PRCC Habitat Subcommittee

Conference Call

Thursday, 12 December 2024
10:00 a.m. – 2:00 p.m.

Meeting Minutes

PRCC Habitat Subcommittee Members

Kate Terrell, Shelby Fowler (alt), USFWS	Chris Fisher, CTCR
Dave Duvall, Deanne Pavlik-Kunkel (alt), GPUD	Brandon Rogers, Hans Smith (alt), YN
Justin Yeager, NMFS	Carl Merkle, CTUIR
Jeremy Cram, Cody Gillin (alt), WDFW	Erin Harris, GPUD
Nathan and Clayton Buck, Wanapum	Tracy Hillman, BioAnalysts, Chair

Meeting Attendees

Kate Terrell, USFWS	Dave Duvall, GPUD
Jeremy Cram, WDFW	Justin Yeager, NMFS
Brandon Rogers, YN	Chris Fisher, CTCR
Deanne Pavlik-Kunkel, GPUD	Cody Gillin, WDFW
Shelby Fowler, USFWS	Erin Harris, GPUD
Tracy Hillman, BioAnalysts	Catherine Willard, CPUD*
Tom Kahler, DPUD*	Carlos Polivka (USFS)*
Keith van den Broek (Hinchinbrook)*	Stine Griep (Hinchinbrook)*
Conor Leahy (Hinchinbrook)*	Sarah Schwarz (Hinchinbrook)*

* Guests who joined for the joint PRCC Habitat Subcommittee and HCP Tributary Committee agenda items.

Action Items:

- Tracy Hillman will inform the Methow Salmon Recovery Foundation that the PRCC HabSC does not support selling Lot #2 of the Robertson property but recommends that the sponsor submit a specification sheet requesting funds to support public access, outreach and engagement, and property maintenance and stewardship on each of the Sugar Reach properties acquired with assistance from the PRCC HabSC.

- Dave Duvall will reach out to potential appraisers to see whether they are interested in working on appraisals for the PRCC HabSC. He will also see whether representatives from the appraisal companies are available to meet with the PRCC HabSC during the January meeting.

Decision Items[1]:

- The PRCC HabSC did not support selling Lot #2 of the Robertson property but recommends that the Methow Salmon Recovery Foundation submit a specification sheet requesting funds to support public access, outreach and engagement, and property maintenance and stewardship on each of the Sugar Reach properties acquired with assistance from the PRCC HabSC.

I. Welcome and Introductions

Tracy Hillman welcomed everyone to the meeting and participants introduced themselves.

Tracy noted that the PRCC Habitat Subcommittee (PRCC HabSC) and HCP Tributary Committees will meet jointly for the Floodplain Monitoring Presentation and the Icicle Creek PIT-tag Array discussion. Following that discussion, the PRCC HabSC will take a short lunch break and reconvene to discuss PRCC HabSC items.

II. Floodplain Monitoring Presentation (with the HCPs Tributary Committees)

Carlos Polivka (U.S. Forest Service) and Hinchinbrook (Keith van den Broek, Stine Griep, Conor Leahy, and Sarah Schwarz) joined the meeting to discuss results from their floodplain monitoring work. Carlos gave a presentation titled "Floodplain Restoration: Monitoring Fish Responses at Site, Reach, and Population Scale" (see Attachment 1). Carlos noted that this was the second year of floodplain monitoring. He identified the objectives of the study, which were to (1) assess habitat use by juvenile Chinook Salmon on floodplains and identify associations between habitat use and floodplain structure, (2) compare juvenile Chinook Salmon abundance, movement, capacity, growth, and survival on seasonally connected floodplains and perennially connected floodplains, and (3) evaluate the extent of fish stranding/entrapment on natural and restored floodplains. He described the sites they monitored within the Entiat, Wenatchee, and Methow basins and the methods used to evaluate the objectives.

Carlos indicated that they used zero-inflation generalized linear mixed models (GLMM) to evaluate habitat use by juvenile Chinook Salmon on floodplains. Consistent with results from the first year of monitoring, juvenile Chinook Salmon selected shallow, low velocity areas on the floodplains. The habitat quality index was correlated with fish abundance in 2023 but not in 2024. They would like to better understand how important it is to enhance floodplains with small-scale habitat features.

Carlos noted that they used Cormack-Jolly-Seber and Jolly-Seber models to assess juvenile Chinook Salmon abundance and survival on floodplains. The highest numbers of fish were found on floodplains in the Entiat River basin. Numbers declined the most over time (May-July) in seasonally connected floodplains; numbers in perennially connected floodplains were relatively stable over time. Increasing water temperatures may be the reason why juvenile densities decreased over time in the seasonally connected floodplains. Carlos noted that juvenile abundance in their monitoring sites was not strongly correlated with redd abundance near the monitoring sites. He also noted that fish survival was relatively high among river basins and was mostly constant.

[1] All decision items listed here were approved by PRCC HabSC members.

Ricker models were used to compare juvenile capacities among the river basins and between seasonally connected and perennially connected floodplains. Carlos stated that the Wenatchee basin had the highest juvenile capacities, while the Methow basin had the lowest. He added that they were able to estimate juvenile capacities for perennially connected floodplains but not for seasonally connected floodplains. This is because the seasonally connected floodplains were too variable to fit the model and fish moved out of these sites making it difficult to estimate capacity.

Mark-recapture methods were used to estimate the movement of juvenile Chinook Salmon and steelhead within the floodplain monitoring sites. Carlos stated that they found both high site fidelity and low site fidelity within their sampling sites. In addition, residence times for juvenile Chinook Salmon and steelhead were much greater in perennially connected floodplains than within seasonally connected floodplains. Fish within seasonally connected floodplains resided within them less than 40 days, while fish in perennially connected floodplains resided within them up to about 150 days.

Fish growth was evaluated using mechanistic growth models and GLMM. Carlos said they found that growth rates in reaches within river basins were more homogeneous than among river basins. Growth rates in the Methow basin, which has the lowest juvenile capacity, were significantly greater than within the other basins. He noted that there were also differences in growth rates among the floodplain sites and in some cases growth rates were higher in seasonally connected floodplains than in perennially connected floodplains.

Carlos then described their stranding and entrapment results. He said they found stranded juvenile Chinook Salmon, steelhead, Coho Salmon, unknown salmonids, dace, whitefish, and sculpin within floodplain sites. In total, they found 110 stranded juvenile Chinook Salmon, 6 stranded steelhead, and 26 stranded Coho Salmon. There were an additional 38 stranded salmonids that could not be identified. Carlos noted that less than 1% of the juvenile Chinook Salmon were stranded. He opined that as water temperatures increased, juvenile salmonids responded by leaving the sites before stranding occurred. Stranding occurred within deeper pools with small temperature fluctuations, pools with a low flow outlet, or outlets that led to other disconnected pools (dead ends). Carlos added that stranding pools sometimes reconnected following heavy rain events.

