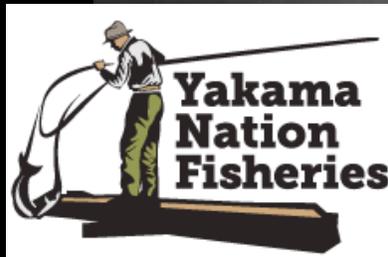


The Evolution of Lamprey Passage Structures within the Yakima Basin

“Are we evolving as fast as these lampreys???”



Presenter: Ralph Lampman

Yakama Nation Fisheries Pacific Lamprey Project (YNPLP)

The Pacific Lamprey Team

Tyler Beals



Dave'y Lumley



Shekinah Saluskin



Sean Goudy



Bob Rose



Michael Buck



Noah Sampson



Mildred Jones



Jarod Swan



Heritage Uni. Student
• Sloane Seelatsee

Partners



Jim Simonson



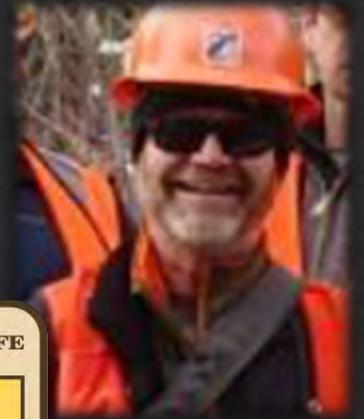
Pat Monk



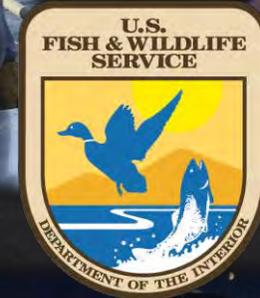
Mark Briggs



RD Nelle



Mark Nelson



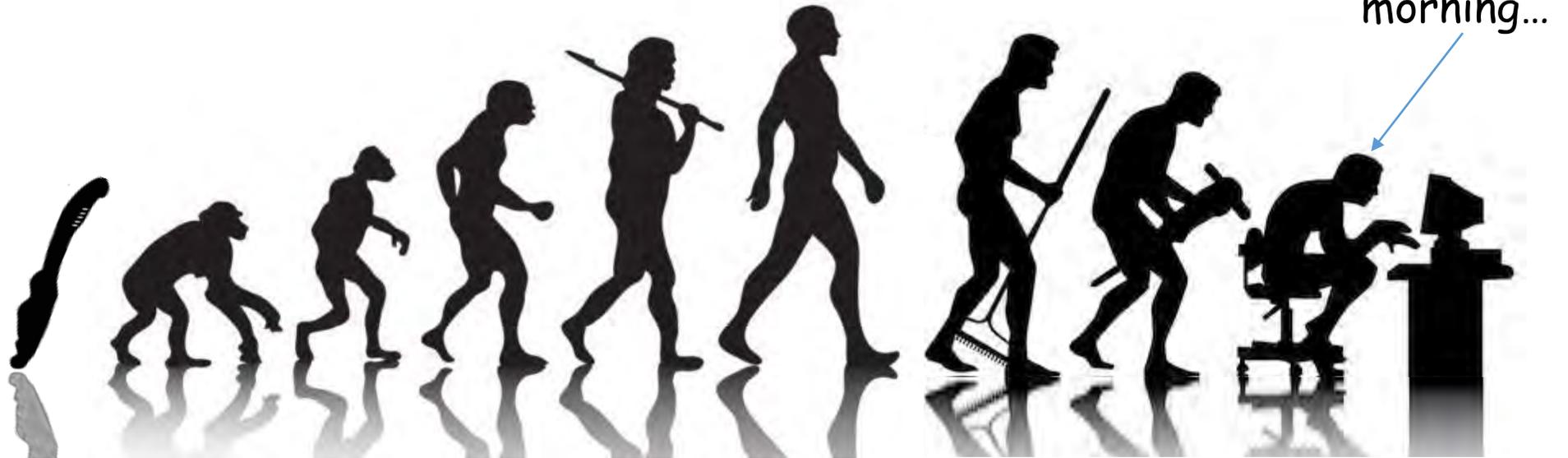
Susan Camp



Ann Grote

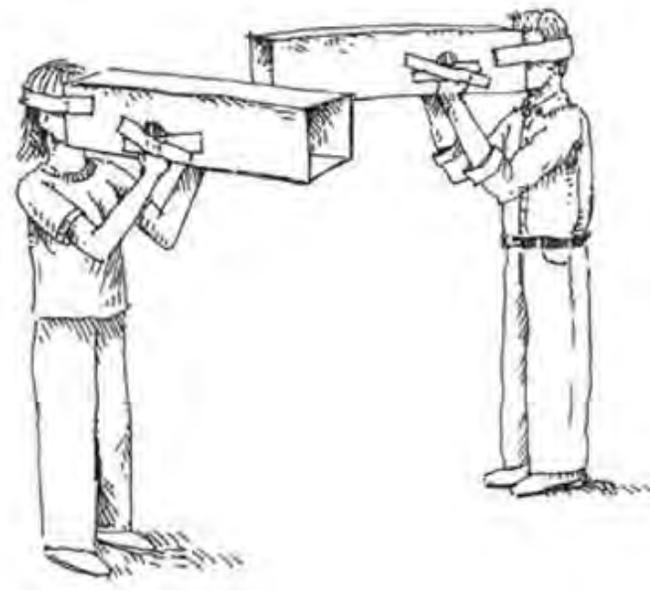
Hiroaki Arakawa

Examining Our Roots...



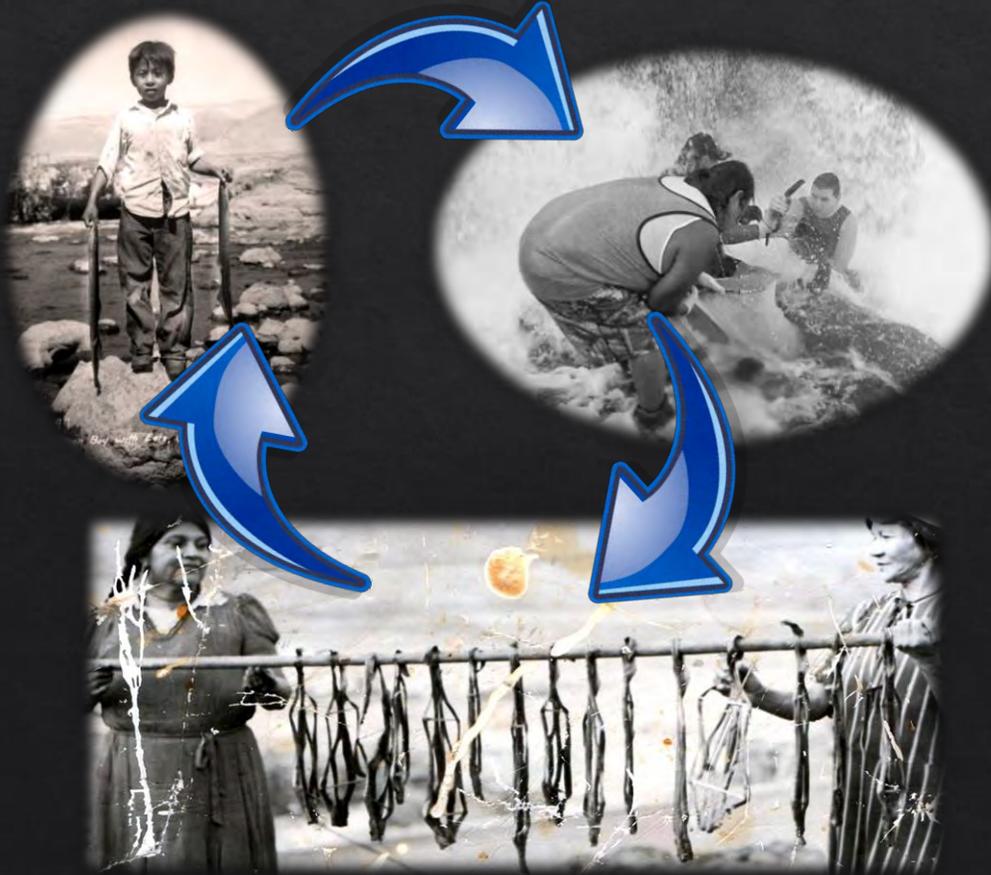
Ralph this morning...

Human Evolution Or Devolution???



Tribal Harvest in the Yakima Subbasin & Ecological Interactions

- ◆ Historically (until 1970s), PA Lamprey harvested in Yakima R. (Horn Rapids, Prosser Falls, Sunnyside, Wapato dams)



Roots to Wings (PNWU/Heritage Uni)

Michael Buck

Carmen Buck



Davis Washines



Overview

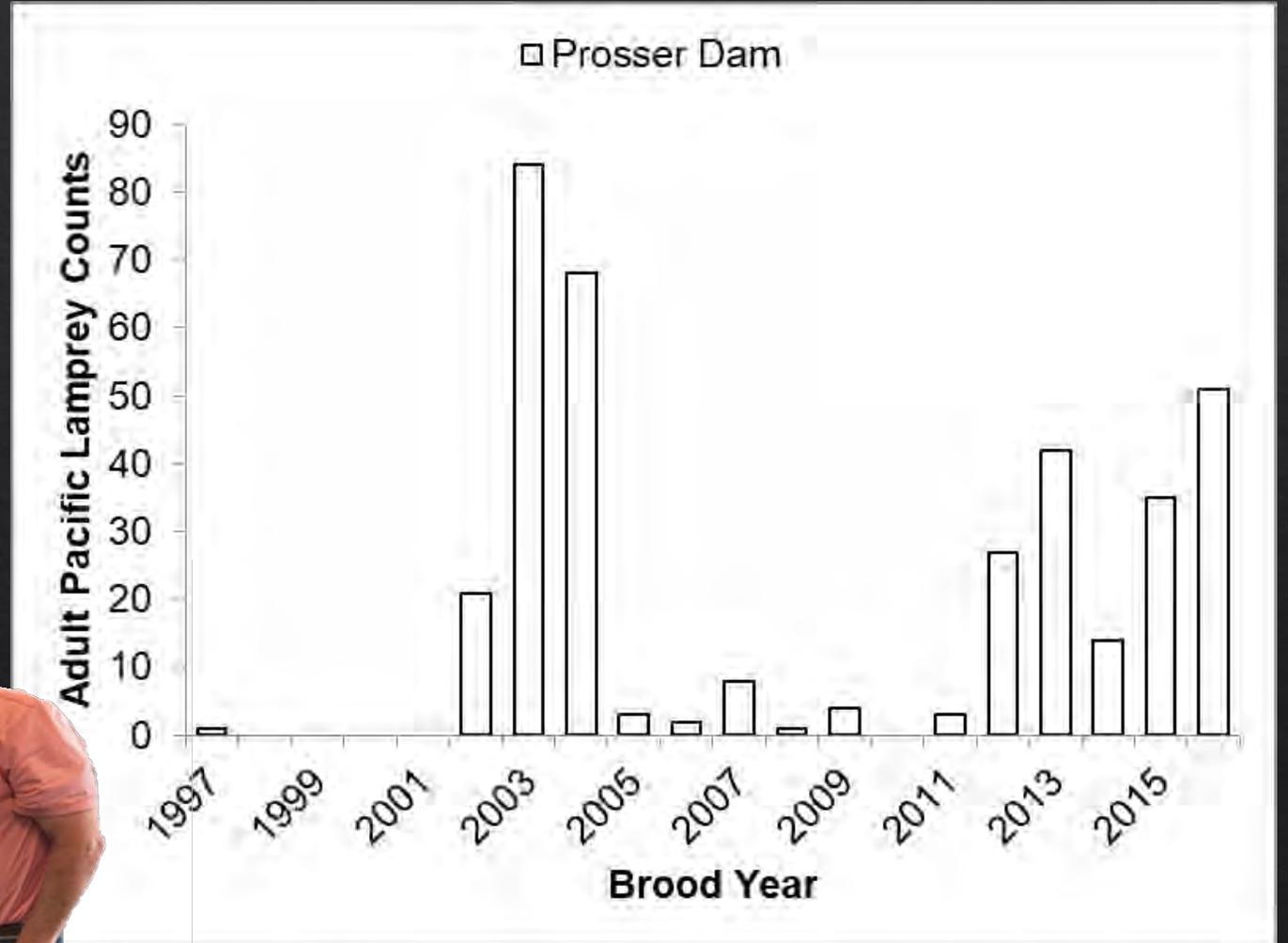


- ◆ Intro
- ◆ Prosser Dam
 - Vertical Wetted Walls
 - Volitional Routing Using Smooth Tubes
- ◆ Designs for Other Dams

