

# Outmigration Survival of Juvenile Salmonids in the Lower Yakima River, 2018–2020

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<sup>3</sup>Bureau of Reclamation

March 11, 2020

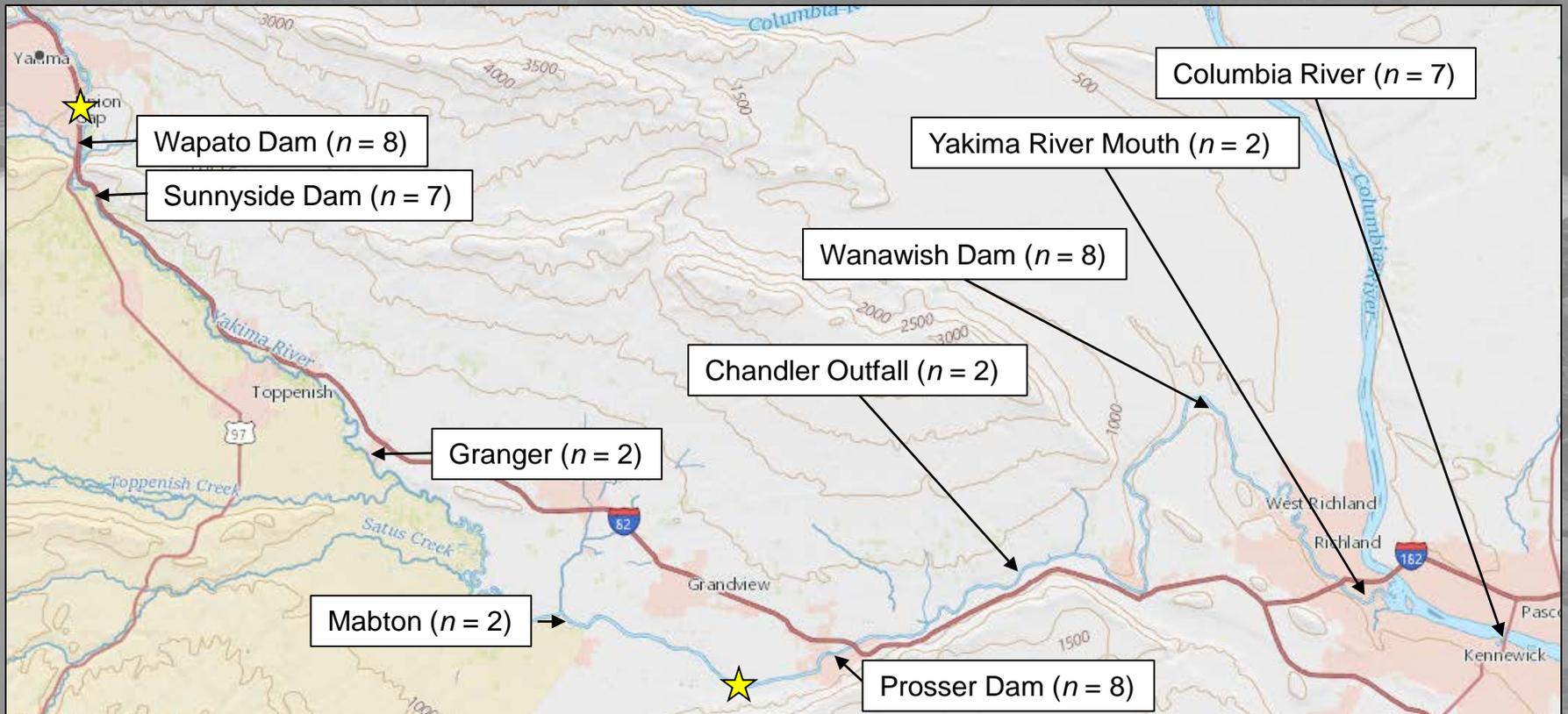
# Acknowledgments

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## Funding provided by:

- Bureau of Reclamation
- Yakama Nation
- U.S. Geological Survey
- Yakima Basin Joint Board
- Kennewick Irrigation District

# Study Area

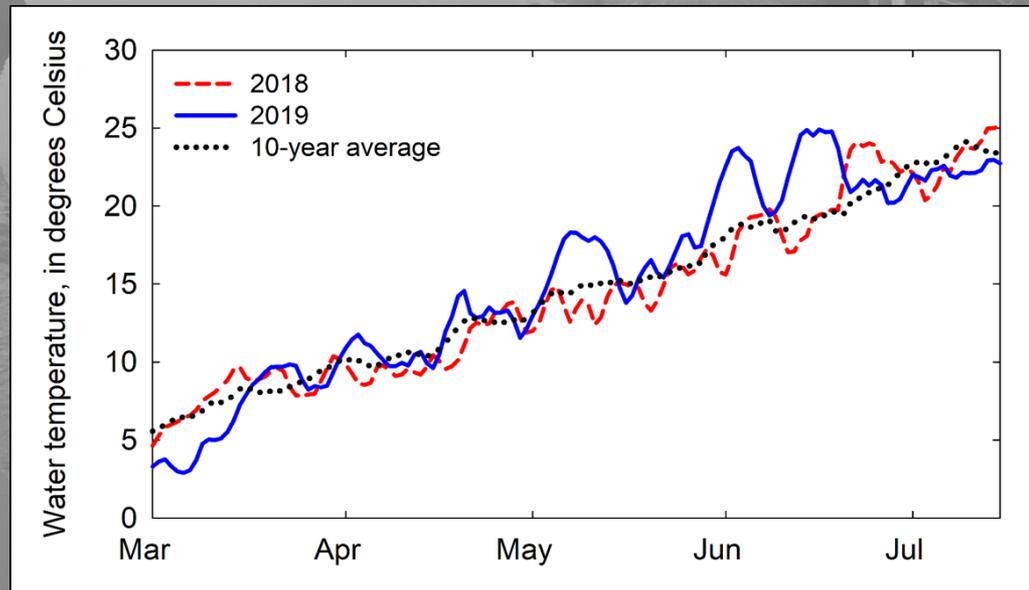
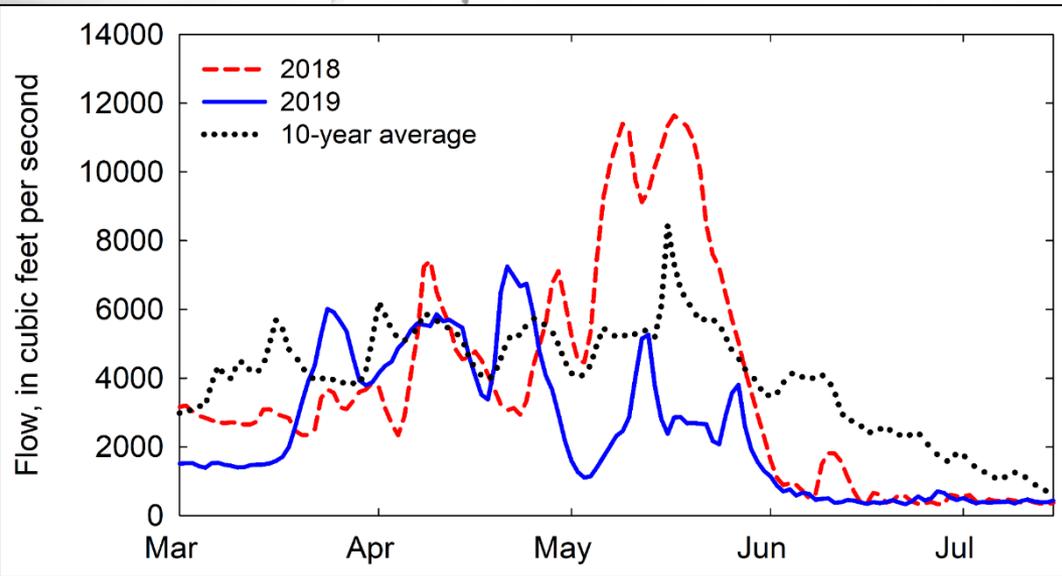


