

Pacific Lamprey:

Keeping a 450 Million Year Tradition
Alive and Strong in the Upper Columbia



Presenter: Tyler Beals

Co-authors: Ralph Lampman and Sean Goudy

Yakama Nation Fisheries Pacific Lamprey Project (YNPLP)



The Lamprey Team

Ralph Lampman



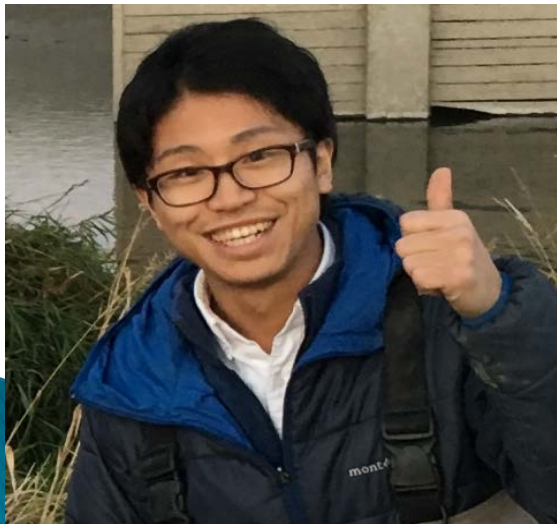
Sean Goudy



Dave'y Lumley



Hiroaki Arakawa



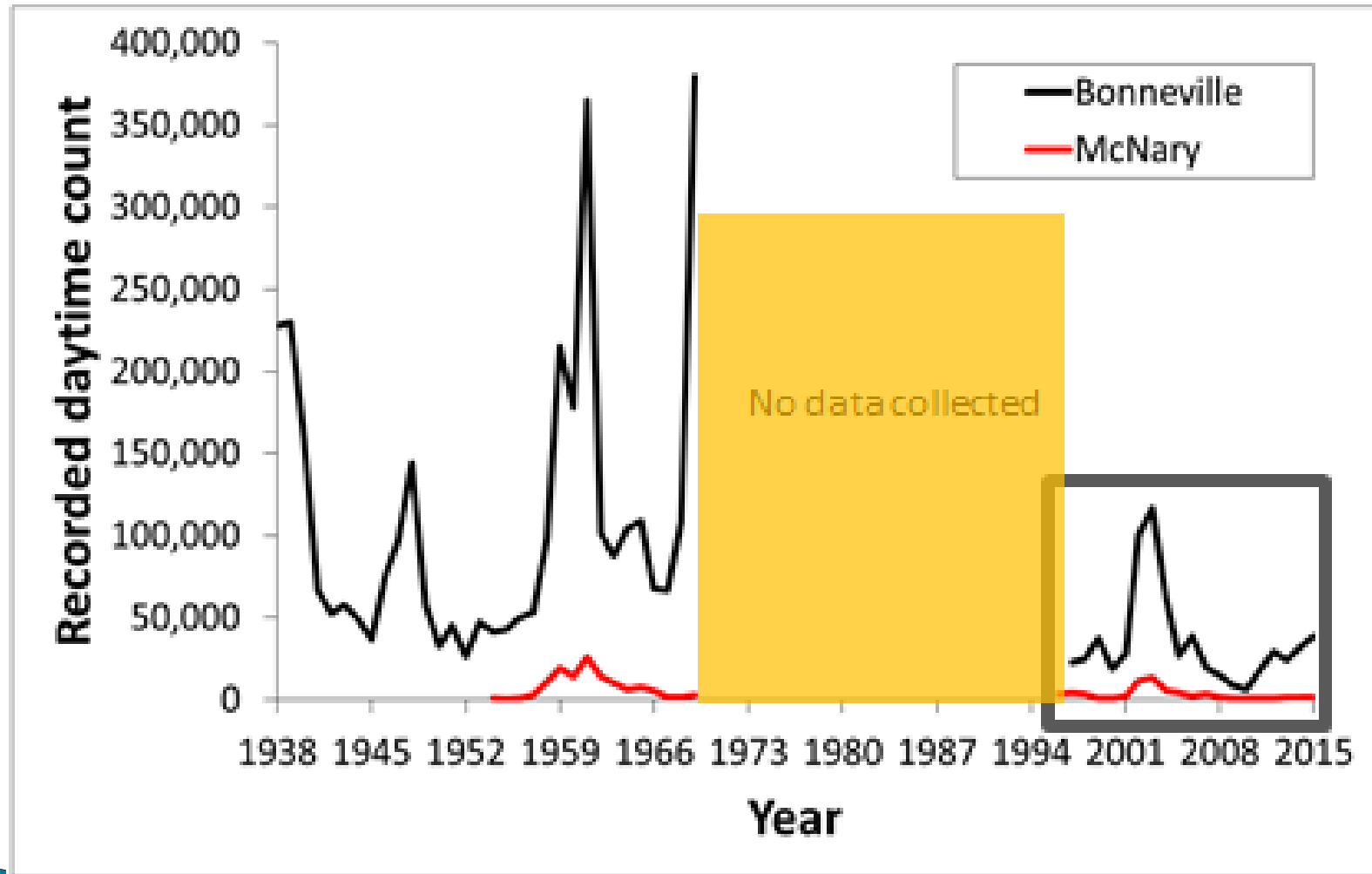
April Hull



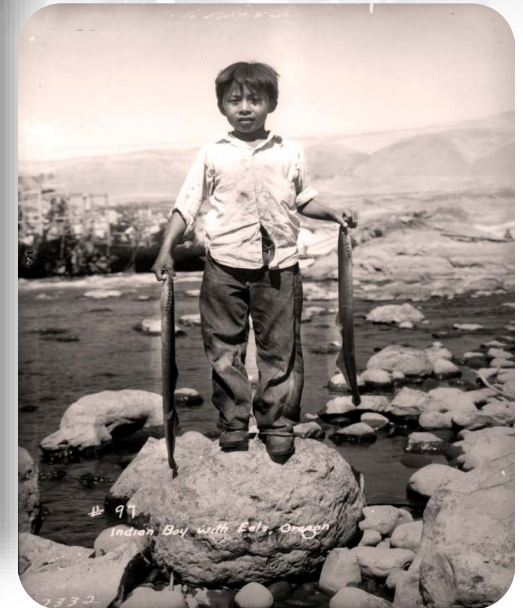
Leona Wapato



Pacific Lamprey Decline....