Carlos concluded his presentation by noting that their newly established methods improved results, but they may not have addressed spatial and temporal variability across the basins sufficiently to make inferences at the reach scale. In addition, he questions (1) whether residence time in restored floodplains lead to improved growth and a life-history shift, (2) whether they can make inferences at the reach scale based on habitat-scale correlations, and (3) whether it is possible to make inferences at the reach scale based on capacity estimates at the habitat scale. He thought life-cycle models may be able to address the last point. As a final point, he noted that a lot of juvenile Coho Salmon use the floodplain habitat and questioned whether they compete with juvenile Chinook Salmon in those sites. They also noted beaver activity within some sites and questions whether beavers positively or negatively affect juvenile salmonids in those sites.

Members had no questions for Carlos following the presentation. Carlos indicated that they would submit their draft report and a proposal seeking funding for the third year of monitoring to the Committees in early January 2025. Carlos added that some of the monitoring work (e.g., mainstem work, movement and site fidelity, and overwintering) is ongoing, and they can provide an addendum describing results from this work in April or May. Tracy Hillman noted that Tributary Committees have exhausted their assessment funds; however, the PRCC Habitat Subcommittee has unallocated monitoring and assessment funds. Tracy added that it appears Carlos and his team have done a good job of addressing the Committees' primary questions. Members thanked Carlos and his team for the presentation and discussion.

III. Icicle Creek Boulder Field Lower PIT-Tag Array (with the HCPs Tributary Committees)

Chris Fisher reported that Trout Unlimited recently brought to his attention an issue with one of the three PIT-tag arrays in Icicle Creek. Apparently, one of the arrays (the one just downstream from the boulder field) is damaged or inoperable. Chris asked whether the Committees or PRCC HabSC would be interested in receiving a proposal to fix or replace the array. He added that this array is needed to monitor fish passage at the boulder field. After checking PTAGIS, Catherine Willard noted that all three arrays in Icicle Creek are operational, but the upper most array is currently inactive. Jeremy Cram indicated that the downstream array near the boulder field has been replaced or fixed and is operational. He added that all of them are supplied with service lines; therefore, all arrays should be operating. He is unsure why the upper-most array is inactive.

IV. Lunch Break

V. Agenda Review

The PRCC HabSC reviewed and approved the December agenda with the addition of an update on the Equesis Dam Decommissioning Project (this project was funded by the HCP Tributary Committees but is of interest to the PRCC HabSC).

VI. October Meeting Notes

PRCC HabSC members reviewed and approved the 10 October 2024 meeting notes on 1 November 2024.

VII. Review Action Items

The PRCC HabSC reviewed the following action items from the October meeting:

- Tracy Hillman will share the updated Specification Sheet with project sponsors. **Complete.**
- Dave Duvall will do some research on whether American West Ag Appraisals could potentially serve as an alternate appraiser and reviewer. **Complete. See discussion under Section VII.**

VIII. Project Updates

Members of the PRCC HabSC provided the following updates on funded projects:

- **Alternate Primary Appraiser** – Dave Duvall reported that this item will be discussed later during the meeting (see Section XI).
- **ORRI VDS Backwatering Project** – Chris Fisher reported that the Okanagan Nation Alliance (ONA) is currently implementing this project.
- **Lower Wenatchee Instream Flow Enhancement Project, Phase II Project** – Kate Terrell reported that the Army Core of Engineers took five months to determine that a 404 Permit was not required. Because of this delay, the sponsor (Trout Unlimited; TU) decided to push most of the work to fall 2025. The sponsor has purchased most of the materials for the project (see photo below). The sponsor is hoping to install a portion of the project after the snowmelt but before the irrigation season.

- **Cascade Orchards Icicle Creek (COIC) Flow Restoration Project** – Justin Yeager reported that Chelan County Natural Resources Department (CCNRD) has completed all below-groundwork on the pump station as well as the in-water work (screen and intake). Work over the winter will focus on the pumphouse building. The delivery pipeline work is currently on hold over winter. The sponsor was able to install the pipeline in the main canal and all but one lateral line (East Leavenworth Road). During spring 2025, they plan to complete the East Leavenworth Road lateral line, finish backfill on the canal, and install all service connections. Work is scheduled to be completed by 1 May 2025.
- **Okanagan Lake Dam East Salmon Passage Project** – Dave Duvall said that ONA is prepping the site for construction, which is scheduled to begin in January or February 2025.
- **Peshastin Creek RM 2.5 Project** – Kate Terrell indicated that Cascade Fisheries (CF) continues to work on permitting. The Conditional Letter of Map Revision (CLOMR) application was submitted to the Federal Emergency Management Agency (FEMA) for review. They expect a response by the end of January 2025. They also prepared and submitted a memo to the USACE, NOAA, USFWS, and WDWF describing their request for an extension to the in-water work window. In addition, in November, the sponsor submitted an application through the BPA Programmatic Program. They are asking for $450,000, which is the projected shortfall for implementation.
- **Bockoven Entiat and Stormy Acquisition Projects** – Kate Terrell reported that the landowner is on pause while they seek a buyer for their home (the Stormy Lodge on 17 acres on river right). The landowner is concerned that a potential buyer may want to purchase either or both properties for hiking or horseback riding. The landowner does not feel an urgency to sell the properties at this time.
- **Canyon Creek Culvert Design and Construction Project** – Kate Terrell indicated that Cascade Fisheries finished the 30% design and shared it with the U.S. Forest Service. This iteration included concepts for both an 18-foot-span arch culvert and an 80-foot-span bridge. The Forest Service will review the concepts and select a preferred alternative.
- **Eagle Rocks Habitat Enhancement Project** – Kate Terrell said the sponsor (Methow Salmon Recovery Foundation; MSRF) completed fall planting and site restoration work and restored the access routes. Work to be completed in Spring 2025 includes monitoring and maintenance of plantings, additional repair to the access routes, and incorporating beaver-dam-analog-style posts into the upper bench planting areas.

- **Kedrowski Acquisition Project** – Kate Terrell indicated that the sponsor (MSRF) is waiting for the completion of the appraisal.
- **Shuttleworth Creek Diversion Removal Project** – Dave Duvall shared that the final Shuttleworth Creek Point of Diversion Removal Construction Report (2024) was received, and the report was sent to members by Tracy Hillman on Monday, 9 December 2024. This project can be closed.
- **Bartsch Acquisition – Lower Twisp River – Reach 2A Project** – Kate Terrell said the appraisal was initiated by Pacific Appraisal Associates and the sponsor (MSRF) is waiting for the final document.
- **Skyline Screen and Fish Return Project** – Kate Terrell said this project is under construction. The sponsor (MSRF) completed installation of the vault, excavated the lower 650-foot trench, installed and backfilled the 30-inch HDPE pipe, installed the recon block wall, backfilled the new screen site, graded the access road for truck access, excavated the ditch that will supply electricity to the screen site, excavated the headwall sluice infrastructure, and seeded the access and staging areas with native trees, shrubs, and grasses. They still need to install the headwall and final sluice pipe, install the chain link fence above the tall wall at the screen site, demobilize, and install the concrete ring and lid on the vault. MSRF provided the following photos.

Step pools and vault location

Fish screen site

Macpherson side channel supply, irrigation pipe buried and ballasted under creek.

