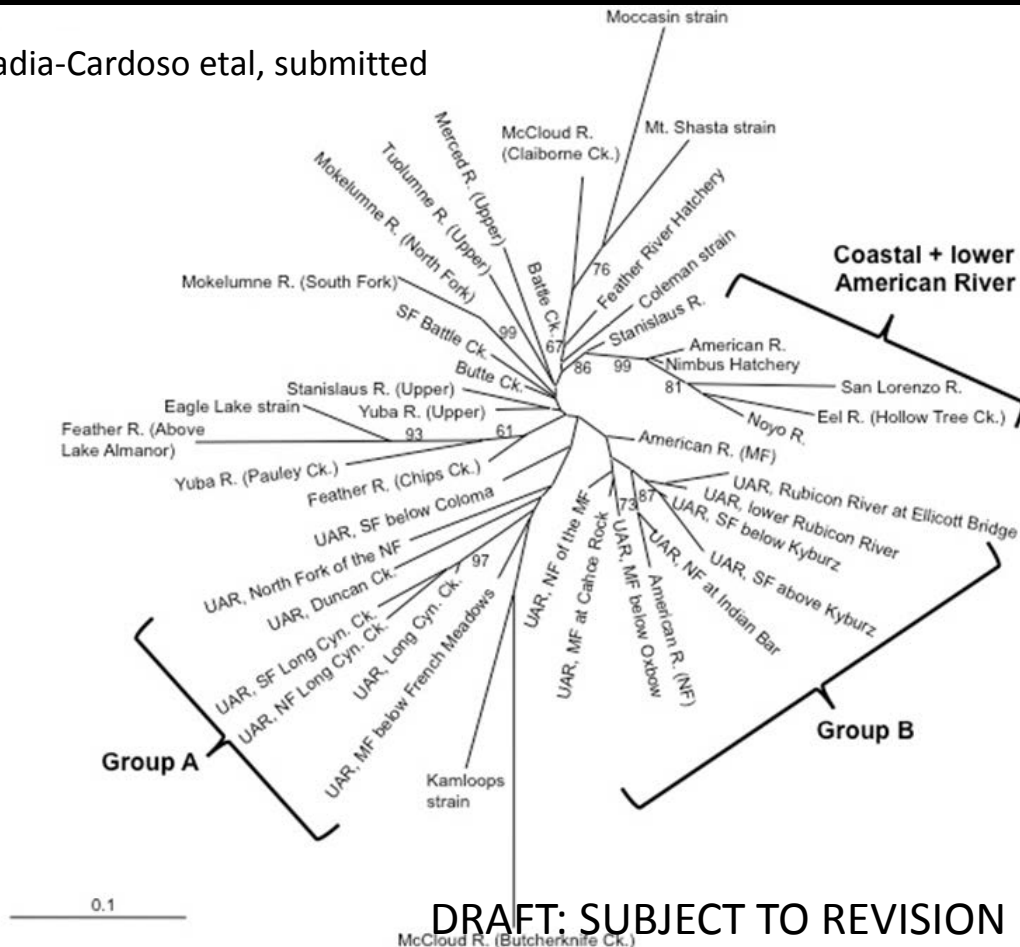
## Genetics

Potential to express anadromy

Ancestry

Group B- Alles associated with migratory ad-fluvial life history

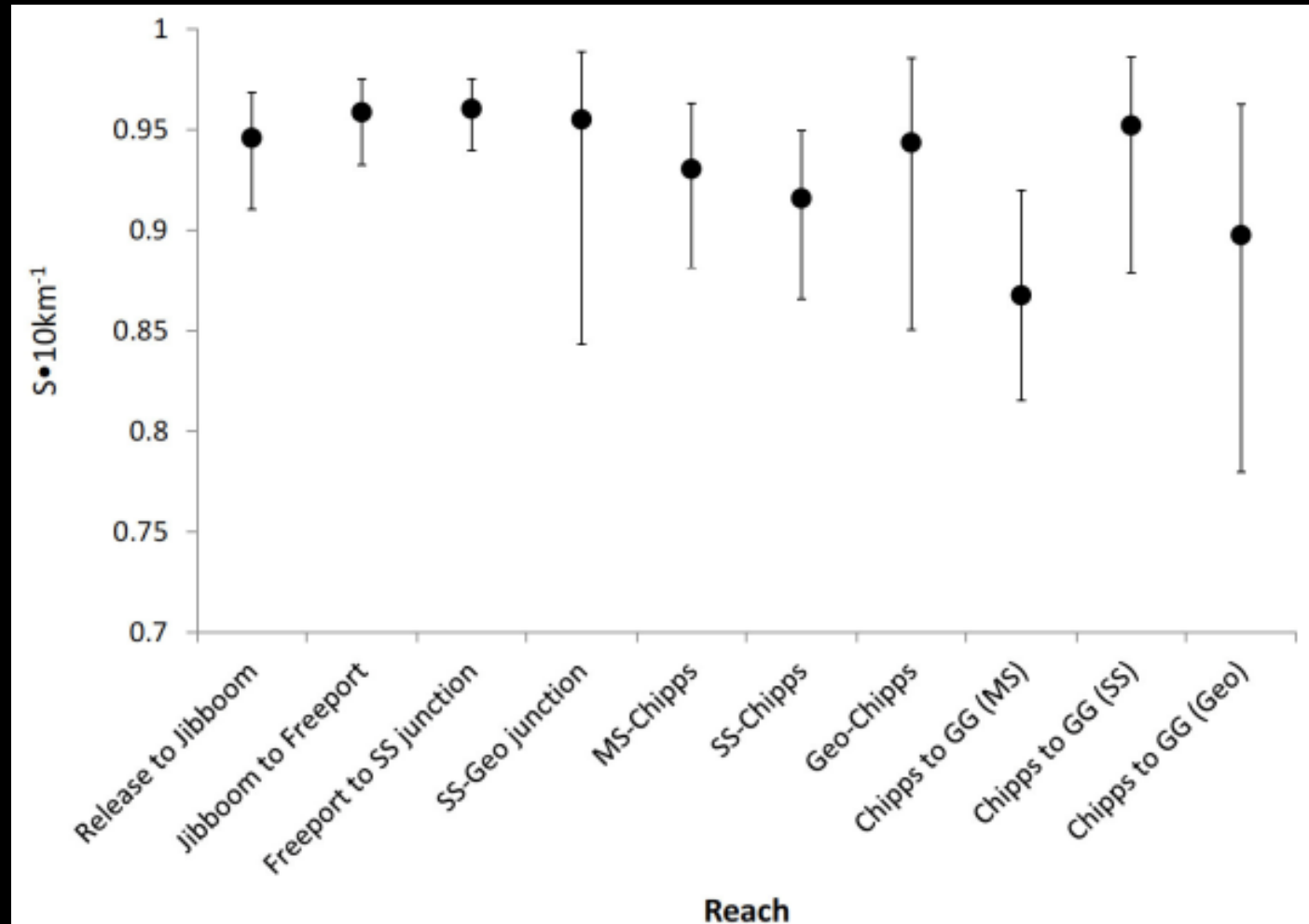
Abadia-Cardoso et al, submitted



# Reach Specific Survival of Tagged Juvenile Steelhead Reared at Nimbus

Zeug et al 2016

Coleman and Nimbus Stocks Combined



