Priest Rapids Fish Forum Meeting

Wednesday, 6 March 2019
10:00 a.m. – 12:00 p.m.

MEETING MINUTES

PRFF REPRESENTATIVES

Steve Lewis, USFWS	Patrick Verhey, Chad Jackson, WDFW
Bob Rose, YN	Breean Zimmerman, WDOE
Pat Wyena, Wanapum	Aaron Jackson, Carl Merkle, CTUIR
Jason McLellan, CCT	Keith Hatch, BIA
Mike Clement, Grant PUD	Chris Mott, Grant PUD
Tracy Hillman, Facilitator	Erin Harris, Grant PUD

ATTENDEES

Paul Grutter, Golder (Via Phone)	Chris Mott, Grant PUD
Erin Harris, Grant PUD (Via Phone)	Jason McLellan, CCT (Via Phone)
Patrick Verhey, WDFW	Doris Squeochs, Wanapum (Via Phone)
Steve Lewis, USFWS	Kirk Truscott, CCT
Tom Skiles, CRITFC (Via Phone)	Laura Heironimus, WDFW (Via Phone)
Breean Zimmerman, WDOE (Via Phone)	Tracy Hillman, Facilitator

Action Items:

- Chris Mott will check with Donella Miller on the testing of juvenile sturgeon at Marion Drain for white sturgeon iridovirus and autopolyploidy and on the proposed fate of surplus production at the hatchery.
- PRFF will review the draft White Sturgeon 2018 Annual Report and provide comments to Chris Mott by 7 March 2019.
- CCT will identify their PRFF policy representative.
- Tracy Hillman will find a meeting day for the White Sturgeon Subgroup.

I. Welcome and Introductions - Tracy Hillman welcomed everyone and participants introduced themselves.

II. Agenda Review – Members reviewed and approved the agenda.

III. Approve November Meeting Notes – The February 2019 Meeting Minutes were reviewed, edited, and approved.

A. Action Items from February Meeting:

1. Steve Lewis will provide updates to the PRFF on the status of the invasive species draft action plan. Complete. Steve indicated that he will provide major milestone updates on the Action Plan. Steve also reminded members that they can check out the website to see when major updates are made to the Action Plan.

2. Chris Mott will check with Donella Miller on the testing of juvenile sturgeon at Marion Drain for white sturgeon iridovirus and autopolyploidy, and on the proposed fate of surplus production at the hatchery. Ongoing. Chris said he is waiting for Donella to respond to his request for information.

3. Jason McLellan will share with the PRFF an abstract prepared by UC Davis researchers on autopolyploidy. Complete. Jason shared the abstract with the PRFF following the meeting.

4. PRFF will review the draft White Sturgeon 2018 Annual Report and provide comments to Chris Mott by 7 March 2019. Ongoing. Comments are due tomorrow (7 March).

5. PRFF will provide questions to Tracy Hillman by 1 March for the consultants to address during the March meeting. Complete. Tracy reported that he received no questions from members.

6. CCT, BIA, and CRITFC/Umatillas will identify their PRFF policy representatives. Ongoing. Tracy reported that CRITFC/Umatillas identified Jeremy Wolf and Bret Hall as their policy representatives and BIA identified Keith Hatch as their representative. Kirk Truscott said he is still waiting on CCT to identify their policy representative.

7. PRFF will review the draft Pacific Lamprey 2018 Annual Report and provide comments to Mike Clement by 11 February 2019. Complete. Deb Firestone (GPUD) sent the final report to FERC.

8. Steve Lewis will contact Tom Dresser about the possibility of monitoring bull trout passage during winter (15 November – 15 March) in the Priest Rapids and Wanapum fishways. Complete. Steve said he spoke with Tom and Tom will check into it. Tom noted his concern with monitoring the fishways given so few bull trout pass during the winter. However, Tom noted Grant PUD may try monitoring for one year and see if the result support monitoring additional years.

IV. White Sturgeon Management Plan

A. Update on Juvenile Rearing – Chris Mott reported no new updates on juvenile sturgeon rearing at Marion Drain. He said fish will be released about the same time in 2019 as they were in 2018.

B. Population Assessments and Future Tagging – Paul Grutter with Golder provided a presentation titled, "Grant County White Sturgeon Monitoring & Evaluation Program: 2018 Summary" (see Attachment 1). Paul started by presenting an outline for his presentation and then described the brood year 2017 juvenile sturgeon tagging and release efforts, including size (length and weight) at release. He also described the flows and temperatures of the river during the time of

release and indicated the level of fin deformities on released fish. Paul noted the locations of telemetry interrogation stations and described post-release movements of juvenile sturgeon following release within Wanapum and Priest Rapids reservoirs. He then showed numbers of tagged sturgeon entrained at Wanapum and Priest Rapids dams.

Paul described the juvenile index sampling design and monitoring efforts conducted in 2018. In general, the design was similar to past years (2014, 2016, and 2017). Sampling in 2018 occurred from 6-29 August. Paul identified the sampling gear (and gear lost and damaged during sampling), described flows and temperatures during sampling, and noted the number of overnight sets within each reservoir. He then described the catch (proportion of positive catch or Ep) of juvenile sturgeon by brood year, reservoir, and section within the reservoirs. He also showed the catch by river mile for 2016, 2017, and 2018. He then showed the length frequency by brood year of fish captured during index monitoring. Finally, he showed abundance estimates, including the assumptions of the model used to estimate abundance. He noted they used a simple model because of a lack of data and model convergence. Abundance estimates in both reservoirs appeared to increase rapidly over time and then reached an asymptote around 12,000 in Wanapum Reservoir and about 3,000-3,500 in Priest Rapids Reservoir. Since 2014, numbers in both reservoirs have not increased as much as they did during 2012-2014. Paul also showed losses due to avian predation, which ranged from 0.1-15.3% (percentage of released fish lost to bird predation). He noted that predation varied depending on where fish were released.

Next, Paul described the 2018 adult indexing efforts. He talked briefly about the sampling design and flows and temperatures during the surveys. He showed the numbers of adults captured (including CRITFC fish) by size class, year, reservoir, and origin (wild v hatchery). He also talked about the harvest of sturgeon in the tribal (Yakama Nation Commercial Fishery) and sport fisheries and showed the sizes (length frequencies) of fish harvested in the fisheries (recall there was a slot-size limit for harvest). Paul then described the effort (hook hours) spend conducting the adult index surveys. Finally, he showed abundance estimates by reservoir for CRITFC and wild sturgeon. Overall, numbers have declined over time (from 2010 to present). Abundance of CRIFTC fish declined from 3,767 to 75 in Wanapum Reservoir and from 1,514 to 20 in Priest Rapids Reservoir from 2010 to present. Harvest does not appear to explain these large reductions in abundance of CRITFC fish.

