WASHINGTON STATE RECREATION AND CONSERVATION OFFICE
Salmon Recovery Funding Board

Salmon Recovery Funding Board Meeting Agenda

June 11, 2020
Online

ATTENTION:

Protecting the public, our partners, and our staff are of the utmost importance. Due to recent health concerns with the novel coronavirus and in compliance with the Governor's Executive Order 20-28(amending 20-05), this meeting will be held exclusively online. The public is encouraged to participate online and will be given opportunities to comment, as noted below.

If you wish to participate online, please click the link below to register and follow the instructions. We ask that you register in advance of the meeting. You will be e-mailed specific instructions upon registering. Technical support for the meeting will be provided by RCO's board liaison who can be reached at Wyatt.Lundquist@rco.wa.gov.

Registration Link: https://attendee.gotowebinar.com/register/2060568760044036619

**Additionally, RCO will record this meeting and would be happy to assist you after the meeting to gain access to the information.*

Order of Presentation: In general, each agenda item will include a short staff presentation and followed by board discussion. The board only makes decisions following the public comment portion of the agenda decision item.

Public Comment: General public comment is encouraged to be submitted in advance to the meeting in written form. Please submit written comments to the board by mailing them to the RCO, Attn: Wyatt Lundquist, board liaison, at the address above or at Wyatt.Lundquist@rco.wa.gov.

Public comment on agenda items is also permitted. If you wish to comment, you may e-mail Wyatt.Lundquist@rco.wa.gov or message Wyatt Lundquist using the messenger in the Webinar before the start of the item you wish to testify on. Comment for these items will be limited to 3 minutes per person.

Special Accommodations: People with disabilities needing an accommodation to participate in RCO public meetings are invited to contact us via the following options: 1) Leslie Frank by phone (360) 902-0220 or e-mail Leslie.Frank@rco.wa.gov; or 2) 711 relay service. Accommodation requests should be received May 28, 2020 to ensure availability.

Thursday, June 11

OPENING AND MANAGEMENT REPORTS

9:00 a.m. **Call to Order** — *Chair Rockefeller*

- Roll Call and Determination of Quorum — *Wyatt Lundquist*
- Overview of Webinar Protocols
- Roll Call and Determination of Quorum
- Review and Approval of Agenda ***(Decision)***
- Approve March 2019 Minutes ***(Decision)***
- Remarks by the Chair

9:10 a.m. **1. Director's Report**

A. Director's Report — *Kaleen Cottingham*
B. Legislative Update — *Wendy Brown*
C. Performance Update *(Written)* — *Brent Hedden*
D. Fiscal Report *(Written)* — *Mark Jarasitis*

9:25 a.m. **2. Salmon Recovery Management Report**

A. Governor's Salmon Recovery Office Report — *Erik Neatherlin*
B. Salmon Section Report — *Tara Galuska*

9:45 a.m. **General Public Comment (non-agenda items):** *Please limit comments to 3 minutes.*

9:50 a.m. **3. Reports from Key Partners** — *Alex Conley and*

- Council of Regions — *John Foltz*
- WA Salmon Coalition — *Trcia Snyder*

BOARD BUSINESS: BRIEFING

10:10 a.m. **4. Recommendations for Setting Funding Request Levels for 2021-2023** — *Wendy Brown, Kaleen Cottingham*

- SRFB Funding*
- PSAR Funding*
- Other Salmon Funding Requests in the RCO Budget

*Decisions to be made at August 12, 2020, board meeting

10:55 a.m. **BREAK**

11:05 a.m. **5. Monitoring Panel Update** — *Keith Dublanica and Pete Bisson*

BOARD BUSINESS: DECISION

11:25 a.m. **6. Allocate Funding for 2020 Grant Round, FY 2021 Capacity Funding and FY 2021 Monitoring Funding** — *Tara Galuska, Jeannie Abbott, Keith Dublanica*

- Grant Round Amount
- Cost Increases
- Regional Organization Capacity Funding
- Lead Entity Capacity Funding
- Monitoring Contracts

BOARD BUSINESS: REQUEST FOR DIRECTION

12:00 p.m.	**7. Criteria for Future Targeted Investments**	*Katie Pruit*
12:45 p.m.	**Adjourn**	*Chair*

Next meeting: August 12, 2020 – Conference Call – Natural Resources Building, Room 172, Olympia, WA 98501

Correspondence

SALMON RECOVERY FUNDING BOARD SUMMARIZED MEETING AGENDA AND ACTIONS

THURSDAY, MARCH 19, 2020

Item	Formal Action	Follow-up Action
OPENING AND MANAGEMENT REPORTS		
Call to Order A. Roll Call and Determination of Quorum B. Review and Approval of Agenda C. Approve December 2019 Minutes D. Remarks by the Chair	**Decision** March 2020 Meeting Agenda **Moved by:** Member Bugert **Seconded by:** Member Endresen-Scott **Decision:** Approved Approve December 2019 Minutes **Moved by:** Member Breckel **Seconded by:** Member Bugert **Decision:** Approved with Amendments	Follow-up: Incorporate Member Sullivan's edits
1. Director's Report A. Director's Report B. Legislative Update • Travel Meeting Location C. Performance Update D. Fiscal Report		No Follow-up
2. Salmon Recovery Management Report A. Governor's Salmon Recovery Office Report • Update to Statewide Salmon Strategy • PCSRF Application for 2020 • State of Salmon Report		No Follow-up

• New Staffing, if Funding by Legislature B. Salmon Section Report • Status of 2020 Grant Round		
General Public Comment (non-agenda items)		
BOARD BUSINESS: DECISION		
3. Delegation of Authority to Director to Resolve Potential PCSRF Audit Funding	**Decision** Move to approve delegation of Authority to RCO Director to resolve federal audit finding **Moved by:** Member Breckel **Seconded by:** Member Sullivan **Decision:** Approved	Follow-up: Director Cottingham will brief the board on the outcomes
BOARD BUSINESS: BRIEFINGS		
4. Criteria for Future Targeted Investments		Staff will work with stakeholders and bring a draft policy to the board in June.
ADJOURN: 10:21am		

Next Meeting: Travel Meeting June 10-11, 2020 – Nisqually, Washington

SALMON RECOVERY FUNDING BOARD SUMMARY MINUTES

Date: March 19, 2020
Place: Natural Resources Building, Room 172, 1111 Washington Street SE, Olympia, WA 98501

Salmon Recovery Funding Board Members

Phil Rockefeller, Chair	Bainbridge Island	**Stephan Bernath**	Washington Department of Natural Resources
Jeromy Sullivan	Kingston	**Brian Cochrane**	Washington State Conservation Commission
Chris Endresen Scott	Conconully	**Jeff Davis**	Washington Department of Fish and Wildlife
Bob Bugert	Wenatchee	**Annette Hoffmann**	Washington Department of Ecology
Jeff Breckel	Stevenson	**Susan Kanzler**	Washington Department of Transportation

This summary is to be used with the materials provided in advance of the meeting. The Recreation and Conservation Office (RCO) retains a recording as the formal record of the meeting

Call to Order

Kaleen Cottingham, Recreation and Conservation Office (RCO) director, introduced **Chair Phil Rockefeller** at 9:03AM. Because this marks the first remote Salmon Recovery Funding Board (SRFB) meeting, Chair Rockefeller delegated new roles to **Wyatt Lundquist**, RCO Board Liaison, and Director Cottingham, handing them logistical control. Mr. Lundquist explained the webinar program functionality and then called roll, determining that quorum was present. Before Chair Rockefeller requested a motion to approve the agenda, Director Cottingham clarified its shortened length, including only essential items.

Motion: Move to approve March 2020 Agenda
Moved by: Member Bugert
Seconded by: Member Endresen-Scott
Decision: Approved

Motion: Move to approve December 2019 Minutes
Moved by: Member Jeff Breckel
Seconded by: Member Bugert

Decision: Approved with amendments by Member Sullivan

Item 1: Director's Report

Director's Report

After a brief update on staff working from home and emergency modifications to the Open Public Meeting Act, **Director Cottingham**, covered agency happenings. Her update included details on RCO's 55th state agency celebration (where Washington's First Lady, Trudi Inslee, spoke), RCO's submission of PCSRF applications for 2020 with a request of $25 million, the move toward e-signatures using Adobe Sign, and an update on social media where RCO had gained 4,000 followers between its Instagram and Facebook accounts. Director Cottingham also noted staff changes, including the loss of Eryn Couch and Rory Calhoun and the gain of a new Governor's Salmon Recovery Office position for an Orca Recovery Coordinator. Moving forward, Director Cottingham relayed the fine tuning of the new tribal agreement templates created through negotiation with the Northwest Indian Fish Commission and tribes such as the Yakama, Quinault, Port Gamble, and Umatilla, who have requested further edits.

Director Cottingham closed her briefing by informing the board that the June 2020 Travel meeting would be located at the Nisqually Heritage Longhouse in Dupont, WA.

Legislative Update

Wendy Brown, RCO Policy Director, gave an overview of legislative updates that related most to RCO and SRFB. The final legislative budget includes a new position in the GSRO to coordinate orca recovery. The legislature also funded a project to design a solution to mitigate steelhead mortality at the Hood Canal Bridge. Ms. Brown also relayed a budget proviso that direct further planning and coordination on statewide culvert corrections between the Brian Abbott Fish Barrier Removal Board and the Washington State Department of Transportation, and a study relating to the Growth Management Act to determine how to incorporate a net ecological gain standard into state-land use, development and environmental laws and rules. Ms. Brown followed with several bill of interest that passed:

- House Bill 2311 directing RCO to seek out all practicable opportunities to limit our carbon footprint.
- House Bill 1154, relating to financing the Chehalis River Basin flood damage reduction and habitat restoration projects.
- House Bill 1187, pertaining to conservation districts abilities to streamline the Hydraulic Project Approval (HPA) process relating to fish and habitat enhancement projects.

- House Bill 1261, prohibiting suction dredge mining in waters noted as critical habitat for salmon, steelhead and bull trout restoration.

The Legislature also created a Climate Resiliency Account containing $50,000,000 and provided direction to RCO and other natural resource agencies to work with Office of Financial Management to identify investments to mitigate the effects of climate change.

In closing, Kaleen Cottingham reminded the Board that next biennium's budget request will be put together over the summer, which will be on SRFB's June meeting agenda with finalizations being made in August. All budget requests may be affected by the economic collapse due to COVID-19.

Item 2: Salmon Recovery Management Report

Governor's Salmon Recovery Office (GSRO) Report

Erik Neatherlin, GSRO Executive Coordinator, began his briefing thanking Wendy Brown, Kaleen Cottingham and Nelson Falkenburg, WDFW Legislative coordinator, for their assistance during the 2020 legislative session. Mr. Falkenburg lead the weekly legislative calls with salmon stakeholders to discuss bills and hearings related to salmon recovery. As a follow-up, the Salmon Recovery Network call will occur April 1, 2020, to provide a legislative session overview from each agency. Due to COVID-19, several meetings in Washington, DC were cancelled, including Salmon Days, which has been moved to September and Puget Sound Day on the Hill, tentatively planned for the end of April.

Mr. Neatherlin gave an update on the Statewide Salmon Strategy. Letters from the Governor were sent to each federally recognized tribe in Washington inviting government to government consultation to update the Statewide Salmon Strategy. Mr. Neatherlin presented a map of the Tribes who they have already met with and are scheduled to meet with, since the letters were sent.

Triangle Associates has also been working with stakeholders to assist with the Statewide Salmon Strategy. There are three workshops to solicit feedback on the strategy from stakeholders. One workshop occurred at the annual Washington Salmon Coalition meeting, attended by regional recovery boards, GSRO staff, and SRFB members. Two other workshops will follow, one in Olympia with westside stakeholders and one in Wenatchee with eastside stakeholders. GSRO has engaged the Washington Academy of Sciences to work on the recommendations from stakeholders and tribes before presenting the updated Statewide Salmon Strategy to the Natural Resources Cabinet. There is hope that this update will be completed in December of 2020.

Closing his briefing, Mr. Neatherlin focused on the upcoming Salmon Recovery Conference (April 27-28, 2021) in Vancouver, WA and the new Orca Recovery Coordinator position, which he is hoping to recruit for soon.

Member Bernath asked for more information on the outreach plan to agencies surrounding the Statewide Salmon Strategy. Mr. Neatherlin clarified that GSRO staff would be setting up meetings with key natural resource agencies and senior policy staff to bring them up to speed.

Salmon Section Report

Tara Galuska, RCO's Salmon Section Manager, presented her report.

Ms. Galuska relayed that site visits had begun on the 189 applications that have been submitted during the 2020 grant round.

For site visits, the RCO Salmon team has created flexible options due to COVID-19. These two options include a live webinar streaming a site visit or a video that can be uploaded to PRISM. Both options still include the Salmon Review Panelists, Outdoor Grant Managers, and each Lead Entity Coordinator. Ms. Galuska reported that there have already been site visits with 15 lead entities. The 10 lead entities that remain will complete their site visits in April and May.

Item 3: Delegation of Authority to Director to Resolve Potential PCSRF Audit Funding

Director **Kaleen Cottingham** gave an update on the Pacific Coastal Salmon Recovery Funding Audit for 2010-2011 grants. This audit was conducted by the Department of Commerce (DOC). DOC had several findings that RCO appealed in 2019, but a final decision has not been made on that appeal. If the DOC rejects the appeal, in order to resolve the audit, RCO staff created several promising options and set aside $1.9 million in state bond funds. These options include the following:

1. Fund partially funded projects from the 2019 grant round, which were adopted by the board in December of 2019.
2. Fund one or both Targeted Delisting projects in Hood Canal, including the Lower Snow or Lower Big Beef, both previously reviewed by the board.
3. Fund Mid-Columbia Region's Little Naches Floodplain Targeted Investment Delisting project also previously reviewed by the board.

Director Cottingham clarified that the acceptance of this strategy is unknown, but she requested that the board delegate her the authority to resolve the audit, nonetheless.

Closing her briefing, Director Cottingham opened discussion from the board. Member Breckel asked for clarification on whether the options were presented in priority order and Director Cottingham relayed that, that was not the case, as one of the projects is more costly than the others.

General Public Comment:

Alex Conley, Yakima Basin Fish and Wildlife's Executive Director, relayed that the Yakima Little Naches Project requires review from the Salmon Review Panel, but it would be an exciting project to move forward with.

David Trout, Nisqually Tribe's Natural Resource director, gave full support to the options provided by RCO staff.

> **Motion:** Move to approve delegation of authority to the RCO Director to resolve the federal audit finding and repayment using the strategy outlined in the staff presentation.
> **Moved by:** Member Breckel
> **Seconded by:** Member Sullivan
> **Decision:** Approved

Item 4: Criteria for Future Targeted Investments

Katie Pruit, RCO Policy and Planning Specialist, gave an update on the staff draft of the targeted investment policy. Ms. Pruit reminded the board that in December 2019, they had directed staff to develop criteria for a targeted investment policy that would direct funds greater than that of the current grant round allocation to board-identified priorities.

Ms. Pruit stated that in January 2020, she had presented a proposal of potential priorities to the Washington Salmon Coalition. During this time, lead entity coordinators expressed concern, explaining that the targeted investments could interfere with the current allocation framework and create additional complexity to the existing process. RCO staff will be taking this commentary into consideration when creating the Targeted Investment Policy.

A draft policy with be created before the end of April in 2020 and a follow up meeting with Washington Salmon Coalition and the Council of Regions will occur in webinar form in May. Following in June, the next draft will be presented to the board with hopes of implementation occurring in September.

Member Bugert expressed concern with project implementation occurring this year due to the late approval. Director Cottingham explained that all funding for the 2020-2021 biennium had been spent so no funding would be available until after July of 2021. Applications for funding would not be taken until September of 2021.

Closing

Chair Rockefeller provided closing remarks and adjourned the meeting.

ADJOURN- Meeting adjourned at 10:21 pm.

The next meeting will be on June 10-11, 2020 at Nisqually Heritage Longhouse in Dupont.

WASHINGTON STATE
RECREATION AND CONSERVATION OFFICE
Salmon Recovery
Funding Board

Salmon Recovery Funding Board Briefing Memo

Item 1

APPROVED BY RCO DIRECTOR KALEEN COTTINGHAM

Meeting Date: June 11, 2020

Title: Director's Report

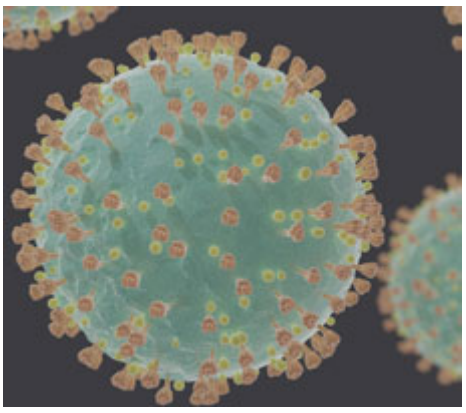
Prepared By: Kaleen Cottingham, RCO Director and Wendy Brown, Policy Director

Summary
This memo describes key agency activities and happenings.

Board Action Requested
This item will be a:
- ☐ Request for Decision
- ☐ Request for Direction
- ☒ Briefing

Agency Update

RCO Adapts to Changes Brought On by the Coronavirus



Facing the coronavirus pandemic, RCO has made many changes with the goals of helping our grant applicants and other customers, keeping our employees safe, and ensuring business carries on as close to normal as possible. To those ends, RCO staff moved their offices to their homes and have been functioning almost seamlessly there since March (and likely well into June or beyond). RCO also extended some recreation and conservation grant application deadlines to give applicants more time, knowing that many of them have been diverted to other work during this crisis. RCO eliminated in-person evaluations, which would have brought hundreds of people to the Natural Resources Building in favor of online presentations and advisory committee meetings. The agency also moved board meetings online and slimmed down the agendas. These efforts have helped the agency and our partners weather the immediate needs of the pandemic. RCO didn't stop there, as planning for the future is a high priority. Economic analysts predict a recession as the pandemic continues because of the large number of unemployed people. In anticipation, RCO has delayed filling two positions–one in

communications and one in the PRISM and Data Section–until we know more about what budget cuts the agency might face. Staff also are reviewing our current budget for cost-savings. The Office of Financial Management has asked each state agency under the umbrella of the Governor to take a 15% expenditure cut from its general fund appropriation. For RCO, it equates to a $244,200 reduction. Staff are currently evaluating options. The Governor also imposed a freeze on hiring, personal services contracts, and equipment purchases over $5000. Each day brings new challenges, but I am confident in our staff's ability to rise to the challenge and continue to deliver excellent service.

Concern Expressed about Changes to Federal Environmental Laws

The Governor's Salmon Recovery Office joined other state agencies across the nation in sending a letter to President Trump expressing concerns over his proposed changes to the National Environmental Protection Act (NEPA). Signed into law in 1970, NEPA requires federal agencies to evaluate the environmental effects of their proposed actions before making decisions. A bedrock environmental law, NEPA is critical for protecting the environment and public health. The Trump Administration has proposed the first major changes to the law in more than 30 years. The changes would limit the scope of environmental assessments that must be done before building highways, pipelines, bridges, and other public infrastructure projects.

Salmon Recovery at Your Fingertips

This past fall, RCO finalized the transition of the Salmon Recovery Portal, formerly known as the Habitat Work Schedule, from Paladin Data Systems (which was acquired by Dude Solutions). The data team, with help from Information Technology staff, have been moving the system to RCO. While the roll-out of the newly rebranded site isn't scheduled until summer, the Salmon Recovery Portal continues to function as an important tool for planning and reporting salmon recovery actions throughout Washington. The portal tracks more than 12,000 on-the-ground projects across the state, making it easy to see how projects relate to each other, what needs to be done next for salmon, and how progress is being made to address the problems harming salmon. The portal is an integral part of the Salmon Recovery Funding Board application process, which begins with applications being started in the

portal. More than 190 applications have been entered so far this year. This summer, RCO plans to improve the portal by better aligning it with RCO's PRISM database, enhancing reporting and standardization, and integrating salmon recovery projects funded by other organizations. The enhancements will allow those doing salmon recovery to track and prioritize projects, making it easier to see the big picture.

Cuts Made to Recent Legislative Projects

When the Legislature approved the supplemental budgets in March, projections indicated the state would have nearly $3 billion in reserves by the end of the biennium. By the time the budgets reached the Governor's desk for signature, the state's economic outlook had diminished dramatically due to the pandemic. The Governor vetoed 147 items to save $235 million now and $210 million in the next biennium. The veto pen eliminated some RCO recreation and invasive species projects, but spared salmon recovery projects. Remaining in the budget is the new position in the Governor's Salmon Recovery Office to coordinate orca recovery work and monitor implementation of the Governor's Southern Resident Killer Whale Task Force final report. The budget also funds the Hood Canal bridge project, and a project for RCO to look at carbon sequestration criteria in our grant programs.

News from the Other Boards

The **Recreation and Conservation Funding Board** met online in April to adjust the grant round due to the pandemic, including reducing match for cash-strapped local and state agencies. The board's next meeting is in July.

The **Washington Invasive Species Council** met in March and adopted the Asian giant hornet as a statewide priority invasive species. Staff are working with state and federal agencies to develop outreach information and update its reporting mobile applications. The council's next meeting is June 17.

Staff Change

Michelle Burbidge joined the Recreation and Conservation Grants Team in April. Michelle comes to us from the Washington Department of Fish and Wildlife, where she managed statewide land acquisitions. Previously, she worked for the Washington Department of Natural Resources managing state trust land transactions.

Fiscal Report

The fiscal report reflects Salmon Recovery Funding Board activities as of May 13, 2020

Balance Summary

Fund	Balance
Current State Balance *reflects removal of potential audit questioned cost payment	$4,541,254
Current Federal Balance – Projects	$3,896,033
Current Federal Balance – Activities, Hatchery Reform, Monitoring	$3,317,846
Lead Entities	$2,219,449
Puget Sound Acquisition and Restoration (PSAR) and Puget Sound Restoration	$793,274

Salmon Recovery Funding Board

For July 1, 2019 - June 30, 2021, actuals through May 13, 2020 (FM 10). 41.6% of biennium reported.

PROGRAMS	BUDGET	COMMITTED		TO BE COMMITTED		EXPENDITURES	
	New and Re-appropriation 2019-2021	Dollars	% of Budget	Dollars	% of Budget	Dollars	% of Committed
State Funded							
2013-15	$1,936,999	$1,936,999	100%	$0	0%	$301,052	16%
2015-17	$2,973,000	$2,938,795	99%	$34,205	1%	$2,382,717	81%
2017-19	$11,332,731	$11,327,851	99%	$4,880	1%	$3,641,722	32%
2019-21	$21,570,000	$17,067,831	79%	$4,502,169	12%	$1,095,660	6%
Total	**37,812,730**	**33,271,476**	**88%**	**4,541,254**	**7%**	**7,421,151**	**21%**
Federal Funded							
2015	$3,333,263	$3,324,232	99%	$9,032	1%	$3,287,405	99%
2016	$7,782,478	$5,770,103	74%	$2,012,376	26%	$1,803,442	27%
2017	$11,149,935	$9,737,363	87%	$1,412,572	13%	$4,525,568	46%
2018	$16,258,379	$13,879,434	85%	$2,378,945	15%	$4,183,144	30%
2019	$18,085,650	$16,684,694	92%	$1,400,956	8%	$1,235,389	7%
Total	**56,609,705**	**49,395,825**	**87%**	**7,213,880**	**13%**	**15,034,947**	**30%**
Grant Programs							
Lead Entities	$7,660,354	$5,440,905	71%	$2,219,449	29%	$1,921,223	35%
PSAR	$98,866,446	$98,073,172	99%	$793,274	1%	$15,396,653	16%

PROGRAMS	BUDGET	COMMITTED		TO BE COMMITTED		EXPENDITURES	
	New and Re-appropriation 2019-2021	Dollars	% of Budget	Dollars	% of Budget	Dollars	% of Committed
Subtotal	**200,949,235**	**188,791,033**	**94%**	**12,158,201**	**6%**	**39,773,975**	**21%**
Administration							
Admin/ Staff	7,534,243	7,534,243	100%	0	0%	2,599,351	35%
Subtotal	**7,534,243**	**7,534,243**	**100%**	**0**	**0%**	**2,599,351**	**35%**
GRAND TOTAL	**$208,483,478**	**$196,325,276**	**94%**	**$12,158,201**	**6%**	**$42,373,326**	**22%**

Note: Activities such as smolt monitoring, effectiveness monitoring, and regional funding are combined with projects in the state and federal funding lines above.

Performance Update

The following data is for grant management and project impact performance measures for fiscal year 2020. Data included are specific to projects funded by the board and current as of May 13, 2020.

Project Impact Performance Measures

The following tables provide an overview of the fish passage accomplishments funded by the Salmon Recovery Funding Board (board) in fiscal year 2020. Grant sponsors submit these performance measure data for blockages removed, fish passages installed, and stream miles made accessible when a project is completed and in the process of closing. The Forest Family Fish Passage Program, Coastal Restoration Initiative Program, and the Estuary and Salmon Restoration Program are not included in these totals.

Sixteen salmon blockages were removed so far this fiscal year (July 1, 2019 to May 13, 2020), with seven passageways installed (Table 1). These projects have cumulatively opened 88.5 miles of stream (Table 2).

Table 1. SRFB-Funded Fish Passage Metrics

Measure	FY 2020 Performance
Blockages Removed	16
Bridges Installed	0
Culverts Installed	7
Fish Ladders Installed	0
Fishway Chutes Installed	0

Table 2. Stream Miles Made Accessible by SRFB-Funded Projects in FY 2019

Project Number	Project Name	Primary Sponsor	Stream Miles
14-1204	Reducing road density in the Naches watershed	Mid-Columbia RFEG	3.00
14-1931	West Beach Road Barrier Correction	San Juan County Public Works	0.74
14-2266	Elochoman Hatchery Barrier Removal	Fish & Wildlife Dept. of	44.00
15-1050	Kristoferson Creek Fish Passage Improvements	Snohomish Conservation Dist.	0.90
15-1090	Silver-Bluebird Creek Restoration	Lower Columbia FEG	4.00
15-1198	Moga Back Channel Construction	Snohomish Conservation Dist.	0.71
15-1555	Ellsworth Creek Watershed Restoration	The Nature Conservancy	0.00
15-1582	Lower Forks Creek Restoration	Fish & Wildlife Dept of	0.00
16-1753	Restoring Fish Passage on Cowiche Creek	North Yakima Conserv Dist	10.00

Project Number	Project Name	Primary Sponsor	Stream Miles
16-2013	West Branch LeClerc Crib Dam Cultural Inventory	Fish & Wildlife Dept of	18.00
17-1157	Unnamed Tributary to Stearns Creek Barrier Removal	Lewis County Public Works	2.40
18-1493	Prairie Creek Barrier Removal Project	Lewis County Public Works	4.75
		Total Miles	**88.50**

Grant Management Performance Measures

Table 3 summarizes fiscal year 2020 operational performance measures as of May 13, 2020.

Table 3. SRFB-Funded Grants: Management Performance Measures

Measure	FY Target	FY 2020 Performance	Indicator	Notes
Percent of Salmon Projects Issued Agreement within 120 Days of Board Funding	90%	**71%**	🟡	171 agreements for SRFB-funded projects were to be mailed this fiscal year to date. Staff mail agreements on average 54 days after a project is approved.
Percent of Salmon Progress Reports Responded to On Time (15 days or less)	90%	**92%**	🟢	426 progress reports were due this fiscal year to date for SRFB-funded projects. Staff responded to 390 in 15 days or less. On average, staff responded within 7 days.
Percent of Salmon Bills Paid within 30 days	100%	**100%**	🟢	During this fiscal year to date, 1,402 bills were due for SRFB-funded projects. All were paid on time.
Percent of Projects Closed on Time	85%	**95%**	🟢	115 SRFB-funded projects were scheduled to close so far this fiscal year. 109 closed on time.
Number of Projects in Project Backlog	5	**4**	🟢	Four SRFB-funded projects are in the backlog. This is more than the last board meeting.
Number of Compliance Inspections Completed	125	**67**	🟢	Staff have inspected 67 worksites this fiscal year to date. They have until June 30, 2020 to reach the target.

WASHINGTON STATE
RECREATION AND CONSERVATION OFFICE
Salmon Recovery
Funding Board

Salmon Recovery Funding Board Briefing Memo

Item 2

APPROVED BY RCO DIRECTOR KALEEN COTTINGHAM

Meeting Date: June 11, 2020

Title: Salmon Recovery Management Report

Prepared By: Erik Neatherlin, GSRO Executive Coordinator & Tara Galuska, Salmon Section Manager

Summary
This memo summarizes the recent work completed by the Governor's Salmon Recovery Office (GSRO) and the Recreation and Conservation Office's (RCO) Salmon Recovery Section.

Board Action Requested

This item will be a:
- ☐ Request for Decision
- ☐ Request for Direction
- ☒ Briefing

Governor's Salmon Recovery Office (GSRO)

Legislative and Partner Activities

Congressional trips back to Washington DC have either been postponed or cancelled due to COVID-19. Puget Sound Day on the Hill which was scheduled for April 2020 was initially postponed and eventually cancelled. There are ongoing discussions with the planning steering committee to determine what if any type of event online or here in Washington may be feasible in the fall. Similarly, the annual trip among the five Pacific Coastal Salmon Recovery Fund recipient states (WA, OR, ID, CA, AK) was initially postponed and then cancelled. Due to growing budget concerns among the five PCSRF recipient states, there are no plans to travel back to Washington DC in 2020. Washington State took the lead on a 5-state Governor PCSRF request letter to Congress, currently in progress.

In addition, site tours and visits throughout Washington State have been put on hold or cancelled for this summer, including in-District Congressional and State Legislative tours. There are ongoing discussions to determine what types of virtual site tours or limited in-person visits may offer a feasible alternative for reaching elected officials and policy makers with salmon recovery priorities and project activities.

As expected, staff travel for conferences and networking was severely restricted or eliminated over the last two months. Erik's plans to attend regional recovery board meetings and to meet with extended partner networks was limited to online web-based meetings or conference calls. Jeannie Abbott and Tara Galuska had to cancel their trip to attend the annual PCSRF grant planning meeting scheduled for Alaska in June 2020. This was an important, but lost opportunity for the five PCSRF recipient states to meet, discuss, and debrief in person about this critical federal funding source that anchors salmon recovery throughout the Pacific Northwest. Also, the biennial Salish Sea Ecosystem Conference, which was scheduled for April 21-22, 2020 in British Columbia, was converted to an all-online virtual conference. This transition worked out better than expected, and actually resulted in increased participation via virtual attendance. Erik Neatherlin presented on behalf of GSRO as a panel member on the Southern Resident Killer Whale Plenary Session.

Statewide Salmon Strategy Update

The statewide strategy update is on track and progressing as scheduled. Triangle will complete an initial draft of recommendations that will be submitted to the Washington State Academy of Sciences for review in June. Following the Academy of Science review, Triangle will prepare the recommendations so they can be distributed and reviewed by the natural resource agencies. In preparation for this state agency review, Erik Neatherlin, Jeannie Abbott, and Leslie Connelly, from the Office of Financial Management, held virtual meetings with senior policy staff from the natural resources agencies, including WDFW, DNR, Conservation Commission, WSDOT, Ecology, Agriculture, Commerce, Puget Sound Partnership, and Utilities and Transportation Commission. These virtual meetings were intended to help senior policy staff prepare their executives for the natural resources sub-cabinet virtual meeting which is in process of being scheduled for some time in late May or early June. The natural resource agencies will be reviewing recommendations through the summer before providing proposed strategy updates later this fall to be considered by the Governor's Office.

Erik Neatherlin, Jeannie Abbott, and Leslie Connelly also initiated outreach to key federal partners associated with the strategy update, including NOAA Fisheries, US Fish and Wildlife Service, Natural Resources Conservation Service, and Environmental Protection Agency. These meetings are scheduled to occur through the month of May.

In addition to meetings with state and federal agencies, JT Austin, from the Governor's Office, Leslie Connelly, and Erik Neatherlin continued their engagement with individual tribes. As a reminder, in 2019 Governor Inslee sent a letter to each of the 29 federally recognized tribes in Washington inviting government-to-government participation and designating JT Austin as the lead for tribal engagement on the strategy. There have been in person or virtual meetings with 12 individual tribes. Given the challenge of

meeting in person or virtually, an email request was distributed to each tribe requesting initial written feedback that could be incorporated into early versions of the strategy update. This tribal engagement, led by JT Austin, will continue on a parallel path to the stakeholder and state and federal agency engagement. There are plans to continue with virtual or in-person meetings as appropriate and as requested by the tribes.

State of Salmon Report

The *State of Salmon in Watersheds* Report is on track to be completed by the end of 2020. RCO and GSRO are required by statute (RCW 77.85.020) to produce this biennial report for the Legislature summarizing salmon recovery progress in Washington, including projects and programs funded by the salmon recovery funding board. The GSRO team, together with other state agencies and tribes, are gathering data and building content for the 2020 edition of the *State of Salmon in Watersheds* executive summary report and web site. The 2020 version of *State of Salmon* will display data, story maps and key messages from our partners in salmon recovery. This year we are improving the usability of the site and making the content easier to understand. Consultants are under contract to support Web site design, usability, and production of both the site and hard-copy Executive Summary.

Salmon Recovery Network

The Salmon Recovery Network (SRNet) continued meeting virtually. At the May SRFB meeting the SRNet partners summarized the 2020 Legislative outcomes, discussed current biennium priorities and activities through the summer, and began early conversations about critical salmon recovery policy and budget priorities leading into the 2021-23 legislative session. The normal activity of coordinating Congressional, Legislative, and partner tours and site visits has been curtailed, and discussions are focused on salmon recovery priorities, shrinking budgets, and engagement with key partners and stakeholders for salmon recovery.

Salmon Recovery Conference

RCO staff met with Western Washington University's Conference Planning team to discuss the current agreement with Vancouver Conference Center. We discussed options for cancelling due to COVID-19 and the potential format if we had to provide an online conference. In addition, the Steering Committee held their second conference call and determined that the theme would be "Building a Movement". The steering committee split into subcommittees to brainstorm keynote speakers; sessions, diversity, equity, and inclusion ideas; and extracurricular activities such as a film festival or field trips. The sub-committees will bring their recommendations to the full Steering Committee at their June 19th meeting. The Steering Committee will determine session themes and keynote

speakers during that meeting. Following that meeting, we will begin the process to solicit workshop sessions/tracks.

Steering Committee members include: Aja DeCoteau, CRITFC; Alicia Olivas, Washington Salmon Coalition; Annette Hoffman, ECY/SRFB; Carrie Byron, Puget Sound Partnership; DR Michel, UCUT; Erik Neatherlin, GSRO; Jacques White, Long Live the Kings; Jeannie Abbott, GSRO; Jeff Breckel, SRFB; Jennie Franks, NOAA; Jeremy Five Crows, CRITFC; John Rosenberg, RFEG; Laurie Peterson, WDFW; Mindy Roberts, WA Environmental Council; Nicole Czarnomski, WDFW; Susan Kanzler, DOT/SRFB; Tara Galuska, RCO

Pacific Coastal Salmon Recovery Fund

NOAA is on track to provide RCO with our annual award amount mid to late May. The PCSRF meeting scheduled for June in Alaska has been postponed until 2021.

NOAA 5-year Status Reviews

NOAA Fisheries closed their public comment period on May 27, 2020 for their call for data and information for their 5-year status reviews. NOAA Fisheries is expected to complete the 5-year status reviews in 2021 but there has not been any formal announcement or federal register notice identifying a specific due date. GSRO submitted a letter to NOAA Fisheries Regional Administrator Barry Thom requesting continued engagement, coordination, and collaboration with the state and tribes as NOAA proceeds through its 5-year status review process. The letter is included in the boards packet for reference.

Orca Recovery Position

Funding for the Southern Resident Orca Recovery position was secured in the 2020 Legislative session and was not vetoed by the Governor. RCO and GSRO were proceeding with the recruitment, and the announcement had closed on May 3, 2020, with interviews in process of being scheduled. Due to the Governor's directive and hiring freeze, RCO and GSRO are exploring options for this position with the Governor's Office.

Salmon Recovery Section Report

2020 Grant Round – implementing LEAN recommendations on timeline and process

The grant round is underway. This year, RCO is also recruiting Puget Sound Acquisition and Restoration (PSAR) projects as well as statewide salmon projects. Funding for the grant round comes from the state capital budget and the NOAA administered federal Pacific Coastal Salmon Recovery Fund. To date there are 209 applications submitted in PRISM. Of those, 8 are requesting PSAR large capital project funding. This year there were 12 PSAR large cap projects submitted to the Puget Sound Partnership (PSP). The

PSP's review team did an initial screening of projects and invited 8 sponsors to submit their large capital proposals into the grant round.

For this report, our biggest successes from the salmon section and our many lead entity and project sponsor partners have been keeping the grant round and projects moving with good work and communication among all in a telework environment. This has been a major effort on everyone's part to be able to accomplish work remotely and get up to speed on perhaps new or different technology and environments than we are accustomed to working in. Everyone, RCO and partners, has really been pulling together to keep the quality of the grant round high and to keep the agency's services intact.

Starting in mid-March, all site visits were moved to on-line format of presentations rather than in-person site visits to the projects. The lead entities came together and created a best practices document for conducting remote project presentations, which was very well received and has been sought out by partner grant agencies who are doing the same type of work.

The first set of project reviews were completed in March for 15 out of 25 lead entities. Staff and the SRFB Review Panel reviewed and evaluated 101 projects. The grant round has changed with the Lean recommendations, and this year project applications had to be complete (rather than minimal draft materials) two weeks before the site visits. The Review Panel provides a project status of clear, conditioned, need more information or project of concern in the first set of comments. Projects that are clear are done with the grant round, other than waiting for final lead entity project ranking and approval from the SRFB In September. This is great news for those sponsors with a status of "Clear" for their projects this early in the round and meets one of the goals of the Lean study by creating sponsor efficiencies. Of 101 projects, 29 received a clear status from the panel in this first set of lead entities, so almost 30% of the projects are clear. The rest of the project applicants continuing refining their applications, to be finalized by June 29th and will receive additional comments and a project status from the panel.

Lead entity virtual site visits continued in May. The next Review Panel meeting for the 10 remaining lead entities is on May 20th. As a result of the Lean study recommendations, funding decisions by the SRFB will be made in September rather than December. The Pacific Coast Salmon Recovery Fund (PCSRF) award and state funds are typically available by September and the new timeline will enable sponsors to receive their funding and start projects sooner than in past years.

PRISM enhancements identified in the Lean study are also being rapidly deployed. The application has been streamlined, and all questions are now in the PRISM database, rather than on a separate document that must be attached. One of the major changes to PRISM is the creation and use of a review and evaluation module. The new feature allows lead entities to use the module for their technical advisory group comments if

they choose. To increase efficiency, all review panel comments, and sponsor responses will go into the PRISM database rather than using separate documents, SharePoint, and emails to track comments and forms.

Manual 18 Updates

Staff have started working on Manual 18 updates with the goals to finalize the Manual in November or December 2020 for the next grant round. Most changes will be administrative in nature unless we find immediate required/desired improvements. The monitoring eligibility policy is being updated to provide a dollar figure for monitoring projects to match the PCSRF application. More to come in September.

Pacific Salmon Treaty Orca Conservation Funding

RCO has been asked by NOAA to apply for and administer some Pacific Salmon Treaty (PST) funding, approximately $11 million, called 2020 PST Conservation of Southern Resident Killer Whales Through Production of Chinook Salmon in Puget Sound and Washington Coastal Hatchery and Habitat. RCO completed and submitted the application by the May 18, 2020 deadline. These projects are a combination of habitat and hatchery projects that will increase the abundance and productivity of Chinook for salmon and Southern Resident Killer Whale recovery efforts.

Salmon Recovery Funding Board Grant Administration

The following table shows projects funded by the board and administered by staff since 1999. The information is current as of May 4, 2020. This table does not include projects funded through the Brian Abbott Fish Barrier Removal Board program (BAFBRB), the Family Forest Fish Passage Program (FFFPP), the Washington Coastal Restoration Initiative program (WCRI), or the Estuary and Salmon Restoration Program (ESRP). Although RCO staff support these programs through grant and contract administration, the board does not review and approve projects under these programs.

Table 1. Board-Funded Projects

	Pending Projects	Active Projects	Completed Projects	Total Funded Projects
Salmon Projects to Date	40	429	2,597	3,066
Percentage of Total	1.3%	14.0%	84.7%	

Strategic Plan Connection

https://www.rco.wa.gov/documents/strategy/SRFB_Strategic_Plan.pdf

The Salmon Recovery Management Report supports *Goal 2* of the board's strategic plan, which focuses on the board's accountability for investments. By sharing information on staff activities and the grant round processes, the board can ensure accountability for the efficient use of resources.

Attachments

Closed Projects

Attachment A lists projects that closed between February 17, 2020 and May 4, 2020. Each project number includes a link to information about the project (e.g. designs, photos, maps, reports, etc.). Staff closed out 22 projects or contracts during this time.

Approved Amendments

Attachment B shows the major amendments approved between February 17, 2020 and May 4, 2020. Staff processed 31 project-related amendments during this period; most amendments were minor revisions related to administrative changes or time extensions.

Attachment A

Salmon Projects Completed and Closed from October 29, 2019 – February 17, 2020

Project Number	Sponsor	Project Name	Primary Program	Closed Completed Date
14-1737	Trout Unlimited Inc.	Barkley Irrigation Company: Under Pressure	Salmon Federal Projects	4/14/2020
16-1792	Cascade Col Fish Enhance Group	Burns-Garrity Restoration Conceptual Design	Salmon Federal Projects	2/21/2020
15-1239	Long Live the Kings	Ecology of Resident Chinook in San Juan Islands	Salmon State Projects	5/1/2020
14-1022	Fish & Wildlife Dept of	Fir Island Farm Restoration Construction	PSAR Large Capital Projects	4/6/2020
18-2293	Fish & Wildlife Dept of	Fish Program IMW Monitoring 2019	Salmon Federal Activities	4/17/2020
17-1046	Kitsap Conservation District	Fleming Fish Passage and Restoration Feasibility	Salmon State Projects	3/4/2020
16-1476	Hood Canal SEG	Hood Canal Summer Chum Riparian Enhancement	Puget Sound Acq. & Restoration	3/17/2020
14-1246	Skagit River Sys Cooperative	Illabot Creek Alluvial Fan Restoration – Phase 2	Puget Sound Acq. & Restoration	4/9/2020

Project Number	Sponsor	Project Name	Primary Program	Closed Completed Date
16-1532	Lower Columbia FEG	Kalama 1A Tidal Restoration	Salmon Federal Projects	4/24/2020
15-1110	Snohomish County Public Works	Knotweed Control in NF & SF Stilly	Salmon Federal Projects	2/24/2020
16-1644	Swinomish Tribe	Kukutali Preserve Tombolo Restoration	Puget Sound Acq. & Restoration	4/8/2020
16-1318	Fish & Wildlife Dept of	Leque Island Estuary Restoration Construction	Puget Sound Acq. & Restoration	4/23/2020
17-1089	Quinault Indian Nation	Lower Quinault Invasive Plant Control (Phase 6)	Salmon State Projects	4/22/2020
17-1180	Methow Salmon Recovery Found	M2 Mid-Sugar Acquisition	Salmon Federal Projects	4/2/2020
15-1093	Lower Columbia FEG	Nutrient Enhancement II WRIA 27-28	Salmon Federal Projects	4/8/2020
16-2286	NW Indian Fisheries Comm	NWIFC Hatchery Reform 2016 Genetics	Salmon Federal Activities	4/10/2020
15-1090	Lower Columbia FEG	Silver-Bluebird Creek Restoration	Salmon State Projects	4/14/2020

Project Number	Sponsor	Project Name	Primary Program	Closed Completed Date
15-1168	Skagit River Sys Cooperative	Skagit Basin Riparian Restoration 2a	Salmon State Projects	3/6/2020
17-1044	Lower Columbia Fish Recov Bd	U. Cowlitz-Cispus Habitat Strategy	Salmon State Projects	2/19/2020
18-2295	Fish & Wildlife Dept of	WDFW Status and Trends Monitoring (Fi-Fo) 2019	Salmon Federal Activities	4/21/2020
18-2294	Ecology Dept of	WECY IMW support 2019	Salmon Federal Activities	3/19/2020
14-1931	San Juan County Public Works	West Beach Road Barrier Correction	Salmon State Projects	4/21/2020

Attachment B

Project Amendments Approved by the RCO Director

Project Number	Project Name	Sponsor	Program	Type	Date	Amount/Notes
16-1215	Adopt A Stream Foundation	Bear Creek Reach 6 - Phase II Construction	PSAR	Cost Change	2/19/2020	Increase funding by $147,332 of returned PSAR funds and an additional $26,000 of sponsor match for higher than anticipated construction costs.
17-1160	Martin Ranch Road Culvert Fish Passage	Skagit County Public Works	Salmon - Federal	Cost Change	3/9/2020	Increase funding by $42,500 of returned PSAR funds, along with $7,500 additional match, to cover the costs for de-watering the site.
18-1487	Skiyou Rock Removal Preliminary Design	Skagit County Public Works	PSAR	Cost Change	2/26/2019	Increase funding by $20,000 of returned PSAR funds to conduct hydraulic modeling to inform the design project
18-1490	Cedar Grove Fish Passage Improvement	Skagit County Public Works	PSAR	Cost Change	3/16/2020	Increase funding by $19,969 returned PSAR for additional design costs. .