# Tagging Overview

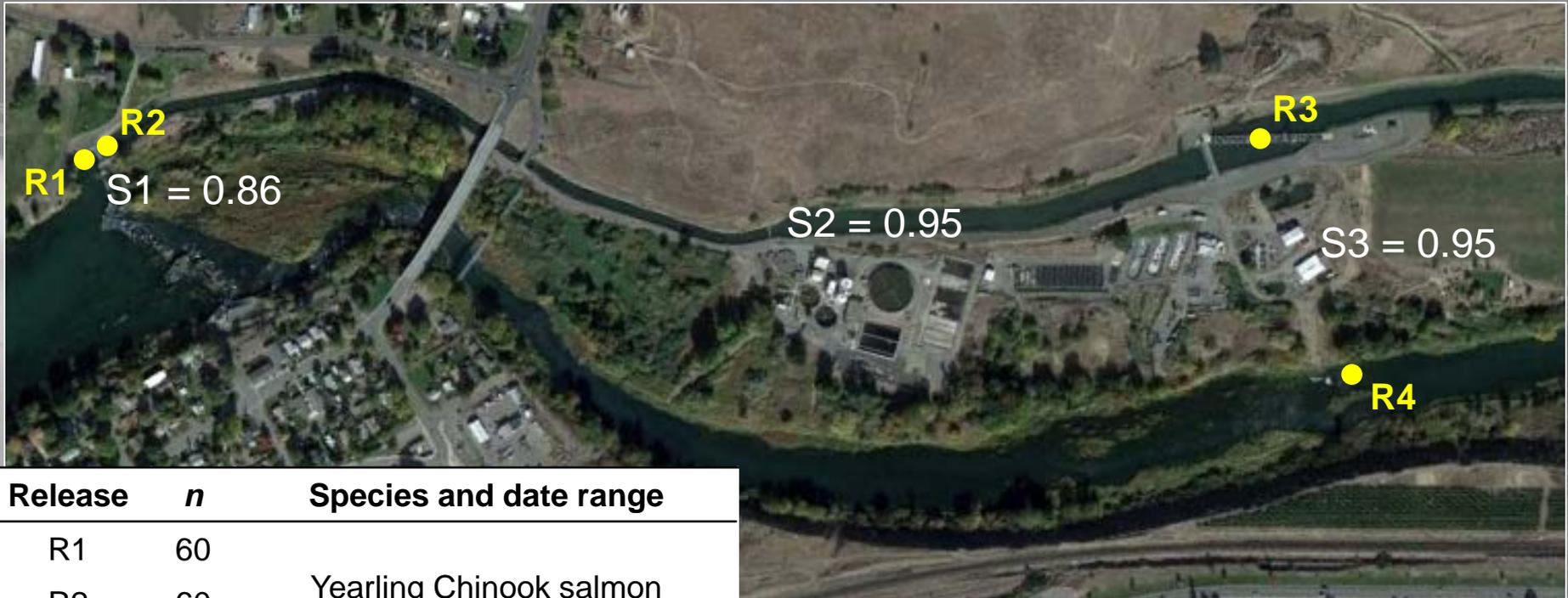
Species	2018	2019	2020
Yearling Chinook salmon	429	590	330
Steelhead	313	350	400
Subyearling Chinook salmon	344	393	456
Lamprey	97	126	130
Adult smallmouth bass	-	10	-
Northern pikeminnow	-	10	-
Adult Chinook salmon	-	4	-
Adult sockeye salmon	20	60	?
Total =	1,203	1,543	1,316