Cultural Importance





**Females Lay
~100,000 Eggs!**



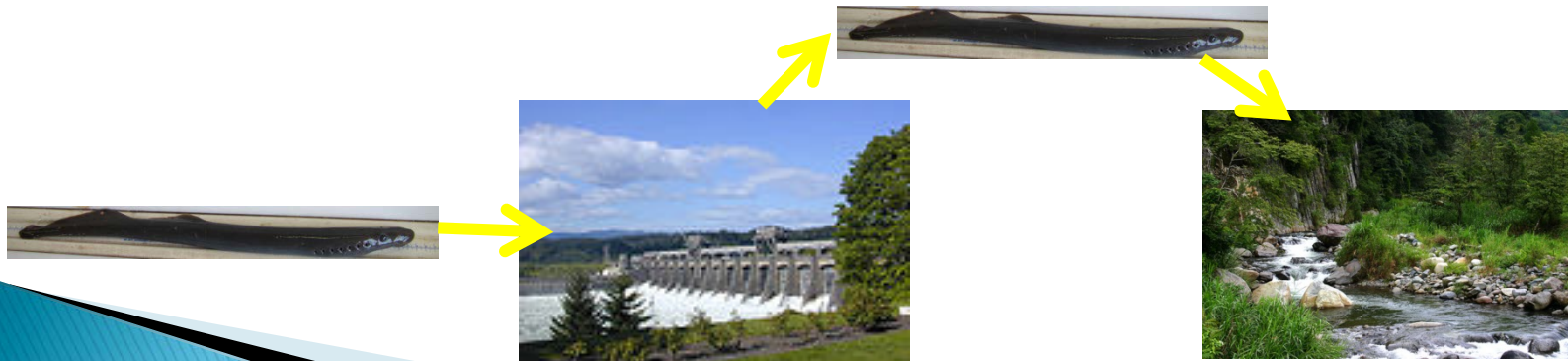
Adult Translocation/Reintroduction

- Subbasins where adult translocation has occurred

- Yakima Subbasin – Primary Focus
 - 2012–2017

- Wenatchee Subbasin

- Methow Subbasin



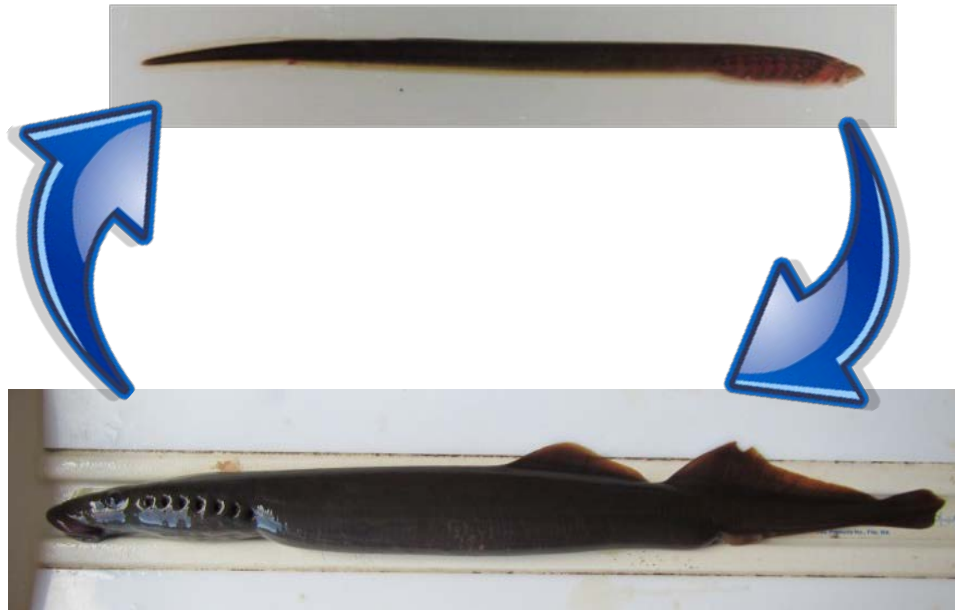


Subbasin		Lower Yakima			Upper Yakima	
Stream	Satus	Toppenish	Ahtanum	Yakima	Yakima	
Year	2011-2012	15	-	-	-	-
	2012-2013	46	45	46	-	-
	2013-2014	92	78	85	4	-
	2014-2015	209	219	201	39	102
	2015-2016	117	128	130	72	-
Total	479	470	462	115	102	

- ▶ = 1,628 Adult Pacific Lamprey (2012–2016)
 - 1,526 into Lower Yakima
 - 102 into Upper Yakima (upstream of Roza Dam)

Results: PBT (Parentage-Based Tagging)

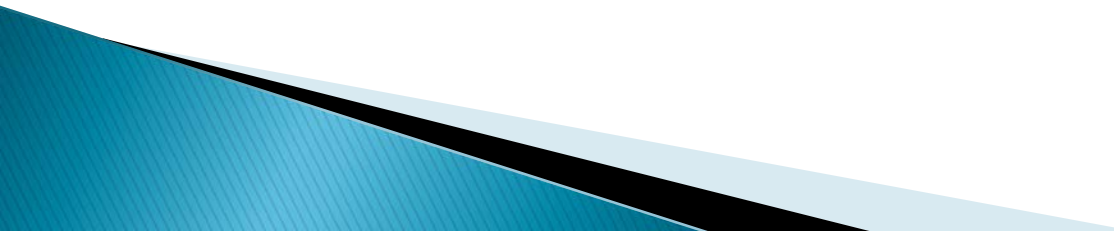
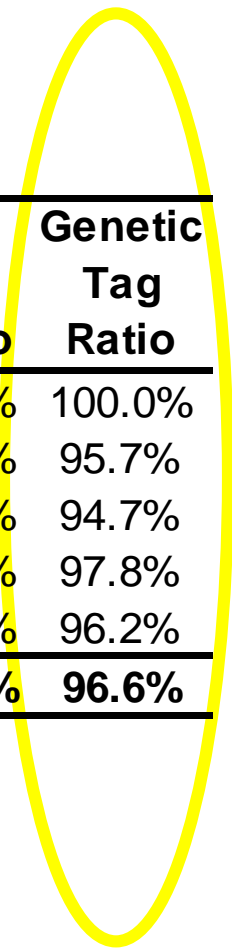
- Parentage Based Tagging (PBT) – CRITFC



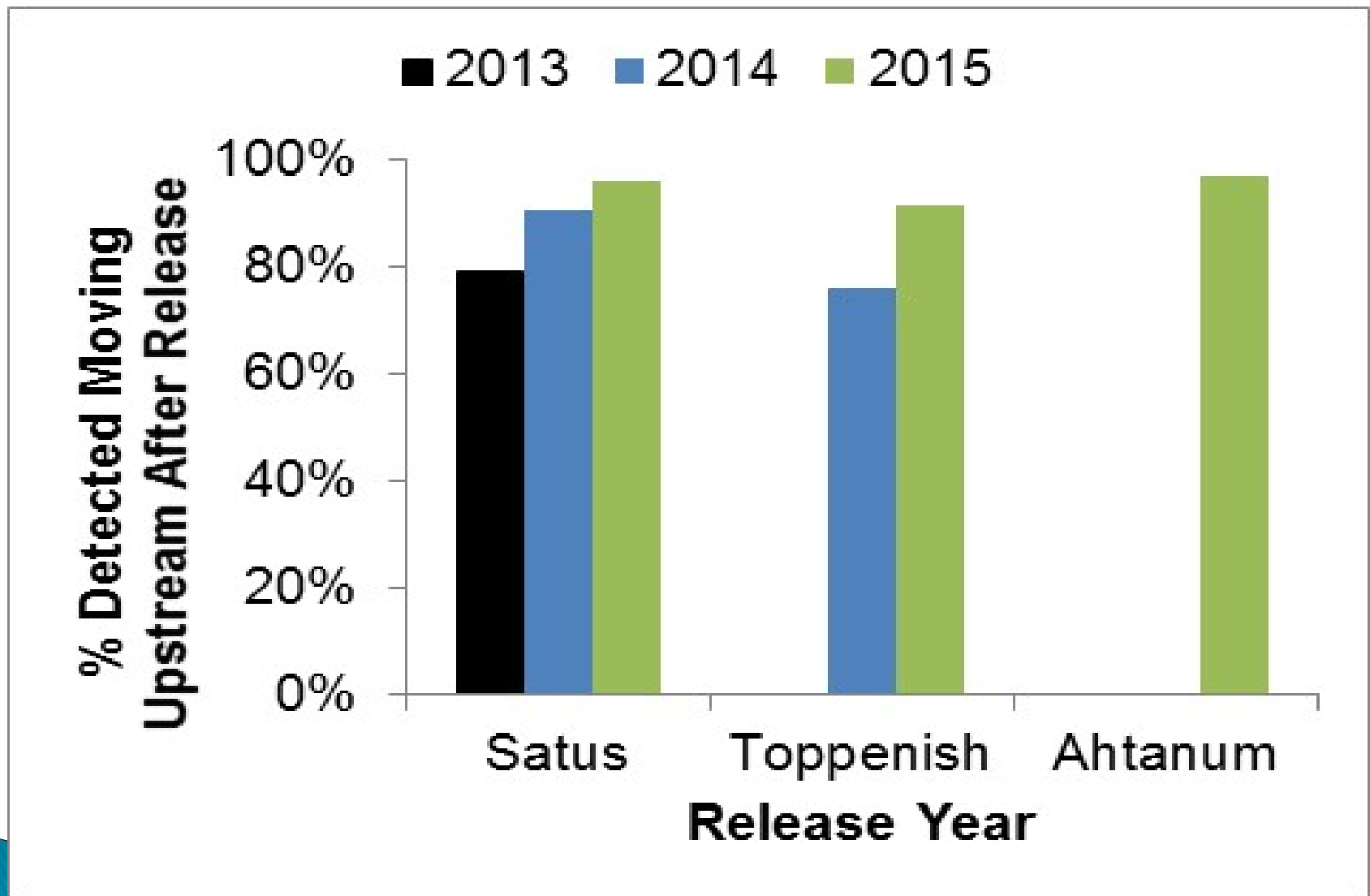


Results: PBT (Parentage-Based Tagging)

Broodstock Year	# Total	# of Female	# of Male	# of Unknown	# with Pit Tags	# with Genetic Tags	Female Ratio	Pit Tag Ratio	Genetic Tag Ratio
2011-2012	15	9	6	-	14	15	60.0%	93.3%	100.0%
2012-2013	141	27	110	4	124	*135	19.7%	87.9%	95.7%
2013-2014	264	111	144	9	213	*250	43.5%	80.7%	94.7%
2014-2015	770	201	492	77	564	753	29.0%	73.2%	97.8%
2015-2016	906	227	352	317	612	872	39.2%	67.5%	96.2%
Total	2096	575	1104	407	1527	2025	34.2%	72.9%	96.6%

