Priest Rapids Coordinating Committee Meeting

FINAL APPROVED MEETING MINUTES

Tuesday, September 22, 2020
1:00 pm
Microsoft Teams

PRCC Representatives

Scott Carlon, Justin Yeager (Alt), NMFS	Jim Craig, USFWS
Keely Murdoch, Brandon Rogers (Alt), YN	Kirk Truscott, Casey Baldwin (alt), CCT
Chad Jackson, P. Verhey (Alt) WDFW	Tom Skiles, CTUIR
Curt Dotson, Peter Graf (Alt), GCPUD	Erin Harris, Admin Ass't, GPUD
Denny Rohr, D. Rohr & Assoc, Facilitator	

PRCC Meeting Attendees

Curt Dotson, GPUD	Peter Graf, GPUD
Keely Murdoch, YN	Denny Rohr, D. Rohr & Assoc, Facilitator
Chad Jackson, WDFW	Erin Harris, GPUD
Tom Skiles, CTUIR	Jim Craig, USFWS
Scott Carlon, NMFS - Absent	Kirk Truscott, CCT
Johnny Buck, Wanapum	

Decisions made during the September 22, 2020 meeting

1. August 25, 2020 meeting minutes approved
2. Dotson proposed extending the end date the Quincy Valley Tourism Association Northern Pikeminnow Fishing Derby, which was cancelled due to the Covid-19 issue, from October 31, 2020 to October 31, 2021; committee members voted to approve (Rohr contacted Scott Carlon after the meeting and received a vote of approval).

I. Welcome and Introductions – Denny Rohr welcomed everyone.

II. Agenda Review (D. Rohr) – One agenda item was added by Denny Rohr**:** XVI. November and December Meeting Schedule.

III. Meeting Minutes (D. Rohr) –
A. August 25, 2020 – Approved

IV. Review of Actions Items from August 25, 2020 Webinar Conference (D. Rohr) – There was no action items from the August 25, 2020 meeting.

V. UPDATE - Barkley Irrigation Co Permanent Point of Diversion, Completing Implementation of the Permanent Solution (D. Rohr) – Denny Rohr reminded committee members that the recent request for additional funding from Trout Unlimited in the amount of $250,000 is being provided by PRCC-HabSC. He shared the PRCC-HabSC currently is continuing their review and discussion regarding the consideration of selling a piece of property purchased during the implementation of this project that is no longer needed and could possibly be used to backfill the $250,000. Current discussions are taking place among PRCC-HabSC members regarding several options for consideration of a path forward with the property. Discussions are also taking place with the Methow Salmon Recovery Foundation and Trout Unlimited regarding their possible involvement in the options being considered. Trout Unlimited currently holds title to the property under discussion. Rohr will keep the PRCC advised.

VI. UPDATE – 2020 FCRPS BiOp and Avian Predation Activities (C. Dotson, T. Skiles, S. Carlon) – Denny Rohr re-surfaced the question of having staff members from the USACE and/or the BOR attend a future PRCC meeting to discuss in detail the subject of avian predation management, primarily on the Columbia Plateau, with a focus on a path forward. D. Rohr asked the committee if they would like the BOR and the USACE to join a future meeting to talk with them on the details of their avian predation activities. Tom Skiles thinks it's a good idea, at the very least have BOR report their 2019-2020 Goose Island activities. Skiles also commented that as far as including the USACE, he would have to think about that one as they sunset-ed their avian program. Curt Dotson feels it would be good to hear their activities and more on the new FCRPS BiOp. All PRCC committee members present agreed to having the BOR attend a future PRCC meeting. D. Rohr will follow up.

VII. Lower Columbia River Sea Lion Activities (C. Jackson, T. Skiles) – Denny Rohr stated that Spring Chinook and Steelhead are a big issue for pinniped activities in the lower Columbia River. Congressional action was taken towards the end of 2018 that resulted in an allowance for increased "take". Additionally, NOAA has provided permits to Washington, Oregon, Idaho, and several tribes allowing the "take" actions. Rohr then asked Chad Jackson and Tom Skiles to provide an update to the committee regarding the involvement of WDFW and CRITFC. Chad Jackson shared WDFW has received a permit that is shared with Idaho and Oregon. He also shared that the process of hiring personnel plus the beginning of the "take" work has been slowed down with the Covid-19 state restrictions being in place in regard to the path forward to remove a large number of pinnipeds. WDFW is also working to hire someone to lead a team of three staff who will perform the "take" work. Tom Skiles shared he is not clear on what their active role will be until they hear from tribal members, but he will check further

and provide more information at next month's meeting. Kirk Truscott ask what time of year would be optimum for the removal of pinnipeds and wondering if it might be in the springtime? Chad Jackson shared they currently will be working to take pinnipeds now, but he does not know yet what they plan for adult removal in the Spring.

VIII. 91% Combined Survival Estimates for Covered Species. (C.Dotson, P.Graf) **–** Peter Graf shared a presentation titled "Priest Rapids Project Estimates for Combined Survival. Please see the attached Power Point Presentation. Questions: Tom Skiles asked if fall Chinook from the Hanford Reach were included in the estimates? Peter Graf shared that NNI fish that we generate a survival estimates for and pass through the PRP were included, those being Spring Chinook, Summer Chinook, Steelhead and Sockeye. The adult (returns) that were used for generating the adult piece of the survival estimates were those fish that were PIT-tagged upstream of PRP as out-migrating juveniles. Tom Skiles stated that fundamentally you can get to the combined estimate if you use these adult survival numbers combined with juvenile survival estimates from survival studies. Peter replied yes, we can get there.