Paul concluded with the following summary:

- 2017BY fin deformity rate was similar to 2016BY (~42%).
- 2017BY exhibited upstream movement after release and low entrainment based on acoustic telemetry.
- Juvenile population indexing
    - Juvenile population estimate was lower than previous model estimates.
    - 2018 estimate included effects of brood year and time since release (first year of release, subsequent years) on survival.
    - Previous models assumed constant survival for all brood years over time.
    - A proportion of the larger 2010BY and 2012BY within the slot limit were likely harvested.
- Adult population indexing
    - There was substantial change in catch composition between 2015 and 2018 indexing efforts.
    - Catch of 2002BY in 2018 was roughly 4-6% of the 2002BY catch in 2015.

- Catch of wild sturgeon in 2018 was about 14% of the catch of wild fish in 2015.
- 2002BY removal effort was highly effective, but catch effort was not accurately recorded or documented.

Tom Skiles asked about fin deformity and whether fish with fin deformities had lower survival rates than fish without deformities. Paul responded they found no difference in survival between fish with and without fin deformities. Tom asked if deformed fins regenerate. Jason McLellan said no. Laura Heironimus asked if fin deformity causes changes in fish behavior or distance traveled. Paul said only juveniles with no fin deformities were radio tagged; therefore, they cannot assess that effect. Jason noted that they have evaluated differences in movement of fish with and without deformities and found no difference in behavior. Steve Lewis asked if there is a way to reduce fin deformity. Jason said increasing feed when fish transition to exogenous feeding will reduce fin deformity. That's because fish at that time have teeth and if there is not enough to eat, they nip on each other's fins. Tom pointed out that harvest on CRITFC fish has been low. Therefore, he questioned how or why the numbers of CRITFC fish has declined so rapidly. Some thought it is because the original population estimates of CRITFC fish were biased high. Thus, there were not as many CRITFC fish in the Project Area as originally thought.

C. Plan Three-Year Check-in with the Policy Committee – Tracy Hillman said the Forum needs to prepare a three-year check-in report for the Policy Committee that explains the status of the white sturgeon population and offer a recommendation on stocking levels for the remaining years of the SOA. He noted the recommendation can be to decrease stocking levels, increase stocking levels, or propose no change in stocking levels. Tracy added that the Forum needs to provide justification for any proposed recommendation including documenting the presence or absence of density dependence.

Steve Lewis asked if there is a target juvenile survival rate that needs to be achieved. Chris Mott said no but we need to determine if survival rates decrease over time (as abundance increases). Laura Heironimus asked if the reduced abundance increase is related to earlier brood years recruiting into larger size classes. Paul Grutter said yes and added that we expect abundance increase to decline as numbers of juvenile sturgeon approach carrying capacity. Jason McLellan added that as numbers of juvenile sturgeon increase to carrying capacity, growth and survival rates will decrease, while movement/entrainment will increase. He said we need to evaluate these density-dependent effects. Paul indicated that he does not believe sturgeon in the Project Area are at carrying capacity. Jason asked if the abundance estimates included tag recaptures of older, larger fish. Paul said no. Jason asked if survival estimates accounted for size at release. Paul said no. Jason suggested there may be density dependence effects. Patrick Verhey noted that the Wanapum Dam fracture, which resulted in very low reservoir levels, may have reduced food (molluscs) for sturgeon. This reduction in food may explain any apparent density dependence in sturgeon.

Tracy said he will find a suitable day for the white sturgeon subgroup meeting. The purpose of the meeting is to evaluate the available information and make a recommendation to the PRFF. Tracy recommended that Paul attend the meeting. Paul indicated that he will also ask Sima Usvyatsov (mark-recapture modeler) to attend the subgroup meeting. Tracy asked members to review the annual report and identify questions for Paul and Sima. Members thought the subgroup meeting should take no longer than four hours.

Tracy identified the following Policy Committee members:

- Yakama Nation: Paul Ward and Steve Parker
- Colville Tribes: Unknown (Kirk Truscott and Jason McLellan are checking)

- Umatilla/CRITFC: Jeremy Wolf and Brent Hall
- Wanapum: Rex Buck, Jr. and Alyssa Buck
- BIA: Keith Hatch
- USFWS: Jeff Krupka
- WDFW: Jim Brown
- Grant PUD: Tom Dresser

D. Other White Sturgeon Items – None.

V. Pacific Lamprey Management Plan

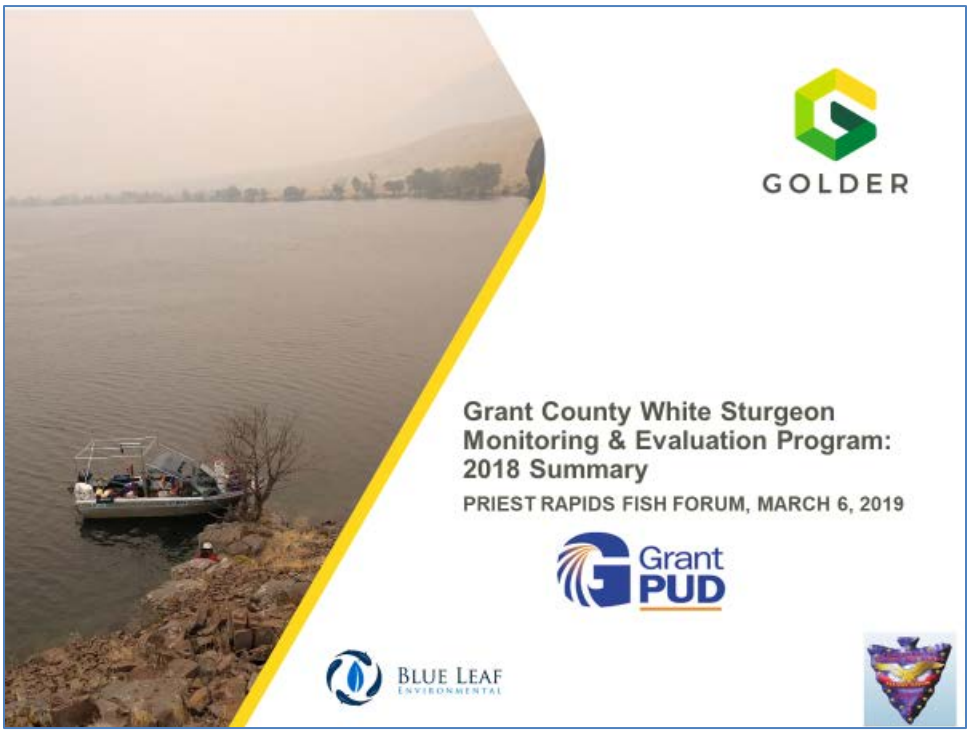
A. Pacific Lamprey Annual Report – Chis Mott said he believes the final report was submitted to FERC. He said they received comments from Ralph Lampman, but because they were received late, Grant PUD was not able to address all of Ralph's comments. Ralph said the comments can be addressed in the 2019 report.