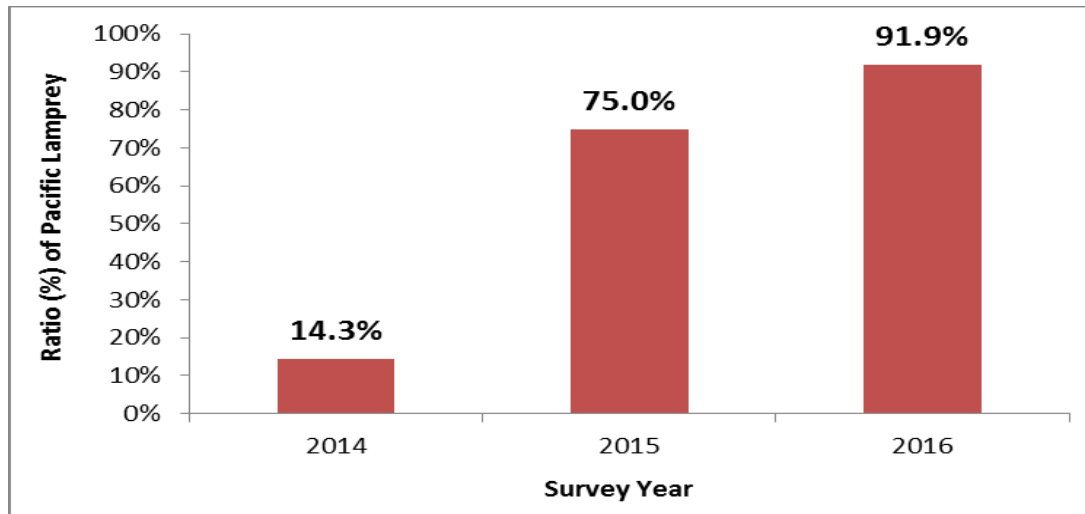


Results: Stream Fidelity (Stray Ratio)

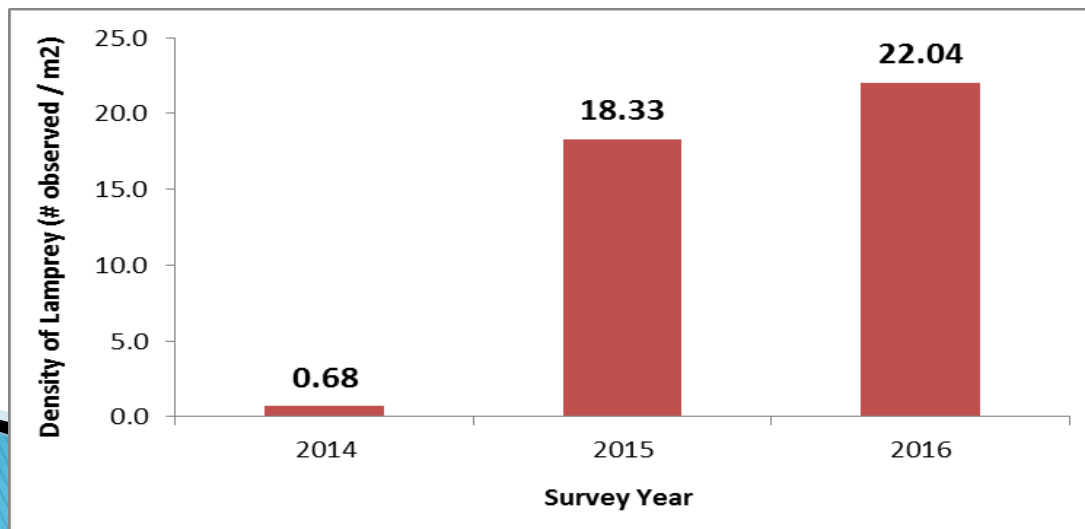


Results: Electrofishing

Satus Creek 2014–2016



Increase in the ratio of Pacific Lamprey (from identified lamprey >50 mm)



Increase in the density of observed lamprey (all species) from observed totals / m2 of survey (#/m2)



In Summary

- Lamprey face *many* risks in ALL life stages
- **Bottom Line:** If we didn't have larval, or adult lamprey in our systems (increased numbers from translocation efforts), it would be extremely difficult to identify, assess and resolve any problems adult lamprey face.
- **We understand** that mainstem (Columbia) dam adult passage is still a major issue, the solution for which costs **enormous money and time.**



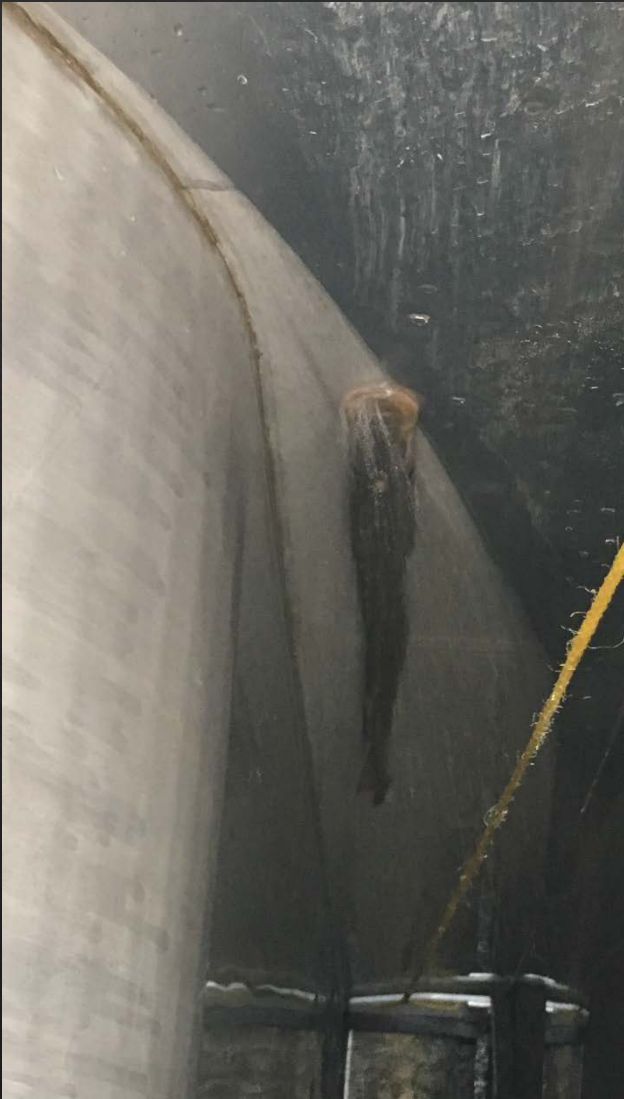
We have a choice!

- ▶ Option 1: Do nothing “Status Quo”
 - Letting what’s happening continue to happen

- ▶ Option 2: We can has a proactive approach; developing solutions within each of our subbasins and watersheds (in order of feasibility) to keep this 450 million year tradition **alive and strong**

