



Priest Rapids Fish Forum Conference Call

Wednesday, 2 March 2022
9:00 a.m. – 11:50 a.m.

FINAL MINUTES

PRFF Members

Steve Lewis, USFWS
Ralph Lampman, Donella Miller, YN
Johnny Buck, Wanapum
Jason McLellan, Bret Nine, CCT
Mike Clement, Chris Mott, Grant PUD
Tracy Hillman, Facilitator

Patrick Verhey, Laura Heironimus, WDFW
Breean Zimmerman, WDOE
Aaron Jackson, Carl Merkle, CTUIR
Marchelle Foster, BIA
Tom Skiles, CRITFC/CTUIR
Erin Harris, Grant PUD

Meeting Attendees

Paul Grutter, Golder
Mike Clement, Grant PUD
Chris Mott, Grant PUD
Nathan Patterson, YN
Steve Lewis, USFWS
Nate Dietrich, Grant PUD
Patrick Verhey, WDFW
Tracy Hillman, Facilitator

Ralph Lampman, YN
Johnny Buck, Wanapum
Paul Hoffarth, WDFW
RD Nelle, USFWS
Doris Squeochs, Wanapum
Breean Zimmerman, WDOE
Erin Harris, Grant PUD

Action Items:

- PRFF members will review the 2021 White Sturgeon Draft Annual Report and send their comments/edits to Mike Clement by 11 March 2022.
- PRFF members will review the 2021 Aquatic Invasive Species Draft Annual Report and send their comments/edits to Nate Dietrich by 1 April 2022
- Mike Clement will contact Corey Wright to organize 2022 white sturgeon broodstock collection and spawning work.

- Ralph Lampman will check to see if anyone intends to tag adult Pacific lamprey in the Lower Columbia this year.
- PRFF members will indicate by 25 March whether they support extending the 2016 white sturgeon stocking SOA one additional year.
- PRFF members will ask their policy representatives if they are willing to meet more frequently (e.g., annually or every other year).
- PRFF members will identify their policy representatives and share those with Tracy Hillman.

I. Welcome and Introductions

Tracy Hillman welcomed everyone to the meeting and identified all attendees.

II. Agenda Review

The PRFF reviewed and approved the March agenda.

III. Approve February Meeting Notes

The PRFF reviewed and approved the 2 February 2022 meeting minutes.

IV. Review Action Items

The PRFF reviewed the following action items from the February meeting:

- PRFF members will review the 2021 White Sturgeon Draft Annual Report and send their comments/edits to Mike Clement by 11 March 2022. **Ongoing**
- Mike Clement will ask Golder to present white sturgeon results and analyses during the March meeting. **Completed**
- Laura Heironimus will contact Oregon Department of Fish and Wildlife and see if they have any concerns with Grant PUD collecting Broodstock downstream from McNary Dam this year. **Completed**
- PRFF members will review the 2021 Pacific Lamprey Draft Annual Report and send comments/edits to Mike Clement by 19 February 2022. **Completed**
- Doris Squeochs will provide Boa Le with Nez Perce Tribe contacts who are engaged in implementing Pacific lamprey actions. **Completed**
- Ralph Lampman will check to see if anyone intends to tag adult Pacific lamprey in the Lower Columbia this year. **Ongoing**
- PRFF members will ask their policy representatives if they are willing to meet more frequently (e.g., annually or every other year). **Ongoing**
- PRFF members will identify their policy representatives and share those with Tracy Hillman. **Ongoing**

V. Aquatic Invasive Species

2021 Annual AIS Report – Tracy Hillman reported that the Aquatic Invasive Species Draft Annual Report was submitted to members on 22 February for review. Comments are due to Nate Dietrich by 1 April 2022.

VI. Water Quality

2021 Fish Ladder Temperature Report – Nate Dietrich (Grant PUD) introduced himself to the PRFF and stated that he monitored water temperatures within the fishways and upstream and downstream of the fishways at each project in 2021. This work is part of the Fish Ladder Water Supply Study that was developed in 2010 and approved shortly thereafter by FERC. The objective of the monitoring is to determine if there is a temperature difference among the three sampling locations (upstream, within, and downstream of fishways). Temperatures were recorded hourly during the period April to October. The definition for a significant temperature difference is $>1^{\circ}\text{C}$ for 12 consecutive hours or $>1^{\circ}\text{C}$ for 6 hours over 4 consecutive days. Data analysis showed there was no significant difference in water temperatures within, upstream, and downstream of the fishways in 2021. Thus, the next sampling of water temperatures will occur in five years (2026). The 2021 Fish Ladder Temperature Report will be completed within the next week or two.

Chris Mott noted that this work does not require PRFF review. Grant PUD is providing this information as a courtesy to the PRFF. Steve Lewis asked whether there is any intention to sample more frequently given the increasing frequency of droughts. Nate Dietrich responded they are only required to monitor temperatures every five years provided there is no significant difference in temperatures among the three sampling locations. Steve asked whether there were temperature differences greater than 1°C but they did not last long enough to trigger a significant difference. Nate responded that yes there were a few high temperature spikes but no differences lasted long enough to trigger a significant difference. Mike Clement reported that these monitoring events have consistently demonstrated no significant temperature differences and wondered if sampling should occur less frequently (e.g., every ten years). Steve Lewis said with more frequent droughts and increasing temperature regimes associated with climate change, sampling may need to be conducted more frequently. Ralph Lampman asked if other PUDs have the same requirements to collect water temperatures within, upstream, and downstream of their fishways. No one knew whether this was also a requirement of the other PUDs.

VII. White Sturgeon

Update on Juvenile Rearing – Nate Patterson reported that juvenile sturgeon at the Yakama Nation Sturgeon Hatchery are doing well and are healthy. He added that they sampled fish on 28 February and fish average three fish per pound. There are currently about 3,800 juvenile sturgeon on station. Mike Clement indicated that they (GPUD and YN) will screen fish for autopolyploidy and tag (PIT tag and scute mark) fish during the week of 28 March. Volunteers are welcome.

2021 White Sturgeon Annual Report and Presentation – Mike Clement reported that the Draft 2021 White Sturgeon Management Plan Annual Report was sent to members on 9 February for review. Comments are due to Mike on 11 March 2022. Mike introduced Paul Grutter with Golder, who helped draft the annual white sturgeon report and will provide an overview of the annual report.

Paul Grutter gave a presentation titled, “2021 Grant PUD White Sturgeon M&E Summary” (see Attachment 1). Paul provided a brief overview of the presentation and gave a brief description of the project area. He then showed Columbia River temperatures and discharges within the project area in 2021 and identified when fish were released and when different aspects of monitoring occurred. He also described the tagging and release activities that occurred in 2021. Paul identified the number and size (length and weight) of fish released at each location in the project area. He noted that nearly all fish had fin deformities. Paul indicated that broodstock were collected downstream from McNary Dam during 17-21 May and 24-28 May 2021. Six females and six males were transported to the Yakama Nation Sturgeon Hatchery and those fish were spawned on 10 June. Sufficient gametes were collected to produce 32 genetic families.

Paul described the adult sturgeon indexing work that was conducted in 2021. He talked briefly about the sampling design and survey methods and showed the numbers of adults captured (including CRITFC fish) by location (river mile, reservoir, and within-reservoir sampling zones), brood year, and origin (wild v hatchery). Paul also described the effort (hook hours and CPUE) spent conducting the adult index surveys. He then showed the length frequencies of sturgeon captured within each reservoir. Finally, he showed abundance estimates by reservoir for hatchery and

wild sturgeon. He concluded by stating that CRITFC fish have decreased over time; however, those remaining in the project area are maturing (i.e., they captured ripe and fecund males and females). He said there has been a reduction in the wild population and there is some evidence of recruitment of older hatchery fish (from the Grant PUD program) to adult gear.