B. Other Pacific Lamprey Items – Chris Mott noted that adult trapping in 2019 will be similar to 2018. Grant PUD will provide additional information as we get closer to the trapping period. Ralph Lampman said he will coordinate with Grant PUD on any need for extra adults for translocation efforts. Chris also reported that representatives from Douglas PUD attended the Wanapum and Priest Rapids fishway tour on Friday, 22 February 2019.

VI. Next Meeting: The next PRFF meeting will be on Wednesday, 3 April 2019 at the Grant PUD Natural Resources Office in Wenatchee, WA.

Attachment 1

Presentation by Paul Grutter on Grant County White Sturgeon Monitoring & Evaluation Program: 2018 Summary



Presentation Outline

MONITORING & EVALUATION PROGRAM: 2018 SUMMARY

- 2017BY Juvenile Marking and Release
- VR2W Telemetry and 2017BY Movement and Entrainment
- Juvenile White Sturgeon Indexing
- Adult White Sturgeon Indexing Summary

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2017BY White Sturgeon Juvenile Tagging and Release

MONITORING & EVALUATION PROGRAM: 2018 SUMMARY

- 2017 broodstock capture efforts resulted in 5Fx6M spawning matrix; 30 genetic crosses (5 unique crosses; 25 half-sib crosses)
  - Genetic testing (August 2017): 12N female identified; 6 genetic crosses culled
  - Water pump failure (August 2017): 6 genetic crosses lost
- 2017BY release consisted of progeny of 18 genetic crosses (4 unique; 14 half-sib crosses)
- 3,224 fish PIT-tagged and scute marked over three days from April 9 to 11, 2018
- 32 fish (1%) received a V9 acoustic tag
  - 2016BY (6Fx6M), 36 genetic crosses
  - 2015BY (9Fx10M), 85 genetic crosses.

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2017BY White Sturgeon Juvenile Tagging and Release

RELEASE LOCATION, LENGTH AND WEIGHT

- Released May 1 2018, 2017BY release by reservoir: Wanapum **(62%)**; Priest Rapids **(38%)**
  SOA (March 11, 2016)

	2018 White Sturgeon 2017BY Release		
Release Location Reservoir (River Mile)	No. of Fish (acoustic-tagged)	Mean FL (± SD) mm	Mean Weight (± SD) g
Wanapum (424.5)	1,983 (20)	289 (43)	150 (56)
Priest Rapids (415.6)	1,241 (12)	279 (41)	136 (59)
Total	**3,224 (32)**	**285 (43)**	**144 (58)**
2016BY	3,248 (32)	272 (31)	126 (45)
2015BY	3,258 (32)	303 (26)	171 (46)

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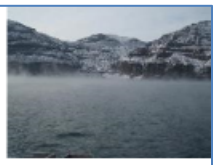
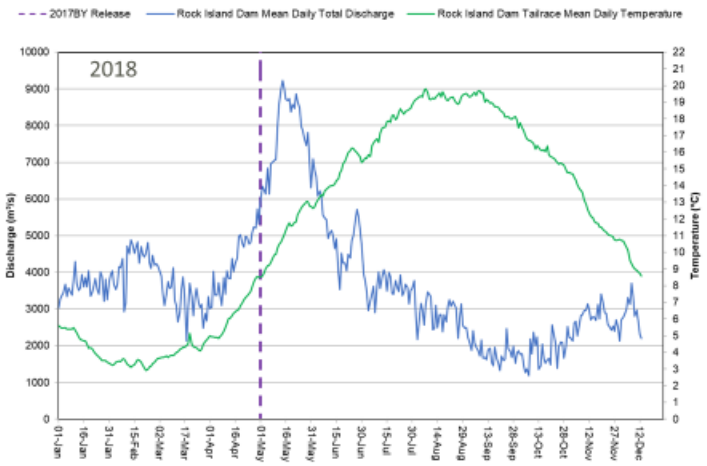
Discharge and Temperature



ROCK ISLAND DISCHARGE AND TEMPERATURE



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2017BY Primary Fin Deformity	Fin Deformity Sub-type	No. of fish with Primary Deformity	No. of fish with Sub-type Deformity
Caudal deformity only		51	
	Deformed, curled, or damaged		51
Both caudal and pectoral deformity		28	
	Two deformed, curled, or damaged finss		18
	One deformed, curled, or damaged fin; one missing fin		1
	Three deformed, curled, or damaged fins		8
	Two deformed, curled, or damaged fins; one missing fin		1
Pectoral deformity only		1,313	
	One deformed, curled, or damaged fin		830
	One missing fin		80
	Two deformed, curled, or damaged fins		334
	One deformed, curled, or damaged fin; one missing fin		53
	Two missing fins		16
Dorsal, pelvic, or anal fin deformity		6	
	Deformed rostrum, operculum, other fins		6
Total fish with fin deformities		1,398 (43%)	
Total fish without fin deformity		1,826 (57%)	
Total 2017BY Release		3,224	

Past fin deformity rates: 2016BY (42%); 2015BY (14%); 2014BY (78.5%)

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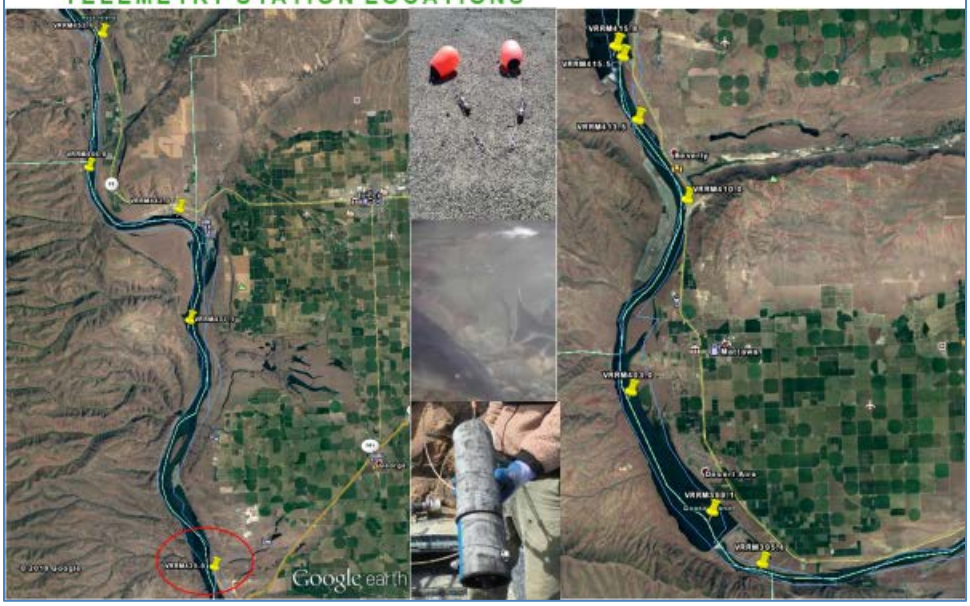
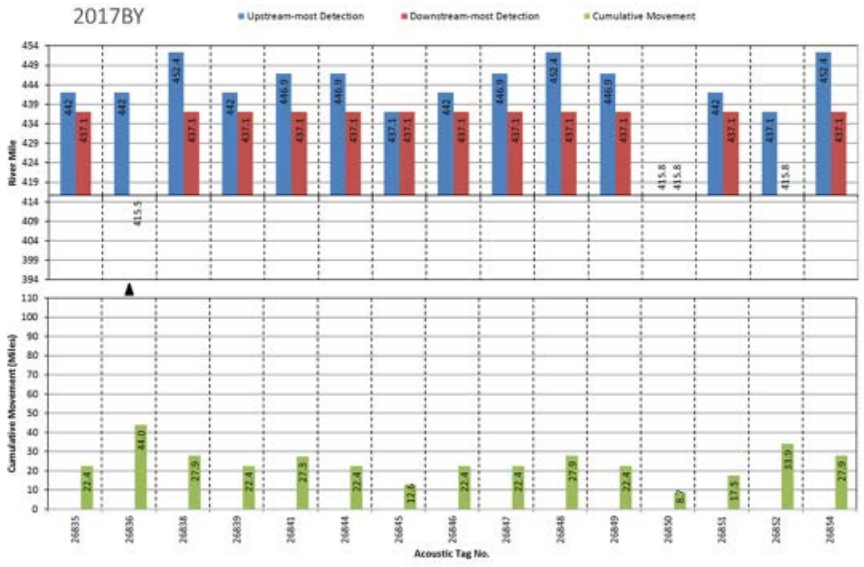
VR2W Telemetry and 2017BY Movement and Entrainment