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# Moving Forward

Assess Anadromy Potential

Smoltification Studies

Seawater Challenge

Silver Test

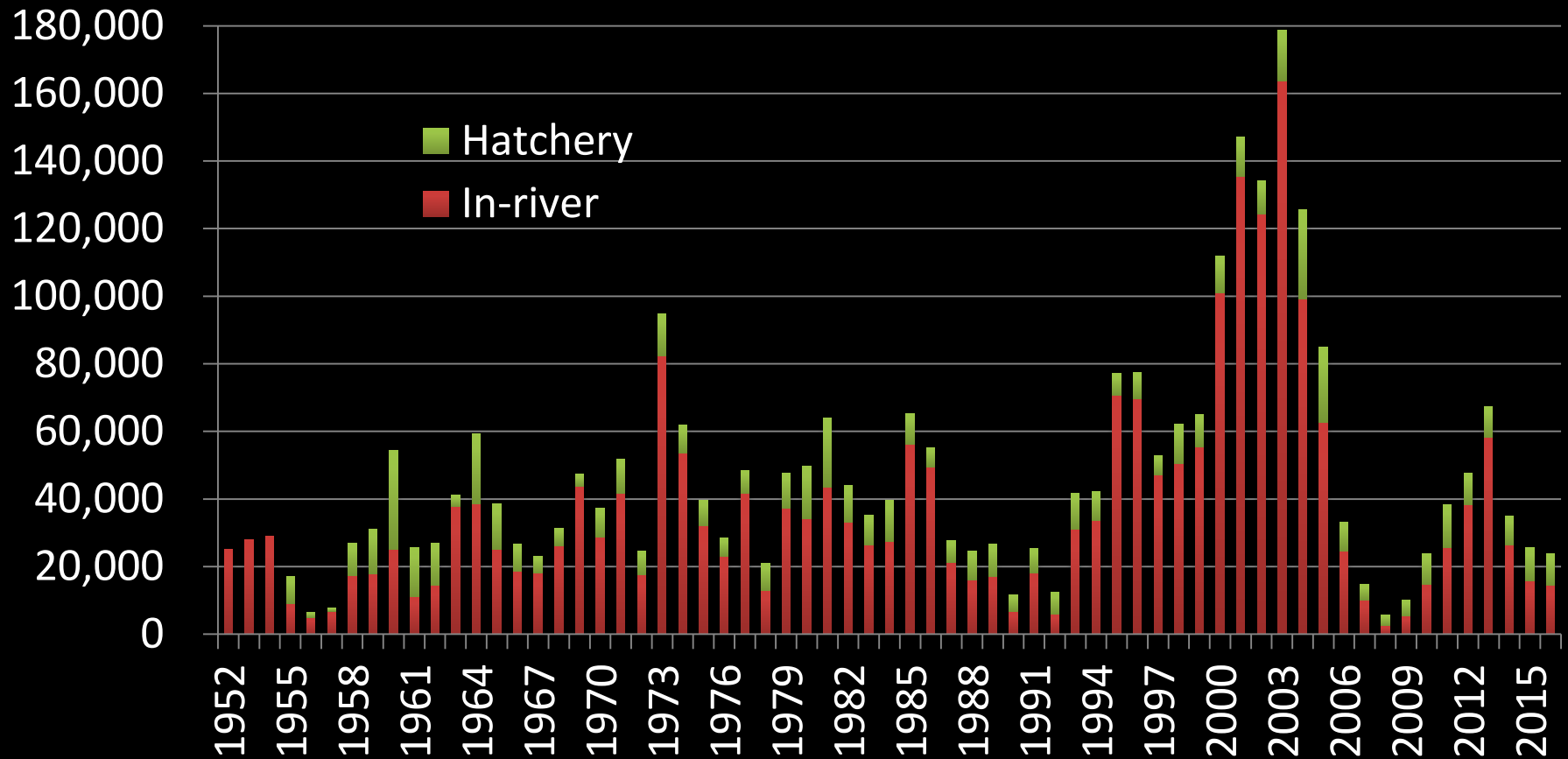


Outmigration Studies  
and Monitor Return Rates

Acoustic Study  
PIT Tag Study



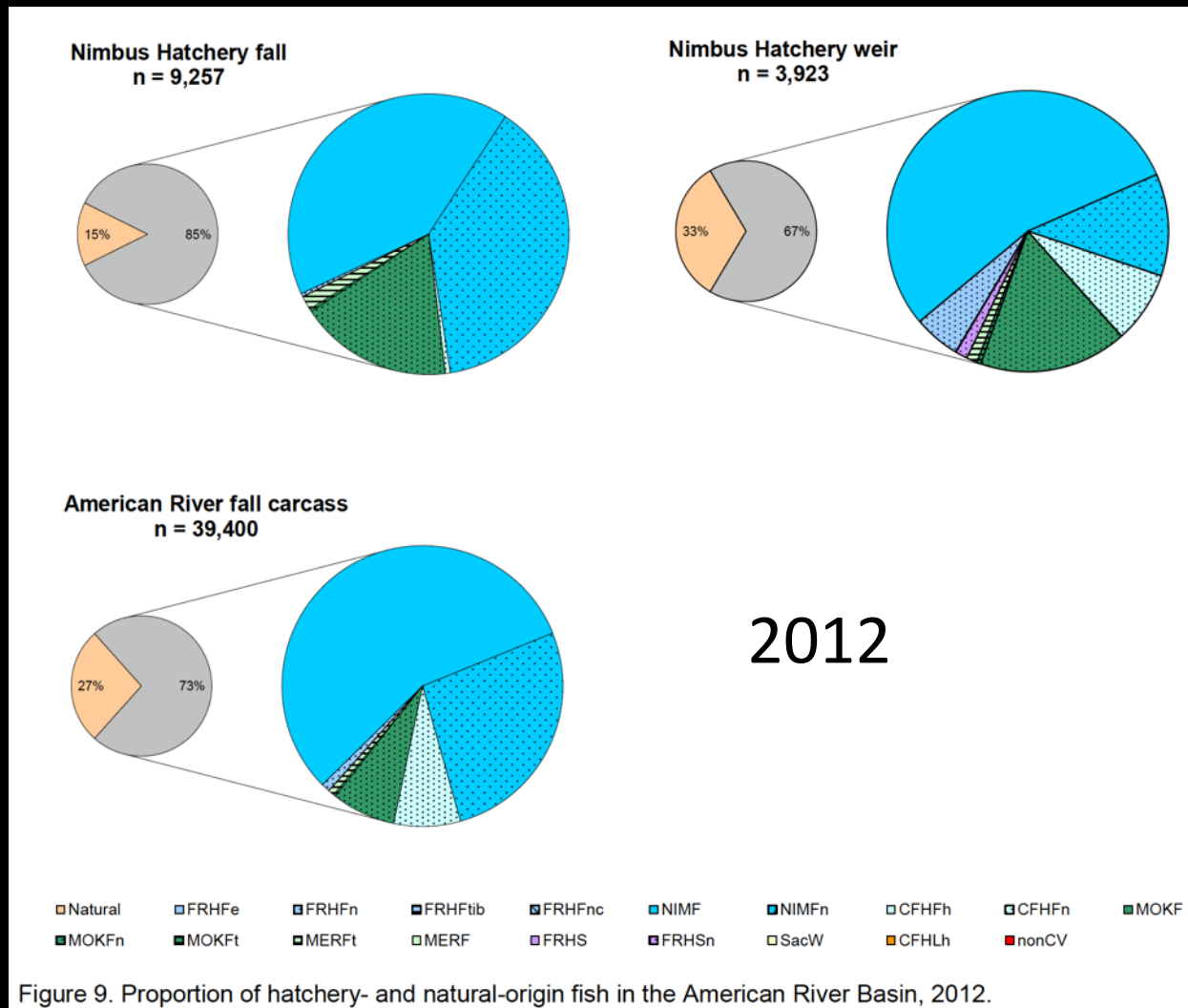
# American River Chinook Salmon Escapement