Prosser Dam Adult Pacific Lamprey Counts (~2016)

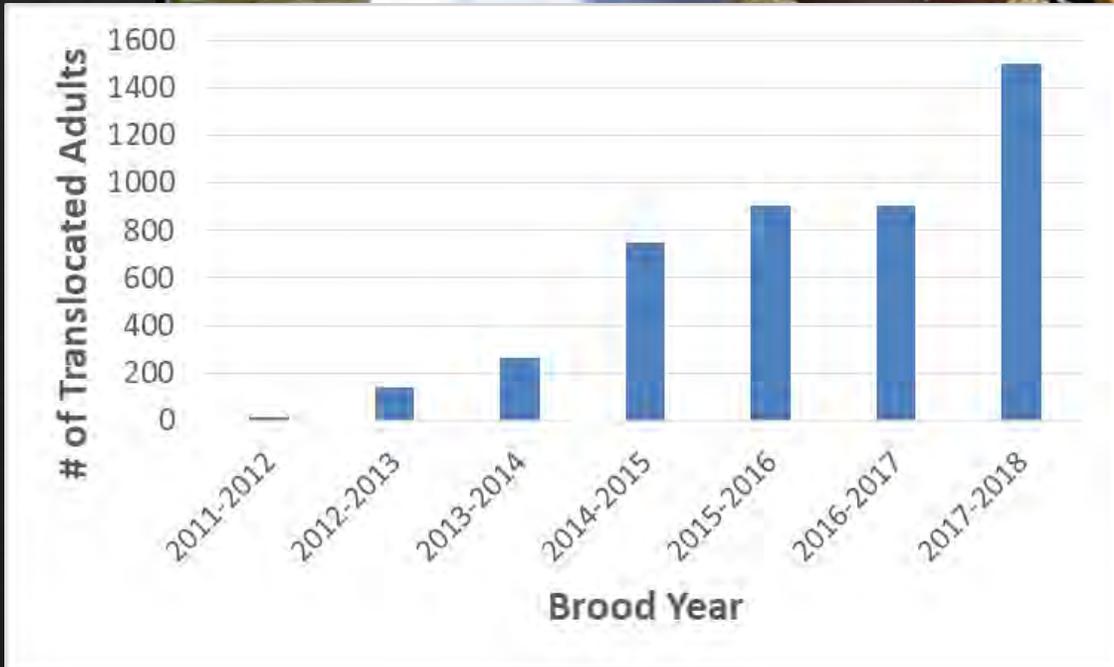
100 adults
in 2250 km of
anadromous
habitat
(2 adults / 50 km)

Functionally
Extinct!!!





Adult Translocation



Broodstock Year	# Total	Destination
2011-2012	15	Yakima
2012-2013	138	Yakima
2013-2014	264	Yakima
2014-2015	752	Yakima
2015-2016	906	Yakima, Methow, Wenatchee
2016-2017	905	Yakima, Methow, Wenatchee
2017-2018	1499	Yakima, Methow, Wenatchee
Total	4479	-

Yakima Subbasin

All 2012-2018 Release Locations
(White Arrows)

Roza Dam

Ahtanum Creek

Toppenish Creek

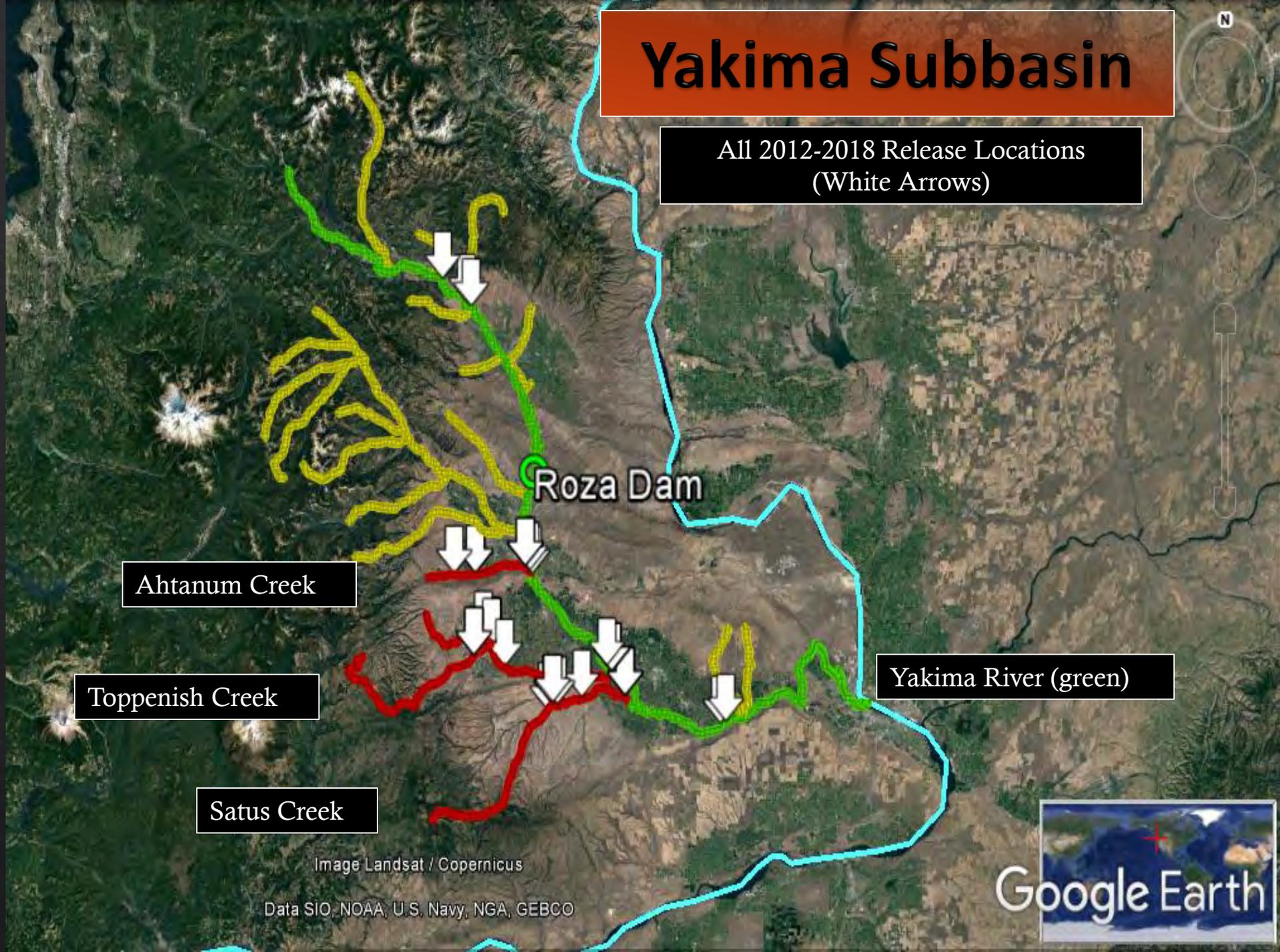
Satus Creek

Yakima River (green)

Image Landsat / Copernicus

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google Earth



Ahtanum Creek

Toppenish Creek

Satus Creek

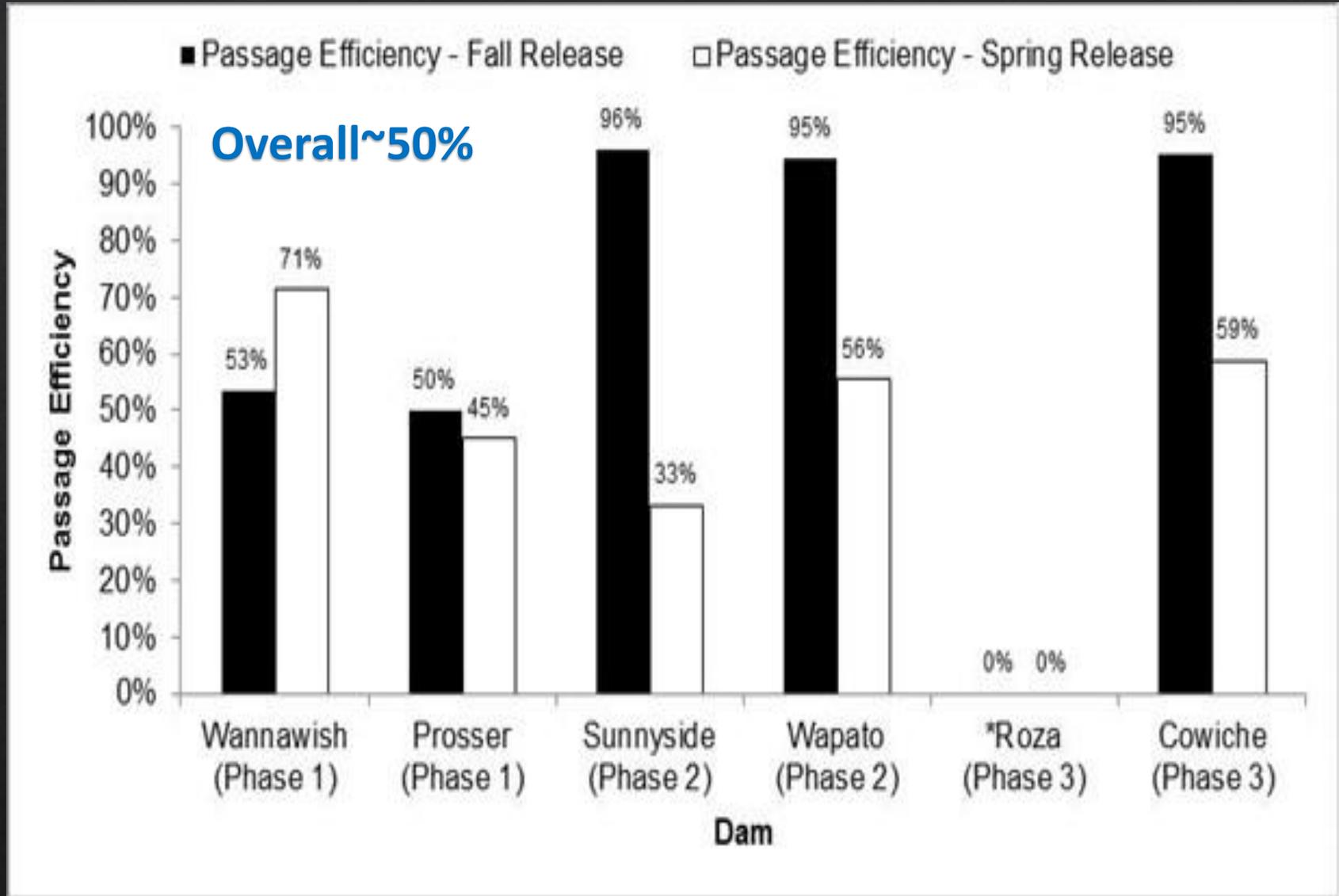
Early Release ~March

Late Release ~May

Image Landsat / Copernicus



USFWS Radio Telemetry Results (2011-2014)