Tom Skiles asked about error bounds requirements. Peter Graf shared error bounds are required for juveniles' studies, but there are no requirements for adult survivals and that adult survival error bounds are nearly zero because of nearly 100% detection efficiency in the ladders and very high survival rates. However, PNNL's CJS model does include error bounds and are reported in the tables in the report and are very small. Peter shared he didn't include error bounds with his DART conversion rate calculations because there was no model or estimate of detection efficiency, it was purely an accounting of how many fish converted to Rocky Reach, which was nearly 100% in most cases. But if a survival model with error bounds is preferred, then see the CJS model to Rock Island, which showed results nearly the same as the conversion rate estimate to Rocky Reach.

Tom Skiles asked about measuring survival beyond the PRP (i.e. to Rocky Reach Dam) and Peter Graf shared that the further upstream you go up to get a detection site, the more likely you'll lose adults along those river-miles and that mortality would be included in the losses attributed to the PRP, so the adult survival estimates, for the PRP, presented here are very conservative estimates.

Tom Skiles asked about the fish counting at the dams and accuracy concerns. Curt Dotson shared that the counting of fish via the (human) fish counters is open to individual (species) identification of a given fish, which could generate errors in actual counts due to this human element, but the adult counts being used for this survival estimates is the result of PIT-tag detections and the analysis of those PIT detections, so no human "fish identification" error is part of the equation Errors at the counting window have no impact at the PIT-tag array and historically the PRD PIT-array has nearly 100% detection efficiency. Curt Dotson stated that the GPUD whitepaper regarding the combined survival estimates, via PIT-tag detections was sent to both PNNL and John Skalski's group for verification that Grant "conducted its analysis correctly". , The report from PNNL

and a memo from Skalski's group will be sent to Denny Rohr and then Denny will distribute the materials to the committee.

Tom Skiles asked about the phase designation from the HCPs. Peter Graf said that GPUD does not have phase designation like the HCPs but instead has the NNI Fund, from the SSSA and Grant's BiOp. The slide shown from the HCP was to show a "yes" or "no" test of meeting standards and that the decision tree from the HCPs provides a visual roadmap of how the 91% standard is used and applied.

Kirk Truscott asked if with the combined survival can you have a juvenile survival less than 93% and still meet the 91% standard. Peter Graf replied that yes, with combined survival being juvenile multiplied by adult the juvenile survival could be slightly less than 93%, but the margin is very small. In the Settlement Agreement (SSSA) and BiOp is phrased slightly different, but both state that 91% combined is the standard and hence the NNI mitigation calculation of 2% habitat + 7% hatchery + 91% combined survival is how the project gets to NNI. Kirk Truscott stated that his concern is that with a combined survival standard, we could see a fall off on juvenile survival.

ACTION: Curt/Denny to send out reports to committee members and more discussion at the next meeting.

IX. Potpourri (D. Rohr) – Nothing to report.

UPDATES

X. Avian Predation Activities (C. Dotson, T. Skiles) – no additional discussion

XI. FCRPS BiOp – Corps/BOR Avian Predation Management in Columbia Plateau Region (C. Dotson, S. Carlon) – nothing additional

XII. Review of Outstanding NNI Funded Projects

A. **Continued Support for UC Fish Screen Program** (C. Jackson) - Chad Jacksons reported that Danny Didricksen will provide the next report at the December 2020 meeting.
B. **Lower Wenatchee Instream Flow Enhancement Project Phase II** (C. Jackson, D. Rohr) - Nothing new reported.
C. **"Non-Native Predator Recruitment Reduction – Phase I"** (K. Murdoch) – Nothing new reported.
D. **"Northern Pike Removal in Lake Roosevelt"** (K. Truscott) – Nothing new reported.
E. **2020 Quincy Valley Tourism Association Northern Pikeminnow Fishing Derby (moved to 2021 due to Covid-19)** (C. Dotson) – Curt Dotson requested approval from committee members to develop a contract change order that will extend the existing contract for the Northern Pikeminnow

Fishing Derby. When the current contract was developed, the end date was October 2020. However, because of Covid-19 state restrictions, the 2020 tournament did not take place. Funds are left over on this contract and Dotson proposes extending the end date from October 31, 2020 to October 31, 2021. **VOTE:** Committee members present voted to **approve**, and Denny Rohr will follow up with Scott Carlon.

F. Avian Predation on ESA-listed Juvenile Salmonids on the Mid-Columbia River, 2020, Real Time Research (C. Dotson) – Curt Dotson shared the avian predation Synthesis Report will soon be sent out for review with the comment period extended from the original September 30, 2020 date to possibly as late as November 30, 2020. This will result in an extension of the final Report due date to early 2021. Dotson will follow up to determine the new Report date and share the information with Rohr for distribution to the PRCC.