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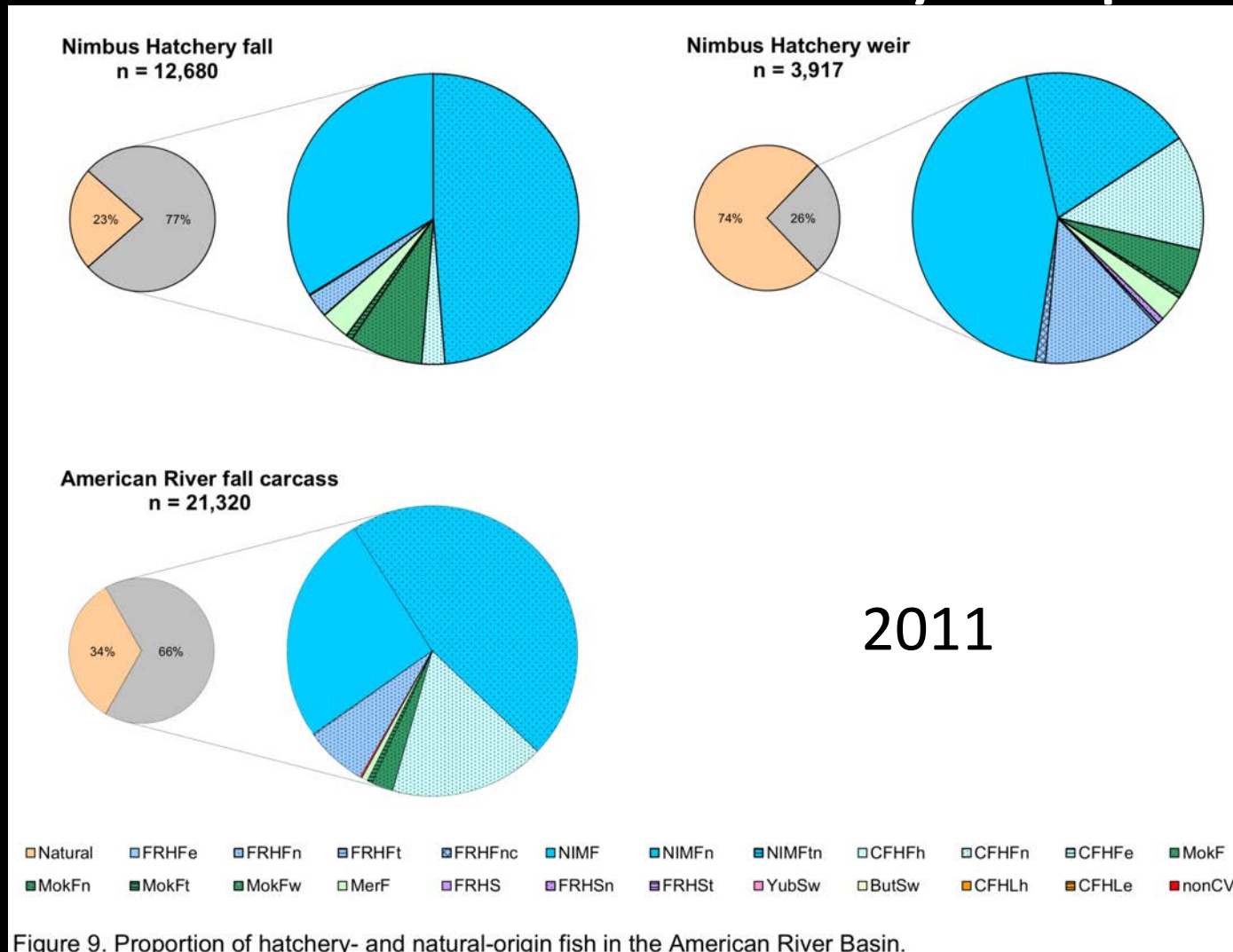
# American River Chinook Escapement Natural and Hatchery Proportions



From Melodie  
Palmer-Zwahlen  
And Brett Kormos

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# American River Chinook Escapement Natural and Hatchery Proportions



From Melodie  
Palmer-Zwahlen  
And Brett Kormos

Figure 9. Proportion of hatchery- and natural-origin fish in the American River Basin.

# In-river Chinook Harvest in 2016

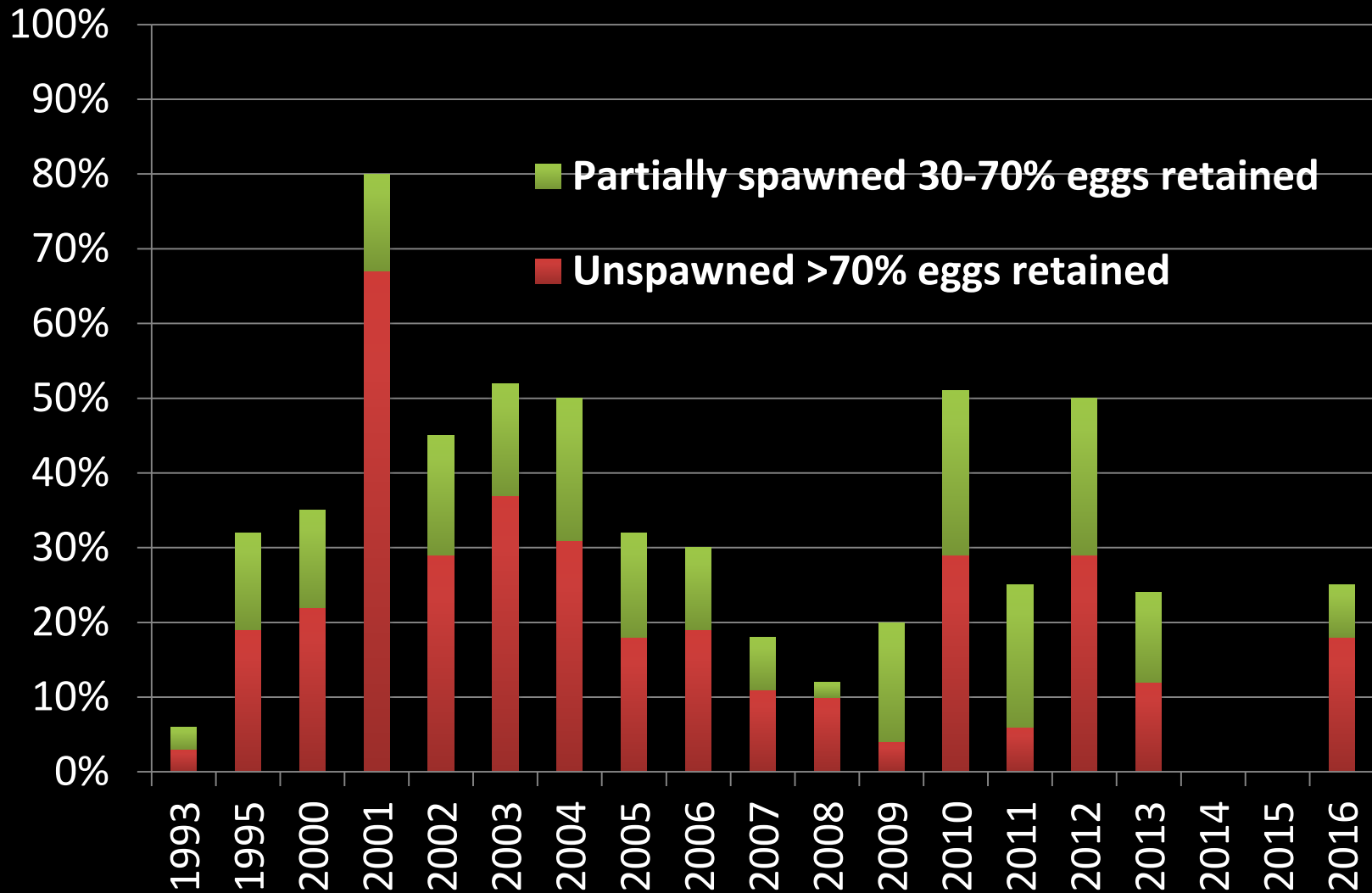
50% of Central Valley Harvest Occurred in American River