RECLAMATION

Managing Water in the West

FOR OFFICIAL USE ONLY

Project Alternatives Solution Study (PASS)
Final Report

Lamprey Passage, Yakima River Diversion Dams

Yakima Project, Washington

C:\Data\VE\Studies\Lamprey Passage\Lamprey PASS Draft 07-02-2015 Compressed.docx

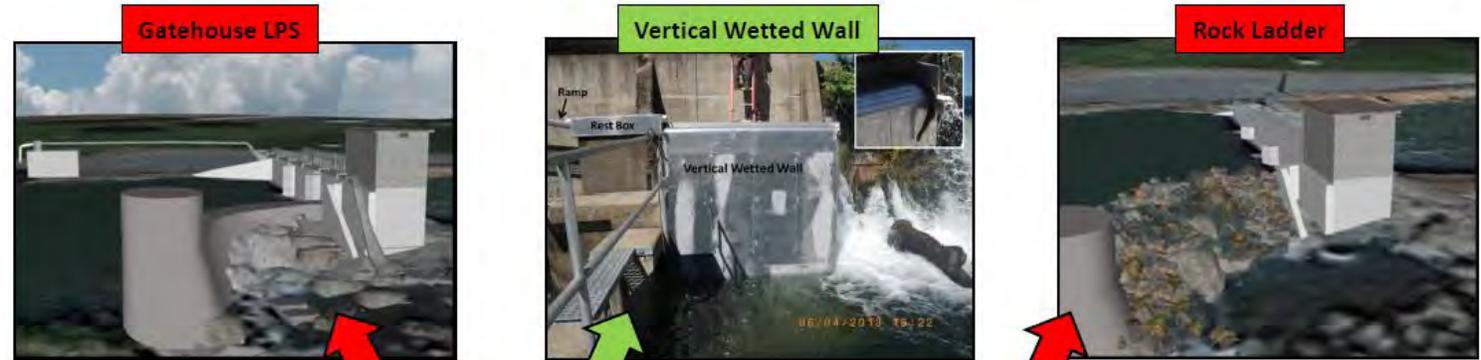
FOR OFFICIAL USE ONLY



Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Boise Idaho

July 25, 2016

Building Partners

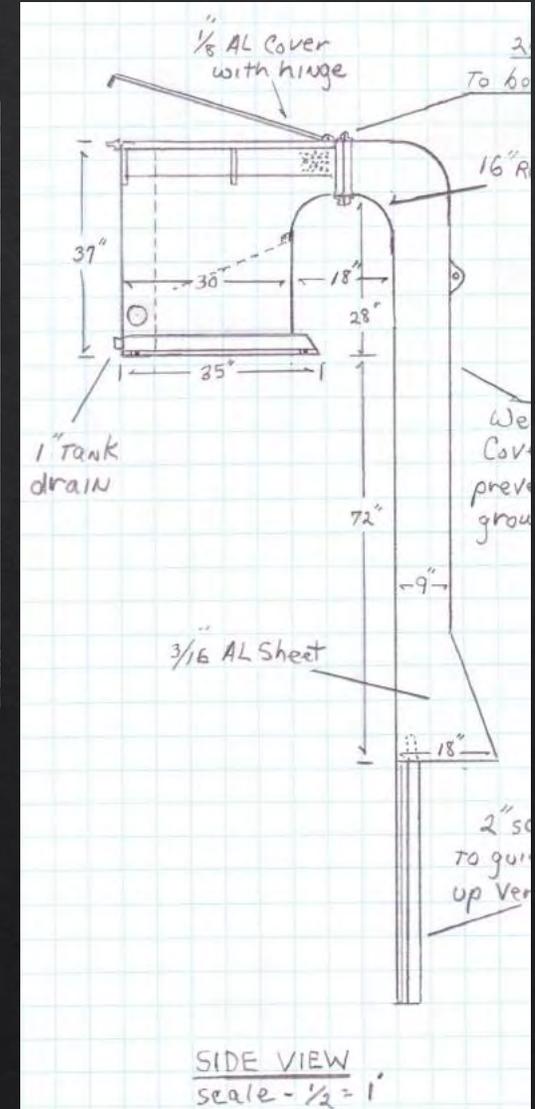


Criteria:	N1	N2	N3	N4	N6	L1	L2	L3	L4	L5	O1	O2	Mean
Compatible Tribal fishery	1	5	5	4	5	3	5	1	4	5	4	4	3.8
Quick implementation	5	5	5	2	3	1	3	2	2	2	5	5	3.3
Effective passage	4	4	5	3	3	4	3	3	3	4	3	4	3.6
Minimize biological risk	4	5	4	4	5	4	5	4	4	4	5	4	4.3
Allow modifications	5	5	5	2	4	2	3	2	2	1	5	4	3.3
Compatible infrastructure	4	5	5	3	4	1	5	3	4	3	4	4	3.8
Minimize impacts ESA	5	5	5	3	3	3	3	4	5	3	5	5	4.1
Cost effective	4	5	5	3	5	1	5	4	3	3	5	5	4.0
Ease construct/install	4	4	5	2	5	1	5	3	2	3	5	4	3.6
Ease O & M	4	4	4	4	5	1	5	5	3	3	4	4	3.8
Technical feasibility	5	4	5	4	5	3	5	4	4	4	5	5	4.4
Ease monitoring	5	4	4	4	2	3	3	3	5	3	2	3	3.4
Totals	50	55	57	38	49	27	50	38	41	38	52	51	

Vertical Wetted Wall (VWW) Structures (Prosser Dam; 2017~)



60 GPM Pump (10' Head)



Wall Height = 8~14 ft

Designed By Fish Head
Technology (Jim Simonson)





New Passage Design from California (4" Smooth Tube)