Next, Paul described juvenile indexing work conducted in 2021. He briefly described the sampling design, sampling locations, gear used, and sampling effort. He showed the number of juveniles captured by brood year in both Wanapum and Priest Rapids reservoirs over time (i.e., BY 2002-2019). He also showed the distribution of catch and CPUE among sampling sites within each reservoir and the catch by river mile. In addition, he showed the length frequency of fish capture by brood year within each reservoir. These data are important as they show fish recruitment to the gear and away from the gear based on fish size. Paul described the mark-recapture methods used to estimate abundance and survival. In general, survival from release to age-1 is less than 50%, while survival for fish older than age-1 is greater than 90%. Paul also showed abundance estimates by reservoir. Finally, Paul showed growth rates for each brood year within each reservoir. Growth appears to reach an asymptote in Priest Rapids Reservoir; an asymptote is less apparent in Wanapum Reservoir. However, it is important to point out that growth rates need to be evaluated in light of gear selectivity. Paul concluded by stating that they experienced the highest catch of juvenile sturgeon in 2021, likely due to reduced flows during sampling. Brood year 2014 is the dominant year class and replaces the 2013 brood year, which has recruited to adult sampling gear. He added that juveniles are most abundant in the upper reservoirs and first-year survival is lower in Wanapum reservoir than in Priest Rapids reservoir. Growth rates of juveniles in Wanapum reservoir asymptote at a lower fork length than do sturgeon in Wanapum reservoir. Growth rates are also lower in the upper sections of both reservoirs where densities are highest.

Tracy thanked Paul for the presentation and reminded members that comments on the draft white sturgeon annual report are due to Mike Clement by 11 March 2022.

2022 White Sturgeon Activities: Broodstock Collection and Spawning – Mike Clement reported that they plan to collect white sturgeon broodstock beginning on 16 May; the actual start date will depend on flows and water temperatures. They will use the same procedures and process as last year. Collections will occur downstream from McNary Dam. Mike Clement will contact Corey Wright (LGL/Blue Leaf Environmental) to begin planning broodstock collection this year.

2016 White Sturgeon SOA – Given the plans to collect white sturgeon broodstock in May, Tracy Hillman asked the PRFF whether they need to extend the existing (2016) SOA another year. Because the number of juveniles to release next year has some effect on the number of broodstock to collect this year, the PRFF needs to determine what the stocking level will be in 2023. Mike Clement noted that there is probably not enough time to revisit and approve “updated” stocking rates. The population model developed for Upper Columbia populations is not at a point that it can be used to model the sturgeon population in the project area. Extending the 2016 SOA another year should give the PRFF enough time to use the population model to inform future stocking rates. This work would need to be completed before broodstock collection in 2023. Because some members were absent and others asked for additional time to discuss it within their agencies, Tracy was directed to call for an email vote on extending the SOA. Members will be asked to provide their votes by Friday, 25 March.

Other Sturgeon Items – No other sturgeon items were discussed.

VIII. Pacific Lamprey

2021 Pacific Lamprey Draft Annual Report – Mike Clement indicated that he received comments on the draft lamprey annual report. He said they (Grant PUD) responded to or addressed most of the comments; however, a few comments from the Yakama Nation could not be addressed in this report. Those comments will be addressed in the 2022 annual report. The 2021 final report will be completed and submitted to FERC within a week.

IX. Administration

PRFF Policy Committee Representatives and Meetings – Tracy Hillman reminded members that they need to identify their policy representatives on the RRFF. There is interest by Grant PUD to have the PRFF Policy Committee meet more frequently (e.g., annually or every other year).

X. Adjourn

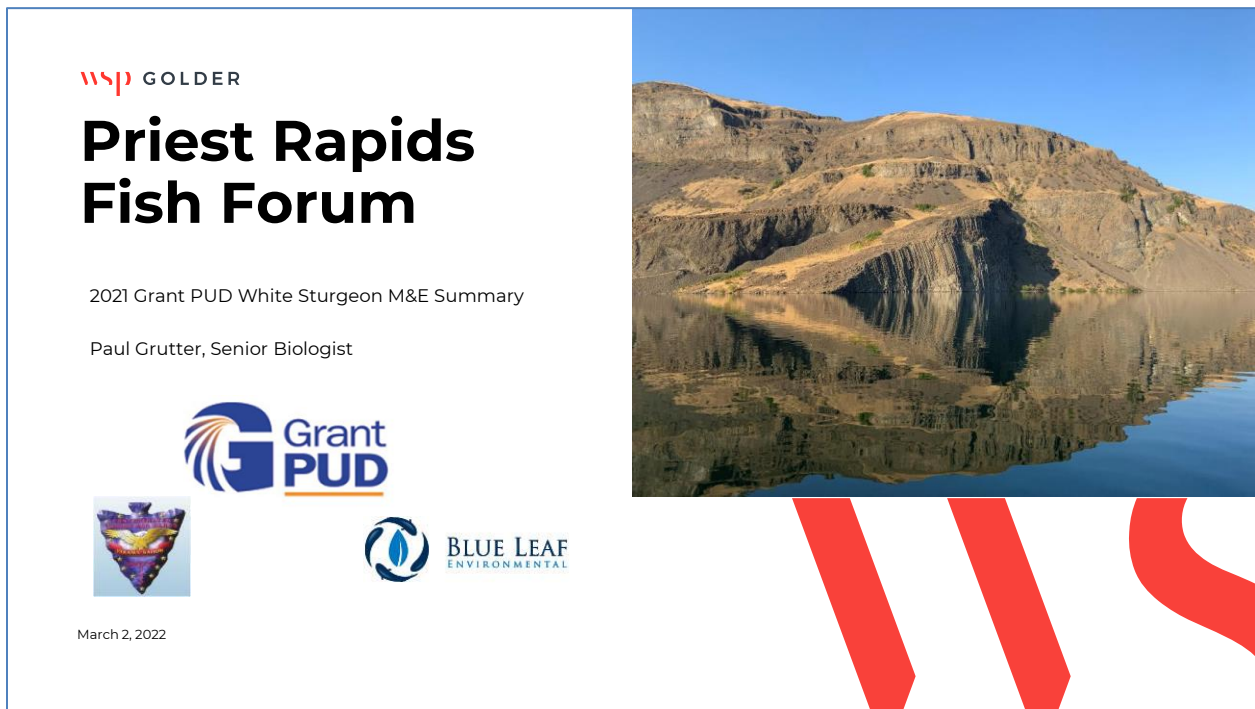
Tracy Hillman adjourned the meeting at 11:50 am.

XI. Next Meeting

The next meeting of the PRFF will be on 4 May 2022. There will be no meeting in April.

Attachment 1

Presentation by Paul Grutter on the 2021 White Sturgeon Annual Report





The slide features a white background on the left and a photograph of a river flowing through a rocky canyon on the right. The photograph shows a wide river with a large, dark rock formation in the center, reflecting in the water. The sky is clear and blue. The bottom right corner of the slide has a decorative red and white striped pattern.