XIII. Committee Reports (D. Rohr) No September committee meetings

XIV. NNI and Habitat Funds Report, Q2, 2020 (D. Rohr) – Denny Rohr shared Q3 will be sent out next month.

XV. Next Meeting – Tuesday, October 27, 2020, 1:00 pm, MS TEAMS mtg

XVI. (addition to agenda) November and December Meetings – Denny Rohr shared updates to the November and December meetings based on discussions with Kristi Geris that occurred in the HCP meetings. Accordingly, all agreed to consideration of leaving the November meeting at Tuesday, November 24th, and changing the December meeting from Tuesday, December 22nd to Tuesday, December 15th. Rohr will discuss this subject further during the October meeting.

Action Items from September 22, 2020 meeting

1. ACTION: 91% Combined Survival Estimates for Covered Species. Curt/Denny to send out reports to committee members and more discussion will take place at the next meeting.
2. Avian Predation on ESA-listed Juvenile Salmonids on the Mid-Columbia River, 2020, Real Time Research. ACTION: Curt Dotson will send the contract expiration date to Denny Rohr.

Priest Rapids Project Estimates for Combined Survival

Priest Rapids Coordinating Committee
September 22, 2020

Operate Responsibly by Attaining Environmental, Cultural Resource and Regulatory Compliance

Grant PUD

Powering our way of life.

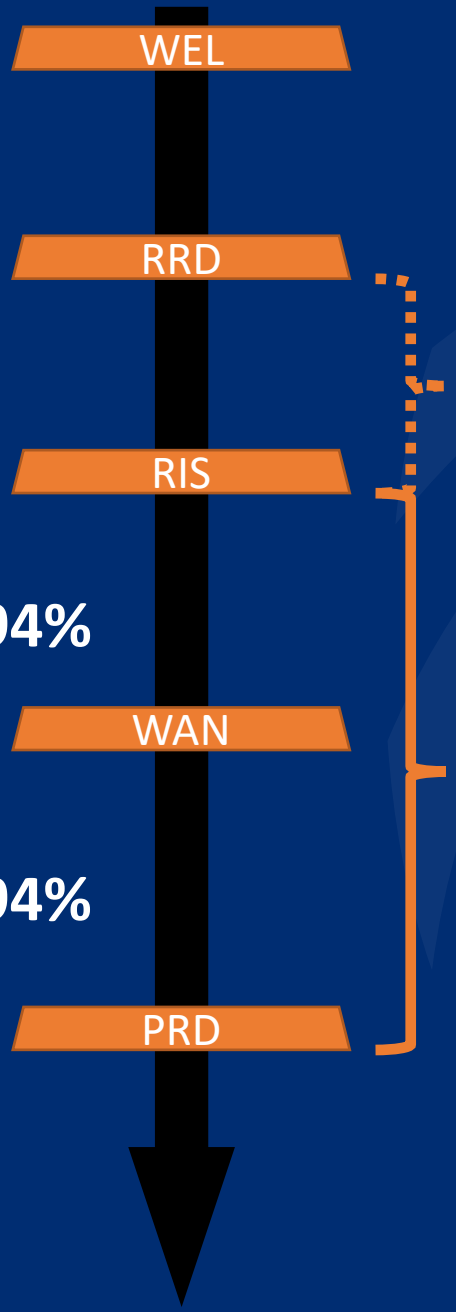
Combined Survival

- **Combined Survival = Total Survival for the Project**
- **Total Survival = Adult Survival × Juvenile Survival**
- **Per Development Standard = 91%**
- **Project Standard = 91% × 91% = 82.8%**
- **“Gold Standard” for No Net Impact**

Salmon and Steelhead Settlement Agreement:

"No Net Impact refers to the condition whereby the Project does not produce unmitigated project related mortality of Covered Species. For purposes of this Agreement, No Net Impact is achieved when there is a minimum of 91% combined adult and juvenile survival rate for each Covered Species past each dam and through each reservoir (survival standard), and when Grant PUD implements 2% mitigation in the form of funding habitat restoration and conservation work in mid-Columbia tributary streams, and 7% mitigation in the form of hatchery supplementation…"