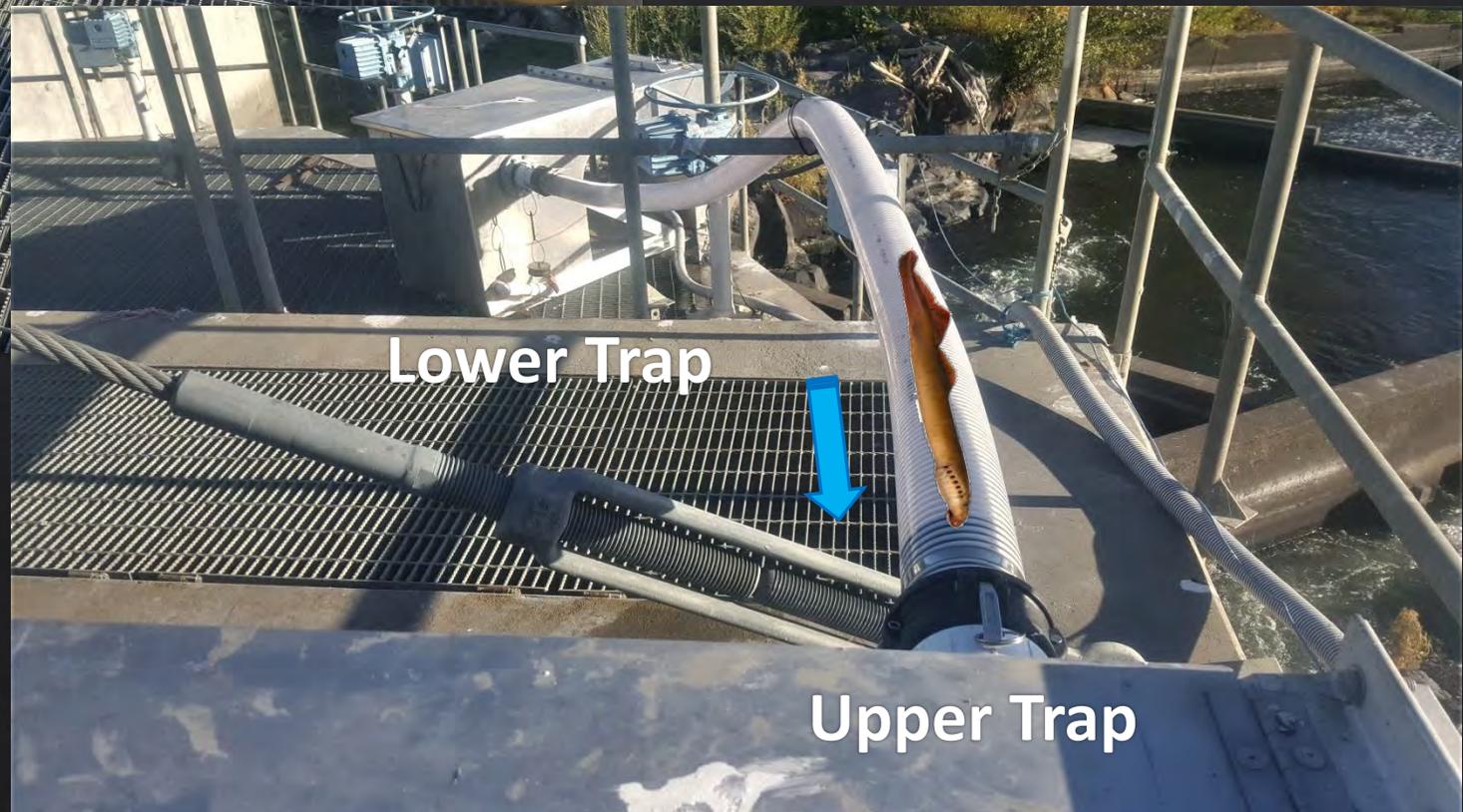
~18 ft

Upper Trap

Lower Trap

1st Step Towards Volitional Passage

10 PIT Tagged Lamprey Placed in Lower Trap (2 Separate Trials)
• 100% were found in Upper Trap



Lower Trap

Upper Trap

Video
Monitoring
Box

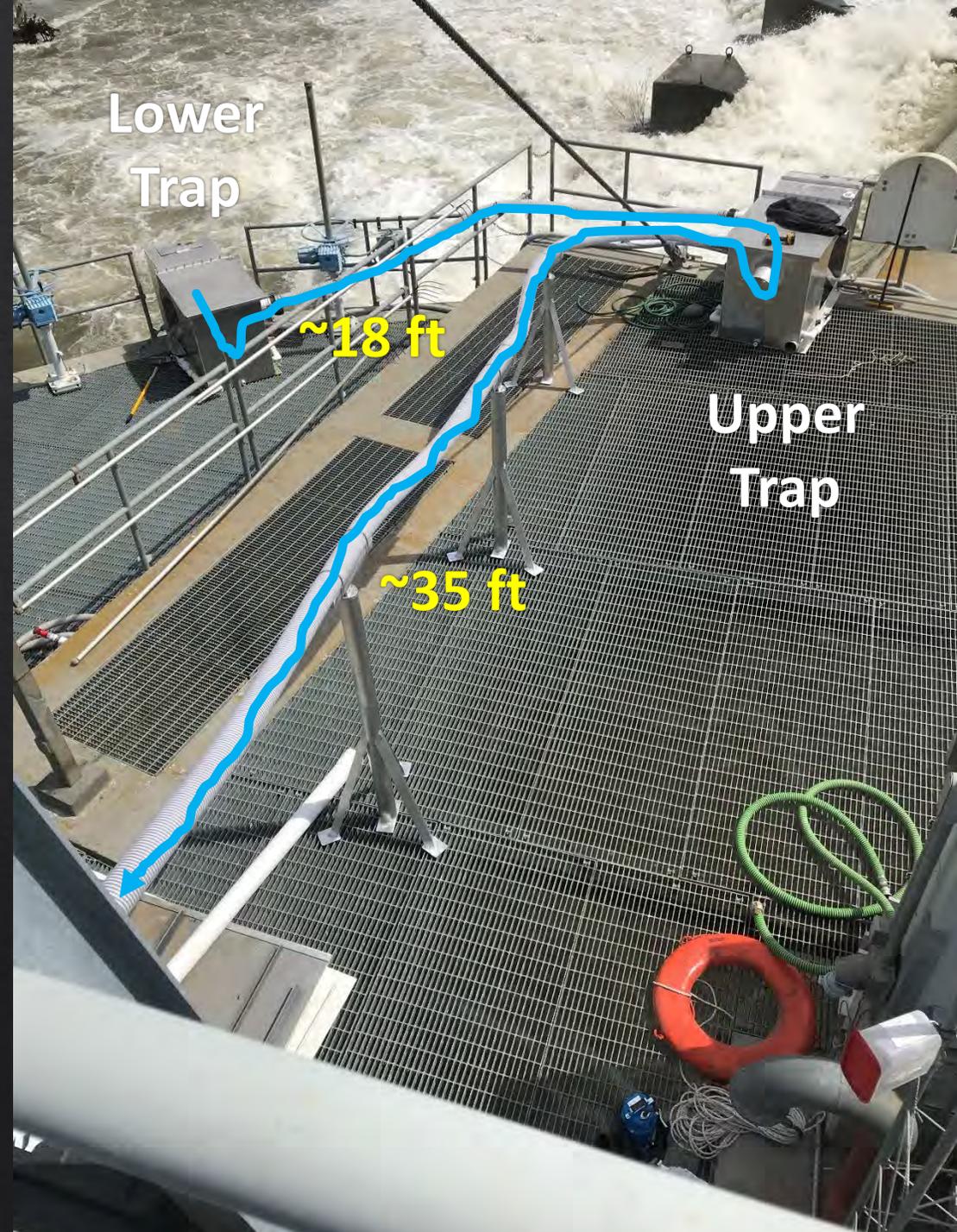


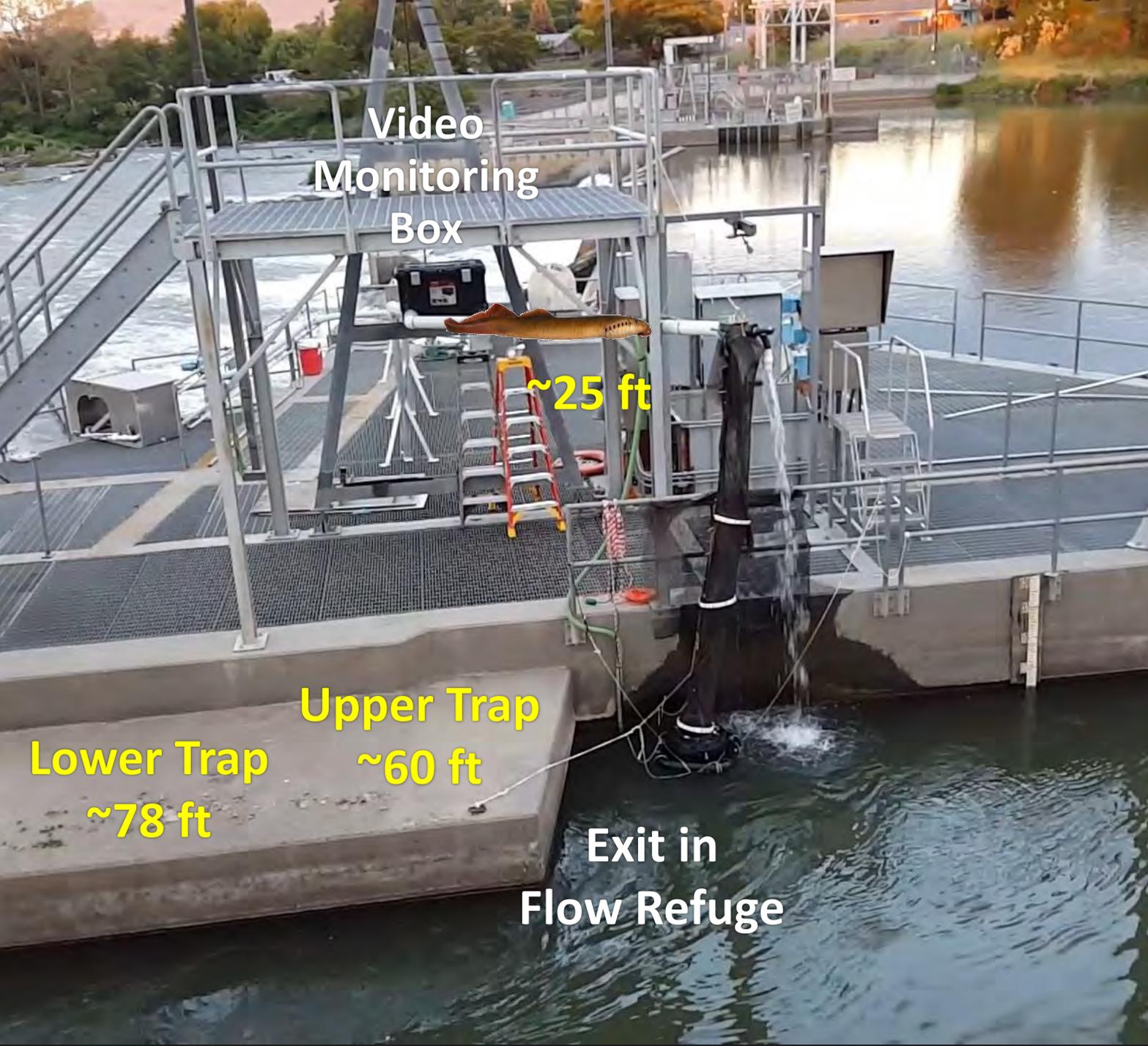
Lower
Trap

~18 ft

Upper
Trap

~35 ft





Video
Monitoring
Box



~25 ft

Upper Trap

Lower Trap

~60 ft

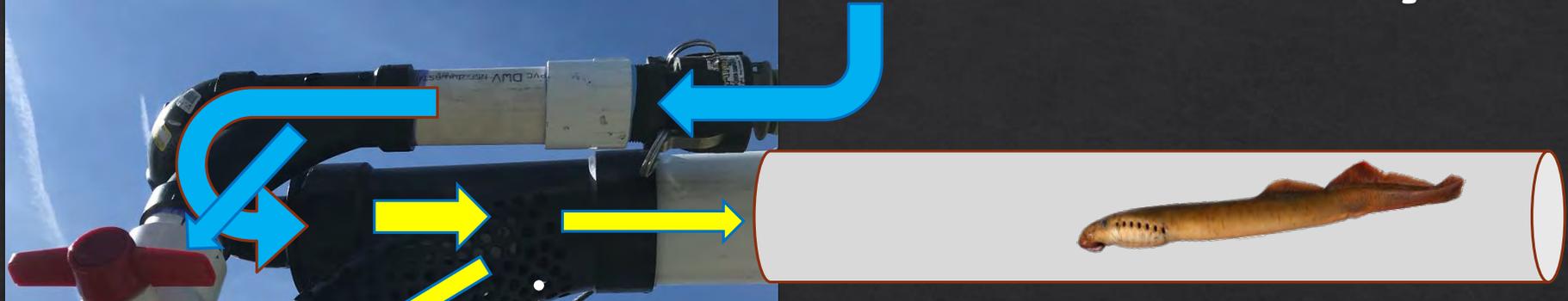
~78 ft

Exit in
Flow Refuge



Exit System (CA Style)

Pump
Water



1/4"
Holes

1" PVC
Inside







**Small Dip in Angle
(holding spots)**

Video Monitoring System



What Is the Optimum Flow in a 4" Tube?