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Priest Rapids Fish Forum

2021 Grant PUD White Sturgeon M&E Summary

Paul Grutter, Senior Biologist



March 2, 2022

Agenda

- Flow Year
- 2019BY Tagging and Release
- Broodstock Capture
- Flow and Temperature
- Adult White Sturgeon Indexing
- Juvenile White Sturgeon Indexing



2021

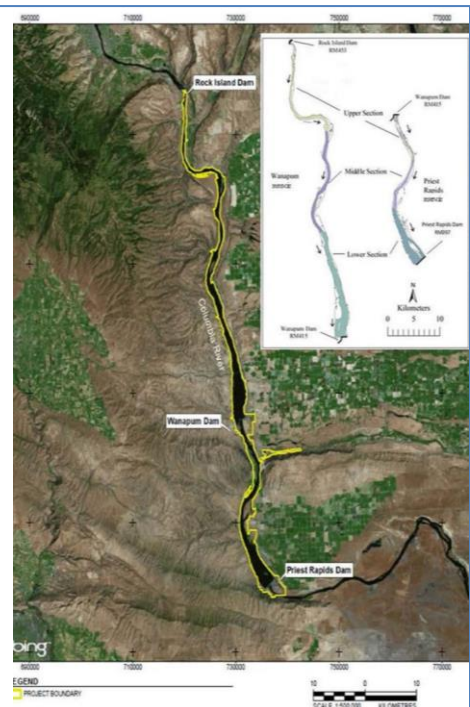
Priest Rapid Project area

Priest Rapids Dam (Grant PUD; River Mile [RM] 397)

Wanapum Dam (Grant PUD; RM 416)

Rock Island Dam (Chelan PUD; RM 453.5)

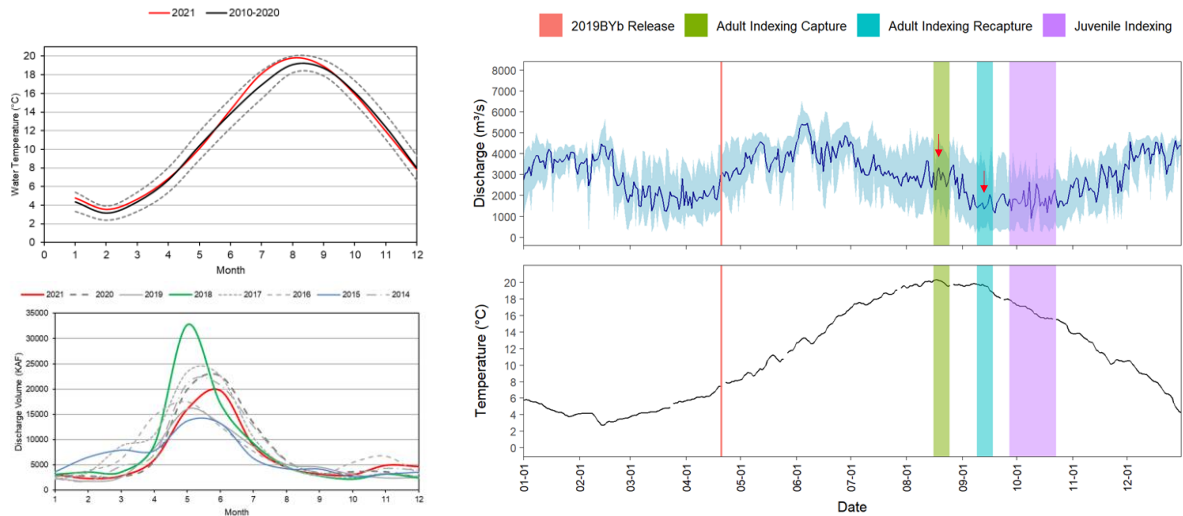
Each reservoir divided into lower, middle, and upper sections based on hydraulic and physical transitions from riverine to lentic dominant habitats



Flow Year

2021

Rock Island Dam discharge and tailrace water temperature 'heat dome'

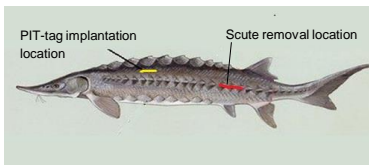


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2019BY Tagging and Release

2021

- Remainder of 2019BY were tagged and released
 - Tagging conducted at YNSH
- All fish tested for autoploidy (10N or 12N vs 8N) prior to tagging
 - Coulter counter
- implanted with a 12.5 mm 134 kHz ISO FDX PIT tag
- marked by removal of three left lateral scutes
- measured for fork length, weight, and assessed for the presence of fin deformities and overall health



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2019BY Tagging and Release

2021



- 2019BY held at YNSH were PIT-tagged and marked from April 6 to 8.
- ~Age-2 (larger), most had one or more fin deformities
- Only 16 fish identified with AP
- 1,485 juvenile white sturgeon from the 2019BY were released in the Project area on April 20
- 936 fish released in Wanapum Reservoir
- Vantage Bridge Launch (RM 420.6)
- 549 fish released in Priest Rapids Reservoir.
- Desert Aire Launch (RM 400.3)

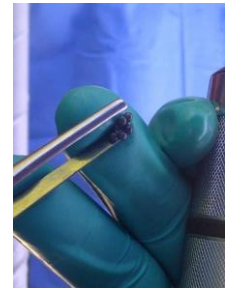
2021 White Sturgeon 2019BYb Release			
Release Location Reservoir (River Mile)	No. of Fish	Mean FL (\pm SD) mm	Mean Weight (\pm SD) g
Wanapum (420.6) ¹	936	483 (\pm 51)	776 (\pm 257)
Priest Rapids (400.3) ²	549	482 (\pm 53)	795 (\pm 277)
Total	1,485	483 (\pm52)	783 (\pm265)

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Broodstock Capture

2021

- Broodstock capture efforts were conducted over ten days from May 17 to 21 and from May 24 to 28
- Angling conducted immediately downstream of McNary Dam
- Involved Grant PUD and Blue Leaf Environment with fishing guide support
- Candidate broodstock identified by surgical inspection of gonads
- Transported to YNSH with the Grant PUD sturgeon transport trailer



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Broodstock Capture Results

2021



- 91 sturgeon were landed
- 56 individual white sturgeon of mature spawning size (i.e., greater than 150 cm fork length)
- 6 ripe females and 6 ripe males were transported to YNSH
- On June 10, a 6x6 spawning matrix was conducted
- Sufficient gametes were obtained to produce 32 genetic families (6 families from 5 females; 2 families from 1 female) of 2021BY progeny for release in 2022 (full release; 3,250 fish)

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Adult White Sturgeon Indexing

2021



- Assessment of the wild fish population and 2002BY
- Wild Fish – low abundance in PRPA (>WR, <PR), evidence of spawning, but 'low' natural recruitment
- 2002BY ~ 20,600 hatchery juvenile released by the CRITFC in 2003 into Rock Island Reservoir
 - 1Fx2M - low genetic diversity, high survival
 - Entrainment into downstream reservoirs.
 - Concern of genetic swamping of wild population and negative effect on recruitment
 - 2015-2018 removal efforts conducted, set line harvest, angling, slot size limit
- 2018 Adult Indexing Assessment recorded a substantial decrease in both 2002BY and wild fish populations, post-removal effort
 - Slot limit encompassed a large proportion the wild population based 2015 indexing data, as well as the 2010BY that grew into the slot limit during the removal effort
- 2021 Adult Indexing Assessment - collect additional data and whether the 2018 trends persist
- Identify evidence of recruitment of older YNSH brood years (2010BY-2019BY) to the adult gear

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Adult White Sturgeon Indexing

2021

- Conducted by Golder and Blue Leaf biologists
- Adult white sturgeon population indexing capture and recapture sessions were conducted from August 16 to 26 (capture session) and from September 9 to 19 (recapture session)
- Two sessions of 96 overnight (192 total) sets distributed between Wanapum (n=132 overnight sets; 82,766 hook-hours) and Priest Rapids reservoirs (n=60 overnight sets; 37,863 hook-hours)
 - 183 m (600 ft) long nylon mainline, 0.64 cm (3/8") in diameter, anchored at both ends with 16 kg (35 lbs) metal anchors attached to float retrieval lines.
 - Up to 30 leaders (gangions) were attached to the ground line at 4.6 m (15 ft) intervals.
 - Three sizes of barbed circle hooks [i.e., small hooks #7 (12/0), medium size hooks #5 (14/0), and large hooks #3 (16/0)]
 - pulled approximately every 24 hours during sampling.
 - All gangions were baited with pickled squid.