91% Survival + 2% Habitat + 7% Hatchery = NNI



Combined Survival Standard =
91% per development
WAN(91%) × PRD(91%) =
82.8%

Juvenile Survival

94% × 94% = 88.4%

Adult Survival

96.0%

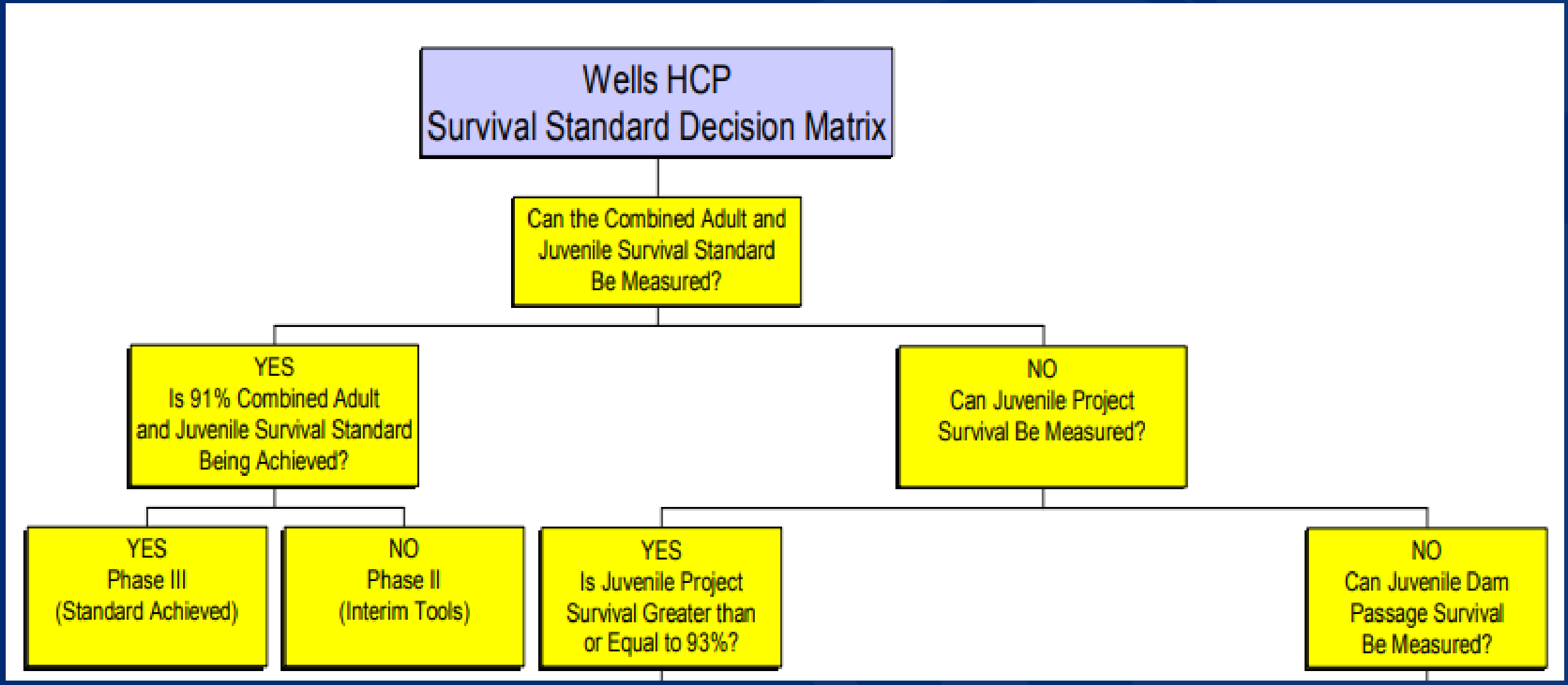
Measured Combined Survival
88.4% × 96.0%
=
84.8%

Estimating Adult Survival

NMFS 2008 BiOp:

"NOAA Fisheries Service and the U.S. Fish and Wildlife Service recognized that as of the Settlement Agreement Effective Date it was not currently possible to measure the 91% combined adult and juvenile survival standard. To address this issue, the Licensee shall use dam and reservoir smolt survival studies to evaluate progress towards meeting 95% juvenile dam passage survival and 93% juvenile project passage survival."