18 L/min



60 L/min



30 L/min



120 L/min



2019/05/22 16:13:20

18 L/min



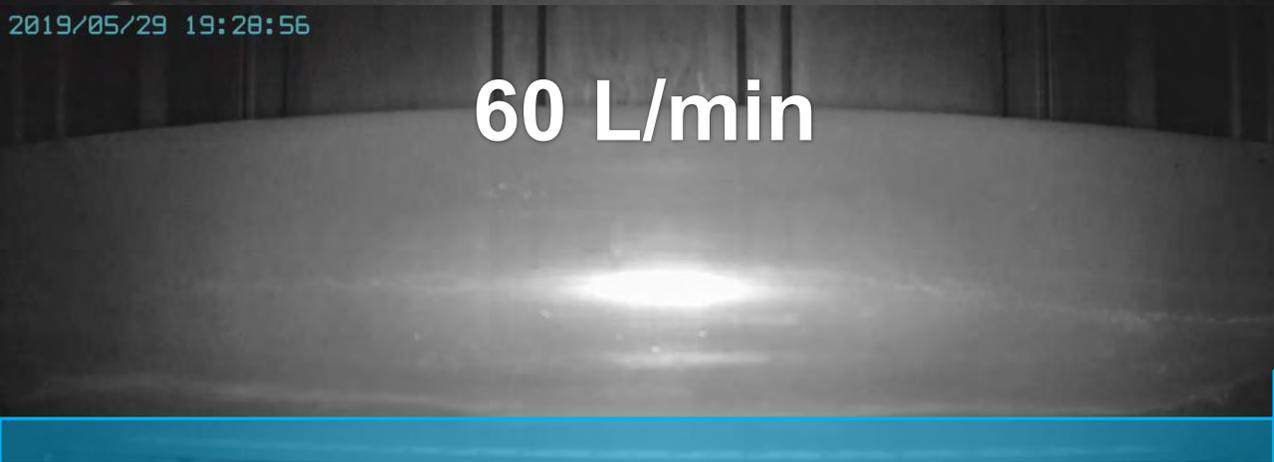
2019/05/23 18:42:35

30 L/min



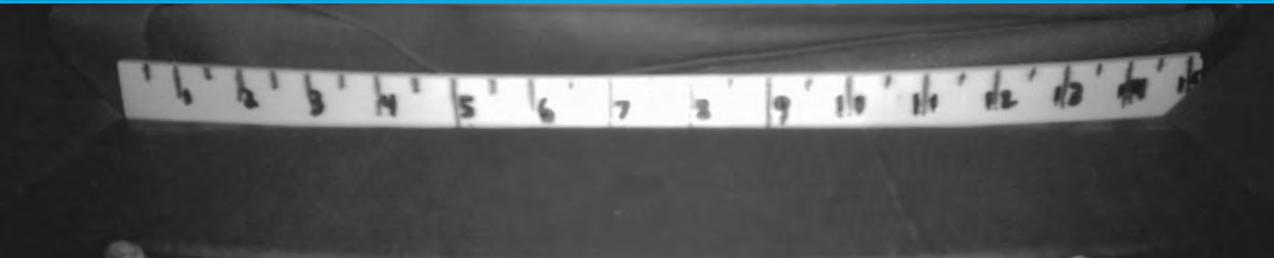
2019/05/29 19:28:56

60 L/min



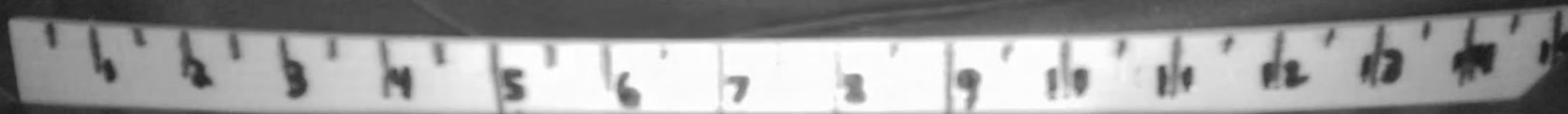
2019/05/24 22:28:50

120 L/min



2019/05/24 21:35:21

120 L/min



Results from Flow Rate Testing

100% = no false positive

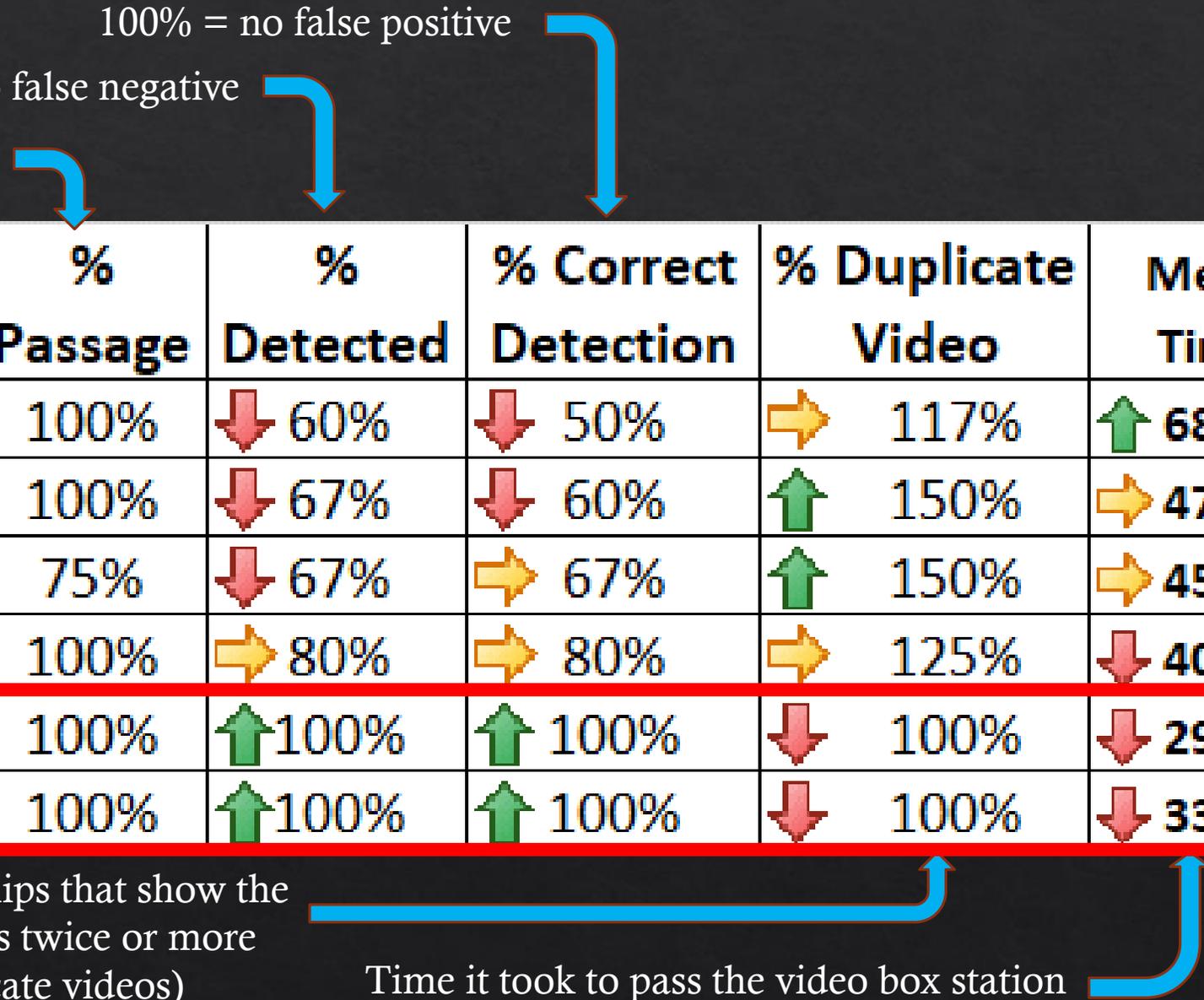
100% = no false negative

Majority – 100% passage

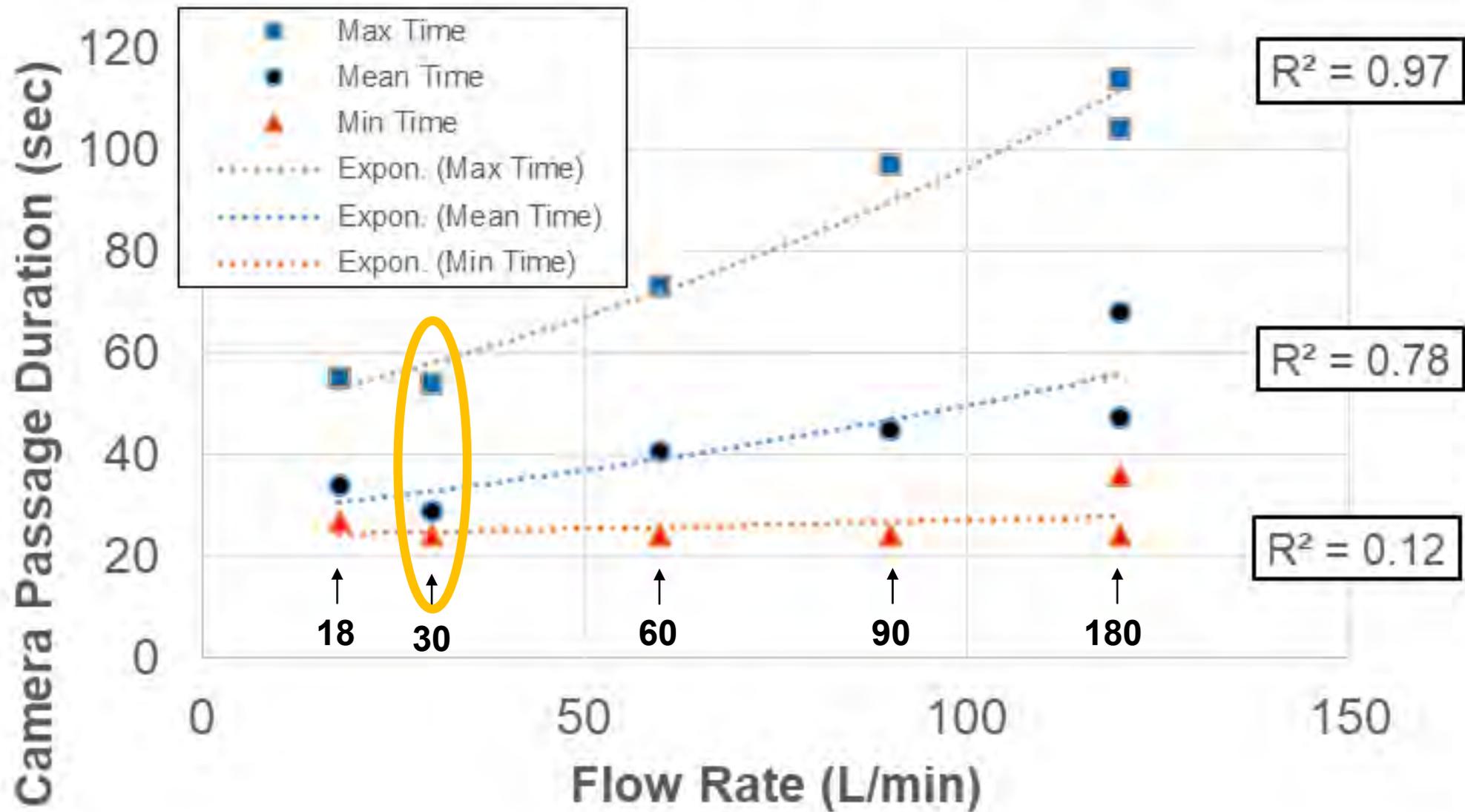
Flow (L/min)	# Placed	# Passed	% Passage	% Detected	% Correct Detection	% Duplicate Video	Mean Time
120	10	10	100%	↓ 60%	↓ 50%	→ 117%	↑ 68.2
120	9	9	100%	↓ 67%	↓ 60%	↑ 150%	→ 47.3
90	8	6	75%	↓ 67%	→ 67%	↑ 150%	→ 45.0
60	10	10	100%	→ 80%	→ 80%	→ 125%	↓ 40.4
30	10	10	100%	↑ 100%	↑ 100%	↓ 100%	↓ 29.0
18	10	10	100%	↑ 100%	↑ 100%	↓ 100%	↓ 33.9

% of video clips that show the same adults twice or more (duplicate videos)

Time it took to pass the video box station



Flow Rate vs. Video Box Passage Duration





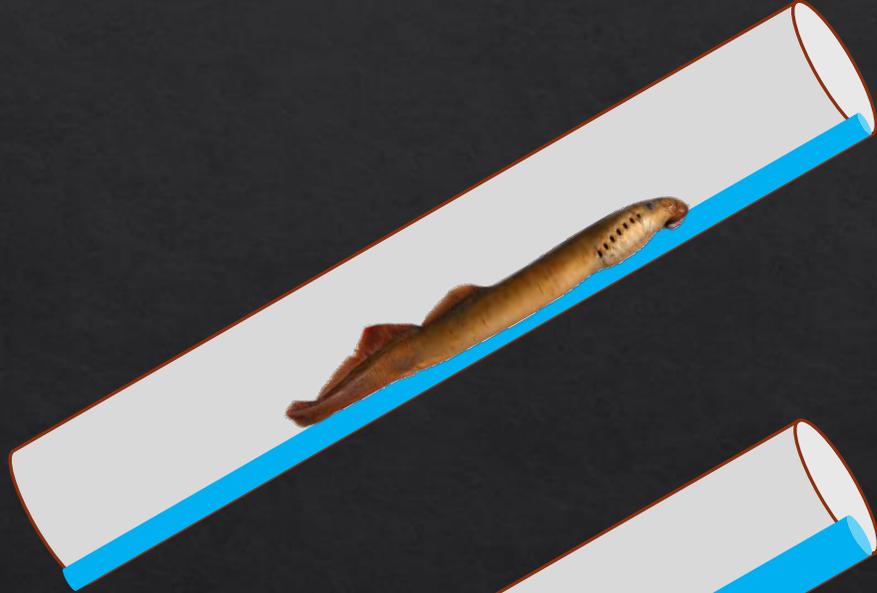
Stop looking
at me you
peeping
Tom!

Night Time Observations

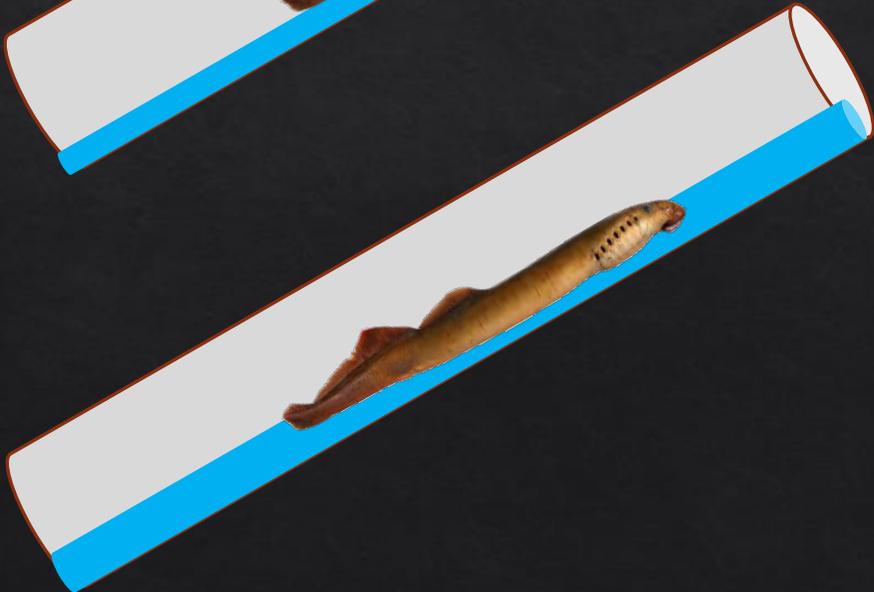




6 ft / 20 sec (18 L/min)



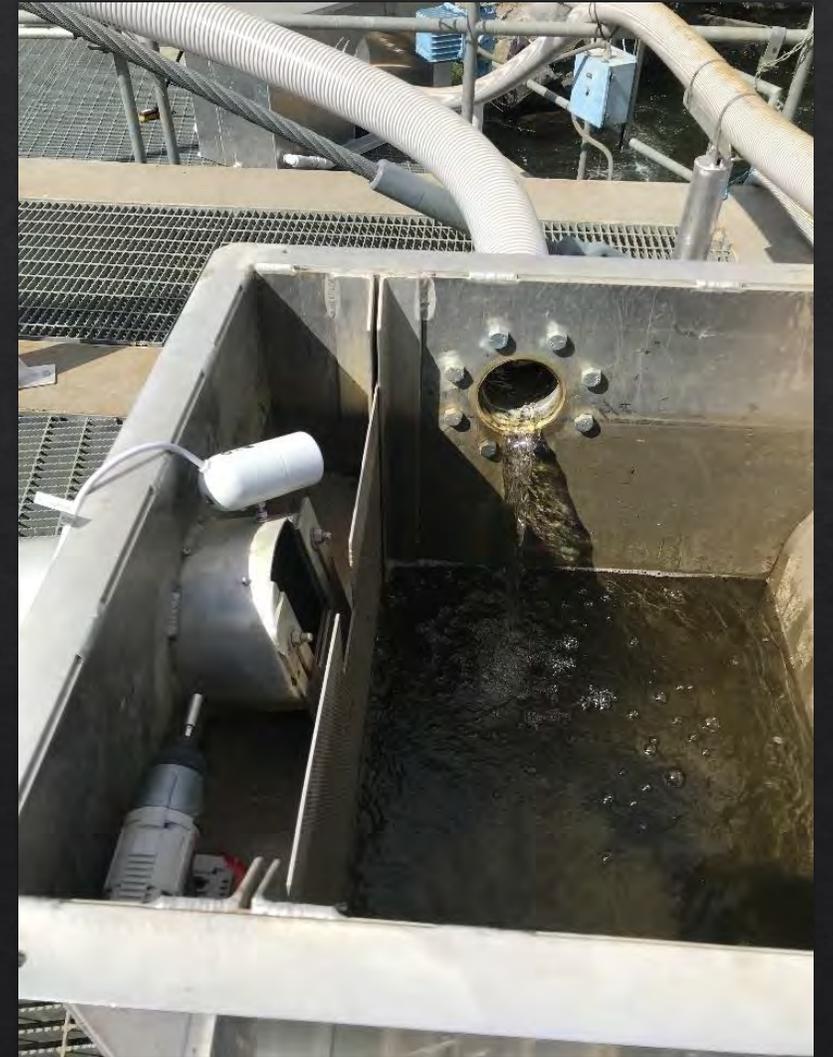
6 ft / 60 sec (18 L/min)



