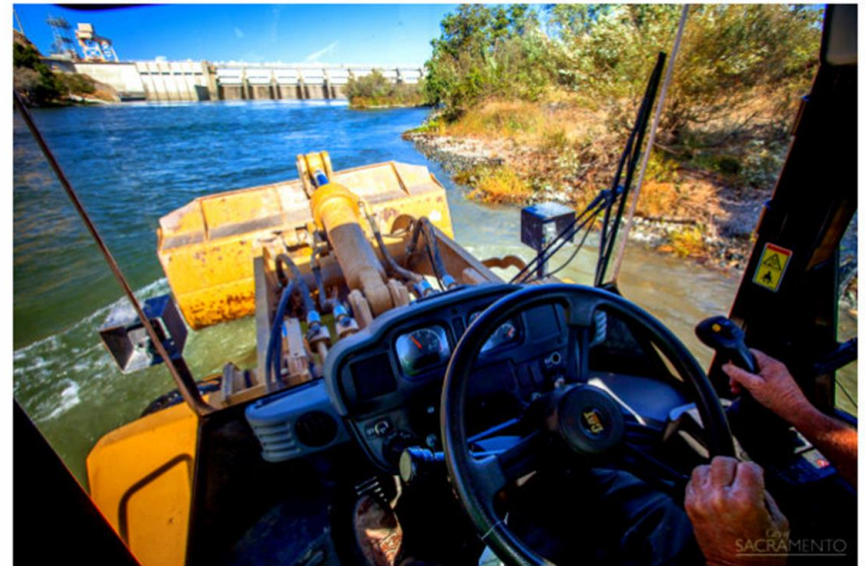


Collaboratively Improving Salmonid Habitats in the American River



Sacramento Utilities provides Big Trucks for Baby Fish

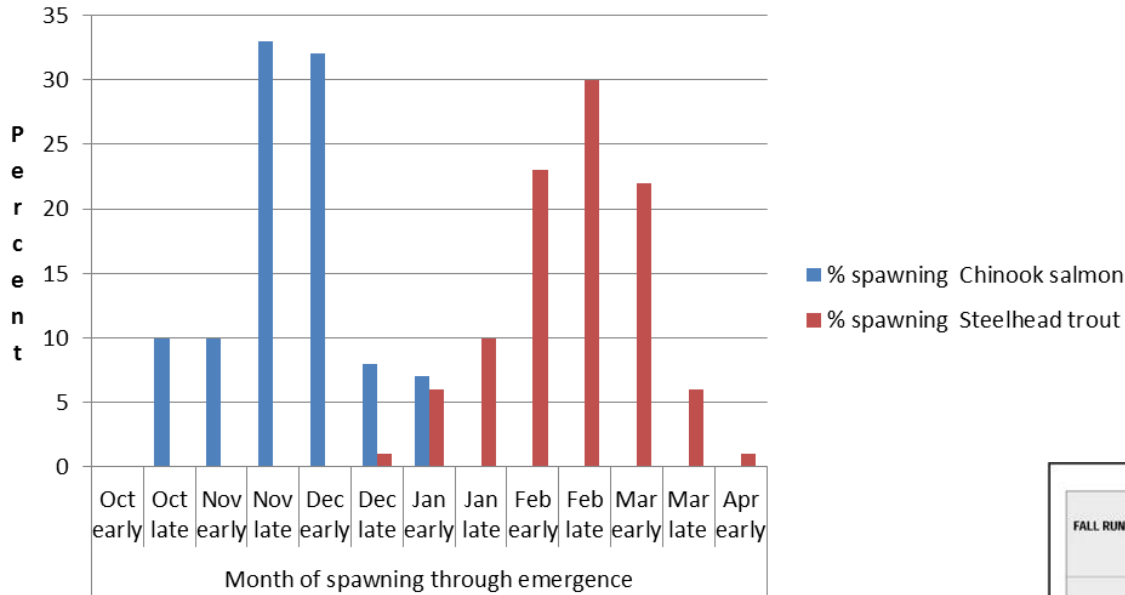
© Posted on August 27, 2014 by City of Sacramento



John Hannon, US Bureau of Reclamation
Sacramento Environmental Commission
July 15, 2019

First some biology...

Lower American River Average Spawning timing



Sacramento River Spawn Timing

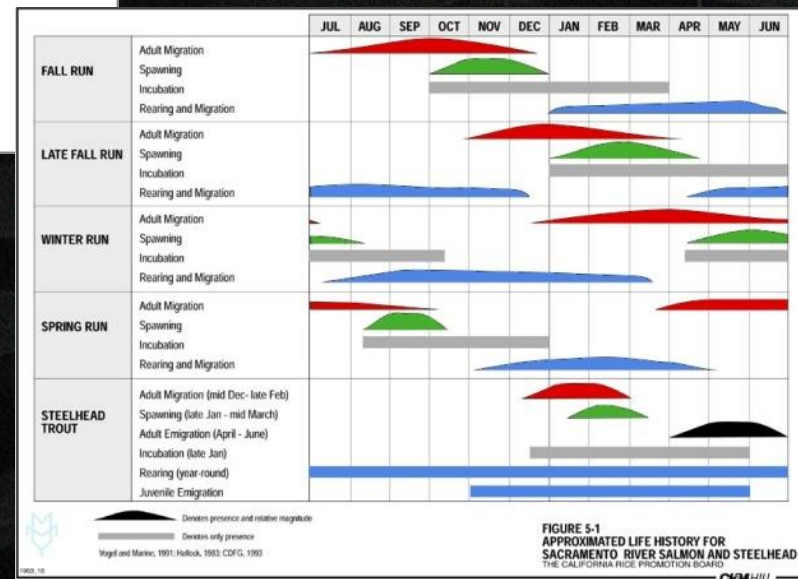
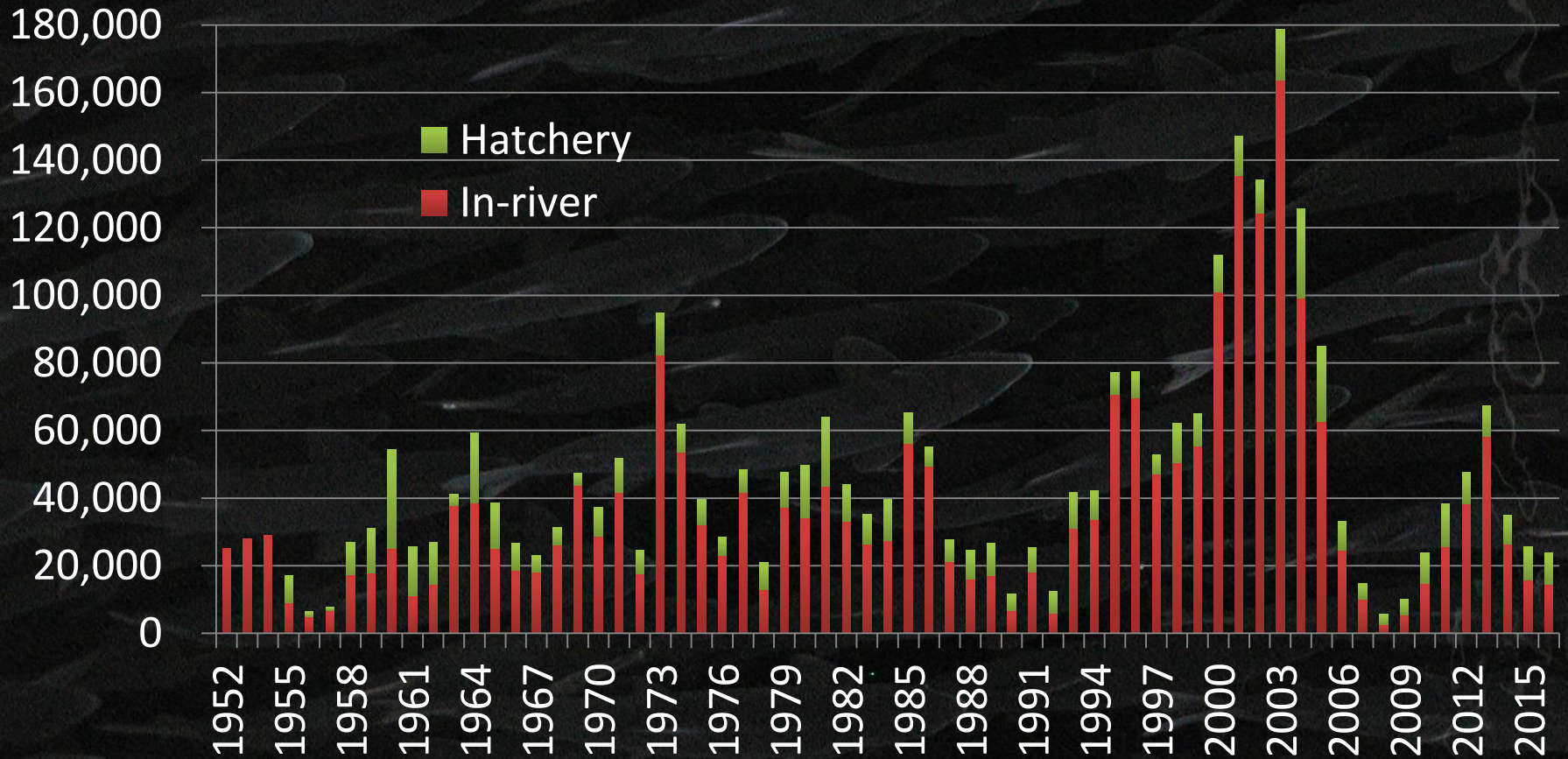


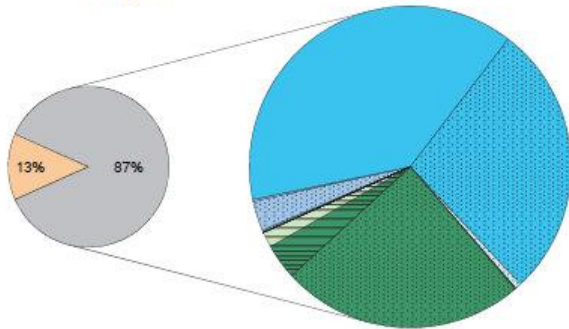
FIGURE 5-1 APPROXIMATED LIFE HISTORY FOR SACRAMENTO RIVER SALMON AND STEELHEAD THE CALIFORNIA RICE PROMOTION BOARD

American River Chinook Salmon Escapement

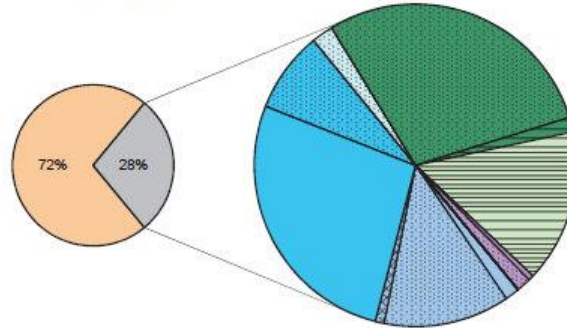


American River Chinook Escapement Natural and Hatchery Proportions

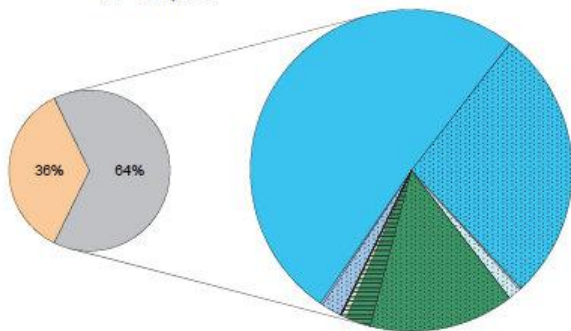
Nimbus Hatchery fall
n = 8,343



Nimbus Hatchery weir
n = 1,972



American River fall carcass
n = 24,503



2014

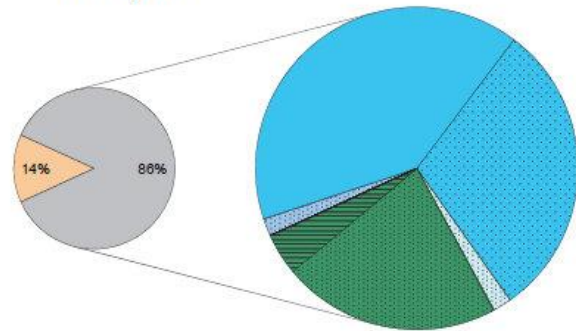


From Melodie
Palmer-Zwahlen
And Brett Kormos

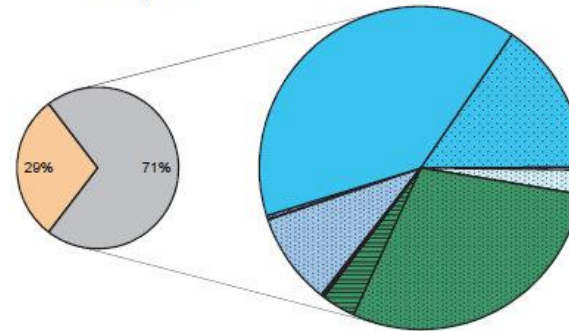
Figure 9. Proportion of hatchery- and natural-origin fish in the American River Basin, 2014.