**Table 2.** Comparison of Chinook Salmon harvest by management zone in the 2016 Sacramento River sport fishery with associated in-river escapement (including hatchery returns and weir counts, as applicable). Exploitation rate as a percentage = (harvest/total of harvest and escapement) × 100

Management Zone	Harvest Estimate	Escapement Estimate	Total	Exploitation (%)
Lower Sacramento <sup>1</sup>	8,410	—	—	—
Upper Sacramento <sup>2</sup>	3,013	18,800	21,813	13.8
Feather River <sup>3</sup>	6,368	60,903	67,271	9.5
American River <sup>4</sup>	17,859	23,893	41,752	42.8

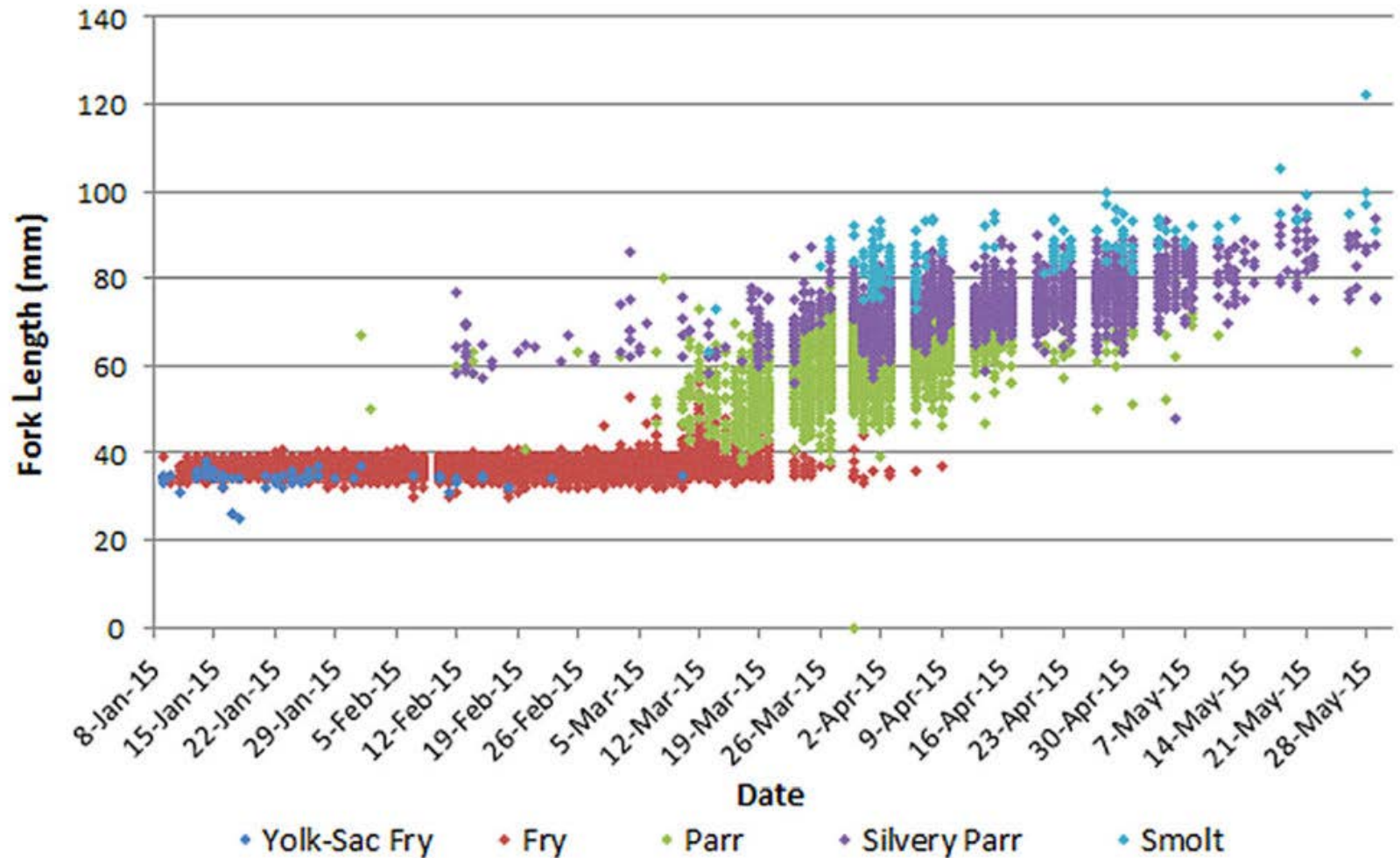
From Rob Titus, Central Valley Angler Survey

# American River Chinook Egg Retention



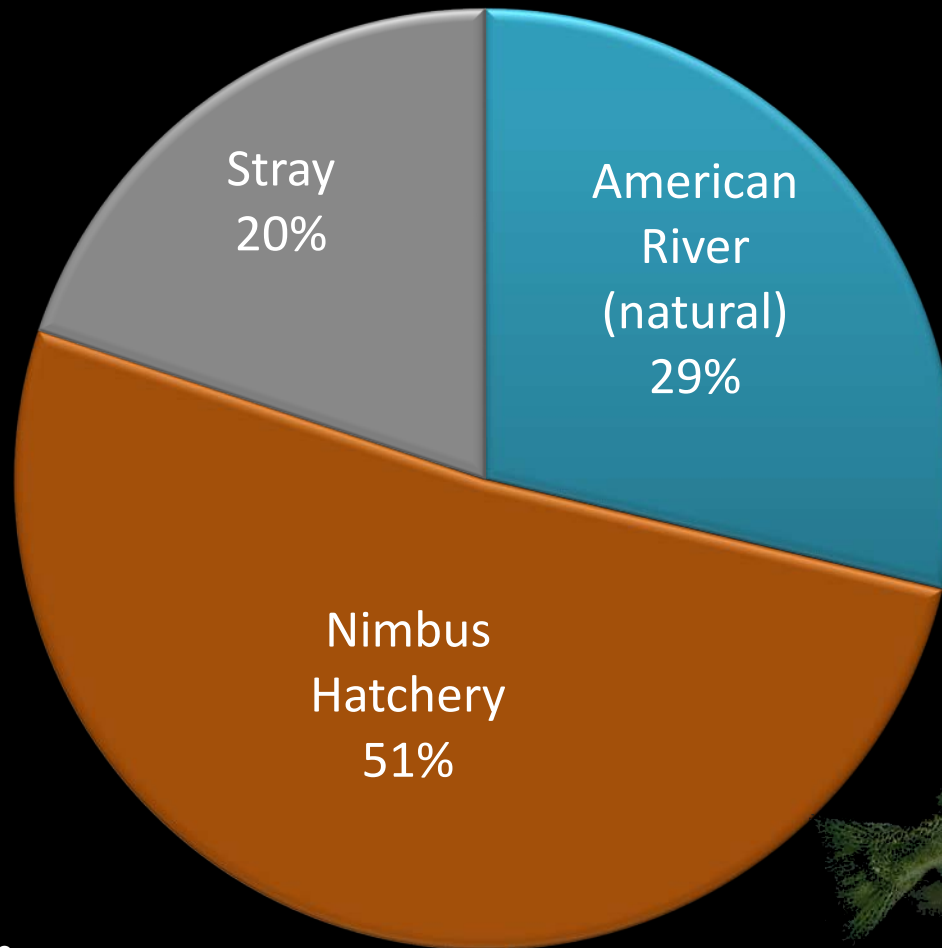
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**Figure 8: Daily fall-run Chinook salmon fork lengths during the 2015 lower American River rotary screw trap survey season.**