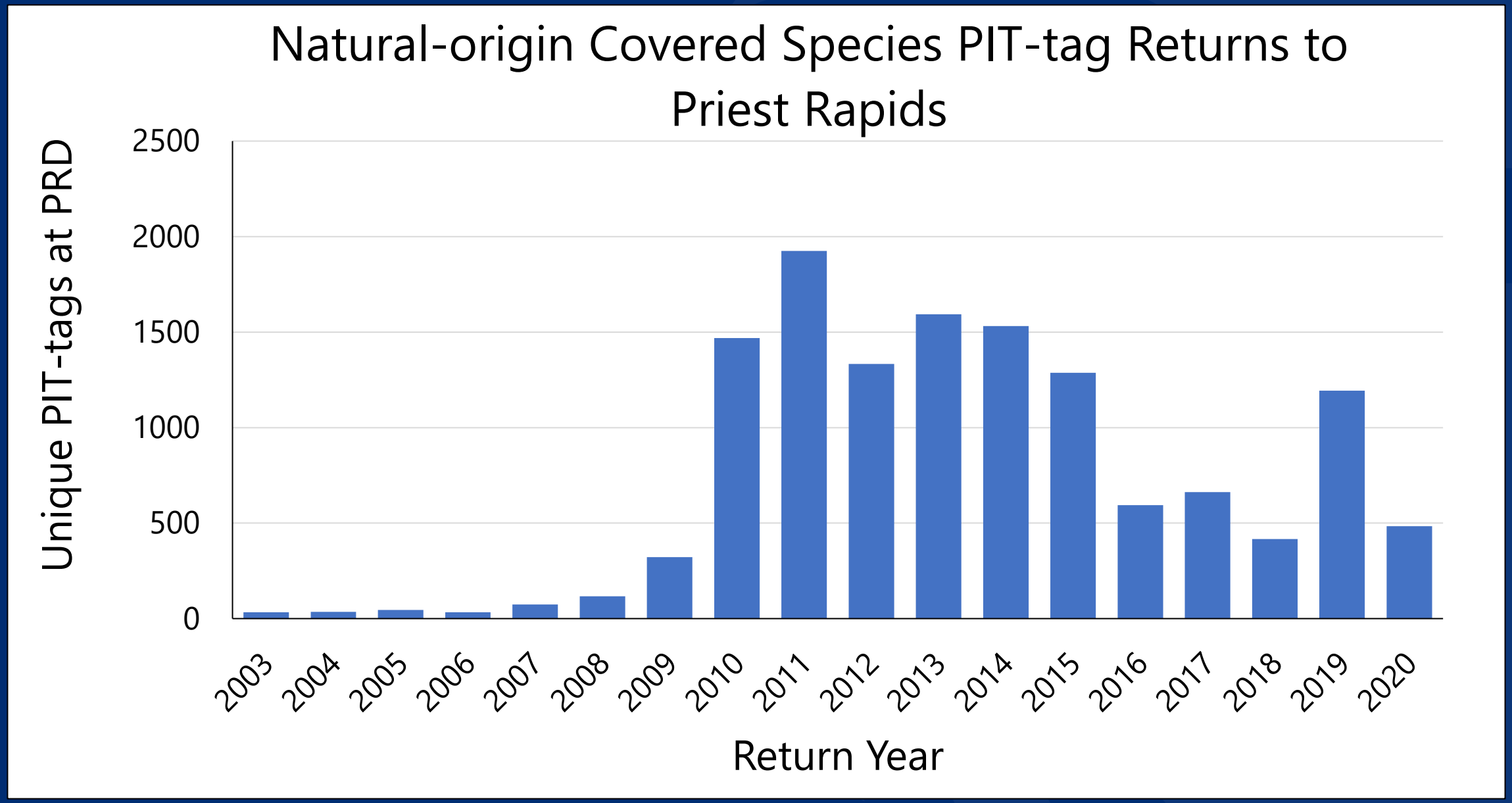
Estimating Adult Survival



Challenges to Estimating Adult Survival

- **Conversation Rates vs. Survival**
  - Strays, harvest, turnoff, natural mortality, spawning, etc.
  - Conversion Rate = Minimum Estimate of Survival
- **Few returning wild adults with PIT-tags**
- **Reliable & High Detection Rate Arrays**
  - PRD and RIS 2003
  - RRD in 2006

Challenges to Estimating Adult Survival



Methods for Estimating Adult Conversion Rates

1. **Study Reach is PRD to Rocky Reach Dam**
   - Dropouts between RIS and RRD are included in the estimate
2. **Source tags are all wild PIT-tagged fish originating from above Rocky Reach Dam (Entiat, Methow, Okanogan)**
3. **Track all fish from PRD to final detection or loss**
4. **Use UW/PSMFC conversion rate data, confirm with PTAGIS and Cormack-Jolly-Seber estimate (UW and PNNL)**
   - CJS estimate to Rock Island with detection prob.
5. **Combine all years on record to maximize sample size and robustness of estimate**

Results – Adult Conversion Rate

Yearling Chinook

Table 1a. Columbia River DART PIT-tag adult returns and conversion rate for Priest Rapids to Rocky Reach wild Spring Chinook released in the Entiat Basin and above Wells Dam.

Observation Year	Released above Wells		Released in Entiat		Above Wells & Entiat Combined		
	Priest Rapids	Rocky Reach	Priest Rapids	Rocky Reach	Priest Rapids	Rocky Reach	Conversion Rate
2006[1]	1	1	4	4	5	5	1.000
2007	1	1	5	5	6	6	1.000
2008	2	2	3	3	5	5	1.000
2009	12	12	8	8	20	20	1.000
2010	23	23	62	62	85	85	1.000
2011[2]	21	21	49	49	70	70	1.000
2012[3]	5	5	38	38	43	43	1.000
2013	8	8	28	27	36	35	0.972
2014	15	15	25	25	40	40	1.000
2015[4]	18	18	27	26	45	44	0.978
2016[5]	17	17	29	29	46	46	1.000
2017	6	6	8	7	14	13	0.929
2018	3	3	7	7	10	10	1.000
2019	2	2	5	5	7	7	1.000
2006-2019	**134**	**134**	**298**	**295**	**432**	**429**	0.993

Results – Adult Conversion Rate

Sub-yearling (Summer) Chinook

Table 2a. Columbia River DART PIT-tag adult returns and conversion rate for Priest Rapids to Rocky Reach wild Sub-yearling (summer) Chinook released in the Entiat Basin and above Wells Dam.

Observation Year	Released above Wells		Released in Entiat		Above Wells & Entiat Combined		
	Priest Rapids	Rocky Reach	Priest Rapids	Rocky Reach	Priest Rapids	Rocky Reach	Conversion Rate
2009	NA	NA	4	4	4	4	1.000
2010	NA	NA	2	2	2	2	1.000
2011	NA	NA	2	2	2	2	1.000
2012	3	3	NA	NA	3	3	1.000
2013[1]	38	38	1	1	39	39	1.000
2014	69	69	6	6	75	75	1.000
2015	74	73	4	4	78	77	0.987
2016	65	65	6	6	71	71	1.000
2017[2]	22	22	11	11	33	33	1.000
2018	2	2	5	5	7	7	1.000
2019	3	3	NA	NA	3	3	1.000
2009-2019	**276**	**275**	**41**	**41**	**317**	**316**	0.997

Results – Adult Conversion Rate

Steelhead

Table 3a. Columbia River DART PIT-tag adult returns and conversion rate for Priest Rapids to Rocky Reach wild Steelhead released above Wells Dam.