**6 ft / 40 sec (30 L/min)
(able to rest up better?)**

**250 ft = 18 – 42 min
(Van Arsdale Dam)**

New Camera Setup (To Monitor Start Time)





Flush with Top ❌

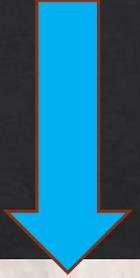


Flush with Bottom ❌



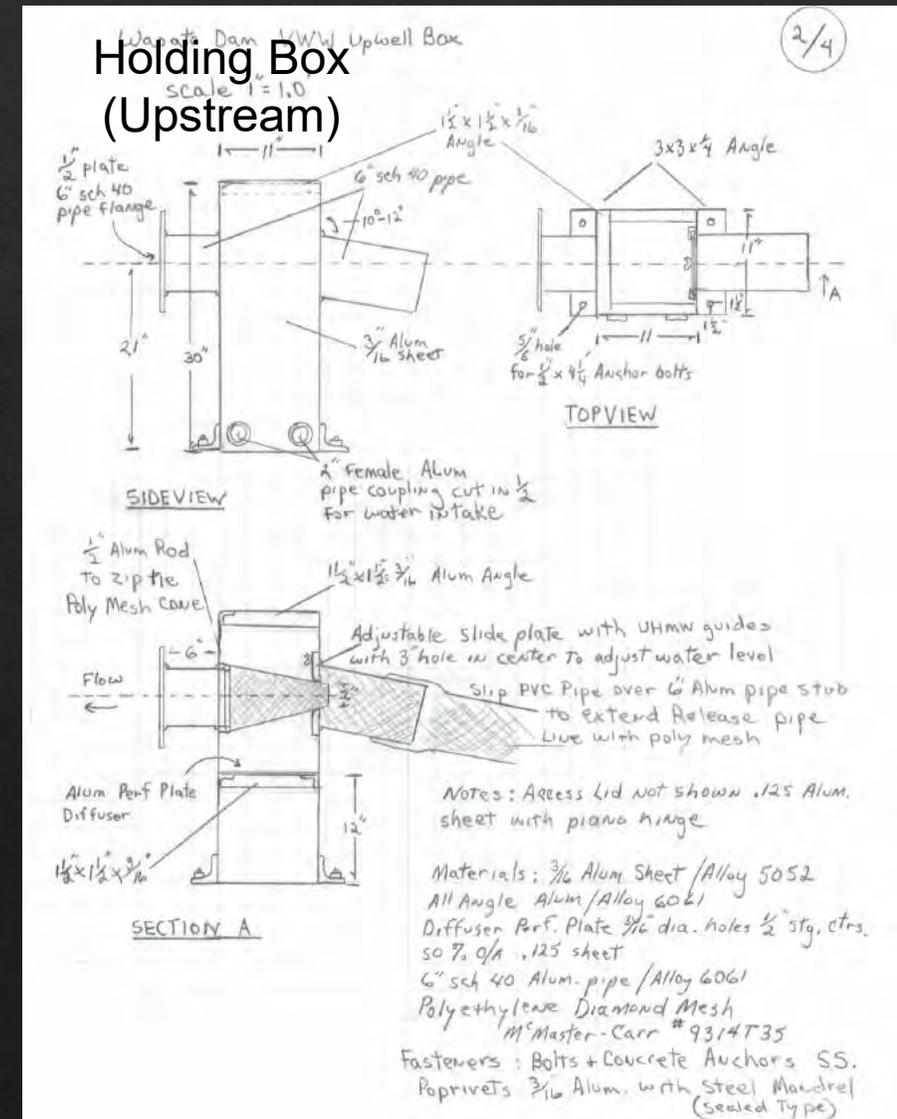
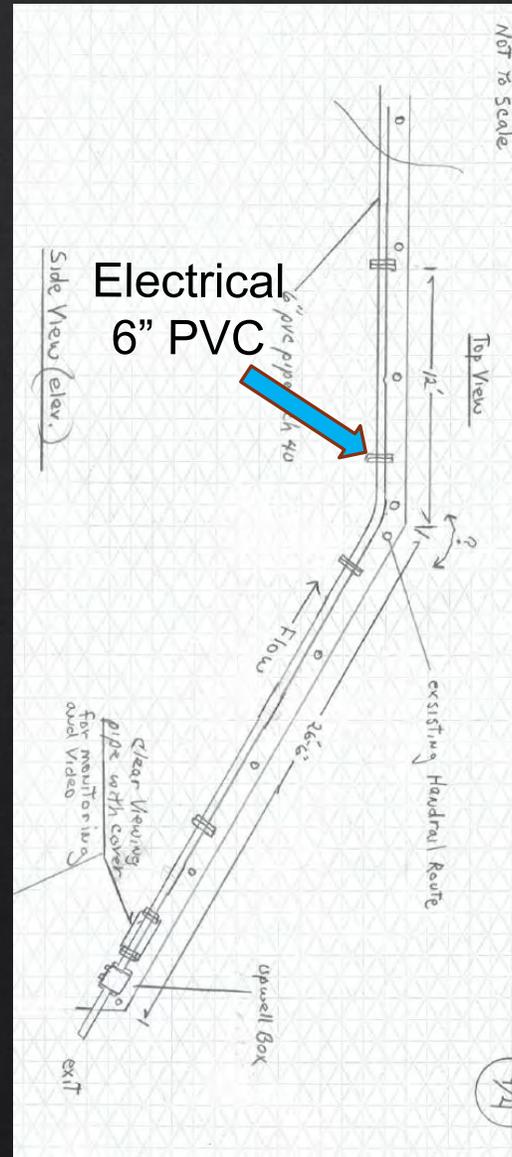
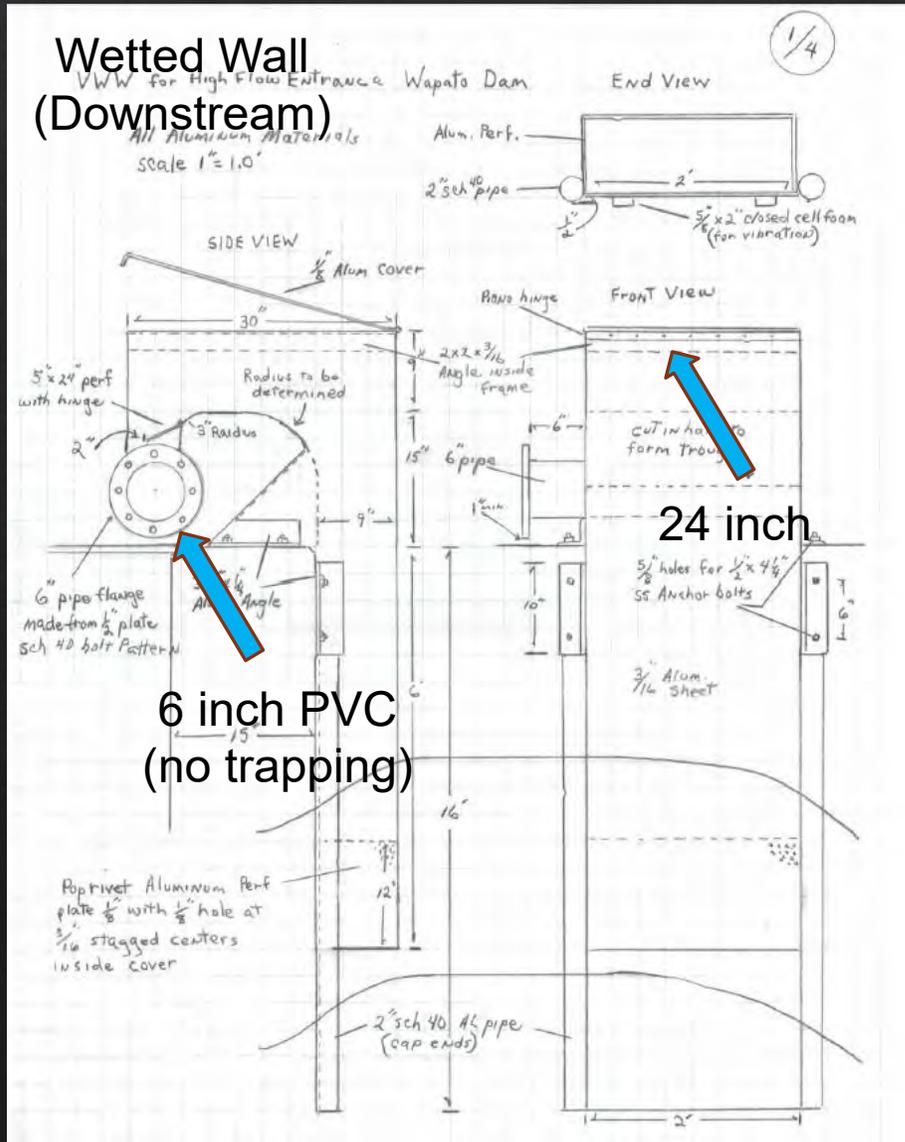
1/2 Full ❌

Sweet Spot!
(no pooling of
water in pipe)



3/4" Deep Water

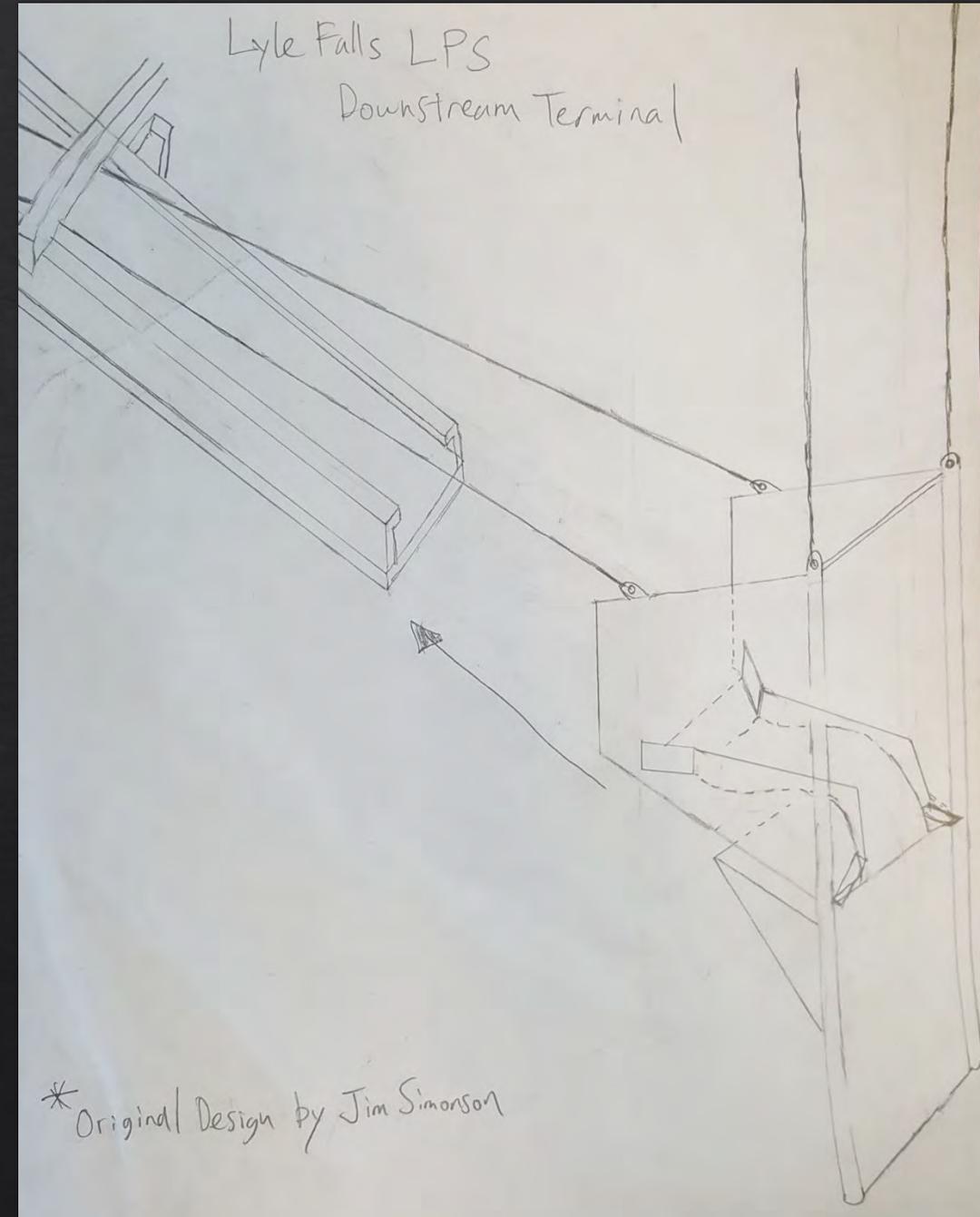
Sunnyside / Wapato Dams (NRCS/BOR/WDFW)