Chris Fisher reported that he recently spoke with ONA about the Equesis Dam Decommission Project (this project was funded by the HCP Tributary Committees). He said the dam has been removed and the riffles were added to the channel. He said that Sockeye Salmon are spawning in the stream. This project reconnected 21 km of stream for Sockeye Salmon.

IX. Restoration/Protection Projects

Robinson Resale Proposal

Kate Terrell introduced the Robinson Resale Proposal from MSRF. She said the sponsor is requesting approval to sell a portion of the Robinson property, which was purchased with funding from the PRCC HabSC over 10-years ago. The sponsor would like to initiate a plat alteration to reduce the total number of development lots, sell Lot #2 (5-acre lot), and invest the proceeds from the sale into a dedicated fund to manage properties within the Sugar Reach acquired with assistance from PRCC HabSC funding.

After review and discussion, the PRCC HabSC concluded that the property should remain an “open” space and therefore they did not support selling Lot #2. However, they do believe it is important to manage the Sugar Reach properties, and therefore they recommend that the sponsor submit a specification sheet requesting funds to establish a stewardship account. If approved, funds from this account would be used to support public access, outreach and engagement, and property maintenance and stewardship on each of the Sugar Reach properties acquired with assistance from the PRCC HabSC. The PRCC HabSC directed Tracy Hillman to share this information with the sponsor.

X. Monitoring Projects

Update on the Wenatchee River PIT-tag Barge

Jeremy Cram provided a brief update on the Wenatchee PIT-tag barge. He noted that it is performing well, successfully remaining in place, and actively collecting data. The barge will be temporarily relocated when ice forms in the river and during construction of the Wenatchee River bridge.

XI. Administration and Information Updates

PRCC Habitat Subcommittee Third Quarter 2024 Expenditures and Unencumbered Balances – Tracy Hillman shared the following financial information with the HabSC:

Habitat Fund	Expenditures through 30 September 2024	Unencumbered Balance
601	892,981.46	5,766,503
602	814,329.50	10,122,341
603	1,117,759.65	2,271,830
Total	***2,825,070.61***	***18,160,674***

Identify Alternate Appraisers and Reviewers

Tracy Hillman indicated that last month the PRCC HabSC discussed the need for alternate appraisers and reviewers. The PRCC HabSC currently uses Pacific Appraisal Associates as their primary appraiser. The PRCC HabSC does not have review or alternate appraisers under contract. Last month, Dave Duvall was asked to do some research on American West Ag Appraisals.

Dave said he spoke with Grant PUD staff and obtained a list of their approved appraisers. In addition to Pacific Appraisal Associates, Grant PUD uses American West Ag Appraisals, Associate Appraisers of Walla Walla, and Agri/Com Appraisals. Members agreed to further research American West Ag Appraisals and Agri/Com Appraisals. Members did not support using Associate Appraisers of Walla Walla because of their distance from potential acquisition projects. Dave will reach out to American West Ag Appraisals and Agri/Com Appraisals to see if they would be interested in working with the PRCC HabSC. If they are interested, Dave will invite representatives to a future PRCC HabSC meeting.

WDFW Representation on the PRCC HabSC

Jeremy Cram reported that WDFW has identified Cody Gillin as WDFW's alternate on the PRCC HabSC (see Attachment 2). Cody introduced himself to the Committees and provided a synopsis on his background. Members welcomed Cody to the PRCC HabSC.

XII. Adjourn

Tracy Hillman adjourned the meeting at 2:00 pm.

XIII. Next Meeting

The next meeting of the PRCC HabSC will be on 9 January 2024.

Attachment 1

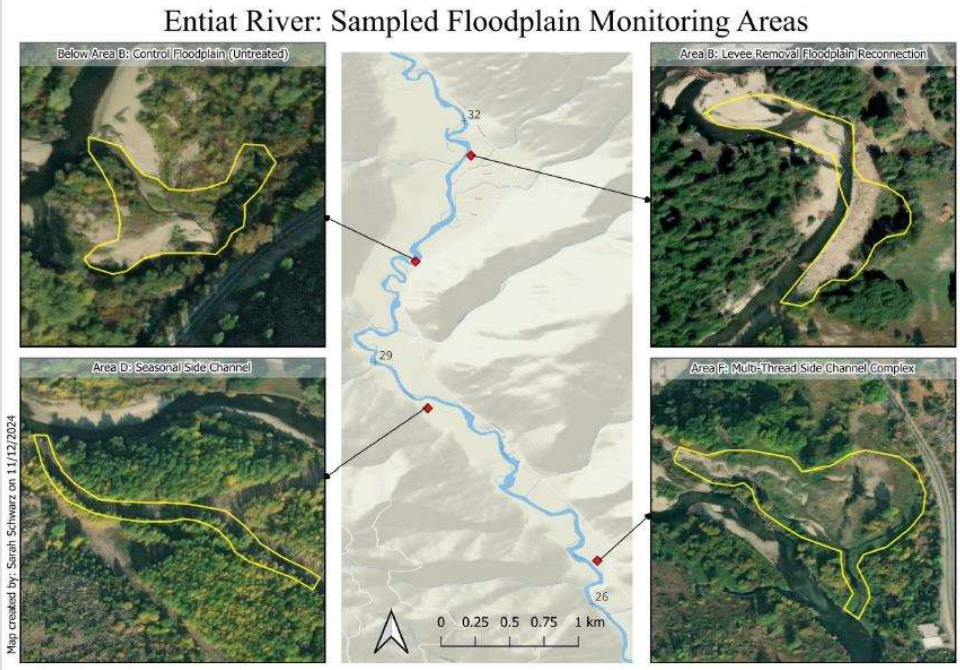
Presentation by U.S. Forest Service on the Floodplain Restoration Monitoring Project

Objectives

1. What patterns of habitat use do Chinook salmon show on floodplains in general, and do habitat associations depend on floodplain identity (and structure)?
2. Floodplain structure: Do seasonally/partially connected floodplains show different abundance, movement, capacity, growth, and survival of fish compared with perennially connected floodplains?
3. To what extent do stranding/entrapment pools form on natural and restored floodplains? What fraction of the fish on the floodplains become stranded? Do pools ended up dewatering, how many became entrapments, and how many remained connected?