Observation Year	Released above Wells		Released in Entiat		Above Wells & Entiat Combined		
	Priest Rapids	Rocky Reach	Priest Rapids	Rocky Reach	Priest Rapids	Rocky Reach	Conversion Rate
2006	NA	NA	2	2	2	2	1.000
2007	3	2	6	6	9	8	0.889
2008	7	7	6	6	13	13	1.000
2009[1]	40	38	55	54	95	92	0.968
2010	20	19	54	52	74	71	0.959
2011	28	27	47	47	75	74	0.987
2012	16	15	21	21	37	36	0.973
2013	28	28	33	33	61	61	1.000
2014	48	48	51	49	99	97	0.980
2015[2]	53	53	46	46	99	99	1.000
2016[3]	29	29	27	27	56	56	1.000
2017	10	8	5	5	15	13	0.867
2018	11	10	12	12	23	22	0.957
2019	20	20	13	13	33	33	1.000
2006-2019	**313**	**304**	**378**	**373**	**667**	**654**	0.981

Results – Adult Conversion Rate

Sockeye

Table 4a. Columbia River DART PIT-tag adult returns and conversion rate for Priest Rapids to Rocky Reach for Sockeye released above Wells Dam.

Observation Year	Priest Rapids Observations	Rocky Reach Observations	DART Conversion Rate
Wild			
2016	4	4	1.000
2017[1]	29	28	0.966
2018	2	2	1.000
2016-2018 Wild	35	34	0.971
Unknown origin			
2013	12	11	0.917
2014	65	57	0.877
2015	48	42	0.875
2016[2]	54	50	0.926
2017	20	20	1.000
2018	42	39	0.929
2019	20	19	0.950
2013-2019 Unknown origin	261	238	0.912
All years and Origin (2013-2018)	**296**	**272**	**0.919**

Confirmation by UW and PNNL

1) Replicate the analysis conducted by Grant PUD using the DART estimator and cross-checking non-converted fish with PTAGIS interrogation histories

2) Compare results from (1) to those obtained using PTAGIS to identify fish that converted from Priest Rapids Dam to Rock Island Dam

3) Estimate conversion rates from Priest Rapids Dam to Rock Island Dam using the Cormack-Jolly-Seber (CJS) model

Confirmation by PNNL

Spring Chinook

Obs. Year	Wenatchee			Entiat			Above Wells			Combined		
	N	S (SE)	p (SE)	N	S (SE)	p (SE)	N	S (SE)	p (SE)	N	S (SE)	p (SE)
2008	21	1.01 (0.01)	0.94 (0.05)	3	1.00 (0.00)	1.00 (0.00)	2	1.00 (0.00)	1.00 (0.00)	26	1.005 (0.01)	0.96 (0.04)
2009	33	0.97 (0.03)	0.94 (0.04)	8	1.00 (0.00)	1.00 (0.00)	12	1.00 (0.00)	0.92 (0.08)	53	0.982 (0.02)	0.94 (0.03)
2010	89	0.97 (0.02)	0.97 (0.02)	62	1.00 (0.00)	1.00 (0.00)	23	1.00 (0.00)	1.00 (0.00)	174	0.983 (0.01)	0.99 (0.01)
2011	113	0.94 (0.02)	0.92 (0.03)	49	1.01 (0.00)	0.89 (0.05)	21	1.00 (0.00)	0.76 (0.09)	183	0.966 (0.01)	0.89 (0.02)
2012	64	0.98 (0.02)	0.98 (0.02)	38	1.00 (0.00)	0.97 (0.03)	5	1.00 (0.00)	1.00 (0.00)	107	0.991 (0.01)	0.98 (0.01)
2013	34	0.94 (0.04)	1.00 (0.00)	28	0.96 (0.04)	0.96 (0.04)	8	1.00 (0.00)	1.00 (0.00)	70	0.957 (0.02)	0.99 (0.02)
2014	35	1.05 (0.04)	0.55 (0.09)	25	1.00 (0.00)	0.52 (0.10)	15	1.00 (0.00)	0.67 (0.12)	75	1.021 (0.02)	0.56 (0.06)
2015	45	0.98 (0.02)	0.81 (0.06)	27	0.98 (0.04)	0.68 (0.09)	18	1.00 (0.00)	0.67 (0.11)	90	0.985 (0.02)	0.74 (0.05)
2016	38	1.00 (0.00)	0.84 (0.06)	29	1.00 (0.00)	0.86 (0.06)	17	1.00 (0.00)	0.71 (0.11)	84	1.000 (0.00)	0.82 (0.04)
2017	31	0.97 (0.03)	0.73 (0.08)	8	0.88 (0.12)	0.71 (0.17)	6	1.00 (0.00)	0.17 (0.15)	45	0.956 (0.03)	0.65 (0.07)
2018	25	1.00 (0.00)	0.44 (0.10)	7	1.00 (0.00)	0.71 (0.17)	3	1.00 (0.00)	0.33 (0.27)	35	1.000 (0.00)	0.49 (0.08)
2019	25	0.97 (0.04)	0.91 (0.06)	5	1.00 (0.00)	1.00 (0.00)	5	1.00 (0.00)	0.60 (0.22)	35	0.980 (0.03)	0.88 (0.06)
2008-2019 Pooled	**553**	**0.976 (0.008)**	**0.87 (0.02)**	**289**	**0.991 (0.006)**	**0.88 (0.02)**	**135**	**1.000 (0.000)**	**0.77 (0.04)**	**977**	**0.984 (0.005)**	**0.86 (0.01)**
All Release Locations and Years (2008–2019) Weighted Average											**0.983**	