# River Conditions



# Paired Releases at Prosser Dam



Release	<i>n</i>	Species and date range
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R1	60	Yearling Chinook salmon April 5–May 22
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R2	60
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R3	60
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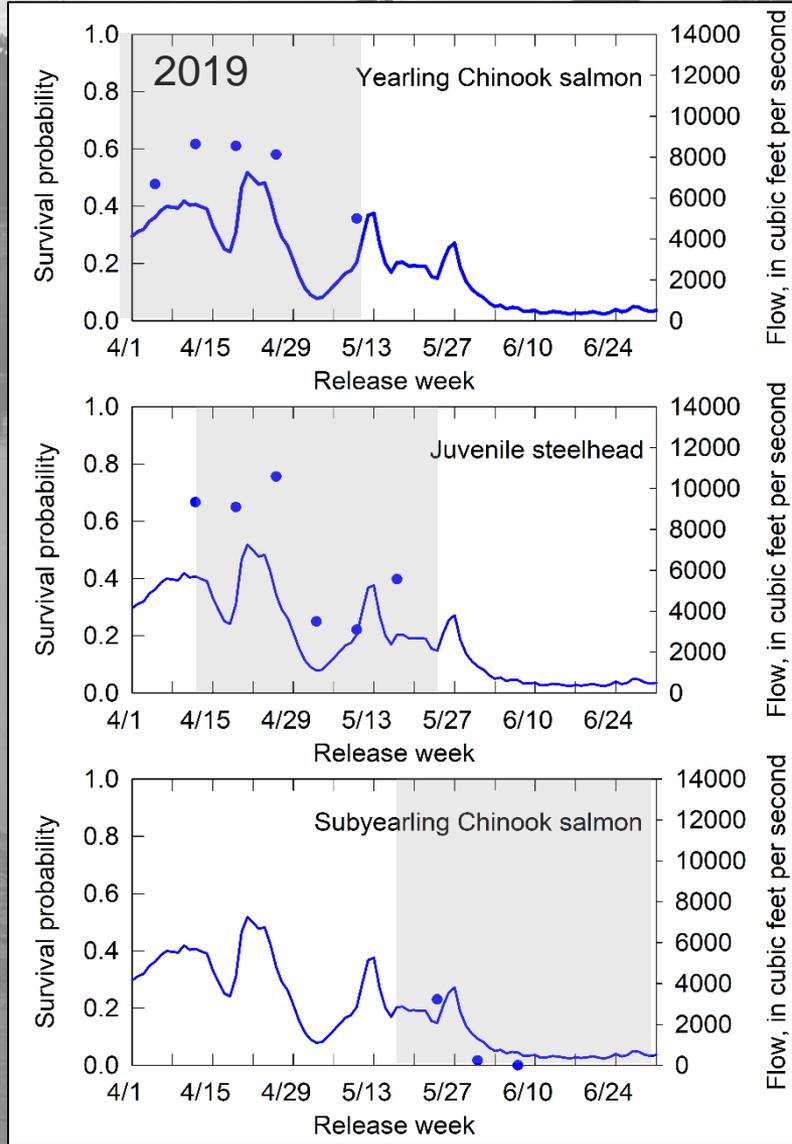
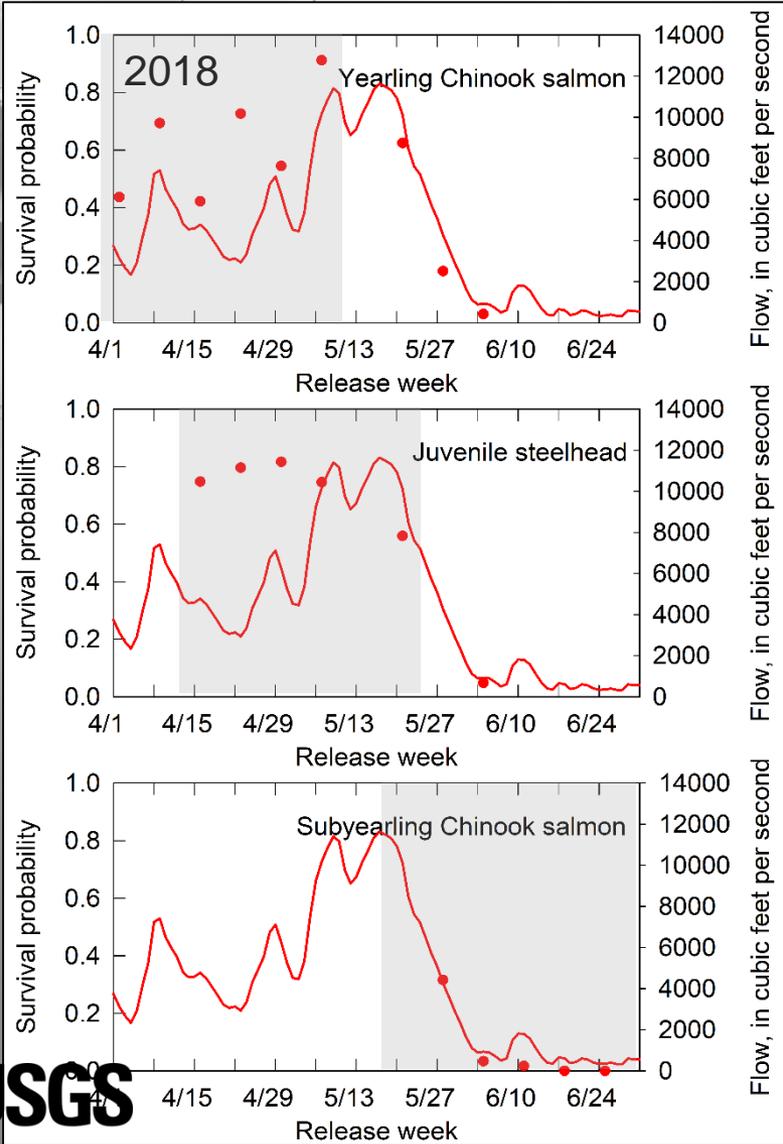
R4	60
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Percent of fish using the canal  
Yearling Chinook salmon = 21.6%