American River Chinook Escapement Natural and Hatchery Proportions

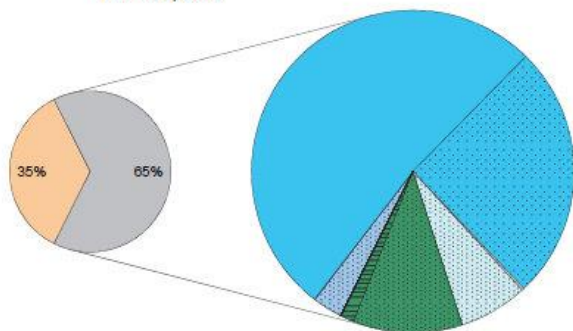
Nimbus Hatchery fall
n = 9,076



Nimbus Hatchery weir
n = 3,969



American River fall carcass
n = 54,259



2013

From Melodie
Palmer-Zwahlen
And Brett Kormos



Figure 9. Proportion of hatchery- and natural-origin fish in the American River Basin, 2013.

American River Chinook Escapement Natural and Hatchery Proportions

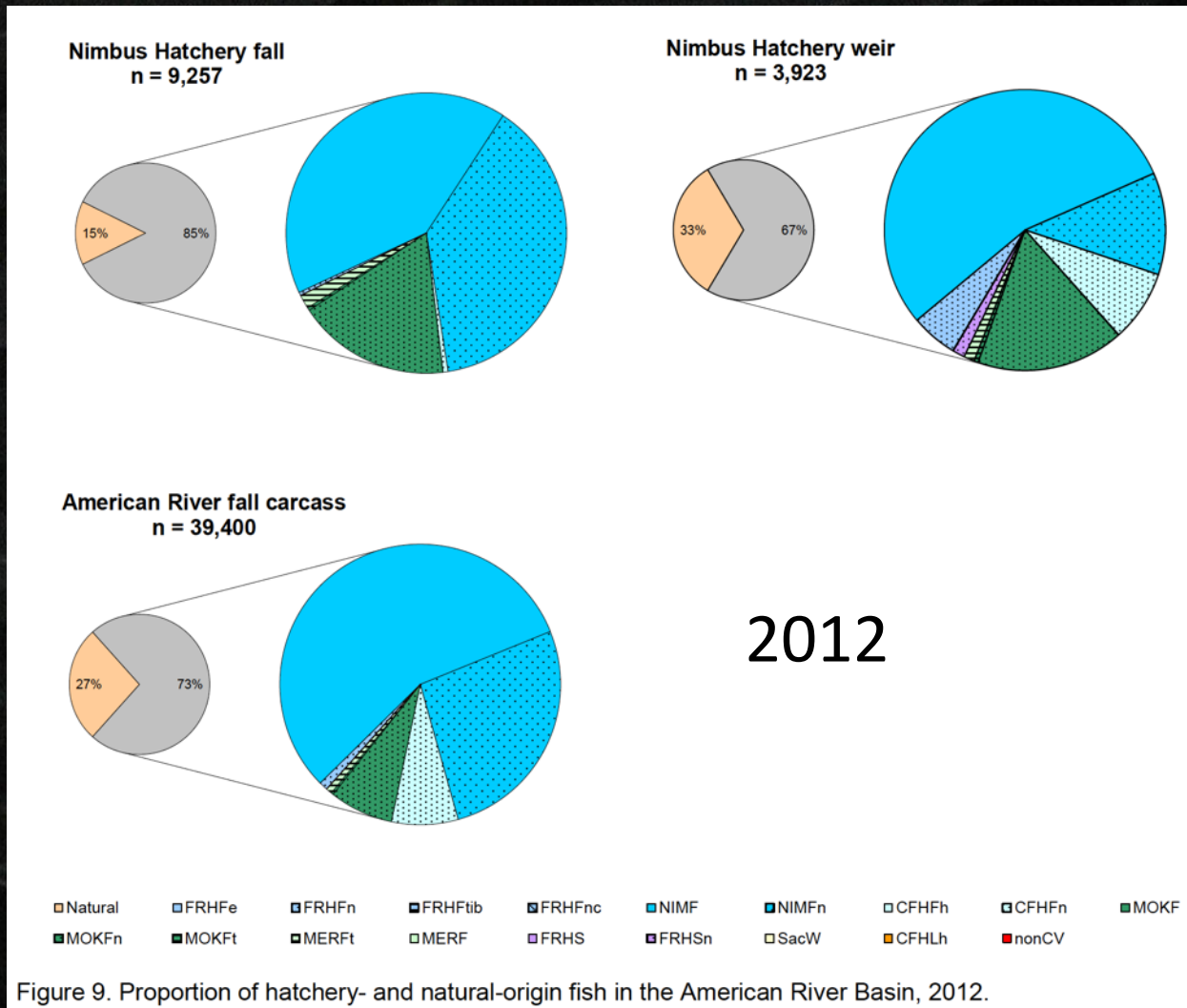
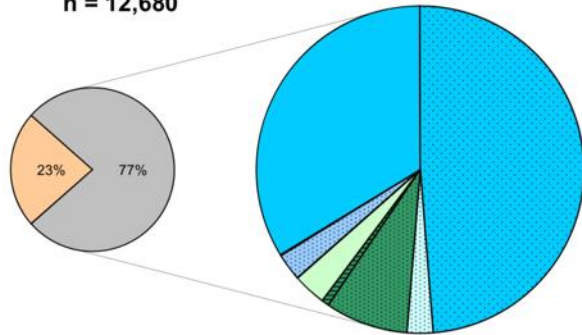


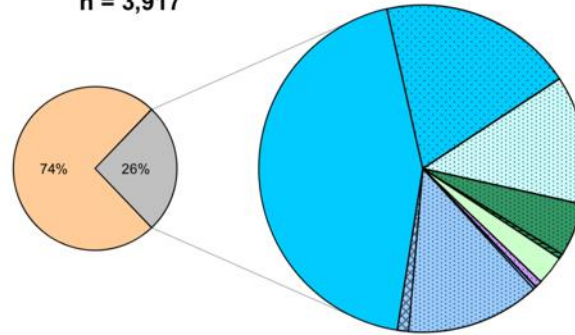
Figure 9. Proportion of hatchery- and natural-origin fish in the American River Basin, 2012.

American River Chinook Escapement Natural and Hatchery Proportions

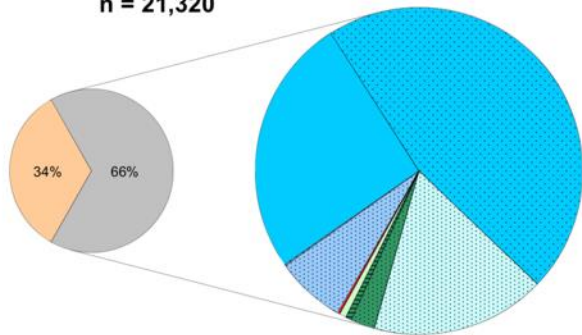
Nimbus Hatchery fall
n = 12,680



Nimbus Hatchery weir
n = 3,917



American River fall carcass
n = 21,320



2011

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

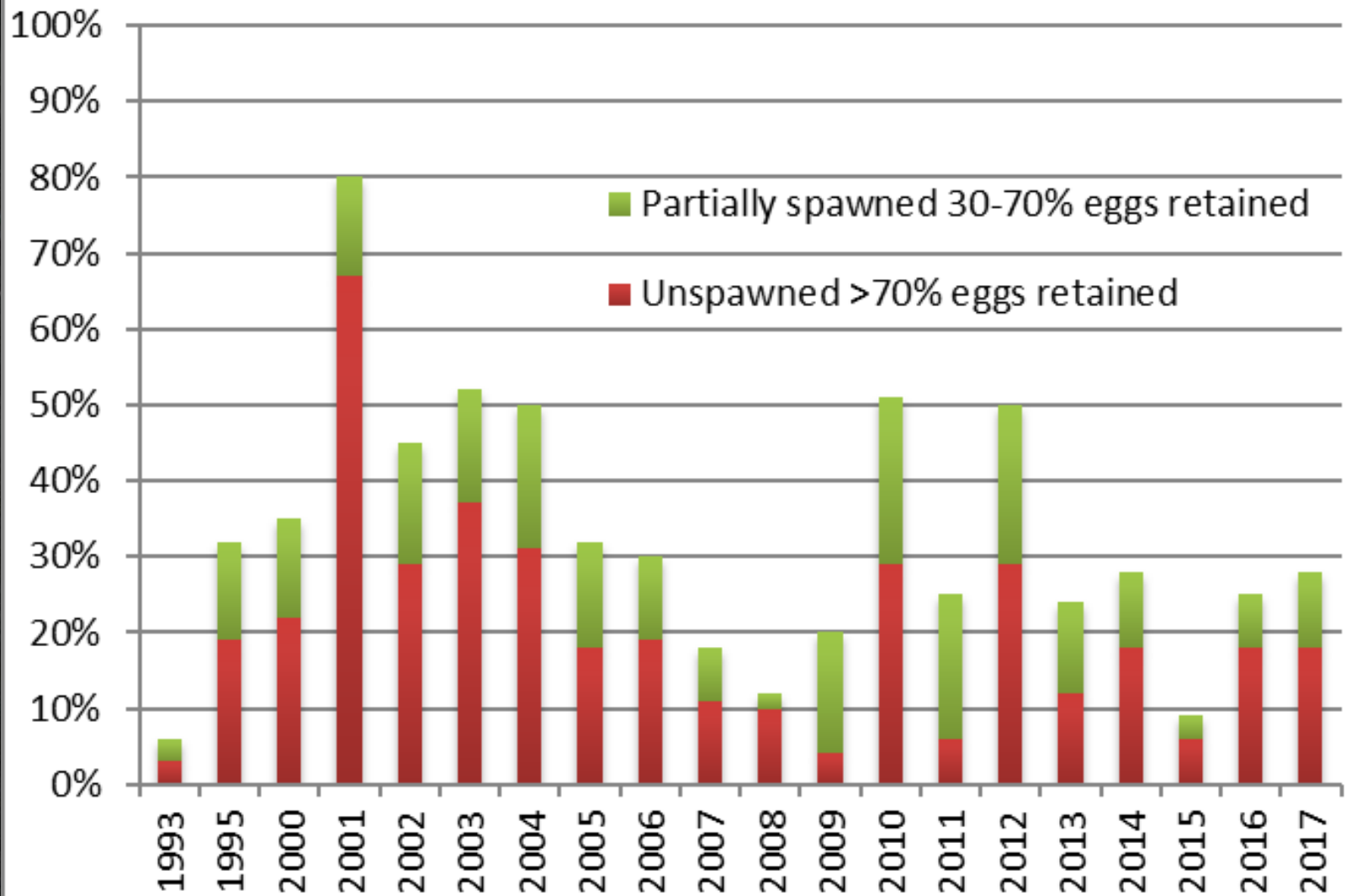
Table 2. Comparison of Chinook Salmon harvest by management zone in the 2016 Sacramento River sport fishery with associated in-river escapement (including hatchery returns and weir counts, as applicable). Exploitation rate as a percentage = (harvest/total of harvest and escapement) × 100