Project Number	Project Name	Sponsor	Program	Type	Date	Amount/Notes
18-1758	Mid Nemah Stream Habitat Assess. and Rest. Design	Pacific Conservation Dist	Salmon-Federal	Cost Change	4/10/2020	Increase SRFB funding by $35,432 to finish design.
16-1574	South Fork Skykomish Restoration Using Beaver	Tulalip Tribes	PSAR	Project Sponsor Change	4/8/2020	The United States Forest Service (USFS) is no longer a party to this Project Agreement.
18-1579	Red Creek Tributary Fish Passage Design	Quinault Indian Nation	Salmon - Federal	Scope Change	2/18/2020	Reduce the scope from final design to preliminary design and deliverables.

WASHINGTON STATE RECREATION AND CONSERVATION OFFICE
Salmon Recovery Funding Board

Salmon Recovery Funding Board Briefing Memo

Item 4

APPROVED BY RCO DIRECTOR KALEEN COTTINGHAM

Meeting Date: June 11, 2020

Title: Recommendations for Setting Funding Request Levels for 2021-2023

Prepared By: Wendy Brown, Recreation and Conservation Office Policy Director

Summary

The Recreation and Conservation Office (RCO) will submit its 2021-23 biennial budget request to the Office of Financial Management in early September 2020. The RCO will include in its request the funding levels selected by the Salmon Recovery Funding Board (SRFB) at its August 2020 board meeting. This memo presents options for consideration in setting the Salmon Recovery (SRFB-State) budget request for the 2021-23 biennium. A recommended funding level for the Puget Sound Acquisition and Restoration grant program will also be provided in the August 2020 board memo, based on discussions with the Puget Sound Partnership.

Board Action Requested

This item will be a:

- ☐ Request for Decision
- ☒ Request for Direction
- ☐ Briefing

Background

Federal Funding Levels

The Recreation and Conservation Office (RCO) submits a biennial budget request for the 2021-2023 biennium to the Office of Financial Management (OFM) in early September 2020. It will include authorization to spend federal funds received during the biennium and funding necessary to meet the match required by the federal funds and to implement the priorities of the board.

The RCO receives annual federal Pacific Coastal Salmon Recovery Fund (PCSRF) awards administered through the National Oceanic and Atmospheric Administration (NOAA). The minimum required match is 33 percent. The PCSRF announcement and awards are made on an annual cycle. RCO applies for each award in the winter and receives funding in October, and funds are authorized to be spent in the current biennial budget. RCO expects similar grant awards for federal fiscal years 2021 and 2022, which would be covered by the capital budget for 2021-2023.

RCO recommends including in the budget request an authorization to spend $50 million in PCSRF awards, which is the total potential grant award expected during the 2021-23 biennium. The alternatives for selecting the amount to request in state funding is set forth in the remainder of the memo.

Planning for 2021-23 Operating and Capital Budget Requests

Washington State enacts budgets on a two-year cycle, effective on July 1 of each odd-numbered year. The budget approved for the 2021-23 biennium will be effective from July 1, 2021 through June 30, 2023.

The RCO will submit its 2021-23 biennial budget request to OFM in September 2020. The board will make decisions at its August 2020 meeting regarding the amount of state funds that RCO should include in its operating and capital budget requests related to salmon activities and programs.

The Economic and Revenue Forecast Council released an April 2020 budget outlook to provide an early look at the state of the economy given the COVID-19 pandemic. This is a preliminary analysis. The formal economic and revenue forecast will be completed in June 2020, but early numbers show collections down by nearly $3.8 billion by the end of the current biennium and down another $3.3 billion in the 2021-23 biennium. The Council made it clear that this unofficial forecast comes with substantial uncertainty given that state tax data are not yet available for March and April. They also acknowledged that there will likely be changes to the revenue forecast in June but declined to speculate on the size of the impact.

On May 13, 2020, the Governor and OFM director issued several directives aimed at addressing COVID-related impacts to the current budget. Agencies are directed to freeze all hiring, large equipment purchasing, and new personal services contracts, with some exceptions. Agencies are also asked to prepare plans to cut 15 percent of their general fund expenditures. RCO has articulated our concepts for making these reductions to OFM but will be submitting the actual plan with specific reductions by June 1. We assume that we will be asked for a similar reduction in our general fund carry forward level in the 2021-23 budget requests but have not yet received guidance in that regard. We also do not have any guidance from OFM about reductions to the next capital budget, and as a result, do not know yet how large of a budget reduction we will take and how any reductions will impact salmon recovery funding.

We believe the capital budget for 2021-23 will be less impacted by the coronavirus pandemic than the operating budget, but bond capacity is expected to be reduced from the projected levels. The current bond capacity projection for 2021-23, based on the

February 2020 official revenue forecast, is $3.3 billion. However, given the April 2020 unofficial forecast, the 2021-23 bond capacity would be reduced by $205 million. This adjustment is expected to be further refined, most likely further reduced, by the June 2020 forecast.

While RCO administers many capital grant programs, this memorandum focuses on funding for the Salmon Recovery Funding Board grant program. Other salmon recovery focused grant program funding level requests will be decided based on recommendations from other state agencies who jointly manage those programs (Estuary and Salmon Restoration Program, Puget Sound Acquisition and Restoration Program, Coastal Restoration Grants, Brian Abbott Fish Barrier Removal Board, and Family Forest Fish Passage Program).

Operating Budget

In the operating budget related to salmon activities and programs, RCO will once again request a portion of lead entity funding – approximately 33 percent of the total funding needed for the biennium. Given the enormous reductions in state general funds predicted in 2021-23, we expect our general fund carry forward number will be reduced by at least 15 percent, and we may be asked to reduce our carry-forward levels even further. We are currently working with the lead entities on addressing the general fund reductions in the current biennium. By the time of the board meeting, we will be able to share the reduction plan submitted to OFM.

Capital Budget

Of the six salmon programs administered by RCO, five are managed jointly with other agencies or organizations: Estuary and Salmon Restoration Program (ESRP), Puget Sound Acquisition and Restoration Program (PSAR), Coastal Restoration Grants, Brian Abbott Fish Barrier Removal Board Grants, and Family Forest Fish Passage Program (FFFPP). The Salmon Recovery Funding Board has exclusive authority over the SRFB grant program and shares authority over the Puget Sound Acquisition and Restoration Program with the Puget Sound Partnership.

This discussion will focus exclusively on the Salmon Recovery Funding Board grant program. Budget requests for the other grant programs will be set in consultation with the other managing agencies. The board will be asked to support the funding requests in those other grant programs.

Salmon Recovery Funding Board Grant Program

A couple of factors can influence the amount of capital funding RCO requests for the state portion of the Salmon Recovery Funding Board grant program:

1. The amount needed to match federal Pacific Coastal Recovery Funds (PCSRF).
2. The number of project applications and their requested funding amounts.

Federal Pacific Coastal Recovery Funds Match

PCSRF provides a significant portion of the funds necessary for salmon recovery in Washington and requires a minimum 33 percent match from the state. The state bond funds appropriated for the Salmon Recovery Funding Board grant program are used for match. In years when the Legislature has appropriated less than the full 33 percent, RCO has relied on a portion of the bonds appropriated for the Puget Sound Acquisition and Restoration and Family Forest Fish Passage programs to meet our match requirement. However, this is risky as the Puget Sound Partnership may need to use PSAR as match for federal funding it receives from the Environmental Protection Agency (EPA).

The 2018 and 2019 PCSRF awards brought in $37.445 million of federal funds ($18.8 million for 2018 and $18.645 for 2019), and the minimum state match was $12.4 million. However, not yet knowing the federal awards for years 2020 and 2021, we should assume that Washington will receive a similar amount to the most recent awards, which conservatively can be assumed at $18 million. Two $18 million awards would equate to a minimum of $11.9 million in state matching funds needed. For context, table 1 lists historic funding levels of both state and federal funds since 2005.

Table 1. Historic Funding Levels for Salmon Projects (all figures shown in millions)

Biennium	State Request	State Appropriation	Federal Award	State Match Required
05-07	$30.0	$18.0	$47.9	$15.8
07-09	$42.0	$18.0	$46.9	$15.5
09-11	$24.0	$10.0	$54.0	$17.8
11-13	$19.8	$10.0	$50.0	$16.5
13-15	$40.0	$15.0	$40.5	$13.4
15-17	$40.0	$16.5	$38.5	$12.7
17-19	$55.3	$16.5	$37.4	$12.4
19-21	$88.9	$25.0	Estimate: $36.0	$11.9
Average	**$42.5**	**$16.1**	**$43.9**	**$14.5**

Requests for Grant Funding

At the September 2019 SRFB meeting, the board discussed the option of developing salmon recovery project lists in advance of the submittal of the biennial budget request.

The logic of this option was to base the request on actual projects likely to occur in the upcoming biennium and use the list to help justify the funding request.

Following much discussion, the board directed RCO to work with the lead entities to develop a planned project forecast list (PPFL) that shows the two-year work plan for each lead entity and can be used as a basis for our budget request. During this transitional time as we work towards this new list, the plan is for the PPFL to be approved by each lead entity citizen advisory committee but not ranked. Projects will also not have been reviewed by the technical review panel. The list will be used to give the board a more solid basis from which to make its budget request and to illustrate the need to the Governor and Legislature.

Included in that direction to RCO was to set the PPFL funding level to $60 million. This provided an important target to the regions and lead entities from which to meet or exceed their allocations at that level. At the $60 million state capital funding level, the funding categories would include:

- $2.40 million for lead entity pre-design costs
- $0.64 million for Regional Fisheries Enhancement Groups pre-design costs
- $54.49 million for projects
- $2.47 million for RCO administration

Next Steps

Based on the direction from the board, RCO staff will move forward with whatever option(s) the board chooses and prepare draft operating and capital budget requests for board consideration at the August 2020 meeting. Following the board's August meeting, RCO will submit its 2021-23 biennial budget request to OFM in early September 2020.

WASHINGTON STATE
RECREATION AND CONSERVATION OFFICE
Salmon Recovery
Funding Board

Salmon Recovery Funding Board Briefing Memo

Item 5

APPROVED BY RCO DIRECTOR KALEEN COTTINGHAM

Meeting Date: June 11, 2020

Title: Monitoring Panel Update

Prepared By: Keith Dublanica- GSRO Science Coordinator,
Dr. Pete Bisson, Monitoring Panel Chair

Summary
The purpose of this memo is to summarize the monitoring panel's 2019 annual report and 2019-2020 monitoring activities. Dr. Pete Bisson will provide an overview of the monitoring panel's activities, outline key results and lessons learned from the board's monitoring programs, and discuss some of the work ahead for the monitoring panel. Dr. Bisson's presentation will also include an update on the study plan developed by Cramer Fish Sciences for restoration-scale effectiveness monitoring and remote sensing technologies

Board Action Requested

This item will be a:
- ☐ Request for Decision
- ☐ Request for Direction
- ☒ Briefing

Monitoring Panel Annual Report Summary

The monitoring panel chair, Dr Pete Bisson, will brief the board on the panel's review of the board's monitoring program and activities that took place in 2019-2020. The monitoring panel will review its performance evaluation that was completed for two of the components of the monitoring program: Intensively Monitored Watersheds (IMW) and Status and Trends Fish Monitoring (Fish In/Fish Out – FIFO). Dr Bisson will provide an update on the request for proposals (RFP) approved in September 2019 and issued in December 2019, to develop a work plan and study design for the new floodplain and riparian restoration-scale assessment monitoring project utilizing remote sensing and innovative technologies.

Executive Summary of the 2019 Annual Report by the Monitoring Panel

The SRFB monitoring panel conducted a review of the SRFB monitoring program for activities that took place in 2019-2020. The performance evaluation was completed for two of the components of the monitoring program: Intensively Monitored Watersheds (IMW) and Status and Trends Fish Monitoring (Fish In/Fish Out – FIFO). Development of a work plan for the new Floodplain and Riparian Restoration Effectiveness Monitoring project is well underway and the contractor is working with the monitoring panel on elements of study design and site selection. The panel collectively agreed to the recommendations included in this report. The monitoring panel incorporated the same terminology for assigning status as that used by the board's Technical Review Panel: clear, conditioned, or project of concern.

- **Clear projects** are considered technically sound with no recommended changes in program implementation during the coming year.
- **Conditioned projects** are recommended as clear to proceed if the principal investigators agree to specific conditions included within the 2019-20 contract.
- **Projects of concern** have technical weaknesses or concerns specifically identified by the monitoring panel that cannot be rectified without extensively re-designing the project.

In this year's review, two projects received a rating of clear, four projects were conditioned, and no projects met the criteria for projects of concern. Because the Floodplain and Riparian Effectiveness Monitoring Project contractor is completing the work plan for a new study, the monitoring panel did not rate that project this year; however, some of the initial designs and site selection considerations are included here.

The Monitoring Panel – 2019 Annual Report can be found in Attachment A.

The Cramer Fish Sciences – 2020 report, Utilizing Remote Sensing and other Techniques to Assess and Monitor Large Floodplain and Riparian Restoration Projects, can be found in Attachment B.

Utilization of Unobligated Monitoring Funds

There is $662,660 in unobligated monitoring funds from PCSRF awards from FY2018 and FY2019. In funding Memo 6, the board will be asked to approve funding for two monitoring activities using the unobligated monitoring funds, as follows:

- The board will be asked to fund a shortfall of $149,557 for WDFW's Habitat IMW Monitoring Program.

- The board will be asked to fund $339,481 to supplement the $300,000 identified in the 2020 PCSRF application to fund regional monitoring proposals submitted pursuant to board policy. Together these funds will support seven (7) regional monitoring proposals that will be brought to the board for funding consideration in September 2020.

The monitoring panel supports both proposals to use the unobligated monitoring funds.

Strategic Plan Connection

The monitoring panel work is guided by both the allocation and monitoring strategies identified in Goals 1 and 2 of the board's strategic plan. The monitoring panel offers independent and objective reviews of monitoring efforts, in a transparent and proactive forum, of the scientific merit of the proposals, and how they address the varied salmon recovery plans. Goals 1 and 2 of the board's strategic plan focus on prioritization and accountability for investments and projects that best advance salmon recovery efforts.

Attachment A

SRFB MONITORING PANEL ANNUAL REPORT 2020

June 11, 2020

2019-2020 Intensively Monitored Watersheds (IMW), Status and Trend Fish Monitoring (FIFO), and Effectiveness Monitoring Project Recommendations

Monitoring Panel members:

Pete Bisson, Chair, Bisson Aquatic Consulting LLC
Ken Currens, Northwest Indian Fisheries Commission
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TABLE OF CONTENTS

SRFB Monitoring Panel Annual Report 2020

2019-2020 INTENSIVELY MONITORED WATERSHEDS (IMW), STATUS AND TREND FISH MONITORING (FIFO), AND EFFECTIVENESS MONITORING PROJECT RECOMMENDATIONS

EXECUTIVE SUMMARY

The SRFB Monitoring Panel conducted a review of the SRFB monitoring program for activities that took place in 2019-2020. The performance evaluation was completed for two of the components of the monitoring program: Intensively Monitored Watersheds (IMW) and Status and Trends Fish Monitoring (Fish In/Fish Out – FIFO). Development of a work plan for the new Floodplain and Riparian Effectiveness Monitoring project is well underway and the contractor is working with the monitoring panel on elements of study design and site selection.

The panel collectively agreed to the recommendations included in this report. We incorporated the same terminology for assigning status as that used by the SRFB Technical Review Panel, i.e., *clear*, *conditioned*, or *project of concern*. *Clear* projects are considered technically sound with no recommended changes in program implementation during the coming year. *Conditioned* projects are recommended as clear to proceed if the principal investigators agree to specific conditions included within the 2019-20 contract. *Projects of concern* have technical weaknesses or concerns specifically identified by the monitoring panel that cannot be rectified without extensively re-designing the project. In this year's review, two projects received a rating of clear, four projects were conditioned, and no projects met the criteria for projects of concern. Because the Floodplain and Riparian Effectiveness Monitoring Project contractor is completing the work plan for a new study, we did not rate that project this year; however, some of the initial design and site selection considerations are included here.

GENERAL COMMENTS AND RECOMMENDATIONS

1. Overall, most of the IMW and FIFO project leaders provided their annual progress reports by the end of 2019 and we commend them for their timely submissions. As well, our written questions about project details were answered promptly and thoroughly. The monitoring panel continues to suggest that project leads follow the recommended reporting template outlined in our previous two annual reports. Only one project (Skagit

IMW) used this template in their 2020 annual report and we feel that employing it will streamline the reporting process and help eliminate tardiness.

2. Restoration treatments for the IMW studies should be completed or under construction by 2022 unless there are extenuating circumstances for prolonging the treatment period. We understand that delays in funding for restoration are often beyond the control of investigators, but the monitoring panel believes it is counterproductive for restoration treatments in IMWs to continue with no clear concluding date because prolonged treatment periods can confound statistical study designs and post-treatment monitoring periods can become even longer and possibly unrealistic. Continued funding for monitoring without completing treatments in a timely manner will not yield answers to the questions IMWs were designed to answer unless treatments are implemented on a schedule that facilitates proper scientific evaluation within a reasonable period. We do acknowledge that IMWs receiving funding from multiple sources may continue implementing treatments as per their other contracts, but for most SRFB-funded IMWs, treatments should be concluded soon. We are pleased to report that restoration is complete or nearly complete in the Asotin and Strait of Juan de Fuca IMWs.

3. A fall teleconference or meeting with the monitoring panel should occur with IMW project leads. The discussion should cover recent progress, restoration implementation scheduling, staffing needs, and annual reporting.

4. Occasional field trips to selected IMW or FIFO sites should be continued. Visits to restoration and monitoring sites give the monitoring panel an opportunity to better understand the progress and challenges specific to each location and to interact in person with project leaders. In 2019 the monitoring panel visited the Strait of Juan de Fuca IMW and in 2020 we are planning to visit the Skagit IMW.

5. The monitoring panel will continue to facilitate an exchange of ideas between the Effectiveness Monitoring project team and Council of Regions members so that the new project can maximize its relevancy to the variety of floodplain and riparian conditions throughout the state.

Covid-19 Considerations

The monitoring panel understands that the coronavirus outbreak of 2020 has imposed numerous hardships on project leaders and staff members, resulting in delays to project and monitoring implementation. We are aware, for example, that smolt trapping this spring has been largely suspended due to the need for social distancing during field operations. We also understand that planning and permitting activities for remaining restoration actions are likely

to suffer delays, and although we are calling for all restoration projects in IMWs to be completed by 2022, some setbacks may be unavoidable. When such delays occur, we ask that project leads keep the monitoring panel informed so that monitoring and reporting schedules can be adjusted accordingly. The health and safety of project staff should take precedence over other considerations.

Project-Specific Recommendations

PROJECT NAME	STATUS
Asotin IMW	**CONDITIONED**

Monitoring Panel Recommendation:

Last year the SRFB MP conditioned this project and made two recommendations to be included in the project agreement:

a. In the 2019 annual report, include a summary of the approximate amounts and costs of post-treatment wood supplementation at treatment sites. Include, if possible, a graph or table of wood added over time to replace wood lost from the post-assisted log structures. Address the question of whether maintaining desired wood loading in the streams exceeds the initial cost of installing the structures, and whether maintenance costs are likely to increase or decrease over time.

b. Provide an update on the status of Asotin Creek riparian restoration, including the types of vegetation re-introduced to riparian areas and the rate of desired plant community development.

We are again requesting that this year's annual report address the request in part a. above. We understand that the Asotin IMW project is not monitoring the success of riparian re-vegetation efforts; however, we would like a brief update on what has taken place to restore native riparian plant communities. Without providing for the long-term recruitment of large wood to the channels through re-establishment of riparian trees there seems to be little hope of maintaining target wood loads in the streams over time.

Hood Canal IMW	**CONDITIONED**

Monitoring Panel Recommendation:

Include in the 2020 annual report a table giving the category of restoration actions completed (e.g., large wood addition, culvert or bridge replacement, floodplain reconnection), the specific metrics being used to evaluate the efficacy of each type of restoration action, and the estimated number of years of post-treatment monitoring that will be necessary to detect a treatment-related change in the target fish population. It is necessary for the SRFB to understand approximately how long the Hood Canal IMW study will need to be continued to produce useful answers about habitat restoration in low elevation Puget Sound streams.

Lower Columbia IMW	**CONDITIONED**

Monitoring Panel Recommendation:

The 2020 annual report should include a more complete description of how restoration actions have changed habitat quality in the two treatment streams.

Skagit IMW	**CLEAR**

Monitoring Panel Recommendation:

The monitoring panel feels that the Skagit IMW should be supported and that no conditions need be added to the 2020 contract.

Strait of Juan de Fuca IMW	**CONDITIONED**

Monitoring Panel Recommendation:

a. The 2020 annual report should provide an update on changes in habitat conditions in the two treatment watersheds and a discussion of how these changes have affected target fish populations. It should update the status of habitat data collection, and state whether or not the sponsors intend any additional data collection post-treatment.

b. Undertake a large wood budget in 2020 that will better assess the quantity, location, and movement of large wood that has occurred in the treatment and reference watersheds.

c. Complete the Historic Photo Analysis begun in prior years. At a minimum, pick a sub-reach of each of the three streams to determine if an analysis of the photos will inform the habitat restoration objectives of the study.

d. Submit an annual report by 12/31/2020 focused on recent accomplishments and progress made in meeting any conditions applied during the current evaluation period. The monitoring panel also strongly suggests that the reporting template developed by the SRFB and provided by GSRO is used in 2020.

Status and Trends Fish Monitoring - CLEAR
FIFO

Monitoring Panel Recommendation:

The monitoring panel feels that the Status and Trends Fish Monitoring project should be supported and that no conditions need be added to the 2020 contract.

INTRODUCTION

The SRFB Monitoring Program consists of four components: 1) Implementation (compliance) Monitoring, 2) Project Effectiveness Monitoring, 3) Intensively Monitored Watersheds, and 4) Status and Trends Fish Monitoring (also referred to as Fish In/Fish Out). The Governor's Salmon Recovery Office (GSRO) commissioned a report in 2014 that summarizes the current SRFB Monitoring Program[1]. The report describes the evolution of each component of the monitoring program and provides greater detail on the operation of each component. The focus of the monitoring panel's work and thus the recommendations within this report relate to Intensively Monitored Watersheds and Status and Trends Fish Monitoring. Five IMWs were included in the review: four are in western Washington (Hood Canal, Lower Columbia, Skagit, and Strait of Juan de Fuca complexes) and one in eastern Washington, the Asotin IMW in the Snake River Salmon Recovery Region. Status and Trends Fish Monitoring is a statewide program conducted by the Washington State Department of Fish and Wildlife, of which SRFB funds support less than 10% of the overall program. SRFB funds are used directly to support the following specific elements of the overall fish in/fish out monitoring effort: Touchet River juvenile summer steelhead; Grays River juvenile coho salmon and steelhead; Wind River adult coho salmon; Salmon Creek adult and juvenile summer chum salmon; Snow Creek adult summer chum salmon, and

[1] Crawford, B. 2015. The 2004-2014 Monitoring Program. Washington Salmon Recovery Funding Board and Fish Friendly, Inc., Olympia, WA. http://www.rco.wa.gov/documents/monitoring/WSRFB-MonitoringProgram_2004-2014_Dec%202015.pdf

Snow Creek adult and juvenile steelhead; and Duckabush River juvenile summer chum salmon, Chinook salmon, and steelhead. It is important to note that some of these projects include both adult and juvenile fish estimates; others focus on either adults or juvenile emigrants.

GSRO asked the monitoring panel to evaluate the technical soundness of each monitoring component and provide recommendations to the SRFB that can be used to help inform monitoring program direction and funding. Specifically, GSRO has asked the panel to provide recommendations to the board on the following:

- Is the SRFB's monitoring program asking the right questions?
- How well are the contractors performing the work – and are there recommended improvements needed?
- Should the SRFB continue to fund the current monitoring components or modify how they are funded or implemented?

In initiating the evaluation, the following questions framed the review:

- Is the monitoring component functioning at a satisfactory level overall?
- Does the composition and administrative structure of the project team facilitate the project's success?
- Are study objectives clearly identified and adhered to?
- Will the experimental design meet the study objectives?
- Are adequate quality control measures in place?
- Will the data and results be useful for salmon recovery?
- Is there a plan and venue for sharing the results of the findings?

The monitoring panel developed the suite of criteria for evaluating each monitoring component in September of 2014, such that the panel's expectations could be clearly articulated to monitoring practitioners in advance of new contracts being initiated. The panel updated reporting requirements in the fall of 2015 and provided project leads with a description of what should be included in their 2019 annual reports.

Principal investigators of each project had an opportunity to respond in writing to monitoring panel questions regarding their annual reports, after which the panel completed comment forms for each project. Monitoring panel members reviewed each project independently and then conferred to identify a status rating and develop recommendations for the SRFB. Not all panel members initially

recommended the same status rating for each project, but where opinions diverged the panel discussed the issues and arrived at a consensus rating.

Project status was documented in a comment form for each monitoring project (each IMW had its own comment form; there was a single form for the Status and Trends Fish Monitoring). The comment forms include any condition language recommended for inclusion by GSRO in the project agreement for the coming year. Conditioning language for each project has also been included in full in the body of this report, along with general observations and comments about the research study. The assessment forms follow the same terminology for assigning status as that used by the SRFB Technical Review Panel, i.e., clear, conditioned, or project of concern.

Clear projects are those that are technically sound and the monitoring panel does not recommend any changes in how the program is being implemented in the coming year. Comments pertinent to successful completion of the project may be included in the recommendation but do not need to be added as contract conditions.

Conditioned projects are those projects which are cleared to proceed with specific conditions to be included within the 2020-2021 contract.

Projects of concern have technical weaknesses or concerns specifically identified by the monitoring panel that the panel believes cannot be rectified without substantially re-designing the project or improving the quality and/or timeliness of outputs.

Several projects conditioned this year were also conditioned in the 2019 review process; however, the panel felt that sufficient progress was made to warrant assigning a status of conditioned again, rather than project of concern. Progress made in addressing panel concerns is noted in the body of the assessment form for each project. The panel divided its findings into general recommendations applicable to two components of the SRFB Monitoring Program (Intensively Monitored Watersheds and Status and Trends Fish Monitoring), and recommendations specific to each project.

INTENSIVELY MONITORED WATERSHEDS

The monitoring panel believes that the SRFB's Intensively Monitored Watershed monitoring component is a critical element in understanding the causal relationships and mechanisms affecting salmonid population trends and that IMWs will help inform pathways to recovery for fish populations listed under the Endangered Species Act. Five IMWs in the SRFB IMW program were reviewed by the panel this year: Asotin, Hood Canal, Lower Columbia, Skagit, and the Strait of Juan de Fuca.

We continue to have concerns about the extended restoration treatment application period being experienced by some IMW studies. Assumptions underpinning the Before-After, Control-Impact (BACI) experimental design are compromised when treatments are spread over many years. This can be especially problematic when different types of habitat improvement actions occur in the same watershed over a long period of time, as it becomes difficult to associate changes in fish populations with a particular type of restoration action such as wood addition, riparian revegetation, or culvert replacement when multiple treatments are implemented simultaneously. However, we do acknowledge that funding for restoration actions has often not been available within the time window originally envisioned when the projects began. In such cases, we support continued restoration only where it can be shown that it is consistent with the original study plan (e.g., the restoration treatment will be large enough to expect a detectable response within a defined time period) and that it will not result in the need to monitor post-treatment recovery for many more years. As a general recommendation, we feel that restoration treatments should be in place or under contract by 2022 unless there are clear and unavoidable reasons for extending the treatment period.

Asotin IMW

The Asotin Creek Intensively Monitored Watershed project was implemented in 2008. The focal species are naturally reproducing summer steelhead. Based on previous habitat assessments and preliminary IMW monitoring, it was decided that riparian function and instream habitat complexity were impaired. The long-term restoration goals are to implement fencing, native plant revegetation, and weed control to enhance riparian function. The short-term restoration goals are to add large woody debris (LWD) to increase habitat diversity and promote a more dynamic channel (e.g., increase sediment sorting, pool frequency, and floodplain connection). The IMW is testing the effectiveness of the short-term goals at increasing steelhead production and productivity in Charley, North Fork, and South Fork Asotin Creeks, using a staircase experimental design where a different study creek was restored in different years starting in 2012 and ending in 2016. Each stream is divided into three 4 km long sections and one or more sections has been restored in each stream with the remaining sections acting as controls. A total of 654 large woody debris structures have been installed at an average density of 4.7 structures per 100 m in the treatment sections. A total of 14 km has been restored (~39% of the study area) and 22 km remains as controls (61% of the study area). LWD has been supplemented in treatment sections as needed based on our adaptive management plan informed by annual habitat survey results. The purpose of adding more wood has been to keep the density of wood high in treatment sections compared to control areas to mimic, promote and eventually sustain processes of wood accumulation, creation of habitat complexity and floodplain connection. Extensive habitat sampling and fish Passive Integrated Transponder (PIT) tagging and re-sighting have been used

to estimate changes in habitat and juvenile steelhead abundance, growth, survival, movement, production, and productivity in each experimental section. There are five PIT-tag interrogation sites within Asotin Creek that are used to monitor adult and juvenile PIT-tagged steelhead movement in the Asotin Creek watershed – three of these sites (ACM, ACB, AFC) were upgraded with new equipment in 2018.

The Asotin Creek IMW is perhaps one of the more robust effectiveness monitoring studies in the region. The study uses a hierarchical-staircase design, which is a complex BACI-type design, and incorporates complex models including geomorphic (GUT), bioenergetic (NREI), and mark-recapture/re-sight (Barker) models to assess treatment effects. Importantly, this study uses "active" adaptive management to test the effects of large wood treatments on habitat complexity and steelhead abundance, growth, survival, movement, and production. The study is one of a few IMWs where implementation of enhancement actions is largely under the control of the investigators and large wood addition is the primary enhancement action. Thus, this project is less likely to suffer from confounding effects common to most IMWs in the region.

Although investigators are still collecting post-treatment data, they are finding positive responses in habitat conditions and juvenile steelhead densities and capacity estimates. It appears too early to demonstrate significant responses in steelhead survival and productivity. Thus, the study needs to continue as planned. Although we have questioned the possible lack of independence between treatment and control sites, the investigators are convinced based on marking studies that steelhead mostly remain within study sites (i.e., juvenile steelhead do not move among sites during rearing). Thus, response variables such as survival and production may not be confounded because of a lack of independence. Unfortunately, the investigators have been unsuccessful finding a suitable control watershed. However, they do not believe this will affect their ability to identify responses at the population/watershed scale.

The Asotin Intensively Monitored Watershed project provides an interesting contrast and alternative approach to the four IMWs in Western Washington. Whereas the western Washington IMWs are found near major estuaries or drain directly into marine waters in the Coast Range and Puget Lowland ecoregions, the Asotin IMW is located in the arid Columbia River Plateau, a long way from any major estuary.

Responsiveness to Monitoring Panel Comments in 2020

Project leads provided thorough responses to the monitoring panel's questions. The main request was for more supporting information to supplement the summary conclusions in the 2019 annual report, and we received a 15-page response. The responses did provide justification for the annual report's conclusions, although project leads did note that additional analyses remain to be completed.

Project leads also provided responses to questions about density dependence, lack of independence, selection and use of a reference/control watershed, statistical analysis, and spawning escapements. As time and funding allow, we do encourage more thought on density dependence. We are pleased to see that the investigators are developing methods to measure channel evolution and will provide more measurements on floodplain change in the future.

The examples provided in the answers to our questions were helpful in linking all the study elements together, seeing how the next steps are related, and the strength of the protocols and results to date. This level of reporting also allows the Monitoring Panel a greater opportunity to engage, make connections in the larger community and support the efforts of the IMWs.

Study Limitations and Concerns

By their own admission, project leads acknowledge that sources of funding for this IMW have been fluid. Two years ago, when BPA cut funding for the CHaMP/ISEMP program, a major source of support for habitat surveys vanished; however, the staff has done a good job of maintaining continuity in the habitat mapping effort. Funding for future monitoring remains a concern, but the project leads are exploring new opportunities. We hope they succeed because this project is further along with post-treatment evaluation of restoration than other IMWs and preliminary results look promising.

A major limitation to testing the response to treatments is the magnitude of spring floods, which is beyond the investigators control. As the investigators begin to asks more questions about the mechanisms underlying some of the responses they have documented, maintaining funding to continue to investigate these mechanisms may be a challenge.

Geomorphic and hydraulic results to date indicate that the PALs are effecting changes in channel complexity and ratios of habitat types by area. However, floodplain activation, increased floodplain connections and new wood recruitment are slower to show changes, as discussed on pages 8 & 9 of the annual report. Furthermore, it was stated that “bank erosion and increased meandering are evident near some structures, but banks are generally armored and resistant to rapid change” and the dense, alder-dominated, stream banks contribute to the armoring.

Other Comments

The monitoring panel thanks Asotin IMW project leads for clarifying that short-term assessment of riparian restoration is not being monitored. This has been a source of confusion for a couple of years, and although some riparian restoration (tree planting) has taken place at the treatment sites, this project will not monitor restoration success until sufficient time has passed for target vegetation species to recover.

We support the development of tools to monitor channel evolution. We also support continuing to model and track steelhead smolt-to-adult return rates (SARs) even though survival outside the Asotin subbasin is not part of this IMW investigation. We continue to support estimates of smolts-per-spawner, as this is one of the best indicators to assess the efficacy of habitat improvement actions.

Final Project Status: **CONDITIONED**

Last year the SRFB MP conditioned this project and made two recommendations to be included in the project agreement:

a. In the 2019 annual report, include a summary of the approximate amounts and costs of post-treatment wood supplementation at treatment sites. Include, if possible, a graph or table of wood added over time to replace wood lost from the post-assisted log structures. Address the question of whether maintaining desired wood loading in the streams exceeds the initial cost of installing the structures, and whether maintenance costs are likely to increase or decrease over time.

b. Provide an update on the status of Asotin Creek riparian restoration, including the types of vegetation re-introduced to riparian areas and the rate of desired plant community development.

We are again requesting that this year's annual report address the requests in part a. above. We understand that the Asotin IMW project is not monitoring the success of riparian re-vegetation efforts; however, we would like a brief update on what has taken place to restore native riparian plant communities. Without providing for the long-term recruitment of large wood to the channels there seems to be little hope of maintaining target wood loads in the streams.

Other comments or suggestions for enhancing the approach of this monitoring component:

In Figure 6 of the 2019 Annual Report a conceptual flow chart is presented that identifies key decision points along the implementation timeline of the project. In next year's report it would be helpful to include a table giving the status of each of these decision points, e.g., questions settled, need more data, move on to next action step, etc.

We encourage the continuation of modeling efforts that support a more complete evaluation of the effects of habitat improvements on steelhead productivity in the watershed. Some of the newer modeling methods being employed, including monitoring channel evolution, may help shed light on the primary objectives of this IMW.

The effort to measure individual growth is commendable. The causal factors discussed in the report for the observed reduced growth were seasonal temperatures and flow conditions. With increased juvenile densities in the treatment reaches, food resources can quickly become a limiting factor. This is something to potentially mention/discuss in the future reports.

Hood Canal IMW

The overall goal of the Hood Canal Intensively Monitored Watershed (IMW) project is to test the hypothesis that stream restoration measurably improves salmon habitat quality and population status. The study monitors a series of fish and habitat metrics in four independent streams in Western Washington: Little Anderson, Big Beef, Seabeck (all treatment) and Stavis (control) creeks. These streams are characterized by rain dominated hydrographs, occur at low elevation in the Puget Lowland landform, and flow through mixed rural-residential land use. The study streams suffer from a legacy of industrial-scale logging and rural development. In particular, road crossings have restricted fish passage and impaired hydrological processes. This has resulted in a dramatic imbalance in sediment dynamics, with some reaches (frequently but not always those upstream of undersized culverts) serving as severe deposition zones and other reaches deeply incised. Restoration efforts seek to improve salmon habitat by enhancing stream connectivity and complexity. First, replacing undersized culverts with larger spans aims to improve passage for fish, woody debris, and sediment. Second, reconnecting previously isolated floodplain habitats by removing dikes provides fish access to overwinter habitat in wetlands and allows for more natural patterns of channel migration. Third, large woody debris (LWD) additions are intended to improve habitat complexity, resulting in more sinuous, multi-thread channels with a greater degree of variation in depth and velocity.

The study focuses on coho salmon because of their cultural and economic importance to the region, and because their life cycle, particularly the extended juvenile rearing phase, is dependent on diverse, productive freshwater habitats. Other salmonids are enumerated where they are encountered. Cutthroat trout, fall chum salmon, summer chum salmon and steelhead trout are captured or counted at one or more streams and one or more life stages. The history of restoration in these watersheds, especially how projects were chosen and implemented that confounded the BACI experimental design, reminds us that IMWs are not just a test of how well scientists can assess watersheds, diagnose treatments, and document change. Rather, they are tests of how well a salmon restoration system works that is built on public participation in choosing restoration actions and meeting multiple, conflicting objectives.

Project leads make a good case for continuing to pursue restoration of Seabeck Creek given the potential improvement if the barrier can be removed. In addition, the report provides a clear summary of work and monitoring completed, although reporting of results could be expanded. New tables provide an overview of this multi-year project. A conclusion or discussion section was not provided, but would be helpful to understand how the data should be interpreted and if hypotheses cannot be tested yet, and when we would expect to see results of hypothesis testing. A description of statistical tests that are expected to be used to test hypotheses would also be informative.

Relatively few enhancement actions have been completed with sufficient post-treatment time to evaluate fish and habitat responses, compared to most of the other IMWs. However, investigators did find an increase in coho smolt abundance following the replacement of a culvert near the mouth of Little Anderson Creek, the results of which were recently published. This study indicates that restoring connectivity is an important enhancement action for increasing coho smolt abundance. However, low escapements and high harvest rates raise concerns about whether these streams are at or near full seeding, and whether a full response to enhancement can be detected. Reach-scale monitoring of LWD placement projects indicates increases in pool frequency and depth, but enhancement has not yet occurred at a scale needed to produce watershed or population-level changes in coho parr, smolts, or adults in all treatment streams. Several high-magnitude enhancement projects are proposed for Little Anderson and Seabeck creeks (see Table 2 in the annual report), but these projects are currently not funded. Acquiring funding for replacement of the Seabeck-Holly Road is a significant step in the restoration of the Seabeck Creek watershed. The property purchases in Lower Big Beef Creek are also welcome news, as this will allow for conservation to be the primary land use within the critical reaches of the lower basin, where nearly all restoration efforts in the IMW have been concentrated.

The monitoring panel has commented on the problem of low adult coho escapement to the Hood Canal IMW streams, and the project leads have acknowledged that the high harvest rate of coho contributes to extreme levels of variability in recruitment that make detection of restoration effects on this target species very difficult. At this time, project leads have no control over the harvest of coho in Hood Canal, as fishery quotas are part of a much more complex negotiation process. Nevertheless, we hope that over time some provision could be made to allow more adult coho to escape the fishery and increase recruitment levels in the Hood Canal IMW streams. An increase in adult coho abundance would certainly make achievement of this IMW's study objectives much more attainable.

Responsiveness to Monitoring Panel Comments in 2020

The investigators provided thoughtful responses to the monitoring panel's questions. The investigators responded to questions regarding potential delays in replacing the culvert on Seabeck Creek, fish use of floodplain habitat during winter, trapping operations on Seabeck Creek, effects of harvest rates on spawning escapements, metrics for evaluating density dependence, and habitat responses.

Based on comments from the Monitoring Panel, the authors expanded the tables with information about goals and objectives and indicators to evaluate the impact of restoration on abundance and productivity (Tables A1 and A3). Table A3 could be expanded to include results of hypothesis testing, specifically related to testing changes in the indicators described in Table 3 of the main document. These indicators and results of testing would be helpful to link to the hypotheses for habitat (page 10 and Table A1) and for fish (Table A1). A column could be added to Table A3 with results of statistical comparisons.

Study Limitations and Concerns

The Hood Canal IMW continues to be challenged by two significant problems. First, the target species of restoration (coho salmon) is chronically under-escaped, due in part to a very high adult harvest rate -- upwards of 90% -- as well as a high level of interannual variability in the number of spawning adults. The monitoring panel agrees with the project leads that reducing adult harvest in terminal fisheries is beyond their reach; however, it does result in the streams being significantly under-seeded with coho and therefore not fully able to benefit from restoration actions in an easily measurable way. Second, restoration activities have taken place over an extended number of years and in the case of the proposed Seabeck Creek bridge have not been completed. Over the extended treatment period (2002-2020 from Table 1), the panel encourages the Hood Canal IMW staff to explore alternative metrics of project success as well as novel sampling and analytical techniques.

The Hood Canal IMW continues to be affected by a lack of consistent funding and in Little Anderson Creek by a lack of willing landowners, which has limited the ability to restore over 50% of the anadromous portion of the mainstem. In reviewing the annual report and reading Anderson et al. (2019), a general lack of hypothesized habitat response appears to be occurring, especially in Little Anderson to date. One speculative answer given by the authors is that the extent or intensity of LWD treatment is insufficient to illicit a watershed-level or reach-level change. This issue needs to be further explored to evaluate potential impacts on the study results and if there are adaptive management efforts that should be considered in relation to increasing the intensity of treatments as increasing the extent is limited by lack of access to other reaches.

Other Comments

We have suggested dropping Seabeck Creek from the suite of treatment streams or converting it to a control stream, but project leads have insisted that the new bridge will result in a significant change in sediment routing and fish habitat quality in the channel downstream from the new bridge site and therefore Seabeck Creek should remain a treatment watershed. We hope that construction of the new bridge will be complete by 2021; otherwise, project leads should consider removing Seabeck Creek from the IMW or considering it a largely unrestored reference site.

Final Project Status: **CONDITIONED**

Include in the 2020 progress report a table giving the category of restoration actions completed (e.g., large wood addition, culvert or bridge replacement, floodplain reconnection), the specific metrics being used to evaluate the efficacy of each type of restoration action, and the estimated number of years of post-treatment monitoring that will be necessary to detect a treatment-related change in the target fish population. It is necessary for the SRFB to understand approximately how long the Hood

Canal IMW study will need to be continued to produce useful answers about habitat restoration in low elevation Puget Sound streams.

Other comments or suggestions for enhancing the approach of this monitoring component:

The monitoring panel is pleased that arrangements have been made to continue to operate the Big Beef Creek fish counting facility. It is one of the longest continuously running adult and smolt counting stations in the Puget Sound region.

Other habitat metrics that may be of interest in future reporting to help describe the dynamic conditions and variability within the Hood Canal IMW are percent sands/fines, degree of sinuosity, and changes in thalweg depth.

Lower Columbia IMW

The Lower Columbia IMW stream complex includes Mill, Abernathy, and Germany creeks, three adjacent watersheds that flow into the Columbia River near river mile 55 just west of Longview, Washington. Target fish species for this study are Coho Salmon, Steelhead Trout, and Chinook Salmon. The study is designed to detect changes in fish population and habitat metrics at the watershed scale by testing for differences in trends between the treatment watersheds (Abernathy and Germany) and the reference watershed (Mill Creek; the "reference" classification is defined in the Study Design section). As of 2019, the completed instream habitat treatments in the Abernathy Creek basin have impacted approximately 27% of the habitat accessible to anadromous salmonids, including 10.0 kilometers (km) of instream habitat, 1.0 km of off-channel and side-channel habitat, 0.10 km^2 of riparian area, and 2.7 km of improved fish passage. Of the three projects yet to be completed, two will be completed by early 2020 (these initially were planned to be completed by December 2019 but were pushed back a month due to logistical constraints) and the third is planned to be completed by 2022. One project (Erick Creek Culvert Replacement), was removed from the project list because the benefit of the project was not commensurate with the cost. As of 2019, the completed instream habitat treatments in Germany Creek include 5.5 km of instream habitat, 0.7 km of off-channel and side-channel habitat, and 0.15 km^2 of riparian area, representing approximately 27% of the habitat accessible to anadromous salmonids (the same percentage as the Abernathy basin).

The primary fish population metrics currently monitored include smolt abundance, parr abundance (Coho only), overwinter survival (Coho only), and adult abundance. In addition, biological information (e.g., body size and age) is collected at all life stages. The current study design is set up to assess changes in these metrics (population productivity, growth, and life history) at the watershed scale.

Specifically, for smolt abundance in the Abernathy basin, we have conducted analyses that suggest the restoration impacts are likely large enough for us to detect changes after a minimum of 10 years post-treatment monitoring. This conclusion indicates that post-treatment monitoring should continue until at least 2030.

The Lower Columbia IMW is a well-designed study that links monitoring at the watershed scale with monitoring at the project scale. This linkage allows the investigators to identify possible mechanisms that may explain responses at the watershed scale. The investigators are also adaptively managing the study without compromising the experimental design. This "fine tuning" of sampling methods will help them more effectively identify possible treatment effects. Importantly, they incorporate existing monitoring data, which increases the length of the pre-treatment time series and hopefully statistical power. In addition, the pairing and synchronicity of Mill Creek (reference watershed) with Germany and Abernathy creeks (treatment watersheds) adds precision to the analyses. Finally, unlike many other IMWs, the Lower Columbia IMW evaluates treatment effects on several salmonid species.

Perhaps the greatest challenge of the study is the prolonged implementation of treatments. An extended (and still ongoing) habitat restoration period has made it difficult to estimate how long the study will last until the population level effects of different restoration activities can be evaluated statistically. The overall potential treatment effects appear to be swamped by larger scale, regional environmental variation as well as within-stream variation. The investigators have tried to adapt to these challenges by building smaller-scale project effectiveness monitoring into the project and by investigating different metrics that might be more responsive.