TELEMETRY STATION LOCATIONS



Acoustic Telemetry and Juvenile Movement

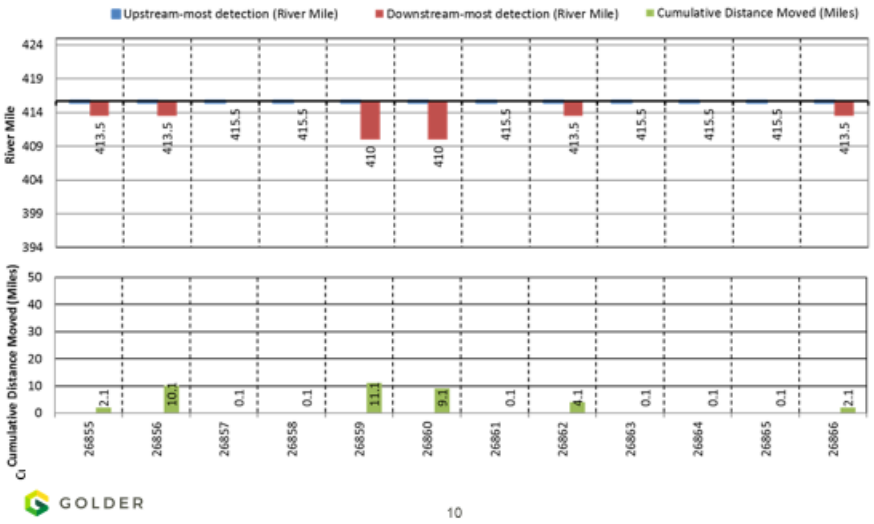
POST-RELEASE: WANAPUM RESERVOIR RELEASE



Acoustic Telemetry and Juvenile Movement

POST-RELEASE : PRIEST R. RESERVOIR RELEASE

2017BY



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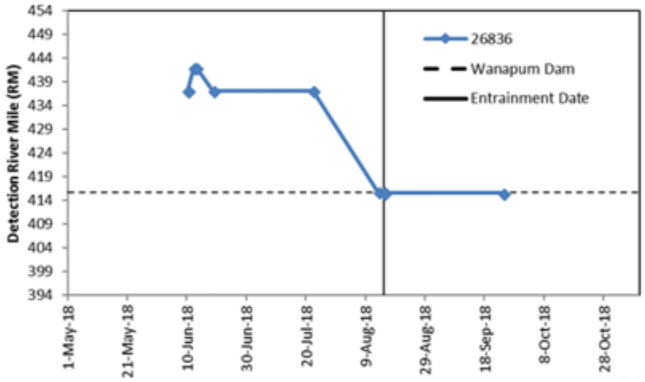
Acoustic Telemetry and Juvenile Movement

POST-RELEASE 2017BY: ENTRAINED FROM WANAPUM

4,522 m³/s (159,700 cfs) at 20:00 h



RM415.8 at 20:19 h (PDT) on August 14

RM415.5 at 21:19 h (PDT) on August 14

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2018 Juvenile Indexing

SAMPLING DESIGN AND EFFORT

- 2018 Sample Design was similar to the 2014, 2016, and 2017 approaches
- Unstratified, Unequal Probability GRTS Survey Design,
  - Wanapum Reservoir partitioned into three sample areas (three multidensity categories) defined as the Upper, Middle, and Lower Reservoir sections
  - Allocate more catch effort/unit area to the upper and middle portions of each reservoir suspected of moderate to high use by White Sturgeon
- August 6 to 29, 2018

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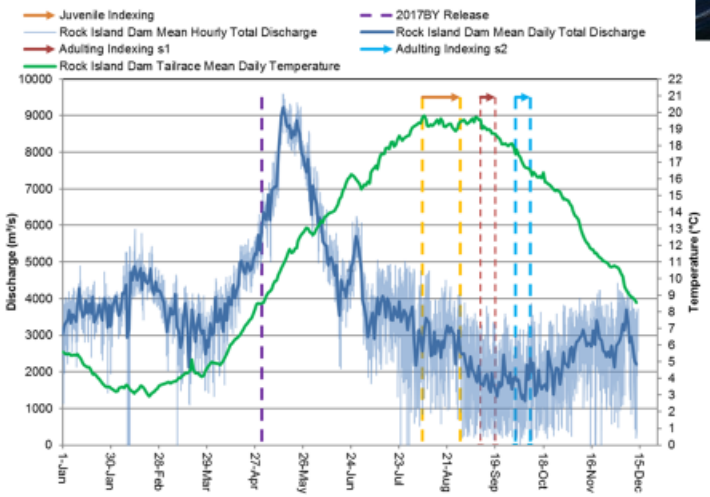
2018 Hydrograph

ROCK ISLAND DISCHARGE AND TEMPERATURE



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2018 Juvenile Indexing

SAMPLING DESIGN AND EFFORT

	Reservoir							
	Wanapum (15m Bathymetric Contour)				Priest Rapids (6 m Bathymetric Contour)			
	Lower	Middle	Upper	All	Lower	Middle	Upper	All
Number of GRTS sites sampled	90	90	90	270	29	33	28	90
Sampling area (Ha)	1,664	727	308	2,699	1,369	346	213	1,928
Samples/100 Ha	5.4	12.4	29.2	10.0	2.1	9.5	13.1	4.7
Sample depths (m)								
mean	20.8	20.8	18.7	20.1	12.9	9.4	8.7	10.3
min	10.0	8.7	8.5	8.5	2.3	2.0	2.7	2.0
max	36.0	49.0	37.0	49.0	23.0	17.5	18.3	23.0