Confirmation by PNNL

Summer Chinook

	Above Wells & Entiat Combined		
Observation Year	**N**	***S* (SE)**	***p* (SE)**
2009	4	1.000 (0.000)	1.000 (0.000)
2010	2	1.000 (0.000)	0.500 (0.354)
2011	2	1.000 (0.000)	1.000 (0.000)
2012	3	1.000 (0.000)	1.000 (0.000)
2013	41	1.003 (0.004)	0.875 (0.052)
2014	77	1.000 (0.000)	0.455 (0.057)
2015	84	0.988 (0.012)	0.855 (0.039)
2016	73	1.000 (0.000)	0.945 (0.027)
2017	33	1.000 (0.000)	0.727 (0.078)
2018	7	1.000 (0.000)	0.714 (0.171)
2019	3	1.000 (0.000)	1.000 (0.000)
2009-2019 Pooled	**331**	**0.998 (0.003)**	**0.771 (0.023)**
All Release Locations and Years (2009–2019) Weighted Average		**0.997**	

Confirmation by PNNL

Steelhead

Obs. Year	Rock Island Dam			Wenatchee			Entiat			Above Wells			Combined		
	N	*S* (SE)	*p* (SE)	N	*S* (SE)	*p* (SE)	N	*S* (SE)	*p* (SE)	N	*S* (SE)	*p* (SE)	N	*S* (SE)	*p* (SE)
2007	8	1.13 (0.13)	0.67 (0.19)	2	1.00 (0.00)	1.00 (0.00)	6	1.00 (0.00)	1.00 (0.00)	3	0.67 (0.27)	0.50 (0.35)	19	0.99 (0.06)	0.80 (0.10)
2008	11	0.94 (0.10)	0.78 (0.14)	15	0.95 (0.07)	0.85 (0.10)	6	1.00 (0.00)	1.00 (0.00)	7	1.00 (0.00)	0.71 (0.17)	39	0.96 (0.04)	0.83 (0.06)
2009	33	0.98 (0.03)	0.96 (0.04)	59	1.01 (0.00)	0.94 (0.03)	55	0.98 (0.02)	1.00 (0.00)	40	0.95 (0.03)	0.95 (0.04)	187	0.98 (0.01)	0.97 (0.01)
2010	32	1.00 (0.00)	1.00 (0.00)	64	0.97 (0.02)	0.98 (0.02)	54	0.96 (0.03)	1.00 (0.00)	20	0.95 (0.05)	1.00 (0.00)	170	0.97 (0.01)	0.99 (0.01)
2011	23	1.00 (0.00)	1.00 (0.00)	52	1.00 (0.00)	0.94 (0.03)	47	1.00 (0.00)	0.94 (0.04)	29	0.97 (0.03)	0.96 (0.04)	151	0.99 (0.01)	0.95 (0.02)
2012	17	1.00 (0.00)	0.94 (0.06)	39	1.00 (0.00)	0.77 (0.07)	22	1.00 (0.00)	1.00 (0.00)	15	1.00 (0.00)	0.87 (0.09)	93	1.00 (0.00)	0.87 (0.04)
2013	14	1.00 (0.00)	0.93 (0.07)	26	1.00 (0.00)	0.89 (0.06)	34	1.00 (0.00)	0.79 (0.07)	28	1.00 (0.00)	1.00 (0.00)	102	1.00 (0.00)	0.89 (0.03)
2014	21	1.00 (0.00)	0.62 (0.11)	30	0.97 (0.03)	0.62 (0.09)	52	0.96 (0.03)	0.68 (0.07)	48	1.00 (0.00)	0.75 (0.06)	151	0.98 (0.01)	0.68 (0.04)
2015	26	1.00 (0.00)	0.92 (0.05)	36	1.00 (0.00)	0.94 (0.04)	47	1.00 (0.00)	0.98 (0.02)	53	1.00 (0.00)	0.96 (0.03)	162	1.00 (0.00)	0.96 (0.02)
2016	9	1.00 (0.00)	0.89 (0.11)	8	1.00 (0.00)	1.00 (0.00)	27	1.00 (0.00)	0.93 (0.05)	29	1.00 (0.00)	0.93 (0.05)	73	1.00 (0.00)	0.93 (0.03)
2017	9	1.02 (0.02)	0.88 (0.12)	6	1.00 (0.00)	0.83 (0.15)	5	1.00 (0.00)	1.00 (0.00)	10	0.80 (0.13)	0.75 (0.15)	30	0.94 (0.05)	0.85 (0.07)
2018	5	1.00 (0.00)	0.80 (0.18)	4	1.00 (0.00)	0.75 (0.22)	12	1.00 (0.00)	0.42 (0.14)	11	0.91 (0.09)	0.60 (0.16)	32	0.97 (0.03)	0.58 (0.09)
2019	11	1.00 (0.00)	1.00 (0.00)	14	1.00 (0.00)	1.00 (0.00)	13	1.00 (0.00)	1.00 (0.00)	22	1.00 (0.00)	1.00 (0.00)	60	1.00 (0.00)	1.00 (0.00)
All Pool	**219**	**0.996 (0.007)**	**0.90 (0.02)**	**355**	**0.993 (0.006)**	**0.89 (0.02)**	**380**	**0.987 (0.006)**	**0.90 (0.02)**	**315**	**0.975 (0.009)**	**0.90 (0.02)**	**1269**	**0.987 (0.003)**	**0.90 (0.01)**
All Release Locations and Years (2007–2019) Weighted Average														**0.987**	