# Natal reconstructions (preliminary results)

“Who” contributed to the escapement?



from Anna Sturroch

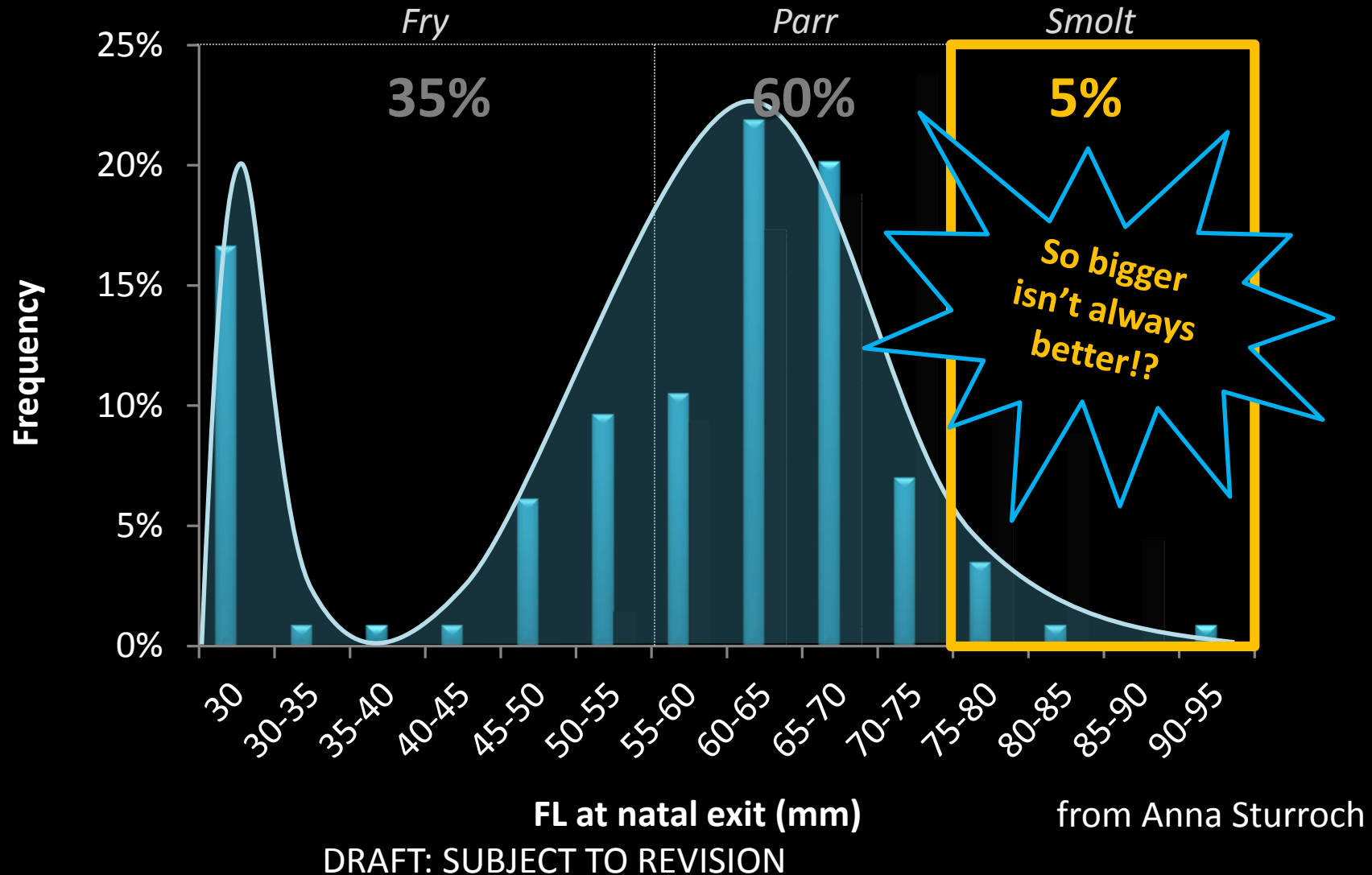
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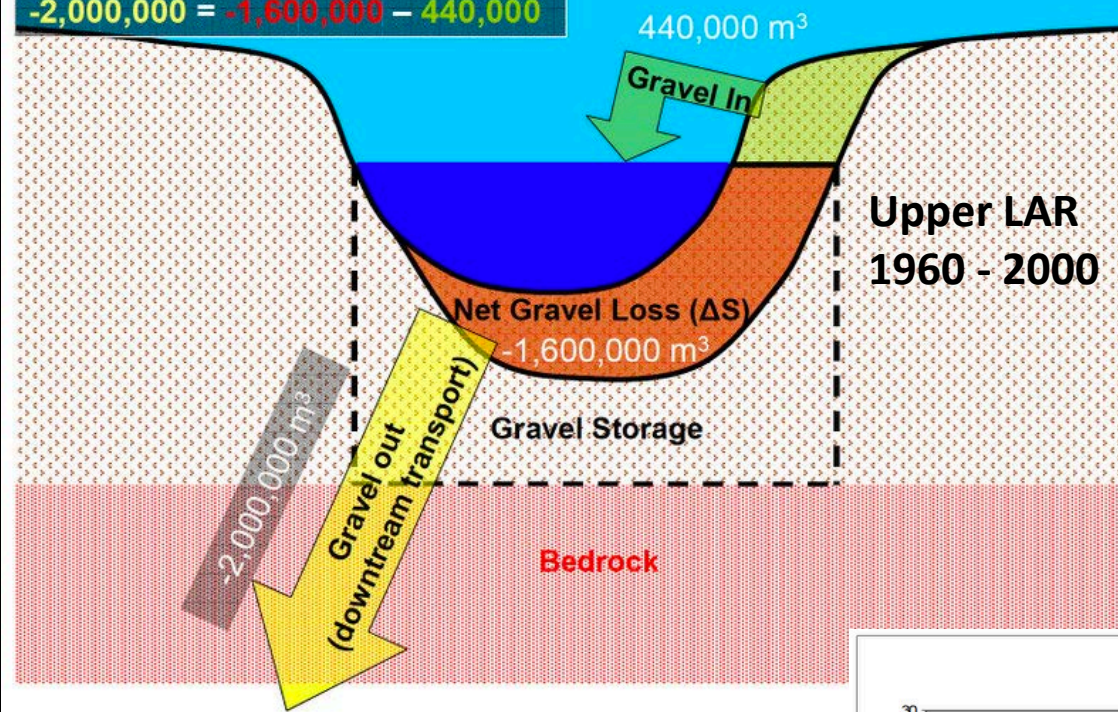
# Movement reconstructions