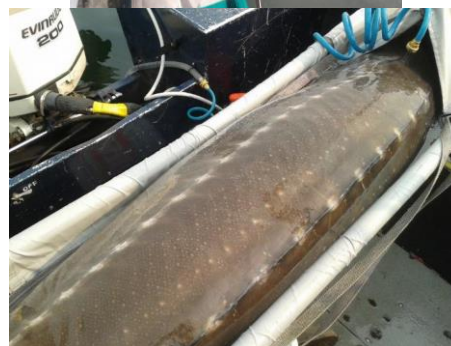


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Adult White Sturgeon Indexing

2021

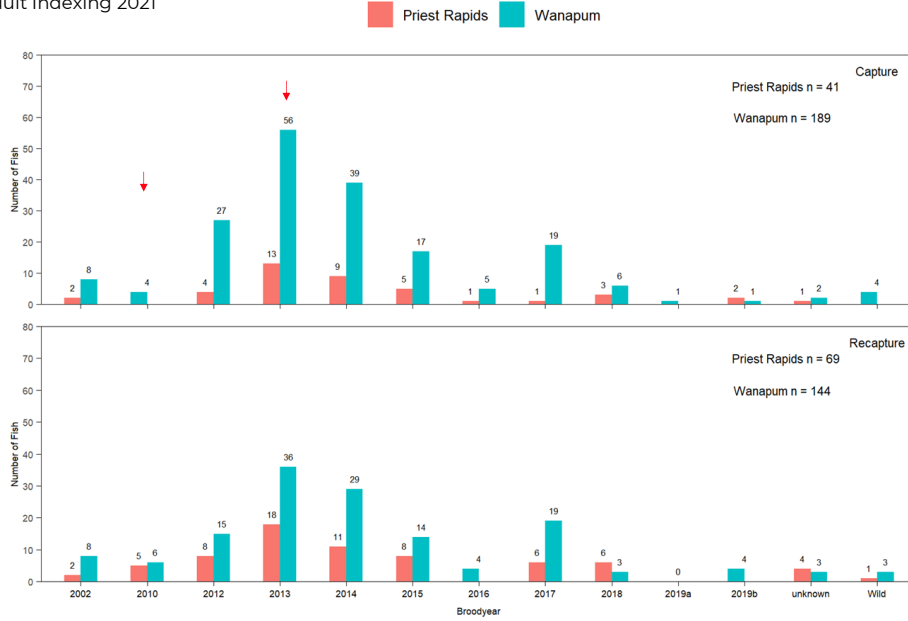
- 443 White Sturgeon Captured
- 333 fish captured in Wanapum Reservoir (n=7 wild; n=16 2002BY; n=310 2010-2019BY)
- 110 fish captured in Priest Rapids Reservoir (n=1 wild; n=4 2002BY; n=105 2010-2019BY)
- Large wild adult female – new capture
- Several mature 2002BY (age-19, black eggs F4, M2 males)



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Catch by Brood Year

Adult Indexing 2021



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Catch, Effort, and CPUE by River Mile

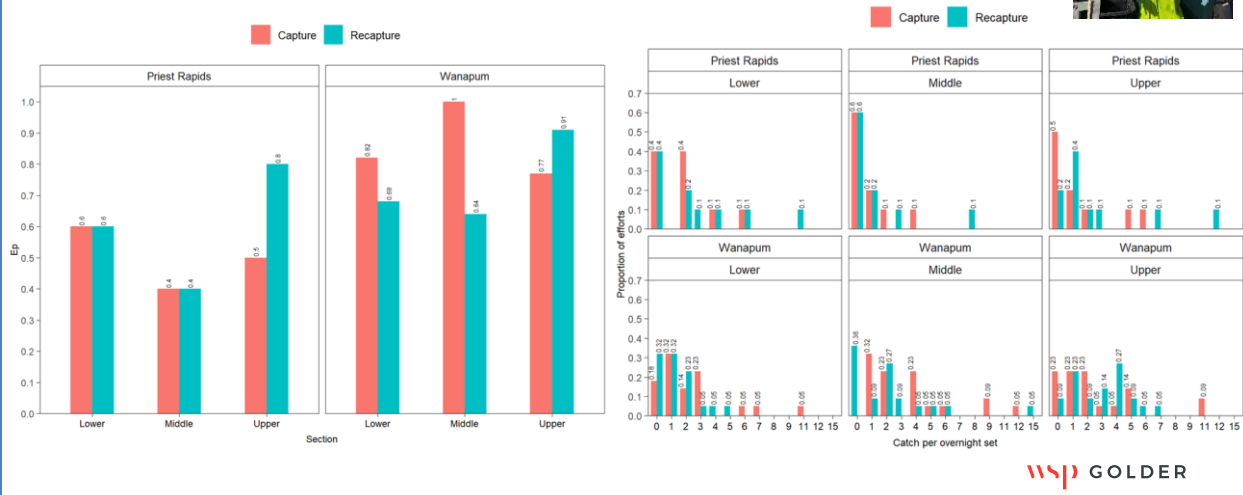
Adult Indexing 2021



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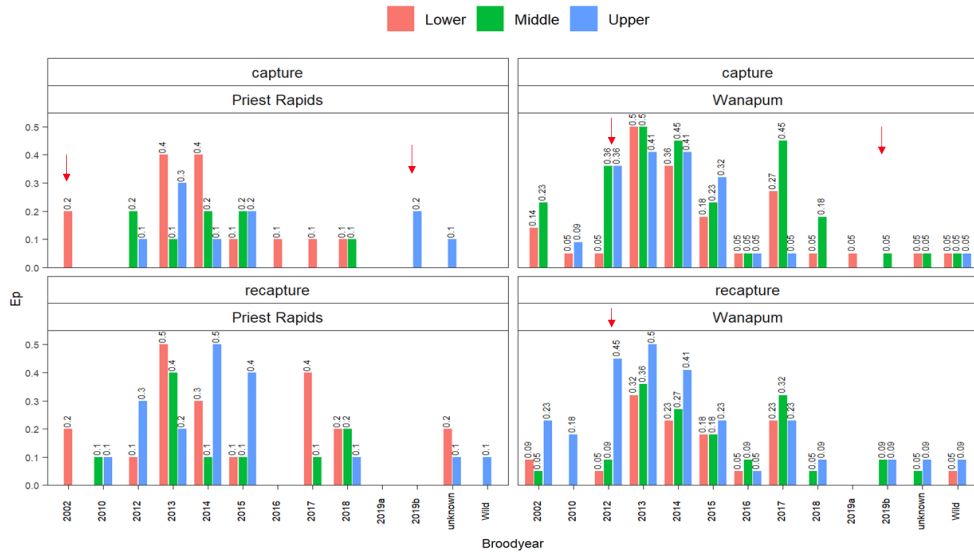
Proportion of Positive Catch (EP)/ Overnight Catch per Line