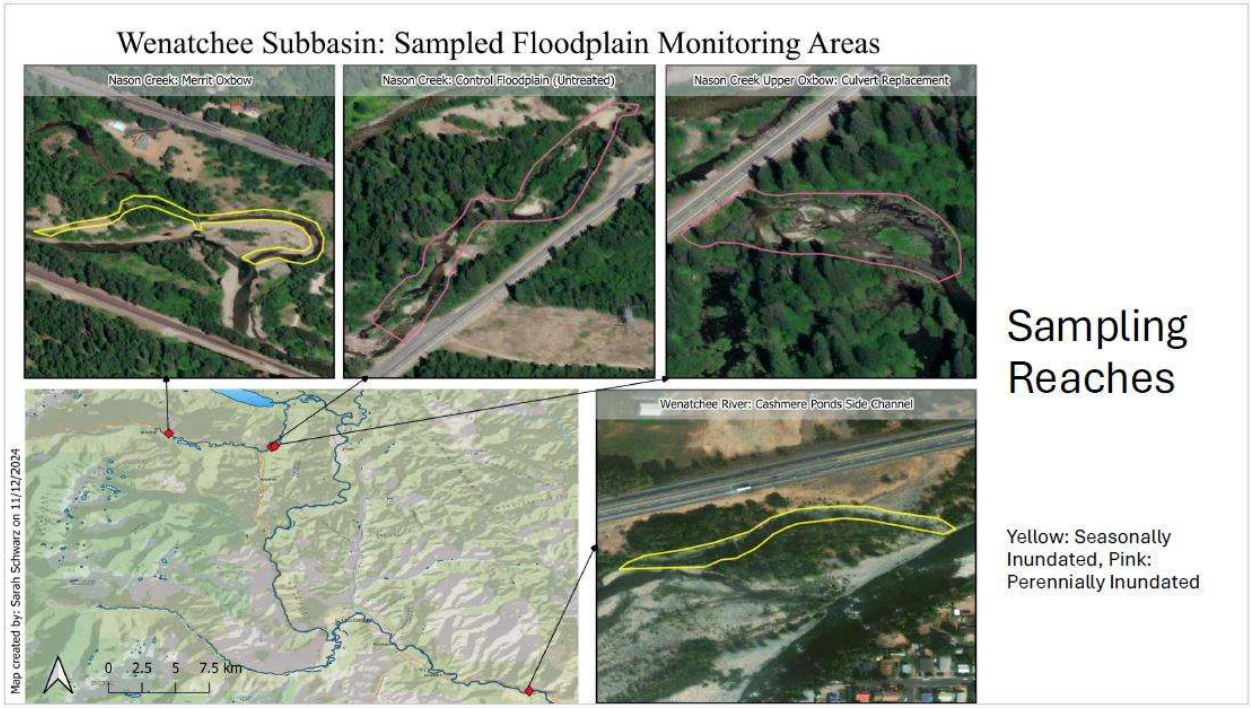
Floodplain Structure

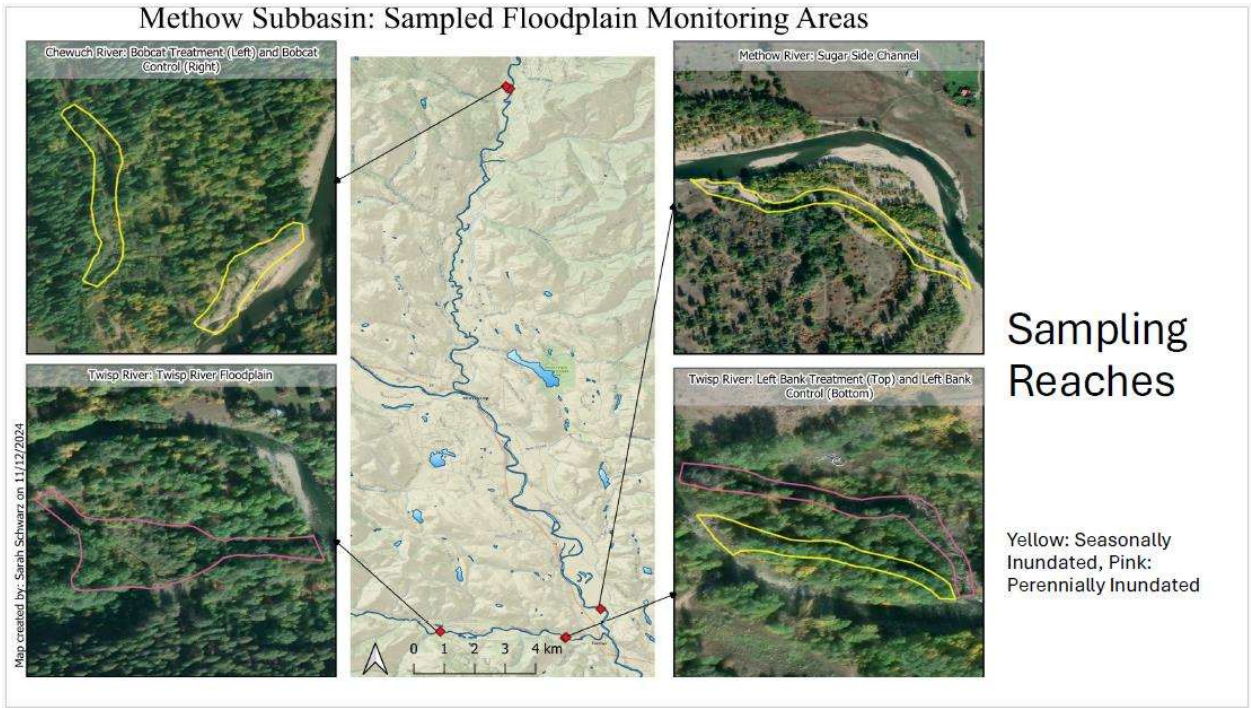
- All studied reaches in the Entiat subbasin were seasonal floodplains
- Perennial floodplains were present in the other subbasins but were not consistently distributed across treatment type (restored vs. unrestored).
- Accessibility and stakeholder interest drove reach selection



Sampling Reaches

Yellow: Seasonally Inundated, Pink: Perennially Inundated


Wenatchee Subbasin: Sampled Floodplain Monitoring Areas
Nason Creek: Merrit Oxbow
Nason Creek: Control Floodplain (Untreated)
Nason Creek Upper Oxbow: Culvert Replacement
Wenatchee River: Cashmere Ponds Side Channel
Map created by: Sarah Schwarz on 11/12/2024
0 2.5 5 7.5 km
Sampling Reaches
Yellow: Seasonally Inundated, Pink: Perennially Inundated


Methow Subbasin: Sampled Floodplain Monitoring Areas
Chewuch River: Bobcat Treatment (Left) and Bobcat Control (Right)
Methow River: Sugar Side Channel
Twisp River: Twisp River Floodplain
Twisp River: Left Bank Treatment (Top) and Left Bank Control (Bottom)
Map created by: Sarah Schwarz on 11/12/2024
0 1 2 3 4 km
Sampling Reaches
Yellow: Seasonally Inundated, Pink: Perennially Inundated

Habitat Use – Descriptive data

GLMM: Zero-Inflation Model because of high number of replicates with zero fish

Number Fish ~ offset(log(Area)) + Temperature + Flow + Depth + Habitat Type + Substrate + Reach + Basin + Inundation Timing + Design

Best model identified using Leave One Out Cross Validation

Habitat Quality Index based on Shannon Diversity Index and GLMM results

GLMModel Results – reaches and subbasins combined

Consistent with last year's result	Fry		Parr	
	Estimate	Pr(>|z|)	Estimate	Pr(>|z|)
Intercept	2.2372	0.836	-9.4565	0.002**
Depth	19.7423	0.000***	6.9128	0.007**
Flow	-7.8691	0.404	-9.9323	0.024*
Temperature	-0.8991	0.050 .	0.4408	0.025*
Gravel	-9.8924	0.031*		
Sand	-2.3631	0.547		
Silt	-2.6482	0.557		
NLJ	9.0695	0.040*	5.6139	0.000***
Open Area	9.9758	0.009**	1.5382	0.429
Riffle	7.4380	0.308	8.5462	0.021*
Vegetation	0.2205	0.953	1.7212	0.269
Nason Control (Reach)	16.7618	0.091.		
Wenatchee (Basin)			4.640	0.001**