Prolonged monitoring implementation is an issue for most IMWs, especially large IMWs (e.g., Middle Fork John Day and Lemhi IMWs). It does, however, delay responses especially at the watershed scale and increase the duration of post-treatment monitoring. The implementation of multiple treatment types (large wood, riparian enhancement, floodplain/side channel reconnection, and reconnection of tributaries) may make it difficult to identify which treatment types or combination of types resulted in watershed responses. The investigators appear prepared to handle this issue by conducting robust project-scale monitoring. They also include covariates to help identify treatment effects at the watershed scale.

The Lower Columbia IMW project leads have assured the monitoring panel that they are working towards an analysis of habitat data for the 2020 annual report. The panel had questions about the extent of the restoration, perceived density dependence and the continued plans to complete additional restoration. The IMW team has completed a power analysis that indicates that the level of restoration treatments planned should be sufficient to detect a change in smolt abundance in Abernathy Creek and they indicated that they may undertake similar power analyses for overwinter survival and parr abundance. Funded treatments in Abernathy are scheduled to be completed within the next 2 years. In reviewing the 2016 treatment plan update, it appears that the majority of Phase 1

and Phase 3 treatments for Abernathy have been or will be completed, while only two of the Phase 2 projects have been funded or completed. When completed, this will constitute approximately 32% of the anadromous stream treated in some way. This level of restoration is approximately equivalent to the extent of restoration actions on the Strait of Juan de Fuca IMW, which, like the Lower Columbia IMW, is undergoing habitat improvements to correct for past forest management operations.

In contrast, the power analysis for Germany Creek did not indicate that planned restoration will be sufficient to detect a change in smolt abundance and at this point only five of the planned projects have been completed (3 – Phase 1, 1 in each from Phases 2 & 3) with two additional projects funded and planned for completion by 2021. When these are completed, this will constitute approximately 27% of the anadromous stream treated.

Habitat data collection is ongoing and will need to continue for several years post-treatment for the watershed and project-specific monitoring. The question about extent and intensity of treatments warrants further attention. At a minimum, it would be useful at this point to see the analyses from pre- and post-project effectiveness data on completed projects. This could be combined with observations/discussion around the level of quality of treatments implemented and whether or not the suite of projects completed (e.g., lots of Phase 1 and Phase 3, few Phase 2 actions) could limit watershed level habitat response and therefore smolt abundance. Until we see the results of the continued habitat analysis, it may be unknown if the effectiveness of the treatments is concomitant with the extent of the treatments.

Responsiveness to Monitoring Panel Comments in 2020

Responses to the monitoring panel's questions were reasonably complete. It would have been helpful if the data points on Figures 1-3 of the response document (smolts per spawner for each target species in each of the three streams) were labeled according to year, or at least as pre-treatment, during treatment, and post-treatment data points to help the reader see whether habitat restoration was making a difference in smolt production per spawning adult.

The answer to question 2 includes the statement "*Current recovery goals combine all three watersheds and are 1,800 adults for coho, 600 adults for steelhead, and 900 adults for* [naturally spawning] *Chinook*". Because present day escapement levels are far below these recovery targets, due presumably to off-site mainstem river, estuary, and ocean influences, and also because evidence of density dependence in the currently restored treatment streams (Abernathy and Germany creeks) suggests that existing habitats are adequately seeded, it is not clear what the overall carrying capacity goal of the Lower Columbia IMWs should be. In each of the treatment watersheds, 27% of the accessible drainage network has received some form of restoration; however, if the goal is to move the watersheds toward target numbers of returning adults, it would appear that much more restoration resulting in greatly improved habitat quality would be needed to maximize smolt production from both

Abernathy and Germany creeks. The question could be asked – Have we done as much as can be reasonably accomplished to improve habitat quantity and quality in the two treatment streams, and therefore improvements in off-site survival will be needed to increase salmon and steelhead escapement? Or, could we see significant improvements in escapement if we increased the carrying capacity for juvenile salmonids in these streams by a much greater factor?

The intention of asking for the summary tables suggested in the reporting template is to provide a larger picture of the restoration and response at the watershed scale because this is the scale of the response variables, that is, changes in habitat in the watershed and changes in the overall salmonid abundance and productivity expected as a result of restoration. Note that Table 14 in Hartema et al. (2014)[2] summarizes individual projects and evaluates response at the watershed scale.

Information for Lower Columbia provided in Tables 1-3 in the report does not include the hypotheses being tested for restoration treatments or the indicators that will be used to evaluate the hypotheses. Goals and objectives would also be informative as context. Goals, results and conclusions have not been provided. It may be too early to report these results, but Tables 7 and 8 indicate that data have been collected. Even if too early, a statement of the hypotheses to be tested, the indicators to be used, and the analysis performed would be informative.

Information in Table B2 provides details on what restoration actions were completed, but does not include the goals of the actions, the indicators used to evaluate the effectiveness, or any conclusions. Table 14 in Hartema et al. (2014) provides a simple example.

Study Limitations and Concerns

The extended treatment period (2012-2022) will make it difficult to determine pre- and post-treatment effects on smolt production, as will the interannual variability in numbers of spawners and smolts per spawner ratio. The statistical challenges of demonstrating a measurable improvement in response metrics deserves to be more thoroughly discussed in future reports.

Many habitat and fish metrics are not showing significant responses to restoration, although the slight increase in coho in recent years is encouraging. Nevertheless, the lack of measurable responses for most of the metrics evaluated is a concern.

Final Project Status: **CONDITIONED**

The 2020 annual report should include a more complete description of how restoration actions have changed habitat quality in the two treatment streams.

[2] http://your.kingcounty.gov/dnrp/library/water-and-land/habitat-restoration/lower-boise-creek/boise-creek-monitoring-report-2013.pdf

Other comments or suggestions for enhancing the approach of this monitoring component:

All restoration treatments should be completed by the end of 2022.

Suggestion for future trend roll-up and easy comparison of habitat metrics to compliment statistical figures 7 and 8 in report: explore using trend line graphs either showing all three creeks (median values) on the same graph or annual % difference from reference "baseline" to show change over time.

Skagit IMW

The monitoring panel appreciates that the Skagit Intensively Monitored Watershed Annual Report followed the suggested annual reporting template. The Skagit River estuary summary of 2019 activities was the only IMW annual report to do so.

Chinook salmon originating from within the Skagit River basin are the focal species of the Skagit IMW. Skagit Chinook salmon make up six of the twenty-two independent populations of Chinook salmon within the Puget Sound ESU. Each population is listed as 'threatened' under Endangered Species Act. Skagit chum salmon and coho salmon are also expected to benefit from Skagit estuary restoration. Skagit chum salmon and coho salmon area not listed under ESA; however, Skagit chum salmon like many other Puget Sound chum stocks are declining and at low abundance. In 2019, long term IMW monitoring was leveraged to evaluate the causes of Skagit chum salmon declines.

Research findings described were developed into predictive tools to estimate benefits of potential estuary restoration, thus linking restoration to the quantitative recovery goals for Skagit Chinook salmon. The Skagit Chinook Recovery Plan goal for estuary habitat restoration is to increase juvenile Chinook salmon carrying capacity of the Skagit estuary by 60%, from 2.25 to 3.6 million estuary rearing smolts annually. As salmon recovery actions are implemented, candidate Skagit estuary restoration actions must be vetted through a local (Skagit watershed) and regional (Puget Sound ESU) salmon recovery plan process. Each project must be consistent with the goals of the Skagit Chinook Recovery Plan. The Skagit IMW effort highlights the importance of life history diversity and estuarine density dependence in regulating juvenile Chinook salmon population dynamics. The findings are most specifically applicable to Salish Sea natal Chinook salmon populations dominated by subyearling migrants and a watershed with an existing or historical tidal delta estuary.

Overall, the Skagit estuary is gaining more habitat than it is losing with habitat restoration being the most important reason for these gains. Direct human causes of lost estuary extent have been minor. Natural gains and losses of estuary habitat have also been documented, with a net loss observed. The largest area of loss is along the bay front of Fir Island where the estuary is sheltered from river

sediment deposition and more exposed to wave caused erosion. Starting in 2000, there has been a systematic effort to restore estuary habitat, resulting in eight completed projects and 653 acres of habitat restored to tidal inundation. Within the next five years, four additional restoration projects are anticipated to be completed, totaling 398 acres.

Skagit estuary restoration is working to the benefit of juvenile Chinook salmon and there are some preliminary conclusions:

• *If you build it, they will come!* All monitored projects in all years after restoration have juvenile Chinook salmon using the restored habitat. What is the reason for this result? The Skagit River produces ample numbers of out-migrating Chinook salmon fry (millions), but has limited estuarine habitat to support them. It stands to reason that fish would immediately take advantage of newly restored habitat.

• *Some restoration designs work better than others*. Generally, restoration projects that have muted natural hydrology patterns or have limited connectivity to adjacent river channels and the source of fish that colonize restored habitat perform poorer than projects with higher connectivity.

At the population level: a) juvenile Chinook salmon become less crowded in the estuary as restoration increases habitat opportunity, and b) the length of fish residence in the estuary increases as restoration increases. Less supported but encouraging results from full system analyses suggests: c) reduced frequency of fry migrants in marine habitats and d) higher smolt-adult return (SAR) rates as restored area increased. Detecting future changes to the fry migrant and SAR metrics might be expected to require years of high abundance when the benefits of restoration are most fully realized and/or a larger restoration treatment effect. Alternately, scenario testing using various life cycle modeling techniques may be able to test the consequences of cumulative restoration when large outmigrations have occurred. These efforts are currently under development.

While restoration efforts have been responsible for the net increase in Skagit tidal delta extent, the current pace of restoration will not achieve the Skagit Chinook Recovery Plan's desired future condition (DFC) for estuary habitat extent until 80-90 years from now. Moreover, assuming natural losses of estuary habitat continues, additional restoration will be needed to offset the chronic natural loss of marsh. Project leaders recommend increasing the current pace and magnitude of tidal delta restoration to: (a) realistically achieve DFC near the midpoint of a 50-year recovery plan implementation period and (b) maintain DFC over time. Within the next five years, four additional restoration projects are anticipated to be completed, totaling 398 acres.

The project has several strengths, including a long time-series of monitoring prior to implementation of big restoration projects, working from data-driven hypotheses, and strong collaborative effort with federal agencies, Washington Department of Fish and Wildlife, and Indian Tribes. The Skagit IMW is

one of the few intensively monitored watershed projects to demonstrate statistically positive system-level response to restoration by juvenile Chinook salmon so far and the investigators have done a good job of analyzing and publishing results. As such, the results have broad applicability to other watersheds where much less is known.

This IMW incorporates before-after (BA) and before-after/control-impact (BACI) designs with treatments added to the South Fork Skagit River, while the North Fork Skagit River serves as the control. The implementation of enhancement actions so far has increased the capacity of juvenile Chinook salmon in the estuary. Investigators have documented longer rearing periods in the estuary and near-shore habitats and higher densities of juvenile Chinook. The increased capacity within the estuary has not yet translated into higher marine survival; although, there is some evidence that smolt to adult return rates increase as restored area increases. Detecting marine survival effects will likely require several years of high spawning escapements and larger treatment effects. This study demonstrates the difficulty of planning enhancement work within the context of a structured research plan. That is, limited opportunities for estuary enhancement work often dictate where and when restoration actions can be implemented. In addition, funding is often limiting, and estuary enhancement projects compete with other recovery actions for scarce funds.

Responsiveness to Monitoring Panel Comments in 2020

Responses to the monitoring panel's questions were thoughtful and complete. The investigators responded to questions regarding issues associated with beach seining within random sites, future directions, reasons for reduced juvenile Chinook abundances, plans for expanding the scope and timing of restoration actions, data management, and additional research questions. The panel appreciates the additional information on the Chinook salmon hatchery release study. We understand the hatchery release study will provide useful information on the effects of release timing on marine survival and contributions to fisheries; however, it will increase sampling effort and may exceed the limits of ESA-take permits. The panel trusts these issues can be resolved and they will not negatively interfere with the sampling of natural-origin Chinook in the estuary.

The panel appreciated the investigators making the distinction between the timeframe to achieve recovery based on current pace (80-90 years) and the timeframe needed to answer the fundamental questions of an IMW investigation, which is much shorter. Decision makers are sometimes surprised to find out that after investing a lot of money in IMWs to detect a response, the recovery work is not yet done.

Study Limitations and Concerns

Uncertainties about the amount, pace, and scope of future restoration actions may, as the 2019 annual report points out, make it difficult to achieve Chinook salmon recovery goals until many decades in the

future. This is a problem over which the team has little direct control; however, we appreciate that they are aware of it and in any case have already contributed to the knowledge of the estuary ecology of Chinook salmon in Puget Sound. Tables 3 & 5 are useful in understanding these limitations and how they affect the implementation of the IMW. There may need to be more discussion on how the lack of adequate levels of treatment will affect the results of the analysis in the future. Table 5 indicates that 4-5 additional projects totaling 398 acres of treatment area could be implemented within the next 5 years if plans come together. This would continue data collection and analysis until at least 2026 or beyond.

Historically, one of the main challenges faced by this project is landowner unwillingness to implement projects. As in other IMWs, principal investigators also note that because restoration treatments for the IMW are part the overall salmon recovery actions for this watershed and not simply experiments, they are vulnerable to political decision making about which restoration projects are important, and which can confound experimental designs and analyses. This year, they noted that a hatchery release experiment conducted by the Washington Department of Fish and Wildlife may confound the original experimental design and sampling. Another potential limitation to this IMW is funding security. The current SRFB IMW funds are only enough to pay for data collection and management. Other aspects of the IMW (data analysis, reporting, planning, etc.) rely on outside funding. This puts the IMW at risk of not producing the required reporting documents if outside (non-SRFB) funding is not secured. Nevertheless, the project appears to have committed funding from several partners.

Other Comments

Regarding section 2.2 (key findings to date) of the annual report: it is appreciated that the Skagit IMW is providing feedback on the variable effectiveness of different restoration efforts. This information is critical for guiding future restoration efforts. A discussion on observed effectiveness of project types and project implementation and its influence on the IMW efforts would be a good discussion to have among all of the IMW groups.

The long-term commitment of the tribes and co-managers to monitoring and testing hypotheses about Chinook salmon responses to recovery actions, which began well before the IMW, suggest that this project may be less vulnerable to changes in SRFB funding to IMWs than other projects.

The discussion of limiting factors for the Skagit IMW is one of the best treatments of the required limiting factors sections from any of the IMW practitioners.

Final Project Status: **CLEAR**

The monitoring panel believes the Skagit IMW should be supported and that no conditions need be added to the 2020 contract.

Other comments or suggestions for enhancing the approach of this monitoring component:

The panel appreciates the ongoing effort at troubleshooting the development of a data integration and query system. We hope the resulting data management system will be publicly accessible.

Strait of Juan de Fuca IMW

Implementation of watershed-scale restoration treatments was initiated in 1998 and has continued to date. This twenty-year effort has required numerous individual grants for each action and has been hindered by both ongoing land uses and difficulty accessing the entire watershed to implement treatments. The study design for the Strait of Juan de Fuca IMW uses three watersheds: East Twin River, West Twin River, and Deep Creek. Deep Creek and the East Twin River were identified as the watersheds that would undergo "full restoration", meaning all possible and identified projects would be implemented. West Twin River was identified as the control watershed, where no restorative actions would be taken, and thus it would only be monitored. The overall goal was to see if, over time, there would be a significant difference in fish abundance at the juvenile and adult salmonid life stages between each of the watersheds that could be correlated to the difference in restorative actions taken. Thus, the main question identified in association with the overall study design was - Do increased wood loadings of placed logs and log structures, coupled with other site-specific restorative actions such as barrier removal, road decommissioning, and floodplain connection, lead to a watershed-scale response in habitat conditions and salmonid populations over time?

The Strait of Juan de Fuca Intensively Monitored Watershed project completed its 16th year in 2019 attempting to answer the preceding questions. In early 2018, a retrospective synthesis was submitted summarizing the results of monitoring these metrics from the inception of the project in 2004 through 2016/2017 that focused on these questions in detail. Another report was produced in early 2019 summarizing and focusing upon basic fish metrics, and in particular juvenile salmonid survival. Initially, the Strait IMW was designed to use a before-after control-impact (BACI) experimental design with two treatment watersheds (East Twin River and Deep Creek) and one control watershed (West Twin River). However, collecting several years of pre-project data was not possible and initial restoration efforts began in the two treatment watersheds at the same time or slightly before baseline monitoring. Investigators have thus used an intensive post-treatment design and are examining differences in fish and habitat temporal trends among treatment and control watersheds.

Adult returns are estimated for the IMW watersheds for steelhead and coho salmon. The 2018-2019 adult coho salmon return were the offspring of the 2015-2016 return, which was the lowest coho salmon escapement measured to date. The low numbers of adults from the 2015-2016 adult class has

been broadly attributed to poor marine survival conditions associated with the North Pacific "blob". These results suggest that marine survival has had a potentially negative effect on Strait IMW coho salmon. Smolt production estimates for 2019 were above long-term historic averages for all watersheds for coho salmon. The 2019 Deep Creek coho production estimate was the largest at 14,065, approximately 20% above the long-term average (Figure 3). East Twin River and West Twin River were 33% above their long-term averages. Juvenile steelhead survival in 2018 was below the normal survival estimates for the majority of the sampling locations in East Twin River, West Twin River, and Deep Creek.

Studies of coho salmon rearing in Strait IMW streams have revealed the existence of a density-dependent relationship between abundance and survival rate. As juvenile coho salmon density increases, the maximum average overall survival in any of the watersheds decreases. Strait IMW research has not yet statistically demonstrated that this density-dependent relationship has been altered by restoration actions.

The results of the otolith microchemistry work, confirming four successful life history pathways for coho in the basin, is exciting. The forthcoming determination of the proportion of successful adults by life history pathway will be important, and if it holds as a general pattern regionally, it will be a significant contribution to our understanding of how to monitor coho salmon populations.

Investigators for the Strait of Juan de Fuca IMW completed a synthesis report summarizing 14 years of monitoring early in 2018, which the Panel has already reviewed. The 2019 annual report summarizes activities, data, and analyses done since then. New analyses include refining the identification of different life-history strategies for Coho salmon based on otolith analyses.

Members of the monitoring panel visited the Strait IMW study sites in autumn 2019 and met with project leaders. The field trip was helpful and informative.

Responsiveness to Monitoring Panel Comments in 2020

The investigators provided thoughtful responses to the panel's questions. They responded to questions regarding otolith sampling, channel morphology metrics, percentage of the migration period that traps are inoperable, and effects of flows on trapping efficiency. The panel also asked for figures showing the relationship between spawners and juvenile per spawner. The investigators provided a time series of juveniles per spawning adults but not figures showing the relationship between spawers (x-axis) and juveniles/spawner (y-axis). The panel would be interested in seeing the relationship between productivity and spawning escapements over time.

Study Limitations and Concerns

The annual report mentions three monitoring aspects of the study that remain unfinished or problematic. These include (1) a time-series of photographs showing restoration changes in the stream channel and adjacent riparian vegetation, (2) a wood budget showing the persistence and movement of emplaced large wood – the primary restoration action – in treatment streams, and (3) continued problems with the PIT-tag detectors in the lower reaches of the sites. Replacement of outdated PIT-tag readers with more modern and efficient equipment is estimated to cost $27-38K. The monitoring panel hopes each of these can be addressed in 2020.

Habitat metrics were collected annually from 2007-2016 using the EMAP protocol for a random sampling of 20 sites and the TFW methodology for individual restoration sites. To date, their reporting has consisted of a comparison of 4 habitat metrics distilled from the EMAP and project sites including comparisons of number of LWD, percent pools, percent gravel, and Bankfull Width/Depth ratio. Inter-annual variability is considerable at all sites, including the control, and confounds their ability to draw significant conclusions on the effectiveness of restoration treatments in East Twin and Deep Creek despite a couple of years showing increases in percentage of pools and gravel. These trends have not persisted throughout the survey period, however. In addition, the methodology for collecting LWD information appears to under report as treatments have added hundreds of pieces of wood to both systems.

The Straits team continues to collect observational information that indicates that LWD is retained in the system and is having positive effects on channel complexity, habitat diversity and increases in floodplain connection where possible. At this time, it is somewhat unclear if formal habitat data collection continued after 2016, and though some habitat results were presented in the 2017 report, a full analysis has yet to be presented. This analysis along with a wood budget has been promised for the last two cycles.

Treatments continued in Deep Creek in 2018 and therefore habitat data collection should continue post-treatment. At our site visit to the Straits in 2019, we also discussed the possibility of using additional habitat analysis tools such as the GUT system that the Asotin IMW has applied to their treatment reaches. This may be a useful tool to combine with observational data to better characterize the effect of the wood addition treatments on changes to channel morphology and habitat complexity. The existing habitat data protocols should continue to be followed in light of recent (2018) treatments for at least 1-2 salmon life cycles.

The panel recommends that the Straits IMW project leads use the Panel recommended format for annual reporting.

Other Comments

This study highlights the need for collecting pre-project data and regular coordination of monitoring and enhancement activities, which have been challenging because of the variety of organizations involved in data collection. The Strait IMW demonstrates the importance of having support and funding to manage large quantities of data. Because fish within these watersheds migrate throughout the year, researchers found that monitoring migrations with PIT-tag arrays provides a more complete picture of life-history diversity, migration timing, and out-migration productivity compared to traditional spring smolt trapping. Because restoration of watershed processes (e.g., riparian and upland enhancement actions) can take years to decades to reach their intended goals, monitoring programs need to be long-term in order to track both habitat and fish population responses at the watershed scale.

The study reports that in 2015 investigators began tagging juvenile Pacific lamprey over 90 mm in length with PIT-tags. The purpose of this effort in the IMW study design, however, is unclear and data are not presented or analyzed.

Final Project Status: **CONDITIONED**

The monitoring panel recommends that the following be added to the 2020 contract:

a. The 2020 annual report should provide an update on changes in habitat conditions in the two treatment watersheds and a discussion of how these changes have affected target fish populations. It should update the status of habitat data collection, and state whether or not the sponsors intend any additional data collection post-treatment.

b. Complete a large wood budget in 2020 that will better assess the quantity, location, and movement of large wood that has occurred in the treatment and reference watersheds.

c. Complete the Historic Photo Analysis begun in prior years. At a minimum, pick a sub-reach of each of the three streams to determine if an analysis of the photos will inform the habitat restoration objectives of the study.

d. Submit an annual report by 12/31/2020 focused on recent accomplishments and progress made in meeting any conditions applied during the current evaluation period. The monitoring panel also strongly suggests that the reporting template developed by the SRFB and provided by GSRO is used in 2020.

Other comments or suggestions for enhancing the approach of this monitoring component:

The monitoring panel is pleased that Strait IMW project leads have been timelier with their reporting submissions and responses to panel questions. We are happy that we are seen as a resource instead of a hurdle to progress.

The Panel appreciates the inclusion in otolith microchemistry analysis. This tool should help identify the life-history strategies of coho salmon.

Status and Trends Fish Monitoring - FIFO

The Washington Department of Fish and Wildlife (WDFW) has a statewide program that measures the status of anadromous salmonids, and provides information necessary to evaluate salmon recovery actions. In this program, WDFW makes scientific abundance estimates for adult salmon and steelhead (fish in) and juvenile migrants (fish out). These data allow WDFW scientists to segregate the effects of freshwater processes from marine processes in their effects on population dynamics. WDFW has prioritized measurement of Fish In / Fish Out data from at least one population from each Major Population Group within each Evolutionary Significant Unit/Distinct Population Segment within each salmon and steelhead species listed under the U.S. Endangered Species Act. The Fish In / Fish Out contract provided to WDFW by the Salmon Recovery Funding Board supported that effort in 2019, and more specifically provided estimates of:

(a) abundance of juvenile migrant summer chum salmon in Salmon Creek (Hood Canal)

(b) abundance of adult summer chum in Salmon and Snow creeks (Hood Canal)

(c) abundance of juvenile migrant summer chum, fall chum, Chinook and steelhead in the Duckabush River (Hood Canal)

(d) abundance of adult coho salmon in the Wind River (Columbia River gorge)

(e) abundance of juvenile migrant coho and steelhead in the Grays River (Lower Columbia River)

(f) abundance of juvenile migrant steelhead in the Touchet River (Walla Walla River)

The monitoring panel considers this fish-in/fish-out (FIFO) monitoring project an essential and important project. Status and trend information on population abundance and productivity is used to inform other monitoring projects (e.g., IMW and project effectiveness), salmon recovery decisions, and to manage commercial and sport fisheries. Where possible, FIFO monitoring associates counts of incoming adults with counts of outgoing smolts of the progeny generation to assess freshwater productivity, an important metric for determining the success of habitat restoration. Not all fish monitoring sites funded under the FIFO program include both smolt and adult monitoring; although,

the program leverages existing monitoring of one life history stage (often the adult phase) by providing funding for monitoring the complementary phase (often smolt emigration).

Where possible, the panel encourages investigators of monitoring studies that do not include both adults-in and smolts-out to seek funding opportunities to expand the scope of their studies to track both adult returns and smolt production. In addition, the finding from several IMW studies that fall migrants can contribute to adult escapement suggests that continuing migrant trapping through the fall period could yield new insights into population status and trends. This has been done in the Touchet River, where investigators there have found that the majority of natural-origin steelhead move past the trap during the fall and early winter.

Responsiveness to Monitoring Panel Comments in 2020

Thoughtful reporting and analyses were provided. The investigators provided responses to the panel's questions regarding calculating coefficients of variation, trapping during fall and early winter, and providing summaries or figures of fish-in and fish-out estimates over time. There are a number of analyses that can be conducted with FIFO data and we trust the investigators are conducting these analyses because they inform recovery efforts as well as other monitoring efforts such as IMWs and Project Effectiveness. Including some of these analyses in the annual reports would be useful to the monitoring panel. For example, including simple time series of adult and juvenile fish abundance estimates over time and juveniles per spawner versus spawning escapements where they exist would be informative. The monitoring panel appreciates the inclusion of peer-reviewed journal publications in which FIFO data have played a role.

Study Limitations and Concerns

In their response to a monitoring panel question about trends in population abundance, project leads state "*our level of reporting is tied to the funding level. All of the Salmon Recovery Funding Board [FIFO] projects are underfunded due to rising costs combined with flatline funding. The project leads have prioritized maintaining the continuity of the field data, but project-specific, quality reporting and the associated scientific inference have become a challenge at current funding levels*." This appears to be a serious problem, and while we understand the need for maintaining continuity in data collection, at some point there should be a dedicated effort to summarize the status and trends of the salmon and steelhead populations under study. The monitoring panel hopes that additional resources can be obtained in order to facilitate such a summary.

The program would benefit from a better understanding of the migration that occurs during high water events when traps are inoperable. It is a logistically difficult (or impossible) to physically sample juvenile fish in migrant traps, usually rotary screw traps, during floods but perhaps there is a way to estimate it based on the number of fish captured in shallow water with low to moderate current

velocity where it is safe to sample before, during, and after a storm, or by using some other estimation technique. Considerable fish movements may be occurring during these events and if estimates assume constant movement rates based on captures before and after trap outages, the total estimated number of migrants might be significantly compromised.

Other Comments

Overall, the investigators do a good job of managing and reporting on this monitoring. The relatively small investment by the SRFB to support this kind of monitoring provides significant benefits to the region. The study continues to be limited by funding for regular in-depth reporting, statistical analyses, QA/QC in some cases, and statewide data summaries. However, we believe the FIFO team is functioning well despite limited resources but we hope that additional monitoring funds become available, especially for analysis of existing data.

Final Project Status: **CLEAR**

The monitoring panel believes the Status and trends Fish Monitoring project should be supported and that no conditions need be added to the 2020 contract.

Other comments or suggestions for enhancing the approach of this monitoring component:

We hope that, in addition to securing funding for long-term population status and trend analyses, project leads are able to obtain more quantitative estimates of adult salmon and steelhead returns to the Grays River and Touchet River. It would be illuminating to see if estimated number of smolts per adult has changed over the years.

As noted above, we encourage project leaders to use FIFO data to help estimate VSP parameters and other metrics wherever possible. These estimates are highly desired by regional managers and will help highlight the importance of continuing these monitoring efforts. We also encourage the publication of FIFO studies in peer-reviewed journals. The monitoring panel was pleased to see that FIFO program data have figured in several scientific publications.

We realize that most studies have only one or two target species but continuing to monitor the abundance of additional anadromous species, e.g., in smolt traps, is worthwhile and will continue to provide insights into the current status and trends of non-target species. In areas where this is being done (e.g., Hood Canal) results have proved valuable.

NEW EFFECTIVENESS MONITORING PROJECT

After multiple discussions in 2019 within the monitoring panel and also between the panel and Council of Regions, it was decided that the new effectiveness monitoring study would focus on evaluating the effectiveness of floodplain and associated riparian restoration projects using novel, remote sensing methods. The 2019-2020 period would include a) selection of a contractor, b) development of the study plan, c) completion of a literature survey on the use of remote sensing and other analytical methods for determining floodplain restoration improvements, and d) initiation of a pilot proof-of-concept study. The contractor (Cramer Fish Sciences) was selected in late November 2019. Following several conferences with the panel the following outline was development that covers objectives, monitoring design, parameters that will be measured, site selection, data management and archiving, and reporting. A draft study plan was submitted to RCO on April 16, 2020. It is currently being reviewed by the monitoring panel and Council of Regions and recommendations for next steps will be presented to the Board at their September meeting.

Outline of Study Plan

Floodplain and Riparian Effectiveness Monitoring: Using Remote Sensing and Other Techniques to Monitor Large Restoration Projects

OUTLINE

I. Executive summary

II. Publication information

a. Suggested citation

b. Web link

c. Other info (Contact, ADA, etc.)

III. Table of contents

IV. List of tables and figures

V. List of acronyms

VI. Acknowledgements

VII. **Introduction and background**

a. RCO/SRFB Restoration Program

b. Purpose of this document; audiences for this document and how they will use the information

c. History of project effectiveness monitoring

d. Results and recommendations of Phase I

e. Lessons from other programs

i. Regional (AEM, PE, CHaMP, ISEMP, CFS pilot studies)
ii. National and international

f. Review of remote sensing and new methods
i. summary from memo
ii. which methods require some field data
iii. Other methods (eDNA etc.)

g. Components for monitoring plan (figure with steps)

h. Process for developing monitoring plan and identification of target audience
i. Regular input from Monitoring Panel
ii. How goals and questions were developed
iii. RCO, Council of Regions etc.
iv. Audience

i. Structure of document

VIII. Goals, Questions and Assumptions

a. Goals
i. Scale
ii. Project types

b. Questions
i. Big picture questions - questions from managers vs. practitioners vs. funders
1. Specific questions
2. Table or figure highlighting ones for floodplain and riparian effectiveness monitoring
ii. How specific questions were developed
iii. Supplemental broad-scale questions
1. Not part of this program but could be answered with existing high-level data (extensive post-treatment or other retrospective analysis)

c. Assumptions
i. Response time
ii. Project implementation time frame
iii. Other factors (climate change, watershed context, etc.)

IX. Monitoring design

a. Types of designs
i. Before-After (BA)
ii. Before-After-Control-Impact (BACI)
iii. Extensive Post-Treatment (EPT)
iv. Hybrid study designs

b. Selection of most appropriate design
c. Spatial and temporal replication
    i. Number of sites
    ii. Years of monitoring
        1. General schedule
        2. Flow-based sampling (after selected high flow events)
    iii. Within-year monitoring (season)
d. Stratification
e. Scale of monitoring
f. Scale of inference from site-specific study

X. Parameters, metrics, and protocols

a. Questions and metrics
b. Protocols for each metric
    i. Remote sensing
    ii. Field data
    iii. Lab/office processing of source data
    iv. Initial QA/QC and data processing
    v. Data cataloging
    vi. Field work schedule
        1. Within and among years
        2. Tracking data collection

XI. Site selection

a. Site selection criteria
    i. Info request for lead entity or recovery regions
b. List of potential sites from PRISM/HWS etc.
c. Screening sites/projects for inclusion (including schedule)
    i. Site size, implantation date, data available
    ii. History of monitoring and restoration activities

XII. Data management and analysis

a. Types of data generated (source vs. metric)
    i. By category and metric
b. Source and metric data mgt, storage, and backup
    i. Data sharing and archiving
c. Calculating metrics
    i. Methods for each metric

ii. Example for each metric

d. Data analysis

i. Individual project

ii. Across projects

iii. Modeling tools

iv. Interpretation of analysis

1. Watershed scale factors

2. Other mgt. activities

XIII. Estimated costs

a. Cost for different components

i. By protocol/metrics

ii. Potential cost saving for LiDAR acquisition

b. Detailed budget

i. w/ hours

ii. Approximate rates

iii. Equipment needs

XIV. Reporting and Implementation

a. Annual reporting requirements

b. Annual report format

c. Recommendations for implementation

d. Results dissemination

i. Annual report

ii. Web

iii. Presentations (conferences, recovery board meetings, etc.)

XV. Challenges and next steps

a. Related or complimentary studies (broad-scale post-treatment analysis)

b. Potential challenges

c. Data gaps/info needs

d. Next steps

XVI. References

XVII. Appendices

Remote sensing and emerging technologies for use in evaluating floodplain and riparian projects

On February 10, 2020, Cramer Fish Sciences submitted a review of remote sensing and emerging technologies for monitoring floodplain and riparian restoration projects. The review's objective was to develop a study plan for the new effectiveness monitoring program, and included two major components: 1) a detailed literature review summarizing emerging methodologies and 2) recommendations for the best approaches for monitoring the metrics needed to answer effectiveness monitoring questions outlined by the monitoring panel.

Literature review

Measurements of many physical, biological, and chemical parameters across large and small floodplain restoration projects have become more efficient with rapid advancements in remote sensing (e.g., satellite, aerial, and unmanned aerial vehicle [UAV] acquired data), marking and tagging technologies (e.g., passive integrated transponder [PIT], radio, acoustic, and other tags), electronic data collection (e.g., tablets), inexpensive water quality and hydrology sensors with longer battery life and more data storage (e.g., thermographs, piezometers, and ultrasonic flow sensors), and other technologies in the last decade. However, the key parameters and metrics, which need to be tied to the monitoring questions and overall project objectives, have remained largely the same. One major difference is that some of the remote sensing techniques allow for continuous coverage or mapping of the floodplain and river channels, where traditional techniques either relied on transects or classification of habitats and measuring the extents of those habitats.

The previous review of papers that examined floodplain effectiveness included 180 papers. An additional 25 papers for a total of 205 papers on floodplain effectiveness were located. More than half (115) of these papers were published in the last 10 years (**Figure 1**). These include broad categories of physical (e.g., channel and floodplain morphology, sediment and flow) and biological metrics (e.g., fish, macroinvertebrates, and riparian and aquatic vegetation). A summary of traditional (field based) and remote sensing methods for monitoring floodplain and riparian areas is provided in **Table 1**.

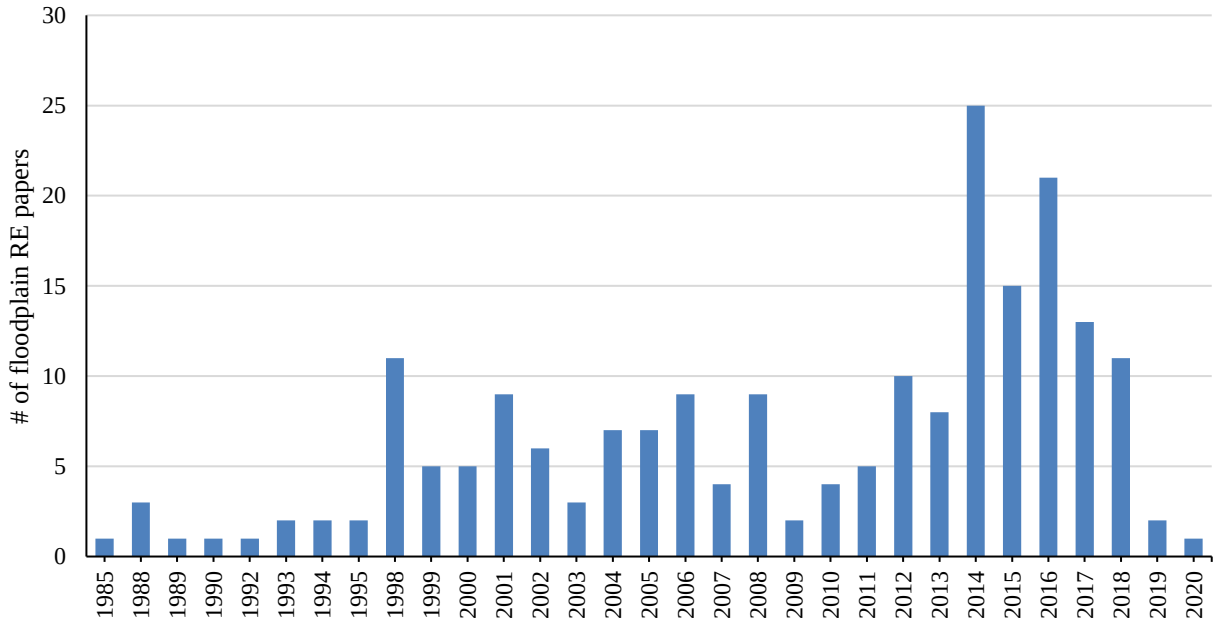


Figure 1. Number of papers by publication year evaluating the effectiveness of floodplain restoration projects. A total of 110 papers have been published between 2010 and 2020. The low number of papers in 2019 and 2020 is more a reflection of the lag in them being entered into library databases and the fact that the literature review was done in January 2020.

Table 1. Summary of papers examined, and common methods and metrics monitored for 205 papers monitoring and evaluating the success of floodplain restoration projects.

Metric class (n)	Metric category (n, %)	Common methodologies	Most common metrics calculated
Physical metrics (146)	Channel and floodplain morphology (59, 40%)	Field methods – Long profiles, cross sections, and topographic surveys (total station or RTK GPS unit). Remote sensing – Aerial photography, UAVs, satellite imagery, and LiDAR.	Change in channel pattern, rate and type of channel pattern, and channel geometry. Floodplain channel length, width, and density, flow that inundate floodplain channels, flood prone width, index of morphological quality, and floodplain inundation area or index.
	Meso-habitat (110, 75%)	Field methods – Long profiles, cross sections, topographic surveys (total station or RTK GPS unit). Substrate size –pebble counts, core or shovel samples or visual estimates. Remote sensing – Aerial photography, UAVs, satellite imagery, LiDAR.	Habitat types (e.g., pool, riffle, and glide) and area at various flows, residual depth or volume, sediment size (D50, D84, percent fines), and area or volume of different sized sediments.

Metric class (n)	Metric category (n, %)	Common methodologies	Most common metrics calculated
	Large wood (16, 11%)	Field methods – Measure or estimation of number, size and volume of pieces of wood and wood jams. Remote sensing – Aerial photography, UAVs, and satellite imagery.	Wood abundance, size, volume, and age; wood storage and transport; number, size and volume of jams, key pieces, number of pieces of wood forming pools, and change in wood supply/storage.
	Sediment (65, 45%)	Field – Cross sections, sediment cores, bedload sampling at different flows, and tagging of particles. Remote sensing – Aerial photography, UAVs, and LiDAR.	Channel sediment storage, transport, volume, composition, spatial extent, and particle size.
	Flow (53, 36%)	Field – direct measurements of flow at cross sections using current or velocity meter, stream gauges, staff gauge or pressure transducer to continuously monitor flow through time, piezometers to measure subsurface flows, injection of nonreactive tracers, Remote sensing – Examination of aerial photos or satellite imagery.	Surface flows (volume, timing, and duration), subsurface flow, travel/residence time, water storage (tracers), velocity, hydraulic conductivity, and extent of flooded area at different flows.
	Water quality (83, 57%)	Field – data logging sensors (e.g., thermographs, piezometers, flow sensors), optical sensors, point measurements. Remote sensing – UAV and aerial thermal imaging.	Temporal and spatial surface water temperatures and variation, degree days for incubation, thermal threshold exceedance metrics, N, P, DO, etc.
Biological metrics (171)	Fish (85, 50%)	Field – Electrofishing, seining, smolt, fyke or minnow traps, snorkeling (underwater counts), biotelemetry (e.g., PIT, radio, archival tags), and eDNA.	Seasonal abundance, presence, absence, diversity, growth, size or biomass, age, survival, diet, condition, genetics, life history diversity, migration timing, and indices of species diversity and richness.
	Macroinvertebrates (60, 35%)	Field – kick nets, Surber samples, drift nets, sediment cores, hyporheic wells, artificial substrates, and possibly eDNA for aquatic species. Pitfall traps and visual observation for adult terrestrial/riparian species).	Abundance, diversity, richness, functional feeding groups, and various regional indices of biological integrity and diversity

Metric class (n)	Metric category (n, %)	Common methodologies	Most common metrics calculated
	Aquatic macrophytes (38, 22%)	Field – direct measurement or visual estimation in plots, transects or census of study area. Remote sensing – aerial photography, and UAV multispectral imaging.	Abundance, diversity, richness, indices of diversity, and areal extent.
	Periphyton (12, 7%)	Field – substrate samples, artificial substrates, and suction removal over known area.	Chlorophyll a, ash-free dry mass, diversity, richness, and chemical ratios.
	Riparian vegetation (69, 40%)	Field – quadrats, cross sections, plots or transects, light meters or densiometers (shade and canopy cover) and bore sample (tree age). Remote sensing – aerial photography, LiDAR, satellite imagery, and UAV multispectral imaging and structure from motion.	Vegetation composition, spatial patterns, canopy cover, species composition, age structure, shade, organic matter (leaf litter, LWD), vertical structure, invasive species distribution.

LiDAR

Light Detection and Ranging (LiDAR) uses pulsed laser returns to measure distances. Measurements are taken at a very high density (e.g., dozens of points/m^2), which allows LiDAR to 'paint' a scene and create a detailed three-dimensional point cloud based on the individual laser returns. By using a high density of laser returns and because lasers are incredibly fine, LiDAR can pierce through vegetation canopies and other incomplete visual obstructions. In addition, LiDAR sensors include returns from oblique angles (usually up to 30°). Thus, by combining returns from multiple scans (i.e., overlapping flight paths), LiDAR can create point clouds that effectively see around barriers.

Standard 'topographic' or 'red' LiDAR relies on low energy (infrared) lasers, that are absorbed by shallow bodies of water. These LiDAR point clouds have returns around water body edges, but no returns from water surfaces or the topography below water surfaces, which effectively silhouettes water bodies. Conversely, 'bathymetric' LiDAR relies on a higher energy (green) laser that is not completely absorbed by shallow water. Because of this, green 'bathymetric' LiDAR can measure subsurface topography, as well as water surface elevations. However, the depth that the green laser can penetrate into the water to measure subsurface topography depends on water clarity, turbulence, and streambed reflectance (i.e., needs high clarity, low turbulence and reflective bottom), as well as the type of sensor used. Green LiDAR has been shown to be powerful enough to measure river bathymetry on medium to large rivers with depths of 10-12 ft.

LiDAR sensors can be mounted to tripods for ground-based LiDAR acquisitions that seek to recreate topography for a small area in incredibly high detail (Figure 3). However, the more common application

is to attach the sensor to an aircraft for an airborne laser scanning (ALS). Traditionally, sensors were placed in fixed-wing aircrafts, though advances in both LiDAR sensors and unmanned aerial vehicles (UAVs or drones) have seen the introduction of lower cost drone-based LiDAR acquisitions for projects covering relatively small areas or lengths of stream (<5 kms or 5 km^2). Drone-based sensors are typically red LiDAR, although bathymetric (green) LiDAR sensors are under development.