Updates on Adult Pacific Lamprey Passage in the Yakima Basin

Ralph Lampman
Lamprey Research Biologist

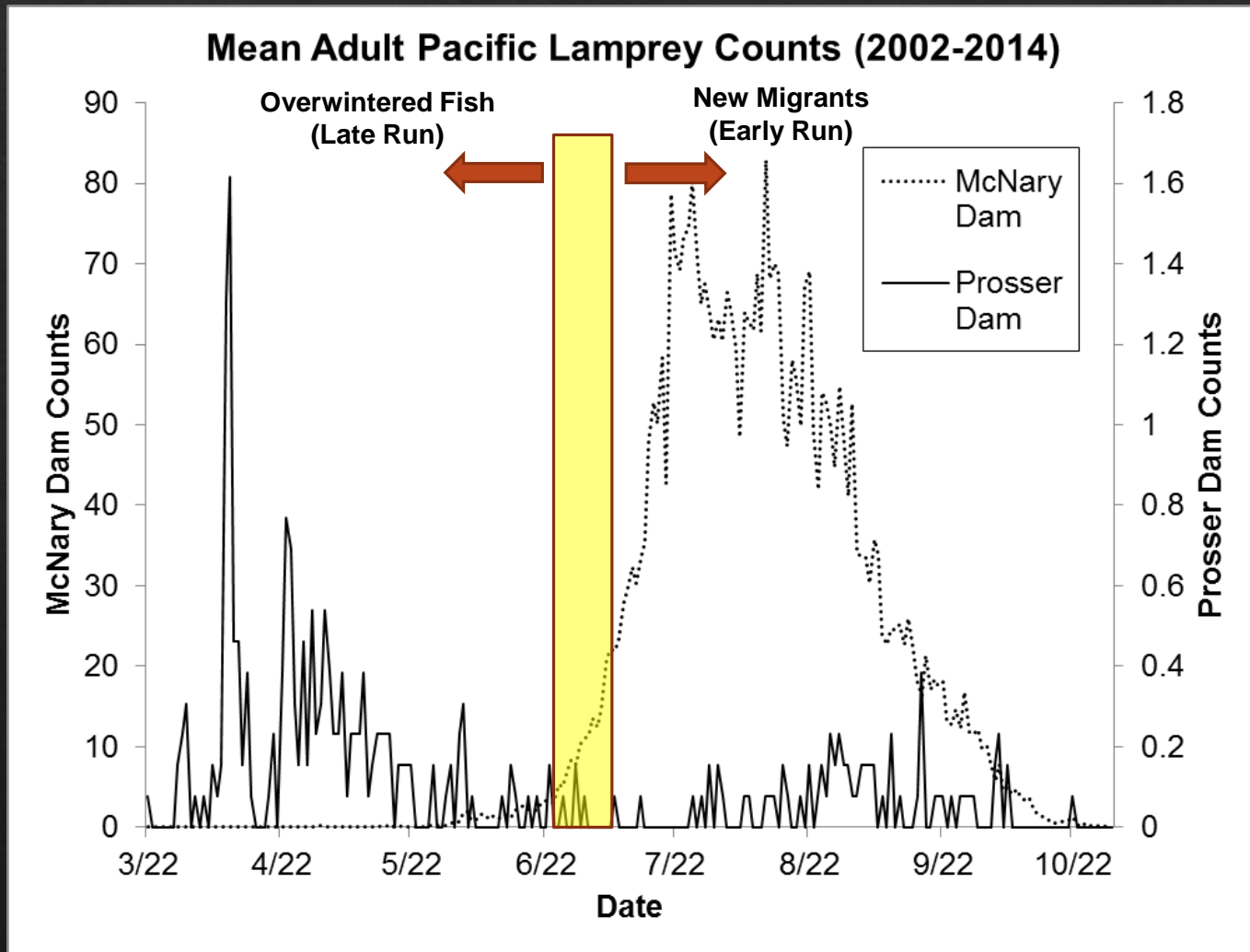


Overview

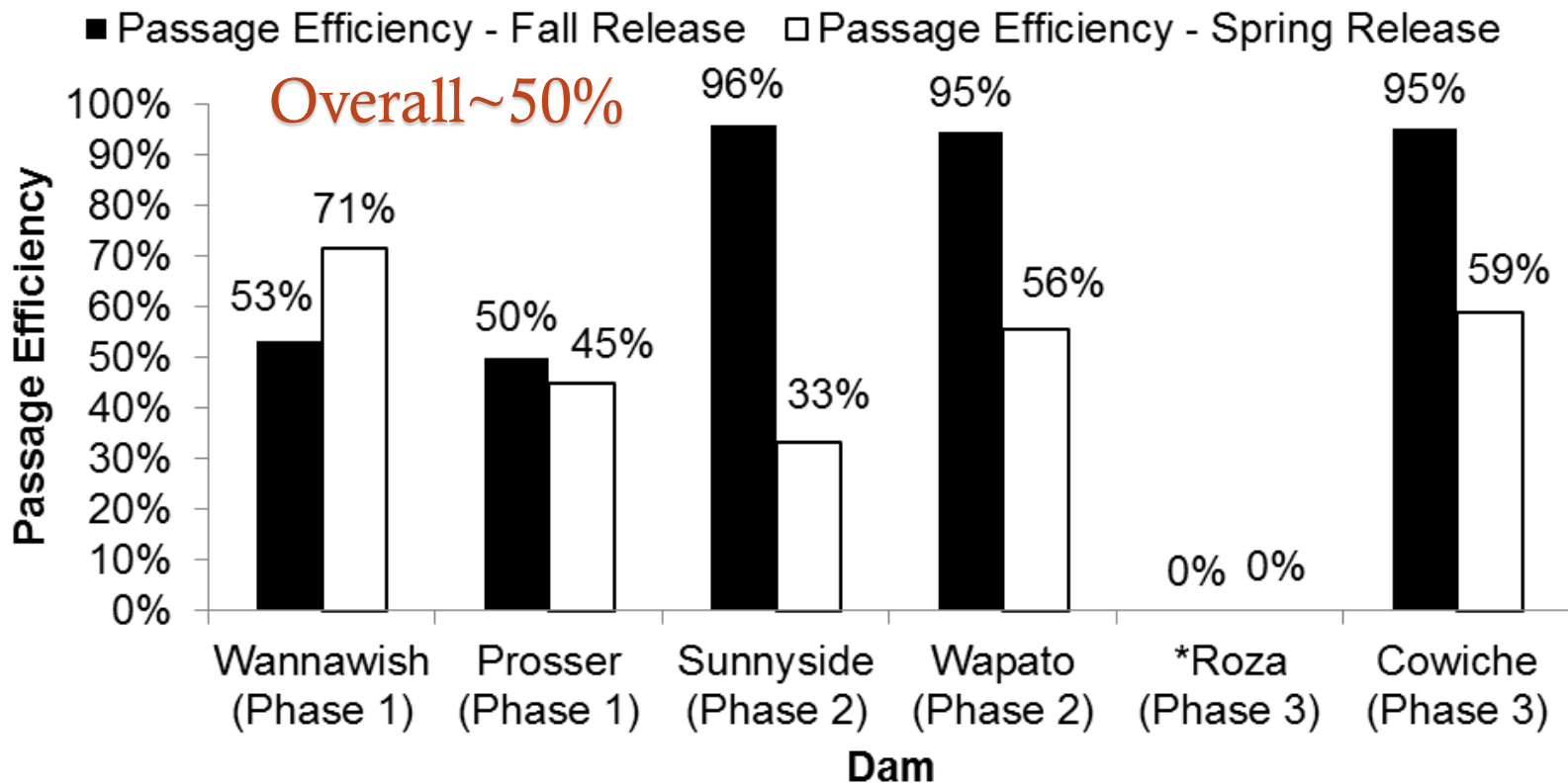
- ◆ Yakima Basin Passage Overview
- ◆ Key Considerations for Lamprey Passage
- ◆ New Passage Improvements
- ◆ Upcoming Passage Improvement Plans

Pacific Lamprey Migration Timing

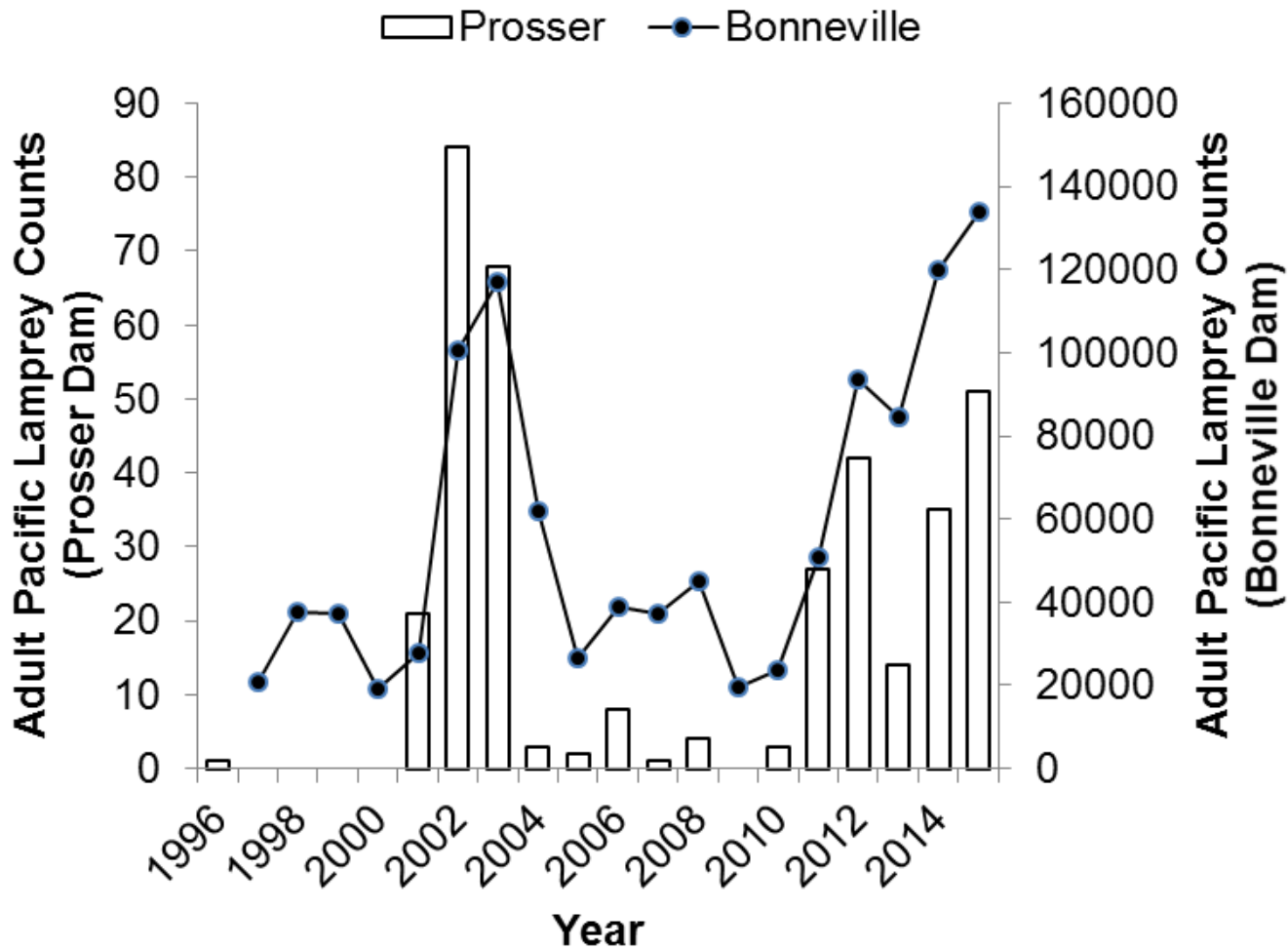
Oct 22 – March 22 = Overwintering (Hybernation) Period