Adult Indexing 2021



Proportion of Positive Catch by Brood Year

Adult Indexing 2021; 2013BY/2014BY most broadly distributed

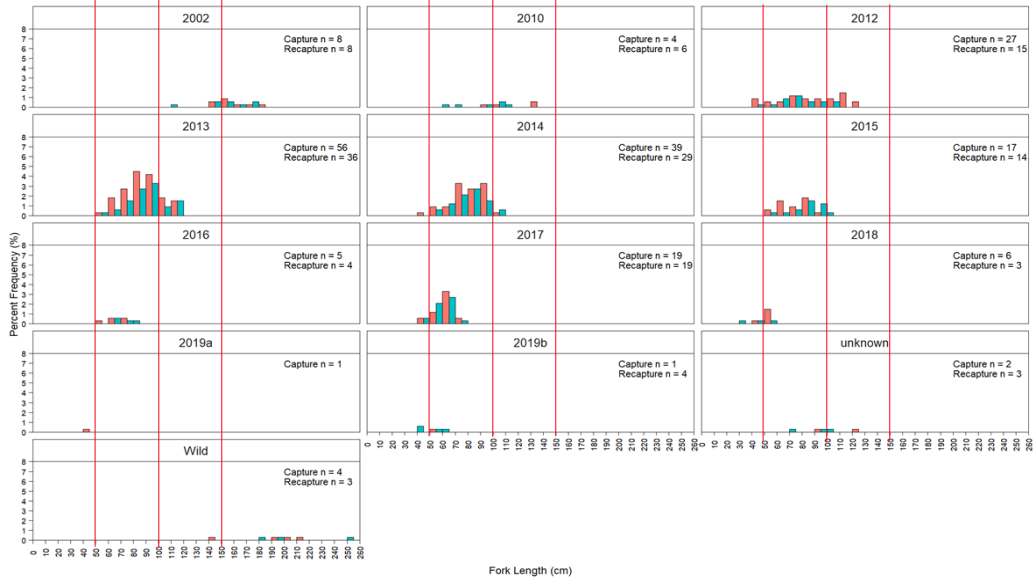


Length Frequency: Wanapum

Adult Indexing 2021

Wanapum

Capture Recapture



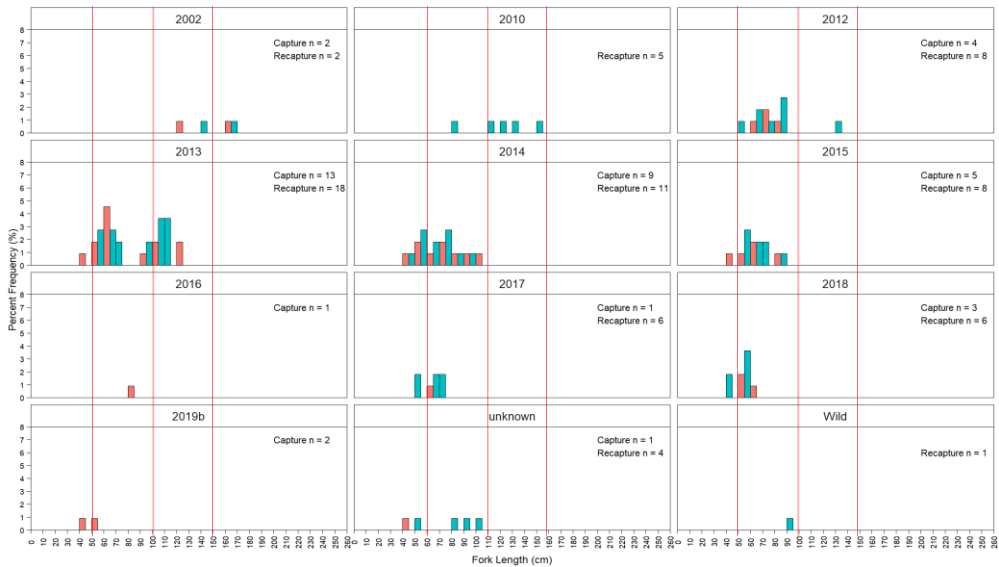
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Length Frequency: Priest Rapids

Adult Indexing 2021

Priest Rapids

Capture Recapture

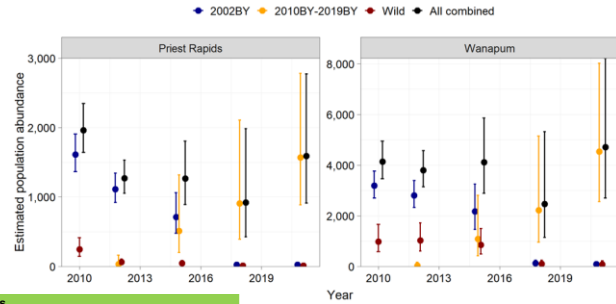
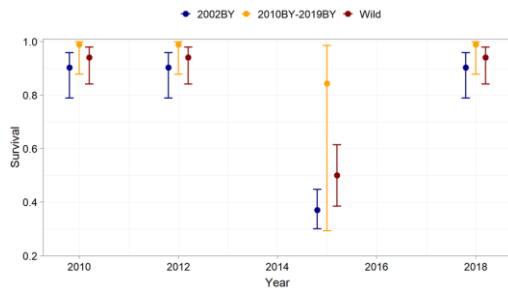


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White Sturgeon Abundance Estimates

Adult Indexing 2021

- POPAN models
- Estimated survival by Adult Indexing study year
- Wild, 2002BY, and 2010BY-2019BY
 - cull / fishery occurred between sampling occasions.



Reservoir	Year	Abundance estimates			
		2002BY Hatchery	2010BY-2019BY hatchery	Wild	Total
Wanapum	2010	3,190 (2,701-3,769)	---	978 (577-1,657)	4,133 (3,454-4,945)
	2012	2,906 (2,325-3,386)	34 (7-158)	1,020 (607-1,715)	3,796 (3,148-4,577)
	2015	2,174 (1,454-3,251)	1,086 (420-2,805)	853 (486-1,496)	4,112 (2,888-5,855)
	2018	125 (66-236)	2,221 (959-5,142)	100 (41-242)	2,469 (1,145-5,324)
	2021	86 (40-187)	4,533 (2,560-8,027)	82 (31-218)	4,714 (2,704-8,219)
Priest Rapids	2010	1,615 (1,367-1,908)	---	244 (144-414)	1,964 (1,641-2,350)
	2012	1,112 (921-1,342)	34 (7-158)	61 (36-103)	1,270 (1,053-1,531)
	2015	710 (475-1,061)	511 (198-1,320)	47 (27-82)	1,268 (890-1,805)
	2018	22 (12-42)	910 (393-2,107)	12 (5-30)	920 (427-1,985)
	2021	22 (10-47)	1571 (887-2,782)	12 (4-31)	1,591 (912-2,773)



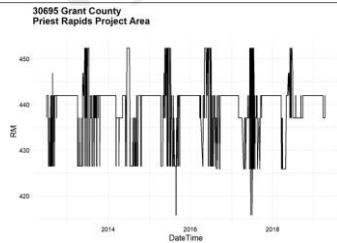
White Sturgeon Adult Indexing Summary 2021