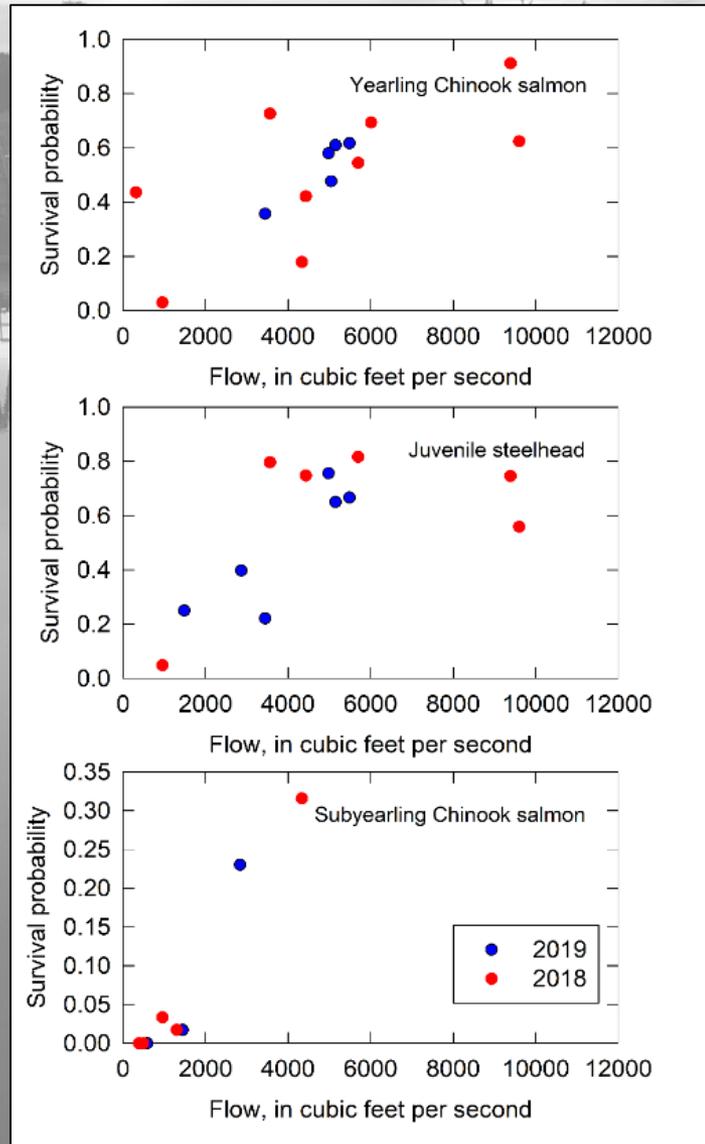
Survival through Canal = 0.78

Survival over the Dam = 0.98

# Cumulative Survival and Flow



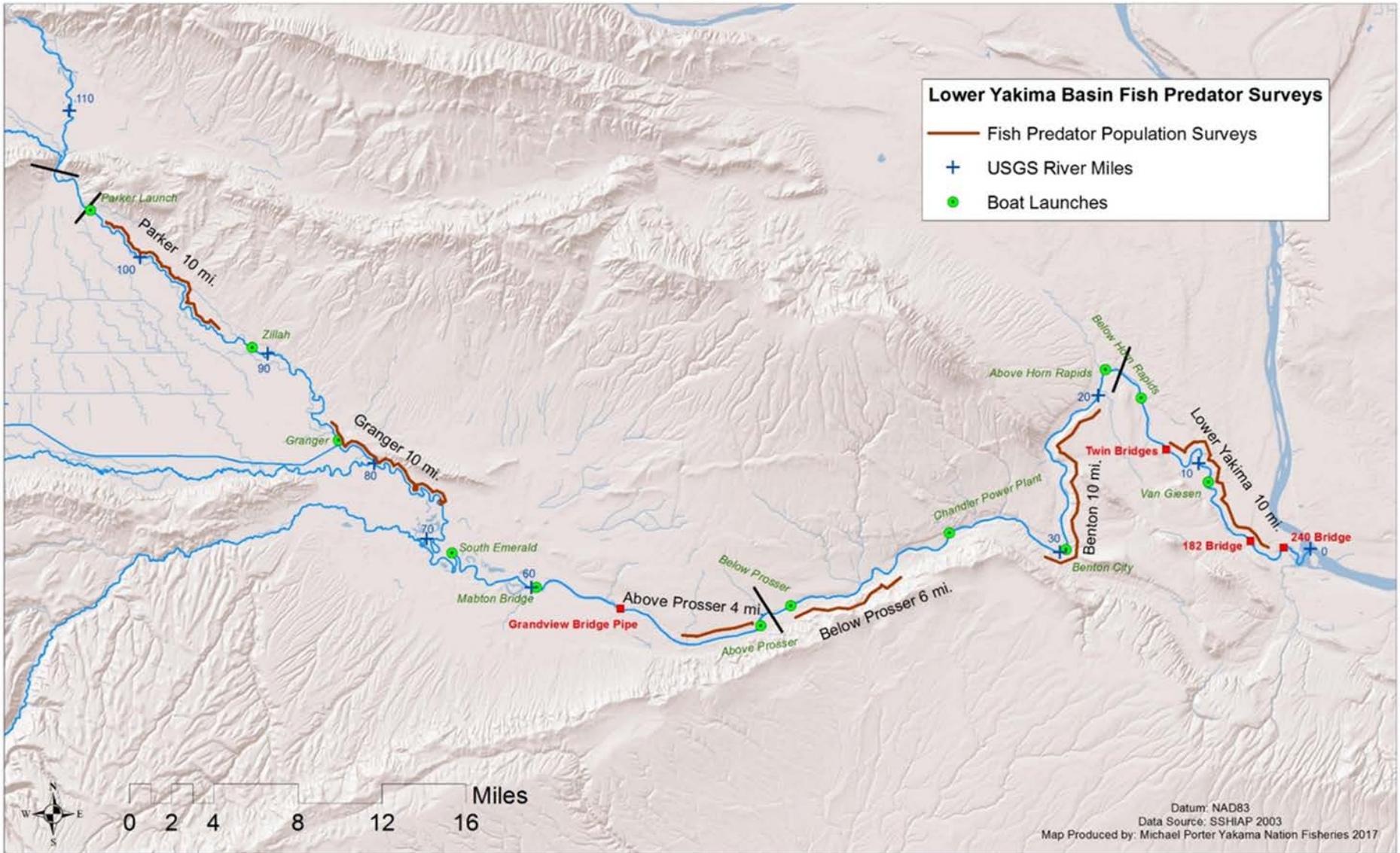
# Flow/Survival Relationship



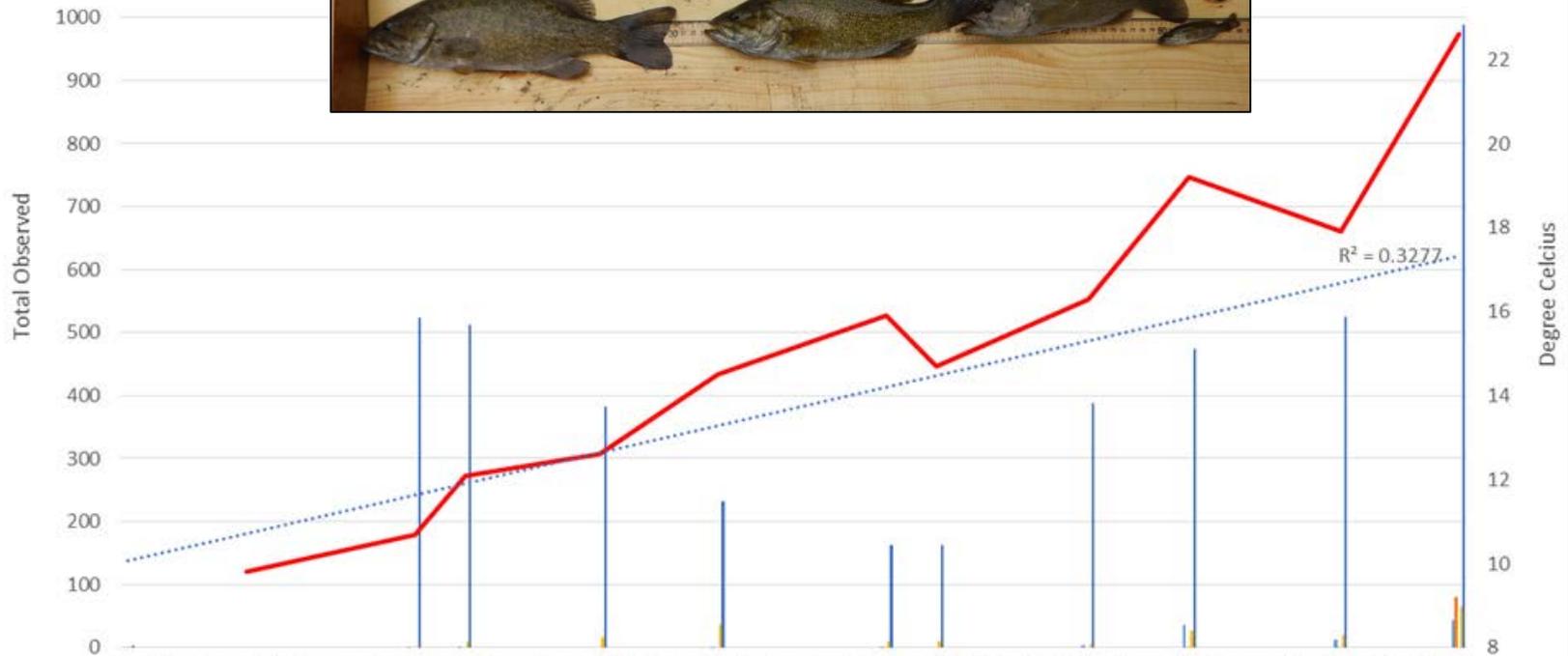
## Predator Abundance

- Fish and Avian
- Reach Specific + Hot Spots
- Compensatory Effects
- Identify Areas for Management
- Gain the Ability to Track Abundance Changes
- Incorporate Predator Data as a Variable of Smolt Survival