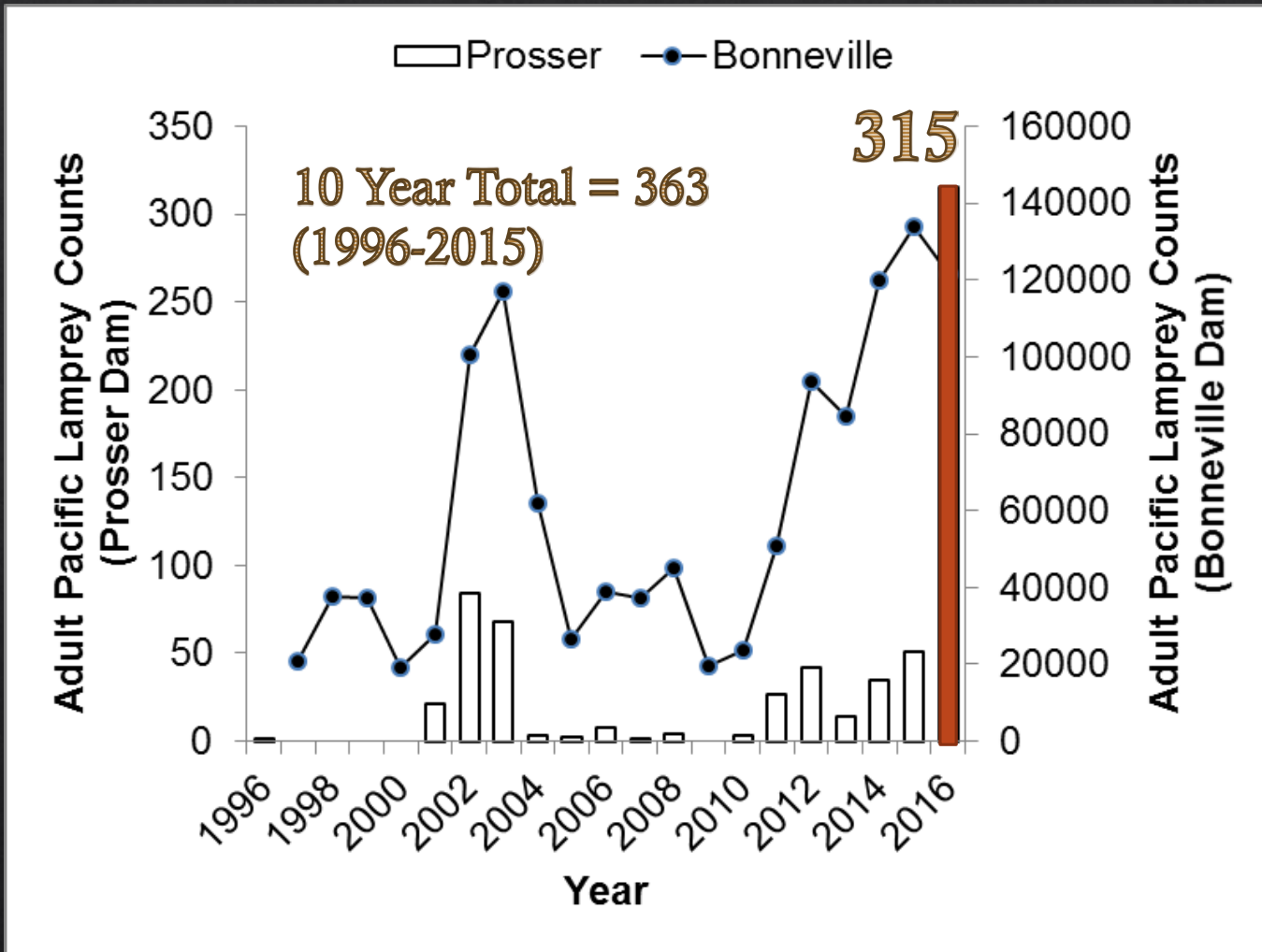
USFWS Radio Telemetry Results (2011-2014)



Prosser vs. Bonneville Counts (1996-2015 Broodstock)



Prosser vs. Bonneville Counts (1996-2016 Broodstock)



What contributed to this increase??

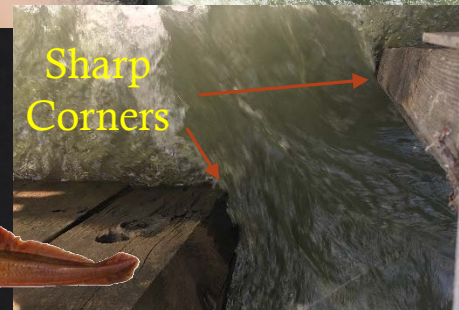
- ◆ Released 150 PIT tagged adults (~50% passage, & only ~45% are detected passing = 50~60 adults)
- ◆ New passage structures (51 adults so far)
- ◆ Left with ~214 extra adults??
 - ◆ From translocation???
 - (5 years since we began)



Key Considerations for Pacific Lamprey Passage



- ◆ Lamprey are nocturnal -> excessive light can hinder movement
- ◆ Lamprey are slow swimmers
 - ◆ $> 1.0 \text{ m/s}$ (3.3 ft/s), mostly use “burst & attach” locomotion (lots of rests in between)
 - ◆ $> 2.4 \text{ m/s}$ (7.9 ft/s), “burst & attach” is inefficient & unsuccessful
- ◆ Most weirs are $1.8 - 2.5 \text{ m/s}$ (6-8 ft/s), fishway entrance = up to 3.0 m/s (10 ft/s)
 - ◆ Mismatch between “salmon criteria” & lamprey ability
 - ◆ High physiological cost for repeated & extensive use of burst swimming & attachment
 - ◆ “Cumulative effect” of multiple challenges may be the issue
- ◆ Attachment surface (for oral disc) crucial
- ◆ Large variation in ability depending relative size, condition, temp, & even temperament -> one size “doesn’t” fit all



Fall Migrant



Spring Migrant



Lamprey are sneaky! (like a ninja)

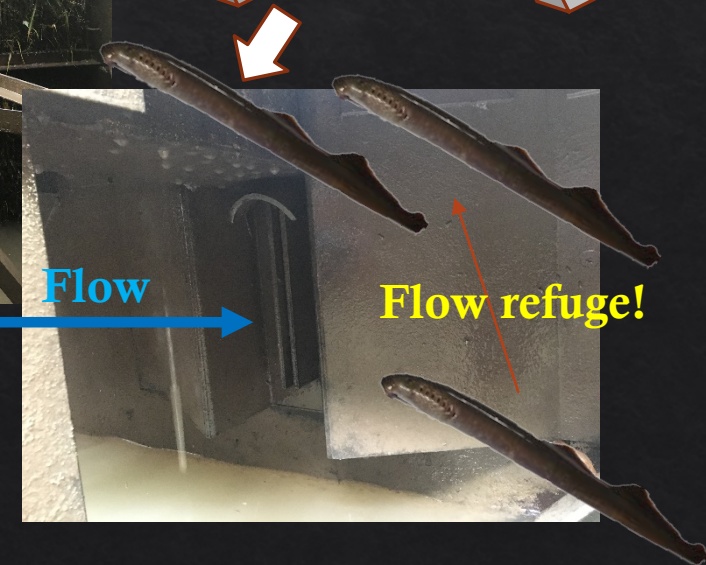


◆ Lamprey can enter areas that fish are not supposed to go...