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



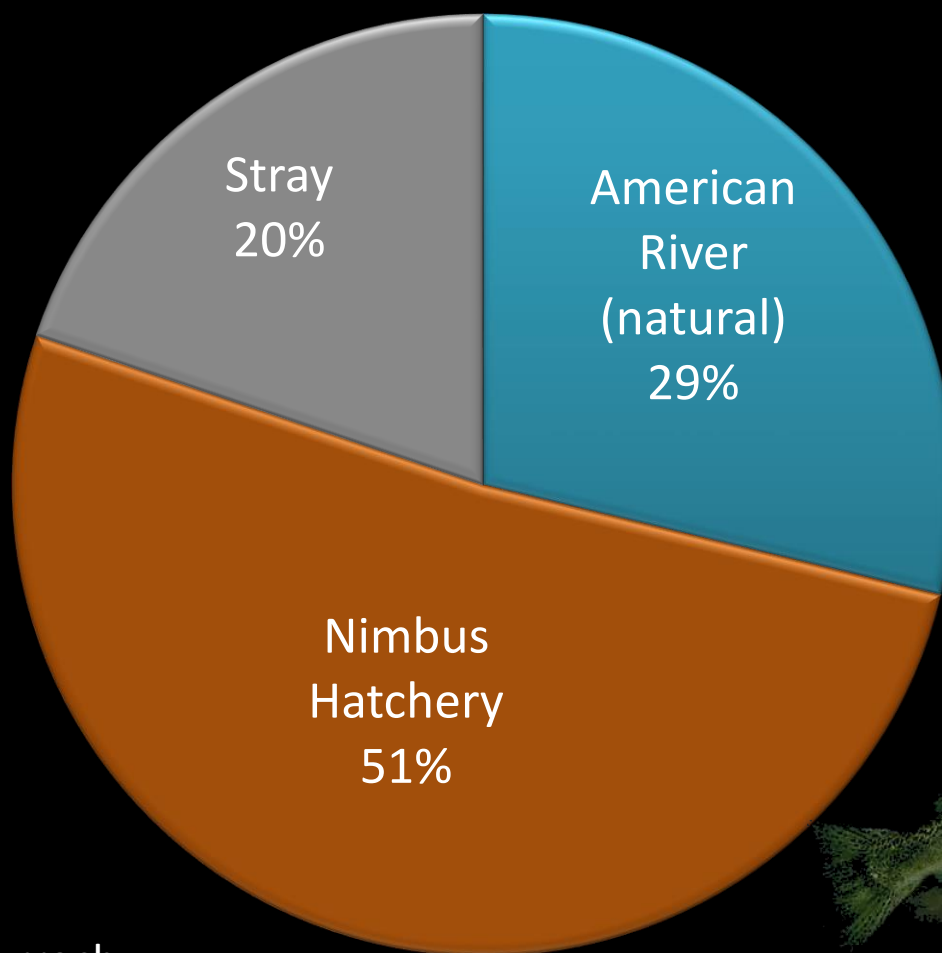
From Rob Titus
Central Valley Angler Survey

American River Chinook Egg Retention



Natal reconstructions (preliminary results from Otoliths)

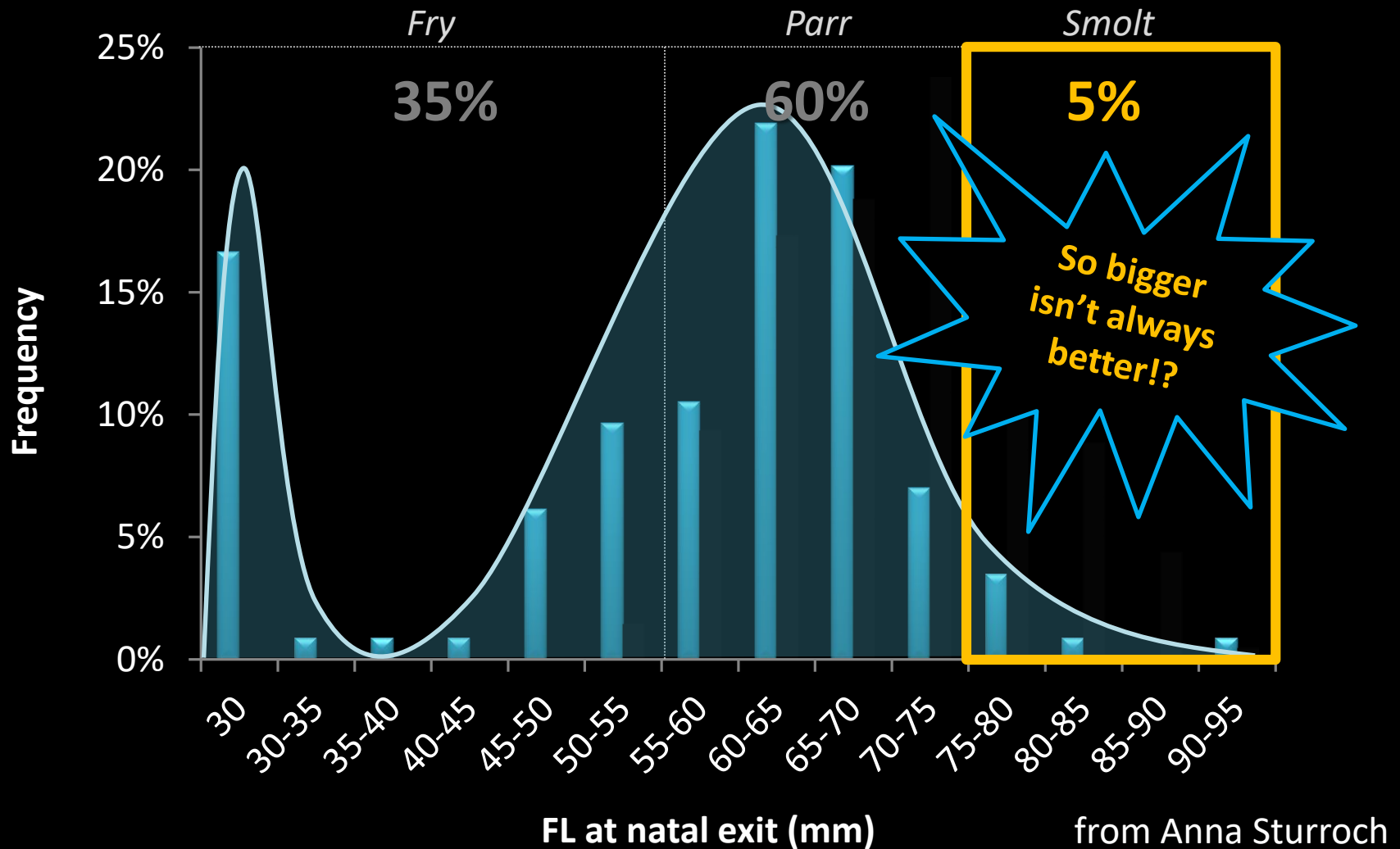
“Who” contributed to the escapement?