Pros	Cons
• High accuracy and high-resolution surface topography • Penetrates (most) vegetation • Measures both bare earth and vertical structure • Green LiDAR can measure bathymetry as well as water surface elevation (typically < 3 Secchi depths) • Can use as input for hydraulic modeling • Creates compelling visuals	• Expensive • Can be computationally difficult • Large file sizes require thoughtful data handling • Bathymetry depends on water clarity, turbulence, bottom reflectance and depth (typically < 2.5 Secchi depths) • May require 'leaf-off' acquisitions for very dense canopies, which may not align with project goals and timelines • Requires favorable weather conditions

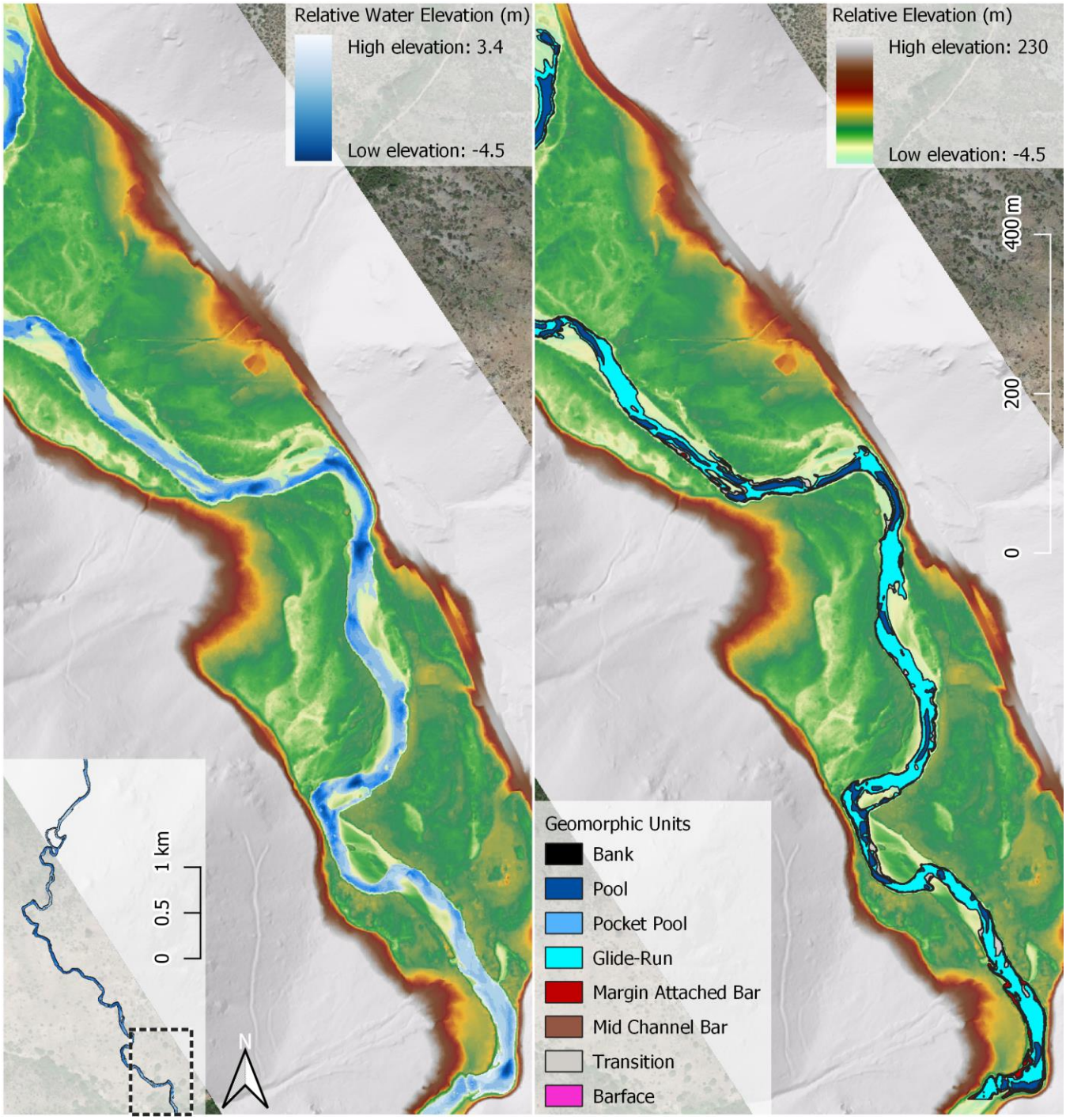


Figure 2. Example of topography developed from green LiDAR we had flown on the Entiat River and its floodplain in September 2018 and channel units generated using the geomorphic unit tool (GUT) and the LiDAR-based topo-bathymetry.

Radar

Synthetic Aperture Radar (SAR) is a technique similar to LiDAR in that it relies on emitting a pulse of energy and measuring returns at the sensor. However, instead of relying on laser pulses, SAR uses pulses of radio waves. Depending on the wavelength, returns can represent bare earth topography, as

well as highest surface (e.g., vegetation), with lower resolution for bare earth and higher resolution for the highest surface returns. A particular benefit of SAR is that radio wavelengths are less affected by fog and rain compared to LiDAR. Additionally, SAR flights are able to fly higher and faster than LiDAR flights, which reduces costs for large area acquisitions. Similar to LiDAR data, SAR provides high resolution (<5 m) bare earth topography, with high resolution (<2.5 m) surface topography but retains much less information about the vertical structure between bare earth and the highest return. This limits the ability for SAR data to be used as a proxy for relative shade, riparian plant cover, and other metrics LiDAR derives from its vertical structure returns.

Pros	Cons
• Lower per area cost for larger acquisitions • Insensitive to fog and rain • Provides both bare earth and surface returns	• Lower resolution for bare earth topography • Less data on vertical structure than LiDAR • Limited UAV deployment • Active research focused on the large scale and not applications to floodplain and riparian monitoring

SfM (Structure from Motion) Photography

Structure from Motion (SfM) is a form of photogrammetry that uses paired imagery taken by offset sensors to create a three-dimensional point cloud representing the surface of the imagery (**Figure 3**). Similar to the human eye, SfM uses changes in parallax between photos to determine relative distances of objects in the images. An additional benefit is that imagery used to create the point cloud can also be used to colorize it to help distinguish features. Because SfM relies on parallax and relative distances, it is most appropriate for smaller projects, and commonly relies on UAV platforms.

Unlike LiDAR, SfM does not penetrate vegetation canopies, and can only represent what is visible in the imagery, which limits its applicability in modelling bare earth topography in heavily vegetated areas. In these cases, SfM offers little more than elevation context for interpreting aerial imagery. Visible ground control points are needed for SfM and heavy vegetation can make this nearly impossible at some locations. Conversely, in open locations with low vegetation, SfM can effectively create high-resolution topography similar to topographic (red) LiDAR. Comparison of SfM and LiDAR at several sites showed that SfM failed to accurately map the bare earth topography at sites with heavy tree and grass cover.

Pros	Cons
• Low cost • High resolution surface representation • Creates compelling visuals • In favorable conditions (e.g., little to no vegetation), comparable to topographic LiDAR	• Computationally difficult and time consuming • Requires visible ground control points • Not appropriate for larger areas • Only represents surface data, not bare earth topography or bathymetry • Issues with object motion (e.g. wind moving branches between images)

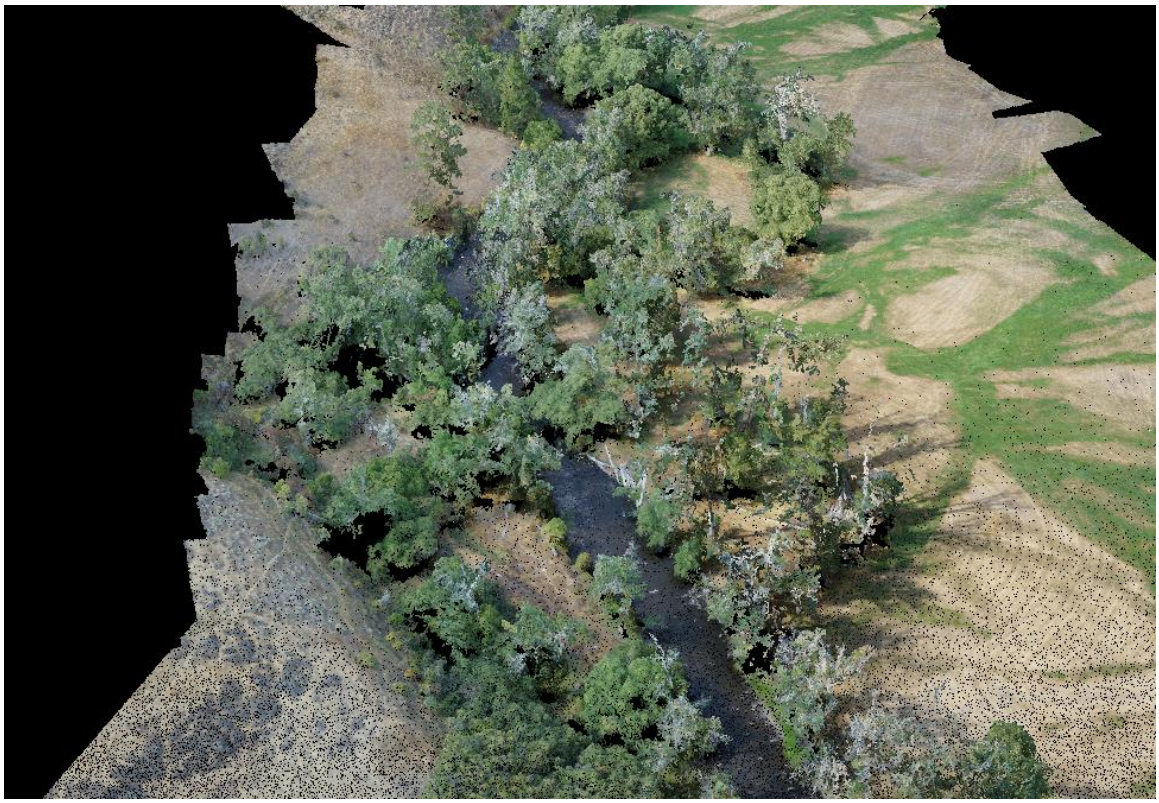


Figure 3. Example of SfM photography from our pilot study showing riparian vegetation on control site of Southern Cross Restoration Project, Catherine Creek, Oregon.

Aerial Photography

Aerial photography refers to images taken from an aerial platform that have been orthorectified to have a consistent scale and resolution across the image. A variety of platforms are utilized for aerial photography including fixed-wing aircrafts, UAVs (drones), and even weather balloons. Sensor choice and image resolution is highly variable depending on intent and scale of the project, covering options that range from site-based to state-wide coverage. It is often used to monitor broad-scale changes in land use. There is a long history of using aerial photography to monitor and assess floodplains and riparian areas. Images can be assessed to describe channel units, bars, and other features, and often serve as some of the only pre-project data available (Figure 5). Time series of images can also be used to monitor changes in floodplain habitat; for example, aerial photography was employed to monitor the recruitment of plant species after large disturbances. Coupled with field surveys, it has been used to monitor and evaluate changes in habitat and geomorphic units. Recent advances have seen the use of artificial neural networks and other artificial intelligence techniques to support automated image classification, including delineating hydrologic river units and classifying floodplain vegetation. Finally, even if no formal analysis is carried out using aerial imagery, it is worth noting that aerial imagery often provides valuable context to help interpret other data sets.

Pros	Cons
• Low cost • High resolution • Historic data likely available • Automated image classification is a powerful new tool	• Limited ability for quantitative analysis • Less useful under heavy vegetation coverage • Often inconsistent timing and resolution between acquisitions (i.e., through time) • Automated image classification is computationally difficult, and often requires costly proprietary software

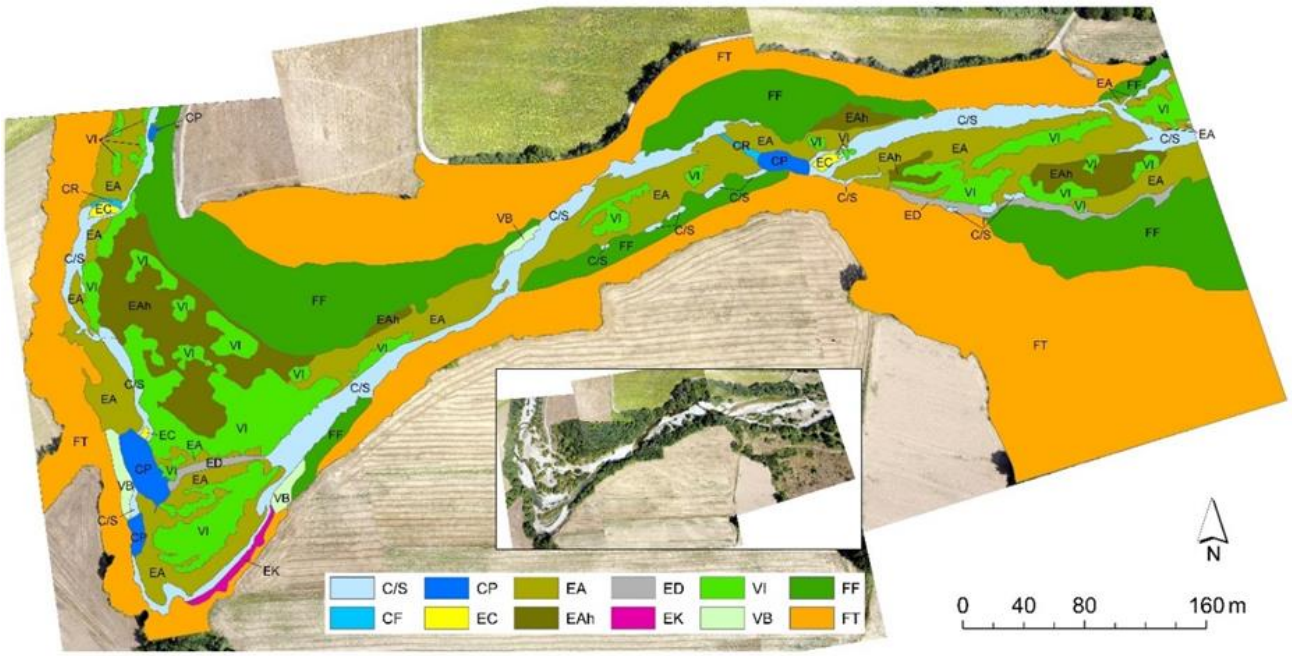


Figure 5. Example of mapping of geomorphic units using aerial imagery combined with a field survey. CF = riffle, CP = pool, EC = mid-channel bar, EA= bank-attached bar, EAh = bank-attached high bar. ED = dry channel. EK = unvegetated bank, VI = island, VB = Bench, FF = modern floodplain, FT = recent terrace.

Satellite Imagery

Satellite imagery, or spaceborne photography, refers to images of the earth's surface collected by imaging satellites in orbit. A variety of satellites are maintained by governments and private enterprises, and data ranges from coarse resolution of 100-m or 30-m pixels, up to modern high-resolution 1-m pixel data. The timing of the acquisitions also varies by satellite program, with recurrence ranging from continuous data delivery to one or two passes a year. The use of satellite imagery to monitor and assess floodplains and riparian areas is very similar to the use of aerial photography and offers many of the same analyses described above for aerial imagery. Because satellites are placed in orbit, there is often a time series of imagery available to analyze, although usually at lower resolutions than other aerial imagery platforms.

Pros	Cons
• Low cost, especially for large areas • Often able to access time series of historic imagery at defined intervals • Consistent data sources across large areas (e.g., time of acquisition and resolution)	• Resolution often limits applicable analyses • Can be expensive for modern data for small areas as vendors often have large minimum area requirements

Infrared Imagery

Normal imagery is a representation of the visible light spectrum, covering wavelengths from roughly 380 to 700 nanometers, which are broken into Red, Green, and Blue bands (RGB) for sensors to record. Thermal Infrared (IR) is a lower energy wavelength, associated with thermal radiation that is invisible to the human eye. IR can be measured with thermographic sensors and then visualized to produce false-color images, called thermographic images or heatmaps, that represent a measure of temperature. Thermographic sensors are commonly deployed alongside other sensors (e.g., multispectral or four-band sensors), from large-scale satellite imagery to UAV deployment for small projects. Infrared mapping has a unique ability to categorize temperature across a continuous area at a snapshot in time. This is particularly well suited to evaluate ground water and aquifer interactions. However, because temperature is a highly dynamic quality, special care must be taken when comparing across locations and or timeframes. Ideally, it should be coupled with continuous temperature monitoring at fixed locations (e.g., temperature loggers) and flown at multiple times throughout a year or across years.

Pros	Cons
• Unique ability to describe temperature over a continuous area • Often included and packaged with other sensors	• Acquisitions are snapshots that depend on many factors, so comparing multiple acquisitions can be difficult • Data has focused utility for temperature monitoring • Best when coupled with field monitoring (fixed data loggers)

Multispectral and Hyperspectral Imaging

Multispectral imagery refers to sensors that measure the visible light spectrum as well as other wavelengths. Common additional bands include ultraviolet, near infrared, mid infrared, and far infrared, in addition to the thermal infrared band mentioned above. Hyperspectral imagery is similar to multispectral imagery, except each band is broken into dozens of smaller bands (some ~200 bands in total compared to <12 in multispectral imagery), to give an almost continuous representation of the surface's spectral signature. Common uses for multispectral data are to create false color composites by using the values from the additional bands in place of the RGB bands to create unique representations of the area imaged. Near infrared and red bands can be used to create an index that can be used to highlight living vegetation (as opposed to things that are just painted green).

Hyperspectral data take this one step further and can be used to separate individual species by their spectral signature and libraries of different plant species have been developed for some regions.

Pros	Cons
• Unique data that can be used to delineate plant species, monitor soil moisture, forest health, etc. • Data comes in addition to standard RGB imagery	• Sensors are more expensive than RGB sensors • Hyperspectral data is computationally difficult • Identifying species using spectral signatures requires reference data

Other Monitoring Methods

GPS

Real-time kinematic adjustment (RTK) is a technique used to enhance the accuracy of location information derived from satellite positioning systems (global navigation satellite systems, GNSS), including GPS measurements. In practice, RTK GPS relies on a base station or network of base stations (e.g., CORs network) and mobile (rover) units that communicate with the base station to correct location measurements. These technologies offer high precision and accuracy (sub centimeter) for field-based recording of location (x, y, and z). Of particular note is the ability to pair field based RTK instream measurements to supplement topographic LiDAR with bathymetric data. RTK is often used to map topography and obtain ground control points.

Acoustic Doppler Current Profilers

Acoustic Doppler current profilers (ADCP) are similar to sonar readers but rely on the doppler effect to measure stream velocity and can be used to provide a continuous measure of discharge. Units can be placed instream, or mounted to boats or other types of watercraft. The term 'remote sensing' is sometimes affiliated with ADCP units, but this usually refers to ADCP units being able to measure velocities up to 1000 m away in ocean settings, profiling a substantial portion of the water column. For riverine systems, this is not generally applicable. For evaluation of floodplain projects, ADCP units are often used to map the bathymetry as well as velocity of streams, particularly those that are too large, deep, or turbid to use other techniques such as green LiDAR, RTK GPS, or a total station. Their main utility in evaluation of floodplain restoration is to create topography and estimate flow and velocity for use in mapping and hydraulic modeling.

New Methods of Biological Monitoring

There are also several newer approaches for biological monitoring such as environmental DNA (eDNA), advances in biotelemetry techniques, and genetic mark-recapture (parentage-based tagging). Environmental DNA can be used for mapping species presence and absence in floodplain habitats but cannot yet be used to estimate population abundance with confidence. Advances in biotelemetry (e.g., PIT, radio, and acoustic tags) allow monitoring of both juvenile and adult fish movements and survival

among floodplain habitats. Tissue samples from a subset of juveniles and adults can use genetic parentage assignment to estimate population size and thus potentially take the place of traditional mark-recapture methods.

Recommendations

Table 3 shows that most metrics of physical habitat features can be monitored with LiDAR. Ideally, this would be done using green LiDAR or using red LiDAR coupled with a bathymetric survey using RTK GPS or ADCP to capture the bathymetry. It is important to note that green LiDAR does not completely eliminate the need for field data collection, as some ground truthing and field data are needed to calculate many metrics. Green LiDAR currently must be flown with a fixed-wing aircraft, which makes it costly and limits the frequency with which it can be collected. Moreover, green LiDAR cannot map the bathymetry in deep, turbid, or turbulent waters, and similar to red LiDAR, will need to be coupled with field surveys to map the bathymetry of floodplain channels. Many metrics, particularly those in **Table 3** with a N (no) or M (maybe) designation, require field data collection. For example, geomorphic habitat units can be mapped from the digital elevation model derived from LiDAR data, but should also be delineated at low flow with a field survey to confirm units estimated at low flow based on the digital elevation model. Similarly, some ground truthing of large wood counts and other metrics should be done to ensure accurate calibration of LiDAR derived metrics.

LiDAR is also the optimal method for calculating most riparian metrics, though riparian composition, stem density, and plant survival will require coupling LiDAR with field data collection. Estimating shade and stem density will require acquiring LiDAR during both leaf-on (May-October) and leaf-off (November-April). The study plan will provide a detailed table outlining the LiDAR data or LiDAR-derived data required (e.g., returns, point-cloud, DEM) and the supplemental field data needed to calculate each monitoring metric needed to answer key questions.

Table 2. Initial list of monitoring questions to be answered with evaluation of floodplain and riparian projects and metrics that would be measured and calculated to answer those questions.

Question	Parameter/metric
Morphology/Physical Habitat	
What is the floodplain area before and after restoration, what is the extent and frequency of floodplain inundation at different flow levels over time, and how much of the floodplain was affected/altered or improved by the enhancement action?	Floodplain area, Floodplain inundation, Area altered
Based on the underlying geomorphic processes and the outcomes expected at the sites, did the channel migration zone change or evolve as predicted? (Did the project meet its geomorphic design objectives?)	Channel migration zone
What is the number, total length, and area of seasonal and perennial side channels, and area of off-channel ponds/wetlands, and how much do they change over time?	Side channel number, length and area, Pond/wetland number and area

Question	Parameter/metric
What is the effect of restoration on channel and floodplain morphology and complexity (RCI [Brown 2002], side channel ratio [Beechie et al. 2017], MQI [Rinaldi et al. 2013, 2017]), and how does it change over time?	Channel pattern
What is the number and diversity of habitat types (i.e., pools, riffles, glides, etc.) within the main channel, and seasonal and perennial side channels at different flows (low, bankfull, flood), and how much do they change over time?	Habitat diversity
What is the abundance and distribution of large wood in the active channel, wetted channel, and on the floodplain, and how do they change over time? What proportion of the wood is actively interacting with the channel?	Large wood
Based on difference of DEMs before and after restoration, what is the areal extent and distribution of sediment erosion and deposition (storage) on the floodplain, and how much do they change over time?	Sediment deposition and storage, Difference in DEM
What is the spatial distribution of water temperatures in summer and winter, and how much do they change over time?	Surface temperature
Based on modeled depths and velocities, what is the area of suitable habitat for juvenile (low, bankfull, flood flows) and spawning adult Chinook *Oncorhynchus tshawytscha*, steelhead *O. mykiss*, coho *O. kisutch*, or other target salmonid species and how has it changed before and after restoration?	Amount of suitable habitat (Based on HSI, hydraulic model, bathymetry)
Riparian	
What is the areal extent of riparian vegetation by vegetation class (e.g., grasses, forbs, shrubs, trees, etc.), and how much do they change over time?	Areal vegetation extent by class
What is the species composition and density of riparian vegetation and how much do they change over time?	Riparian composition and density
Has riparian/floodplain restoration led to restored riparian function including shade, bank stabilization, LW recruitment, organic matter following riparian restoration?	Bank stability, Shade, Organic inputs, Large wood

Table 3. Cross walk between metrics needed to answer effectiveness monitoring questions and whether remote sensing techniques can accurately collect data to calculate these metrics. Y = yes, N = no, M = maybe depending on level of resolution, accuracy needed, or site conditions. Not included are radar and other types of LiDAR (e.g., oblique, ground-based). FLIR = forward looking infrared.

Parameter/metric	LiDAR (Green or w/ bathymetric survey)	LiDAR (near-Infrared)	SfM	Multispectral Imagery	Aerial Photography	Satellite Imagery	FLIR
Channel morphology	Y	Y	Y	N	M	M	N
Channel pattern	Y	Y	Y	N	M	M	N
Bathymetry	Y	N	N	N	N	N	N
Topography	Y	M	Y	N	N	N	N
Habitat units	Y	M	M	M	M	N	N
Habitat diversity	Y	M	M	M	M	N	N
Floodplain inundation	Y	Y	M	N	N	N	N

Parameter/metric	LiDAR (Green or w/ bathymetric survey)	LiDAR (near-Infrared)	SfM	Multispectral Imagery	Aerial Photography	Satellite Imagery	FLIR
Floodplain area	Y	Y	Y	N	N	N	N
Area altered	Y	Y	Y	M	M	M	N
Channel migration zone	Y	Y	M	N	N	N	N
Side channel no., length, & area	Y	Y	M	M	M	M	N
Pond/wetland number & area	Y	Y	M	M	M	M	N
Sediment deposition & storage	Y	N	M	N	N	N	N
Large wood	Y	Y	Y	Y	Y	M	N
Surface temperature	N	N	N	N	N	N	Y[2]
HSI (Habitat suitability index)	Y	N	M	N	N	N	N
Riparian shade	Y	Y	M	N	N	N	N
Riparian composition	M[1]	M[1]	M	Y	M	N	N
Riparian stem density	M	M	M	N	N	N	N
Plant survival	N	N	N	M	N	N	N
Growth	Y	Y	M	N	N	N	N
Area vegetation extent by class	Y	Y	N	N	N	N	N
Bank stability	Y	Y	M	N	N	N	N
Organic inputs (leaf litter)	Y[3]	Y[3]	N	N	N	N	N

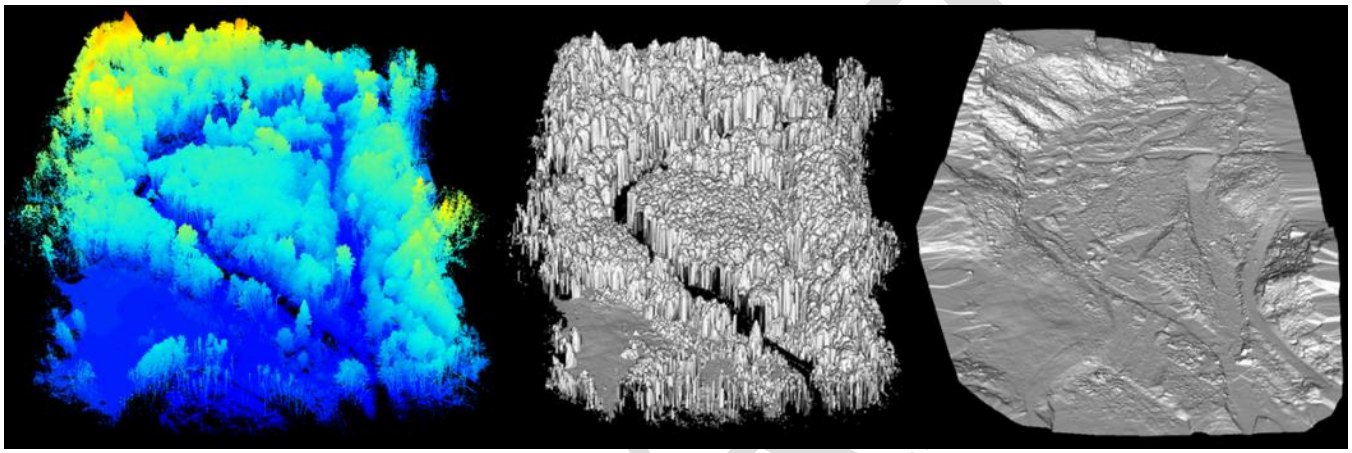
[1] Difficult under heavy canopy.

[2] Snapshot in time, should be coupled with field data (temperature loggers) to get daily and seasonal trends.

[3] If done at both leaf-on and leaf-off.

Attachment B

USING REMOTE SENSING AND OTHER TECHNIQUES TO ASSESS AND MONITOR LARGE FLOODPLAIN AND RIPARIAN RESTORATION PROJECTS



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EXECUTIVE SUMMARY

The Washington State Salmon Recovery Funding Board (SFRB) has invested more than 1 billion dollars in salmon recovery and habitat restoration efforts since 2000. While previous efforts to evaluate the efficacy of SRFB-funded habitat restoration actions have provided some useful information on the effectiveness of instream structures, large wood placement, and barrier removal, they have provided limited information on two of the most important and common habitat restoration actions—floodplain and riparian planting projects. In addition, other monitoring programs and recently published studies have emphasized the need to evaluate large restoration projects that cover several kilometers of stream. Moreover, recent technological advances have made it possible to monitor large restoration projects efficiently using remote sensing. Cramer Fish Sciences was contracted by the Recreation and Conservation Office to work with the SRFB Monitoring Panel to develop a monitoring and evaluation plan for large floodplain and riparian projects that leverages the latest remote sensing techniques coupled with field data. To achieve this, we first worked closely with Monitoring Panel to refine the objectives and questions to be answered by the evaluation program. Objectives identified were that the monitoring program should focus on results at the project level, focus on physical and riparian response, and produce results within 5 to 10 years; that annual costs not exceed $250,000 to $300,000; and that the program avoids implementation issues seen in some other regional monitoring programs. Monitoring questions to be answered by the study include:

1. What is the floodplain area in the reach before and after restoration, what is the extent and frequency of floodplain inundation at different flow levels over time?
2. Based on the underlying geomorphic processes and the outcomes expected at the site and reach, did the project meet its geomorphic design objectives and did the active channel zone change as predicted?
3. What is the number, total length, and area of seasonal and perennial side channels, and area of off-channel ponds/wetlands in the reach, and how much do they change over time?
4. What is the effect of restoration on channel and floodplain morphology and complexity, side channel ratio, morphological quality index (MQI) in the reach, and how does it change over time?
5. What is the number and diversity of habitat types (i.e., pools, riffles, glides, etc.) within the main channel, and seasonal and perennial side channels at different flows (low, bankfull) in the reach, and how much do they change over time?

6. What is the abundance and distribution of large wood in the active channel, wetted channel, and on the floodplain within the reach, and how do they change over time? What proportion of the wood is actively interacting with the channel?
7. Based on difference of DEMs in the reach before and after restoration, what is the areal extent and distribution of sediment erosion and deposition (storage) on the floodplain, and how much do they change over time?
8. Based on modeled depths and velocities, what is the area of suitable habitat for juvenile (low, bankfull, flood flows) and spawning adult Chinook *Oncorhynchus tshawytscha*, steelhead *O. mykiss*, coho *O. kisutch*, or other target salmonid species in the reach and how has it changed before and after restoration?
9. What is the areal extent of riparian vegetation by vegetation class (e.g., grasses, forbs, shrubs, trees, etc.), and how much do they change over time?
10. What is the species composition and density of riparian vegetation and how much do they change over time?
11. Has riparian/floodplain restoration led to restored riparian function including shade, bank stabilization, and organic matter following riparian restoration?

Next, we identified key response metrics to answer these questions and reviewed the latest remote sensing and monitoring methods to determine the best methods for measuring these metrics. For most questions and metrics, the ideal protocols use a combination of LiDAR (Light Detection and Ranging) to capture topography and bathymetry and riparian conditions across sites coupled with field data collection to validate estimates from LiDAR and calculate metrics that require field-based methods. Based on recently published guidance, lessons from other regional monitoring programs, and the questions and objectives describe, we identified a before-after (BA) design as the most appropriate method to monitor physical response. The lack of adequate remote sensing data—green-LiDAR coupled with required field data—for existing projects largely precludes the use of previously completed projects or a post-treatment design to answer the monitoring questions defined. Therefore, a subset of large floodplain and or riparian projects proposed to begin construction in either 2021 or 2022 will be selected for monitoring.

Projects will be stratified by the eight recovery regions, which will allow the recovery regions to provide input on site selection. This is possible because the level of inference is at the project scale and the study does not require a random sample. This design allows for both the evaluation of individual projects (project-level inference) as well as a roll up and analysis of all projects collectively. Site selection will be

done as part of study implementation and a list of candidate projects should be sent to recovery regions as soon as possible. In addition to when the restoration will begin (2021 or 2022) and be completed, key criteria for site selection include that: a project is 1 km or greater in length, no other habitat management actions will be implemented other than restoration in the foreseeable future, and an adequate buffer of 20 times bankfull width exists at upstream and downstream boundaries of project footprint. The number of sites that can be sampled is limited largely by the cost of acquiring topography and bathymetry (LiDAR), which we estimate will limit sampling to 6-10 sites total, with monitoring at half of the sites initiated in 2020 and the other in 2021. The sampling schedule for sites will be a combination of flow-based and periodic, with sites to be sampled one year before restoration, immediately after restoration is completed (year 0, as built), and at 3, 5, and 10 years after restoration. However, if, for example, in year 1 or 2 after restoration, a 2-year (bankfull) or higher flow event occurs, monitoring will be initiated sooner (year 1 or 2 rather than 3).

Metrics, site layout, methods, and protocols for remote sensing and field data collection necessary to answer the questions are described. Methods were informed by two recent pilot studies to examine remote sensing techniques for evaluating small (<1 km of mainstem) and large (1 to 8 km of mainstem) floodplain projects, a recent extensive literature review, and, methods recently developed for monitoring riparian projects in the Columbia River Basin. Data collection will occur in late summer for field data and after leaf-off for remote sensing (LiDAR). Because of the size of the sites and that the corresponding response should be large (>25% change), data analysis at the individual sites (projects) will focus on graphical summaries and statistical summaries before and after restoration and through time. Evaluation of the efficacy of restoration design for floodplain projects will use a combination of hydraulic modeling and habitat suitability modeling coupled with geomorphic analyses (e.g., geomorphic unit tool, DEM of differences). In contrast, combined analysis across projects will use mixed-effects ANOVA or similar approach. Other monitoring programs have been challenged with data management and reporting, and we outline a detailed plan for both in order to ensure timely reporting of results to inform restoration projects and programs and to adaptively manage the monitoring program. Potential challenges for a study like this are largely related to implementation such as site selection, consistent data, or attempting to monitor additional metrics without adequate funding. However, these can be overcome by following the methods and recommendations provided in the study plan based on pilot studies and lessons learned from other large monitoring and evaluation programs. Finally, we outlined complementary studies such as monitoring changes in water temperature or flow using data loggers that would enhance this monitoring and evaluation program and could be implemented by partners or if additional funding were available.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Acronyms

ADCP	Acoustic Doppler Current Profiler
AEM	Action Effectiveness Monitoring
BA	Before-After
BACI	Before-After Control-Impact
BFW	Bankfull Width
BOS	Bottom of Site
BPA	Bonneville Power Administration
CHaMP	Columbia Habitat Monitoring Program
DEM	Digital Elevation Model
DNR	Department of Natural Resources
DoD	DEM of Difference
DSM	Digital Surface Model
eDNA	Environmental DNA
EPT	Extensive Post-Treatment
ESU	Evolutionary Significant Unit
FLIR	Forward-Looking Infrared
GPS	Global Positioning System
GUT	Geomorphic Unit Tool
HSC	Habitat Suitability Curve
HSI	Habitat Suitability Index
GSRO	Governor's Salmon Recovery Office
IMW	Intensively Monitored Watershed
IPT	Intensive Post-Treatment

ISEMP	Integrated Status and Effectiveness Monitoring Program
LiDAR	Light Detection and Ranging
LW	Large Wood
mBA	Multiple Before-After
mBACI	Multiple Before-After Control-Impact
MQI	Morphological Quality Index
NAIP	National Agriculture Imagery Program
PE	Project Effectiveness
PCSRF	Pacific Coastal Salmon Recovery Fund
RCO	Recreation and Conservation Office
RTK	Real-Time Kinematic
SfM	Structure from Motion
SRFB	Salmon Recovery Funding Board
TOS	Top of Site
WUA	Weighted Usable Area

1.0 INTRODUCTION AND BACKGROUND

The Washington State legislature created the Governor's Salmon Recovery Office (GSRO) to provide a statewide salmon recovery plan and the Salmon Recovery Funding Board (SRFB) to distribute funds earmarked for salmon habitat restoration and protection. Since 2000, the SRFB has invested more than 1 billion dollars in salmon recovery and habitat restoration efforts (GSRO 2018). Federal and state funding agencies needed a way to evaluate and document success of these restoration actions. To meet this need, in 2002, the SRFB provided criteria for the monitoring and evaluation of salmon recovery in their Washington Comprehensive Monitoring Strategy and Action Plan for Watershed Health and Salmon Recovery (MOC 2002). The monitoring strategy aimed to identify monitoring efforts and priority needs and also described the need for statewide project monitoring coordination and a succinct monitoring strategy. In 2004, Washington State established a reach-scale effectiveness monitoring program (Project Effectiveness Monitoring or PE) to assess the response of stream habitat and localized salmon populations to salmon habitat restoration efforts.

The SRFB PE Monitoring Program included monitoring and evaluation discrete categories including fish passage, instream habitat, riparian planting, livestock exclusion, constrained channel, spawning gravel, diversion screening, estuary restoration, and habitat protection. Final data collection was completed in 2018 and a final report was completed in 2019 and detailed findings to date and recommendations for future monitoring. While PE monitoring demonstrated that fish passage projects were successful at increasing juvenile fish numbers (fish passage) and livestock exclusion and instream habitat projects at improving habitat conditions, the results for floodplain and riparian projects were largely inconclusive due to many implementation, procedural, and data management problems seen in other large monitoring programs (e.g., proper site selection, lack of stratification, timing of data collection, data analysis, protocol changes, and data management; Reid 2001; Roni et al. 2018; Rosgen et al. 2018), not the least of which was the sheer difficulty in maintaining a large network (30 or more) of treatment and control sites over more than a decade (Roni et al. 2019b). The final PE report provided detailed recommendations on how to overcome these in the future and recommendations on which project categories needed additional monitoring. Based on results from PE and other large completed and ongoing monitoring programs (e.g., Roni et al. 2015a; Clark et al. 2019, 2020), instream habitat and barrier removal did not warrant additional effectiveness monitoring. In contrast, the final report recommend that additional monitoring was needed for floodplain restoration, riparian restoration, and possibly estuarine and nearshore restoration projects.

In addition, the final report emphasized the need to evaluate large projects as most effectiveness monitoring has focused on small projects that range in size from a few hundred meters to a kilometer.

Other large monitoring programs provide similar lessons on the most appropriate methods for future programmatic evaluation of restoration projects. The Columbia Habitat Monitoring Program (CHaMP), Integrated Status and Effectiveness Monitoring Program (ISEMP), Intensively Monitored Watershed (IMW) Program, and the Action Effectiveness Monitoring (AEM) Program have faced challenges, particularly with implementation and data management (Roni et al. 2015b; Bennett et al. 2016; Rosgen et al. 2018). Results from these programs similarly noted the need for improved implementation of monitoring as well as suggestions for improved protocols for monitoring the effectiveness of floodplain restoration utilizing before-after or before-after control-impact monitoring designs. In addition, recent papers reviewing the methods for programmatically evaluating projects implemented under a large restoration programs like the SRFB, as well as guidance for monitoring river restoration projects across the European Union, have provided additional guidance and improved methods for evaluating floodplain and riparian restoration projects in particular (Friberg et al. 2016; Roni et al. 2018; Weber et al. 2018). These reports collectively provide guidance to overcome challenges in implementation and improved design and protocols for evaluating restoration projects to overcome challenges seen in PE and other effectiveness monitoring programs developed more than a decade ago. Based in part on the results of SRFB PE monitoring and the lessons from other monitoring and evaluation studies, the SRFB Monitoring Panel, with input from the different recovery regions, that evaluation of effectiveness should focus on large (greater than 1 km) floodplain and riparian restoration projects.

Rapid advances in remote sensing and other techniques have provided improved methods to map and monitor physical and biological responses to river, floodplain, and riparian restoration projects (Belletti et al. 2015; Rinaldi et al. 2017; Roni et al. 2019a). Compared to 2003, when the SRFB PE Program was designed and implemented, a suite of remote sensing and analytical approaches have become available or improved that have revolutionized the methods and scale at which one can monitor physical and biological responses to habitat restoration projects. For example, light detection and ranging (LiDAR), satellite imagery, high-resolution aerial photography, multi-spectral imagery, and structure from motion photography (SfM) allow for mapping of the entire floodplain. Similarly, the use of drones or unmanned aircraft with photography, LiDAR, or other instrumentation can be used to map sites in cases where using fixed wing aircraft are too expensive (Tompalski et al. 2017; Roni et al. 2019a). Forward looking infrared (FLIR) can be used with a fixed-wing aircraft to map water-surface temperatures across many kilometers

of stream (Handcock et al. 2012). We recently reviewed remote sensing techniques to determine their applicability in monitoring floodplain and riparian restoration projects. Green, sometimes called bathymetric, LiDAR can be used to calculate many of the key metrics used to monitor both changes in riparian vegetation and physical habitat due to restoration (Table 1).

Table 1. Crosswalk between common metrics used to evaluate success of floodplain and riparian restoration projects and which remote sensing techniques can accurately collect data to calculate these metrics. Y = yes, N = no, M = maybe depending on level of resolution, accuracy needed, or site conditions. Not included are radar and other types of LiDAR (e.g., oblique, ground-based). FLIR = forward looking infrared. It should be noted that remote sensing techniques often still require some minimum level of field data collection for validation and supplemental data to calculate of monitoring parameters and metrics.

Parameter/metric	LiDAR (Green or w/ bathymetric survey)	LiDAR (near-infrared)	SfM	Multispectral imagery	Aerial photography	Satellite imagery	FLIR
Channel morphology	Y	Y	Y	N	M	M	N
Channel pattern	Y	Y	Y	N	M	M	N
Bathymetry	Y	N	N	N	N	N	N
Topography	Y	M	Y	N	N	N	N
Habitat units	Y	M	M	M	M	N	N
Habitat diversity	Y	M	M	M	M	N	N
Floodplain inundation	Y	Y	M	N	N	N	N
Floodplain area	Y	Y	Y	N	N	N	N
Area altered	Y	Y	Y	M	M	M	N
Channel migration zone/Active channel	Y	Y	M	N	N	N	N
Side channel no., length, & area	Y	Y	M	M	M	M	N
Pond/wetland number & area	Y	Y	M	M	M	M	N
Sediment deposition & storage	Y	N	M	N	N	N	N
Large wood	Y	Y	Y	Y	Y	M	N
Surface temperature	N	N	N	N	N	N	Y[2]
HSI (Habitat suitability index)	Y	N	M	N	N	N	N
Riparian shade	Y	Y	M	N	N	N	N
Riparian composition	M[1]	M[1]	M	Y	M	N	N
Riparian stem density	M	M	M	N	N	N	N
Plant survival	N	N	N	M	N	N	N
Growth	Y	Y	M	N	N	N	N
Area vegetation extent by class	Y	Y	N	N	N	N	N
Bank stability	Y	Y	M	N	N	N	N
Organic inputs (leaf litter)	Y[3]	Y[3]	N	N	N	N	N

[1] Difficult under heavy canopy

[2] Snapshot in time, should be coupled with field data (temperature loggers) to get daily and seasonal trends
[3] If done at both leaf on and leaf-off.

Similarly, there are also several newer approaches for biological monitoring such as environmental DNA (eDNA), advances in biotelemetry techniques, and genetic mark-recapture (parentage-based tagging; Roni et al. 2019a; Steele et al. 2019). Environmental DNA can be used for looking at species presence and absence in floodplain habitat but cannot be used to estimate population abundance (see review in Roni et al. 2019a). Advances in biotelemetry (e.g., PIT, radio, and acoustic tags) allow monitoring of both juvenile and adult fish movements and survival among floodplain habitats. Tissue samples from a subset of juveniles and adults can use genetic parentage assignment to estimate population size and thus potentially take the place of traditional mark-recapture methods.[1] These advances in physical and biological monitoring highlight the need for any future SRFB monitoring and evaluation program of habitat restoration to utilize the latest advances in remote sensing and other monitoring methods. Recognizing these advances in remote sensing and new methodologies in recent years, the SRFB Monitoring Panel also determined that future monitoring and evaluation of floodplain and riparian projects should utilize remote sensing techniques and focus on changes in physical habitat and riparian vegetation.

As directed by the SRFB and Monitoring Panel, we developed the following study plan to monitor and evaluate large floodplain and riparian projects throughout Washington State using the latest remote sensing and other techniques. Developing a rigorous programmatic monitoring and evaluation program requires several key steps to ensure the monitoring meets its objectives and is properly implemented and completed (Figure 1).

[1] Additional detail advances in biological monitoring methods can be found in Roni et al. (2019a) and Steele et al. (2019).

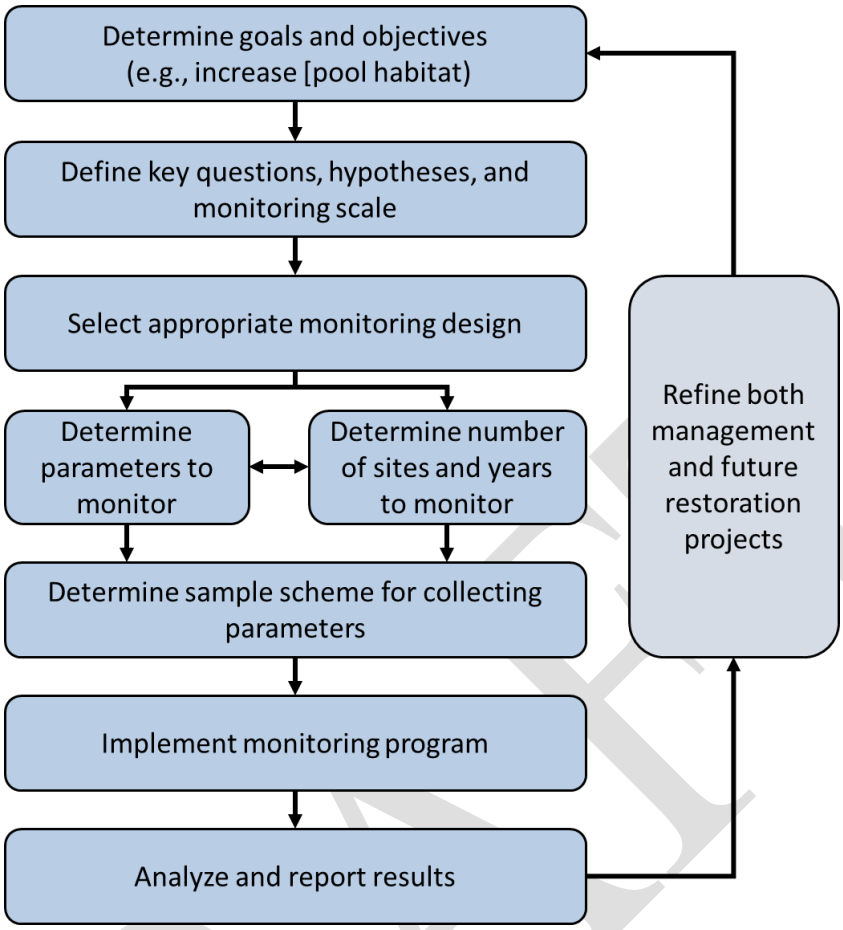

Figure 1. Steps for designing a successful monitoring program to evaluate restoration success (modified from Roni et al. 2005, 2013).