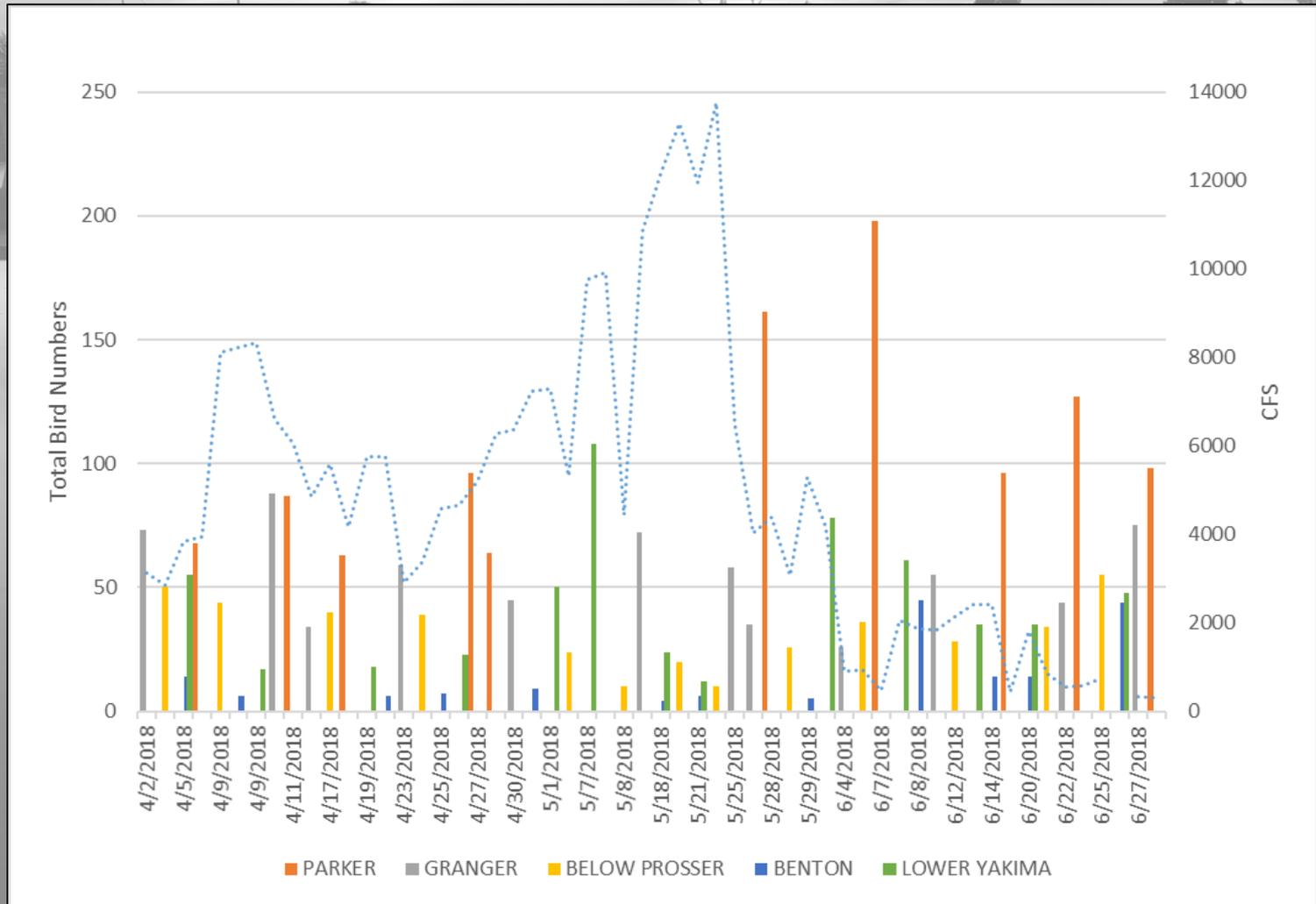


# Fish Predators Below Prosser Dam



	4/3/18	4/10/18	4/20/18	4/23/18	5/1/18	5/8/18	5/18/18	5/21/18	5/30/18	6/5/18	6/14/18	6/21/18
BRCT			2	1		1	1		4	36	12	44
CHCT							1				2	81
LMB	1									1		
NPM			1	8	16	36	10	10	5	27	20	66
SMB	4		524	513	382	233	162	162	388	474	525	989
River Temp C°		9.8	10.7	12.1	12.6	14.5	15.9	14.7	16.3	19.2	17.9	22.6

# Avian Predator Counts



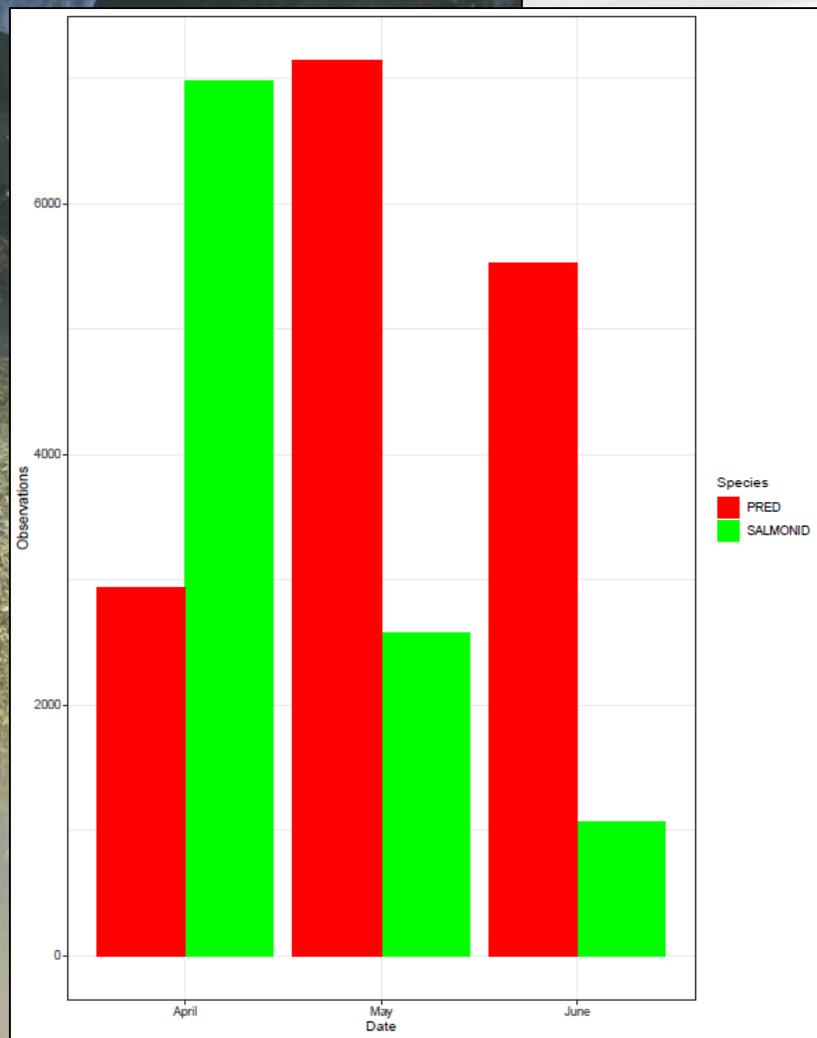


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Chinook	254	1061	532	2108	1654	1357	1270	1374	567	206	452
Coho	153	209	313	243	215	317	311	163	187	91	22
Sockeye					23	3	4				
Steelhead	3	6	4	8	19	22	16	33	33	13	