Slide from Anna Sturroch

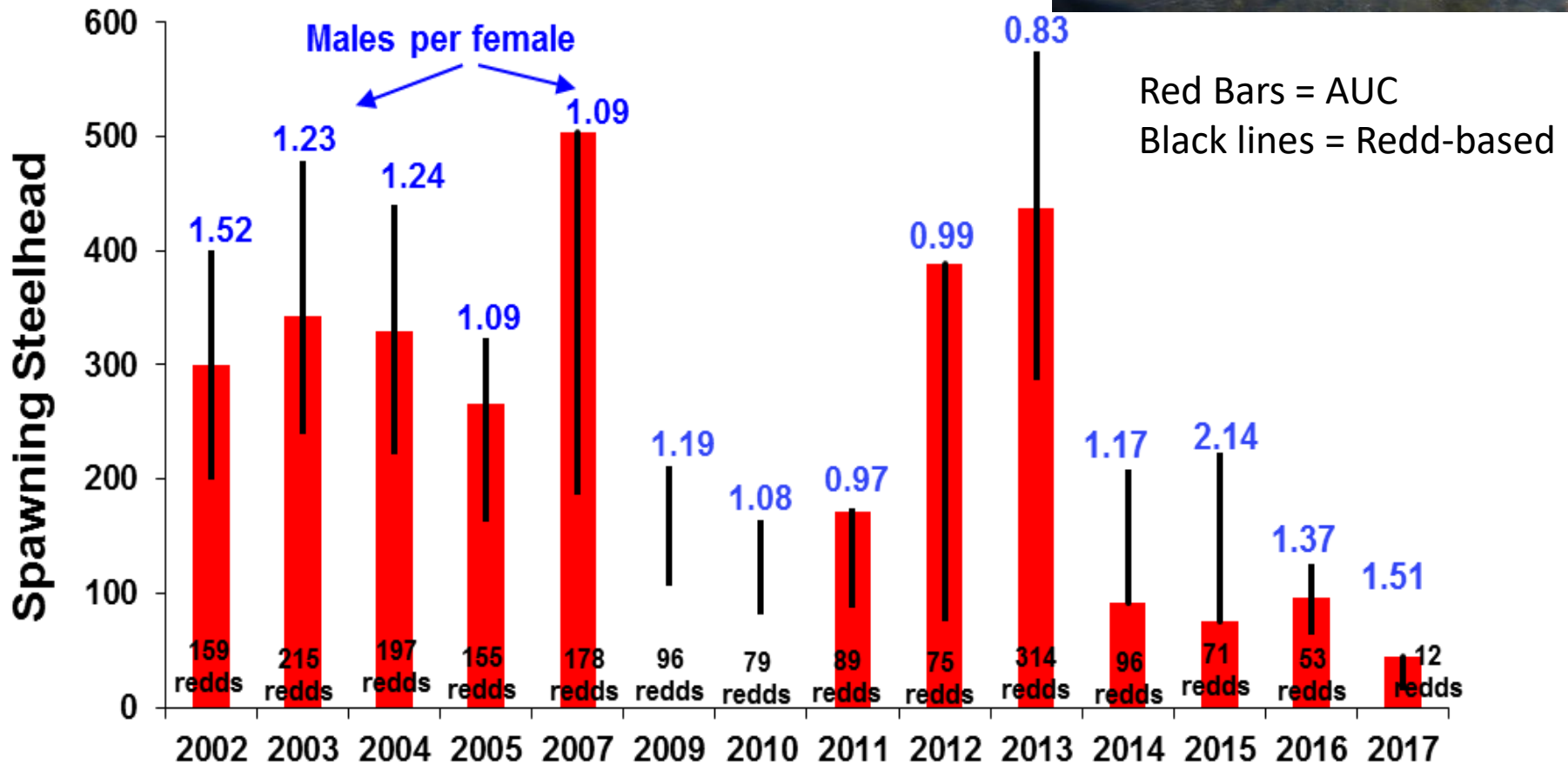
Movement reconstructions

Size at natal exit & phenotype contributions

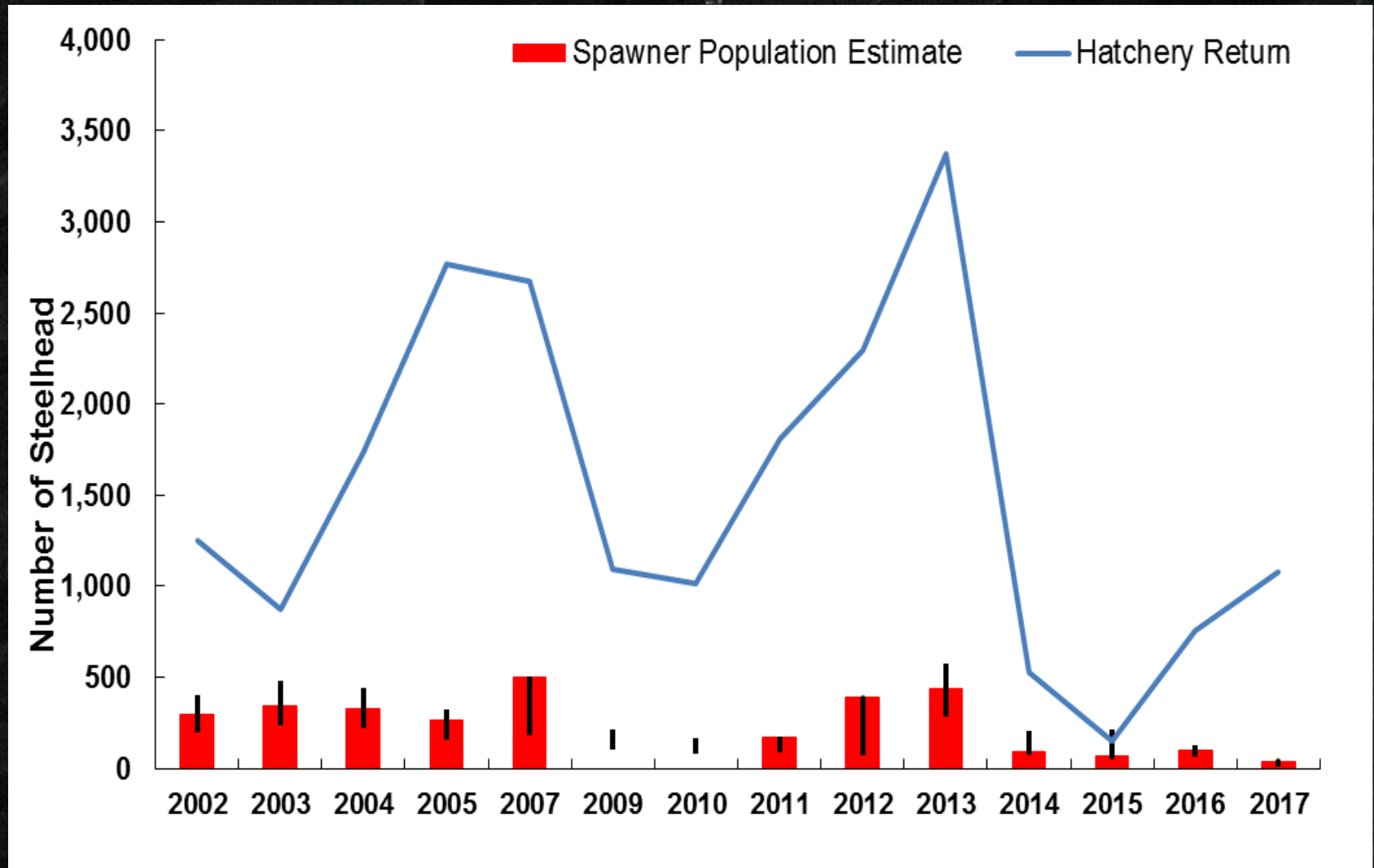


American River Steelhead

In-river spawning estimates



American River Steelhead In-river Spawners and Hatchery Return



Proportion of Steelhead Unclipped = naturally spawned

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

Upper American River Broodstock Study



Genetics Results

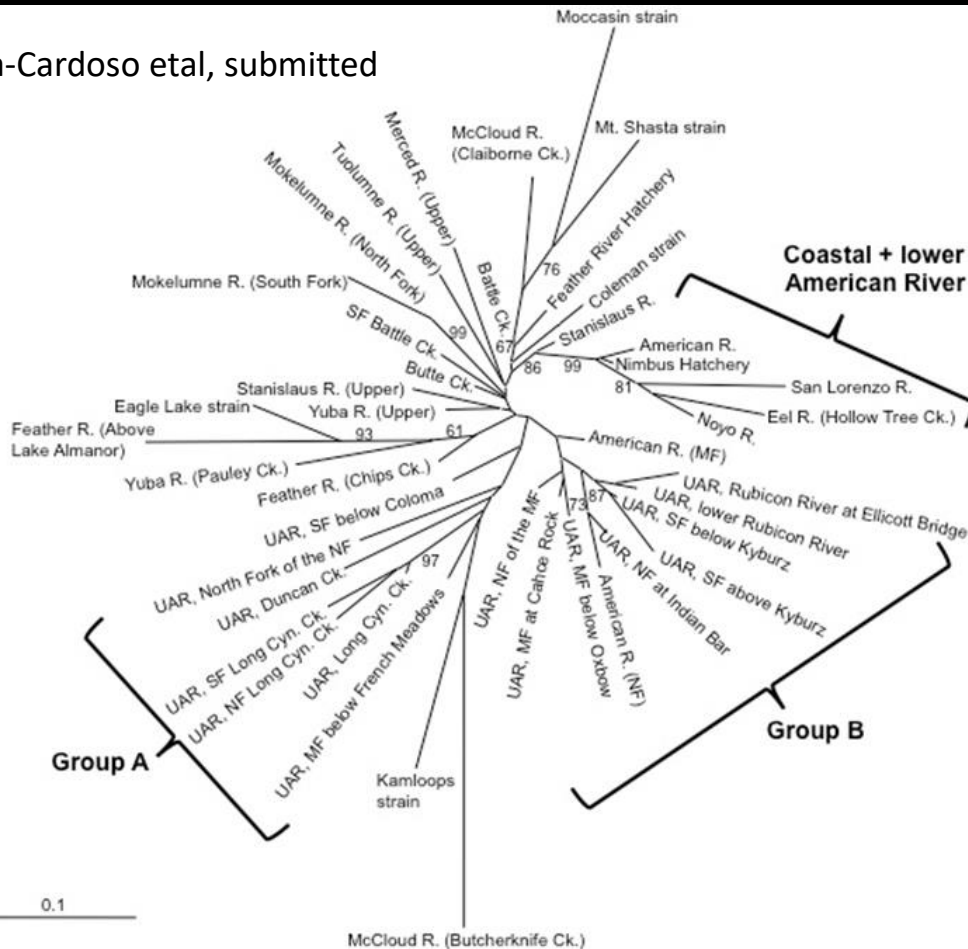
Genetics

Potential to express anadromy

Ancestry

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

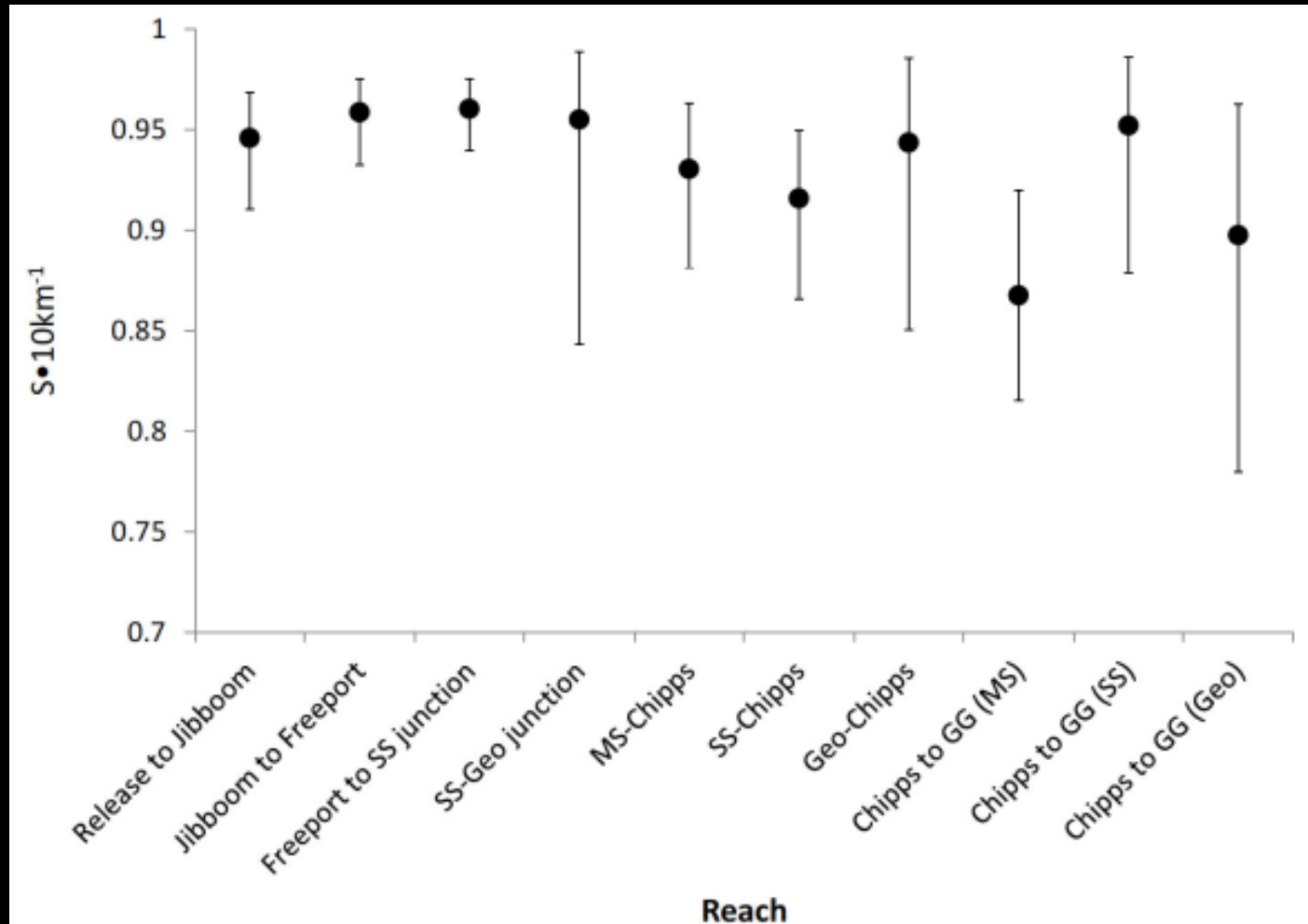
Abadia-Cardoso et al, submitted



Reach Specific Survival of Tagged Juvenile Steelhead Reared at Nimbus

Zeug et al 2016

Coleman and Nimbus Stocks Combined



Moving Forward

Assess Anadromy Potential

Smoltification Studies

Seawater Challenge

Silver Test