## Size at natal exit & phenotype contributions



$$\text{Gravel out} = \Delta S / \Delta t - \text{Gravel in}$$

$$-2,000,000 = -1,600,000 - 440,000$$



# Gravel Budget for the LAR

Dave Fairman, 2007

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Rates of Gravel Loss on the Lower American River  
Reaches 1-4

Years	Gravel Volume Eroded (m <sup>3</sup> )	Adjusted Gravel Volume Eroded (m <sup>3</sup> )	Time (years)	Rate of Gravel Loss (m <sup>3</sup> /yr)	Adjusted Rate of Gravel Loss <sup>1</sup> (m <sup>3</sup> /yr)
1906-1998	8,000,000	6,100,000	92	87,000	66,000
1906-1962	4,900,000	2,800,000	56	88,000	51,000
1962-1998	3,100,000	3,200,000	36	87,000	90,000

Reaches 3&4

1906-1998	5,100,000	3,400,000	92	56,000	37,000
1906-1962	3,100,000	1,800,000	56	55,000	32,000
1962-1998	2,100,000	1,600,000	36	58,000	44,000

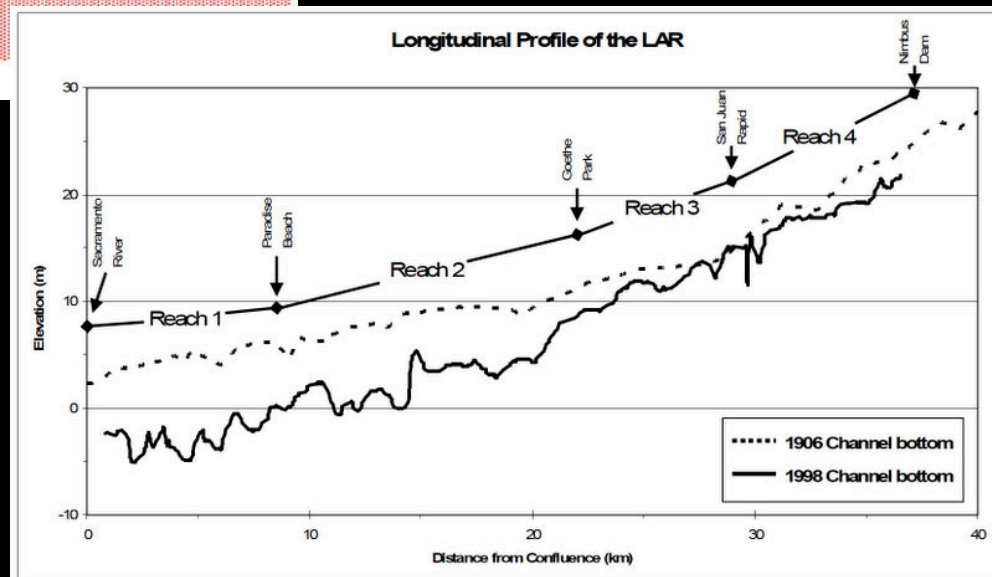
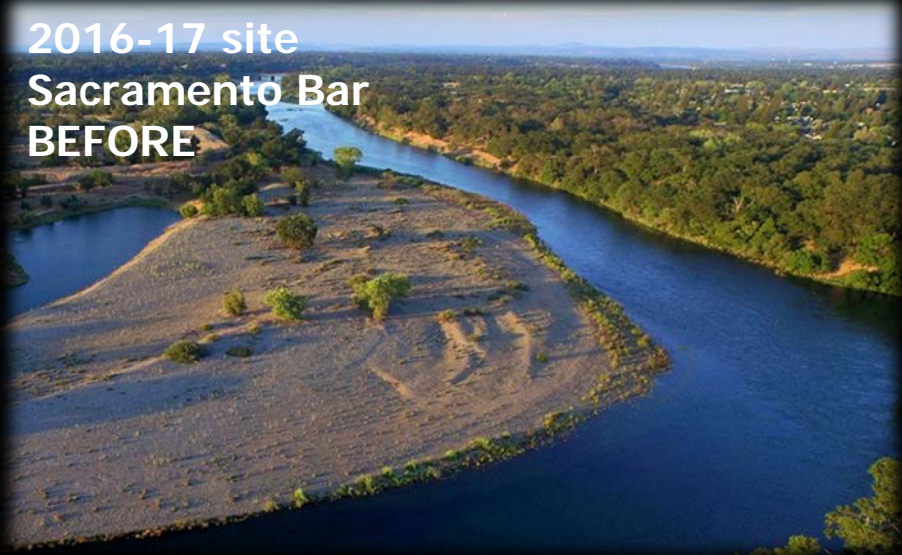


Figure 2-10 Longitudinal profile of the LAR showing the incision since 1906 and the steep gradient (knickpoint) near Goethe Park.



# Spawning and Rearing Habitat Projects

2016-17 site  
Sacramento Bar  
**BEFORE**



**Sacramento Bar Construction**

**AFTER**  
2.0 acres of new side channel  
2.5 acres floodplain  
4.3 acre riffle  
20,000 cubic yards spawning  
gravel



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**Sacramento Bar woody  
material placement**