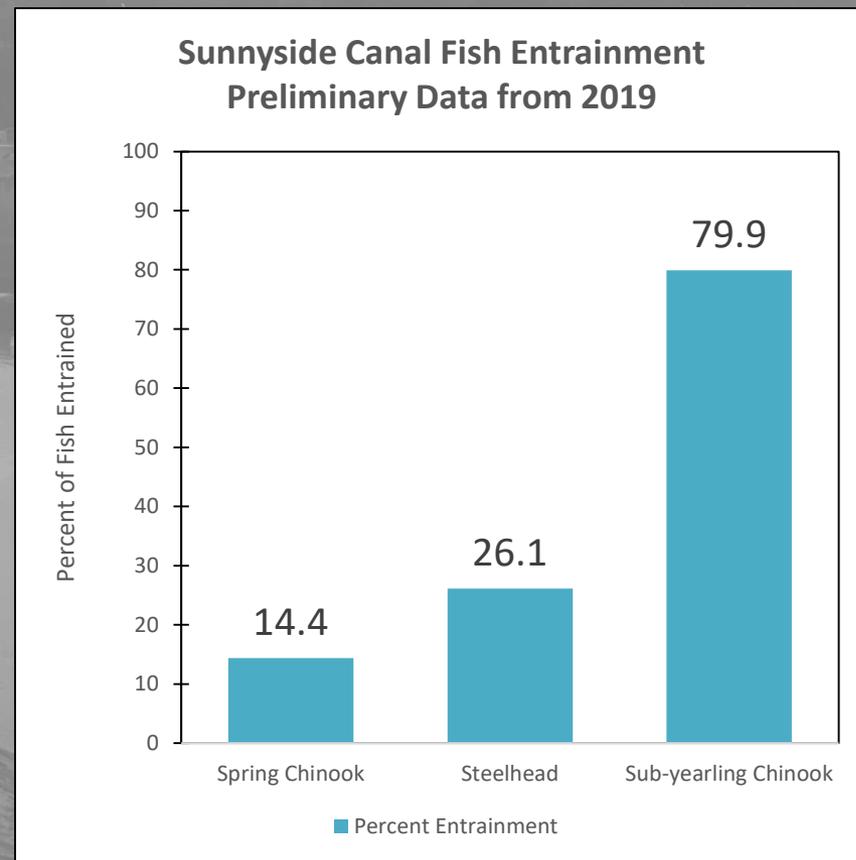






# Reclamation Facilities

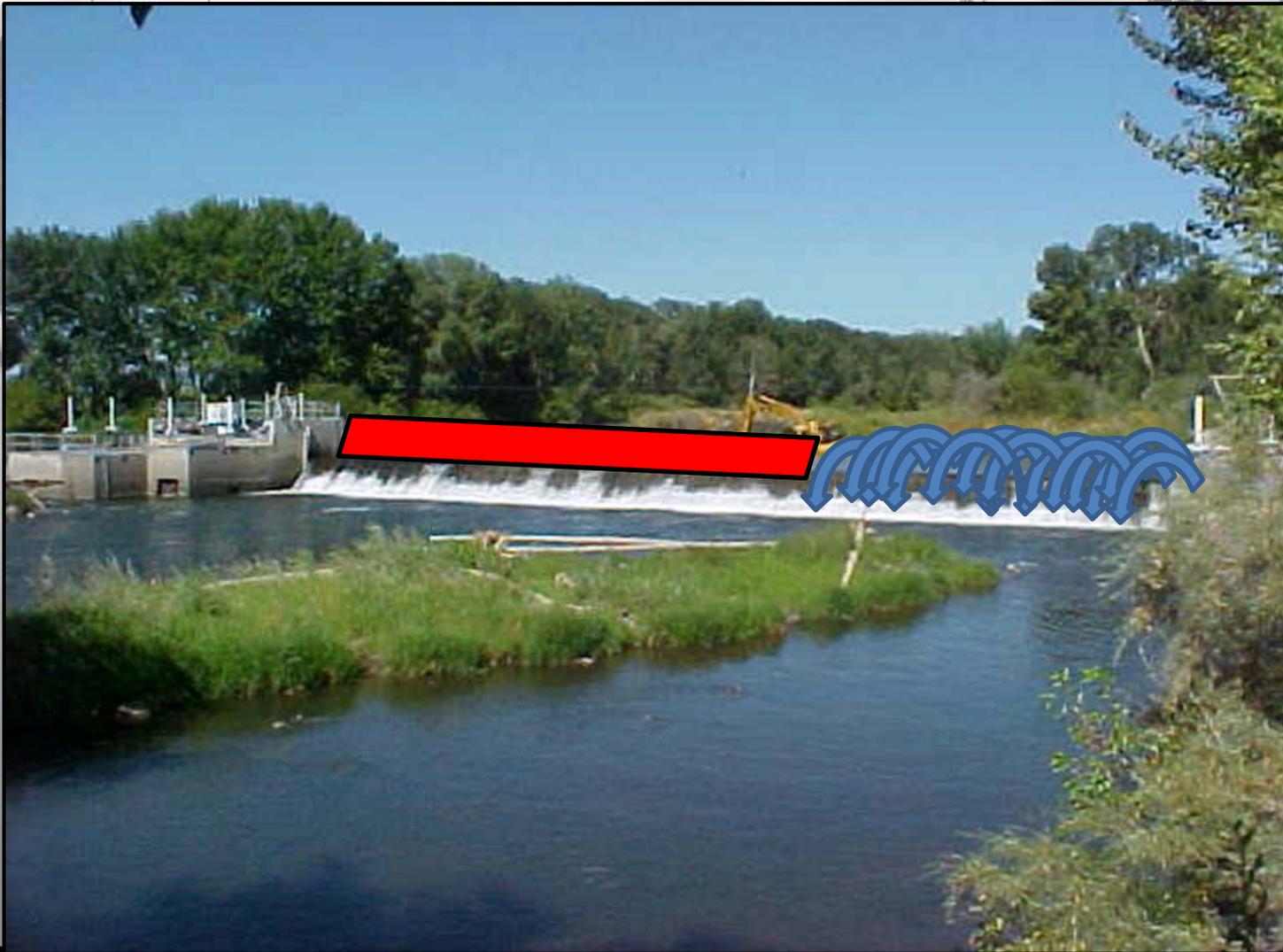
- High entrainment rate: proportion of fish diverted into canals
- Canal survival poor relative to in-river: Prosser example ~20%
- High entrainment times poor survival: facilities significantly limiting productivity
- Cumulative Effects: high priority passage improvements will yield significant, measurable smolt survival benefits
- Example: 8 Dams, 2 affected reaches to pass, if  $S = 96\%$ , then facilities effects only 34% smolts lost before reaching the estuary