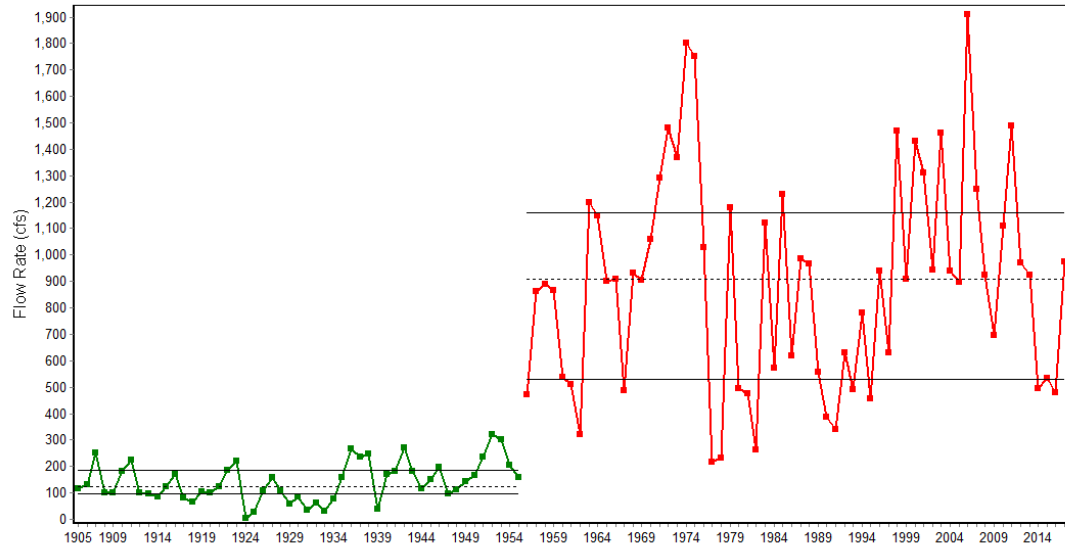
Outmigration Studies
and Monitor Return Rates

Acoustic Study

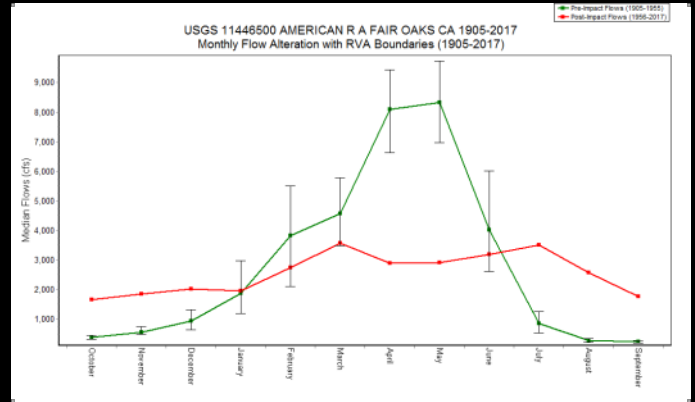
PIT Tag Study



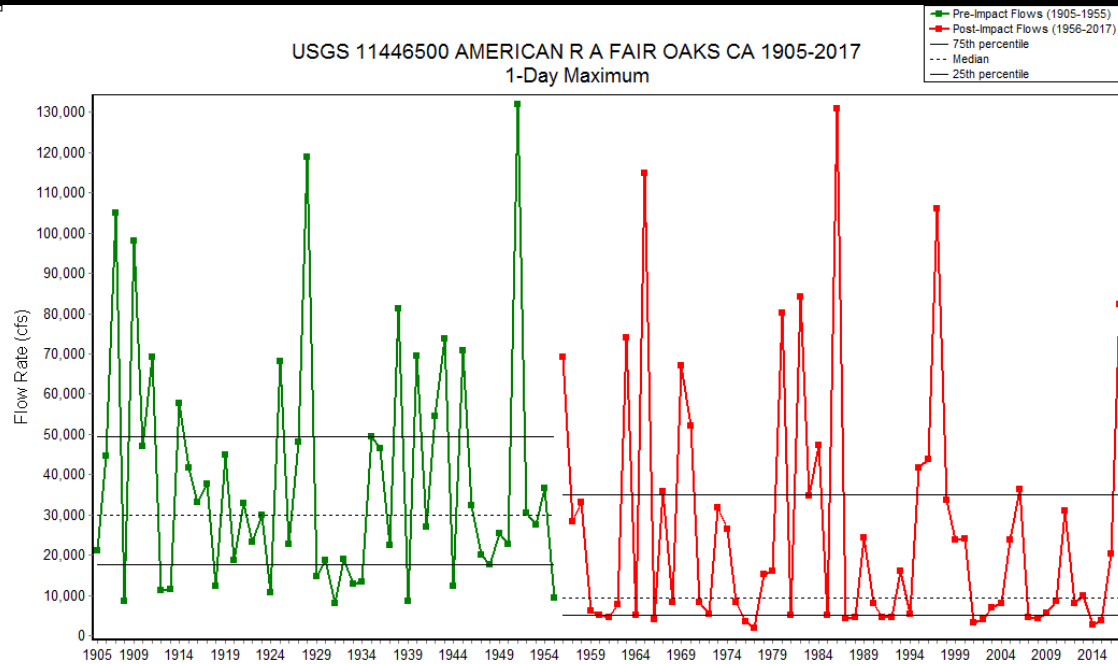
USGS 11446500 AMERICAN R A FAIR OAKS CA 1905-2017
1-Day Minimum



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

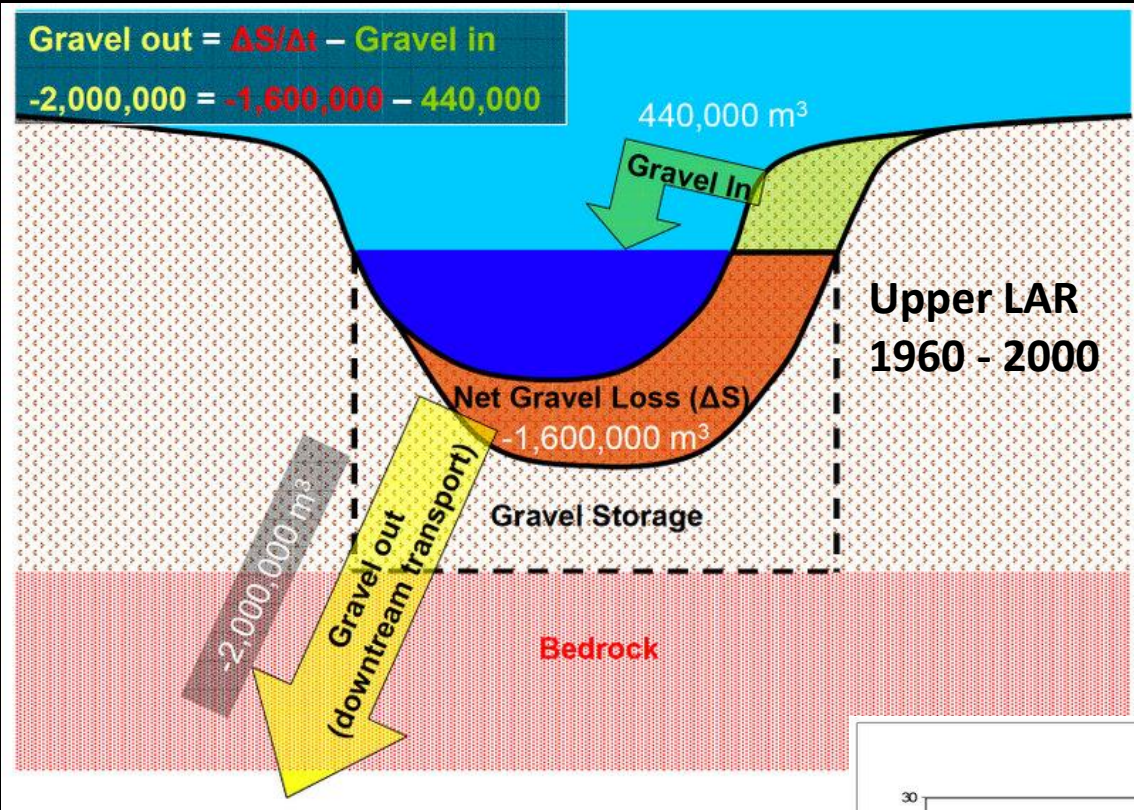


USGS 11446500 AMERICAN R A FAIR OAKS CA 1905-2017
1-Day Maximum



Gravel Budget for the LAR

Dave Fairman, 2007



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

Years	Gravel Volume Eroded (m ³)	Adjusted Gravel Volume Eroded (m ³)	Time (years)	Rate of Gravel Loss (m ³ /yr)	Adjusted Rate of Gravel Loss ¹ (m ³ /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

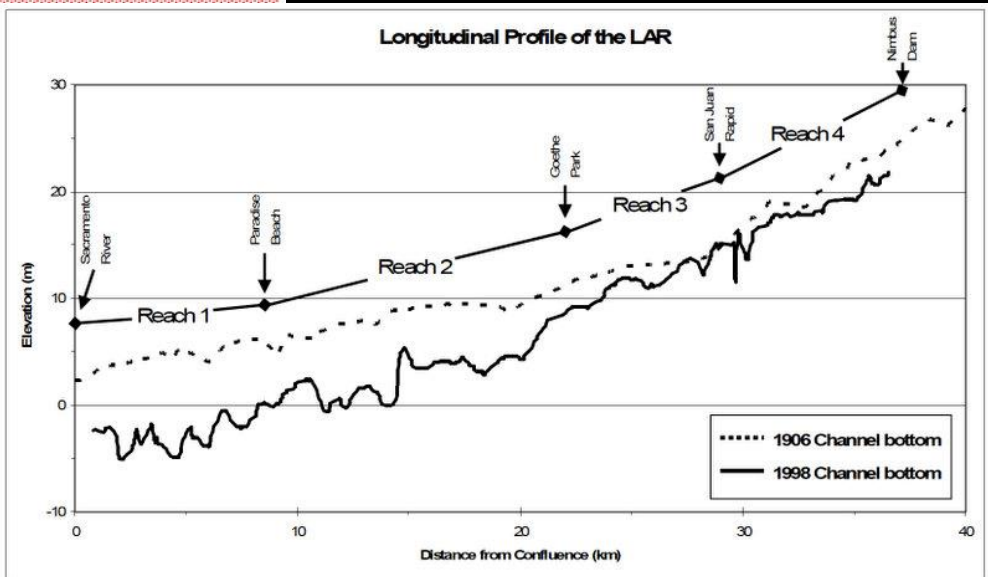


Figure 2-10 Longitudinal profile of the LAR showing the incision since 1906 and the steep gradient (knickpoint) near Goethe Park.