- 270 overnight sets in Wanapum - 2 crews, Golder and BLE
- 90 overnight sets in Priest Rapids - 1 crew, Grant PUD biologists
- All fish scanned for a PIT-tag, measured for Fork Length & Weight, and assessed for fin deformities
- All data directly entered in the Juvenile Indexing Database

GOLDER

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2018 Juvenile Indexing

SAMPLING GEAR

Assembled by Grant PUD staff

Line Length: 400 ft (122m), ¼" Everson Aqua tarred line - 3 strand nylon - soft lay

40 hooks per line, attached at marked intervals ~ 9 ft (3 m) apart

2/0 and 4/0 Mustad Demon Circle Perfect 2X Strong. Twenty of each size hook per line

Jinkai (or similar) monofilament leaders; 150lb test, 12" in length excluding hook and clip

Stainless snaps sized for main line being used with attached swivels.

Gilmore Pickled Squid

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Juvenile Indexing

GEAR LOST/DAMAGE

		Gangions			Hook/Gangion Fate				
Reservoir	Hook Size	Set #	Gear Inventory		Bent	Lost	Total	Proportion of Set Gangions with Lost or Damaged Hooks	Proportion of Gangion Inventory with Lost or Damaged Hooks
		n	n		n	n	n	%	%
Wanapum	2/0	5438	400		56	6	62	1.1	15.5
	4/0	5358	400		55	8	63	1.2	15.8
Total		10796	800		111	14	125	1.2	15.6
Priest Rapids	2/0	1800	200		11	9	20	1.1	10.0
	4/0	1800	200		7	7	14	0.8	7.0
Total		3600	400		18	16	34	0.9	8.5
PRPA	2018	14396	1200		129	30	159	1.1	13.3
	2017								12.0
	2016								32%

GOLDER

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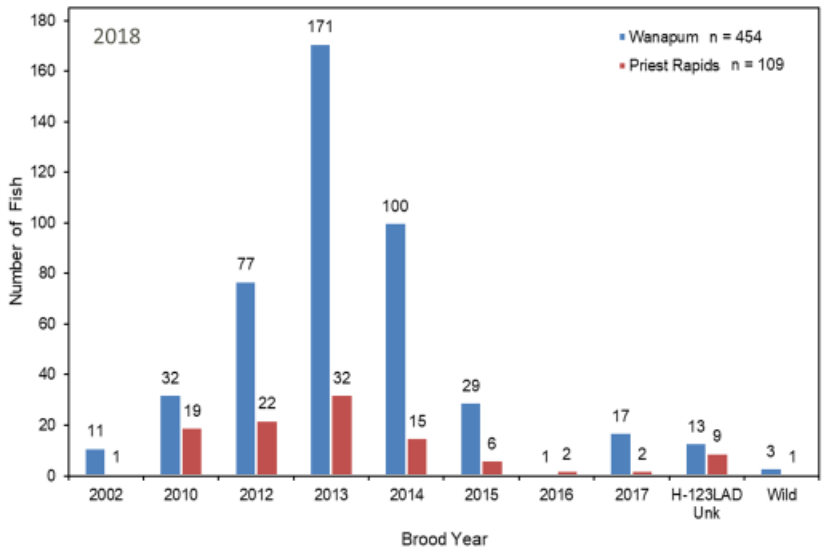
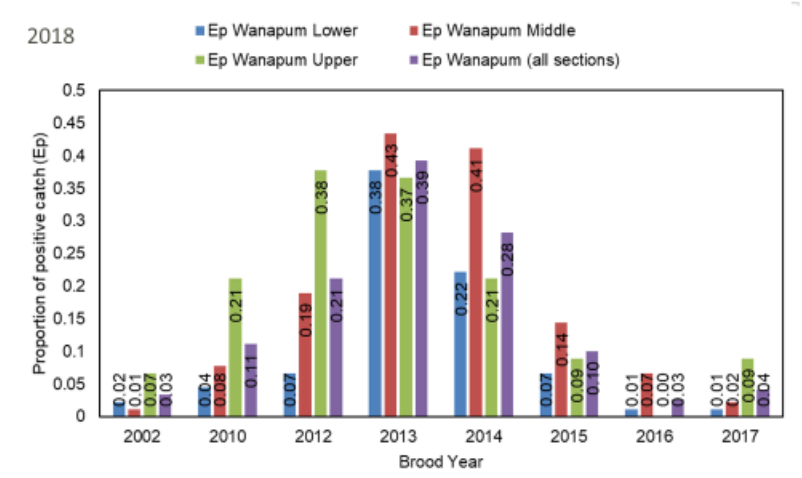
Juvenile Indexing

JUVENILE INDEXING CATCH BY BROOD YEAR



Juvenile Indexing

EP BY WANAPUM RESERVOIR SECTIONS



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Juvenile Indexing

BROOD SOURCE, RELEASE SITE, RELEASE TIMING

						Wanapum Reservoir: Juvenile Indexing Catch			
BY	Release Reservoir	Release Location	Brood source	Date	Number Released	2016	2017	2018	Total
	H1: Suspected genetic or behavioral difference between UCW and MCW compared to LCC origin fish resulted in greater emigration of LCC from Wanapum Reservoir.								
2010	Wanapum	Columbia Siding	UCW[1]	26-Apr-11	2,020	39	23	17	79
			MCW[2]	29-Apr-11	2,996	42	22	8	72
			LCC[3]	27-29-Apr-11	2,000	9	3	1	13
	H2: Survival (reduced avian predation) of fish released in deep water habitat (Columbia Cliffs), further downstream from Cormorant rookeries was higher compared to fish released shallow water habitat (Columbia Siding) upstream nearer the rookeries								
2012	Wanapum	Columbia Siding	MCW	14-May-12	1,135	33	22	15	70
		Columbia Cliffs	MCW	14-May-12	1,129	95	48	61	204
	H3: Survival of fish released in spring (May) is higher compared to fall (September) releases								
2013	Wanapum	Rocky Coulee	MCW	06-May-14	3,331	228	165	136	529
			MCW	18-Sep-14	1,762	41	35	35	111