- ◆ Auxillary water channels
- ◆ Outlet pipes
- ◆ Ladder bottom grates
- ◆ Past picketed lead areas (for fish counting stations)

Lamprey holding behavior at ladder PIT arrays!!

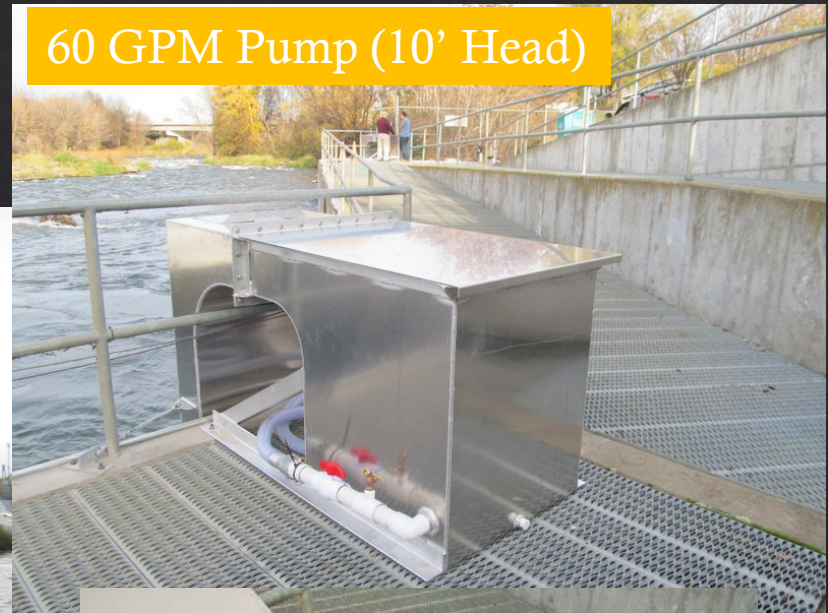
- ◆ Pros & Cons for allowing entrance...
- ◆ Gap of <0.75 " to block fall migrant entry
- ◆ Gap of <0.5 " to block spring migrant entry
- ◆ Most picketed lead gaps are 1"



New Passage Structure at Prosser Dam Vertical Wetted Wall (VWW) Structure



Wall Height = 8~14 ft



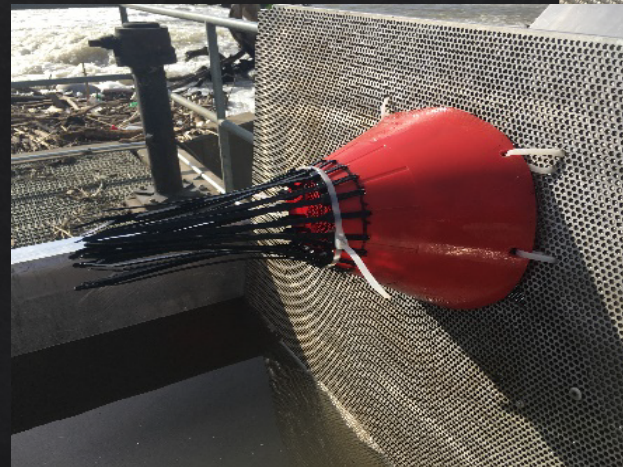
60 GPM Pump (10' Head)



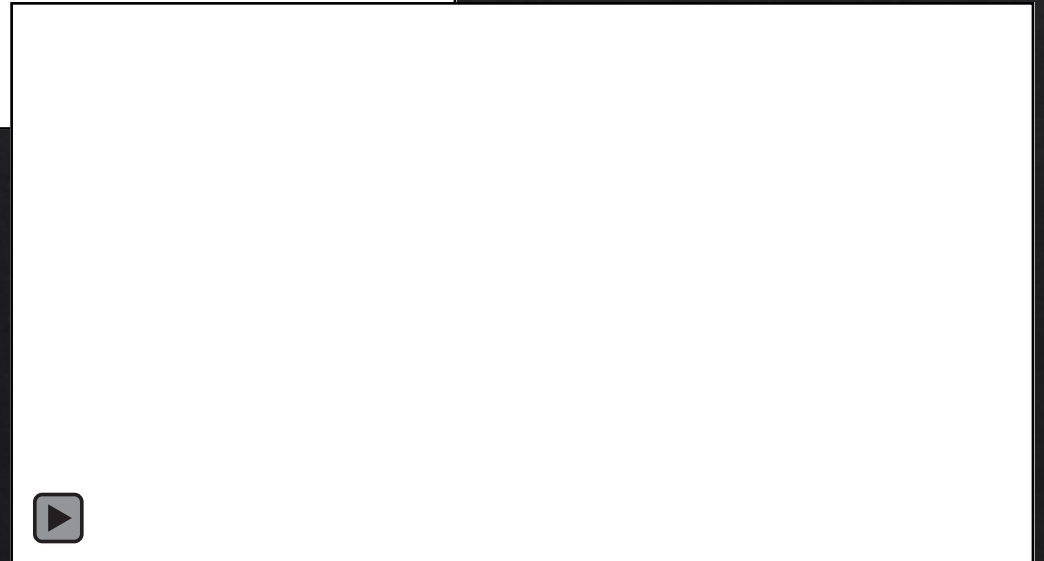
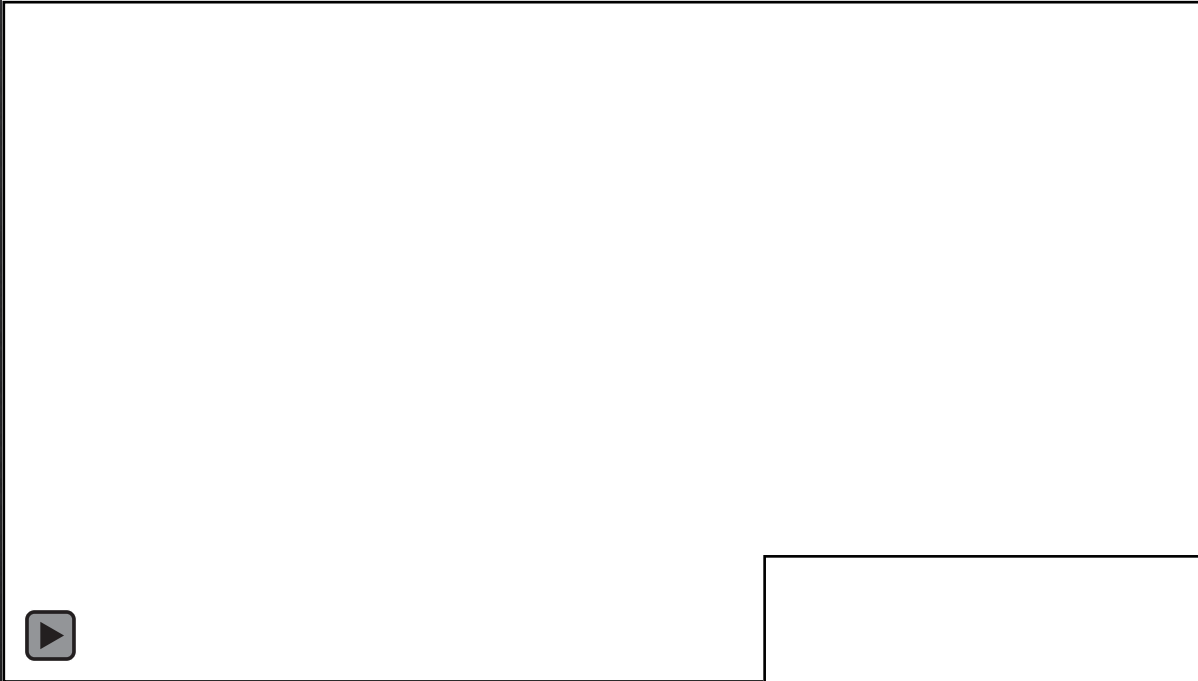
Designed By Fish Head Technology
(Jim Simonson)
Partners = USFWS, BOR, YN

Challenges

- ◆ Climbing (Issues at the Radius)
- ◆ Escapement from Trap Box
- ◆ Hesitation in Entering the Trap Box