Sunnyside Dam (Center & Right)

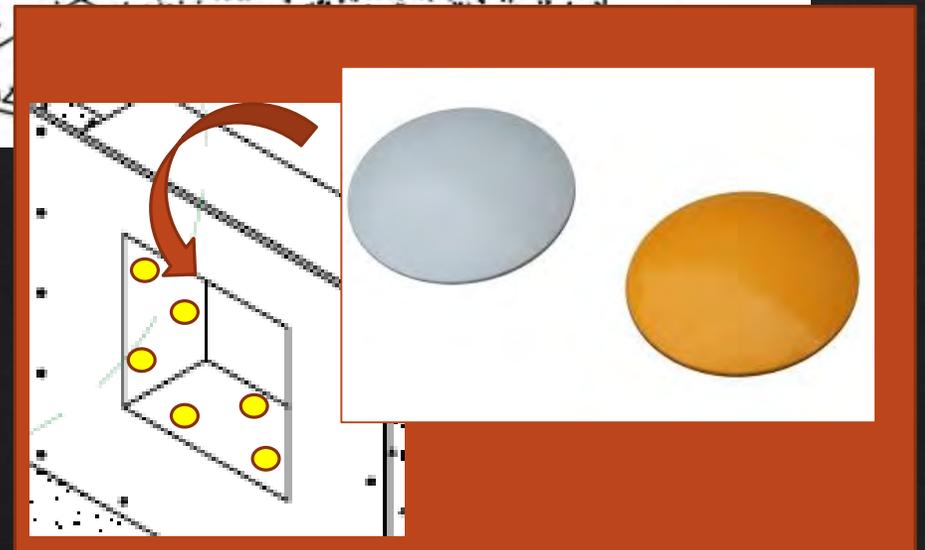


Klickitat Lyle Falls Passage Improvement



Roza Dam Adult Holding

1. Eliminate holding
2. Improve passage



Utility of Pavement Markers (Traffic Buttons)

1. Provides a perfect flow break / disruption for adult PA Lamprey
2. Hydrodynamic shape (allows lamprey to attach, too)
3. Designed for maximum adhesion to surface
4. Cheap! (\$0.45 each)
5. Does not have to be yellow (custom color available)
6. Does not have to be 4" diameter (various sizes available, 1-8")



4 inch Yellow Round Plastic Pavement Markers, 0.45 each, Case of 100

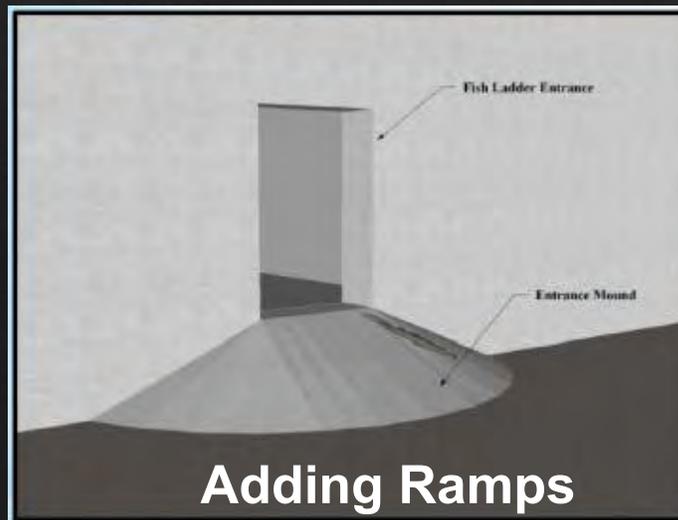
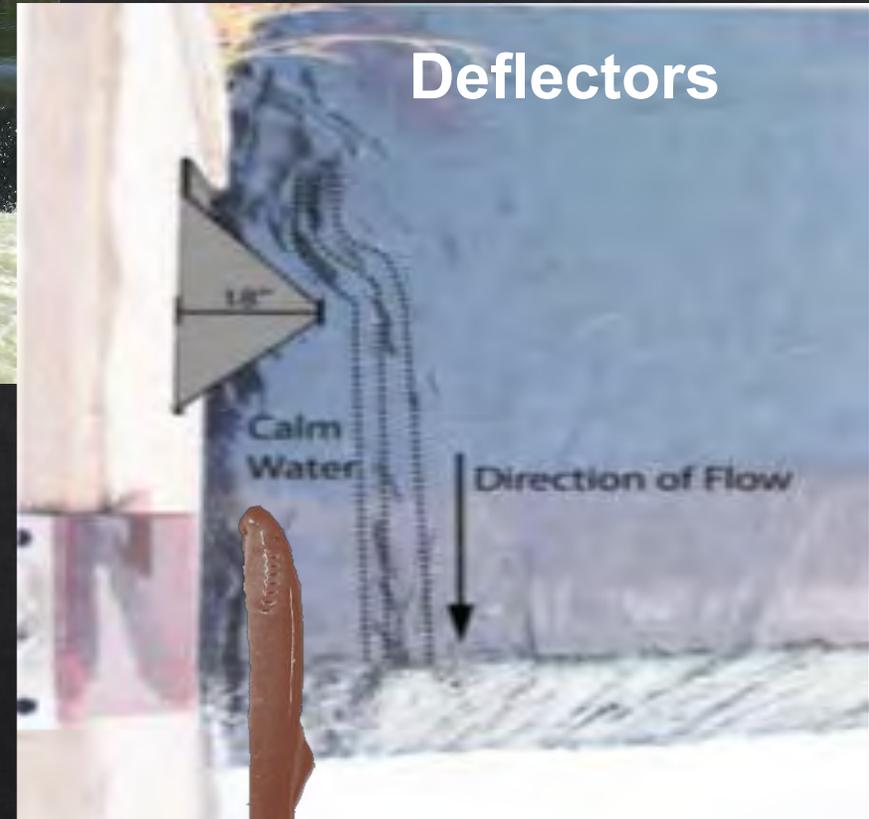
Part #: PAVEMENTMARKER4INPLASTICY
Our Price: \$45.00
Suggested Retail Price: \$41.40
Shipping Weight: 15.00 pounds
Quantity: 1

[Add To Basket](#)



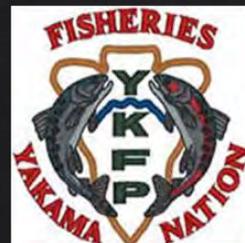


Other Designs?



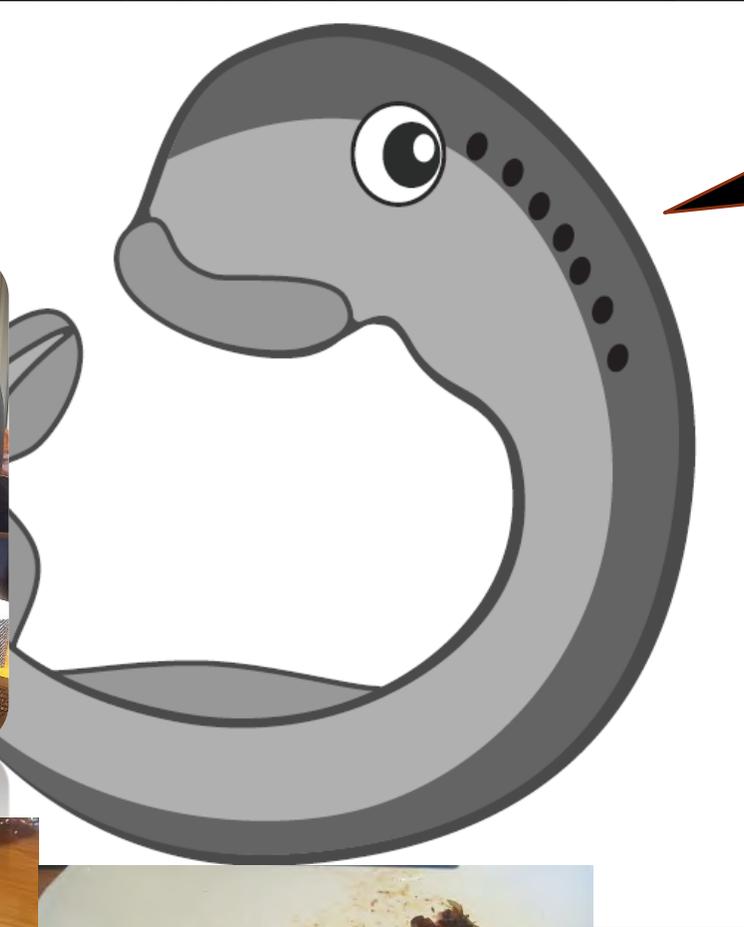
The Strong Need for Partnerships!!!

(All of us need to “contribute”)



"Spiritually he is one of us" (Elmer Crow)

Questions?