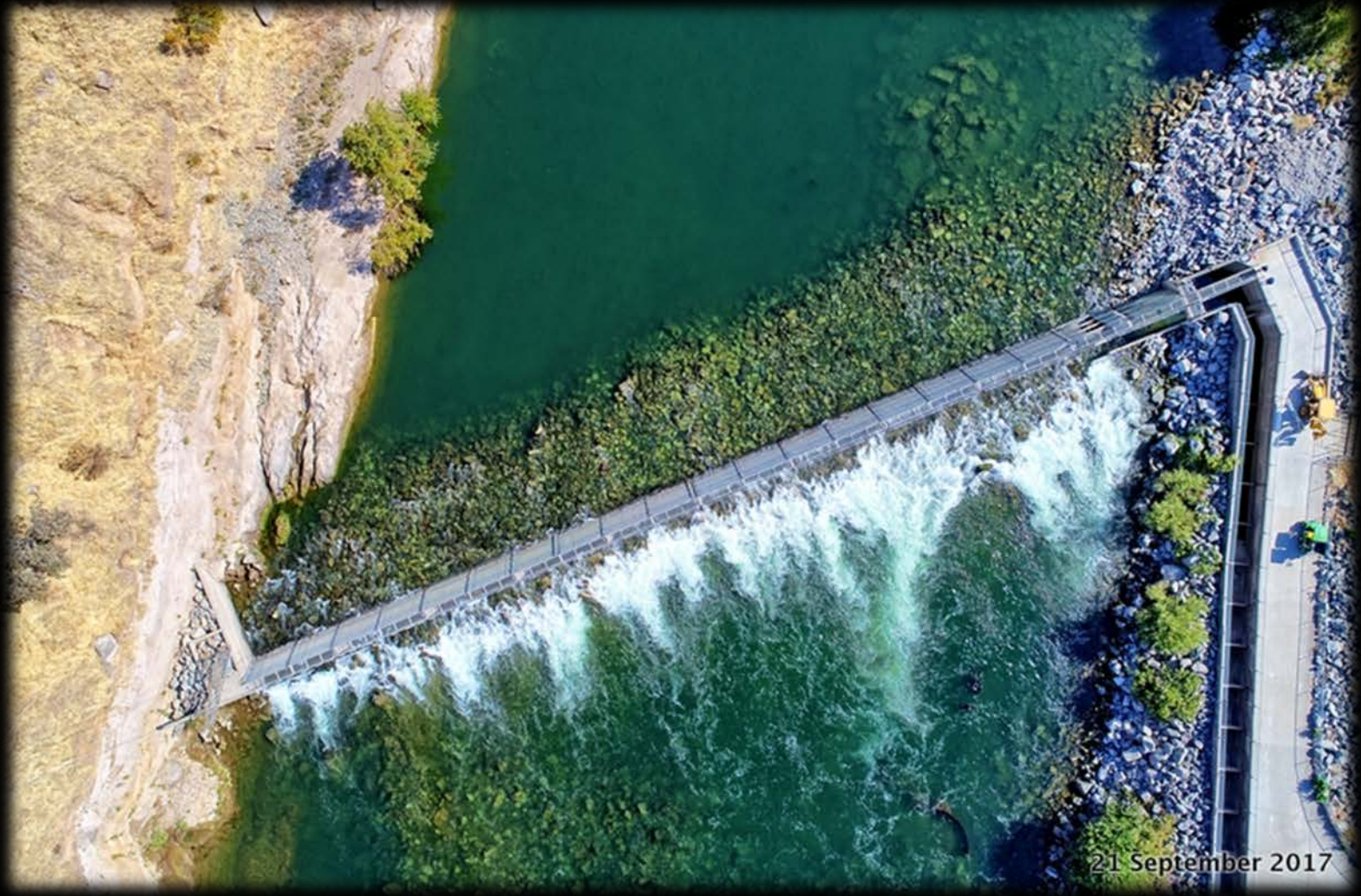
# Nimbus Basin – RM 23



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# Hatchery Weir, RM 22



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# Upper Sailor Bar – RM 22



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# Lower Sailor Bar – RM 21



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# Upper Sunrise - RM 21



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# Upper Sunrise Side Channel – RM 21



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# Lower Sunrise – RM 20

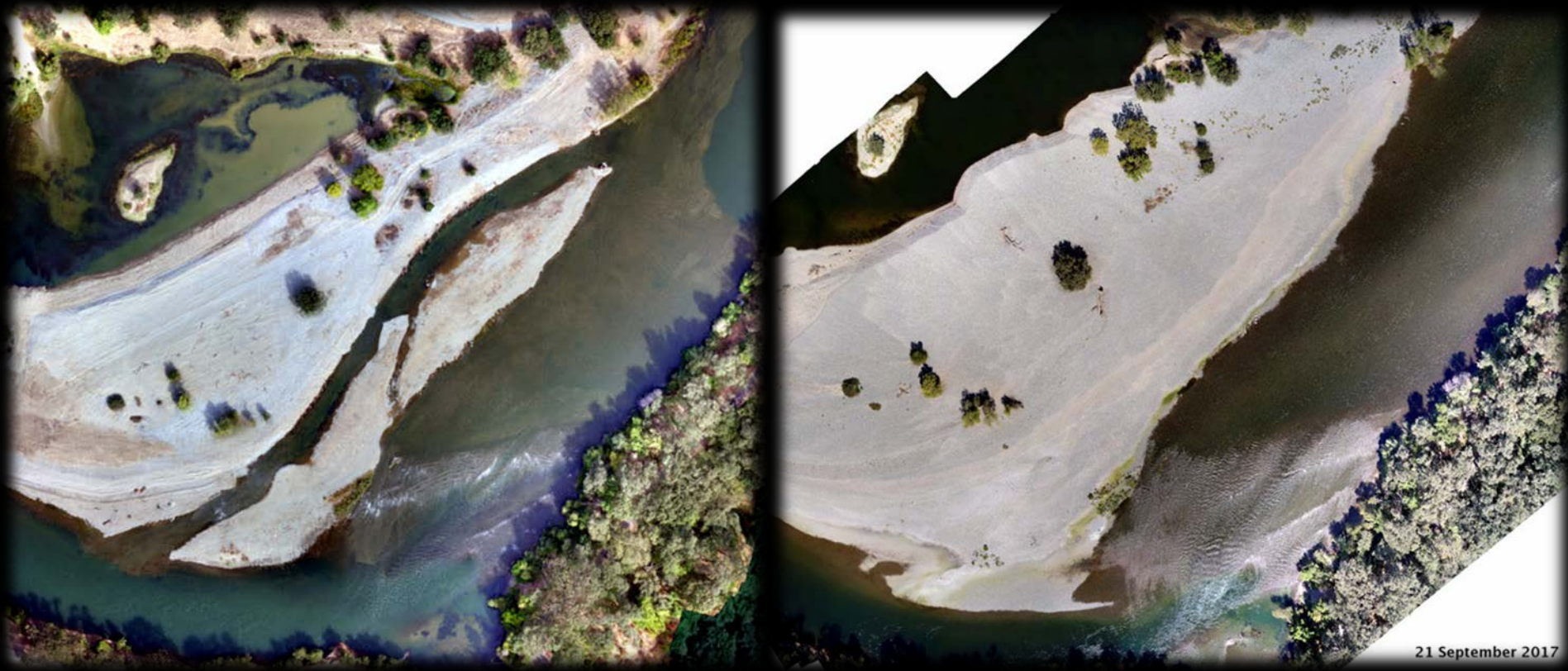


21 September 2017

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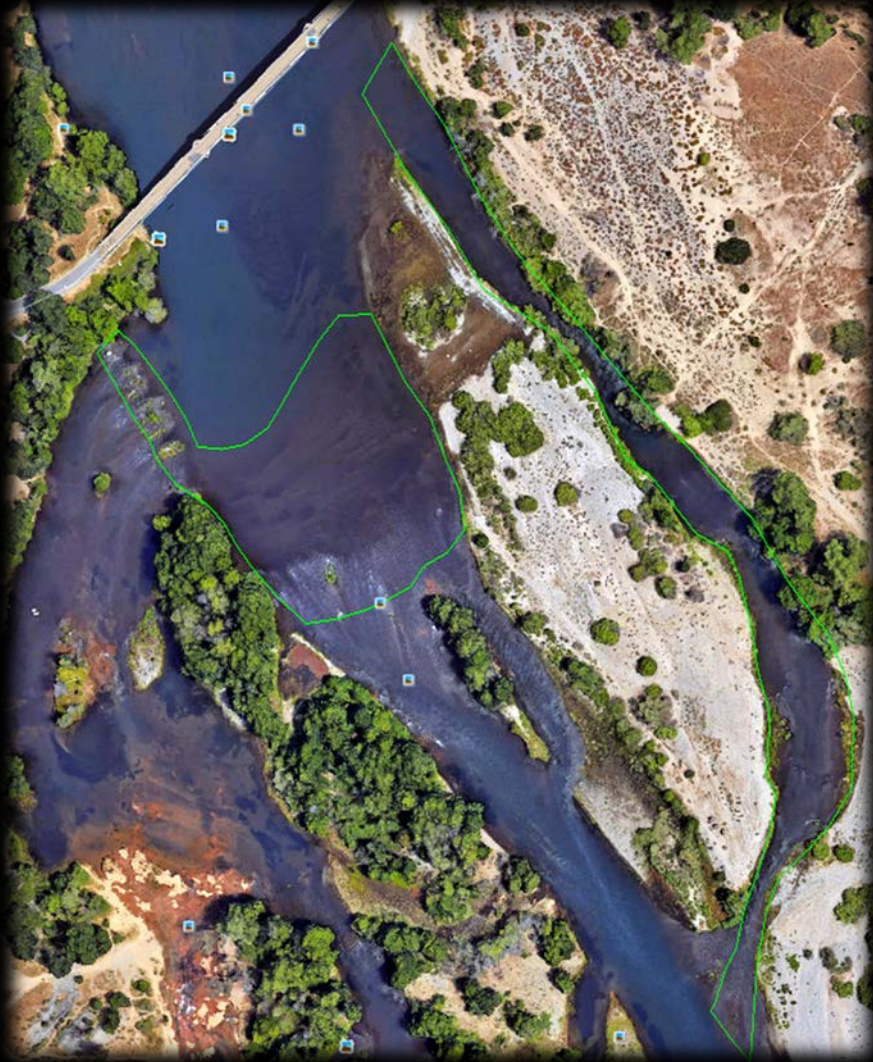
# Sacramento Bar – RM 19