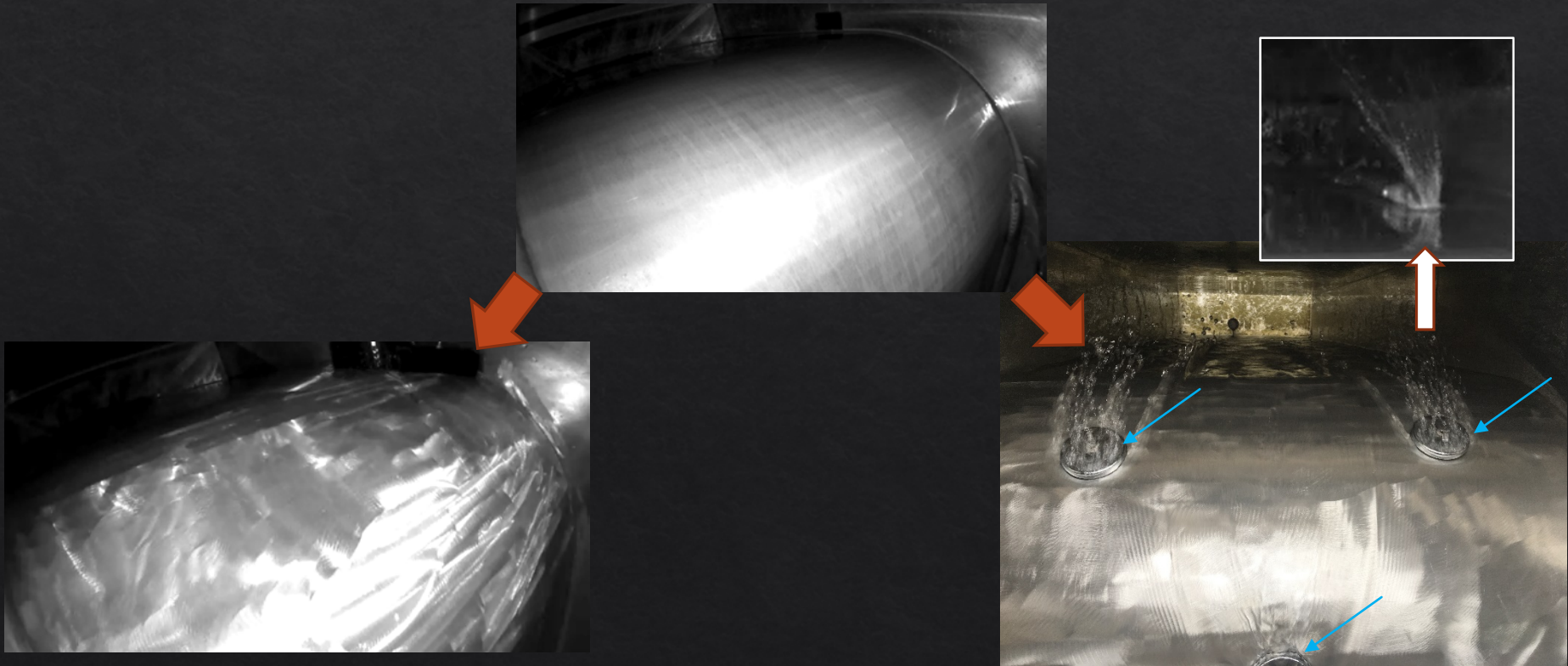


Climbing (Issues at the Radius)



Solutions

- ◇ Grind down the ridge lines (smooth out the radius)
- ◇ Added magnets to break up the flow and add flow “diversity”
- ◇ Discovered the “Buddy System” (magnets act as lamprey positioned upstream) -> Larger Population = Better Passage



Success!!!



Problem #2... Escapement from Trap Box



Solutions

<0.5" Opening

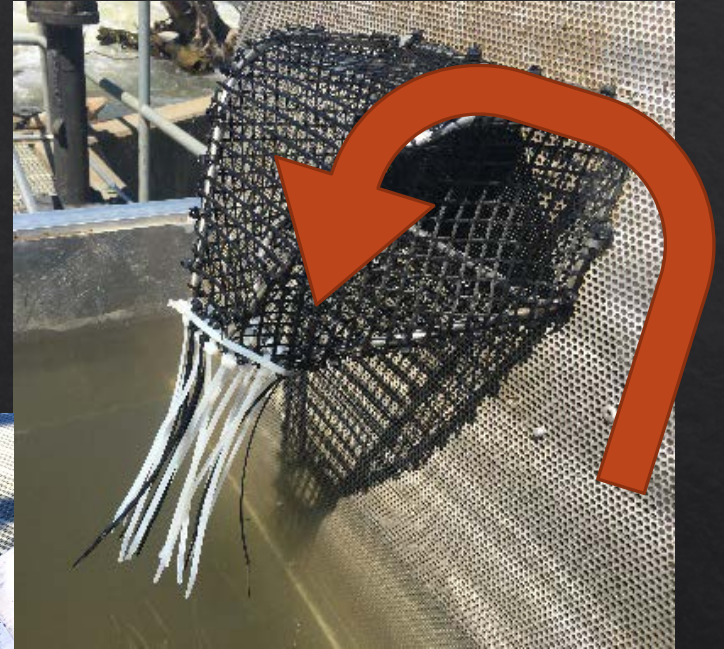


Zip Ties

Drinking Straws



Problem #3...Hesitation in Entering the Trap Box



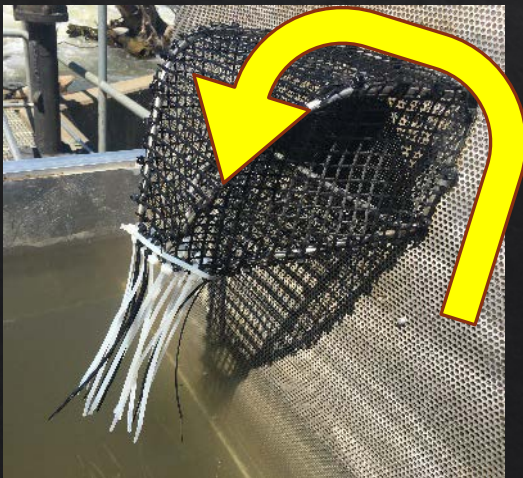
Sharp Angles
Problematic for Entry

Solutions



Enlarged the opening (made it a round shape)

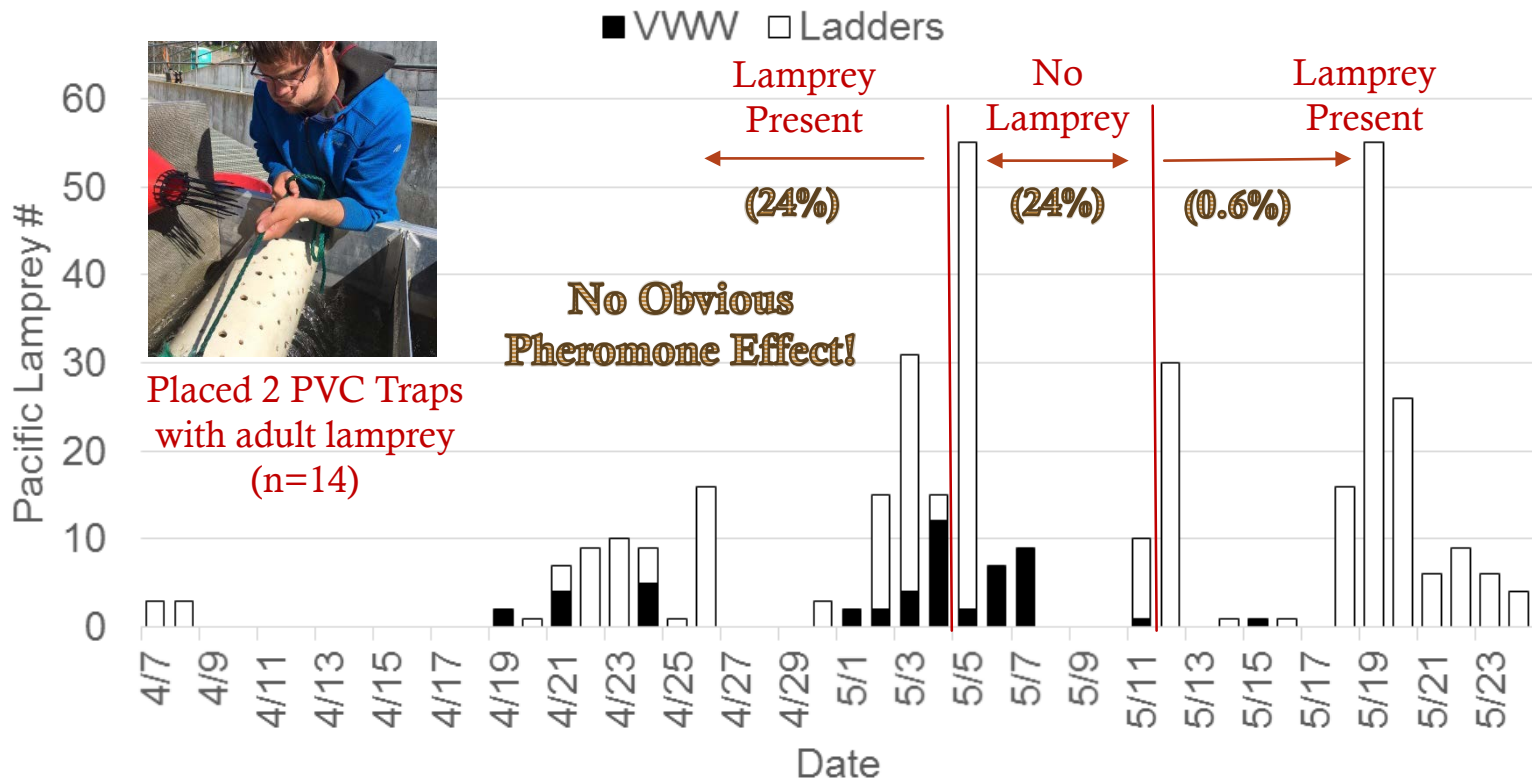
Added curvature to the opening (& removed the sharp edge)