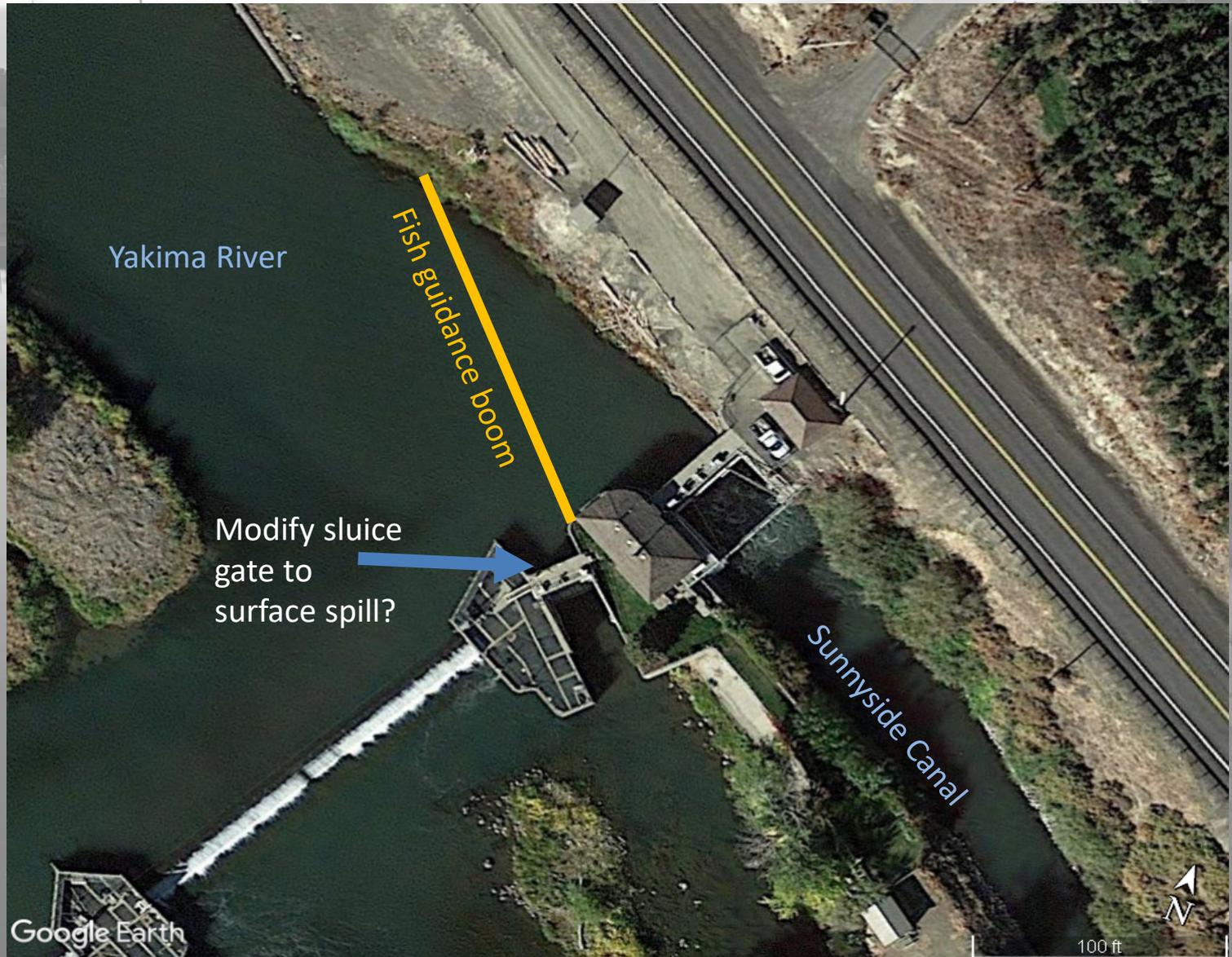
# Passage Improvement Options



# Passage Improvement Options



# Sunnyside Diverson Dam

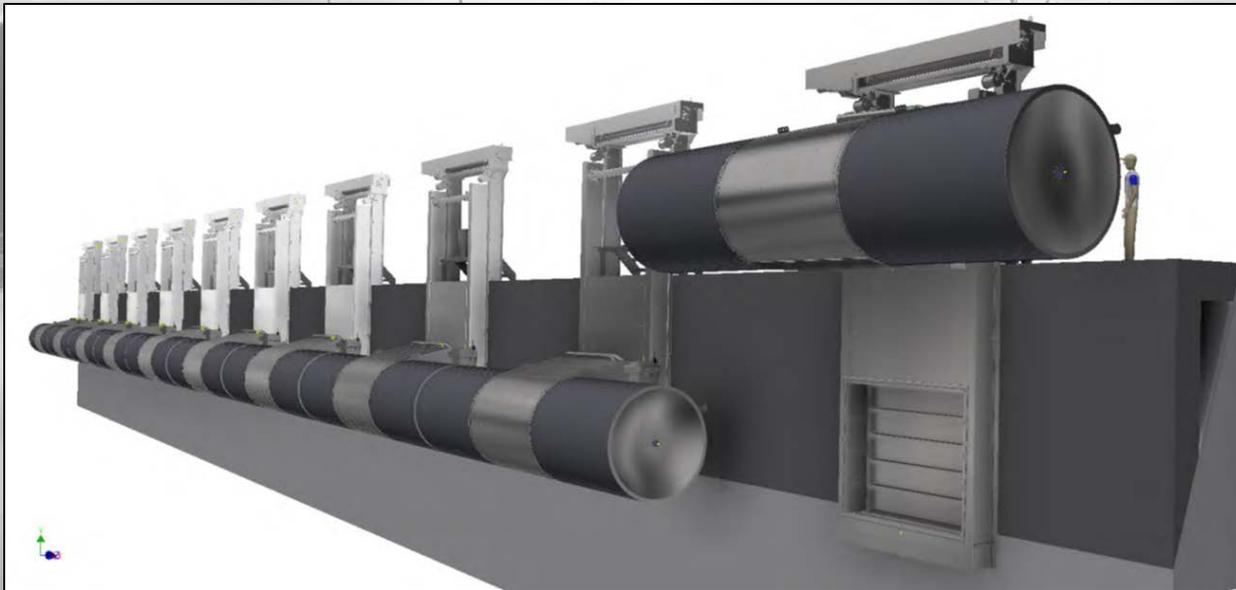


# Sunnyside Diversion Dam

Sunnyside Diversion Dam



# Other Passage Options



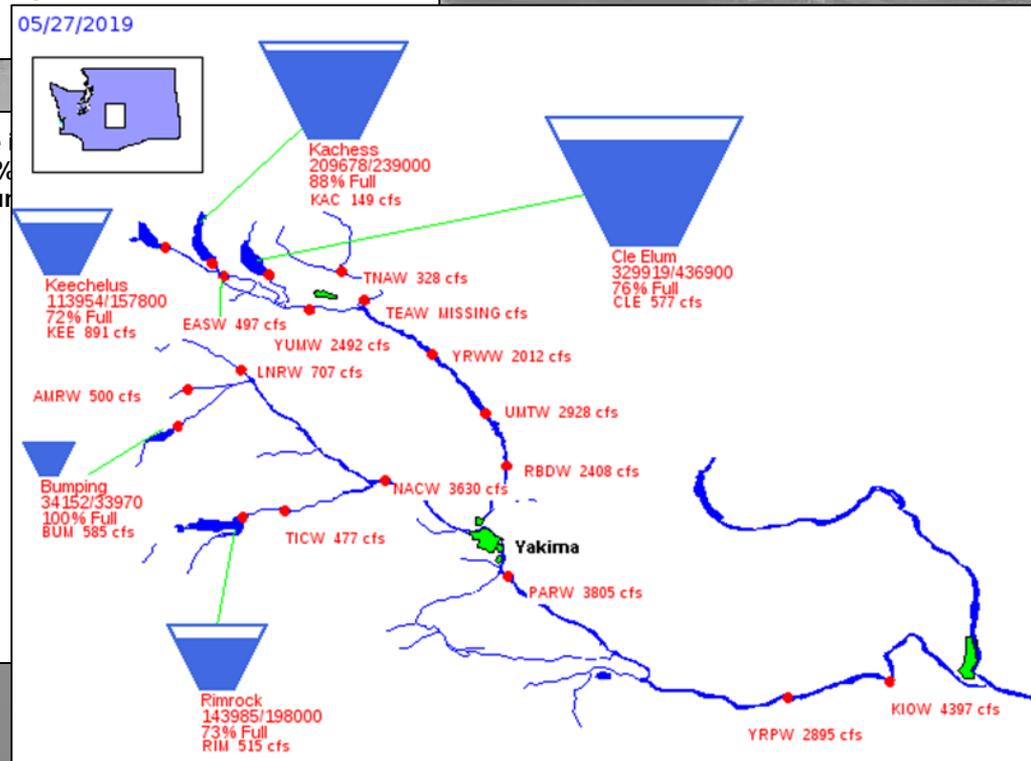
# YFO Water Management

- YRBWEP Conserved water will yield about 40 KAF for 2020, and will be >70 KAF with YRBWEP conservation and Cle Elum pool raise completed.
- Storage system approx. 1.1 MAF, demand 2.4 MAF
- Spring reservoir releases can be managed and timed to improve fish migration conditions.

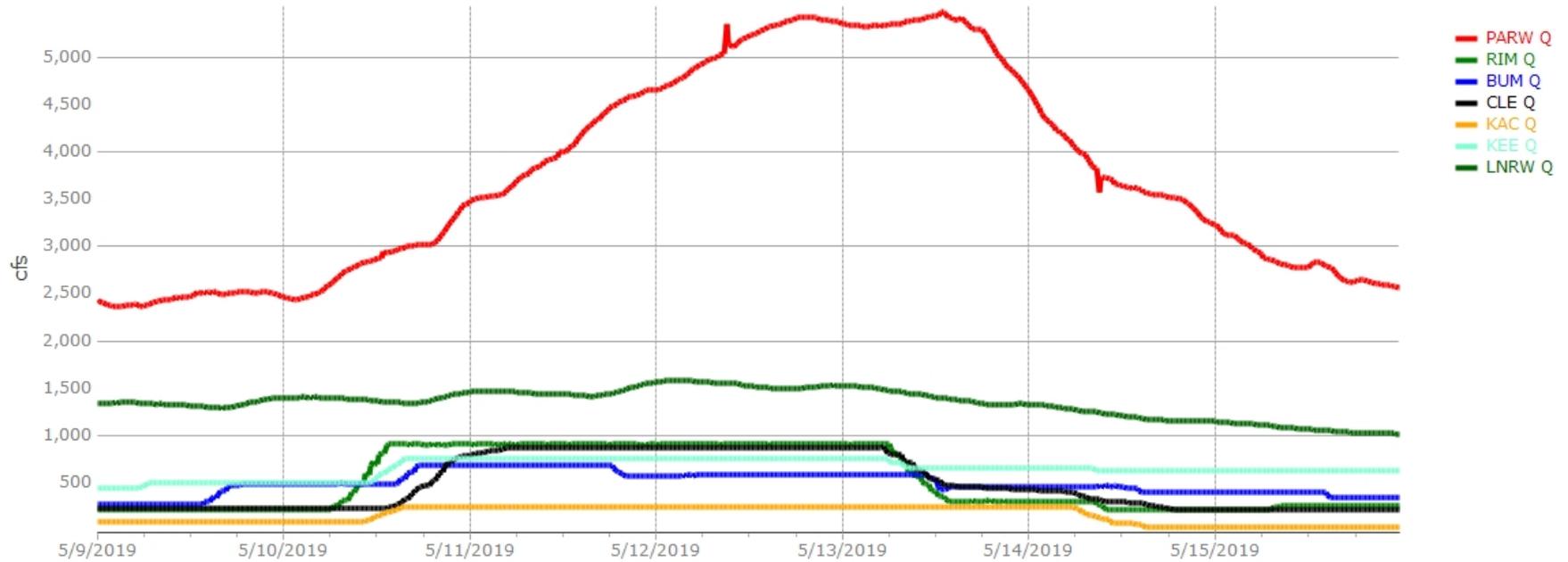


Table 2-1. Minimum volume of water (acre-feet) that will be available years when water prorationing levels are equal to or greater than 70% flows. Outmigration flows are measured at Tieton Dam (RIM), Cle Elum River at Easton (EASW).