Ralph Lampman
Lamprey Hotline - 509-388-3871
lamr@yakamafish-nsn.gov

PG-13

**PARENTS STRONGLY CAUTIONED
SOME MATERIAL MAY BE INAPPROPRIATE
FOR CHILDREN UNDER 13**

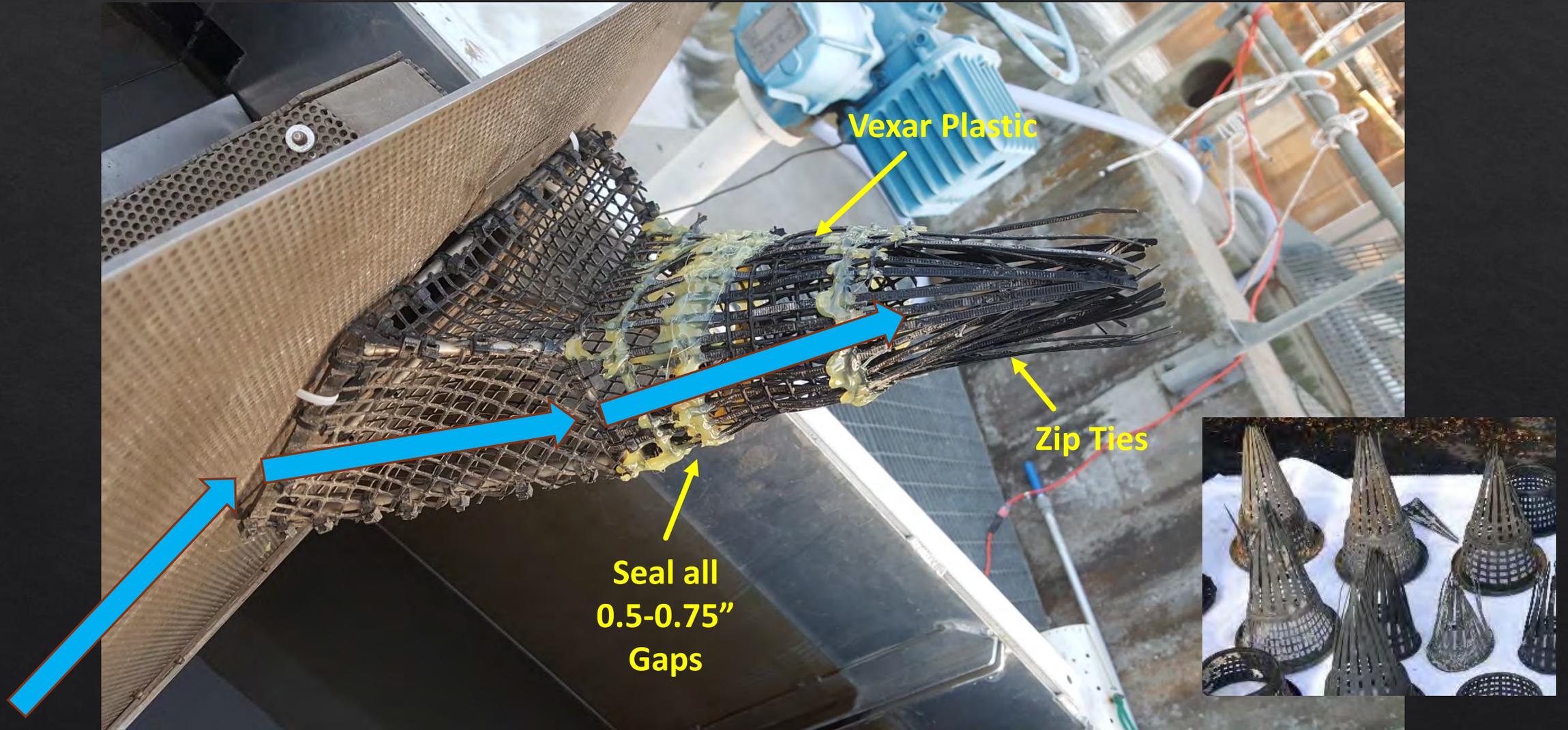
There may be depictions of violence in a PG-13 movie, but generally not both realistic and extreme or persistent violence.





slow motion (half speed)

Entrance/Escapement Solution (Generation 3 Evolution)



Phylink Bullet Cameras

Advantages

- Motion Detection works!
(image processing)
- Self sufficient – no need for DVRs / NVRs
- Time management (on/off time)
- 10 sec prior to trigger
- FTP / Google Drive / Dropbox automatic file transfer
- Continuous video possible, too
- Can be wired or wireless



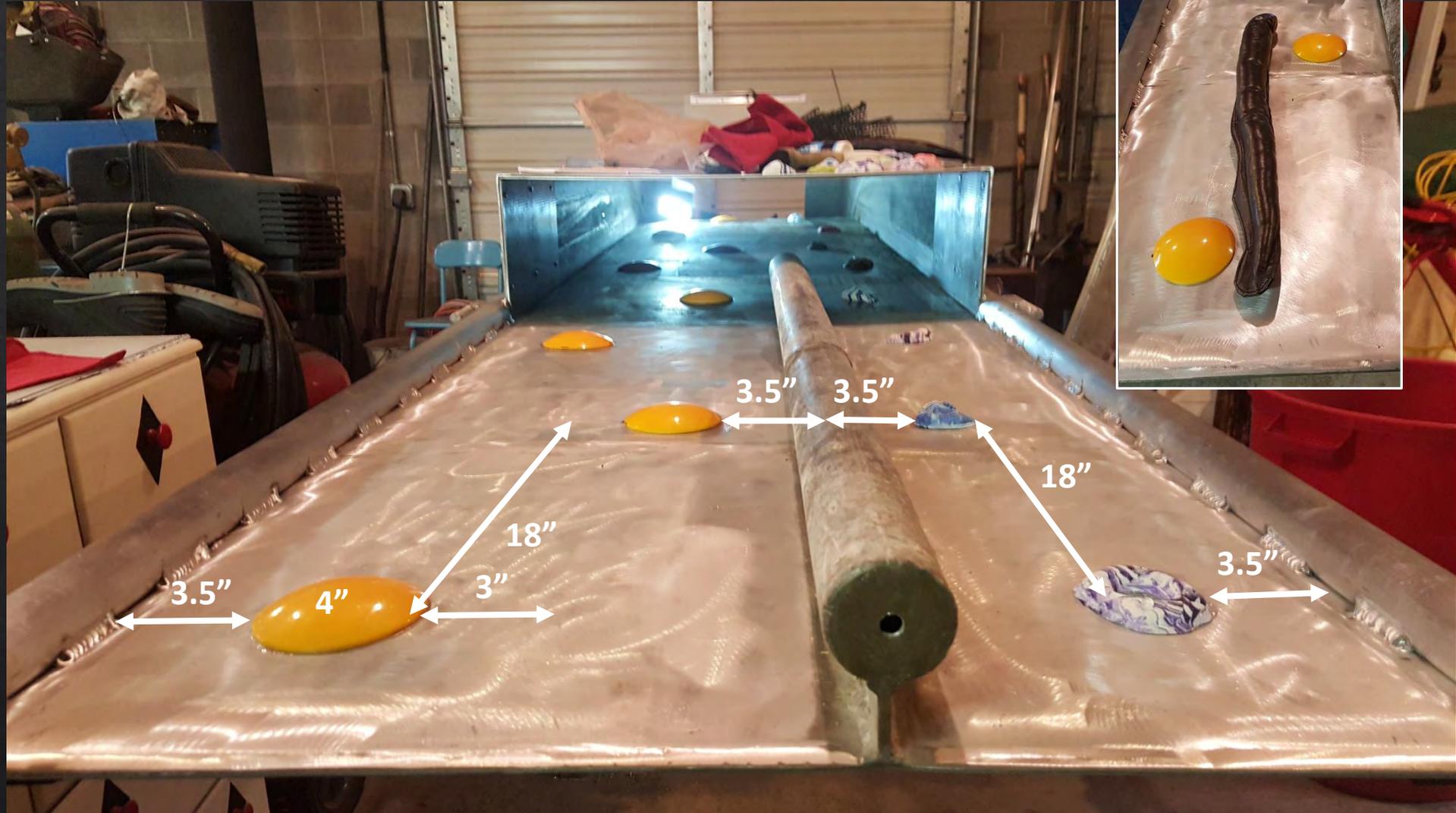
Night Time Observation Summary

- ◇ “Holding” at dips in slope (pooling of water)
- ◇ Usually one adult at a time, but occasionally they will group up and push each other (especially in high flow 60~120 L/min)
- ◇ Only saw 1 able to turn around (in pooled water)
- ◇ ~20 sec to climb 6 ft (most took a break after every ~6 ft)
- ◇ 1 fish took 1.5 min from video to exit (flat section)
- ◇ On average, took 10-15 min for entire trip (18 L/min)
- ◇ In 30 L/min, confirmed some faster passage 7~8 min; 7.5-8.5 ft/min

Evolution of Wetted Wall



New Design



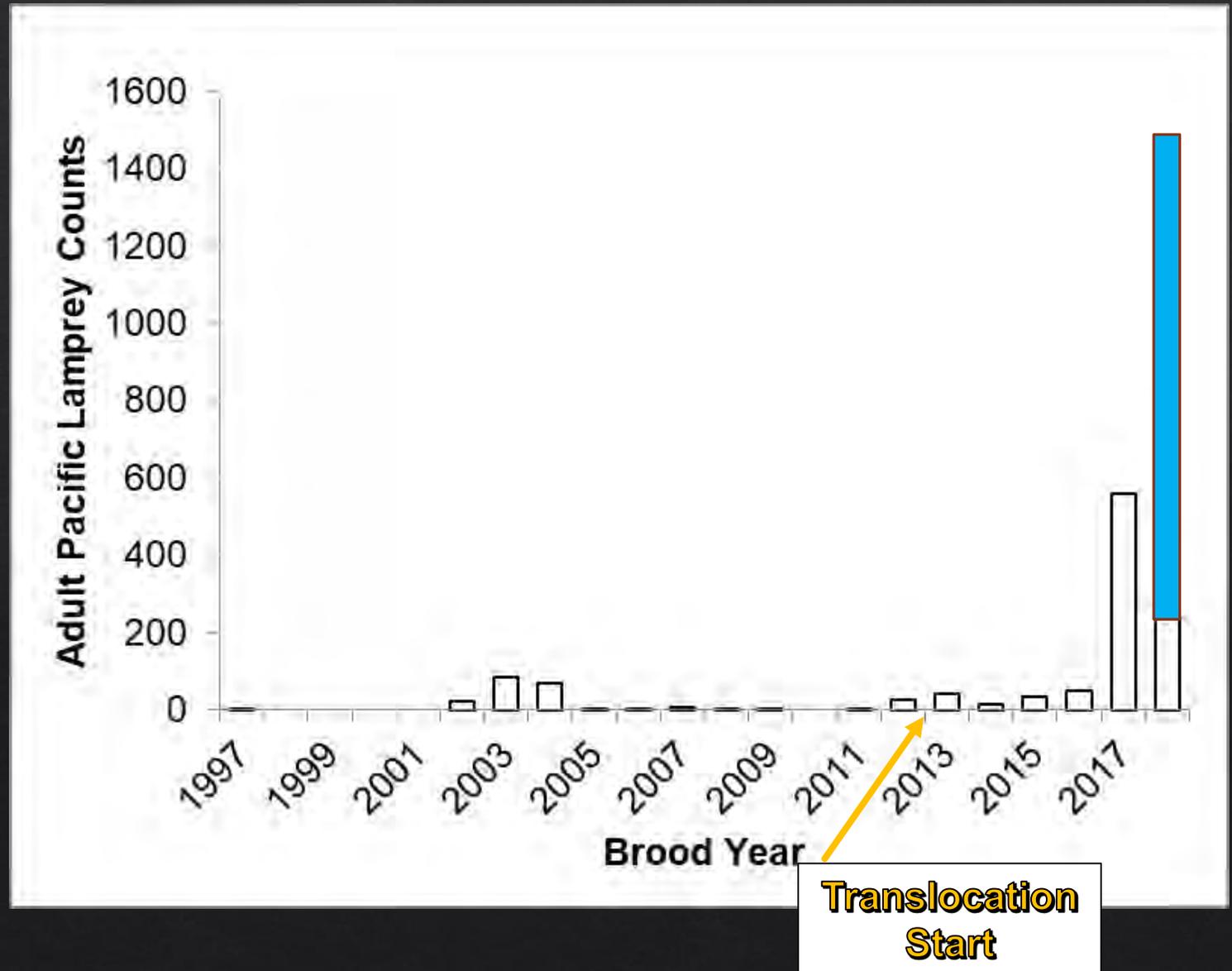
Prosser Dam Adult Pacific Lamprey Counts (2017~2018)

Translocation Began
in 2012-2013

In 4~6 yrs, a large
increase observed
(≤ 87 to ~ 1500)

Harvestable #
in the near future??

Goal = 35,000



Applied Vexar Sheeting to Prevent Holding

Success! – Eliminated all lamprey holding at Prosser Dam



- ◆ Use of Half Duplex Tags for Lamprey?
- ◆ Testing of Dual Mode at BON, TDA, McNary dams in 2018

Summary from PIT Tag Passage Studies

Prosser Dam

- ◇ ~10% of adults used the VWW in 2017 (51 VWW vs. 510 Fish Ladder)
- ◇ ~97% used the VWW in 2018 (224 VWW vs. 7 Fish Ladder)
 - ◇ However, from PIT Study 46-54% estimated to pass the fish ladder (only PIT detection, so likely passing through picketed lead area)
 - ◇ Based on mark-recapture, we estimate that 2613 adult lamprey are approaching Prosser Dam, and at least 1306 (~50%) are passing the dam

Roza Dam

- ◇ Passage rates unknown, but a lot of holding and moving back and forth
- ◇ Issue of holding by PIT arrays

Best Radius Curvature Length?

- ◇ For VWWs, maybe “longer” is not the best answer?
- ◇ 6” radius (12” diameter) seems to work
- ◇ We used 11” radius (22” diameter) to be conservative – but water seems to weigh down on them as it slides down the radius