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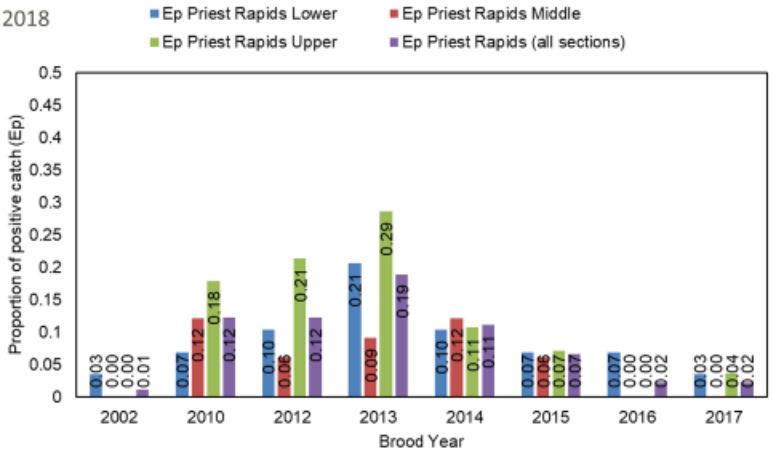
Juvenile Indexing

E_P BY PRIEST RAPIDS RESERVOIR SECTIONS



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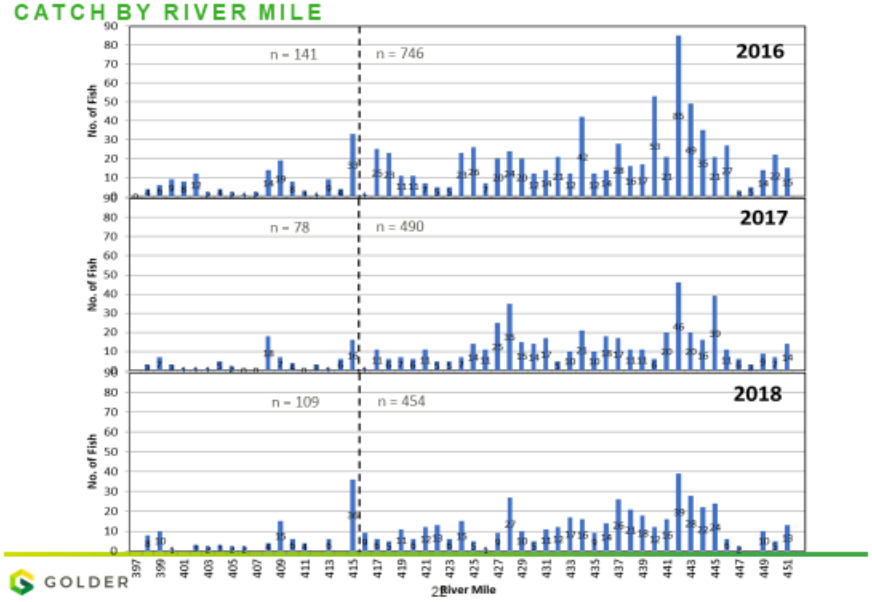
2016-2018 Juvenile Indexing

CATCH BY RIVER MILE



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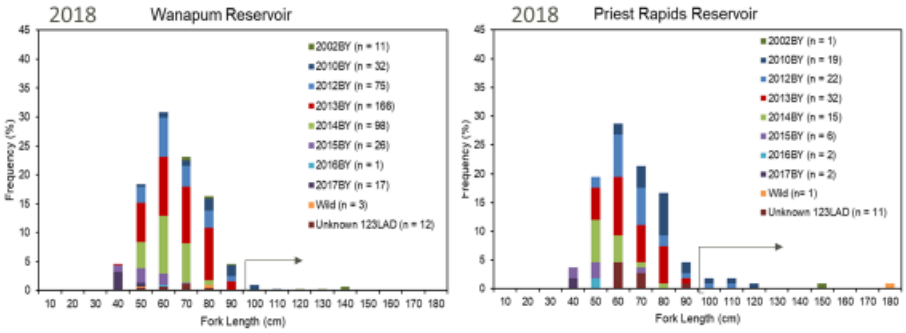
Juvenile Indexing

LENGTH FREQUENCY BY BROOD YEAR



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Juvenile Indexing

R MARK ABUNDANCE ESTIMATE ASSUMPTIONS

2017 Model – more simple model due to lack of data and model convergence

The model assumed no difference between survival for first year and subsequent years.
Models were constructed using all combinations of the following survival and recapture specifications:

a) Survival as constant, as function of age, and as function of release reservoir;
b) Recapture as constant, as function of sampling year, and as function of release reservoir

Reservoir	Parameter	Estimate		
		Mean	Lower 95% Confidence Limit	Upper 95% Confidence Limit
Shared by both Wanapum and Priest Rapids	Recapture, 2013	Fixed	--	--
	Recapture, 2014	0.021	0.018	0.025
	Recapture, 2015	Fixed	--	--
	Recapture, 2016	0.048	0.043	0.054
	Recapture, 2017	0.037	0.032	0.042
Wanapum	Survival (Phi) All Years	**0.840**	0.810	0.866
Priest Rapids	Survival (Phi) All Years	**0.658**	0.617	0.698

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Juvenile Indexing

R MARK ABUNDANCE ESTIMATE ASSUMPTIONS

2018 Model – Sufficient data to year 1 survival and all subsequent years; by reservoir, by brood year

Models were constructed using all combinations of the following survival and recapture specifications:

a) Survival:
   a. constant,
   b. separate constant values for first year post-release and all subsequent years,
   c. as function of release reservoir,
   d. as function of brood year,
   e. as additive function of brood year and first year post-release and all subsequent years.

b) Recapture:
   a. constant,
   b. separate constant values for first year post-release and all subsequent years,
   c. as function of sampling year,
   d. as function of release reservoir,
   e. as function of age,
   f. as additive function of release reservoir and age, and
   g. as multiplicative function of release reservoir and age.

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Juvenile Indexing

R MARK ABUNDANCE ESTIMATE ASSUMPTIONS

Reservoir	Parameter	Estimate		
		Mean	Lower 95% Confidence Limit	Upper 95% Confidence Limit
Shared by both Wanapum and Priest Rapids	Survival, 2010BY-First-Year, Post-Release	0.371	0.343	0.400
	Survival, 2010BY-All Subsequent Years	0.825	0.724	0.894
	Survival, 2012BY-First-Year, Post-Release	0.404	0.346	0.464
	Survival, 2012BY-All Subsequent Years	0.844	0.771	0.897
	Survival, 2013BY-First-Year, Post-Release	0.445	0.392	0.499
	Survival, 2013BY-All Subsequent Years	0.865	0.794	0.914
	Survival, 2014BY-First-Year, Post-Release	0.271	0.223	0.325
	Survival, 2014BY-All Subsequent Years	0.748	0.653	0.824
	Survival, 2015BY-First-Year, Post-Release	0.190	0.151	0.236
	Survival, 2015BY-All Subsequent Years	0.652	0.535	0.753
	Survival, 2016BY-First-Year, Post-Release	0.012	0.006	0.025
	Survival, 2016BY-All Subsequent Years	0.091	0.040	0.194