Habitat Quality Index

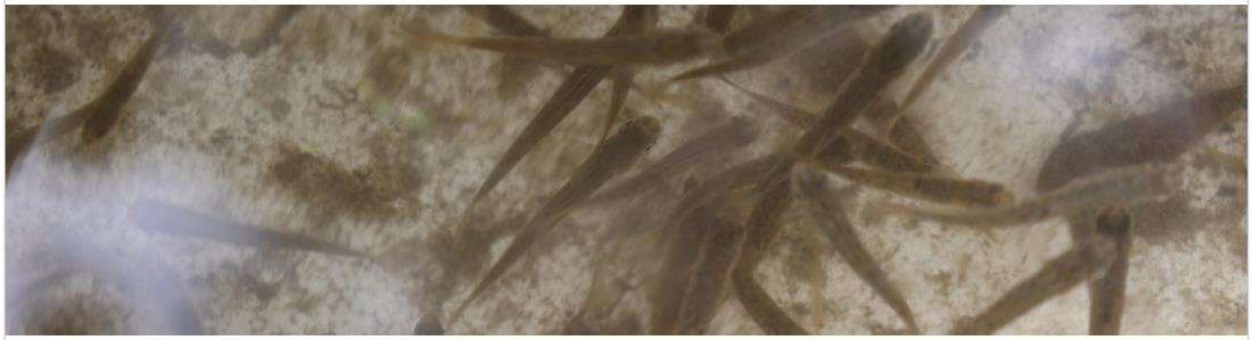
Floodplain Reach	HQI Fry	HQI Parr	HQI	Population
		Methow		
Bobcat	4.39	2.96	6.97	-
Bobcat Control	7.37	4.98	12.7	2244
Sugar	5.50	4.29	10.1	4893
TRFP	6.42	4.79	11.4	177
Left Bank Control	7.33	2.78	9.68	-
Left Bank	4.26	3.74	8.16	1955
		Entiat		
Stormy B	5.27	3.82	9.07	7628
Entiat Control	5.60	4.62	10.7	-
Gray D	4.33	1.09	4.28	-
Gray F	4.55	2.57	6.47	13350
		Wenatchee		
Merritt Oxbow	5.83	2.59	7.78	8399
Nason Control	5.71	4.35	10.6	3070
Upper Oxbow	5.91	3.85	9.67	6551
Cashmere Ponds	4.51	2.73	6.72	-

Summary

Physical habitat characteristics consistent among years – habitat within floodplains is important

HQI correlated with abundance in 2023, but not 2024

Remaining question: How important is it to enhance restored floodplains with small-scale habitat features (i.e., can habitat scale associations lead to reach scale benefits)?



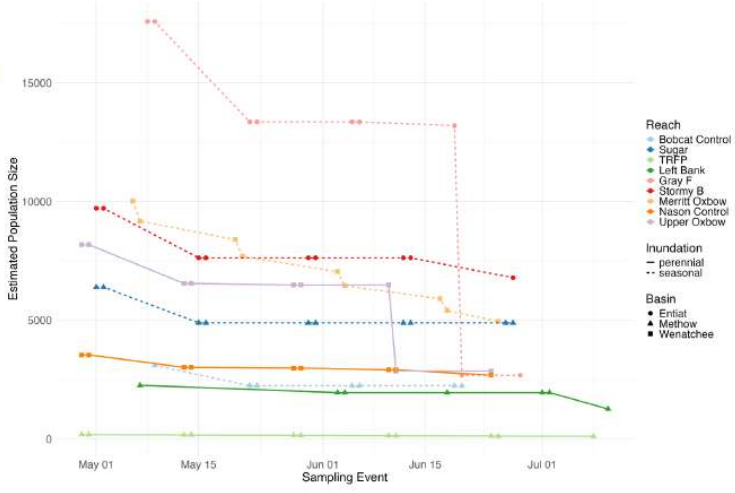
Abundance & Survival

- Cormack-Jolly-Seber and Jolly-Seber models with the Schwarz-Anason POPAN formulation
- Comparisons of river basins on the reach scale

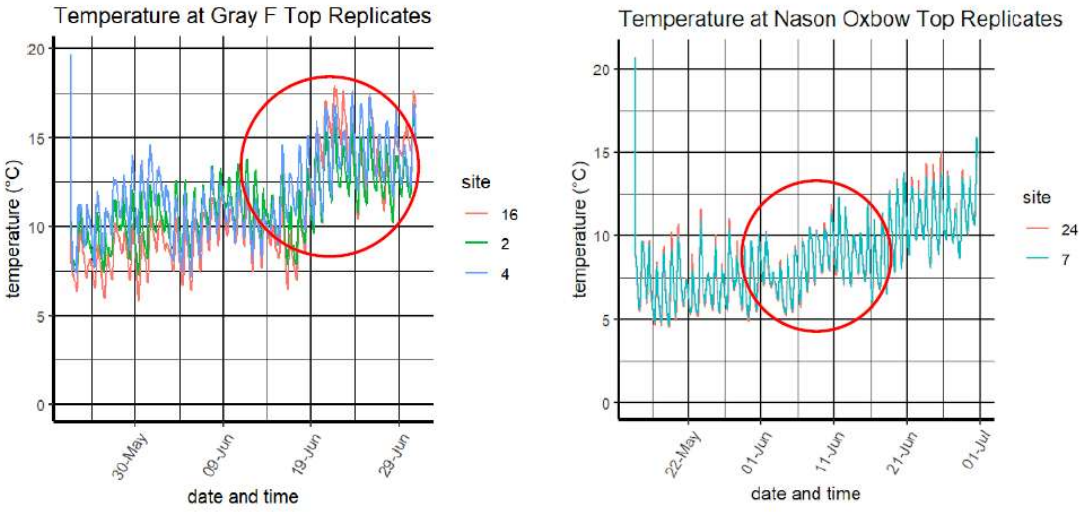
Population Size Estimates over Time

- Largest population of juvenile Chinook Salmon in the Entiat.
- Seasonally connected floodplains:
  - Bobcat*, Bobcat Control, Sugar
  - Stormy B, Entiat Control*, Gray D*, Gray F
  - Cashmere Ponds*

** No estimates because of low sample sizes or recapture rates*



Temperature reason for migration?