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# River Bend – RM 15



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# Above Watt – RM 10



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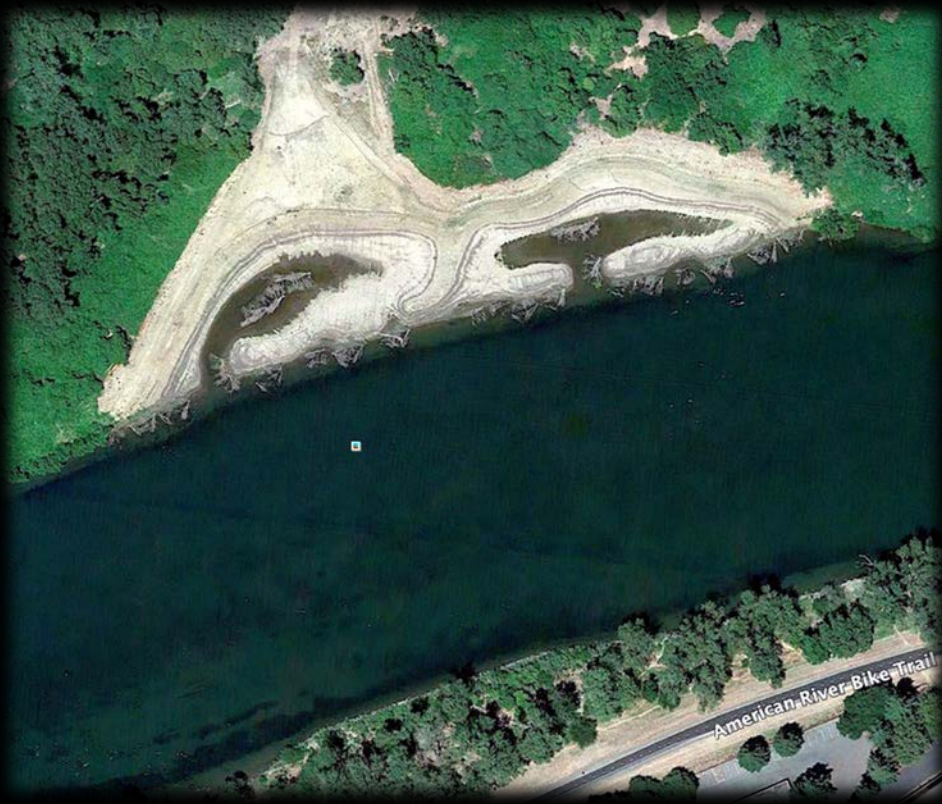
# Highway 160 – RM 2



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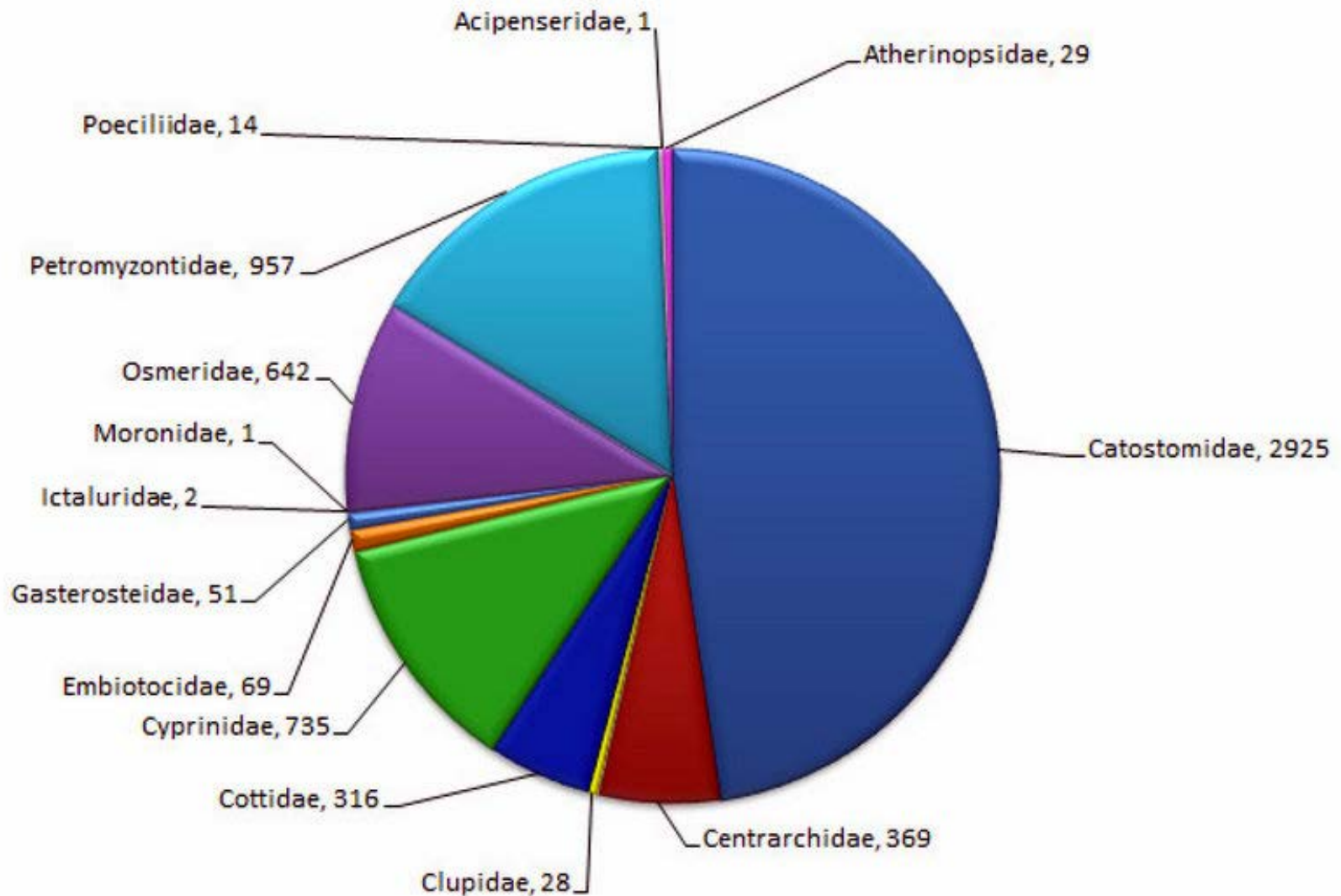


# Discovery Park - RM 0.5



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# Non-salmonids from RST



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