We address each of these steps in the monitoring plan. We first discuss goals, questions, and assumptions before discussing the monitoring design and parameters and metrics. We then discuss site selection, data management, projected costs and schedule, and reporting and implementation. We close with challenges and next steps.

This monitoring plan was developed with oversight and guidance from the SRFB Monitoring Panel. This included multiple conference calls and meetings to define the goals and scope of the monitoring plan, the key questions, and potential metrics. This document was developed for the Recreation and Conservation Office (RCO), SRFB, SRFB Monitoring Panel, Council of Regions, and its partners.

2.0 GOALS, QUESTIONS, AND ASSUMPTIONS

Setting the goals and objectives of a monitoring program (study) and defining key monitoring questions as well as assumptions is a critical step in developing a successful monitoring program (Roni et al. 2005; Weber et al. 2018). The goals and objectives of the restoration and monitoring help inform the questions or hypotheses the monitoring program will answer. These in-turn drive the development of the entire monitoring program. The initial goals and questions for this monitoring program were determined by the SRFB Monitoring Panel. To refine and clarify these, we met with the Monitoring Panel to clarify the goals and objectives of the program as well as any additional side boards. Based on these discussions, the following goals and objectives were defined.

Overall Monitoring Goal – The goal of the program is to evaluate the effectiveness of large (> 1 km in main channel length) floodplain and riparian restoration projects using the latest remote sensing techniques.

Specific objectives and guidance provided by the Monitoring Panel included:

- Evaluate floodplain and riparian projects with the assumption that most riparian projects are part of floodplain restoration projects
- If there are suitable number of large riparian-only projects (1 km or longer in length), consider including them as part of the monitoring program
- Focus on large projects(> 1 km)—phased projects should be considered one project
- Event-driven monitoring rather than time driven (after so many high flow events rather than strictly 3, 5, 7 years post treatment)
- Focus on remote sensing and monitoring protocols that will give us response at a large (broad) scale
- Focus on physical monitoring with understanding that if there is some efficient way to do biological monitoring it would be described as an option
- Time frame – initial results in 5 to 10 years (sooner if possible), with idea that this would be set up for monitoring long term (20+ years) response
- To ensure the full impact of restoration, consider monitoring additional habitat immediately upstream and downstream of project footprint
- Level of inference is the individual project and site (area influenced by project)
- Evaluate effectiveness of previously completed projects if possible and new projects if necessary

- If possible, include sites where previous data/monitoring has occurred to leverage previous data/efforts
- Cost of monitoring needs to be within modest PE monitoring budget (presumably $250,000 to $300,000 per year)
- Ensure program does not face same implementation challenges as IMW program (e.g., funding, delays in restoration, coordination, dependence on many partners for data collection)

Defining the questions for an effectiveness monitoring program can be a difficult task as different parties are interested in different questions. For example, managers and policy makers who distribute funds are often interested in broad-scale questions about whether specific types of projects are effective at improving habitat or increasing abundance, while practitioners are often more interested in not only what types of projects are most effective, but why a specific project was or was not successful or why a specific design worked or did not achieve desired physical objectives (Table 2). Traditionally, effectiveness monitoring programs have focused only on broad questions about effectiveness and provide general design guidance. For example, studies examining the effectiveness of large wood (LW) placement have shown that the projects that have the most pool forming wood or increase pool habitat the most lead to the largest increases in juvenile salmonids (Roni and Quinn 2001; Roni et al. 2015a; Clark et al. 2019), but stopped short of evaluating design of specific projects.

Table 2. Cross walk of major monitoring questions often posed about effectiveness of restoration projects, the scale the response is measured at, the scale of inference (scale results can be applied to), whether the monitoring focuses on an individual project, or multiple projects, or all projects in a program, and which parties are typically interested in a specific questions. Traditionally, effectiveness monitoring has provided general guidance on projects design, which is often the main focus of practitioners, while funders and managers have been focused on broader questions of effectiveness.

Questions	Scale of measurement	Scale of inference	Monitoring of individual or multiple projects	Interested parties (in order of importance)
Watershed Scale				
What is effect of a specific project on watershed conditions or a salmon population?	Watershed	Watershed	Individual project	Managers/funders
What is effect of a suite of projects on watershed conditions or a salmon population?	Watershed	Watershed	All projects	Managers, funders, practitioner
Segment or Reach-scale				
What is the effect of projects on fish and habitat in a valley segment? (multiple reaches)	Valley segment	Valley segment	All projects in segment	Funders, practitioners

Questions	Scale of measurement	Scale of inference	Monitoring of individual or multiple projects	Interested parties (in order of importance)
What is effect of a specific project on habitat and fish in project reach?	Reach or project	Reach, project	Individual project	Funders, Practitioners
What is effect of a project type on habitat or fish at a reach-scale?	Reach	Program/region	All or sub-sample of a specific project type	Managers, funders
Project Level Monitoring				
How effective was design of a specific project?	Project, meso and micro-habitat	Project	Individual project	Practitioner, funder
What is optimal design for different project types under different conditions?	Project, meso and micro-habitat	Program, project	All or sub-sample of projects	Practitioner, funder

Based on input from both managers and practitioners and guidance provided by the Monitoring Panel, an additional goal is to provide feedback on project designs. Thus, in addition to the questions on reach-scale effectiveness, enough detailed information should be collected to evaluate the design of the project. This will meet the objectives of reach-scale monitoring, but the inference will be at the project scale.

The Monitoring Panel also provided and initial list of monitoring questions that they had developed with input from the Council of Regions and others. We refined these questions based on guidance above and added additional questions to help evaluate project design. The monitoring program is designed to answer the following 11 questions[2]:

1. What is the floodplain area in the reach before and after restoration, what is the extent and frequency of floodplain inundation at different flow levels over time?
2. Based on the underlying geomorphic processes and the outcomes expected at the site and reach, did the project meet its geomorphic design objectives and did the active channel zone change as predicted?
3. What is the number, total length, and area of seasonal and perennial side channels, and area of off-channel ponds/wetlands in the reach, and how much do they change over time?

[2] An additional twelfth question related to remote sensed monitoring of water temperature was proposed, but moved as an optional or complementary study.

4. What is the effect of restoration on channel and floodplain morphology and complexity (RCI [Brown 2002], side channel ratio [Beechie et al. 2017], MQI [Rinaldi et al. 2013, 2017]) in the reach, and how does it change over time?
5. What is the number and diversity of habitat types (i.e., pools, riffles, glides, etc.) within the main channel, and seasonal and perennial side channels at different flows (low, bankfull) in the reach, and how much do they change over time?
6. What is the abundance and distribution of large wood in the active channel, wetted channel, and on the floodplain within the reach, and how do they change over time? What proportion of the wood is actively interacting with the channel?
7. Based on difference of DEMs (digital elevation models) in the reach before and after restoration, what is the areal extent and distribution of sediment erosion and deposition (storage) on the floodplain, and how much do they change over time?
8. Based on modeled depths and velocities, what is the area of suitable habitat for juvenile (low, bankfull, flood flows) and spawning adult Chinook *Oncorhynchus tshawytscha*, steelhead *O. mykiss*, coho *O. kisutch*, or other target salmonid species in the reach and how has it changed before and after restoration?
9. What is the areal extent of riparian vegetation by vegetation class (e.g., grasses, forbs, shrubs, trees, etc.), and how much do they change over time?
10. What is the species composition and density of riparian vegetation and how much do they change over time?
11. Has riparian/floodplain restoration led to restored riparian function including shade, bank stabilization, organic matter following riparian restoration? *[Note for Monitoring Panel - removed LW recruitment from this list as itis very long-term]*

2.1 Scale

Based on the questions and the objectives of the monitoring program, both the scale of monitoring and the scale of inference become clear. First, because the goal is to look at broad-scale response relying primarily on remote sensing, the actual monitoring will occur at the reach or valley segment scale[3]. The scale of inference refers to the at which conclusions can be accurately drawn. Rather than using the monitoring

[3] We follow the definitions of Gurnell et al. (2015) were a reach is geomorphically similar section of stream ranging from 0.1 to 10 km in length and a valley segment is a section of river subject to similar valley-scale influences ranging from 10 to 100 km.

data to draw conclusions regarding all possible floodplain or riparian restoration projects in a region (i.e., project or restoration type inference), this monitoring is designed to draw conclusions about individual projects. Thus, the level of inference is at the restoration project level, which may cover an entire reach or valley segment. This is with the understanding that these projects can be analyzed collectively to provide guidance to other similar projects being implemented throughout the region.

The above questions are designed to provide detailed evaluation of selected projects. Less detailed or specific questions utilizing existing data and completed projects could also be answered. These would be designed to answer very general questions about effectiveness of specific project types such as: does floodplain restoration lead to increased side channel length or does vegetation cover increase following riparian restoration? These would not provide information about the effectiveness of a specific project but would provide broader-scale information on overall effectiveness of floodplain or riparian projects and the overall SRFB program. Because this less rigorous monitoring would not meet original goals and questions defined by SRFB and Monitoring Panel, we discuss this in section 8.2 Related or Complimentary Studies.

In addition, to the guidance provided by the Monitoring Panel, we made the following assumptions. First, we assume that physical response for floodplain restoration projects will begin to occur within three to five years following restoration, while riparian restoration (planting) may take more than 10 years to see a response. We also assume that any new projects selected will be implemented within 1 to 2 years of the initiation of the monitoring program. This is to ensure that the program does not become too protracted. We also assume that broad climatic factors will not change dramatically before and after restoration, or if they do, we can account for these by looking at aerial imagery for other nearby stream reaches. Finally, we assume that the study should be designed to evaluate the suite of floodplain restoration techniques used to restore connectivity of the main channel with the floodplain. These include but are not limited to levee removal or set back, removal of bank armoring removal, Stage 0 restoration, channel remeandering, side-channel reconnection and construction, and large wood placement[4].

[4] Only when large wood is placed with goal of reconnecting floodplain or side channels

3.0 MONITORING DESIGN

There are a handful of different experimental designs used to evaluate restoration projects, each with strengths and weaknesses. Common designs used to evaluate restoration projects include before-after (BA), before-after control-impact (BACI), multiple-BA (mBA) or multiple-BACI (mBACI), extensive post-treatment (EPT), and intensive post-treatment (IPT; Hicks et al. 1991; Downes et al. 2002; Roni et al. 2005, 2013). The first four designs (BA, BACI, mBACI, mBA) require data collection before and after restoration and each has strengths and weaknesses (Table 3). For evaluating a restoration program like the SRFB Program, these designs have been applied using different approaches that are suited for different scales and time frames (Table 3).

Table 3. Summary of the strengths and weaknesses of different programmatic monitoring and evaluation approaches. For the first four strengths, Yes or No indicates if an approach can address this question. Level of inference is whether one can apply results across a program or only to an individual project or both. Hybrid design includes a combination of experimental designs including before-after (BA), multiple before-after control-impact (BACI), extensive post-treatment (EPT), or others. Table is adapted from a recent review of approaches for monitoring and evaluating a restoration program (Roni et al. 2018). IMW = intensively monitored watershed.

Strength	Case study	Meta-analysis	Multiple BA or BACI	EPT	IMW	Hybrid
Can examine interannual variation in response?	Yes	Yes	Yes	No	Yes	Yes
Provides info on why some project are more effective than others?	No	Yes	Yes	Yes	No	Yes
Results are broadly applicable?	No	Yes/No	Yes	Yes	No	Yes
Requires standardized data collection?	No	No	Yes	Yes	Yes	Yes
Length of monitoring (years)	10+	10+	5+	1-3	15+	3+
Cost (low, medium, or high)	L	M	H	M	H	M
Level (scale) of inference	Project & Program	Project & Program	Project & Program	Program	Program	Program
Monitoring designs	BA, BACI	BA, BACI, EPT	BA or BACI	EPT	BA or BACI	Various

Almost all of the 12 monitoring questions defined above require before and after monitoring. Moreover, based on the scale of the monitoring (reach or segment > 1 km), scale of inference (project), the focus on physical monitoring, and the difficulty in finding suitable control reaches for larger floodplain projects, this indicates that paired control or reference reaches are unlikely to exist and not necessary.

Another factor to consider in the design is characteristics of the restoration projects themselves. Any type of post-treatment design will require a large population of projects to choose from as typically one-third or less of all projects will have suitable control reaches (Roni et al. 2013). Moreover, before and after monitoring of past projects will require locating completed projects where the necessary data have been collected. To examine this, we queried all completed, active, and proposed projects in the PRISM database that had floodplain and riparian elements and treated more than 0.9 kilometers of stream[5]. Because there are not no specific work elements in PRISM for floodplain or riparian projects, we used a multi-step process to identify appropriate worksites (restoration sites). First, we worked with the RCO to query the PRISM database for project types that included restoration (i.e., Acquisition & Restoration, Acquisition & Restoration & Development, Planning & Restoration, Planning & Restoration & Acquisition, and Restoration). This was further limited to the Salmonid Habitat Restoration and Acquisition project category and two sub-categories: Instream Habitat and Riparian Habitat. We then selected for work types related to floodplain (channel reconfiguration and connectivity) or riparian restoration (riparian plantings, invasive plant removal, and/or other riparian project types). Projects that solely focused on invasive plant removal, while important, are not the focus of this monitoring program. We then filtered these worksites, which represent unique on the ground restoration sites (projects) for those that were greater than 0.9 km (Table 4).

Table 4. Entries from the Pacific Coastal Salmon Recovery Fund (PCSRF) data dictionary and headings used to select relevant categories, sub-categories, and metrics for identifying worksites in the PRISM database. PRISM uses the PCSRF data dictionary to track project, work type, work type metrics for each worksite (unique restoration site).

Category	Sub-category	Data field ID	Work type	Work type metrics	ID #	Data field format and metrics
C. Salmonid Habitat Restoration and Acquisition	C.4 Instream Habitat	C.4.c	Channel reconfiguration and connectivity	Changes in channel morphology, sinuosity or connectivity to off-channel habitat, wetlands or floodplains. This includes instream pools added/created; removal of instream sediment; meanders added; former channel bed restored; removal or alteration of levees or berms (including setback levees) to connect floodplain; and, creation of off-channel habitat consisting of side channels, backwater areas, alcoves, oxbows, ponds, or side-pools.	C.4.c.3	# miles (to nearest 0.01 mile) of stream treated.
					C.4.c.4	# miles (to nearest 0.01 mile) of off-

[5] The estimates of length or area treated reported in PRISM are approximate, so we used 0.9 km to make sure we captured any projects that might have underestimated length treated.

Category	Sub-category	Data field ID	Work type	Work type metrics	ID #	Data field format and metrics
						channel stream created
	C.5 Riparian Habitat	C.5.b	Total riparian area treated	Total length of streambank riparian area treated and amount of riparian area treated or managed. Report the actual length of streambank riparian area treated, adding lengths of treatment on both sides of stream if treatment was on both streambanks.	C.5.b.1	# miles (to nearest 0.01 miles) of streambank treated.
		C.5.c	Riparian planting	Riparian planting or native plant establishment.	C.5.c.4	# miles (to nearest 0.01 mile) of streambank treated.
		C.5.k	Unspecified or other riparian habitat project	Unspecified or other riparian habitat project (not included in C.5.c to j.).	C.5.k.2	# miles (to nearest 0.01 mile) of streambank treated.

There were 74 projects with floodplain components that reported treating more than approximately 1 km (Table 5). These projects (work sites) ranged in size from approximately 1 km to more than 4 kms, with an average length of approximately 2 km (Figure 2). Of these floodplain projects, 51 also contained riparian restoration treatments, demonstrating that most floodplain projects incorporate riparian planting or other riparian treatments. However, when we examined the Washington Department of Natural Resources (DNR) LiDAR Portal to see how many of these projects had readily available LiDAR, only 22 of the 74 large projects(~30%) had LiDAR before the restoration occurred, and only three (4%) had green LiDAR. It is likely that not all LiDAR datasets available have been reported in the DNR LiDAR Portal, but this analysis indicates that few if any existing projects will have adequate pre-project data. There were also 242 riparian restoration only worksites that reported treating more than approximately 1 km.

Table 5. Results of query of the Recreation and Conservation Office (RCO) PRISM database for completed, current, and proposed restoration projects in Washington State that have a floodplain component and were 1 kilometer or larger. We used a length of 0.9 kilometer rather than 1 km realizing that project sponsors often estimate the total length treated. We also examined how many of these had riparian metrics and riparian treatments that also spawned more than 1 km. We then queried the DNR LiDAR portal to see the number of projects where LiDAR data was readily available and how many of those sites had green (bathymetric) LiDAR. Metrics search in PRISM were c.4.c.4 miles of stream treated for channel reconfiguration and connectivity and c.4.c.4 miles of off-channel stream created.

	Floodplain metric	Floodplain metric + any riparian metric	Floodplain metric + riparian metric ≥0.9 km
Total projects	282	174	64
Projects with ≥0.9 km floodplain metric	74	51	38
Projects with any LiDAR	66	46	36
Projects with LiDAR from 2010+	64	44	35
Projects Green LiDAR from 2010+	5	2	1
Projects with LiDAR from 2010+ and before implementation	22	16	13
Projects with Green LiDAR from 2010+ and before implementation	3	1	1

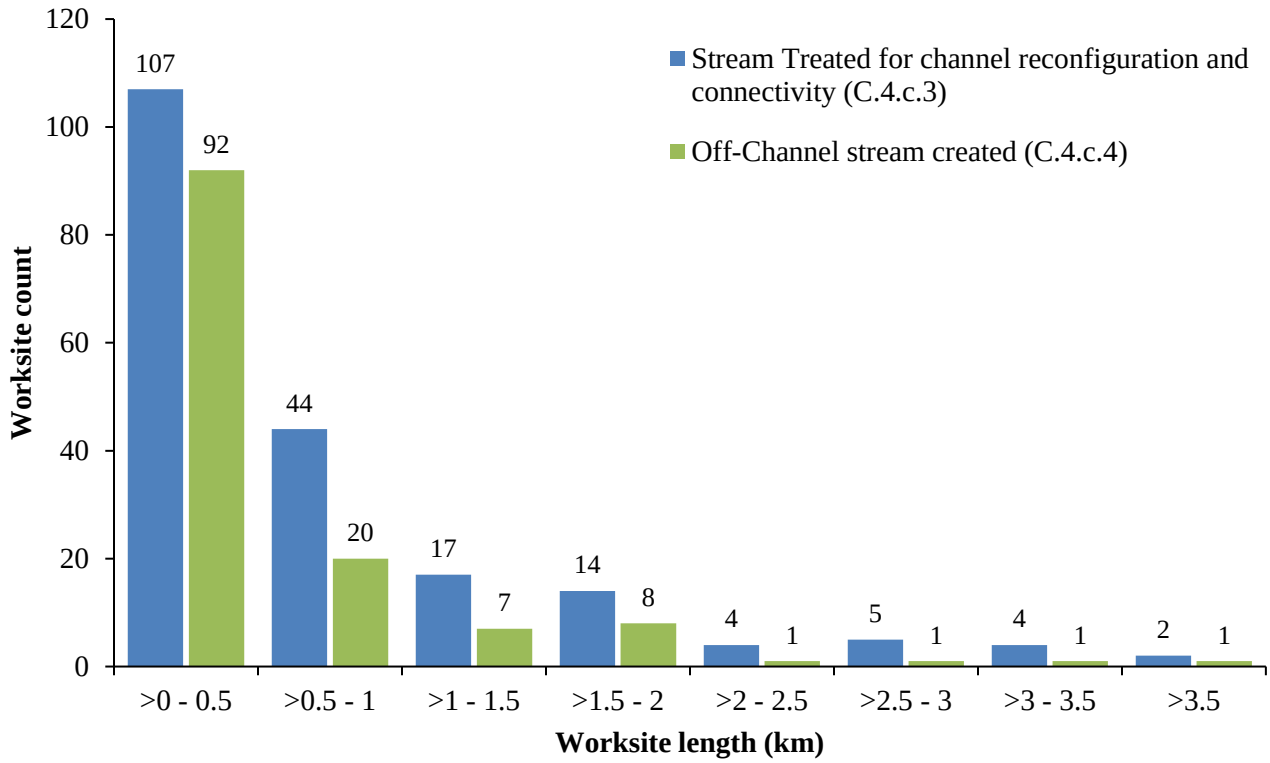

Figure 2. Frequency of projects (worksites) that reported floodplain treatments that were more than 1 kilometer in length. The two primary work elements related to floodplain restoration in the PRISM database were C.4.c3 and C.4.c.4). It was not possible to determine "phased projects" based on data available so some sites may be much longer but may have been phased over multiple years and projects.

This analysis indicates that a post-treatment design or a before-after design using previously completed projects will be very difficult because only a few projects have the required pre-project data LiDAR data. Moreover, it is unlikely any of these have the necessary field data that will need to be collected at the time

of LiDAR acquisition. Therefore, we recommend a simple before-after design to evaluate floodplain and riparian restoration projects.

3.1 Spatial and Temporal Replication

The next step in designing an effectiveness monitoring program is typically to estimate the number of sites and number of years that need to be monitored. However, given that the proposed monitoring program focuses on project level results, large projects, and the availability of potentially costly techniques (LiDAR), a rigorous power or sample size estimation is neither necessary nor particularly useful. We will discuss in the cost section specifics of estimating the cost of monitoring, but green LiDAR alone will likely cost in excess of $30,000 per site. We recommend sampling as many sites as is possible given funding, ideally at least one per recovery region (8) but a minimum of a half a dozen projects. If large riparian projects are to be monitored as a separate category, a similar sample size should be monitored. *[Note for Monitoring Panel - need clarification of whether riparian only category will be part of final plan]*.

Defining the temporal replication is more straightforward and needs to consider the required pre-project data, how long it will take to implement project, and how long before a response is detected. Given the lower inter-annual variability, large size of projects, and the expected improvements in habitat, one year of pre-project data is adequate for physical habitat metrics. In contrast, fish or other biota may require many years of pre-project monitoring because of their high interannual variability (Minns et al. 1996; Ham and Pearsons 2000; Roni et al. 2013). To address questions about whether a project is meeting design objectives, an "as-built" survey completed within a few months of the completion of restoration and before any high flow events is needed along with a planting plan for riparian projects. Post-treatment monitoring for floodplain projects would ideally be flow-based and initially occur after one or more channel forming flows (bankfull or approximately 1.5- to 2-year recurrence interval; Williams 1978; Leopold 1994; Castro and Jackson 2001) and following large flow events (5-, 10-year recurrence interval). However, this can make planning and implementing monitoring difficult as it will require waiting until late spring each year to determine which projects will be sampled. In addition, depending upon the goals and techniques used for a floodplain restoration project, the response time could be anywhere from a few years to more than a decade to see the full response of the channel or aggradation and degradation. Response of riparian restoration is less flow dependent, though riparian planting and treatments can take on the order of several decades to see full vegetation response. Another factor to consider are the goals and assumptions of the project. In this case, the SRFB would like to see responses within 5 to 10 years, with the idea that these

sites will likely be monitored for many years beyond that. Based on these factors we developed a pre- and post-treatment monitoring schedule that considers all these factors and uses a combination of event based and periodic monitoring (Table 6).

Table 6. General sampling schedule for floodplain sites based on necessary sampling one year before restoration, after restoration is completed, and post-treatment monitoring based on either flow or time passed since restoration. If no bankfull flow event occurs within first three years, monitoring should occur in year 3, should a bankfull event occur in year 1 or year 2, year 3 monitoring should be bumped up to year 1 or 2 and then not repeated again until year 5. Sites that have riparian restoration only are not as dependent on flow could be monitored at regular intervals.

	-1 (pre)	0 (as-built)	1	2	3	4	5	6	7	8	9	10	15	20
Regular intervals	X	X			X		X					X	X	X
If event occurs in year 1+	X	X	X				X					X	X	X
If event occurs in year 2+	X	X		X			X					X	X	X

An additional temporal component is the season of sampling. Much of the remote sensing and field data collection will occur during low flow and during late fall because it is the optimum period to obtain data and map the topography and bathymetry. To examine seasonal aspects of changes in floodplain habitat, many metrics will be calculated at different flows that represent different seasons (e.g., base flow [summer low flow], bankfull flow, spring-snowmelt). We describe these seasonal or flow-based aspects for appropriate metrics in Section 4.0 Parameters, Metrics, and Protocols.

3.2 Stratification

Washington State is composed of eight salmon recovery regions which roughly coincide with EPA Level III ecoregions and ESA evolutionarily significant units (ESU) for salmon and steelhead populations (Figure 3). Given the differences in salmonid species, climate, geology as well as the fact that different groups oversee restoration in each region, we recommend stratifying projects by recovery region, ideally with a minimum of one project monitored in each recovery region. This will also allow different recovery regions to assist with selection of projects for monitoring.

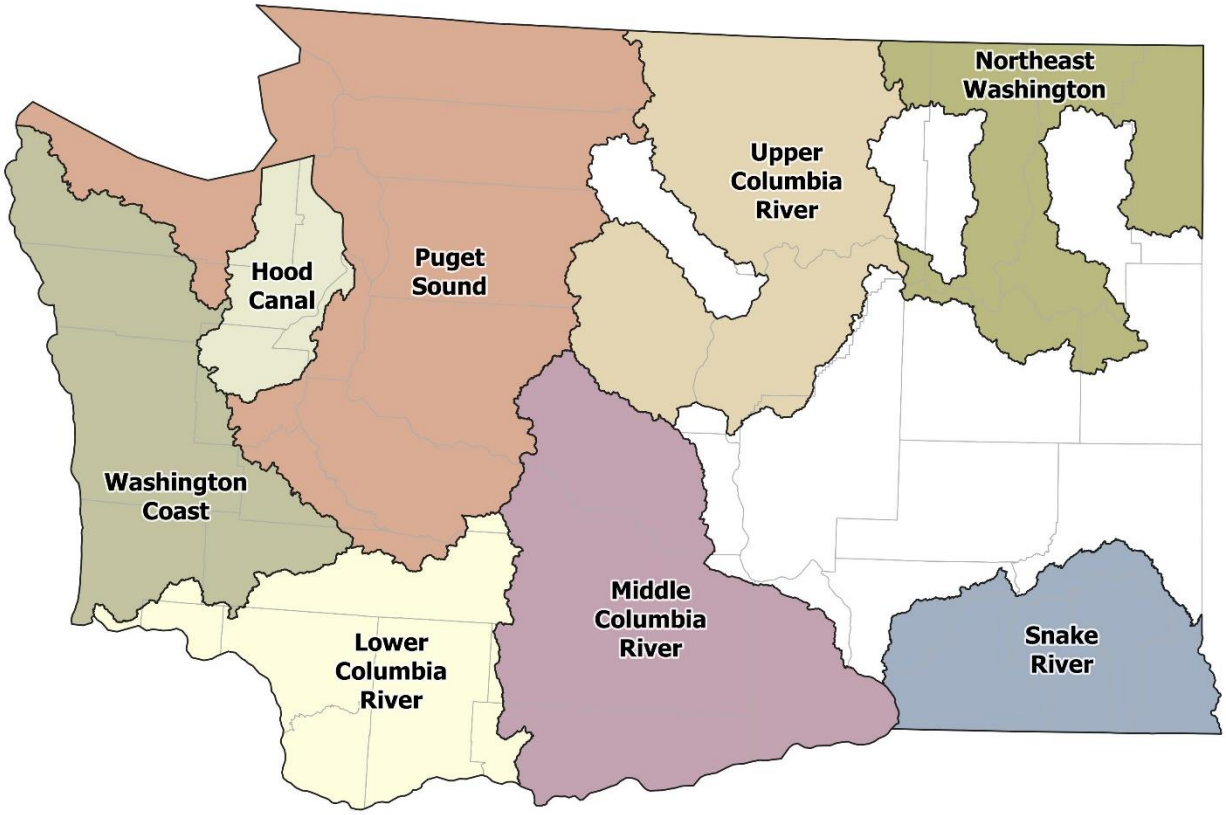

Figure 3. Map of eight Washington State salmon recovery regions.

3.3 Site Selection

The method of how sites will be selected for the study is a key component of the monitoring design. The actual selection of sites is typically done as part of the implementation phase. Because the program focuses on evaluation of projects funded by the SRFB, an initial population of projects can be drawn from the PRISM database. As noted previously, currently there are 74 worksites that include floodplain metrics that cover approximately 1 km or longer, though many of these are completed projects, and only 17 of these are projects that have not been completed (Table 7). However, this likely does not include all projects that are planned in the next few years and some recovery regions have more projects than others. It also assumes that data in PRISM are accurate. Therefore, the list of projects should be shared with the Recovery Regions prior to implementation so that they can confirm that these projects meet the following criteria:

- Main objective of project is floodplain restoration (or riparian restoration for riparian projects)
- Restoration treatments cover greater than 1 km of mainstem channel
- Project will be implemented in 2021 or 2022
- Landowner(s) willing to allow access for next 10 years

- There is access to area immediately upstream and downstream of project (20 times bankfull width) to allow monitoring/surveys to include areas outside of project footprint potentially influences by restoration (not necessary for riparian only projects)

Based on the revised list of sites from the recovery regions, the contractor implementing the monitoring program will select sites for long-term monitoring. After getting an initial list of sites from recovery regions, field visits will be needed to confirm the sites meet the criteria and are appropriate including in the study. If there are more than one or two sites that meet the criteria, either sites can be selected randomly, or the recovery regions could be allowed to identify which site or sites would be most useful[6]. The latter could be beneficial in ensuring that the recovery regions and lead entities are supportive of sites selected.

Table 7. Initial list of worksites in PRISM with floodplain component (C.4.c.3 or C.4.c.4) greater than approximately 1 km (0.9 km) that are proposed or expected to be completed in 2020 and beyond including: recovery region, PRISM project name and worksite name, expected year of completion (end year), latitude, and longitude. It is likely that other projects exist that are not in PRISM or that length metrics were not accurate. The list should be vetted with recovery regions to confirm and identify other projects. List of projects that are completed are can be found in Appendix A.

Recovery Region	Project Number	Project Name	Worksite Name	End Year	Latitude	Longitude
Hood Canal	16-1372	Lower Dungeness Floodplain Restoration	Towne Road between Schoolhouse and Creamery	2021	48.142678	-123.1301
Hood Canal	18-1300	Dungeness River Floodplain Restoration	Towne Road between Schoolhouse and Creamery	?	48.142745	-123.1287
Lower Columbia River	16-1519	Elochoman Stream Restoration Cothren	Elochoman River Cothren	2021	46.228453	-123.364
Lower Columbia River	16-1520	Skamokawa Stream Restoration Project McClellan	Skamokawa Stream Restoration Project McClellan	2020	46.315347	-123.4549
Lower Columbia River	17-1025	Elkinton Property Stream Restoration	Elkinton	2021	46.2215	-123.3423
Lower Columbia River	17-1030	Johnston Wilson Creek Restoration	Johnston Wilson Creek	2022	46.296752	-123.3952
Middle Columbia River	10-1765	Eschbach Park Levee Setback & Restoration	Eschbach Park Phase 2	2015	46.679516	-120.6507
Middle Columbia River	17-1179	Yakima River Side Channel at Bull Canal Diversion	Irene Rinehart Riverfront Park	2021	46.986579	-120.5702
Middle Columbia River	18-1711	Teanaway Community Forest Floodplain Restoration	Indian Creek Section 16	2022	47.307897	-120.8461

[6] Assuming funds are available to monitor more than one site.

Recovery Region	Project Number	Project Name	Worksite Name	End Year	Latitude	Longitude
Puget Sound	16-1651	Hansen Creek Reach 5 Restoration	Hansen Creek New Channel	2022	48.515343	-122.2007
Puget Sound	18-1258	Riverbend Floodplain Restoration Construction	Riverbend	2023	47.464215	-122.1119
Snake River	15-1286	NF Touchet Floodplain & Habitat Rest. RM 3.3-4.3	Phase 1	2020	46.272538	-117.8931
Snake River	16-2091	Tucannon Complexity & Connectivity (PA-18)	PA-18 WDFW	2020	46.38559	-117.6964
Snake River	17-1267	Bridge to Bridge Restoration Phase 2-	Bridge to Bridge Phase 2	2020	46.052314	-118.57
Snake River	18-2091	Tucannon River Habitat Restoration, PA-32	PA-32	2021	46.483753	-117.9543
Upper Columbia River	18-1762	Middle Entiat Restoration - Area F (RM 16.2-16.7)	Middle Entiat Restoration Projects Area F	2021	47.799903	-120.4029

The exact schedule for monitoring of sites would need to be developed after site selection and need to consider when the project will be implemented. We propose that projects be selected where construction will begin in either 2021 or 2022 so that data collection can be staggered to allow a stable budget for the project through time and spread monitoring costs across years. This schedule could be adjusted depending on when the study begins, but we caution against including sites over several years as this has led to the problems with other programs evaluating restoration projects using a mBA or BACI design (Roni et al. 2018, 2020a). Another factor that will need to be considered is the time it takes to complete restoration; it is likely that some projects will take more than a year for restoration to be completed. This will influence the monitoring schedule.

4.0 PARAMETERS, METRICS, AND PROTOCOLS

To determine the methods and protocols for monitoring, we first defined the parameters and metrics needed to answer the monitoring questions (Table 8). The questions were designed in such a way that, when possible, they state clearly the response metric. For example, to answer the first question related to changes in floodplain inundation at different flows, we need to calculate floodplain area and floodplain inundation. As demonstrated in Table 8, monitoring of physical parameters for floodplains consists of metrics that summarize and evaluate channel and floodplain morphology, meso-habitats, large wood, sediment storage, and flow. Monitoring of riparian areas consists of metrics that summarize and evaluate changes in vegetation cover, species composition, bank stability, organic matter inputs, and shade.

Table 8. List of monitoring questions and parameters or metrics to be measured or calculated to answer these questions for floodplain and riparian restoration sites. R = remote sensing, F = field data.

Question	Parameter/metric and data collection methods (R or F)
(1) What is the floodplain area before and after restoration, what is the extent and frequency of floodplain inundation at different flow levels over time, and how much of the floodplain was affected/altered or improved by the enhancement action?	Floodplain area, (R, F) Floodplain inundation index, (R, F) Area altered (R)
(2) Based on the underlying geomorphic processes and the outcomes expected at the site and reach, did the project meet its geomorphic design objectives and did the active channel zone (Beechie et al. 2017; Stefankiv et al. 2019) change as predicted?	Active channel zone, geomorphic unit tool (GUT) (R, F)
(3) What is the number, total length, and area of seasonal and perennial side channels, and area of off-channel ponds/wetlands, and how much do they change over time?	Side channel number, length, and area, (R, F) Pond/wetland number and area (R)
(4) What is the effect of restoration on channel and floodplain morphology and complexity (RCI [Brown 2002], side channel ratio [Beechie et al. 2017], MQI [Rinaldi et al. 2013, 2017]), and how does it change over time?	Sinuosity, bankfull width and depth, side channel ratio, RCI, MQI (R, F)
(5) What is the number and diversity of habitat types (i.e., pools, riffles, glides, etc.) within the main channel, and seasonal and perennial side channels at different flows (low and bankfull), and how much do they change over time?	Shannon diversity index, diversity , habitat metrics (pool area, percentage, pool/riffle ratio) (low flow F, bankfull R)
(6) What is the abundance and distribution of large wood in the active channel, wetted channel, and on the floodplain, and how do they change over time? What proportion of the wood is actively interacting with the channel?	Large wood (R)
(7) Based on difference of DEMs before and after restoration, what is the areal extent and distribution of sediment erosion and deposition (storage) on the floodplain, and how much do they change over time?	Sediment deposition and storage, Difference in DEM (R)
(8) Based on modeled depths and velocities, what is the area of suitable habitat for juvenile (low, bankfull, flood flows) and spawning adult Chinook *Oncorhynchus tshawytscha*, steelhead *O. mykiss*, coho *O. kisutch*, or other target salmonid species and how has it changed before and after restoration?	Amount of suitable habitat Weighted Usable Area (WUA based on habitat suitability index [HSI] model) (R,F)
(9) What is the areal extent of riparian vegetation by vegetation class (e.g., grasses, forbs, shrubs, trees, etc.), and how much do they change over time?	Areal vegetation extent by class (R, F)
(10) What is the species composition and density of riparian vegetation and how much do they change over time?	Riparian composition, richness, diversity, and density (R, F)

Question	Parameter/metric and data collection methods (R or F)
(11) Has riparian/floodplain restoration led to restored riparian function including shade, bank stabilization, LW recruitment, organic matter following riparian restoration?	Bank stability (F), Shade (R, F), Organic inputs (R), Large wood (R)

Determining the appropriate monitoring protocol requires defining how each metric is calculated, the data that will need to be collected to calculate those metrics, and the method(s) needed to collect those data (Table 9). While a handful (6) of these metrics are calculated using solely data obtained from remote sensing, the majority require at least some data from field surveys; with the most common data need being bankfull width measurements for floodplain projects. While there are methods for determining bankfull width without direct field measurements, they are often subjective (i.e., rely on expert opinion; CHaMP River Bathymetry Toolkit, CHaMP 2016), rely on assumptions about bank morphology that cannot be guaranteed across many study sites or regions (reliance on bank inflection points; De Rosa et al. 2019, Fryirs et al. 2019), or are designed for broad-scale assessments (Beechie and Imaki 2014), and provide relatively coarse measures of bankfull width that are not ideal for monitoring at a site or reach scale.

Table 9. Floodplain and riparian metrics needed to answer monitoring questions and methods for calculating each. References provided where appropriate. *[NOTE FOR MONITORING PANEL – we could be reduced down a bit by removing or combining some of these so we have a core set of maybe dozen metrics. For example, side channel, number, length and area are really similar and measures of same metric.]*

Metric	Calculation
Floodplain area	Floodprone area, which is determined using 2 times the average maximum bankfull depth
Floodplain inundation index	Floodprone area divided by the mainstem wetted centerline length
Area altered	Delineate the project footprint from aerial imagery immediately after restoration. Use implementation documents as a guide as well.
Active channel zone[7]	Delineate the active channel based on historical aerial imagery and LiDAR.
Side channel number	Total count of wetted side channels Total count of bankfull side channels
Side channel length	Sum of the side channel wetted centerline lengths Sum of the side channel bankfull centerline lengths
Side channel area	Sum of the side channel wetted centerline areas Sum of the side channel bankfull centerline areas
Pond/wetland number	Count the number of isolated habitats at low flow surveys using LiDAR and aerial imagery
Pond/wetland area	Delineate the isolated habitats at low flow using LiDAR and aerial imagery to calculate total area
Residual pool depth	Maximum pool depth minus the pool tail crest in pool habitats, averaged across a reach for pools that the thalweg runs through (Lisle 1987)

[7] This is similar to the channel migration zone, but there is not widespread agreement on delineating the CMZ and for this reason NOAA status and trends and other programs are monitoring the active channel zone rather than the CMZ (Beechie et al. 2017; Hall et al. 2019; Stefankiv et al. 2019).

Metric	Calculation
Sinuosity	Divide the thalweg line length by the straight-line distance between the start and end points (i.e., top of site and bottom of site) of the thalweg (Rosgen 1994, 1996; Jones et al. 2015)
Side channel ratio	Sum of all the side channel bankfull centerline lengths divided by the mainstem bankfull centerline length (Beechie et al. 2017)
RCI (River complexity index)	RCI = (S*(1 + J) / (reach length))*100, where S = sinuosity, J = # of side channel bankfull junctions, reach length = mainstem wetted centerline length (Brown 2002)
Bankfull width to depth ratio	For each bankfull transect, divide the bankfull width by the maximum bankfull depth and average this ratio across transects within a reach (Rosgen 1996)
MQI (Morphological quality index	Extensive calculation using field data: confinement, sinuosity, anastomosing index, braiding index, mean bed slope, mean channel width, dominant bed sediment, and others (Rinaldi et al. 2013, 2017)
Pool/riffle ratio	Divide the total pool habitat area by the total riffle habitat area
Slow water (%)	Add together the pool and glide habitat areas. Then divide by the total wetted area, excluding side channel areas that do not have habitat units delineated
Pool area	Sum of the pool habitat areas
Pool frequency	Total count of pool habitats divided by the mainstem wetted centerline length
Shannon diversity index of habitat units	Shannon diversity index (H) of the channel units in the mainstem and side channels with habitat units delineated (Shannon 1948)
Large wood	Count of jams and individual pieces from aerial imagery (Beechie et al. 2017; Roni et al. 2020b)
Sediment deposition and storage	Create a DEM of Difference (DoD) for the years of interest and calculate the areas of deposition and storage
Habitat Suitability Index (HSI)	Sum of weighted usable area (WUA) and normalized WUA by species and life stage based on hydraulic and HSI modeling
Areal vegetation extent by class	Ratio of number of lidar returns in understory height band to number in ground band. Similar for overstory (R, F) (Akay et al. 2012)
Riparian composition and density: richness, density, diversity	Richness – count of unique species across all transects (F) Density – count of individual species across all transects, divided by the aggregated area of all transects (F) Diversity – Shannon's diversity index using species abundance data (Shannon 1948)
Bank stability	Measure of length of eroding bank (F)
Shading	Total insolation hours. Calculate using the GRASS r.Sun modules (R, F) (Greenberg et al. 2012)
Organic inputs	Volume of canopy that overhangs the active channel (R) (Laslier et al. 2019)

Based on the requirements in Table 9, surveys are required to collect data on topography and bathymetry, habitat and channel characteristics, substrate, flow, and riparian condition. We first describe the basic methods for laying out the survey extent and then summarize the remote sensing or field methods for each of these survey types below.

Site Layout

Site layout consists of delineating the top and bottom mainstem channel boundaries, which define the longitudinal extent of the site. For floodplain restoration sites, the upstream and downstream boundaries of the site should be delineated based on the proposed restoration plans and then an additional length upstream and downstream of 20 times the average bankfull width of the reach will be measured to mark

the top and bottom of the survey. The additional length above and below the project is needed to quantify any changes in habitat due to the restoration that might occur immediately upstream or downstream of the project footprint. Care should be taken to ensure the survey boundaries do not bisect a channel unit (e.g., do not split a pool unit with the boundary). All site visits following the initial survey will reoccupy the site boundaries (i.e., boundary locations to not change even if a channel unit is bisected during subsequent visits). The lateral survey extent for floodplain projects will include all of the floodplain. The procedure for delineating survey extent for riparian only projects will include marking the upstream and downstream ends of the riparian treatment as additional length upstream and downstream of the project is not needed.

4.1 Topography and Bathymetry

Collecting the topography of the floodplain and the active channel are essential for data collection and calculating the metrics to answer monitoring questions about floodplain restoration projects being monitored. Our review of the latest remote sensing techniques and our pilot study on floodplain monitoring methods (CFS 2019, 2020), demonstrated that the optimal method for this is green (or bathymetric) LiDAR. The near-infrared (red) LiDAR, which is the most frequently acquired data for mapping topography, does not penetrate the water surface and thus cannot be used to map bathymetry. Bathymetric (green) LiDAR can be used to map below the water surface. However, the depth that the green laser can penetrate into the water to measure subsurface topography depends on water clarity, turbulence, and streambed reflectance (i.e., needs high clarity, low turbulence, and a reflective bottom), as well as the type of sensor used. Green LiDAR has been shown to be powerful enough to measure river bathymetry on medium to large rivers with depths of three or four meters (Campana et al. 2014; Roni et al. 2020b; Figure 4). Most green LiDAR sensors can measure depth of 1.5 to 2.5 Secchi depths depending on water clarity and bed reflectance (Quadros 2013; Pratomo et al. 2019). Thus, green LiDAR cannot effectively map bathymetry if the channel is too deep or turbid, or there where there are high levels of surface turbulence. Acquiring green LiDAR, which currently needs to be flown with a fixed-winged aircraft[8], can be costly (>$30,000 for 3–8 km^2 or >$40,000 for 8–20 km^2) and still requires some field data collection. For floodplain projects that cover less than approximately 4 kilometers of main channel length, it is currently more cost effective to fly red LiDAR with a drone to obtain topography (<$5,000 for a site covering 4 km of mainstem or 8 km^2) and collect bathymetric data with using a field survey with a real-time kinematic

[8] Several vendors are working to develop a green LiDAR sensor that is small and light enough to be flown with a drone, but there are many technological challenges to this and none have been perfected or accurate to date are on the market as of the writing of this report. If perfected, they will likely be far more expensive than a near infrared LiDAR sensor for a drone which currently cost $60K to $100K or more.

(RTK) global positioning system (GPS). In addition, as we describe in the channel and habitat survey section, even green LiDAR will require some field data collection for validating the LiDAR and for collecting habitat data necessary for many metrics. Based on this, we propose that green LiDAR is flown only at sites greater than 4 km and where turbidity or depth is not an issue, and red LiDAR using a drone is flown on smaller sites and coupled with an RTK survey of bathymetry. The optimal methodological approach will in part be based on the site and the cost-tradeoffs of the different approaches, which may change over time. Given that the current information suggests most floodplain projects are less than 4 km, the drone-based red LiDAR is likely most appropriate for most sites. For sites that include only riparian restoration, red LiDAR is adequate and can be flown with either a drone or fixed winged aircraft (red LiDAR is less costly than green LiDAR).