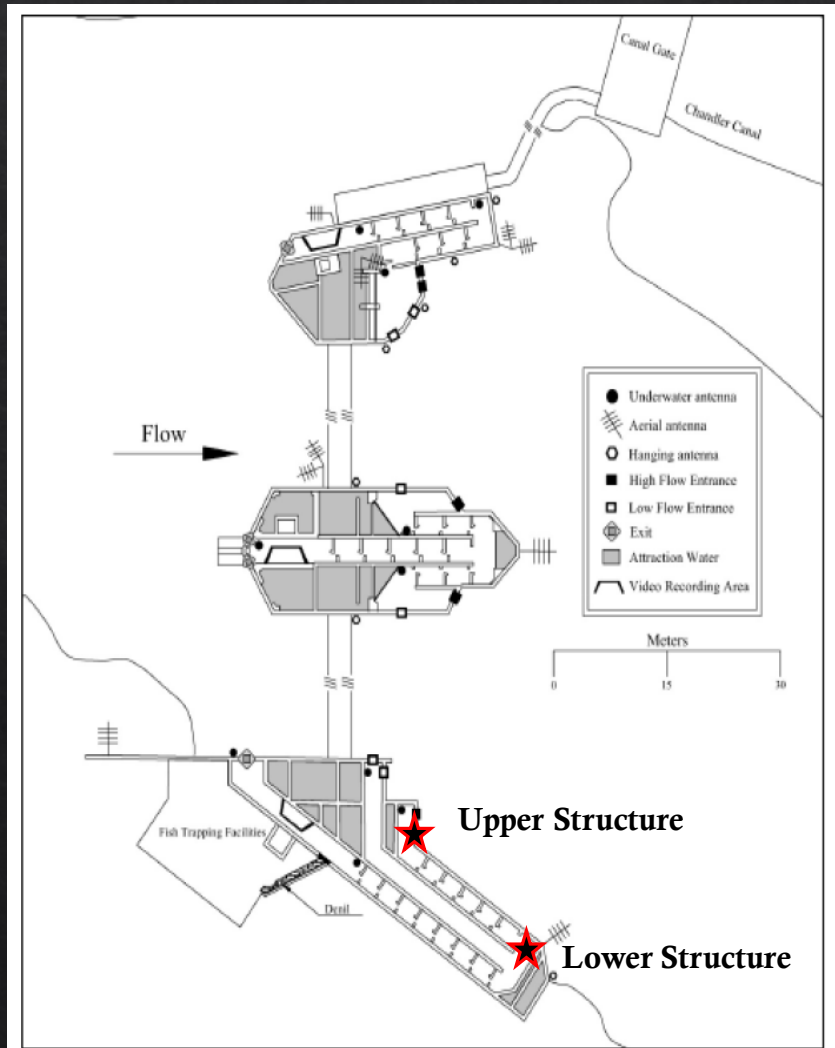
Reduced the sharp angle (easier access)

Overall VWW Performance

Prosser Dam Pacific Lamprey Counts (VWW vs. Ladders)



Location, Location, Location!



Upper Structure = 51 Adults
Lower Structure = 0 Adults

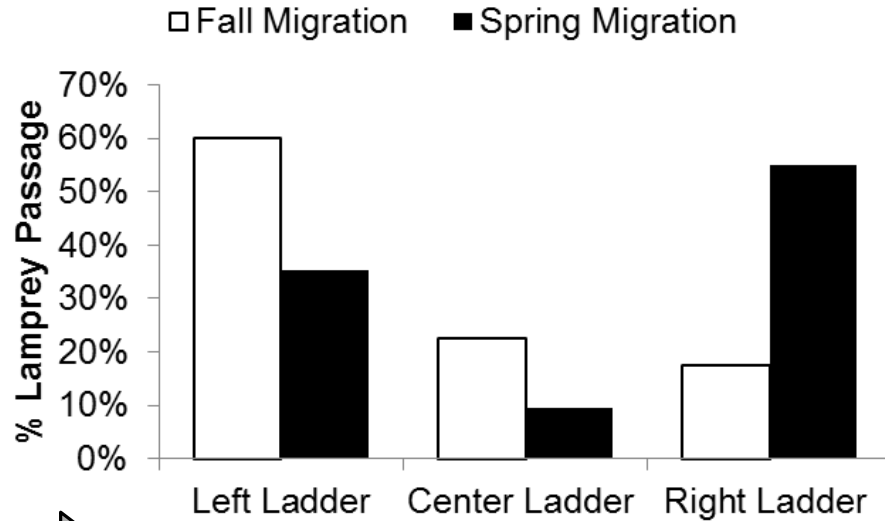
Upper Structure is near fish ladder entrance (mixture of fast attraction water and slow water)

Lower Structure is mostly slow water

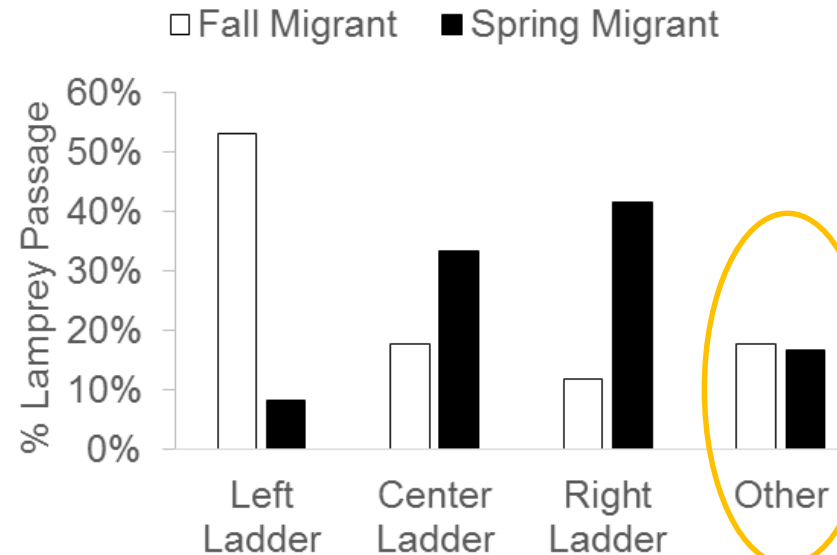
Importance of proximity to attraction water

Migration Routes by Season

Prosser Dam



Wapato Dam



Deflectors
(2-Tiered)

Rounding
Corners

Calm Water

Direction of Flow

Ramp Addition

Fish Ladder Entrance

Entrance Mound

Future Plans

Yakima River:

- ◇ Passage Structure at Prosser Dam (Left Ladder) -> 2017-2018
 - ◇ Eventually make it all volitional (complete passage)
- ◇ Sunnyside & Wapato Dams -> 2018-2019
- ◇ Roza Dam -> As soon as funding available!

Toppenish Cr:

- ◇ Unit 2 Diversion Dam -> 2018-2019

Others??? (please keep us in the loop of any dam modification work)

Please Keep Us in Mind!!!
(we need “your” help)



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