Chinook Redd Count Data

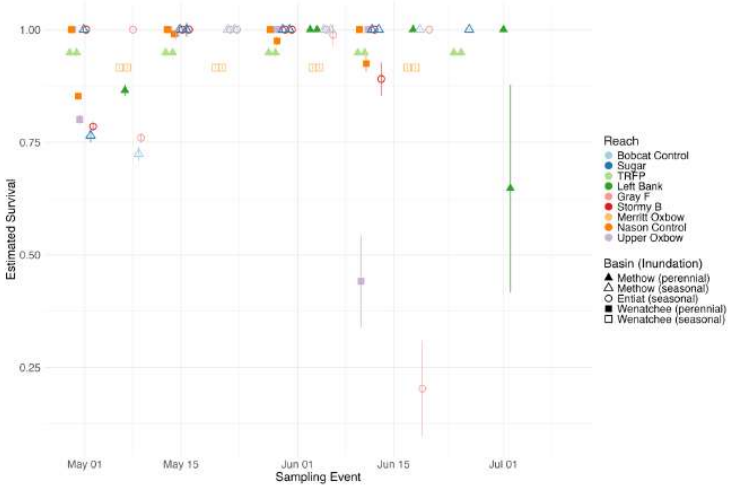
Floodplain Reach	Summer Run	Spring Run	Population*	Notes
	Methow (Summer: 1170, Spring: 44)			
Bobcat	unknown	unknown	-	no data for Chewuch River
Bobcat Control	unknown	unknown	2244	no data for Chewuch River
Sugar	22	0	4893	upstream and downstream of channel
TRFP	0	2	177	upstream and downstream of channel
Left Bank Control	0	0	-	
Left Bank	0	0	1955	
	Entiat (*Summer: 158, Spring: 84*)			
Stormy B	4	1	7628	most spring redds upstream
Entiat Control	2	0	-	some redds upstream
Gray D	6	3	-	small entry channel to floodplain
Gray F	>50	0	13350	
	Wenatchee (*Spring Nason: 269, Spring Wenatchee: 950*)			
Merritt Oxbow	0	>10	8399	
Nason Control	0	4	3070	floodplain not sampled for redds
Upper Oxbow	0	0	6551	floodplain not sampled for redds
Cashmere Ponds	unknown	0	-	no data for summer run

* Population size estimate from third sampling event because method tends to overestimate during the first events

Survival Estimates over Time

- Survival comparably high between river basins and mostly constant.
- Seasonally connected floodplains:
  - Bobcat*, Bobcat Control, Sugar
  - Stormy B, Entiat Control*, Gray D*, Gray F
  - Cashmere Ponds*

** No estimates because of low sample sizes or recapture rates*



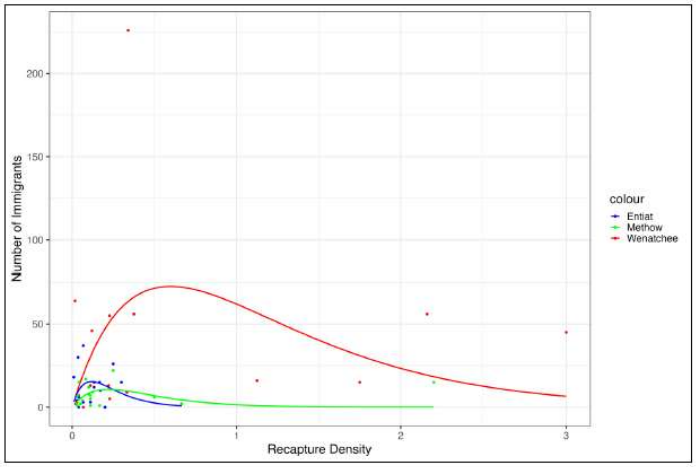
Capacity

Ricker models to compare capacity differences on the habitat scale between

- River basins
- Seasonal connected and perennial inundated floodplains

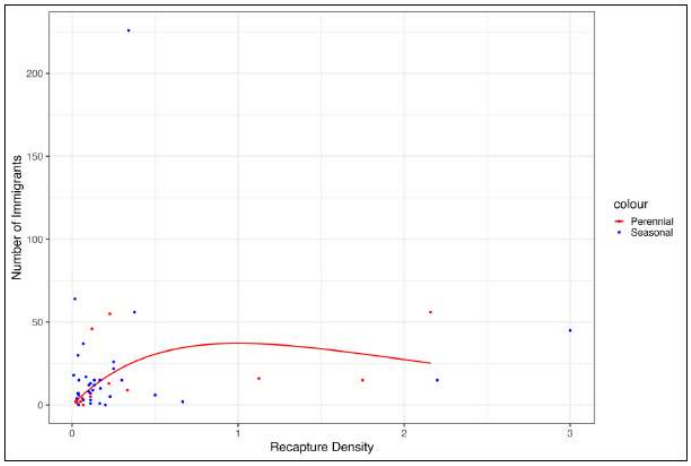
Capacity of River Basins

- Habitats at sites in the Wenatchee subbasin have highest capacity
- Methow subbasin has lowest habitat scale capacity
- Wenatchee capacity possibly driven by high overall density in Nason Creek



Capacity of Seasonal / Perennial Floodplains

- Perennially inundated floodplains have measurable capacity
- Seasonal floodplains are too variable to fit a curve with significant capacity
- Possibly due to movement out of seasonal floodplains (see movement, next section)



Movement

Floodplains (mark/recapture)

Nason Upper Oxbow and Entiat Stormy B (mark/recapture & array)

Within-reach, among-habitat movement and habitat-scale fidelity

Bobcat (Methow-Chewuch)

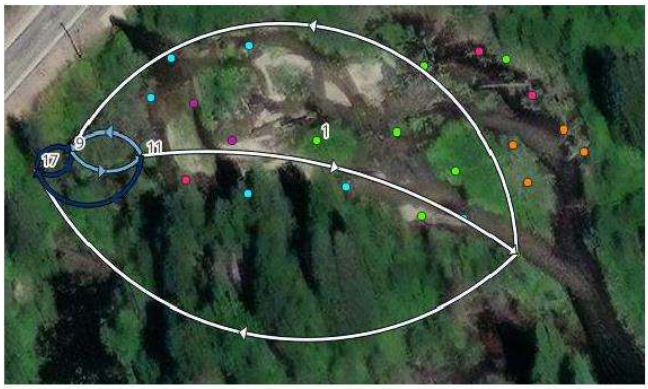
F = 0.037 (sd = 0.052)

Gray F (Entiat)

F = 0.018 (sd = 0.039)

Within-reach, among-habitat movement and habitat-scale fidelity

Nason Oxbow (Nason – Wenatchee)



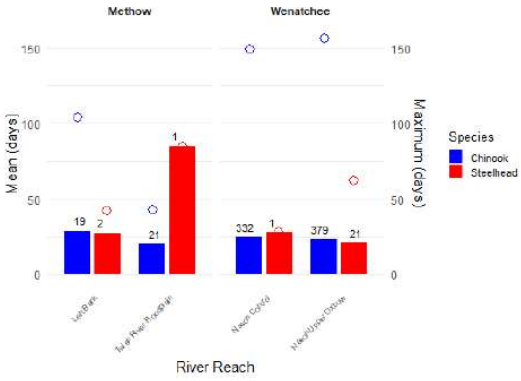
F = 0.028 (sd = 0.038)

Nason Control (Nason – Wenatchee)

F = 0.078 (sd = 0.219)