2002BY

Adult Indexing Study Year	Wanapum Catch FL (cm)					Priest Rapids Catch FL (cm)					All Catch FL (cm)				
	n	mean	SD	min	max	n	mean	SD	min	max	n	mean	SD	min	max
2010	311	104.1	15.1	58.0	132.5	158	101.3	14.3	64.5	132.5	469	103.2	14.9	58.0	132.5
2012	192	115.1	16.2	62.5	144.0	86	113.9	14.3	79.0	141.0	278	114.7	15.6	62.5	144.0
2015	291	137.7	15.6	77.0	170.0	98	135.4	16.1	57.5	165.0	389	137.1	15.7	57.5	170.0
2018	17	134.2	30.7	81.5	178.7	4	133.4	17.5	107.2	144.0	21	134.0	28.3	81.5	178.7
2021	16	156.6	16.3	116.5	184.0	4	149.2	17.7	127	164.0	20	155.1	16.4	116.5	184.0

Wild

Adult Indexing Study Year	Wanapum Catch FL (cm)					Priest Rapids Catch FL (cm)					All Catch FL (cm)				
	n	mean	SD	min	max	n	mean	SD	min	max	n	mean	SD	min	max
2010	53	169.8	31.3	116.0	241.0	5	166.4	34.4	137.5	205.0	58	169.6	31.3	116.0	241.0
2012	30	190.3	41.8	60.5	258.0	3	162.8	43.8	118.0	205.5	33	187.8	42.0	60.5	258.0
2015	54	198.4	36.9	81.0	256.0	3	139.3	65.4	65.5	190.0	57	195.3	40.3	65.5	256.0
2018	8	213.2	27.5	165.5	259.0	1	57.5	---	57.5	57.5	9	195.9	57.9	57.5	259.0
2021	7	198.6	31.7	148.0	252.0	1	98.0	---	98.0	98.0	8	186.1	46.1	98.0	252.0



Reduction 2002BY population

- Remaining 2002BY fecund and ripe males and females
- Ripe females ~150 cm FL.
- Selective removal

Reduction of wild fish population

- More prone to genetic swamping
- Evidence of natural recruitment

Some evidence of recruitment of older YNSH brood year to adult gear

- Lower than expected numbers of 2010BY due to removal effort; other factors possible (emigration)
- 2013BY dominant catch; similar catch proportion to early juvenile indexing effort prior to 2013BY aging out of the juvenile gear



Juvenile White Sturgeon Indexing

2021

- Study Objectives
 - Assess populations hatchery white sturgeon juvenile released since 2011 (2010BY-2019BY)
 - Catch by reservoir and reservoir section (CPUE/Ep)
 - Length frequency by brood year and reservoir
 - Survival estimate by brood year
 - Abundance estimates by reservoir
 - Growth and evidence of density dependent growth
 - Used in part to support/guide/determine management objectives for the white sturgeon population in the Project area and future juvenile stocking numbers.



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Juvenile White Sturgeon Indexing

2021

- Conducted by Golder and Blue Leaf biologists
- Juvenile white sturgeon population indexing September 27 to October 23
- 360 overnight sets (288,766 hook-hours) distributed between Wanapum (n=270 overnight sets; 211,821 hook-hours) and Priest Rapids reservoirs (n=90 overnight sets; 76,945 hook-hours)
- 122 m (400 ft.) 0.25 cm (1/4") diameter ground line
- 40 gangions per line
- 0.5 m (20") in length and consisted of a swivel snap, a 30" (12") length of 150# test monofilament
- 2/0 or 4/0 sized circle hook
- pulled approximately every 24 hours during sampling
- All gangions were baited with pickled squid



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Juvenile White Sturgeon Indexing

2021

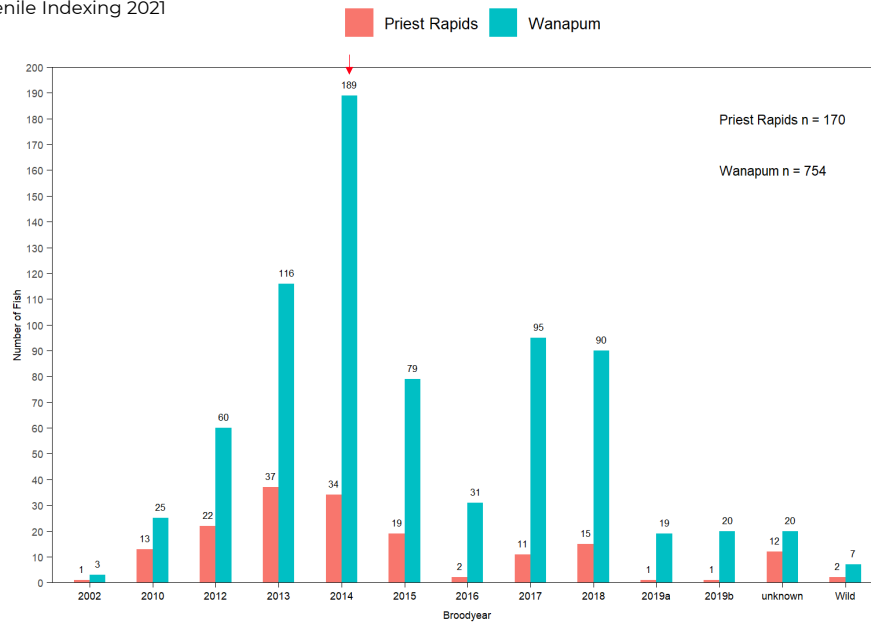
- 924 White Sturgeon captured (all time record!)
- 754 fish captured in Wanapum Reservoir (n=7 wild; n=3 2002BY; n=744 2010-2019BY)
- 170 fish captured in Priest Rapids Reservoir (n=2 wild; n=1 2002BY; n=167 2010-2019BY)



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Catch by Brood Year

Juvenile Indexing 2021



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Catch, Effort, and CPUR by River Mile

Juvenile Indexing 2021

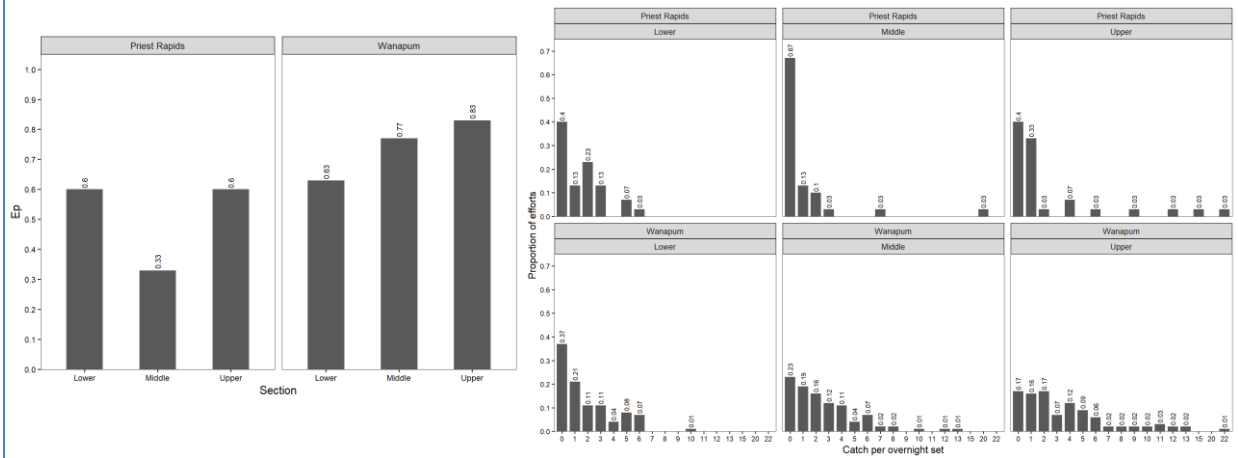
■ Priest Rapids ■ Wanapum



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Proportion of Positive Catch (EP)/ Overnight Catch per Line