Table 10. Table of methods for collecting topographic or bathymetric data for floodplain projects. Within limit of green LiDAR

Site Size	Water depth, clarity, turbidity, turbulence	Method
Main channel length < 4 km	Any	Red LiDAR with RTK Survey
Main channel length > 4 km	Within limits of green LiDAR	Green LiDAR
Main channel length > 4 km	Exceeds limits of green LiDAR	Red LiDAR and RTK GPS or ADCP

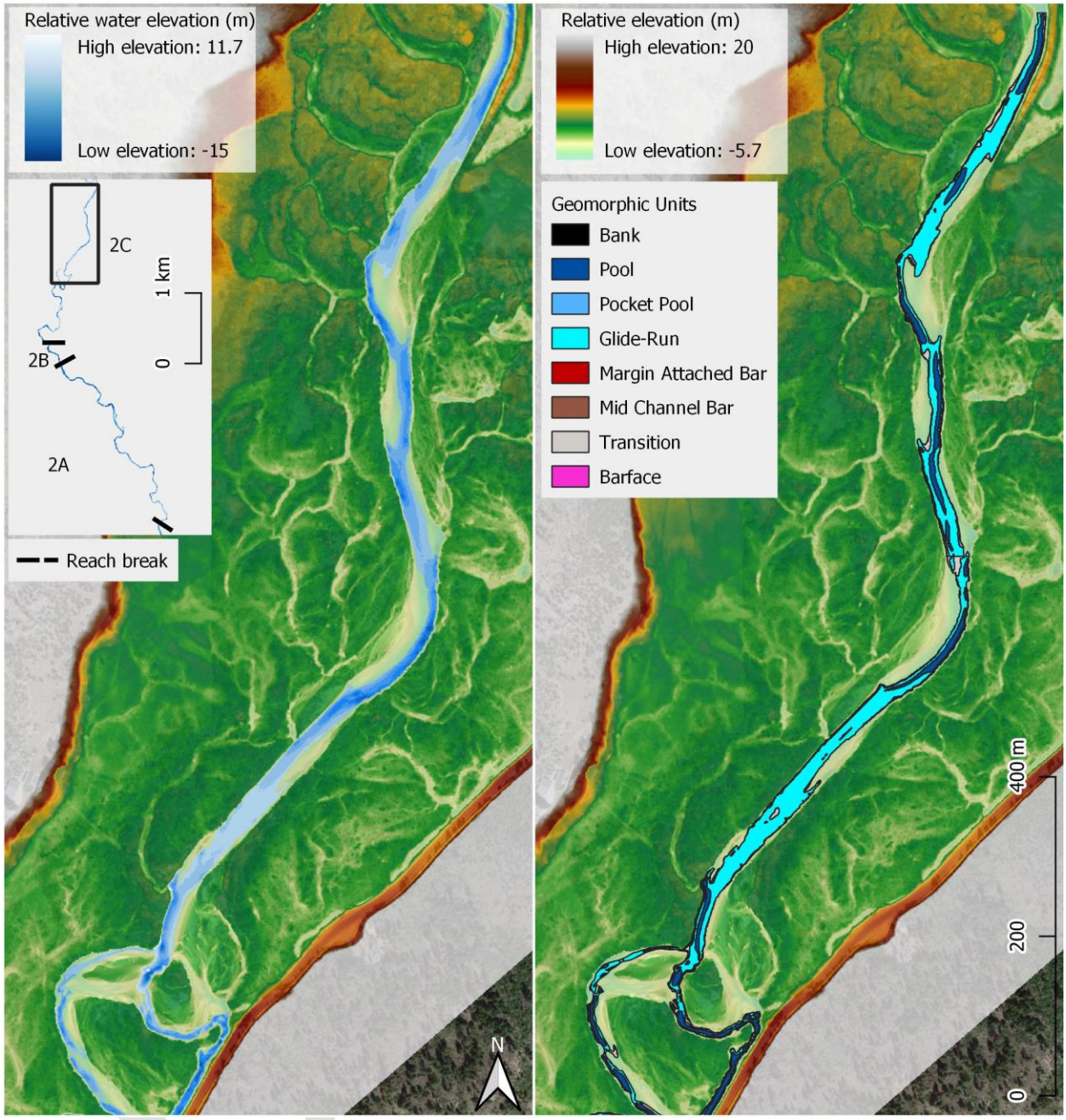

Figure 4. Example of topography and bathymetry from green LiDAR flown before restoration on Entiat River (from Roni et al. 2020b).

Given that LiDAR sensors continue to improve, it is important that LiDAR data collected are consistent and compatible. Therefore, LiDAR acquisitions should be of sufficient quality to support creation of digital elevation and surface models at half meter resolution (0.5 m^2 pixels) with a goal of at least 5-15 ground returns per meter (Thomas et al. 2017). LiDAR should be flown during low flow and leaf-off conditions to ensure adequate ground returns to facilitate accurate DEM models. This ideally would occur in October before any high flow events. In addition to the DEM for topography, a digital surface model

(DSM), and the point clouds from LiDAR are necessary for monitoring riparian conditions at both floodplain and riparian restoration sites. For sites that green LiDAR is not appropriate, potential methods for a mapping channel bathymetry are described below.

4.2 Channel and Habitat Survey

The approach for the channel and habitat survey will differ in intensity based on whether green LiDAR or red LiDAR is obtained. We first describe the approach assuming green LiDAR is acquired, we then describe additional bathymetric data needed if red LiDAR is collected. While green LiDAR allows for creation of a DEM and collection of detailed topographic and bathymetric data at a level not possible historically, it has not completely eliminated the need for field data. Supplemental field data is needed to calculate many floodplain metrics, ground truth elevations calculated from the LiDAR DEM, and collect data needed for hydraulic modeling and Habitat Suitability Index (HSI) calculations. To obtain the supplemental data, a field survey using an RTK GPS and a tablet with survey forms will be used to collect habitat unit boundaries, bankfull points, and side channel data. The bankfull points are needed to assist with delineating a bankfull polygon to calculate bankfull width and depth, which can be done in part from the DEM.

While some geomorphic units can be calculated in the bankfull channel using the geomorphic unit tool (GUT; Bangen et al. 2017), these do not coincide with meso-habitats types that are indicators of fish-habitat quality (Roni et al. 2020b). Thus, characterization of habitat units at base flow will be conducted in the mainstem and flowing side channels as part of field surveys to accurately quantify fish habitats. Habitat units will be numbered and classified as pool, riffle, rapid, cascade, glide, or backwater (Hawkins et al. 1993), and recorded on a tablet with unit number and unit type. All habitat units within a reach will be delineated at the wetted edge in addition to across the bottom and top of the habitat units. These data will be used with the DEM to delineate the wetted edge and wetted area of each habitat unit at the surveyed flow. If a bar is present, additional habitat unit points (wetted edge) should be collected so the bar can be delineated in post-processing. In-channel habitat unit points should be collected for habitat units with complex boundaries (i.e., boundaries not perpendicular to channel orientation) for better delineating in post-processing. The top and bottom of all wetted or dry side channels will be delineated. For wetted side channels, where channel units greater than 10 m^2 can be delineated, then habitat units will be surveyed using the same procedures as described above for the main channel. Any other water features that are not connected to the mainstem will be delineated and classified as off channel habitats.

Bankfull and wetted edge points will be collected using the RTK at 50 m intervals depending on site length beginning at the bottom of survey extent (BOS) and continuing upstream along both stream margins to the top of the survey extent (TOS). In addition, wetted edge points outside the survey extent will be collected to assist with detrending the entire DEM (CFS 2019). Four wetted edge points should be collected on each bank and extending approximately 30 meters up- and downstream, for a total of 16 wetted edge points outside the site survey extent (8 upstream of TOS and 8 downstream of BOS).

Data on substrate will be collected to assist with hydraulic and HSI modeling. The dominant (≥50%) and sub-dominant (<50%) substrate classes will be visually estimated within each habitat unit. Substrate will be assigned to categories of fines (<0.06 mm), sand (0.06–2 mm), gravel (2–64 mm), cobble (64–256 mm), small boulder (256–1,024 mm), large boulder (1,024–4,096 mm), bedrock (>4096 mm), or hardpan/clay.

Similarly, bank armoring, erosion, and riparian condition along the main channel are needed for calculating the Morphological Quality Index (MQI) and will be collected as part of the habitat and channel survey. The length (m) of eroding bank and length (m) of armored bank within each habitat unit will be visually estimated. In addition, any significant substrate embeddedness and bed armoring will be noted for each habitat unit as 'yes' or 'no', as well as the presence of a bed stability structure. Finally, any evidence of riparian vegetation removal within a habitat unit and along the banks will be noted as 'yes' or 'no'. Detailed riparian surveys to monitor riparian response are described below.

If red LiDAR is collected rather than green LiDAR, in addition to the above data, a bathymetric survey needs to be conducted while collecting habitat data so that a point cloud of the bathymetry can be created and meshed with the topography collected with red LiDAR. This will include using an RTK to conduct a longitudinal survey of the mainstem channel thalweg coupled with channel cross sections, and supplemental data points as necessary to capture inflections in bathymetry. The longitudinal thalweg profile involves surveying the streambed elevation where the greatest stream depth and flow coincide (the thalweg), yielding a two-dimensional longitudinal profile of streambed elevation (Mossop and Bradford 2006). Significant inflections (>30 cm) of streambed elevations at the channel thalweg are recorded by collecting X, Y, and Z point data with the RTK rover. Based on our pilot study (CFS 2019), we recommend point spacing should not be greater than 1 to 1.5 bankfull widths (BFW) or 10 meters, whichever is greater. Typically, 40 or more locations along the thalweg will be measured to adequately capture topographic changes every 100 m. At each measured point water depth and elevation will be recorded. Cross-section

profiles (i.e., transects) will be collected using the RTK at 50 m intervals beginning at the bottom of site and continuing upstream. The transect cross section should start at the bankfull edge and continue perpendicular to the direction of flow until the traverse has ended at the opposing riverbank bankfull edge. As the transect is traversed, any significant inflection points encountered will be captured using the transect point types as necessary. Required points to capture along a cross section include bankfull, wetted edge, and toe of slope. The number of points collected between the two wetted edge points will depend on the variation in bed topography. A streambed with little to no variation between these points will result in just a couple points being collected. Conversely, an undulating stream bed will require several points across the stream bed. Additionally, additional points can be collected between transects when the point is needed to better map the channel bathymetry.

Large Wood

Large wood jams and individual pieces within the bankfull channel and side channels will be identified using aerial imagery. Imagery sources may range from the most current National Agriculture Imagery Program (NAIP) imagery, Google Satellite imagery, or imagery collected during site visits (e.g., during LiDAR flight). Jams and pieces will be enumerated within the site boundaries. Minimum discernable size will depend on the resolution of the imagery. Previous studies have reported a minimum diameter of 0.25 m and length of 2 m when using NAIP imagery (Roni et al. 2020b). In general, this method does not allow for exact counts of wood contribution for larger jams therefore large wood will be classified as small jams (3-4 pieces), large jams (>5 pieces) or individual pieces (1 or 2 pieces). Jams and pieces will be attributed as wet or dry based on having any visible contact with the water surface. All jams that encompass an area of > 50m^2 will be delineated in GIS to calculate the total area of LW jams (e.g., Beechie et al. 2017; Figure 5).

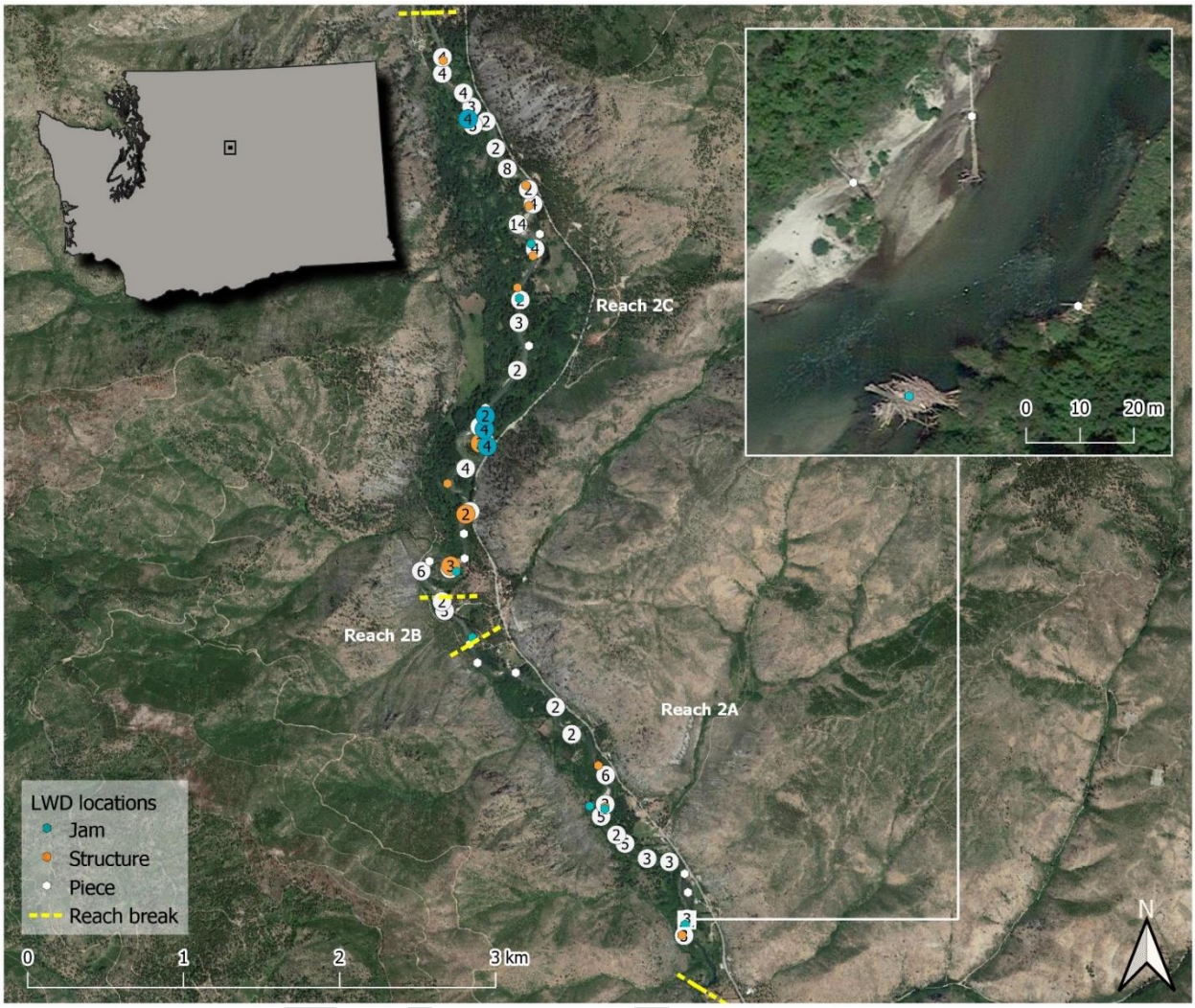

Figure 5. Example of results of LW survey using aerial imagery. Locations of natural large woody debris in the Middle Entiat River were identified using aerial imagery and classified as pieces (<3), small jams (3-4), or large jams (≥5) based on the number of contributing pieces of wood in each complex. Numbers indicate clusters of the same wood jam categories. Imagery was flown on July 1, 2017 at a mean flow of 1,025 cfs (29 cms). From Roni et al. (2020b).

Flow

Flow measurements are needed for the habitat and channel survey and to build the hydraulic model for HSI modeling. Flow will be taken at the top and bottom of each study site. Flow will be recorded at each site using a calibrated water velocity meter to the nearest 0.01 ft/s after delineating reach and channel unit boundaries. A measuring tape will be strung perpendicular to the stream channel from river left to river right and the measuring tape readings on both banks will be recorded. Total wetted width will be measured and recorded and a minimum of 20 equally spaced flow points will be collected across the channel. If water depth is 2.5 feet or less, velocity will be measured at 0.6 times total depth. If water depth exceeds 2.5 feet velocity will be measured at 0.2- and 0.8-times total depth and averaged to obtain one velocity

reading for that station (Harrelson et al. 1994). Distance from the bank, the tape measure reading, and water depth will be recorded at each flow measurement.

4.3 HSI Modeling

A 2D hydraulic model will be developed using HEC-RAS (or similar 2D hydraulic modeling software) using the topobathymetry and selected data from the channel and habitat survey (Brunner 2016). Regardless of the methods used to collect and compile the topography and bathymetry, the final topobathymetric surface will include the entire floodplain and channel within the survey extent. The final topobathymetric surface will be the base surface for the hydraulic model and used to create a computational mesh covering as much of the valley bottom as possible. The river geometry including the channel centerline, banks, junctions, flow paths, and downstream and upstream boundaries will be created based on the topography.

The model will then be parameterized using data collected during the channel and habitat survey. Roughness values for the channel, banks, and floodplain will be informed by the dominant substrate of each habitat unit and estimated based on a range of typical values (Arcement and Schneider 1989; Yochum et al. 2014). The topographic mesh cell size will be set to 0.5–1 m, depending on quality of the topobathymetry. Steady flow model runs will be prepared for discharges that match biologically and geomorphically significant levels and seasonal timing. The model run for base flows will be based on the discharge measured during the field surveys. Discharges for the 2- (bankfull), 5-, and 10-year flow recurrence intervals will be estimated using local gauge data or based on regional regressions. Discharges for biologically significant model runs will be determined by site depending on the periodicity of present species and at a minimum will cover mean discharge during rearing and spawning life stages. For example, if a site contains only steelhead, there would be a minimum of five steady flow model runs (base, snowmelt, 2-, 5-, and 10-year flows) that would adequately cover summer and winter juvenile rearing and adult spawning (Figure 6).

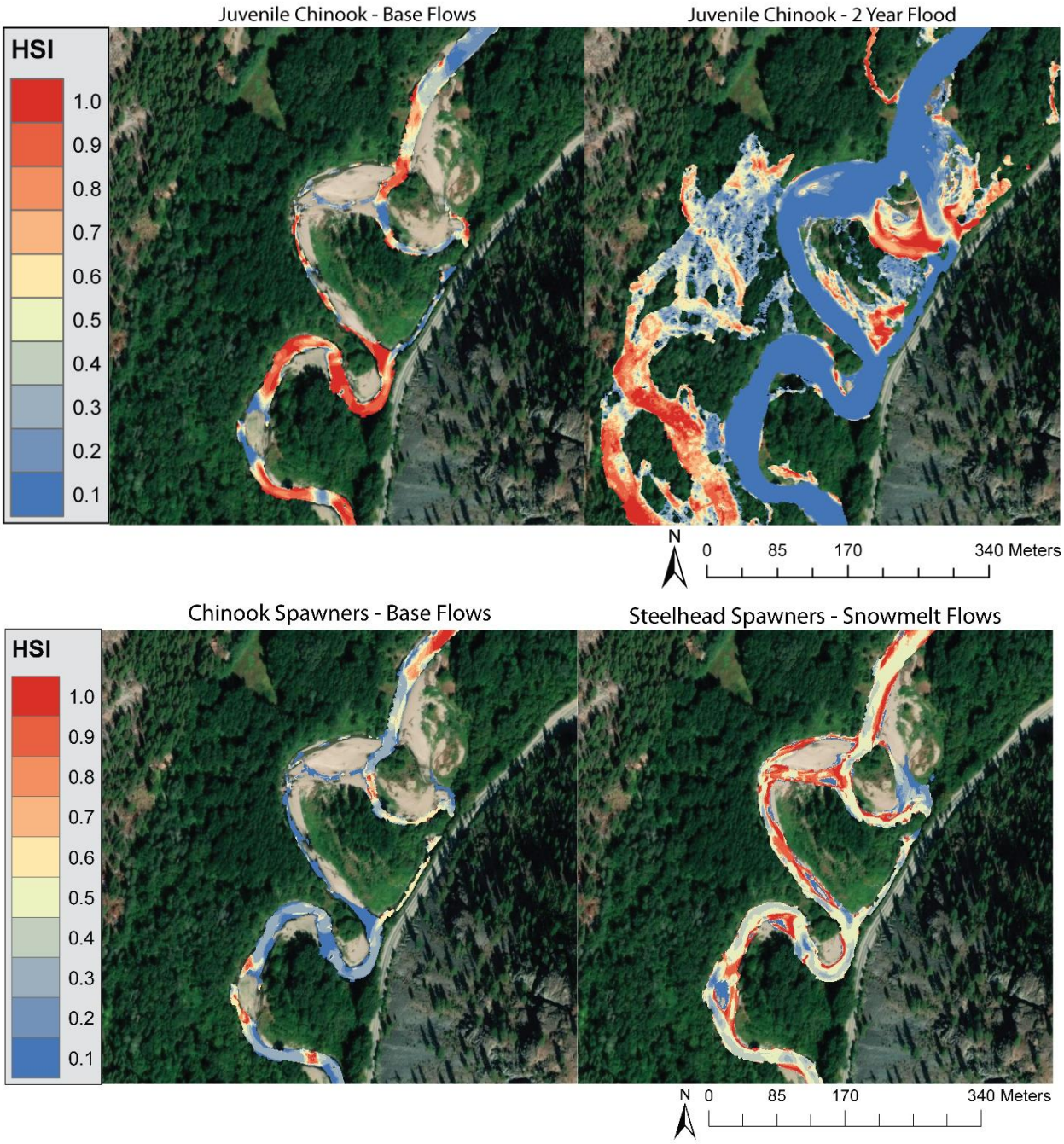

Figure 6. Example of HSI outputs and maps for different flows, species, and life stages for the Entiat River before restoration (Roni et al. 2020b).

The hydraulic model will contain values for water depth and velocity for each run and provides the basis for calculating the HSI. Habitat suitability curves (HSC) available in the literature express the preferences for water depth and velocity by species and life stage on a unitless scale of 0 (not suitable) to 1 (most suitable; Figure 6). Unless site-specific HSCs have been developed, the HSCs reported in Beecher et al. (2016) or Maret et al. (2006) will be used. A suitability index for water depth and velocity will be

calculated separately for ever raster cell in the hydraulic model results. Then, depth and velocity suitability will be combined using the geometric mean, resulting in a final HSI value for every raster cell. As an option, substrate preferences may be added to this workflow if an appropriate HSC exists for the species and life stage in question. This process will be repeated for each steady flow model run.

Habitat suitability index results will be summarized graphically as histograms and maps to visualize the distribution of HSI values among each site and modeled discharge. To summarize HSI at the reach scale, weighted usable area (WUA) will be calculated as the sum of the product of HSI and cell area (Equation 1). WUA represents the amount of habitat that is available to a species during a given discharge (Kondolf et al. 2000; Hong et al. 2018). Normalized WUA (nWUA) is helpful to facilitate interpretation and compare discharges, reaches, subsequent surveys, and is calculated as WUA divided by the total area evaluated (Equation 2). nWUA represents the proportional area that contains suitable habitat during a given discharge.

Equation 1. Calculation for weighted usable area (WUA).

$$WUA = \sum(HSI \times cell\ area)$$

Equation 2. Calculation for normalized weighted usable area (nWUA).

$$nWUA = \frac{\sum(HSI \times cell\ area)}{total\ area}$$

4.4 Riparian Survey

The types of data required to monitor riparian projects are heavily influenced by the questions being investigated. Monitoring riparian response to floodplain or riparian restoration requires a combination of remotely sensed data (LiDAR data products) and field data to both validate and verify remotely sensed estimates and to measure parameters necessary to calculate metrics that cannot be estimated from remotely sensed platforms (e.g., understory species composition). The point cloud associated with LiDAR data can be classified and analyzed to create several data products to calculate monitoring metrics such as canopy models, understory layers, and shade models, but does not eliminate the need for high quality field data to answer the key monitoring questions for this monitoring program. In addition to topographic data (DEM) that will be obtained from the LiDAR, a DSM, as well as the point cloud itself (Figure 7) will be analyzed to help generate many of the riparian monitoring metrics. In general, most LiDAR vendors provide a classified point cloud along with a DEM and DSM, but these products should be considered required from the contractor or vendor for this study. Below we describe riparian field methods including

initial site layout, which are based on and consistent with the recent U.S. Forest Service riparian monitoring guidance (Merritt et al. 2017), and those recently developed to monitor riparian projects as part of Bonneville Power Administration's (BPA) Action Effectiveness Monitoring (AEM) Program (Roni et al. 2020a).

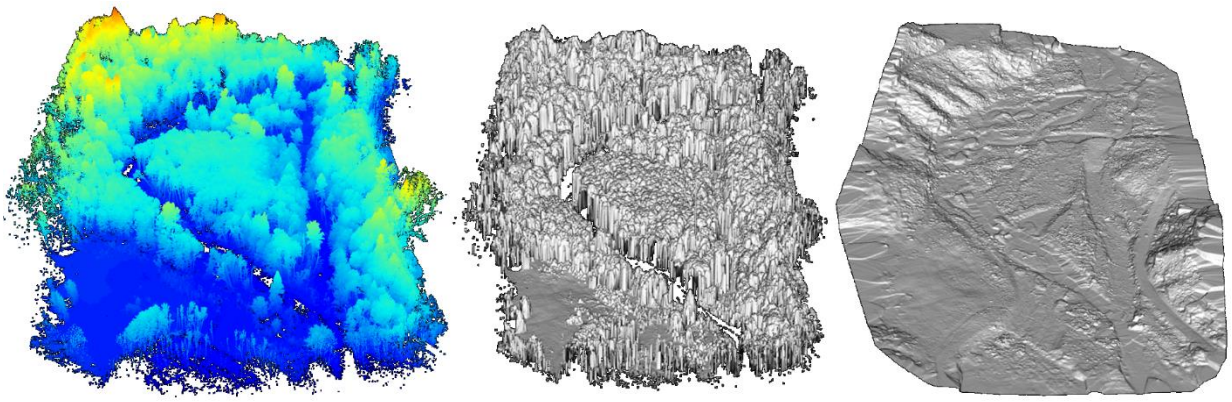

Figure 7. Example of point cloud (left) and digital surface model (DSM; middle) and digital elevation model (DEM) right from drone-based LiDAR flown on Morse Creek Washington in fall of 2019.

Riparian Site Layout and Survey Methods

The purpose of this survey is to (1) identify species, (2) provide validation data for remotely sensed metrics, and (3) record conditions relating to planting projects, such as evidence of browsing, or if planting protections are still functional (tree tubes, fencing). While we described delineation of the upstream and downstream location of site boundaries, additional detail on site layout for riparian monitoring is described in the following. Field sampling of riparian conditions at floodplain restoration sites or at floodplain and riparian only restoration sites will be done using a transect approach (Merritt et al. 2017). The sampling layout along a site consists of equally spaced, 2-m wide transects every 100 meters that extend from the active channel zone to the edge of the planting project or 30 m, whichever is greater, and are 90 degrees perpendicular to the stream channel at the location of each transect (Figure 8). Thirty meters was chosen as the extent of the transect in part because it is validation for the LiDAR and necessary for plant species and diversity data, but also because many riparian plantings do not extend beyond this point, it represents the extent of the riparian management zone for forest practices, and beyond 30 meters we are relying on the remote sensing. A meter tape will be strung down the middle of each transect allowing delineation of a 1 m-wide sampling area on each side of the meter tape. Sampling transects every 100 m will result in a minimum of 10 transects for a 1 km site. Additional transects can be added if the equally spaced transects

do not cover the riparian treatment areas. The exact GPS coordinates of the transects will be recorded and benchmarks placed in the field to assist with relocated and sampling the exact same transects each year.

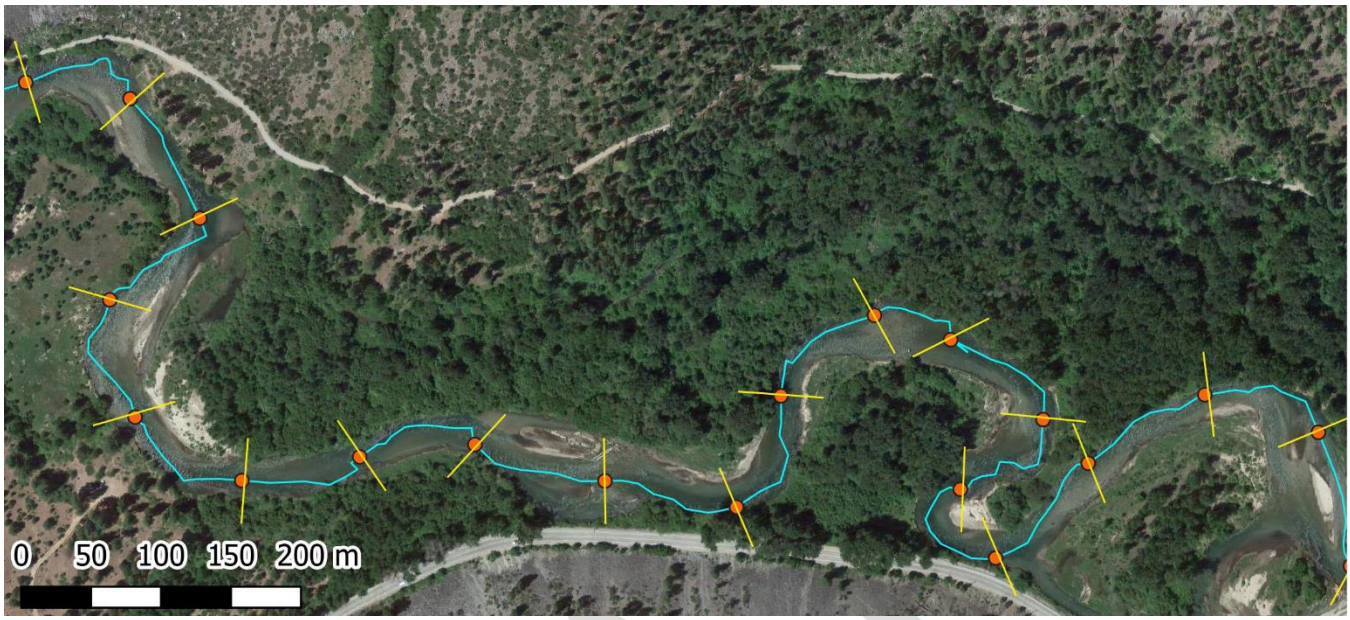

Figure 8. Example of site layout for riparian field surveys of a 2-kilometer long site (floodplain or riparian restoration) project. Transects will be spaced 100 meters apart perpendicular to the flow and start at the edge of active channel and extend 30 m into the riparian treatment zone (plantings). Additional transects can be added if riparian treatments as part of floodplain restoration are not continuous and not intersected by 100 m transects and, the same number of transects are surveyed before and after restoration at each site.

At each transect, all woody species (shrubs and trees) will be identified down to species except for willows, which will be denoted as *Salix* spp. The location along the transect and the height of each woody plant specimen encountered will be recorded. Due to the complexities in identifying forbs and grasses, they will be assigned to a single category (forbs and grasses), and the continuous length they occupy along the meter tape will be recorded. Additional data on individual woody plant species will be collected as follows: bud browse (y/n), beaver damage (y/n), living or dead, and evidence of planting (e.g., planting tube, fence, tree marker).

Vegetation cover will be assessed in three different height categories using a line transect (meter tape located in the middle of the transect) following the line-intercept method (Elzinga et al. 2001). Cover estimates are calculated along the transect by noting where along the tape the canopy of an individual plant begins and ends. Plant height categories include herbaceous (<1 m), shrub (1–5 m), and tree (>5 m). The length of the center line represented by bare earth will also be measured. Bare earth, logs, rocks, etc. must occupy more than 30 cm to be counted in the bare earth category.

While riparian shade will be calculated in part from remote sensing, some field data is useful to validate these estimates. Therefore, canopy cover (i.e., shading) will be measured using a convex spherical densiometer. The densiometer will be taped so that there is a "V" at the bottom with 17 grid intersections visible (Mulvey et al. 1992). Densiometer readings will be collected at every at the wetted edge of a stream and at the active channel boundary. At these locations four readings will be recorded: facing downstream, facing upstream, facing toward the center of the channel, and facing away from the main channel. The densiometer will be held 1 m above the water surface. The number of grid intersections covered by a tree, leaf, branch, or other vegetative shade providing feature will be recorded (0–17).

Multiple site characteristics will also be recorded during surveys for further analysis to elucidate why some plantings within and among projects are more successful than others. These characteristics include: (1) whether a planting plan was drafted and followed, (2) if ongoing maintenance has been taking place at the site (e.g., watering, soil augmentation), (3) the distance of the riparian restoration plot (site) from the active channel edge, and (4) the elevation from the stream bed surface to the floodplain or riparian planting site height (taken at the project midpoint). Additionally, for floodplain projects, the bankfull depth and incision (from floodplain monitoring) will be measured.

Areal Vegetation Extent by Class

Areal extent of vegetation classes will be based on the methods developed by Akay et al (2012). LiDAR returns between a min and max height (shrub height) will enumerated and compared to the number of ground returns. More understory coverage will intercept more pulses, increasing the returns in the height band, and decreasing the number of ground returns, so this serves a relatively direct proxy for understory cover. A similar method will be used for measuring the overstory areal extent. Predicting the extent of the herbaceous layer is more difficult and will depend on site characteristics. Comparisons of LiDAR derived estimates to field based surveys will allow the LIDAR estimates to be calibrated and validated. Calculating this metric requires the point cloud and DEM data from LiDAR coupled with binned understory data and other field data to calibrate the LiDAR data.

Riparian Composition and Density

Riparian composition and density can only be reliably calculated using the field survey data. Species richness will be calculated as the sum of identified unique species, while density will be estimated by species counts divided by area of transects. Diversity will be calculated using Shannon's diversity index (Shannon 1948) and averaged across all transects. Additionally, there is potential to extrapolate values to unsampled areas using LiDAR data and machine learning techniques (Singh et al 2015).

Bank Stability

Coarse measures of bank stability and erosion can be done with remote sensing but can be unreliable under heavy riparian cover or can be too coarse for reach-scale monitoring (Longoni et al. 2016; Billah 2018). Therefore, to assess bank stability, field crews will measure and record the length of unstable banks at each transect (see section 4.2 Channel and Habitat Survey above).

Shade

Riparian shade will be measured using the DEM and DSM to measure vegetation height based on methods of Greenberg et al. (2012) and requires understory canopy height estimates from riparian transects. LiDAR data is used to create surface models, and then 100 m stream buffers are analyzed to estimate solar insulation using the r.Sun model (Hofierka and Suri 2002) incorporated into the GRASS geospatial software environment (GRASS Development Team 2017), which incorporates time of day, time of year, and atmospheric turbidity, and can model both clear sky and overcast conditions (Greenberg et al. 2012). Comparisons to bare earth model-based results can describe the impact and effect of riparian vegetation along the waterbody. The GRASS insolation workflow describes methods to estimate surface albedo and Linke atmospheric turbidity coefficients (Linke 1922), which are both required to run simulations.

Organic Inputs

Organic matter inputs will be estimated based on volume of canopy that overhangs the active channel (Laslier et al. 2019). This can be directly estimated from LiDAR point cloud returns. Although this methodology is consistent, it is a low-end estimate for organic input as it does not consider input from locations adjacent to the active channel, and both gravity and wind are ignored. More accurate input could be obtained from remote sensing if LiDAR was flown both on leaf-on and leaf-off, but we assumed that would be too costly so the method we proposed is based on LiDAR flown at leaf-off only. We caution that due to the many nuances and complexities of measuring organic inputs, a separate study is warranted if these questions are of critical importance.

5.0 DATA MANAGEMENT AND ANALYSIS

5.1 Types of Data Generated

All collected data and data products for metric generation will range widely in file size based on the data and the size and complexity of the site. Altogether, total file size *per site per visit* will likely exceed 10 GB with all the data collections and data products combined (Table 11). Once all spatial data and shapefiles are created and finalized for a site, they should be stored in one spatial database per site for

consistency and to decrease file size. Due to the large file size, it is imperative that the computers and/or hard drives storing the data have the appropriate storage space and computing capacity. Planning for the total amount of data will require estimates of total sites, size of site (sq. km) and the total number of visits in the monitoring plan.

Table 11. File types and the range of their overall file size for floodplain projects for one site visit.

File type	General file size
Point cloud (LAS file)	0.5 to 6.5 GB
DEMs	5 to 16 MB
Aerial imagery	1.5 to 4 GB
RTK data exports	3 to 10 MB
RTK point data	2 to 6 MB
Shapefiles (e.g., polygons, linework)	2 to 8 MB
Riparian field surveys	< 2 MB

5.2 Data Management, Storage, and Backup

Prior to any data acquisition, it is important to create a data management structure that is clear and organized (Figure 9). All folder and file names should be descriptive of a site name or number as well as the year of survey (e.g., Cle Elum_2020, Cle Elum_2020_wetted-polygon). Folder and file structure with a similar naming system and files with the same column headings across all monitored sites and years will allow for easier automation in metric generation. Once a data management structure is finalized, it is important to have a system in place that provides the site name, reach, and year monitored for all sites in one file location.

For best data management practices, all data should be backed up in multiple locations on a regular basis.

Figure 9. Example of folder structure for data storage. This is not the exact folder structure that needs to be used but is an example of one possible layout.

- Site Name
  - Year
    - Collected Data
      - Topography
      - Bathymetry
      - Auxiliary
        - RTK Data
        - Field Data
    - Data Products
    - Metrics

Any collected auxiliary data—both RTK and field data—should go through a thorough quality assurance and quality control workflow. Visually inspect data to identify any erroneous measurements that may need further consideration. Auxiliary data needs to be exported and stored each day to eliminate data loss in the case of any malfunctioning equipment.

Finally, for improved cost efficiency, executable scripts should be developed for automated metric generation using the data products. The metric calculations described in Table 9 should be used when developing any scripts for metric generation. As metrics are calculated, they should be exported and stored in one file that will be used in data summarization and analysis. In addition, data analysis and summarization scripts should be developed for improved cost efficiency and consistency across years (see Section 7.0 for reporting).

5.3 Data Analysis

5.3.1 Project Level Analysis

Because the focus of the monitoring design is at the project level, analyses will include evaluating the difference in metric values before and after restoration (see Table 6 yearly schedule). The change in each metric will be quantified and relativized (i.e., percent change) to help determine the effectiveness of projects. Some metrics will likely see immediate changes due to restoration treatments (e.g., large wood, side channel area), while some changes may take several years before a change can be seen or detected (e.g., increased shading from riparian planting), and still others will depend on a large disturbance event taking place before changes can be detected (e.g., changes in sinuosity post flood).

Changes will be reported and analyzed both in tabular form, as well as diagrams and figures that demonstrate changes over time as more data points are collected (Table 12). Metrics with continuous spatial representation (e.g., topography, bathymetry, solar insolation, cover class) derived from remote sensing will be displayed analogously to a DEM of Difference (DoD), where a new surface layer is created that represents the difference in metrics at that site (Figure 10). Compared to aggregated metrics (e.g., total insolation, aggradation, degradation), this provides a more granular summary of changes, highlights spatial patterns, and can help to understand the extent of effects. For example, the aggregated metric of average insolation hours (energy/m^2) may show a decrease, which implies additional shading, but the surface of differences will show where the changes in solar insolation are occurring. Similarly, See 7.0 Reporting and Implementation for more information on table and figure reporting recommendations.

Table 12. Example of tabular presentation of six floodplain restoration sites monitored before and after restoration. These sites were approximately 0.5 km in length and are being monitored as part of BPA's AEM Program but provide a simple example of tabular summaries for a subset of floodplain monitoring metrics. RCI =river complexity index, LW = large wood. Yr -1 = before restoration, Yr +1 or Yr +3 year of post-restoration monitoring.

Site name	Year	Pool:riffle ratio	Slow water (%)	Residual pool depth (m)	Habitat Diversity (H)	RCI	LW
Hartsock	Yr -1	1.33	40	0.26	1.31	0.44	15.2
	Yr +1	0.86	40	0.32	1.24	1.62	73.8
Touchet	Yr -1	0.25	46	0.18	0.96	0.64	0.5
	Yr +3	0.60	39	0.29	1.08	0.65	15.4
Southern Cross	Yr -1	0.40	48	0.29	1.03	0.40	0.7
	Yr +3	1.00	72	0.62	1.10	0.40	110.9
Tucannon	Yr -1	1.00	31	0.58	1.37	3.22	75.3
	Yr +3	1.6	42	0.42	1.51	2.61	143.5
Pine	Yr -1	2.33	77	0.50	1.03	1.34	26.2
	Yr +3	2.33	82	0.53	1.23	1.41	203.7
Caribou	Yr -1	1.60	78	0.53	0.88	0.63	0.8
	Yr +1	2.67	90	0.65	1.16	1.25	31.1

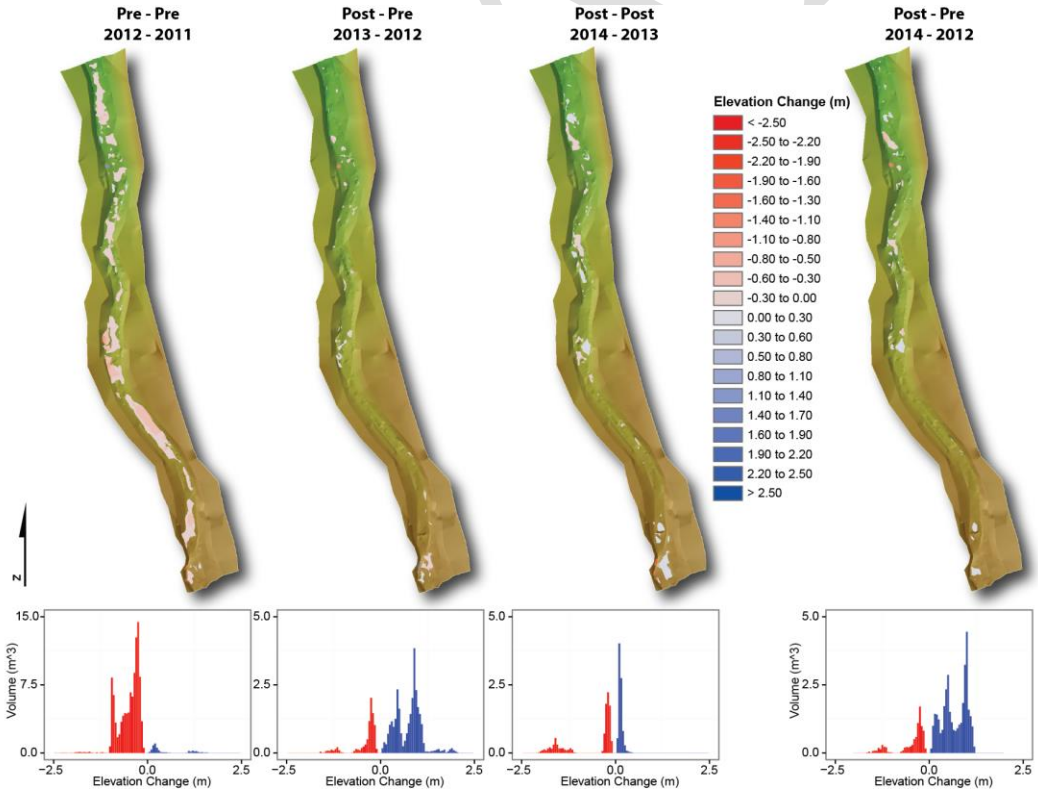

Figure 10. Example of DEM of Difference (DoD) at different points in time before and after restoration showing aggradation and degradation.

Evaluating whether a project meets its design objectives is not as straightforward as traditional monitoring analysis, and requires detailed information on the project design, goals, and objectives as well as detailed "as-built" survey data. Previous programmatic effectiveness monitoring programs were designed to provide general recommendations on project design (e.g., most successful projects more pool forming wood; Roni and Quinn 2001; Roni et al. 2018; Clark et al. 2019). Fortunately, for the proposed study, the pre-project topographic and bathymetric data and hydraulic and HSI models, combined with information from the aggradation and degradation and outputs from the GUT can be used to understand why certain actions (e.g., logjams, side channels, levee removal, meanders) did or did not result in the desired changes in scour, deposition, and habitat formation (Figure 11). This information can be used to provide detailed information on restoration design not previously examined in SRFB PE monitoring, and one of the main reasons that "as-built" surveys are needed once restoration has been is completed.