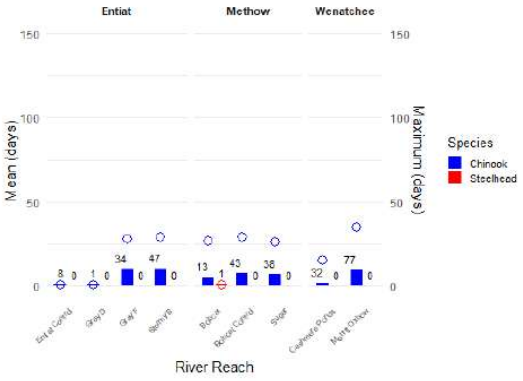
Residence Times

Mean and Maximum Residence Time (Perennial Reaches)

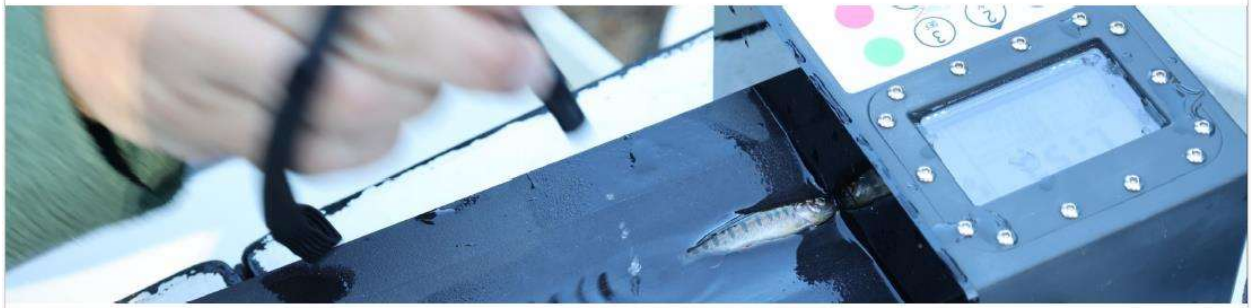


Sample time: 6.5 months
4/29/24 to present

Mean and Maximum Residence Time (Seasonal Reaches)



Sample time: 2.5 months
4/29/24 to 7/11/24



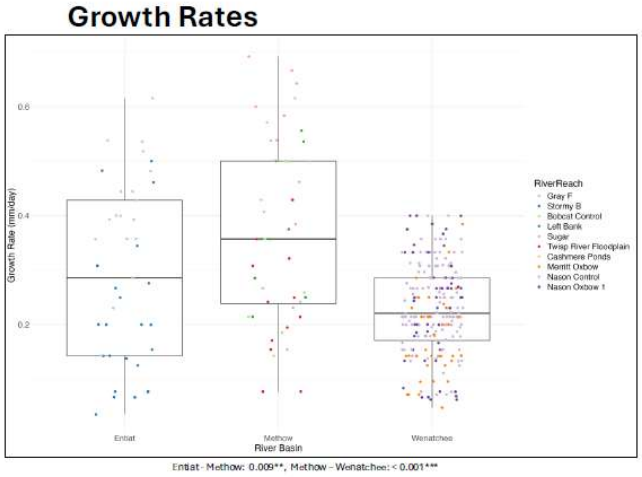
Growth

- Generalized Linear Mixed Models (GLMM) – Differences between River Basins and River Reaches
- Mechanistic Growth Models – Differences within Nason Creek
- Ongoing longer term growth in perennially inundated floodplains and Stormy B (Entiat)

Differences between River Basins

- Best GLMM (AIC) includes:
  - Log Growth Rate ~ Initial Fork Length + River Reach (fixed) + River Basin (random)

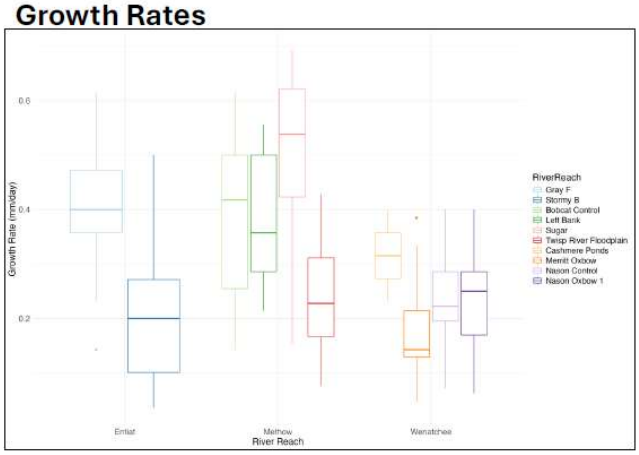
- Growth rates in reaches within river basins are more homogeneous than among river basins.
- Growth rates in the Methow subbasin are significantly higher than in the Entiat and Wenatchee subbasin.



Differences between River Reaches

- Methow:
  - Sugar (S) > TRFP (P): $p < 0.001$
  - Bobcat Control (S) >TRFP (P): $p = 0.04$
- Entiat:
  - Gray F (S) > Stormy B (S): $p < 0.001$
- Wenatchee:
  - Nason Control (P) > Merritt Oxbow (S): < 0.001

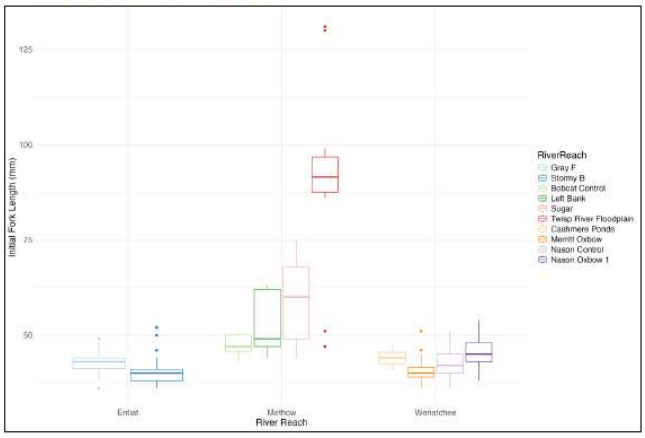
Growth Rates



Differences between River Reaches

- Methow:
  - Parr / yearlings at TRFP and Sugar
  - Fry at Bobcat Control and Left Bank were larger when marked compared to other river basins
- Entiat and Wenatchee:
  - Mainly fry at all river reaches with comparable sizes within and between river basins during marking

Initial Fork Length

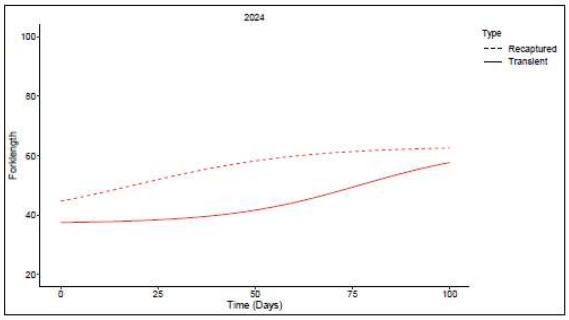


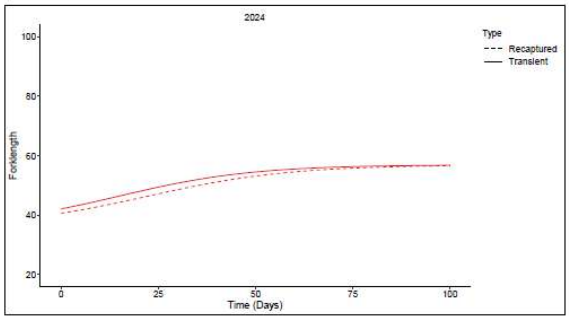
Differences within Nason Creek

Growth model (Polivka et al., 2020)

Nason Control: Recaptured individuals have higher growth than transient individuals.