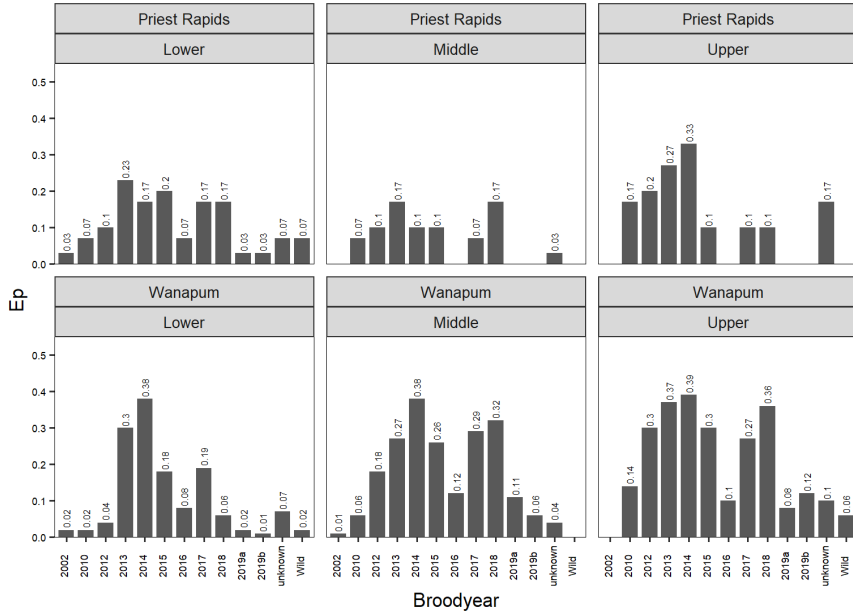
Juvenile Indexing 2021



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Proportion of Positive Catch by Brood Year

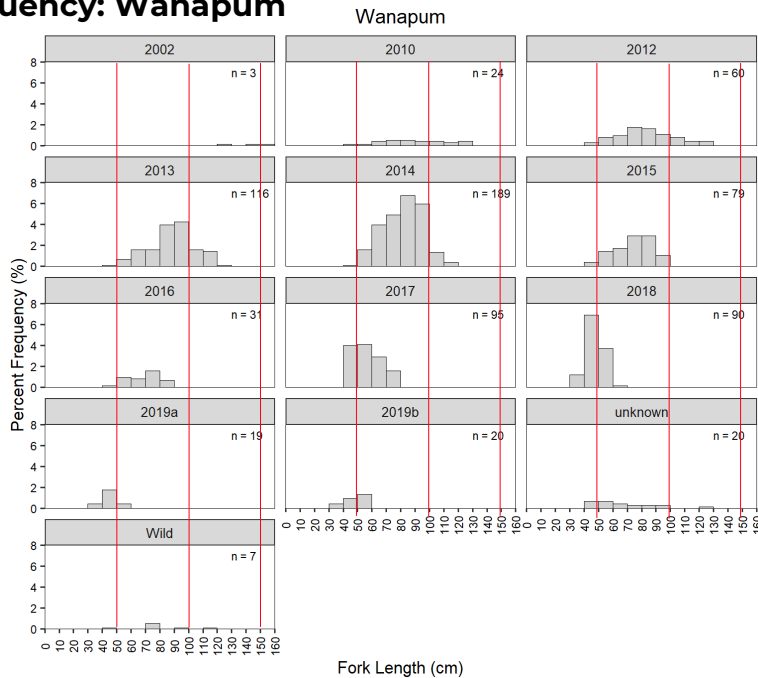
Juvenile Indexing 2021



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Length Frequency: Wanapum

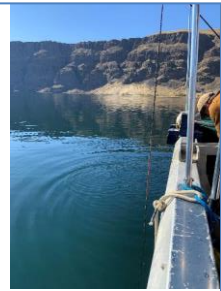
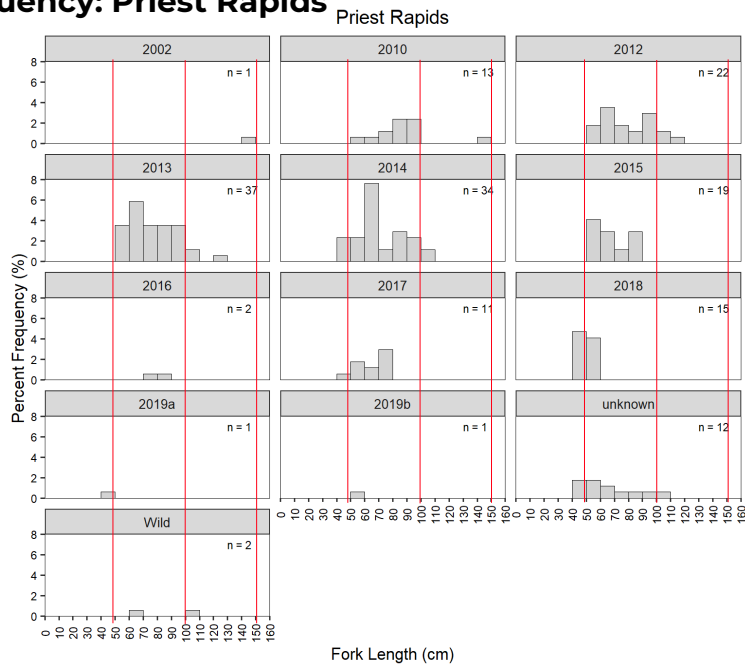
Juvenile Indexing 2021



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Length Frequency: Priest Rapids

Juvenile Indexing 2021

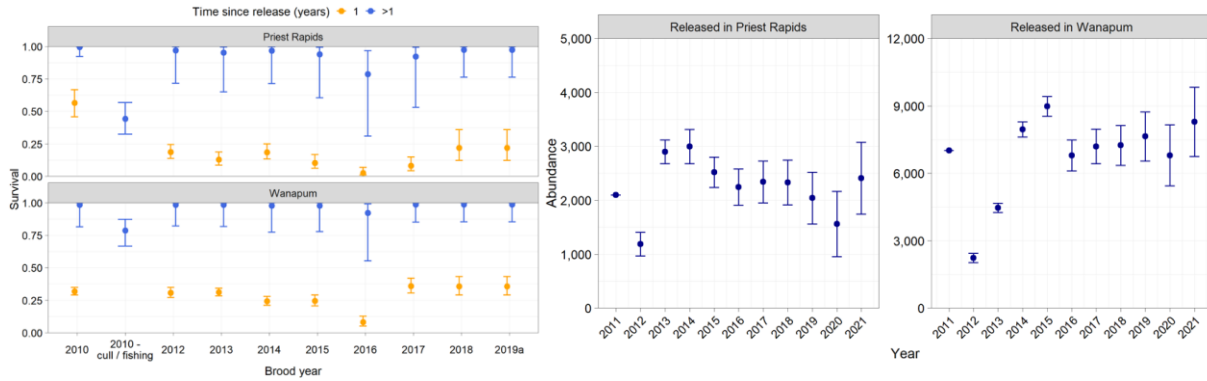


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White Sturgeon Abundance Estimates

Juvenile Indexing 2021

- Cormack-Jolly-Seber models
- Best supported model (as indicated by QAICc) - survival by brood year and release reservoir
 - cull / fishery effects on 2010BY and generated two separate survival estimates
- To account for the reduction in captures of larger fish as fish recruited away from the juvenile gear, the recapture rate was allowed to vary with age.