GOLDER

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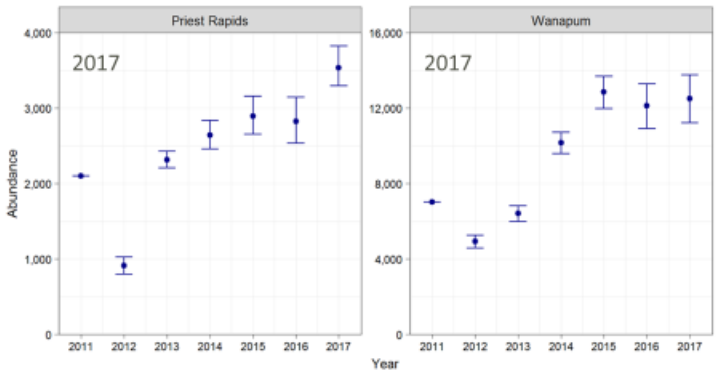
Juvenile Indexing

ABUNDANCE ESTIMATES OF HATCHERY FISH BY RESERVOIR



GOLDER

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Juvenile Indexing

AVIAN MORTALITY

Brood Year	Release Location (RM)[b]	Wanapum Reservoir Hatchery Juvenile	PIT-tags Detected at RISFWC	Fork Length (mm)			Weight (g)		Percent of Wanapum Release PIT-tag detected at RISWSC
		White Sturgeon Release No.	n	Mean	S.D.		Mean	S.D.	%
Grand Total		27,631	976	285	33		146	49	3.5

Brood Year	Percent of Wanapum Release PIT-tag detected at RISWSC
	%
2010	4.7
2012	15.3
Columbia Cliff	5.1
Columbia Siding	10.2
2013[a]	0.3
2014	1.8
2015	2.9
2016	0.9
2017	0.1

GOLDER

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2018 Adult Indexing

SAMPLING DESIGN AND EFFORT

- Adult Indexing conducted every 3rd year; last conducted in 2015
- 2018 sample effort identical to 2015:
  - 132 Sample Sites in WP; 60 Sites in PR
  - Session 1: September 10-19 ; Session 2: October 1-10

- 2018 Sample Design Standardized
  - Unstratified, Unequal Probability GRTS Survey Design
  - Identical selection criteria as Juvenile Indexing Sample Design
  - 2015 design, GRTS, Stratified Design; Wanapum North (106 sites) and South (24) at I-90

	Wanapum (15 m Bathymetric Contour)				Priest Rapids (6 m Bathymetric Contour)			
	Lower	Middle	Upper	All	Lower	Middle	Upper	All
Number of sample GRTS sites	44	44	44	132	20	20	20	60

GOLDER

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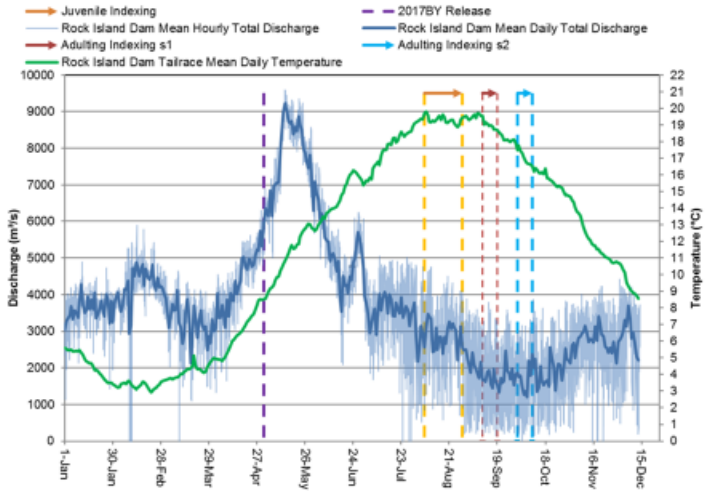
2018 Hydrograph

ROCK ISLAND DISCHARGE AND TEMPERATURE



GOLDER

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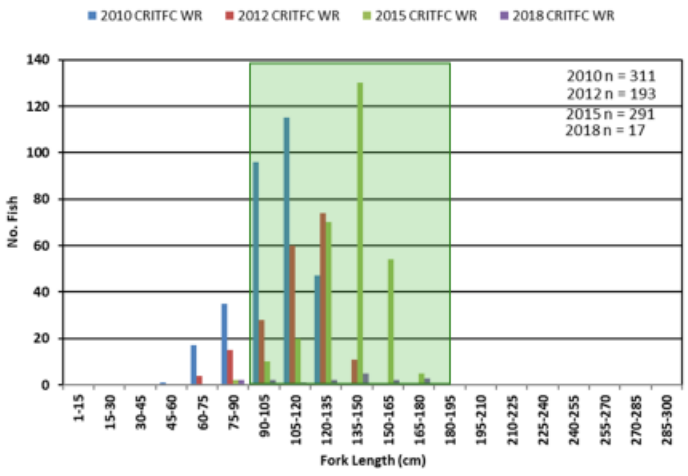
Adult Indexing

2002BY(CRITFC) 2010, 2012, 2015, 2018: WANAPUM



GOLDER

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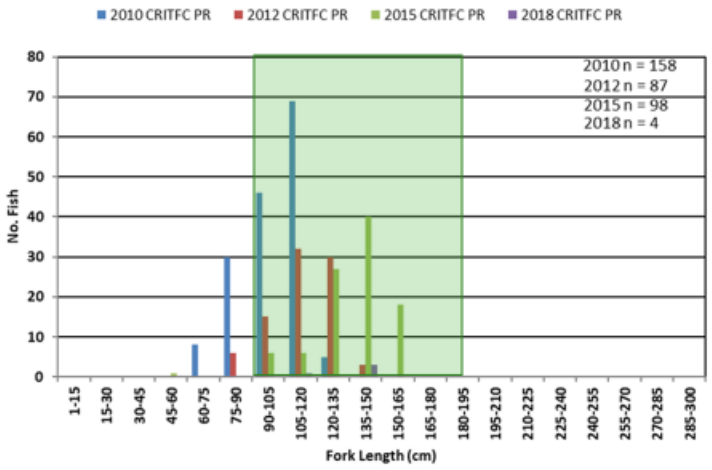
Adult Indexing

2002BY (CRITFC) 2010, 2012, 2015, 2018: PRIEST RAPIDS



GOLDER

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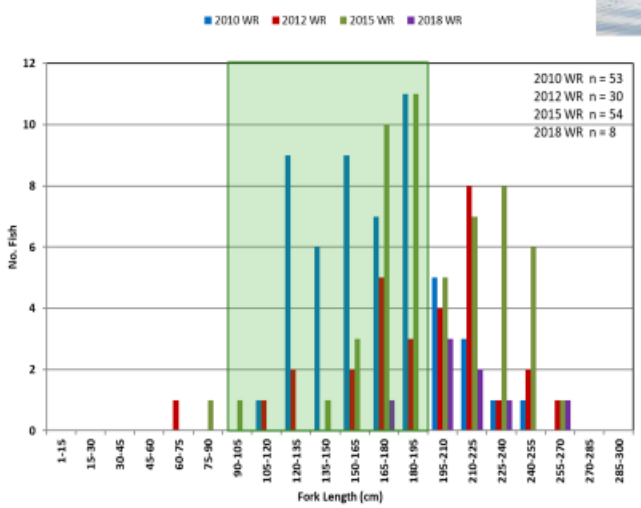
Adult Indexing