1947-8-5
 200 cfs in American
 5,300 cfs in Sacramento



2015-4-16
 500 cfs in American
 5,000 cfs in Sacramento

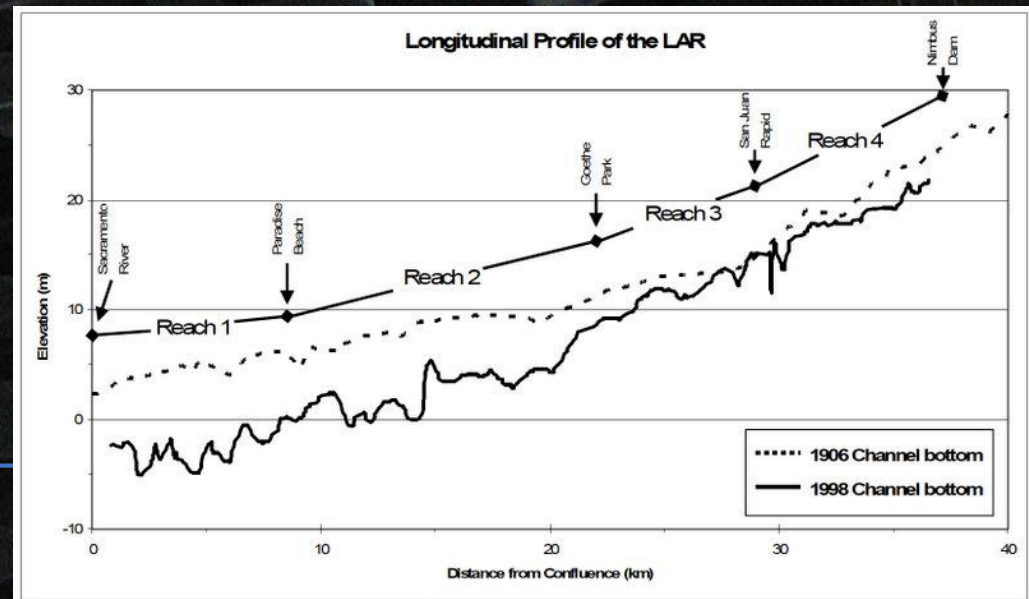


Figure 2-10 Longitudinal profile of the LAR showing the incision since 1906 and the steep gradient (knickpoint) near Goethe Park.

Why Gravel? The river is made of it

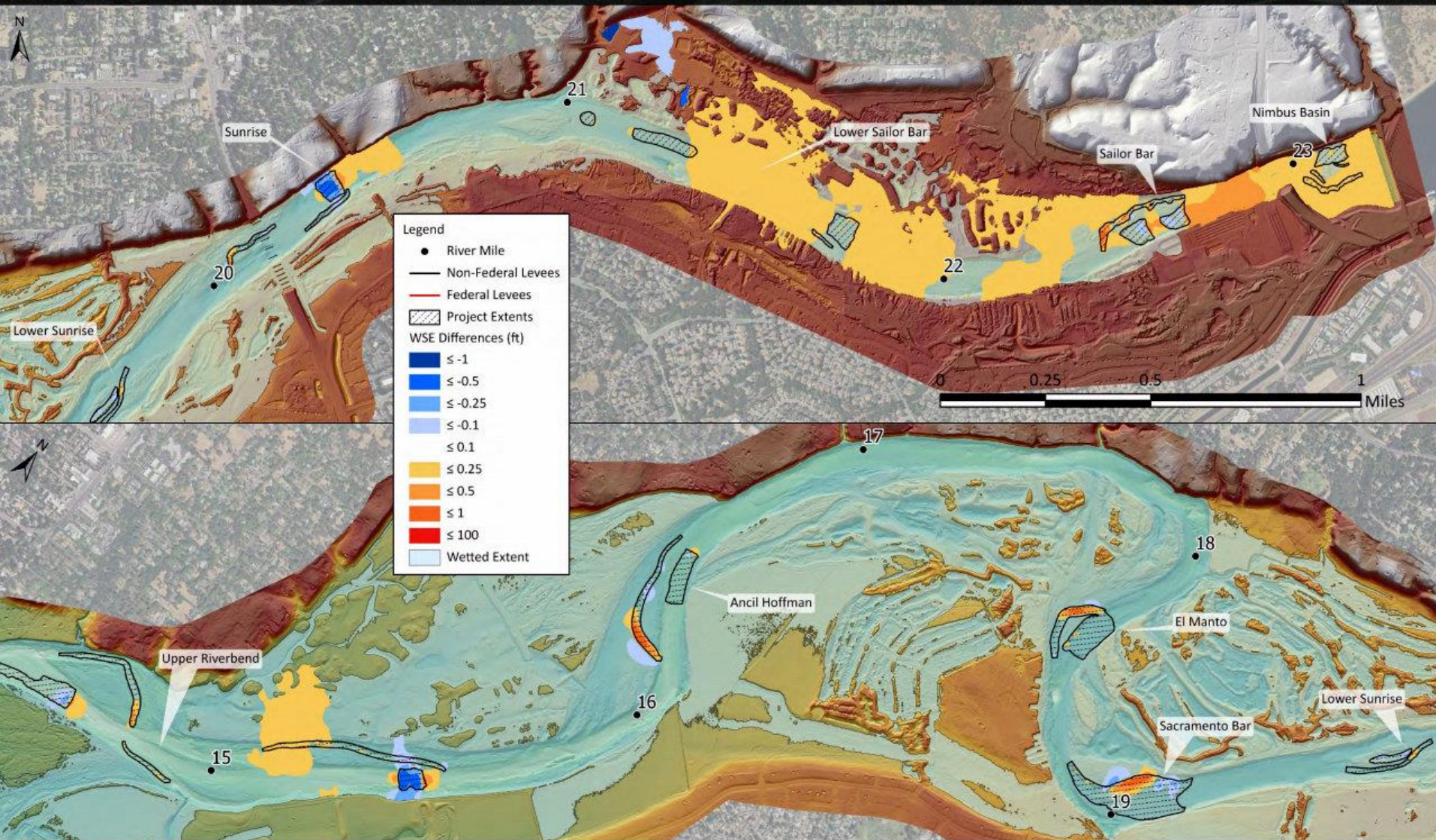
- Annual gravel deficit 90,000 tons (Singer and Dunne 2004)
- Provides
 - Spawning habitat
 - Rearing habitat
 - Habitat for aquatic insects
 - Food for salmonids and other species



Future Planned Habitat Project Sites



Water Surface Elevation Analysis



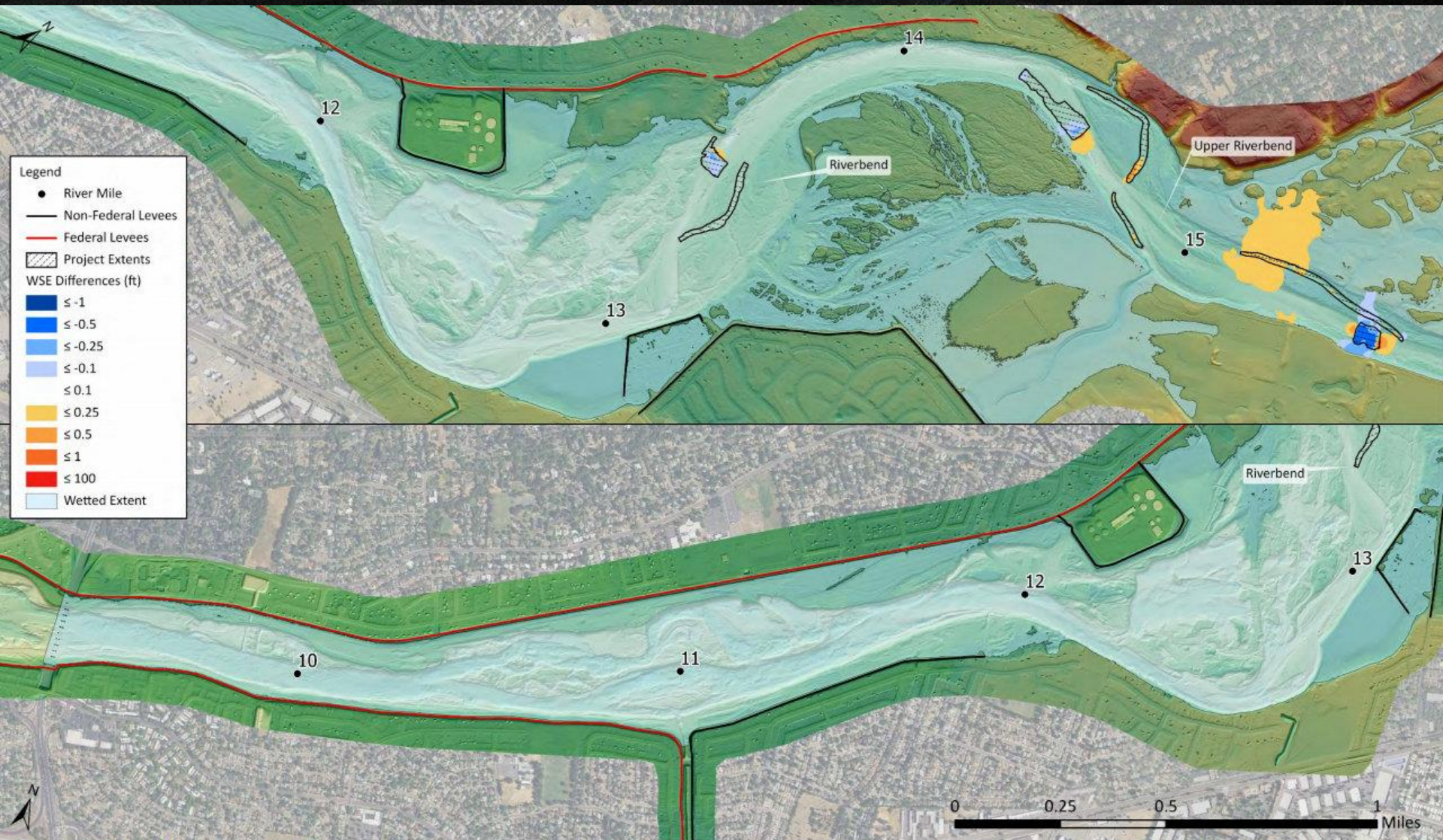
Notes: WSE differences between future grade (FG) and existing grade (EG) (FG WSE minus EG WSE)