Confirmation by PNNL

Sockeye

Year	Rock Island Dam			Wenatchee			Above Wells			Combined		
	N	*S* (SE)	*p* (SE)	N	*S* (SE)	*p* (SE)	N	*S* (SE)	*p* (SE)	N	*S* (SE)	*p* (SE)
2008	35	0.91 (0.05)	0.88 (0.06)	0	NA	NA	0	NA	NA	35	0.914 (0.05)	0.88 (0.06)
2009	32	0.97 (0.03)	0.97 (0.03)	0	NA	NA	0	NA	NA	32	0.969 (0.031	0.97 (0.03)
2010	106	0.97 (0.02)	1.00 (0.00)	174	0.94 (0.02)	0.99 (0.01)	0	NA	NA	280	0.954 (0.013	1.00 (0.00)
2011	92	0.92 (0.03)	0.89 (0.03)	116	0.81 (0.04)	0.98 (0.02)	0	NA	NA	208	0.865 (0.02)	0.93 (0.02)
2012	87	0.95 (0.02)	0.88 (0.04)	111	0.94 (0.02)	0.95 (0.02)	0	NA	NA	198	0.948 (0.02)	0.92 (0.02)
2013	52	0.91 (0.04)	0.91 (0.04)	7	1.00 (0.00)	1.00 (0.00)	12	0.92 (0.08)	0.91 (0.09)	71	0.917 (0.03)	0.92 (0.03)
2014	130	0.97 (0.03)	0.36 (0.04)	0	NA	NA	65	0.88 (0.04)	0.30 (0.06)	195	0.943 (0.03)	0.34 (0.04)
2015	73	0.86 (0.04)	0.91 (0.04)	0	NA	NA	48	0.88 (0.05)	0.93 (0.04)	121	0.868 (0.03)	0.91 (0.03)
2016	26	0.92 (0.05)	1.00 (0.00)	31	1.00 (0.00)	1.00 (0.00)	58	0.93 (0.03)	0.98 (0.02)	115	0.948 (0.02)	0.99 (0.01)
2017	11	1.00 (0.00)	0.82 (0.12)	34	0.88 (0.06)	0.93 (0.05)	49	0.98 (0.02)	0.96 (0.03)	94	0.948 (0.02)	0.93 (0.03)
2018	33	0.95 (0.04)	0.73 (0.08)	6	0.83 (0.15)	0.60 (0.22)	44	0.93 (0.04)	0.73 (0.07)	83	0.932 (0.03)	0.72 (0.05)
2019	17	1.00 (0.00)	0.94 (0.06)	1	1.00 (0.00)	1.00 (0.00)	20	0.95 (0.05)	1.00 (0.00)	38	0.974 (0.03)	0.97 (0.03)
2008–2019 Pooled	**694**	**0.936 (0.010)**	**0.81 (0.02)**	**480**	**0.911 (0.013)**	**0.97 (0.01)**	**296**	**0.922 (0.016)**	**0.78 (0.03)**	**1470**	**0.928 (0.007)**	**0.85 (0.01)**
All Release Locations and Years (2008–2019) Weighted Average											**0.928**	

Confirmation by PNNL

1. **The DART Conversation tool captured 95-100% of available tags.**
2. **CJS modeling to Rock Island increased sample size (Wenatchee Basin) and generated results within 1% of DART estimate.**
3. **Estimates are a minimum estimate of survival.**

Results of Combined Survival

1. **Project Survival for Juvenile × Adult > 82.81%**
2. **NNI is being achieved for all NNI species.**

Table 9. Priest Rapids Project combined juvenile and adult Project-level survival estimated using the Grant PUD and Cormack-Jolly-Seber (CJS) model conversion rate methods.

Species/ Run	Juvenile Survival	Grant PUD Conversion Rate Method			CJS Model Conversion Rate Method		
		Conversion Rate	Combined Project Survival	Difference from Combined Standard	Conversion Rate	Combined Project Survival	Difference from Combined Standard
Spring Chinook	0.866	0.993	0.860	+0.032	0.984	0.852	+0.024
Sockeye Salmon	0.917	0.919	0.842	+0.014	0.928	0.851	+0.023
Summer Chinook	0.834	0.997	0.832	+0.004	0.998	0.832	+0.004
Steelhead	0.870	0.981	0.853	+0.025	0.987	0.859	+0.031

Follow Up Materials

1. **Grant PUD report with DART analysis and results.**
2. **Memo from Columbia Basin Research (R. Buchanan) on analysis and methods.**
3. **Report from PNNL (R. Harnish) repeating DART analysis, additional CJS analysis, and results.**