Year 1 survival lower in Priest Rapids than Wanapum
 Culling affected >1 year survival of 2010BY – fish grew into the slot size
 2016BY had the lowest survival

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White Sturgeon Abundance Estimates

Juvenile Indexing 2021

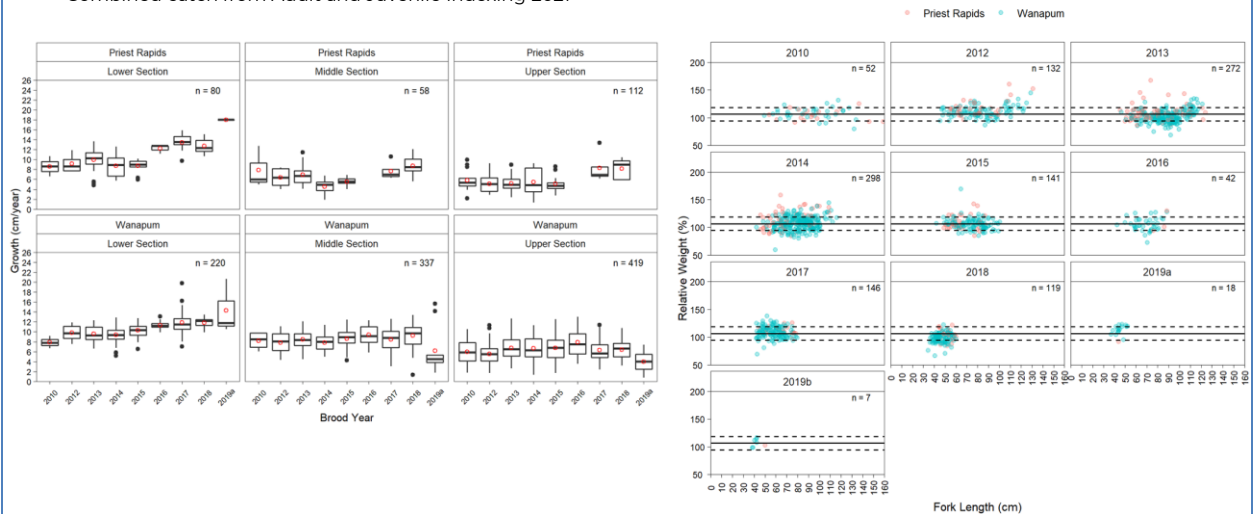


Pool	Year	Abundance Estimate (95% CI)	Annual Hatchery Release Number	Cumulative Release Number
Wanapum	2011	7,015 (7,015 – 7,015)	7,015	7,015
	2012	2,233 (2,028 – 2,437)	0	7,015
	2013	4,461 (4,252 – 4,671)	2,264	9,279
	2014	7,950 (7,613 – 8,288)	5,092	14,371
	2015	8,980 (8,533 – 9,427)	5,007	19,378
	2016	6,795 (6,109 – 7,481)	2,005	21,383
	2017	7,196 (6,429 – 7,964)	1,999	23,382
	2018	7,248 (6,359 – 8,137)	1,983	25,365
	2019	7,639 (6,549 – 8,730)	1,767	27,132
	2020	6,802 (5,452 – 8,152)	411	27,543
	2021	8,292 (6,748 – 9,836)	946	28,489
Priest Rapids	2011	2,101 (2,101 – 2,101)	2,101	2,101
	2012	1,188 (967 – 1,410)	0	2,101
	2013	2,899 (2,676 – 3,121)	1,717	3,818
	2014	2,995 (2,678 – 3,311)	1,500	5,319
	2015	2,519 (2,238 – 2,801)	1,495	6,814
	2016	2,244 (1,908 – 2,580)	1,253	8,067
	2017	2,342 (1,954 – 2,729)	1,249	9,316
	2018	2,332 (1,918 – 2,746)	1,241	10,566
	2019	2,042 (1,561 – 2,523)	890	11,446
	2020	1,562 (958 – 2,166)	261	11,707
	2021	2,408 (1,744 – 3,073)	549	12,256

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White Sturgeon Growth: 2010-2019 Brood Years

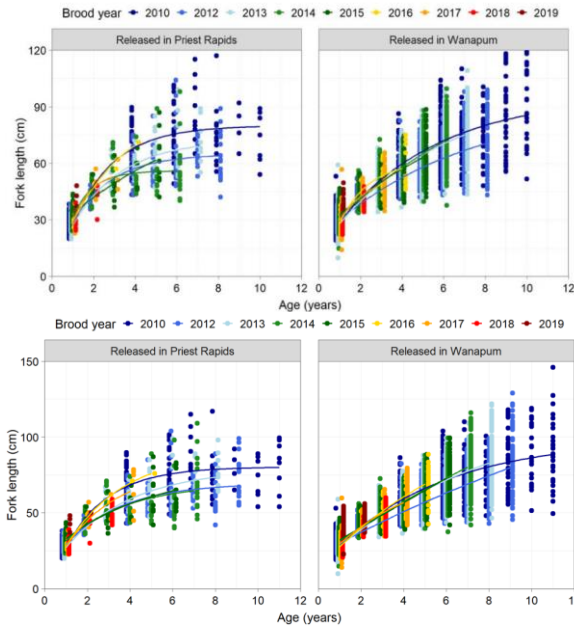
Combined catch from Adult and Juvenile Indexing 2021



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White Sturgeon Density Dependent Growth

Juvenile Indexing 2021



Lower growth rate of 2012BY in both reservoirs

- Overall lower growth rates in Priest Rapids than Wanapum (2014BY) in older brood year fish (growth plateaus)
- Higher velocity habitat in the upper section require more energy for fish to hold and feed
- Greater abundance of fish in the upper section results in increased competition for available food resources
- Genetic differences that affect food conversion and growth rate
- Suspected Priest Rapids hatchery fish release location in Wanapum tailrace may result in local density dependent growth
- New downstream release location in Priest Rapids (RM 403). Upstream movement of 2019BYb released in 2021 detected

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Juvenile White Sturgeon Indexing Summary

2021

- Highest catch to date in 2021 (924 fish); possibly due to reduced flows during sampling and higher catch in upper section of each reservoir
- 2014BY dominant brood year, replacing 2013BY, which are recruiting away from the juvenile gear
- Higher uses of upper reservoir sections in both reservoirs; lower use of middle section in Priest Rapids, possibly flow related
- Lower first year survival in Priest Rapids compared to Wanapum
 - 2016BY lowest survival in both reservoirs
- Population estimates in both reservoirs slightly increased compared to previous years based on the 2021 model. Priest Rapids compared to previous estimates;
- Lower (plateaued) growth rate of older fish in Priest Rapids than in Wanapum
 - Possibly related to release location and localized density dependence; subsequent growth data of fish released at the new downstream release site may answer this
- Lower growth rate in upper sections of each reservoir
 - Energetic, genetics, density



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Questions?

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