WILD CATCH 2010, 2012, 2015, 2018: WANAPUM



GOLDER

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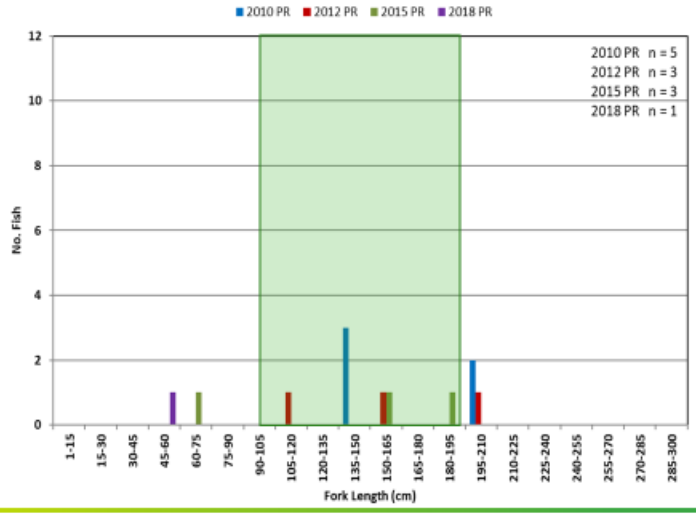
Adult Indexing

WILD CATCH 2010, 2012, 2015, 2018: PRIEST RAPIDS



GOLDER

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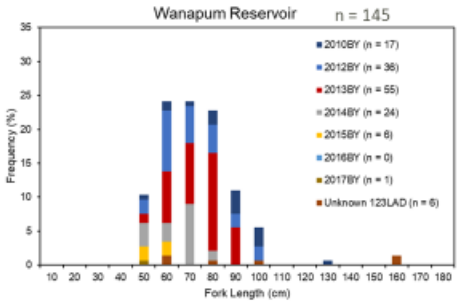
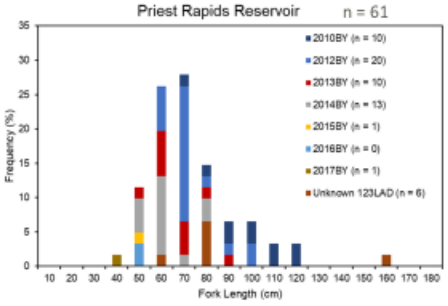
Adult Indexing

YNSH CATCH LENGTH FREQUENCY 2018





GOLDER

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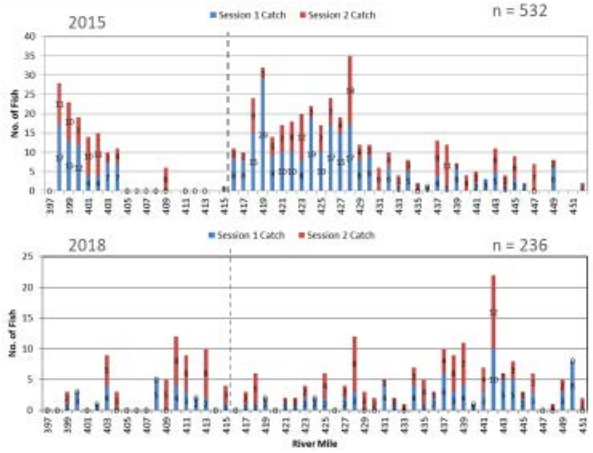
Adult Indexing

CATCH (ALL) BY RIVER MILE



Wild	YNSH	2002BY
60	75	397

Wild	YNSH	2002BY
9	206	21

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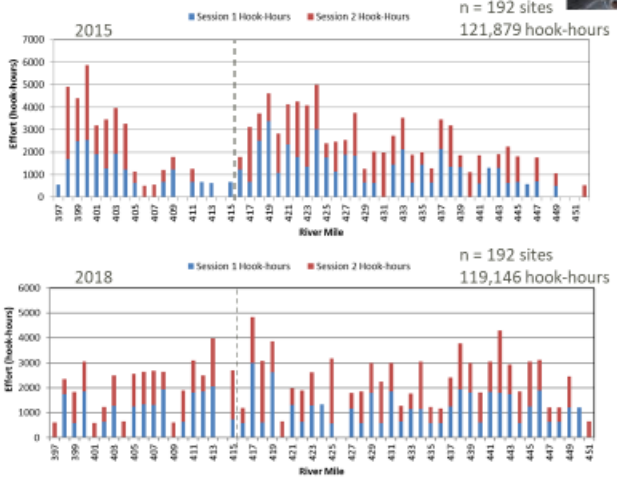
Adult Indexing

EFFORT BY RIVER MILE



GOLDER

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Adult Indexing

POPULATION ESTIMATE

Reservoir	Year	Abundance estimate		
		2002BY	Wild	Total
Wanapum	2010	3,767 (2,447-5,087)	536 (306-767)	4,303 (2,753-5,854)
	2012	2,419 (1,471-3,366)	391 (222-561)	2,810 (1,692-3,927)
	2015	1,251 (204-2,298)	249 (36-462)	1,500 (240-2,759)
	2018	**75 (12 – 137)**	**35 (5 – 65)**	

Reservoir	Year	Abundance estimate		
		2002BY	Wild	Total
Priest Rapids	2010	1,514 (971-2,057)	45 (15-74)	1,559 (986-2,132)
	2012	972 (584-1,360)	33 (11-54)	1,005 (595-1,415)
	2015	503 (80-925)	21 (0-41)	524 (80-967)
	2018	**20 (0-41)**	**<10**	

GOLDER

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Grant PUD White Sturgeon Monitoring & Evaluation Program

2018 SUMMARY

- 2017BY fin deformity rate similar to 2016BY (~42%)
- 2017BY exhibited upstream movement after release and low entrainment based on acoustic telemetry
- Juvenile Population Estimate Lower than previous model estimates
  - 2018 estimate included effects of brood year and time since release (first year of release, subsequent years) on survival
  - Previous models assumed constant survival for all brood years over time
  - A proportion of the larger 2010BY and 2012BY within the slot limit were likely harvested
- Adult Population Indexing
  - Substantial change in catch composition between 2015 and 2018 indexing efforts
  - 2002BY 2018 catch ~ 4-6% of the 2002BY 2015 catch
  - Wild 2018 catch ~14% of the Wild 2015 catch
  - 2002BY removal effort highly effective, but catch effort not accurately recorded or documented

GOLDER

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GOLDER
Questions?
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