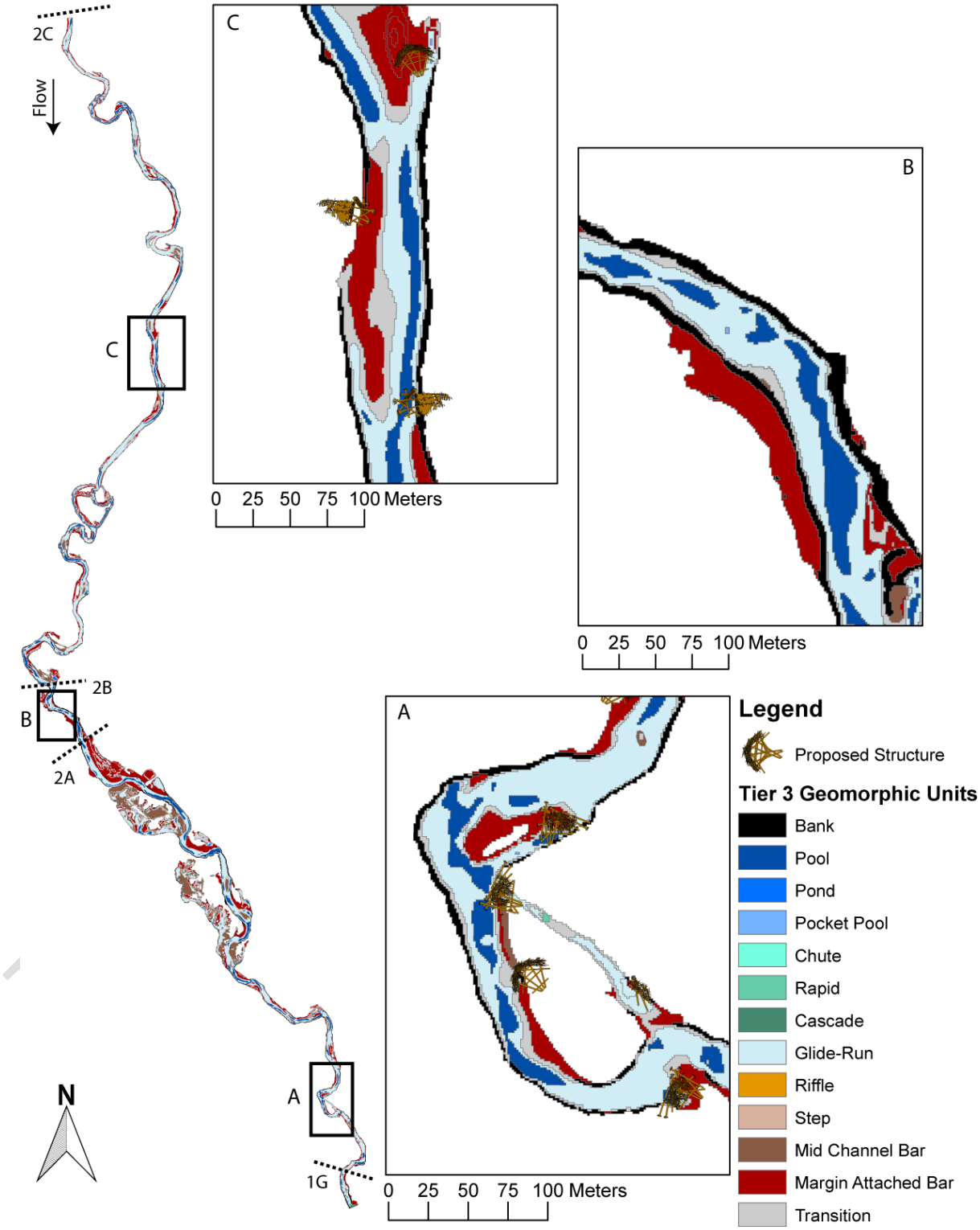

Figure 11. Example of output from GUT at bankfull stage and proposed structures for a large (~8 km) restoration project underway on Entiat River (Roni et al. 2020b).

5.3.2 Combined Analysis

While sites will not be selected entirely randomly, they will be stratified by recovery region and representative of projects occurring in the region. Therefore, a combined analysis can be conducted to examine the overall response of large floodplain and riparian projects sampled as long as it is understood that drawing inference to all other floodplain or riparian projects in the region is not appropriate. A mixed-effects model will be used to collectively analyze floodplain and LW projects sampled (Downes et al. 2002; Schwarz 2015). Other approaches (Bayesian, repeated-measures, boosted regression trees) are also potential methods for analyzing the data that will be considered, but the mixed-effects model is considered the most robust method for analyzing data collected using BACI and BA designs (Downes et al. 2002; Schwarz 2015). Mixed-effects models are also being used to evaluate floodplain projects under BPA's AEM Program. Sample size can influence the ability to detect changes, but evaluation of smaller floodplain projects (<1 km in length) have shown differences due to restoration with a sample size of only six sites, assuming responses are relatively large (>50% change). Simple graphical summaries will also be provided to demonstrate differences among projects (Figure 12).

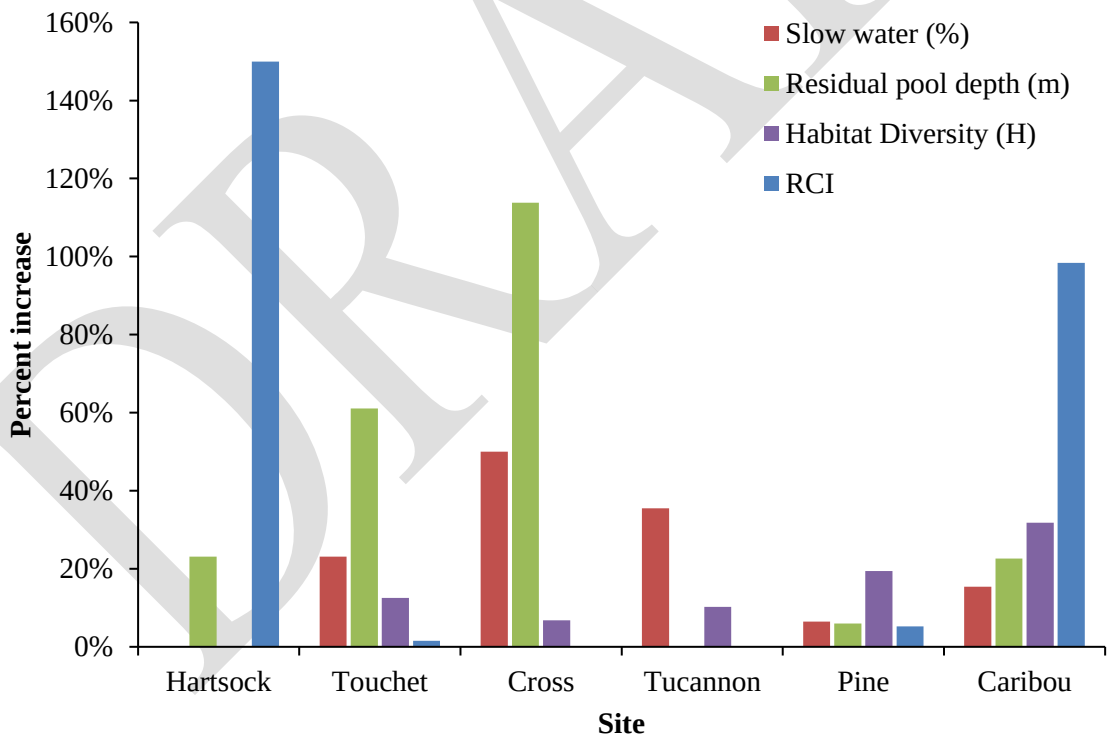

Figure 12. Example of simple graphical presentation of change of a sub-set of monitoring metrics for six floodplain restoration projects before and after restoration.

6.0 APPROXIMATE COSTS

While costs for data analysis and reporting are not trivial, the costs of the proposed monitoring program are largely driven by three key components: the cost of acquiring LiDAR, the cost of field data for floodplain metrics, and the cost of riparian surveys. These three components are largely driven by the number, size, and complexity of sites, making accurate costs estimates before study sites have been identified challenging. Based on our experience with pilot studies (CFS 2019; Roni et al. 2020b), our experience monitoring other riparian and floodplain projects in the last two years, and estimates of green LiDAR acquisition from the Department of Natural Resource's LiDAR vendor, we estimated the approximate costs for data acquisition for different sized sites. These estimates are for planning purposes and actual costs will depend upon site selected, contractor staffing costs, and other factors and may be slightly higher or lower. Given that the average mainstem length of floodplain restoration treatment for large restoration worksites in PRISM was 2 kilometers, with most worksites ranging from 1 to 4 kilometers (Figure 2), we estimate the cost for sites in this size range (Table 13). Given that acquiring green LiDAR will cost about $35,000 (range $30-40,000) for sites of up to 8 km in mainstem length, it will likely be more cost-effective to acquire data for sites shorter than 4 km using drone-based red LiDAR and a field survey for bathymetry. Total costs for acquiring floodplain data with this approach will be about $17,750 per kilometer. Riparian surveys will cost approximately $4,500 per kilometer.

Table 13. Approximate cost of acquisition LiDAR and necessary field data for monitoring floodplain restoration projects. Field surveys for riparian projects would only require riparian component and red LiDAR, which could be acquired with either drone or fixed wing aircraft.

	Length of Site Surveyed			
	1 km	**2 km**	**3 km**	**4 km**
Green LiDAR (fixed wing aircraft)	$35,000	$35,000	$35,000	$35,000
Field data	$3,600	$7,200	$10,800	$14,400
Total	*$38,600*	*$42,200*	*$45,800*	*$49,400*
Red LiDAR (drone)	$6,200	$6,200	$6,200	$6,200
Bathymetry and field data	$11,550	$23,100	$34,650	$46,200
Total	*$17,750*	*$29,300*	*$40,850*	*$52,400*
Riparian	$4,450	$8,900	$13,350	$17,800

Costs for analysis and reporting are likely similar regardless of length of sites surveyed, and while we did not estimate them, based on our experience with other monitoring programs allocating $25,000 or more a year each for analysis and reporting is not unexpected. Nor is $15,000 for coordination and study

management unreasonable; though in the first year of the study, it may be nearly double that to do initial site selection. In addition, the initial development and validation of hydraulic models at multiple flows could cost $5,000 to $10,000 per site, though updating the models with a new surface from post-treatment surveys should cost substantially less (<~$1,000). If one assumes that most floodplain sites will be 2 km in length and data collection will begin at four sites 2020 and four in 2021, for a total of one site per recovery region (8 sites), data collection alone will $152,800 a year at least for the first two years. Including riparian only projects in the study would increase costs, but field data collection is much less expensive, and since they do not require bathymetry, red LiDAR might be available from DNR or other partners. If not, red LiDAR can be collected relatively inexpensively ($6,200 per a site) using a drone.

It is likely that there could be some costs savings as time goes on but given many studies or monitoring programs evaluating restoration have been underfunded, it is wise to not assume this will occur. These estimates are for planning purposes and highlight the decisions that need to be made in terms of site selection (e.g., size, number, and type) and in potentially refining or prioritizing the study questions (e.g., are all questions relevant).

7.0 REPORTING AND IMPLEMENTATION

While most attention on developing a monitoring program is placed on design, methods, protocols, and even costs, the lack of proper reporting has plagued many large monitoring programs (Reid 2001; Roni et al. 2015b, 2018, 2019b; Bennett et al. 2016; Rosgen et al. 2018). Restoration often fails because data are not regularly anayzed and reported (Kershner 1997). Previous monitoring programs like SRFB PE, CHaMP, the IMW monitoring program, and ISEMP have all suffered from lack of standardized scientific reporting. Thus, annual reporting is critical for effectiveness monitoring to ensure timely anaysis of data, identify errors in data collection and analysis, adpatively manage results, facilitate review of the monitoring program, and perhaps most importantly, dissimenate information to partners and interested party for adaptive management and collaborative learning (Weber et al. 2018). To meet these requirements, we outline the key components that should be reported on an annual basis for the effectiveness monitoring report:

Executive Summary

Acknowledgements

1.0 Introduction

- 1.1 Background
- 1.2 History
- 1.3 Goals and Objectives
- 1.4 Monitoring Questions

2.0 Methods

- 2.1 Design and Replication
- 2.2 Metrics
- 2.3 Data Collection
  - 2.3.1 Remote sensed data
  - 2.3.2 Field data
  - 2.3.3 Data management
- 2.4 Data Analysis
  - 2.4.1 Individual project level
    - 2.4.1.1 Graphical analysis
    - 2.4.1.2 Statistical analysis
    - 2.4.1.3 Additional modeling

A critical component will be to ensure that all data are summarized and reported for all metrics and, if not provided in body of results, are provided in summary data tables in appendices. Moreover, each annual report should build off the previous one so that it includes not just the current year's data, but all previous years. This will allow the Monitoring Panel, partners, and others to examine see the data and conduct an independent evaluation or analysis of the data quality and findings. It will also allow restoration practitioners to readily locate and obtain data on their project and use it for their own purposes. An example of a summary data table and caption for multiple projects from the SRFB PE final report is provided in Table 14. Given the number of metrics, this could mean fairly lengthy appendices in the later years of the project, but it ensures all data are reported and readily available.

Table 14. Bank erosion (%) in the treatment and control reach for all sampling years for livestock exclusion projects. Missing values were not measured in that year of sampling for a particular site.

Site ID	Site name	Reach	Year 0	Year 1	Year 3	Year 5	Year 10
02-1498	SRFB: Abernathy	Treatment	2	3	4	7	0
		Control	2	0	3	13	0
04-1655	SRFB: Hoy Riparian	Treatment	100	100	96	4	0
		Control	70	90	83	0	0
04-1698	SRFB: Vance	Treatment	70	0	0	0	0
		Control	40	0	0	11	0
05-1447	SRFB: Indian Creek-Yates	Treatment	10	2	0	0	0
		Control	0	0	0	0	0
05-1547	SRFB: Rauth Coweeman	Treatment	33	21	7	30	19
		Control	1	2	5	12	18
205-060a	OWEB: Bottle	Treatment	11	1	3	5	12
		Control	7	2	12	15	31
205-060b	OWEB: NF Clark	Treatment	39	0	2	9	0
		Control	37	5	8	32	0
206-072	OWEB: Greys	Treatment	13	35	5	0	---
		Control	63	64	7	8	---
206-095	OWEB: Jordan	Treatment	95	0	6	12	12
		Control	100	100	27	47	59
206-283a	OWEB: Johnson	Treatment	80	75	26	12	39
		Control	4	77	4	12	20
206-283b	OWEB: Noble	Treatment	50	11	1	---	---
		Control	0	28	21	---	---
206-357	OWEB: NF Malheur	Treatment	71	42	37	7	29
		Control	59	34	45	12	26

With the focus on project level inference for interpreting results, simple straightfoward graphics will be an important part of the reports. Graphical interpretation of effectiveness monitoring using the BA or mBA monitoring designs often lend itself well to graphical or tabular analysis and are often more easily understood by a broader audience (Conquest et al. 1994; Kershner 1997). For example, quantifying the number and area of side channels and wetted area can be easily presented before and after restoration in a simple table, but maps and graphics can more clearly demonstrte these differences (Figure 13).

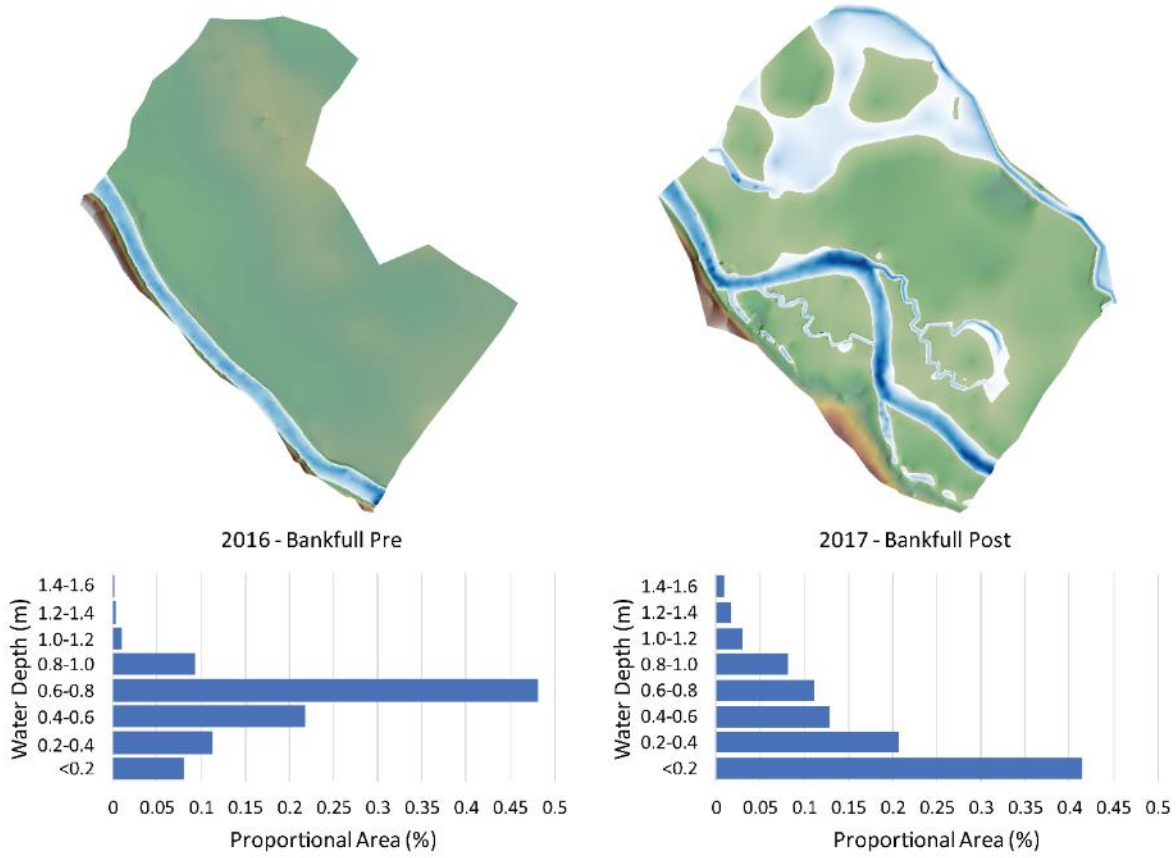

Figure 13. Example of a topographic survey output showing side channels and water depth distribution at bankfull flow before and after floodplain restoration for Catherine Creek, Oregon.

7.1 Annual Reporting Schedule

There should be an annual reporting schedule based on when (what year) data need to be collected within year. Based on the timing of data acquisition, both remote sensing and auxiliary field data, which should occur in late summer or early fall, we recommend the approximate annual schedule for the study including draft and final reporting in Table 15.

Table 15. Proposed annual schedule including period for data collection and dates for draft and final report.

Task	Time Frame
Planning for data collection	April to July
Data collection	Aug to October
Data processing	October to November
Data analysis and writing	November to January
Draft Annual Report	March
SRFB/Monitoring Panel review	April
Final Annual Report	May

In addition to annual reporting, sharing and communicating results to funders, partners, and stakeholders is key to maintaining interest and ultimately the success of long-term ecological monitoring programs (Lindenmayer and Likens 2018). Thus, it will be important to present the results and share the finding of the study annually to SRFB at regional meetings and workshops. Ideally, this would occur at scientific meetings that occur annually or biennially in the region including River Restoration Northwest, Upper Columbia Science Conference, Salmon Recovery Conference, and other conference as well as meetings and workshops of the SRFB and different recovery regions.

8.0 CHALLENGES, COMPLIMENTARY STUDIES, AND NEXT STEPS

8.1 Potential Challenges to Implementing the Monitoring

Many factors other than goals, questions, design, and protocols can reduce the utility of long-term monitoring (>5 years) programs (Lindenmayer and Likens 2018). Below we discuss potential challenges that the proposed study evaluating large floodplain and riparian preojcts might face over the long-term and how these can be avoided or overcome. We see a number of potential challenges that fall into two major categories: (1) implementation (e.g., site identification, controlling other management activities, relying on others for data collection), and (2) technological challenges (e.g. technological changes, improvements in analytical methods, limitations of remote sensing). We describe these challenges below and how they can be addressed or overcome should they arise.

8.1.1 Potential Challenges in Implementation

Potential challenges in implementing an evaluation and effectiveness study or monitoring program include site identification, controlling other mangaement activities, and broad-scale climate changes. Site identification is an important part of any effectiveness monitoring program. Given the amount of floodplain and riparian restoration occurring in Washington State every year, it is assumed that an adequate number of large projects will be scheduled for implementation in 2021 to 2023, so that all pre-project data can be collected in that period. This depends in part on identifying two or more suitable sites in each recovery region by summer 2021 and potentially more importantly, that these projects will all be completed on schedule within one to two years of pre-project monitoring. Delays in the start or completion of the restoration (the treatment) at study sites, will protract the study, which happened with the IMW monitoring programs, and is a problem seen in large programmatic effectiveness monitoring using an MBACI or BA design (Bennett et al. 2016; Roni et al. 2018; Roni et al. 2019b). This challenge can be addressed in three potential ways. First, if the duration of the study is not a concern, then initiation of monitoring at the site can be delayed with the understanding that the change in timing may lead to shifting in costs for monitoring of that project into other years. Second, given that the main level of inference of the study is at the project level, a site that has unforseen delays in restoration timing or other implementation issues after monitoring has begun could be dropped, though it would reduce the sample size for analysis across projects. Third, one could include extra sites with the idea that some sites might eventually be dropped due to issues with implemenation or other management activities compromising the site.

A common challenge faced by any long-term field study is confounding effects of additional restoration measures, maintenance, or other management acitivities following initial restoration implementation. The first two might simply be additional treatments or maintenance that are deemed necessary to improve habitat at the site. For example, it is not uncommon for watering and maintenance to occur at riparian planting sites for three or more years after initial treatment. These restoration measures are expected for riparian planting, but larger efforts such as additional addition of large wood or channel construction could "reset the clock" on the time since restoration. The monitoring would still continue at the site, but the post-restoration monitoring schedule might need to be adjusted. Additional management interventions, such as bank armoring or other infrastructure would need to be treated on a case to base basis. If they impact a large portion or the site or trajectory of the site, the site may need to be dropped (i.e., monitoring discontinued). However, if they impact only a small portion of the site, the monitoring can continue.

Another potential challenge could be large-scale changes occuring at a scale much broader than the reach where the monitoring is occuring, such as a large flood that causes signficant changes in floodplain conditions throughout a watershed or broad-scale changes in climate that influence flow and temperature throughout a region. Two main approaches can be used to address these concerns. For floodplain projects, the reach monitored will include monitoring an additional length upstream and downstream of the project footprint (area to be restored) of 20 times bankfull to examine if restoration-induced channel changes are transmitted beyond the site. This may give some insight into changes occurring elsewhere in the watershed. These areas could be expanded so that they encompass a larger area upstream and downstream not likely to be influenced by the restoration. More importantly, while intensive monitoring of channel changes will occur at the sites, examination of coarser-resolution remote sensing (aerial or satellite imagery) data several kilometers above and below the restoration site will alllow us to quickly determine if similar broad-scale changes are occuring in other parts of the basin.

Finally, relying on data collection or acquisition from partners can be problematic and increases the need for extensive coordination. First, given the history with field data collection by multiple partners for SRFB PE, IMWs, and CHaMP/ISEMP programs (Rosgen et al. 2018; Bennett et al. 2016; Krall et al. 2019), all field data collected should be overseen by one group or contractor. All remote sensing data collection should be done or coordinated by the contractor leading the study. However, if partners are scheduling flights that are intended to acquire LiDAR to be used in this study, it will be necessary for the contractor leading this study to ensure the data is collected on or by specfic dates and under the specifications

required. Moreover, if the data is not collected by that date, the contractor needs to go collect the data using a drone or schedule another flight with the green LiDAR vendor.

8.1.2 Potential Technological Challenges

Another category of challenges involves technological issues including changes in technology over time or challenges in data acquisition (e.g., LiDAR, data collected by partners). The quality, accuracy, and resolution of LiDAR has improved from it's initial use. It is likely that in the next decade we will see improvements in quality, accuracy, and resolution of the LiDAR sensors and processing algorithms. However, given that current collection allows for submeter pixel resolution (often ~3 to 5 cm), it is unlikely that near-future improvements to LiDAR resolution will change our recommendations for calculating many of the proposed metrics. Moreover, taking higher resolution data and resampling it to reduce it to be consistent with lower resolution data is statistically possible and well supported.

While there may be some improvements in technology and resolution, a key change likely to occur is improvements in processing and analytical techniques (Tomsett and Leyland 2019). Our review of remote sensing techinques found few new methods in recent years, with most papers focusing on new and novel ways to procsses or analyze the data. Rather than a challenge, however, these innovations are likely to reduce the time and cost of processing the data. For example, new methods for examining riparian metrics from LiDAR are constantly appearing in the published literature. In addition, while most remote sensing relys on ground control points and surveys to confirm and refine mapping and estimates of parameters (Tomsett and Layland 2019), it is likely that these new innovations in analysis will reduce the intensity of field data that needs to be collected, further reducing costs or allowing the monitoring budget to stay stable across years, despite potential inflation.

The reliance on remote sensing when possible in this study may lead to some limitations in resolution or accuraccy of data collected. For example, LW volume and counts will be based on aerial imagery, which may undercount total volume of large wood in areas of heavy canopy or LW that is under the water surface, though LIDAR data can also be used ot help characterize and enumerate LW (e.g., Abalharth et al. 2015; Richardson and Moskal 2016). In addition, if this is a large concern, some field data could be collected to corroborate or supplement LW estimated from remote sensing. However, it should be noted that the questions around wood focus mostly on LW accumulations (jams) in the active channel and causing changes in the floodplain, which should be visible with remote sensing.

The majority of floodplain restoration projects occur on rivers where either green LiDAR or an RTK survey can acquire bathymetry. However, it is possible that some sites will be too deep for either approach. In those cases, an an Acoustic Doppler Current Profiler (ADCP) mounted on a raft or drone (remote control boat) can be used to map the bathymetry (CFS 2020; Tomsett and Leyland 2019). This is widely used by the Bureau of Reclamation (Sixta 2019) and others for mapping bathymetry in large-rivers and likely similar in cost to an RTK survey.

8.2 Related or Complimentary Studies

There are a handful of complimentary studies or data collection that could be done that would enhance the proposed study. This study was designed to meet the goals and questions defined by the SRFB and its partners to detect large changes (>25%) in physical habitat and riparian conditions at large floodplain and riparian restoration projects. Because of the need for high quality and consistent remotely sensed and field data to calculate metrics and answer these questions before and after restoration at each and every project being monitoring, it is difficult, if not impossible to use previously collected data or monitor previously completed projects. However, there are two related approaches that could be used to evaluate projects using completed projects. These include evaluating completed projects using an EPT design, sometimes called a control-impact design, or reducing the number of metrics to just those that can be evaluated with existing LiDAR data to evaluate historical projects before and after restoration.

The EPT design—which samples paired treatment and control reaches at many sites well after restoration has occurred—has been widely used to evaluate the effectiveness of historical restoration action in both the U.S. and Europe (e.g., Roni and Quinn 2001; Louhi et al. 2011; Hering et al. 2015; Poppe et al. 2016; Roni et al. 2018). As noted in Table 3, this design is meant to answer questions about the effectiveness of different project types for managers and provides limited information on individual projects.

For floodplain projects, the question would be:

1) Have previously completed large-floodplain restoration projects lead to improvements in key physical and biological metrics (e.g., floodplain area and inundation, channel migration, side channel area, habitat diversity, HSI)?

Thus, it could be done by modifying methodologies described in this document. There are approximately 175 existing floodplain projects to choose from based on the data in the RCO PRISM database as of January 2020. This design requires locating a suitable control, which even for projects that are less than 1

km in length can be challenging. For example, our efforts have suggested that one-third or less of all projects examined for inclusion in this design have a suitable control (Roni et al. 2018). This will prove much more challenging for large projects (> 1 km), though it is likely that at least 15 to 20 sites can be located from the available sites in PRISM. This design is not recommended for riparian projects both due to the difficulty in finding suitable controls, but also because, often, poor records exist for the extent and location or riparian projects (Roni et al. 2020a). This EPT monitoring design will provide some general project and engineering design guidance, but really describes the average response of all projects and will provide limited information on efficacy of different project or engineering designs. The original recommendations from the PE Final Report (Roni et al. 2019b), were in fact to couple a BA study at a small number (6 to 10) new floodplain projects, coupled with an EPT study evaluating previously completed restoration projects. Bonneville Power Administration is using this approach to monitor floodplain restoration projects in the interior Columbia River Basin, though on floodplain project that are less than 1 km in length, as part of the AEM Program.

Another companion or alternative study would be to reduce the list of metrics in Table 9 that can be calculated without auxiliary field data and with just red LiDAR (topography, but not bathymetry) and conduct a simple mBA design to evaluate previously completed projects using existing data or some new or existing data. This would limit the study to just a handful of metrics and allow one to evaluate previously completed projects that have pre-project LiDAR data. Moreover, post-project data could be collected and then projects that are not yet completed could also be included. This would leverage existing data but provide an examination of only a subset of metrics. Without the auxiliary field data, bathymetric data, and the 'as-built surveys', it would be difficult to provide specific recommendations on restoration design to project sponsors. Similar to the EPT approach, this approach would provide answers to broad questions about physical changes and changes in riparian cover before and after restoration for a limited set of metrics that are often of most interest to managers (Table 2).

If one wanted to look at past projects that had existing green LiDAR and other remote sensing techniques, 13 of the 29 metrics could be calculated with only remote sensing data (Table 16). If one were to use coarser, less reliable methods that have not been proven effective for monitoring change, potentially 20 of the metrics could be calculated from remote sensing. The major change in methods would be using professional judgement to estimate bankfull width from a DEM derived from LiDAR and using the GUT to estimate geomorphic units, which is not a reliable indicator of amount of fish habitat (Roni et al. 2020b). There would likely not be the required data to do hydraulic and HSI modeling. It should be noted that few

sites have green LiDAR and there have been advances in green LiDAR sensors in recent years, and the quality of older green LiDAR may not be accurate. More importantly, the coarser level of resolution when utilizing purely remote sensing for metrics that require information on bankfull width, depth, and elevation will reduce the ability to detect changes in key floodplain metrics before and after restoration.

Table 16. Floodplain and riparian metrics that can be calculated with only remote sensing (green LiDAR)using proposed protocols and those that could be calculated with remote sensing using coarser less quantitative methods than proposed. * = approximate BFW from DEM (professional opinion), ** = based on Geomorphic Unit Tool (GUT) at bankfull depth, *** = forward looking infrared (FLIR). Y = yes can be reliably measured with remote sensing, Blank = cannot be reliably estimated with remote sensing.

Metric	Current methods	Less accurate or unproven methods
Floodplain area		Y*
Floodplain inundation index		Y*
Area altered	Y	Y
Active channel zone	Y	Y*
Side channel number	Y	Y
Side channel length	Y	Y
Side channel area		Y*
Pond/wetland number	Y	Y
Pond/wetland area	Y	Y
Residual pool depth	Y	Y
Sinuosity	Y	Y*
Side channel ratio	Y	Y
River complexity index		
Bankfull width to depth ratio		Y*
Morphological Quality Index (MQI)		
Pool/riffle ratio		Y**
Slow water (%)		Y**
Pool area		Y**
Pool frequency	Y	Y
Shannon diversity index of habitat units		Y**
Large wood	Y	Y
Sediment deposition and storage	Y	Y
Habitat suitability (HSI)		
Aerial vegetation extent		
Riparian composition (richness, diversity)		
Bank stability		Y
Shading	Y*	Y
Organic inputs	Y	Y
Water temperature		Y***

Restoration of floodplains can lead to changes in water temperature where there is significant change in hyporheic or groundwater exchange (Beechie et al. 2013), and an original question posed by the monitoring panel was:

> What is the spatial distribution of water temperatures in summer and winter, and how much do they change over time?

While there are remote sensing methods like FLIR, which have been used to map surface temperatures across an entire river or valley segment and to identify thermal refuges (Torgersen et al. 2001; Handcock et al. 2012; Dugdale 2016; Dugdale et al. 2019), FLIR methods create a snapshot in time and would need to be repeated seasonally. To compare these thermal maps before and after restoration would require sampling a much broader extent upstream and downstream of the restoration project to ensure any differences seen before and after restoration could be attributed to the actual restoration. FLIR is best suited for monitoring changes before and after restoration at reach-scale when coupled with placement of continuous data loggers throughout a study reach. Ideally, FLIR would be used to map a reach and identify locations for deployment of continuous data loggers at a study site so that seasonal and diurnal changes in temperature before and after restoration could be examined. *[NOTE for MONITORING PANEL – we moved this as an option because of some of the challenges with the temperature monitoring]*

Moreover, floodplain restoration includes a variety of treatments and not all projects lead to physical changes that will produce changes in water temperature and exchange with hyporheic or groundwater. So, it is likely that a substantial investment in both remote sensing and field data (temperature loggers) would need to be made, with the understanding that some sites will show little or no change in temperature. Therefore, we recommend temperature monitoring as an optional study component that could be added at sites where substantial temperature changes or refugia are goals of the floodplain restoration. For example, some floodplain projects include remeandering a straightened channel, which may have limited effects on temperature, while others, like Stage 0 restoration projects (Power et al. 2018), potentially create dramatic changes in hyporheic exchange and thus water temperatures. Given the site specificity of this approach and need for periodic downloading of data loggers, it might be a well-suited monitoring component for local partners.

Because of the focus on physical monitoring other than the riparian monitoring, we did not propose other biological monitoring. We see two potential biological components that could be conducted by partners or as companion studies. First, while eDNA is not to the point where it can be used to accurately estimate

abundance, it can be used to look for fish presence and absence in different habitats (Ficetola et al. 2008; Thomsen and Willerslev 2015; see Roni et al. 2019a for a review). As was done on a large restoration project in the Entiat River, samples could be collected in different side channels and other floodplain habitats in winter or multiple seasons to examine species presence and diversity in different seasons. This would, of course, be limited to examining broad changes in species presence and habitat use before and after restoration.

Finally, there are obvious additional data collection that could be added to refine the proposed methods or provide more detailed responses (e.g., site specific flow monitoring, leaf-off and leaf-on LiDAR flights, snorkel surveys or other fish monitoring). Estimating bankfull flow, width, and hydraulic modeling could be enhanced by placing pressure transducers at the top and bottom of each site and conducting periodic flow measures to create site specific bankfull and other flow statistics. Estimates of riparian shade and organic matter inputs would be enhanced by flying red LiDAR both during summer (leaf-on) and early fall (leaf-off). These and other components would improve the precision and possibly the accuracy of metrics monitored, but could substantially increase the cost and reliance on field methods. As with some of other complimentary previously discussed, these types of data collection that could be funded or taken on by partners.

8.3 Next Steps

In this study plan, we have outlined all of the key components of a robust study to evaluate the effectiveness of large floodplain and riparian restoration projects. Apart from selecting a contractor to implement this plan, there are several steps to implement the program. These include but are not limited to:

1. Site selection
    a. Reach out to recovery regions to get list of projects
    b. Do preliminary site selection based on response from recovery regions
    c. Visit sites and meet with recovery regions and project sponsors
    d. Delineate site boundaries
        i. Restoration footprint
        ii. Additional length above and below project (20x BFW)
2. Develop a draft field manual
    a. Update MQI
3. Work out sampling schedule and time frame for sites

    a. Annual and 10-year schedule
4. Based on sites selected and footprint, determine best approach for acquiring LiDAR at each site
    a. For any sites requiring green-LiDAR begin coordinating with DNR and LiDAR vendor
5. Begin collecting pre-project data for sites scheduled for construction in 2021

The most important and pressing of these is site selection, which should be done as part of the study implementation and by the team doing the monitoring. An additional consideration would be drafting a field manual including data. A draft field manual is recommended to train field staff for collection of both remote sensing and field data. This could be drafted and revised and finalized after the first year of data collection. It might also be beneficial to have the field manual detail any post-processing steps needed to calculate metrics from data collected. This should include modifying MQI for use in rivers across Washington State. This multi-metric index of floodplain morphology was developed for use in European rivers, and tested on some sites in Washington and Oregon, some minor regional modifications are still needed for adaptation of use at sites throughout the Pacific Northwest.

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APPENDICES

Appendix A. Initial List of All Floodplain Worksites in PRISM

Table A-1. Initial list of worksites in PRISM with a floodplain component (C.4.c.3 or C.4.c.4) greater than 1 km (0.9 km) including: recovery region, PRISM project name and worksite name, expected year of completion (end year), latitude, and longitude.

Recovery Region	Project Number	Project Name	Worksite Name	End Year	Latitude	Longitude
Hood Canal	09-1610	Donovan Creek Acquisition and Restoration - 135	Lower Donovan Creek	2013	47.828091	-122.8587
Hood Canal	14-1284	Lower Big Beef Creek Restoration - Construction	Lower Big Beef Creek	2019	47.648787	-122.7834
Hood Canal	15-1053	Dungeness R. RR Reach Floodplain Restoration	Trestle at Railroad Bridge Park	2016	48.085342	-123.148
Hood Canal	16-1372	Lower Dungeness Floodplain Restoration	Towne Road between Schoolhouse and Creamery	2021	48.142678	-123.1301
Hood Canal	18-1300	Dungeness River Floodplain Restoration	Towne Road between Schoolhouse and Creamery	Un-known	48.142745	-123.1287
Lower Columbia River	00-1872	LCRE Grays River Phase II	LCRE Grays Bay/Secret River #1	2005	46.306173	-123.6904
Lower Columbia River	07-1675	Abernathy Habitat Restoration and Riparian Protect	Abernathy Habitat Restoration	2012	46.206039	-123.1535
Lower Columbia River	07-1676	Historic Skamokawa Creek Restoration	Historic Skamokawa Restoration	2014	46.287636	-123.449
Lower Columbia River	07-1692	Lower Dean Creek Restoration	Lower Dean Creek Restoration	2012	45.83104	-122.6398
Lower Columbia River	08-1735	Lower Hamilton Ck Restoration Phase 1 Reach 2	Hamilton Crk Reach 2	2013	45.640291	-121.9777
Lower Columbia River	10-1022	Upper Washougal Restoration III	Upper Washougal Restoration III	2015	45.675903	-122.1375
Lower Columbia River	10-1028	Lower Hamilton Restoration Phase II	Hamilton Creek Mainstem & Spring channel	2015	45.665765	-121.9961
Lower Columbia River	13-1156	Lower Cispus Side Channels Restoration	Lower Cispus Side Channels	2017	46.441871	-121.8453
Lower Columbia River	14-1311	Abernathy Creek Cameron Site	Abernathy Creek Cameron Site	2018	46.196281	-123.1638
Lower Columbia River	14-1335	SFK Toutle@ Johnson Creek Restoration	SF Toutle at Johnson Creek	2018	46.312123	-122.6605
Lower Columbia River	16-1519	Elochoman Stream Restoration Cothren	Elochoman River Cothren	2021	46.228453	-123.364

Recovery Region	Project Number	Project Name	Worksite Name	End Year	Latitude	Longitude
Lower Columbia River	16-1520	Skamokawa Stream Restoration Project McClellan	Skamokawa Stream Restoration Project McClellan	2020	46.315347	-123.4549
Lower Columbia River	17-1025	Elkinton Property Stream Restoration	Elkinton	2021	46.2215	-123.3423
Lower Columbia River	17-1030	Johnston Wilson Creek Restoration	Johnston Wilson Creek	2022	46.296752	-123.3952
Lower Columbia River	17-1115	IMW- Erick Creek In-Stream Habitat Restoration	Erick Creek	2020	46.268115	-123.1759
Middle Columbia River	Aug-48	Upper Wapato Reach Restoration	SS Wildlife Area - Donald Wapato Reach	2013	46.480984	-120.4123
Middle Columbia River	Jul-20	Reecer Creek Floodplain Restoration 2	Reecer Creek Floodplain	2013	46.990942	-120.5719
Middle Columbia River	Jun-41	Cle Elum River Instream Habitat	Cle Elum River Instream Habitat	2010	47.226435	-121.0502
Middle Columbia River	Jun-77	Upper Klickitat R. Enhancement, Phase II	Upper Klickitat River Enhance Phase II	2009	46.318558	-121.2591
Middle Columbia River	07-1725	Upper Klickitat River - Phase 3	Upper Klickitat - Phase 3	2013	46.355505	-121.1945
Middle Columbia River	09-1461	Tepee Creek Restoration - Phase 2 Construction	RM 4.5-5.3	2014	46.172662	-121.0327
Middle Columbia River	10-1742	Upper Klickitat R. Enhancement, Phase IV	Upper Klickitat River	2015	46.458661	-121.3875
Middle Columbia River	10-1765	Eschbach Park Levee Setback & Restoration	Eschbach Park Phase 2	2015	46.679516	-120.6507
Middle Columbia River	11-1428	Klickitat Floodplain Restoration Phase 3	Phase 3	2014	45.887521	-121.1149
Middle Columbia River	12-1317	Yakima River Gap to Gap Habitat Enhancement	Gap to Gap Reach-Terrace Heights to Buch	2016	46.594407	-120.4686
Middle Columbia River	12-1644	Klickitat Floodplain Restoration Phase 4	Haul Road Phase 4	2015	45.864495	-121.0956
Middle Columbia River	13-1314	Cle Elum River Side Channel Restoration Ph 2	Cle Elum River Side-channel Restoration	2015	47.228582	-121.0536
Middle Columbia River	13-1401	Klickitat Floodplain Restoration Phase 5	Phase 5 Project Area	2017	45.859419	-121.0849
Middle Columbia River	14-1860	Klickitat River Floodplain Restoration Phase 6	Phase 6 Project Area	2019	45.92631	-121.1282

Recovery Region	Project Number	Project Name	Worksite Name	End Year	Latitude	Longitude
Middle Columbia River	17-1179	Yakima River Side Channel at Bull Canal Diversion	Irene Rinehart Riverfront Park	2021	46.986579	-120.5702
Middle Columbia River	18-1711	Teanaway Community Forest Floodplain Restoration	Indian Creek Section 16	2022	47.307897	-120.8461
Puget Sound	Jul-08	Lower Ohop Creek Restoration Phase II	Lower Ohop Creek	2011	46.856286	-122.3514
Puget Sound	Aug-56	Lower Tolt River Floodplain Reconnection 08	Tolt River Floodplain Reconnection	2010	47.640339	-121.9267
Puget Sound	Jun-23	Greenwater R. ELJs and Rd Decommission	Greenwater Engineered Log Jams	2010	47.120313	-121.5722
Puget Sound	Jun-50	Chinook Bend Levee Removal 06	Chinook Bend Levee Removal	2012	47.668675	-121.9223
Puget Sound	01-1237	Sherwood Creek Fish Passage	Sherwood Creek Fish Passage Project	2006	47.35052	-122.8914
Puget Sound	01-1307	North Meander Slough Reconnection	North Meander Slough	2006	48.201553	-122.232
Puget Sound	01-1421	Puyallup River Setback Levee	Puyallup River Setback Levee	2007	47.088492	-122.211
Puget Sound	02-1606	Pentland Creek/Smoke Farm Rearing	Pentland Creek at Smoke Farm	2008	48.253555	-122.0572
Puget Sound	04-1338	Lower Newaukum Restoration	Lower Newaukum Restoration	2010	47.284056	-122.0657
Puget Sound	04-1646	Ennis Creek Restoration	Ennis Creek	2007	48.656331	-122.2041
Puget Sound	05-1503	Lower Ohop Creek Restoration, Phase 1	Lower Ohop Restoration	2009	46.846792	-122.3653
Puget Sound	07-1701	Cherry Creek Floodplain Restoration	Cherry Creek Floodplain Restoration	2013	47.761344	-121.9571
Puget Sound	07-1735	Blue Slough Side Channel Reconnection	Blue Slough Side Channel Reconnection	2011	48.281917	-121.7608
Puget Sound	07-1737	NF Stillaguamish ELJs	North Fork Stillaguamish Eng. Log Jam	2012	48.419756	-121.6666
Puget Sound	09-1379	Klein Farm Acquisition and Restoration	Dan and Pamela Klein Farm	2013	48.18337	-122.0807
Puget Sound	10-1852	Howard Miller Steelhead Park Off Channel Enhance	Howard Miller Steelhead Park	2013	48.48295	-121.6075
Puget Sound	10-1863	Calistoga Setback Levee - Construction	Calistoga Setback Levee	2015	47.091214	-122.2156
Puget Sound	13-1144	Lower Ohop Restoration Ph III	Ohop Valley	2017	46.856941	-122.3523
Puget Sound	15-1198	Moga Back Channel Construction	Rt Bank Snohomish River RM 15.7	2019	47.857783	-122.0785
Puget Sound	16-1651	Hansen Creek Reach 5 Restoration	Hansen Creek New Channel	2022	48.515343	-122.2007
Puget Sound	16-1899	Lower Russell Levee Setback & Habitat Restoration	Lower Russell Levee Setback & Habitat Restoration	2021	47.409112	-122.267

Recovery Region	Project Number	Project Name	Worksite Name	End Year	Latitude	Longitude
Puget Sound	18-1258	Riverbend Floodplain Restoration Construction	Riverbend	2023	47.464215	-122.1119
Puget Sound	18-2085	MF - Porter Creek Reach Phase 1	Phase 1	2017	48.805803	-122.1277
Snake River	00-1691	George Creek Instream and Riparian	Hagenah	2005	46.308512	-117.1126
Snake River	09-1596	Tucannon River Off-Set Dike Construction	Tucannon River Off-Set Dike	2014	46.446602	-117.7884
Snake River	12-1641	Project Area 14 LW Restoration	Project Area 14	2015	46.336419	-117.6807
Snake River	13-1391	Tucannon Ranch Habitat Improvement	Tucannon Ranch	2015	46.525134	-118.1411
Snake River	14-1900	PA 24 Floodplain and Channel Complexity	PA 24 Floodplain and Channel Complexity	2018	46.430721	-117.729
Snake River	15-1286	NF Touchet Floodplain & Habitat Rest. RM 3.3-4.3	Phase 1	2020	46.272538	-117.8931
Snake River	15-1323	Tucannon Large Wood & Floodplain Restoration PA6-9	Tucannon Large Wood & Floodplain Restoration PA6-9	2019	46.28287	-117.6565
Snake River	16-2091	Tucannon Complexity & Connectivity (PA-18)	PA-18 WDFW	2020	46.38559	-117.6964
Snake River	17-1267	Bridge to Bridge Restoration Phase 2-	Bridge to Bridge Phase 2	2020	46.052314	-118.57
Snake River	18-2091	Tucannon River Habitat Restoration, PA-32	PA-32	2021	46.483753	-117.9543
Upper Columbia River	Jun-92	Hancock Springs Restoration Project	Hancock Springs Restoration Project	2011	48.534144	-120.3316
Upper Columbia River	18-1762	Middle Entiat Restoration - Area F (RM 16.2-16.7)	Middle Entiat Restoration Projects Area F	2021	47.799903	-120.4029
Washington Coast	00-1892	Elk Creek Restoration Project	Elk Creek Restoration Project	2004	46.705153	-123.7088
Washington Coast	02-1463	Salmon Creek 02	Salmon Creek Restoration	2007	46.410865	-123.6248
Washington Coast	09-1232	Wickett Flood Plain Connection/Barrier Removal	Barrier Removal Site	2011	46.829631	-123.2596

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Salmon Recovery Funding Board Briefing Memo

Item 6

APPROVED BY RCO DIRECTOR KALEEN COTTINGHAM

Meeting Date: June 11, 2020

Title: Funding Projections and Allocations

Prepared By: Tara Galuska, Salmon Section Manager, Recreation and Conservation Office
Jeannie Abbott, Lead Entity Program Manager, Governor's Salmon Recovery Office
Keith Dublanica, Science Coordinator, Governor's Salmon Recovery Office

Summary

The Recreation and Conservation Office (RCO) requests project and capacity funding as part of the annual grant application to the Pacific Coastal Salmon Recovery Fund (PCSRF) and as part of our biennial state capital and operating budget requests to the Governor and Legislature. Together, these funds pay for salmon habitat improvement projects, monitoring, hatchery improvement projects and programs, and support for the network of regional organizations and lead entities that underlie the locally driven approach to salmon recovery in the state.