Lower American River Salmonid Habitat Improvement Project

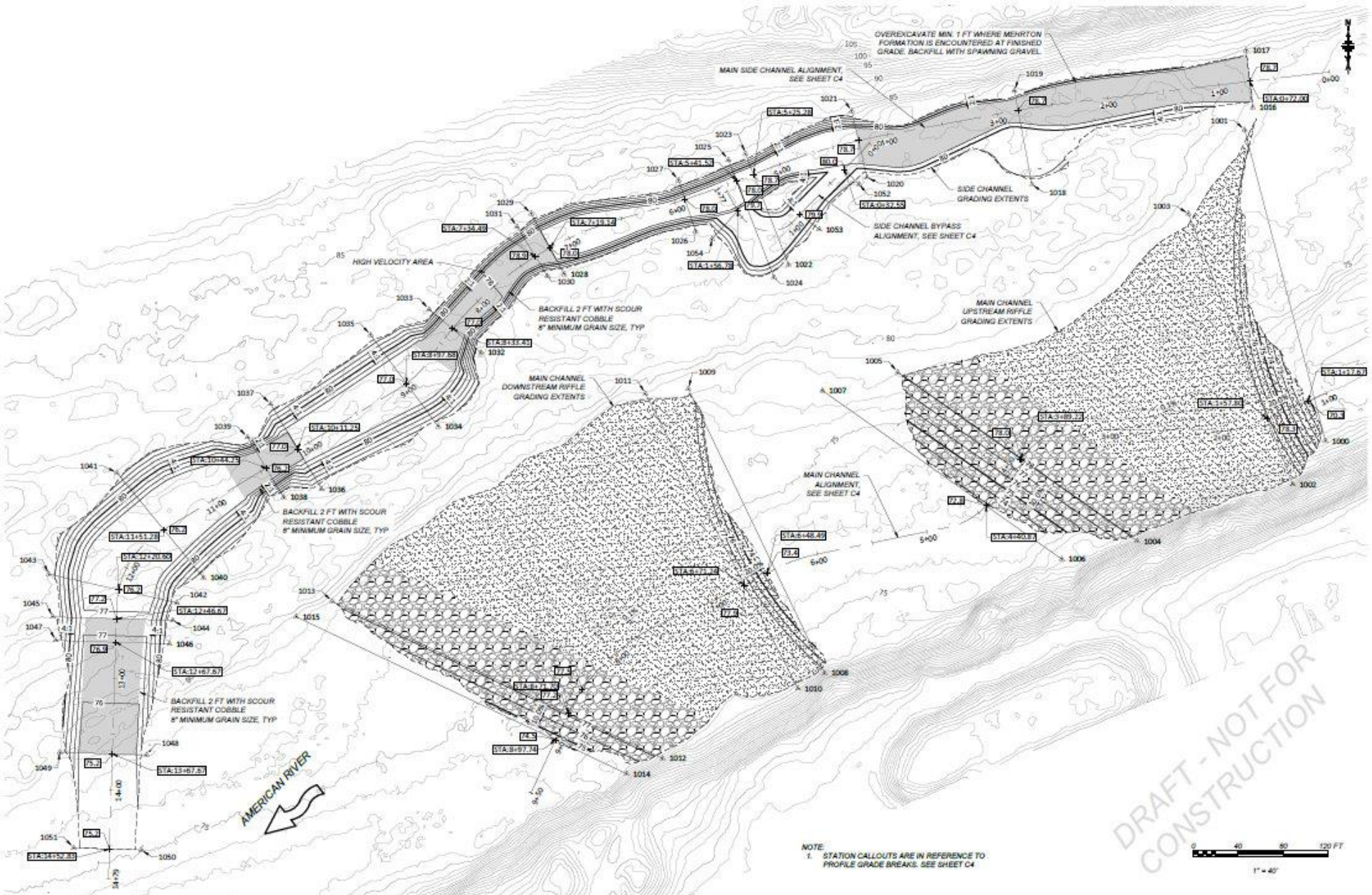
Upper FG vs. EG 160,000 cfs WSE

Water Surface Elevation Analysis



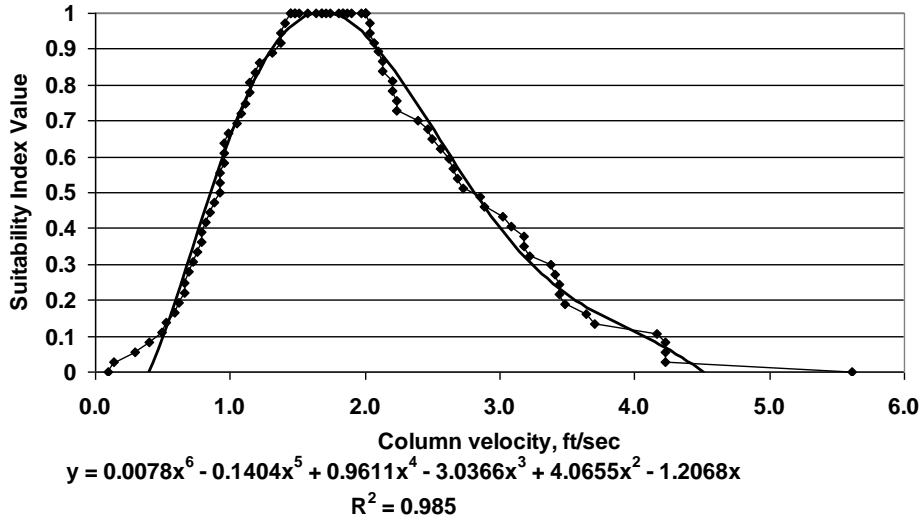
Notes: WSE differences between future grade (FG) and existing grade (EG) (FG WSE minus EG WSE)

2019 Project at Upper Sailor Bar



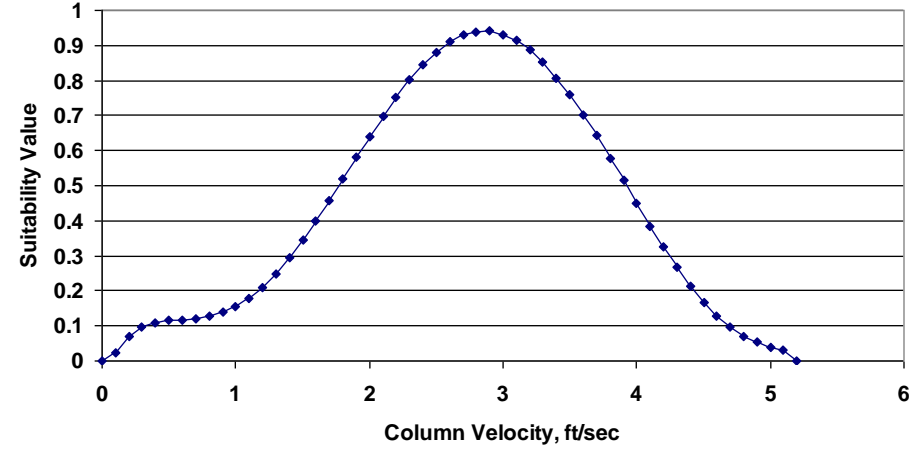
Steelhead Suitability Indices

American River Steelhead Spawning Column Velocity Suitability Index

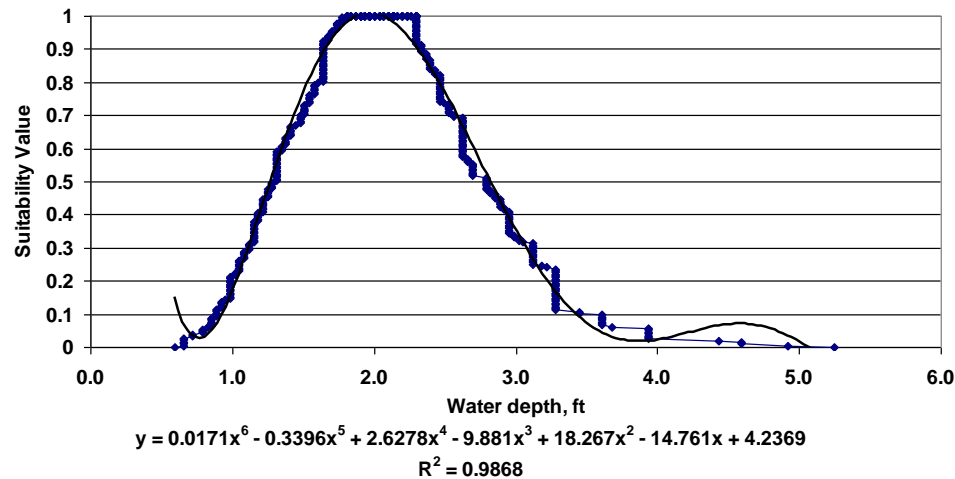


Chinook Suitability Indices

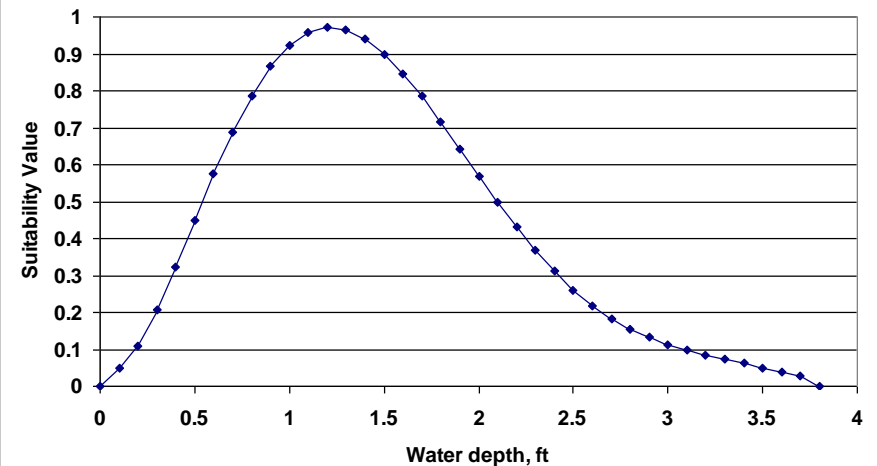
Chinook Spawning Velocity Suitability Values (Mokelumne)



American River Steelhead Water Depth Spawning HSI

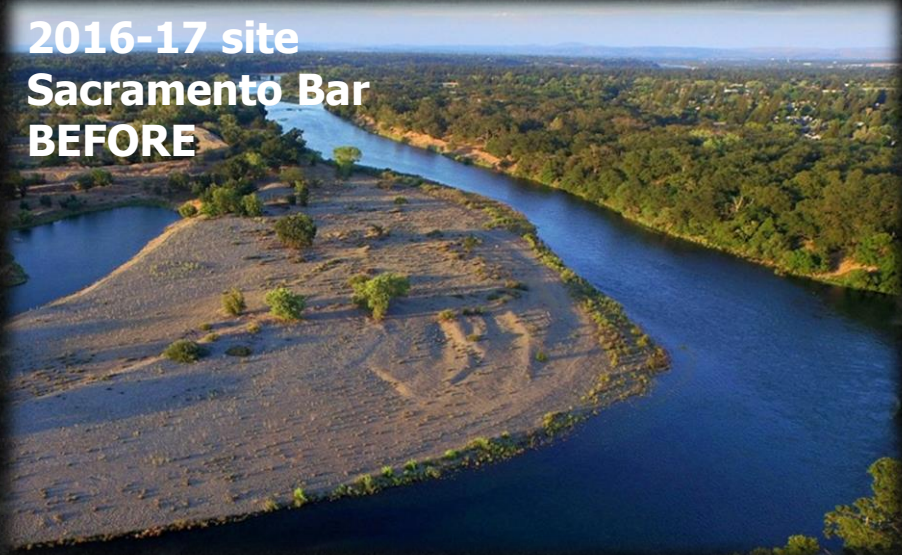


Chinook Spawning Depth Suitability Index (Mokelumne)



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



**Sacramento Bar woody
material placement**

Nimbus Basin – RM 23



Hatchery Weir, RM 22



21 September 2017



Upper Sunrise Side Channel (American River)

**Goal: provide habitat
at all flows (steelhead)**

**Fill main channel
to rewater side channel**





Upper Sunrise Side Channel



Upper Sunrise Side Channel Completed
2.2 acres wetted area
1.8 acres spawning, 0.7 acre rearing