Merritt Oxbow & Upper Oxbow (graph): No difference between recaptured and transient individuals.





Stranding and Entrapment

Maps, numbers

Isolated Pools

- Number Salmonids stranded per species*:
  - Chinook - 110
  - Steelhead - 6
  - Coho - 26
  - Unidentified Salmonid – 38

** fish might have been counted more than once*

- Other species:
  - Dace - 1430
  - Whitefish - 1
  - Sculpin - 2
  - Unknown - 2

- Not all pools without fish listed
- Population size estimate from third sampling event because method tends to overestimate during the first events

	Number of Pools Containing Salmon	Number of Stranded Salmon	Percent Chinook Stranded
River Reach		Methow	
Bobcat	4	7	-
Bobcat Control	4	15	0.2
Sugar	0	0	0
TRFP	1	6	0
Left Bank	0	0	0
Left Bank Control	0	0	-
		Entiat	
Stormy B	4	72	0.8
Entiat Control	0	0	-
Gray D	1	12	-
Gray F	5	35	0.2
		Wenatchee	
Merritt Oxbow	0	0	0
Nason Control	1	1	0
Nason Oxbow 1	0	0	0
Cashmere Ponds	1	2	-

Isolated Pool Images

Bobcat Control (Chewuch – Methow)

Isolated Pool Hypotheses

- Rapidly increasing temperatures before pool disconnection cause salmon to follow the flow to leave the area to avoid stranding.

- Possible reasons for stranding/entrapment:
  a. Deep pools with smaller temperature fluctuations before disconnecting
  b. Pools with small, low flow outlet
  c. Outlets that lead into other disconnected pools (dead ends)
- Stranding pools sometimes reconnect e.g., heavy rain events

Conclusions & Open Questions

Newly established methods improved results but …

- some metrics are difficult to make inferences from habitat scale to reach scale (habitat correlations - HQI, capacity)
- Some are difficult to make inferences from reach scale to subbasin scale (growth, e.g., Methow)

➢Have we addressed spatial variability across the three sub-basins sufficiently to make inferences at the reach scale?

- High variability in the Methow – vast differences in fish abundance at some reaches (TRFP) from Year 1 to Year 2.
- Habitat Quality Index not consistent from year to year.

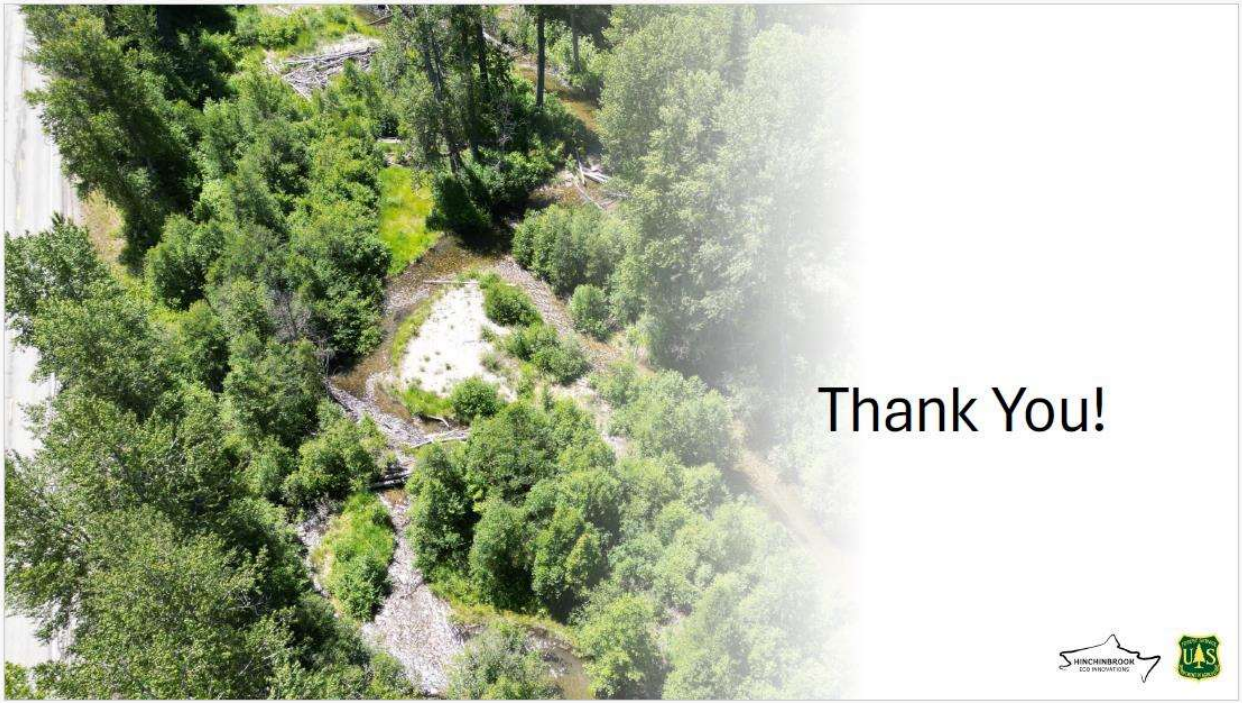
➢Have we addressed temporal variability across the three sub-basins sufficiently to make inferences at the reach scale?

Broader Scientific Questions

- Does residence time in restored floodplains lead to improved growth and a life history shift (toward later outmigration)?
- Is it possible to make inferences at the reach scale based on habitat scale correlations?
- Is it possible to make inferences at the reach scale based on capacity estimates at the habitat scale? -> Life cycle models?

New Interesting Questions Encountered Along The Way

- Pre-implementation opportunities (Nason-Hwy 207-Yakama, ongoing Sugar restoration, i.e. side channel)
- Other projects for which gathering fish data is important to future project assessment.
- Presence of Coho – competition with Chinook? (esp. in Methow)
- Beaver activity – impacts at some sites (Nason Oxbow, Bobcat, TRFP, Stormy B); Do beavers positively or negatively affect the benefits to fish found on restored floodplains?
- Adult redds present in/near perennial floodplains more so than seasonal? (associated with habitat use)



Attachment 2

Letter from WDFW Identifying Their Alternate on the PRCC Habitat Subcommittee

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Mailing Address: PO Box 43200, Olympia, WA 98504-3200 · 360 902-2200 · TDD 360 902-2207
Main Office Location: Natural Resources Building, 1111 Washington Street, Olympia, WA

December 3, 2024

Dear Dr. Hillman,

This letter serves as notification that Cody Gillin will serve as the alternate representative for the Washington Department of Fish and Wildlife on the Priest Rapids Coordinating Committee's Habitat Subcommittee and the HCP Tributary Committees.

Sincerely,

Jeremy Cram
Salmon Recovery Policy Lead