	Monthly Min. acre-feet for Outmigration Flows		
	< 2.36	2.36 - 3.13	> 3.13
April TWSA (MAF)	< 2.36	2.36 - 3.13	> 3.13
May TWSA (MAF)	< 2.20	2.20 - 2.61	> 2.61
RIM	4,500	8,400	14,800
CLE	4,200	9,900	18,800
EASW	3,700	4,800	9,900



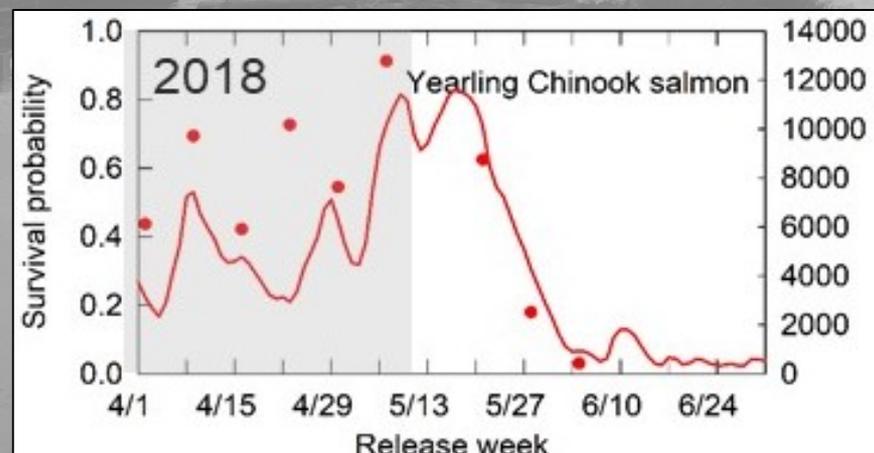
# Managed Flow Releases



May 9-14 flow increase at Parker of 1798 cfs; YRBWEP water volume 10,699 acre-feet, timed with BUM flood control release

# Managed Flow Releases

- Limited volumes to manage for fish survival in low water years
- Current survival study needs to isolate flow from facilities
- USGS Decision Support tool to predict flow and survival
- Volumes of flow needed to meet survival objectives can be estimated



# Questions?

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