American River, Mile 21, Upper Sunrise

Before

Side channel rewatered by adding large gravel in incised area of channel

Spawning Gravel, island, and woody material added

After



Upper Sunrise Side Channel – RM 21



Lessons Learned

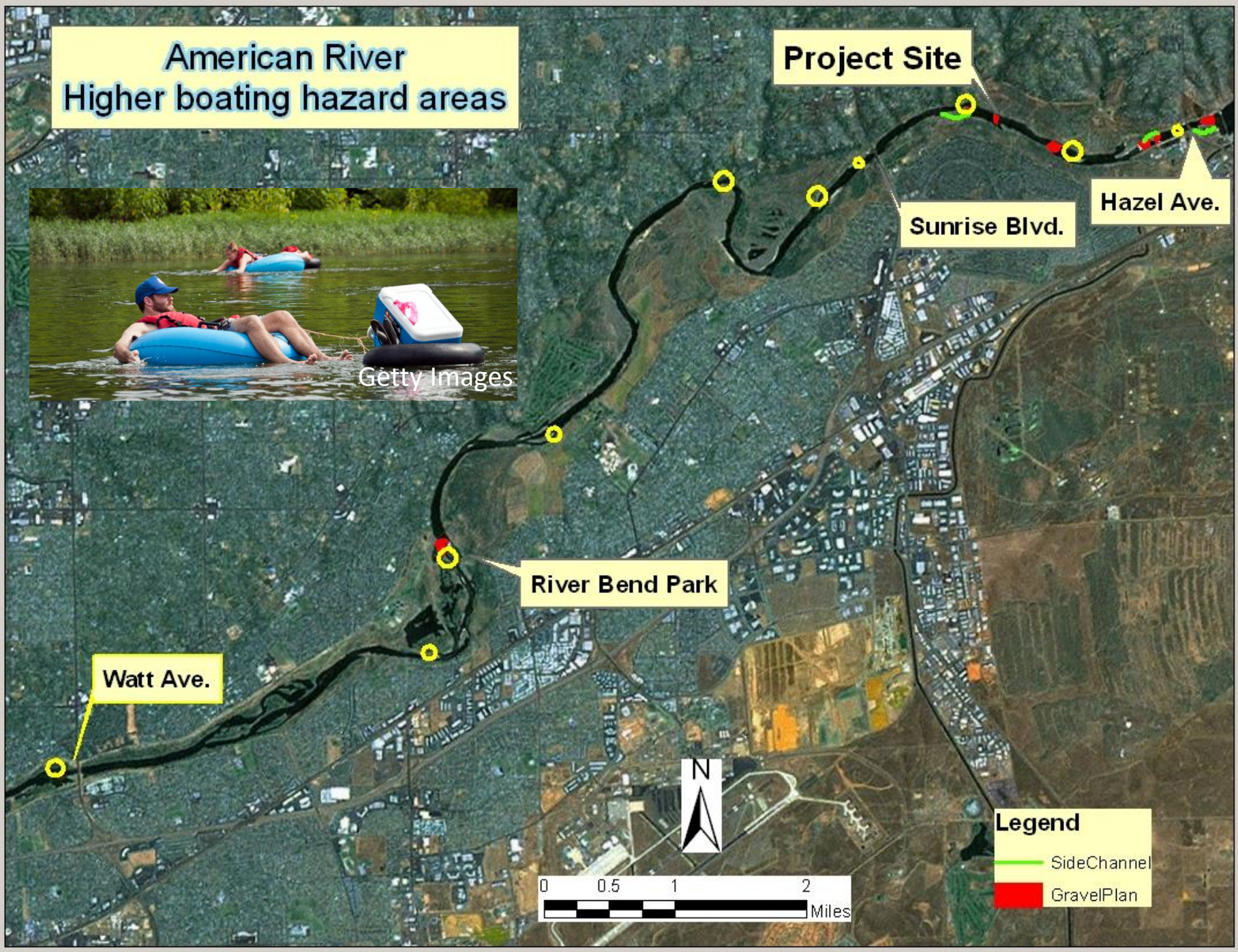
- Keep trying
- Keep the plants
 - New ones get eaten
- Boater's chute



- Keep it safe for the public



American River Higher boating hazard areas



Project Site

Sunrise Blvd.

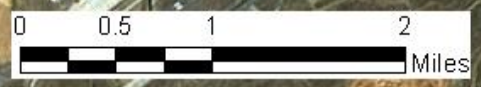
Hazel Ave.

River Bend Park

Watt Ave.

Legend

- SideChannel
- GravelPlan





20170210

Lessons Learned

- Acceptance of larger wood
- High percolation thru gravel bar
- Air quality monitors

POLICY AND PROCEDURAL GUIDANCE FOR
PROCESSING REQUESTS TO ALTER US ARMY
CORPS OF ENGINEERS CIVIL WORKS PROJECTS
PURSUANT TO 33 USC 408



Sacramento Bar – RM 19

2016



2017



21 September 2017

Lower Sailor Bar Side Channel



20150410



20150410

Lower Sailor Bar – RM 21

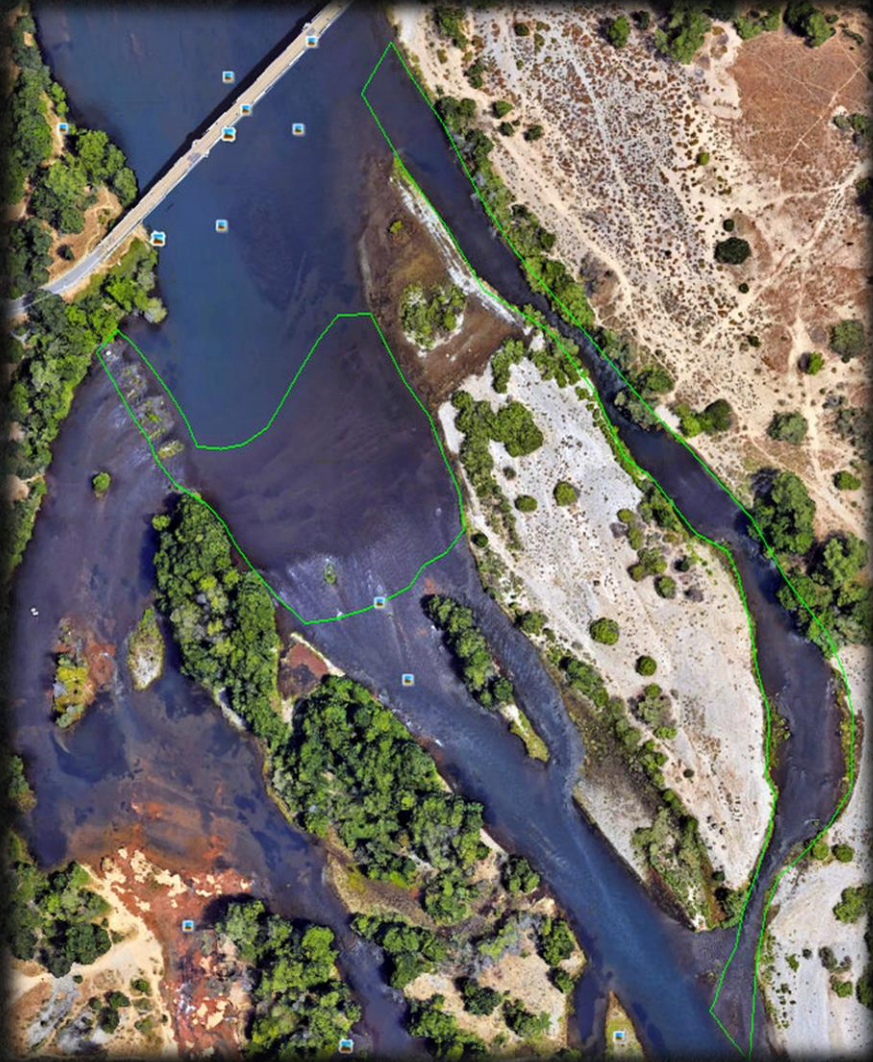


Lower Sunrise – RM 20



21 September 2017

River Bend – RM 15



21 September 2017

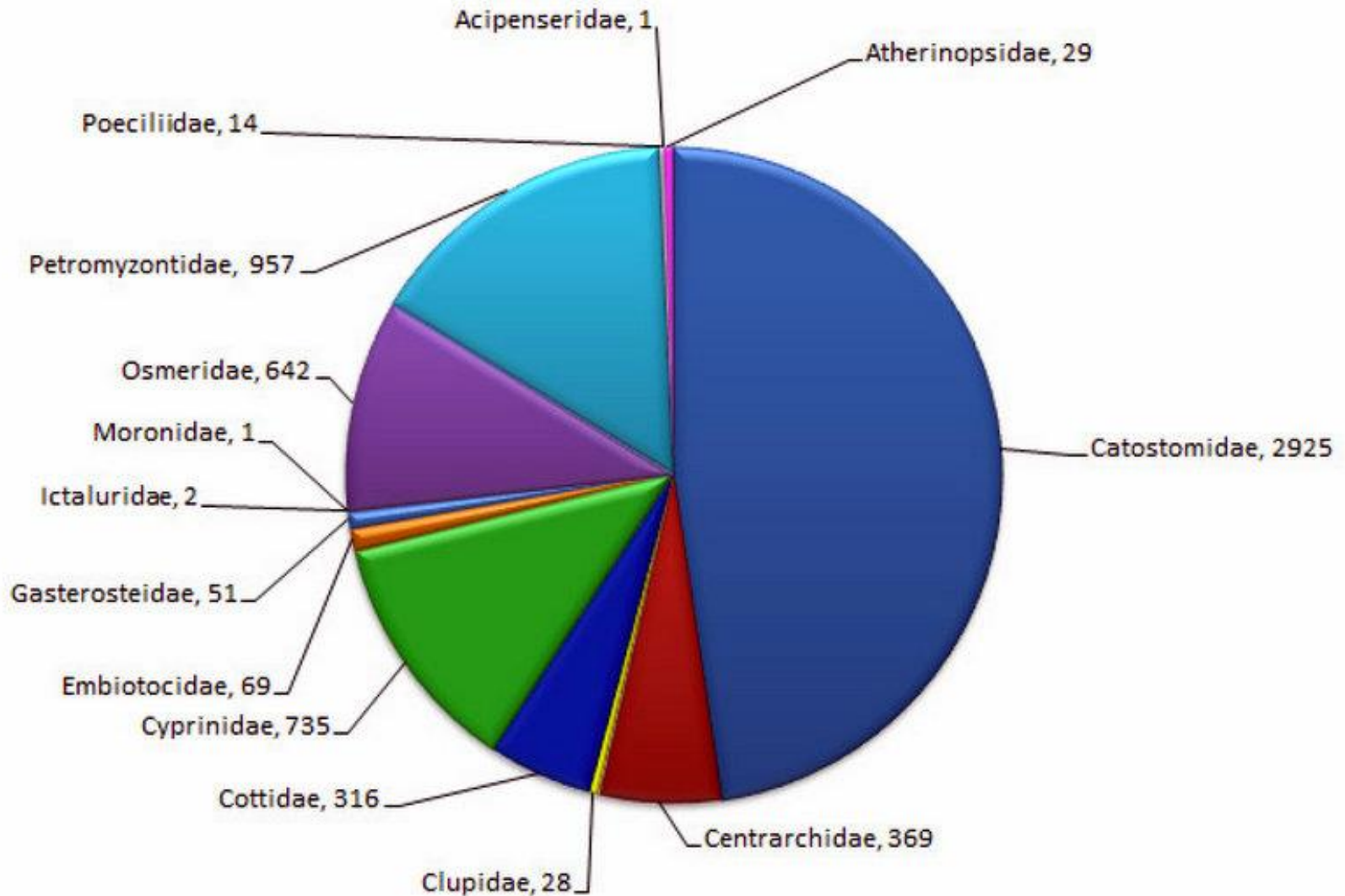
Thank You Collaborators!!!!!!!

- Water Forum
- City of Sacramento
- Sacramento County Parks
- California State Parks
- National Park Service
- Sacramento State
- MWH
- California Dept of Fish and Wildlife

- Golden Gate Salmon Association
- CA Regional Water QC Board
- National Marine Fisheries Service
- US Fish and Wildlife Service
- US Bureau of Reclamation
- Cramer Fish Sciences
- CBEC Eco Engineering
- CVPIA Restoration Fund

Questions – jhannon@usbr.gov

Non-salmonids from RST



New Hatchery Ladder