This memo provides information about the projected funding from the 2020 PCSRF application and the known state funding for the remaining 2019-21 biennium. Information about specific activities and funding decisions that will advance the Salmon Recovery Funding Board's (board) biennial work plan are included.

Board Action Requested

This item will be a:

- ☒ Request for Decision
- ☐ Request for Direction
- ☐ Briefing

Staff recommends that the board make funding allocation decisions and delegate authority to the RCO Director to enter into contracts consistent with those decisions once we have received the 2020 PCSRF award. The board will make decisions on which projects to fund in September 2020.

Background:

Each year, the Recreation and Conservation Office (RCO) submits a single Washington State application to the National Oceanic and Atmospheric Administration (NOAA) for Pacific Coastal Salmon Recovery Fund (PCSRF) grant funding. The application is prepared on behalf of the Salmon Recovery Funding Board (board), Washington Department of Fish and Wildlife (WDFW), and the Northwest Indian Fisheries Commission (NWIFC).

The board portion of the PCSRF application includes funding for habitat projects, monitoring (required by NOAA), administration, and capacity funding. Capacity is the established organizational foundation that allows salmon recovery to take place at the grassroots level by maintaining a network of regional organizations. PCSRF no longer provides funding for lead entities.

In 2017 and 2018 RCO removed the request to fund lead entities from the federal PCSRF applications to increase the competitiveness of Washington State's application by shifting a larger percentage of funds into Priority 1 habitat projects. Funding for lead entity capacity became part of the RCO state capital budget request and has been funded by the legislature over the past several biennia.

Available Funds for Year 2 of the 2019-2021 biennium

Current Budget

Federal Funding: The RCO was notified of the final 2020 PCSRF federal award in early June 2020. The award amount for 2020 for the State of Washington is $18,500,000. This is a decrease of $145,000 from 2019. The funding will be awarded in August 2020.

State Funding: The board is asked to make decisions for year 2 of the biennium. The Legislature's adopted budget for the 2019-21 biennium includes:

- $974,000 in general state funds for lead entities, the same amount provided in the 2017-19 budget.
- $25 million in capital funds for salmon recovery, which includes:
    - $2,400,000 million in lead entity capacity funding;
    - $640,000 to the Regional Fisheries Enhancement Groups (RFEG) for project development. (It is important to note that the funding provided to lead entities and RFEGs is only to develop projects – any other capacity costs are not eligible to be covered with these capital funds);
    - $20,930,000 for salmon recovery projects; and
    - $1,030,000 (4.12%) to RCO to administer these grants and contracts.

Returned Funds

"Returned funds" refers to money allocated to projects/activities in previous years that has been "returned" to RCO when projects/activities either close under budget or are not completed. These dollars are returned to the overall budget and made available for

cost increases and to increase the funding available for projects in the upcoming grant round. In order for the funds to be used beyond the intended biennium, the Legislature must re-appropriate the funds. The legislature has reappropriated all of these earlier funds.

In past years, the board made up the difference between the PCSRF award and the amount needed for regions and lead entities with returned PCSRF funds. Currently, due to reduced federal funding, specific federal grant requirements on "priorities", and the removal of lead entities from the PCSRF award, utilizing returned funds for lead entity capacity funding is no longer a sustainable strategy.

Projected Funding Available

Table 1 displays the amount of funding available for board decisions in Year 2 of the biennium (2020-2021). This scenario includes the remainder of the unobligated state appropriation and the NOAA PCSRF award of $18,500,000 to Washington State.

Table 1: Projected Available Funding for Year 2 of the 2019-2021 Biennium

Funding Available for the Year 2 of 2019-21 Biennium	State Fiscal Year 2021
State General Funds	$487,000
State Bond Funds Lead Entities	$1,226,500
Unobligated Project Funds Available (state and Federal)	$8,437,287
Returned funds	$62,713
PCSRF 2020 (includes Admin)	$15,263,685 [1]
Total Funds Available	**$25,477,185**

[1] This amount is from the Federal Pacific Coastal Salmon Recovery Fund award for 2020. This figure does not include monitoring or hatchery reform funds to Northwest Indian Fisheries Commission and WDFW.

Table 2: Projected Funding Decisions/Uses for Year 2 of the 2019-2021 biennium

Funding Decisions	Amount
Project Funding for grant round	$17,700,000[2]
Regional monitoring projects to fill data gaps	$300,000
Technical Review Panel	$200,000
Regional Organizations	$2,878,685
Lead Entities (bond funds)	$1,226,500
Lead Entities (general fund)	$487,000
Monitoring	$2,000,000
Subtotal Board Decisions	**$24,792,185**
PCSRF 2020 funds for RCO administration	*$555,000*
Communications	*$60,000*
Salmon Conference	*$70,000*
Total	**$25,477,185**

Board Decisions for the Year 2 of the 2019-2021 biennium funding

The board is being asked to make decisions on $24,792,185 of the $25,477,185 listed in Table 1 above. This includes project funding, capacity funding and monitoring. The board does not make decisions on RCO administration. In addition, the board has already approved the decisions to fund the conference and communications.

The decisions outlined in this memo will support the board's grant program for the 2020 grant round to fund habitat restoration, acquisition and design grants, salmon recovery capacity, and monitoring.

Below are the specific staff recommendations:

1. Set a target of $18 million for the 2020 grant round.
2. Approve funding for the Technical Review Panel for the remainder of the biennium ($200,000).
3. Reserve $500,000 to be used for project cost increases (for December 2020 through December 2021) consistent with policies in Manual 18.
4. Approve $2,878,685 in capacity funding as shown in Table 1 for each regional organization for fiscal year 2021, carrying forward any unspent capacity funds into each regional organization's contract.

[2] This includes $62,713 in returned funds, $8,437,287 in unobligated funds, and $9,200,000 in PCSRF 2020 funds.

5. Approve capacity funding as shown in table 1 for each lead entity for fiscal year 2021.
    - Approve the use of $487,000 from general funds. This includes funding for lead entity training and a Washington Salmon Coalition (WSC) chairperson ($8,000 and $4,500 respectively).
    - Approve the use of $1,226,500 for lead entity contracts from bond funds. This includes use of returned lead entity capacity bond funds to exchange with FY21 general fund state funds for the Washington Salmon Coalition to maintain facilitation and other organizational support for FY21 up to $24,000.
6. Approve PCSRF funding for monitoring contracts totaling $2,000,000 in the following categories:
    - $208,000 for status and trends;
    - $236,000 for project effectiveness "pivot" (delayed, as noted below);
    - $1,456,000 for IMW monitoring contracts;
    - $100,000 to continue the support of the monitoring panel.

2020 Grant Round Target for Year 2 of the 2019-2021 biennium (FYY 2020)

Available Funds and 2020 Grant Round Projection

The board funds grants with state and federal money received for salmon recovery, the majority of which is allocated to projects, capacity and monitoring. Funding is determined annually based on Washington State's PCSRF grant award and the state dollars appropriated by the Washington State Legislature each biennium. Based on the budget projection in Table 1, staff recommends setting a target grant round amount at $18,000,000, which includes $300,000 for regional monitoring projects to fill data gaps.

Technical Review Panel

To ensure that every project funded by the board is technically sound, the board's technical review panel evaluates projects to assess whether they have a high benefit to salmon, a high likelihood of success, and that project costs don't outweigh the anticipated benefits of the project. There is $200,000 in the PCSRF application to support the technical review panel. The Puget Sound Acquisition and Restoration Fund also supports the Review Panel.

Cost Increases

Each year, the board reserves $500,000 for cost increase amendments requested by project sponsors. These funds are available on a first come, first served basis to sponsors seeking additional funds for cost increases to accomplish their existing scope of work.

The RCO director has authority to approve cost increases or to request review and approval by the board. Cost increases are reported to the board at each meeting.

Allocation of Project Funding -- Staff Recommendation

Staff recommends that the interim project allocation formula approved by the board at the March 2, 2017 meeting be utilized to allocate project funding to regions, with the board approving ranked project lists at its September board meeting, shown in Table 3 below. No additional allocation recommendations have been presented to the board at this time.

Table 3. Regional Allocations for Project Funding Using the New Interim Allocation Formula

Regional Salmon Recovery Area	Regional Allocation Percent of Total	2020 Allocation based on $18 million
Hood Canal Coordinating Council	2.40%	$432,000
Lower Columbia Fish Recovery Board	20.00%	$3,600,000
Northeast Washington	1.90%	$342,000
Puget Sound Partnership	38.00%	$6,840,000
Snake River Salmon Recovery Board	8.44%	$1,519,200
Upper Columbia Salmon Recovery Board	10.31%	$1,855,800
Washington Coast Sustainable Salmon Partnership	9.57%	$1,722,600
Yakima Basin Fish and Wildlife Recovery Board	9.38%	$1,688,400

Regional Organization and Lead Entity Capacity Contracts in Year 2 of the 2019-2021 biennium

As reported in Item 2B, regional organizations and lead entities are currently operating with scopes of work and contracts that began in 2019 and extend through June 30, 2021.

Regional Organization Capacity Contracts

Pending board approval regional organization capacity contracts will be funded with their full FY20 amounts and all unspent capacity funds will be rolled into their new contracts. Regional capacity funds come from the federal PCSRF award.

Lead Entity Capacity Contracts

Pending board approval lead entity capacity contracts will be funded with their full FY21 amounts.

Staff Recommendations

Staff recommends the board fund region capacity for fiscal year 2021 at $2,878,685 from PCSRF, plus any carry forward unspent funds by region. Staff recommends the board fund lead entities for fiscal year 2021 using $1,226,500 in bond funds and $487,000 in general funds. Table 4 summarizes the recommendation; Attachment A provides detail on the funding recommendations.

Table 4. Proposed Lead Entity and Regional Organization Funding for Fiscal Year (FY) 2021

Purpose	Proposed Funding FY 2021
Lead Entities bond funds	$1,226,500
Lead Entities general funds	$487,000
Washington Salmon Coalition facilitator ($24,000)	
Lead Entity training ($8,000)	
WSC Chair stipend ($4,500)	
Regional Organizations	$2,878,685
TOTAL	**$4,592,185**

Reallocation of Unspent Lead Entity Capacity Funds

Background

Since 2014, the board has approved the use of unspent lead entity capacity funds to support the implementation of the Washington Salmon Coalition's (WSC) Action Plan and address other statewide lead entity needs. Staff recommend that the board continue this practice; however, in the event of a shortfall in the next fiscal year that these unspent funds be available for the lead entity capacity contracts instead.

Due to lead entity coordinator vacancies and capacity related issues, not every lead entity is able to expend all its capacity funds within the grant period. Since 2009, the annual unspent lead entity capacity fund balance is approximately $50,000 on average, or about 3 percent of total lead entity capacity grants.

In 2019, the board delegated authority to the RCO director to allow the lead entities to exchange a portion of their general fund state allocation for 2017-2019 unspent capacity bond funds to hire a facilitator and provide training for the Washington Salmon Coalition for the 2019-21 biennium.

Staff Recommendation for Unspent Lead Entity Capacity Funds

Staff recommends that the board delegate authority to the RCO director to maintain WSC facilitation or other organizational support by allowing the lead entities to

exchange a portion of the FY21 lead entity capacity general fund state allocation with 2017-2019 return capacity bond funds, not to exceed $24,000 or to use these funds to make up shortfalls in capacity funding.

Monitoring Funding in Year 2 of the 2019-2021 biennium

Board-Funded Monitoring Efforts

The following decisions are specific to the ongoing board-funded monitoring efforts included in the 2020 PCSRF application. These board-funded monitoring efforts have been vetted by the monitoring panel. The efforts include status and trends (fish in/fish out) monitoring, intensively monitored watersheds (IMW) program, and the "pivot" from reach-scale project effectiveness monitoring.

Additionally, continued support is requested for the monitoring panel, which provides an objective science-based assessment of the board's monitoring program, including review of regional monitoring project proposals.

Department of Fish and Wildlife Status and Trends (Fish In/Fish Out) $208,000

This funding provides annual support for status and trend monitoring in five (5) index streams. Status and trends refer to fish in (returning spawning adults) and fish-out (juvenile migration downstream). These funds are approximately 7% of the total statewide status and trends monitoring through WDFW.

Intensively Monitored Watersheds (IMW) $1,456,000

The IMW program continues to provide comprehensive validation monitoring for the four IMWs in western WA, as well as support for one IMW in eastern WA. These include the Straits, Skagit, and Hood Canal IMW complexes in the Puget Sound region, the Abernathy IMW complex in the Lower Columbia, and the Asotin IMW complex in the Snake region. This total includes one contract to the Department of Ecology ($699,639) and two to the Department of Fish and Wildlife (Fish $489,000 and Habitat $267,361).

Project Effectiveness Monitoring "pivot" $236,000

This funding has provided support for project effectiveness monitoring in the past. The board is in transition with this monitoring program as the monitoring panel working with GSRO and the regional recovery organizations evaluates options.

As a reminder, in 2018 the board directed the monitoring panel to consider a "pivot" away from project effectiveness monitoring, and to consider other monitoring options as the project effectiveness work came to a close. In 2019, the monitoring panel worked with representatives from the board, practitioners, and council of regions to prepare options and recommendations for the board. In September 2019, the board approved funding for a request for proposals (RFP) to move forward with evaluating feasibility and to develop a study design for restoration-scale effectiveness monitoring for floodplain and riparian restoration. The board also approved a complimentary analysis for remote

sensing technologies, such as Light Detection and Ranging (LiDAR), to evaluate restoration effectiveness at broad spatial scales. In December 2019, Cramer Fish Sciences was awarded the contract and in June 2020 delivered their final report that included a restoration scale study design and an assessment of remote sensing LiDAR technologies. The key findings from the report suggested that restoration scale effectiveness monitoring is feasible and could be informative for the board's program. To achieve the desired results, the report highlighted that a 5- to 10-year study horizon would be needed, and that the monitoring needed to be closely coupled with the simultaneous implementation of appropriate floodplain and riparian restoration projects that adhered to the study design.

Given the importance of this decision and the required commitment, the recognition that no field work can begin this summer, and the ongoing discussions with some regional organizations about how this monitoring aligns with or informs their regional priorities, the GSRO and the monitoring panel are proposing to delay this funding decision, but keep the $236,000 as a placeholder. The monitoring panel will work with regional boards over the summer and present options and recommendations for this pivot at the September 2020 board meeting.

Monitoring Panel $100,000

The monitoring panel is entering its seventh year of operation, following the 2013 Stillwater Sciences report implementing an objective review and assessment of all the PCSRF-funded monitoring efforts. In addition, the monitoring panel reviews regional monitoring projects, which will be funded by the board at the September 2020 meeting.

The seven monitoring panel members provide subject matter expertise in a collegial and mutually supportive and respectful environment. The panel meetings include web-based meetings and conference calls, in-person reviews and interactions, as well as follow-up with monitoring principal investigators. The monitoring panel conducts an annual science evaluation of the board's monitoring program summarized in an annual report, provides recommendations on board monitoring direction, programs, and projects, and evaluates and provides recommendations on individual monitoring projects as appropriate. The monitoring panel provides annual reviews of all PCSRF-funded monitoring projects. Those reviews and assessments are embedded within the panel recommendations, reached by consensus and with conditions if necessary, and presented annually to the to the board by the panel chair,

The PCSRF funding as shown in Table 5 supports the monitoring panel through September 30, 2021. Panel members' contracts will have cost increase amendments, as appropriate, as well as a time extension amendment processed for their continued participation, as necessary. The members have identified common tasks, scopes of work, field visits, and deliverables, which are revised as appropriate and entered into PRISM as contract conditions. The monitoring panel chairman, Dr. Pete Bisson, has provided

excellent guidance of the monitoring panel, and has agreed to continue his duties facilitating and coordinating the panel tasks, through the 2021 grant round.

Table 5. Anticipated Monitoring needs for use of 2020 PCSRF funds

Monitoring Efforts	2020 Allocation
Washington Dept. of Fish and Wildlife Fish in / Fish out Monitoring	$208,000
Washington Dept. of Ecology IMW Status and Trend Habitat Monitoring	$699,639
Washington Dept. of Fish and Wildlife IMW Fish Monitoring	$489,000
Washington Dept. of Fish and Wildlife IMW Habitat Monitoring	$267,361
Project Effectiveness Monitoring "Pivot" (set aside for future board decision)	$236,000
Monitoring Panel	$100,00
Total	**$2,000,000**

Staff Recommendation for 2020 Monitoring Efforts

Staff recommends the board approve the monitoring efforts as outlined above in Table 5, with delaying the final decision on project effectiveness until September 2020, and delegate authority to the director to enter into such agreements. Staff also recommends consideration of the Monitoring Panel recommendations as provided in their report and presentation to the board.

Unobligated Monitoring Funding

Background

The board has unobligated funds from FY2018 and FY2019 for monitoring, totaling $622,660 (Table 6). These unobligated funds are primarily the result of funding set aside for the project effectiveness pivot, which is discussed above, and fewer requests in the past for regional monitoring projects. The requests for regional monitoring have increased every year since this program was put in place, and this year the FY2020 requests for regional monitoring projects exceed available funds by $339,481.

In addition to an increase in the regional monitoring proposals, there are several proposed monitoring expenditures from these unobligated funds as shown below in Table 6.

Table 6. Unobligated Monitoring Funding

Proposed Unobligated Monitoring Funding Expenditures	Proposed Expenditures
Washington Dept. of Fish and Wildlife IMW Habitat Funding Gap	$149,557
Regional Monitoring Projects	$339,481

Set Aside for Project Effectiveness Pivot or Other Board Monitoring Priorities	$133,622
Total Unobligated Monitoring Funds	**$622,660**

Staff Recommendation for Unobligated Monitoring Funds

Staff recommends the board approve the monitoring efforts as outlined above in Table 6 and delegate authority to the director to enter into such agreements.

- Use $339,481 of the available unobligated monitoring funds to fully fund the regional monitoring requests that will be presented for funding in September 2020. These unobligated funds will be added to the FY2020 regional monitoring allocation approved by the board for $300,000. This combined funding of $639,481 will fully fund all seven regional monitoring projects. These projects have not yet been fully reviewed nor ranked by Lead Entities, which will occur prior to the September 2020 board meeting.
- Use $149,557 of the unobligated monitoring funds to fill a gap in WDFW IMW habitat monitoring. This WDFW funding gap is due to legislatively mandated wage increases and changes in WDFW indirect policy as the result of changes in rules for federal funding. In the past, WDFW could waive the indirect charges, but that is now prohibited.
- Set aside remaining $133,622 of the available unobligated funding for future monitoring activities that could include the project effectiveness pivot or other board monitoring priorities.

Motions for Board consideration

Move to set a target of $18 million for the 2020 grant round, which includes $300,000 for funding regional monitoring projects.

Move to delegate to the RCO Director the authority to implement the following project related decisions:

- Funding for the Technical Review Panel for the remainder of the biennium ($200,000).
- Funding to be used for project cost increases ($500,000 for September 2020 through August 2021) consistent with policies in Manual 18.

Move to delegate to the RCO Director the authority to implement Region capacity funding as shows in Attachment A and carry forward funding as described in Memo 6.

Move to delegate to the RCO Director the authority to implement Lead Entity capacity funding as shown in Attachment A and as described in Memo 6.

Move to delegate to the RCO Director the authority to implement monitoring projects totaling $2,000,000 from the 2020 PCSRF award as described in Memo 6.

Move to delegate to the RCO Director the authority to implement monitoring projects using unobligated federal monitoring funds from prior PCSRF awards totaling $622,660 as described in Memo 6.

Attachment A: Capacity Funding For Regional Organizations & Lead Entities FY 20

Regional Organization	Proposed Funding FY 2021
Lower Columbia Fish Recovery Board	$456,850
Hood Canal Coordinating Council	$375,000
Puget Sound Partnership	$689,162
Snake River Salmon Recovery Board	$333,588
Upper Columbia Salmon Recovery Board	$435,000
Coast Sustainable Salmon Partnership	$304,085
Yakima Valley Fish & Wildlife Recovery Board	$285,000
Total	**$2,878,685**

Capacity Funding for Lead Entities for Fiscal Year (FY) 2021

Lead Entity	Proposed Funding FY 2021
WRIA 1 Salmon Recovery Board Lead Entity	$65,000
San Juan County Lead Entity	$60,000
Skagit Watershed Council Lead Entity	$80,000
Stillaguamish Co-Lead Entity (Stillaguamish Tribe)	$25,000
Stillaguamish Co-Lead Entity (Snohomish County)	$37,000
Island County Lead Entity	$60,000
Snohomish Basin Lead Entity	$62,500
Lake WA/Cedar/Sammamish Watershed Lead Entity	$60,000
Green/Duwamish & Central PS Watershed Lead Entity	$60,000
Pierce County Lead Entity	$60,000
Nisqually River Salmon Recovery Lead Entity	$62,500
Thurston Conservation District Lead Entity	$60,000
Mason Conservation District Lead Entity	$60,000
West Sound Watersheds Council Lead Entity	$60,000
North Olympic Peninsula Lead Entity	$80,000
North Pacific Coast Lead Entity	$60,000
Quinault Indian Nation Lead Entity	$60,000
Grays Harbor County Lead Entity	$60,000
Pacific County Lead Entity	$60,000
Klickitat County Lead Entity	$60,000
Pend Oreille Lead Entity	$60,000

Upper Columbia Regional Salmon Recovery	$135,000
Yakima Basin Regional Salmon Recovery	$65,000
Snake River Regional Salmon Recovery	$65,000
Lower Columbia Regional Salmon Recovery	$80,000
Hood Canal Regional Salmon Recovery	$80,000
Washington Salmon Coalition Chair	$4,500
Lead Entity Training	$8,000
Washington Salmon Coalition facilitator	$24,000
Total	**$1,713,500**

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Salmon Recovery Funding Board Briefing Memo

Item 7

APPROVED BY RCO DIRECTOR KALEEN COTTINGHAM

Meeting Date: June 11, 2020

Title: Criteria for Future Targeted Investments

Prepared By: Katie Pruit, RCO Planning Specialist

Summary

This memo includes a draft policy to target investments in salmon recovery. The policy draft includes investment priorities and criteria for the board's consideration. Stakeholder input is summarized and has informed this draft. Staff request direction to solicit broader public input on the draft policy.

Board Action Requested

This item will be a:

- ☐ Request for Decision
- ☒ Request for Direction
- ☐ Briefing

Background

The Salmon Recovery Funding Board (board) directed staff to develop a targeted investment policy to guide future funding decisions when funding remains available after grant-round allocations have been made. In December 2019, the board included strategic priorities for an adaptive management approach for future targeted investments. As envisioned, the policy would guide allocation of funds remaining after the current grant-round allocation to a board-identified priority each biennium. Because these targeted investments would occur only after grant-round allocations have been made, they could only occur when the board receives funding from the state legislature that is more than the regional annual grant-round allocation of $18 million[1].

Regional recovery organizations and lead entity coordinators were provided opportunities to comment on the draft targeted investments policy in April and May of 2020. The policy has been amended to incorporate their specific edits. Staff heard

[1] This is a combination of federal and state funds. The grant-round allocation has been $18 million annually over the past five biennia.

strong concern, especially from lead entities, that it was difficult to comment on the policy before an implementation process is known. A general policy to allow the board to target investments is a necessary first step before staff can address implementation.

The Board's Role in Targeting Investments

The Salmon Recovery Act (Chapter 77.85 RCW) establishes the board's authority to make grants and loans for salmon recovery activities. The Act directs the board to develop procedures and criteria for allocating funds for salmon habitat projects and recovery activities on a statewide basis[2].

The board adopted a formula based on objective parameters of physical and biological factors within a region, including number of salmon listed through the Endangered Species Act. This formula, known as the regional allocation formula, gives a set percentage to each regional salmon recovery organization. This formula has been reviewed and modified by the board on several occasions. The regional allocation is awarded each year and has totaled $18 million each year since 2010. Annual funding is a mix of state capital budget funds and National Oceanic and Atmospheric Administration (NOAA) administered Federal Pacific Coast Salmon Recovery Funds.

A targeted investment policy would not alter the current funding allocation process. The proposed policy would only permit targeted investments if more funds are available above the status quo regional allocation of $18 million. Funding targeted investments is within the board's authority.

Why Target Investments?

In 2018, a lean study recommendation advised the board to create a grant program to fund larger, more complex projects on a biennial basis[3]. In March 2019, the board considered options for creating a new statewide, competitive grant program. Staff were directed to form a sub-committee and survey regions, lead entities, and project sponsors about this approach.

The majority of survey respondents did not want another grant program, but there was substantial support to look at targeting investments to assist a region nearing de-listing. The survey also indicated many important projects were not funded due to limits of the allocation formula.

[2] Chapter 77.85.130 RCW

[3] The board discussed a large capital projects grant program as early as 2015.

The board asked the regions to present their highest priority projects that could benefit from a one-time injection of funding. Based on the delisting priority, three regions were eligible and presented funding proposals. In July 2019, the board allocated $6,430,562 in state capital funding to these regions.

Buoyed by the success of the 2019 targeted investments award process, the board asked staff to use it as a model and draft criterion for a targeted investment policy focused on delisting. After further consideration, the board expanded that directive to include a focus on strategic priorities. This approach would provide flexibility to address emerging issues when and if additional state capital funds are appropriated.

Draft Targeted Investments Policy

The intent of this policy is to guide funding for projects that cannot be funded within the current allocation or sub-allocation, clarify when the board will make funding decisions, and provide flexibility for the board to respond to emerging issues. Targeting investments may also increase funding for salmon recovery in Washington state.

The language in this policy is intended to be broad enough to give the board flexibility in its application.

Targeted Investment Definition

A targeted investment is a project that addresses a board-identified priority to accelerate progress towards achieving salmon recovery. Targeted investment funds may be made available when the annual regional status quo allocation is greater than $18 million.

Board-Adopted Biennial Priority

The board will adopt one targeted investment priority each biennium from the list below. A board-identified priority will address a critical gap in salmon recovery funding.

1. Approaching recovery: The investment improves habitat for an ESA-listed species nearing recovery goals per National Marine Fisheries Service (NMFS} status reviews. The targeted investment would address an outstanding habitat restoration and/or protection issue or threat that, if corrected, would move the listed species close to the recovery threshold.

2. Southern Resident Orca Whale Recovery[4]: The investment focuses on actions that benefit listed[5] natural origin salmon populations that are a high priority identified by the Southern Resident Orca Task Force long-term plan for orca recovery.

3. Populations at risk[6]: Funding to improve habitat for endangered, threatened, or non-listed populations in decline, or risk of extinction, where at-risk populations are identified by indicators such as fishery closures or updated status reviews.

4. Future threat abatement[7]: The project removes/dramatically abates a future threat to nullify recovery efforts (e.g., climate change, predation).

5. Emergency response priority: Funding to advance salmon habitat protection and restoration in watersheds that have experienced natural disasters that have or will result in significant adverse impact on a population.

Qualified Investment Criteria

The targeted investments definition is further refined by criteria that will be used by the board to select investments.

A qualified investment must address each of the criteria below:

1. Address a board-identified priority for the current biennium,
2. Improve long-term habitat quality and productivity, and therefore resiliency, of listed salmonids,
3. Advance a project that cannot be funded within the current allocation or sub-allocation,
4. Leverage additional federal funds (other than PCSRF),
5. Restore and/or acquire habitat (does not include design), and
6. Be endorsed and submitted by the salmon recovery region for funding.

[4] Washington State Executive Order 18-02
[5] Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq.)
[6] SRFB discussion, December 13, 2019 – per WSC comment
[7] SRFB discussion, December 13, 2019 – per board discussion to address challenges we do not yet anticipate

Stakeholder Input

Opportunities for Input

RCO first sought input from stakeholders at the Washington Salmon Coalition meeting on January 29, 2020, on the strategic priority approach. Many concerns were raised about developing a policy that would allow funds to be distributed outside of the regional allocation. It was difficult for the lead entities to support the list of strategic priorities because their projects are the highest priorities by design. There were also requests for certainty around the implementation process including project evaluation criteria, ranking process, and funding schedule.

In April 2020, staff circulated a draft policy that included the general policy language as well as a possible implementation schedule and process. This was intended to address lead entity questions raised in January. It raised more questions and concerns about how this policy would be implemented, what level of work would be expected, and frustration that there was not time to understand all the implementation details (project solicitation, evaluation, ranking, funding, and the schedule for these steps).

After numerous discussions, staff determined a bright line is best drawn between phase 1: policy development and phase 2: implementation. A typical process is to formulate a policy, adopt, implement, and evaluate. There can be overlap at any of these process steps, but a general policy to allow the board to target investments is a necessary first step. Attempting to address implementation in advance of the policy created more uncertainty and stress than is necessary. We continue to track implementation concerns and are sensitive to lead entity concerns. Staff are prepared to address those once we have a policy in place.

Summary of Stakeholder Input

A summary of stakeholder input is included in Appendix A. Staff request board input on a few items enumerated below.

Regional Recovery Organizations

The recovery region directors reviewed a draft policy in April and May 2020. Staff discussed their comments with them on April 29, 2020 and found general support for the draft policy, although one individual expressed concern about adding complexity to the existing process. The directors provided specific edits, especially to the priorities, that have been integrated. Staff requests board direction on two of the proposed criteria based on regional input.

Criteria 4: Leverage additional federal funds (other than PCSRF)

Comment summary: This criterion would unnecessarily exclude certain projects.

Staff analysis: This criterion is to address board comments that a targeted investment should leverage additional funds for salmon recovery in Washington state. For example, one 2019 targeted investment (Duckabush estuary) leveraged Puget Sound Nearshore Estuary Restoration Program (PSNERP) funds.

Staff support an amendment to require one (or more) criterion are met, as opposed to the draft requirement that all criteria are met.

Criteria 5: Restore and/or acquire habitat (does not include design)

Comment summary: Some regions recommend design be included. For example, the 2019 targeted investments funded design for the Duckabush estuary project. That design match was necessary to leverage the PSNERP funds.

Staff analysis: Staff does not recommend including funding of design. The policy is intended to focus on habitat restoration and acquisition to ensure projects are well-planned and "shovel ready" and have an expeditious benefit.

Lead Entity Coordinators

After a discussion about strategic priorities at the January Washington Salmon Coalition meeting in Vancouver, lead entity coordinators reviewed a draft policy in April and May 2020.

There is a strong preference by the lead entities for the board to not adopt a targeted investment strategy and, instead, apply additional funds to the regional allocation formula. Lead entity coordinators are concerned they will be tasked with the extra work of developing projects and/or not have opportunity to compete for targeted investments if the policy priority does not apply to their watershed.

The solicitation approach is yet to be determined. The implementation process will, as always, include stakeholder input. Staff understands there has been a resistance to comment on the policy before implementation questions are addressed. That said, here are the top takeaways from lead entity coordinators (as understood by staff):

- Targeted investments should be endorsed by the lead entity
- Do not limit the policy to one priority; accept proposals that meet any of the priorities so that all or most watersheds would be eligible for funds.
- Support utilizing this policy above the normal $18 million grant-round.

- Do not adopt a priority until there is some clarity on implementation for the 2021/2023 biennium.

As mentioned above, we are asking the board to consider the policy before discussing implementation details. Phase two will include an implementation plan that will address the solicitation approach, evaluation criteria, project review and ranking procedures.

2019/2020 Project Schedule

DATE	ACTION
September 2019	Board funded targeted investments in regions nearing delisting; staff directed to develop a targeted investments policy.
December 2019	Board direction to focus policy on strategic priorities.
Jan/Feb 2020	Staff met with WSC to discuss targeted investments policy.
March 2020	Staff briefing on policy development status.
Apr/May 2020	Stakeholder input on draft policy (WSC and COR).
June 2020	Board Direction on public review of policy.
September 2020	Board to consider policy adoption and 2021/23 priority.
Winter 2020/21	Staff to develop implementation process.
July/Summer 2021	As part of the biennial allocation analysis, determine whether funds are available to target under this policy

Strategic Plan Connection

The draft policy supports **Goal 1** of the board's strategic plan: Fund the best possible salmon recovery activities and projects through a fair process that considers science, community values and priorities, and coordination of efforts.

https://www.rco.wa.gov/documents/strategy/SRFB_Strategic_Plan.pdf

Attachment A

Stakeholder comment summary

Item 7, Appendix A

2020 Stakeholder Input: Draft Targeted Investments Policy

Timeline of stakeholder input

- December 13, 2019 SRFB meeting public comment
- January 29, 2020 RCO presentation to Washington Salmon Coalition
- April 15, 2020 draft policy circulated for stakeholder comment
- April 29, 2020 discussion with Council of Regions
- April 30, 2020 discussion with the Washington Salmon Coalition
- May 4, 2020 revised draft based on stakeholder comments
- May 11, 2020 deadline for stakeholder comments

Written Comment Summary

Please note: Most comments have been edited and/or paraphrased. An original copy of comments is available upon request. Staff response to comments is indicated in *red italic*.

1. LCFRB – Steve Manlow – April 17, 2020

Priorities

- Recommends against using the "delisting" term. *Amended*
- Keep the focus on recovering natural origin populations. *Amended*
- Remove "populations at risk category." *Amended*
- "Future threat abatement" too broadly written. This is really a subset under #1 – significant viability improvements. *Amended*

Criteria

- Remove large complex project. *Amended*
- Add a focus on key and high priority population viability bottlenecks. *Amended*
- Rethink investing in areas where habitat gains are demonstrably being outpaced by ongoing habitat losses and programs are not in place to reverse that trend, and ensure investments are sustainable. *Noted*
- Endorsement by region should be the requirement. *Amended*

Implementation

Develop a separate application that captures information regarding a project's unique contribution to population viability. This is not captured in existing application forms. *Noted – phase 2*

2. John Foltz – Snake River Recovery Board – April 17, 2020

Priorities

- Consider adding "emergency response priority" for watershed that has experienced significant flooding. *Amended*
- Recommends against using the "delisting" term. *Amended*
- Remove "populations at risk category" - could reword to "Identify populations at significant risk" and eliminate the qualifying fisheries criteria. *Amended*

3. Scott Brewer – Hood Canal Coordinating Council – April 20, 2020

- This should be coming from the Regions only. If there is a difference between Regions and their respective LE, they need to reconcile within before contributing to a statewide policy. *Amended*
- Why set status quo limit of $18 million? This should be at the discretion of the SRFB. *Noted*

Priorities

- Recommends against using the "delisting" term. *Amended*
- Suggest deleting "orca recovery" priority. *Noted*
- "Future threat abatement" too broadly written. Suggest adding this to the definition of a targeted investment (i.e. all investments in habitat improvements, but also consider future threat abatements). *Noted*

Criteria

- Remove large complex project. *Amended*
- Add a focus on key and high priority population viability bottlenecks. *Amended*
- Endorsement by region should be the requirement. *Amended*

Implementation

Develop a separate application that captures information regarding a project's unique contribution to population viability. This is not captured in existing application forms. *Noted – phase 2*

4. Alicia Olivas – Hood Canal Lead Entity – April 20 and May 11, 2020

The stance of the SRFB within the targeted investment policy, will further support the entities that are working for the same goal of trying to move the needle on recovery efforts and the stance will help the salmon recovery regions leverage efforts and possibly funding needs to further the SRFB's priorities. *Noted*

The SRFB's setting of a specific priority, such as to get a species to recovery, would help the region and the associated salmon recovery partners leverage efforts across state and federal agencies to engage in the difficult discussions and possibly find funding for the needed monitoring to answer key questions and further these discussions. *Noted*

Priorities

- A "critical element" should be identified by the current process in place. Maybe what is missing here is addressing an element that is impeding a critical element from being implemented. i.e. landowners, infrastructure, industry, … These elements need increased political will. *Noted*

- Amend populations at risk - may be a priority for reasons other than fisheries. Populations that are needed to meet recovery goals for instance. *Amended*

Criteria

- Remove large complex project. *Amended*
- Remove federal match requirement. *Noted*
- Important to keep LE endorsement because must have community support in order to fund it. I think this is all this is intended to do. The regional priority may or may not be the highest priority for the LE, but a LE must not be against it. *Noted*

5. Mara Zimmerman – Coastal Recovery Region – April 24 and May 5, 2020

Priorities

- Suggested rewording of populations at risk: Funding to improve habitat for non-listed populations in decline, where at-risk populations are identified by indicators such as fishery closures or updated status reviews. *Amended*

6. Amber Moore – Puget Sound Partnership – April 28, 2020

Concerned this will add another layer of complexity to the recovery system that funders and decision-makers might not understand, plus adding more strain on recovery partners that will essentially need to go through another grant round. *Noted*

Priorities

- Should look to the PPFL to see what sort of projects are priority according to the watersheds. For instance, if every watershed is proposing more projects related to delisting than any other topic, maybe that should be the priority. *Noted*
- Could we add capacity needs as another priority, given that the SRFB has flagged LE coordinator capacity funding as an issue to tackle? *Noted (does not fit policy intent)*
- Orca recovery: How is the SRFB planning to identify these projects? It might make more sense to say that the project is a high priority for protecting or restoring habitat for a population that is a high priority for SRKW. *Amended*

7. Alex Conley – Yakima Basin Fish and Wildlife Recovery Board and Tricia Snyder – YBFWRB Lead Entity - May 1, 2020

Discussions on Targeted Investments and two-year project lists (PPFL) have put more important discussion on the back burner (recovery plan updates- 10-year work plans). *Noted*

Priorities

- If board chooses one priority, does that eliminate options for emergency priority outside of the grant round later in the biennium (such as Oso landslide or methow fire)? *No*
- Would targeted investments reduce funding for other emergent board needs? *Unknown*
- Recommend option in policy to allow more than one targeted investment per biennium. *Noted*

Implementation

- Recommend waiting to award funds until the second year of the biennium to be sure the $18 million can be met for each year. *Noted – phase 2*

- Without implementation details it is unlikely that this policy will have clear LE and regional support. *Noted – phase 2*
- Recommend RFP detailing targeted investment priority, its rationale, eligibility criteria (project and regions), and evaluation criteria and ranking process. Allow ample (one meeting cycle) time for partner input prior to final RFP approval. *Noted – phase 2*
- Recommend draft RFP in March of even years – would be on PPFL and thus inclusion in state budget request. *Noted – phase 2*
- In 2020 ask LEs to include their best TI candidate on their PPFL (at least this once). *Noted, but not possible in 2020 due to PPFL timeline and statement of work.*

8. Melody Kreimes – Upper Columbia Salmon Recovery Board and Pete Teigen – Upper Columbia Lead Entity - May 5, 2020

Suggest adding to definition: The SRFB will request and manage targeted investment funds separately from, and in addition to, any planned project forecast list funding requested and received. *Noted – the role of the PPFL will be determined in phase 2*

Add priority - Extinction abatement: funding to prevent extinction of endangered population at risk of decline as indicated by recent factors influencing their decline. *Amended "populations at risk" to address comment.*

9. Kit Crump – Stillaguamish River Lead Entity – May 6, 2020

My comments are all around the priority language on Page 1 of the Targeted Investment Policy. These comments mostly reflect having flexibility in the Targeted Investment Strategy.

- It would be good to see the board accept any proposal from any of these priorities in any given biennium. They are all important and it may be too constraining to pick one of these priorities at the beginning of a biennium and stick with it even if there is a new emerging issue or a new significance related to one of the existing priorities. *Noted*
- It would be good to have a priority labeled "new emerging issue" or something wording like that to allow for something that is not covered by the existing priorities. *Noted*
- There have already been emergency responses from SRFB so hopefully this is more related to that and not something different. This could potentially be covered in the proposed new emerging issue section. *Noted and not intended to be something different. See Ali's comment below under number 13 for recommendation.*

10. Suzanna Smith – WRIA 9 Lead Entity – May 8, 2020

Email summary - Urge the SRFB to not adopt this policy. We all feel compelled to act to "fund the highest priority projects in the state". It is our belief that overwhelmingly, *this is already happening* and results in the high priority projects seen on lead entity project lists year after year. Regional leadership is needed to creatively develop new, innovative funding mechanisms that further support the important work already underway, and we hope the Board's intentions can be redirected to that end. *Noted*

If the board moves forward, then much more work is needed on the policy:

1. **Acknowledge the lead entity process:** Stronger language of inclusion and adoption of a lead entity approval process as part of any elevation of projects. *Noted*

2. **Proliferate dollars, not capital programs.** Adequate and reliable investments in the watershed is the most significant limiting factor for recovery. *Noted*
3. **Provide justification for a new funding program:** The policy is vague, and it is not clear why it is necessary (no justification for a new funding program and will confuse messaging to decision-makers). *Amended*
4. **Clarity on projects selection and identification of biennial priorities:** Creating criteria to support a new funding program requires capacity and resources to ensure is this is done transparently, consistently, and defensibly. Deferring the development of a formal selection process for criteria is not good public process and does not demonstrate good fiscal stewardship. Further, additional clarity is needed on how biennial priorities will be selected. *Noted – phase 2*
5. **Provide clarity for implementation:** Much more detail is needed to build consensus and avoid unintended consequences before this policy moves forward. Additionally, in this current economic climate the focus should be on navigating an evolving budget crisis and protecting/expanding existing funding structures – not creating new ones. *Noted*

11. Tricia Snyder – Washington Salmon Coalition - May 8, 2020

1. We want to ensure the policy is clearly communicating the importance of and how it relates to the Lead Entity process. Lead Entities support utilizing this policy above the normal $18 million grant round and want to ensure that our individual allocations are not adversely impacted by the introduction of a Targeted Investment Policy. *Noted*
2. We want to make clear that by separating the policy and implementation discussions, some of our feedback may change and we will have additional comments to include when we get to the implementation piece. *Noted*
3. We encourage the timeline chosen to allow for a conversation on implementation before a priority is chosen by the SRFB (currently scheduled for September) or at a minimum to include a check-in to revisit that decision, following the implementation discussion. *Noted*
4. Lead Entities are divided on the SRFB choosing just one priority per biennium or allowing multiple and developing some either criteria to evaluate between projects. *Noted*

12. Steven Hagerty – WRIA 14 Lead Entity – May 8, 2020

- I encourage this investment policy to focus on existing regional allocation frameworks, i.e., to either be distributed among lead entities using the allocation formula, or to fund PSAR large capital projects in order down the ranked list, rather than selecting particular general regional priorities that give SRFB broad discretion. A lot goes into the lead entity ranking and while I understand the need for a framework to compare apples to oranges across lead entities, I think one of the options above would be less controversial among LEs. I understand at this comment is pretty unaligned and perhaps somewhat unproductive with

the general direction of this policy at this point, but just wanted this opinion noted. Hope you understand where I am coming from. *Noted*

- If the targeted investment policy moves forward without sticking to one of the existing regional allocation frameworks described above, I think criteria for each priority will need to identified in much more detail about what type of projects are supported…a project that supports populations approaching recovery or support ESA-listed species for orcas to me is a bit vague and could be used to justify a number of different types of projects. I would want more details on criteria for this policy otherwise it gives SRFB discretion to choose any project that fits this pretty general description. Maybe some of this guidance will come in Phase II/implementation if I understand that properly? *Noted*

13. Ali Fitzgerald – Snake River Recovery Board Lead Entity- May 11, 2020

Support emergency response priority given recent flooding in February. Timing is challenging though because you don't know when you will get a natural disaster, there could be a long delay between the event and receiving funding. Option to choose one primary priority for each biennium with this as a backup so flexibility exists should a natural disaster occur. *Noted*

14. Cheryl Baumann – North Olympic Lead Entity - May 11, 2020

- Why limit to one priority. *Noted – would create biennial focus that would be lost with multiple priorities.*
- Delisting priority should not be limited to habitat only projects. What about projects like broodstock supplementation? *Noted; staff recommend habitat only projects to maintain focus.*
- Amend populations at risk to read: Funding to support listed or non-listed populations in danger of disappearing or in great decline as indicated by recent factors or data. *See amended language*
- Do not limit to federal match. This could be something that gets you more points when scored. *Noted*
- Projects should be part of PPFL. *Noted – Phase 2*
- Regions should work in tandem with their lead entities. *Noted*

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STATE OF WASHINGTON

RECREATION AND CONSERVATION OFFICE

May 18, 2020

Barry Thom, Regional Administrator
NOAA Fisheries, West Coast Regional Office
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232

RE: 5-year reviews for 28 listed species of Pacific Salmon and Steelhead

Dear Mr. Thom:

In response to the Federal Register Notice issued on October 4, 2019, I am writing on behalf of Washington State Governor's Salmon Recovery Office (GSRO) to offer my assistance with ensuring there is robust coordination between NOAA Fisheries and Washington State as you prepare the 5-year status reviews. While some salmon and steelhead populations in Washington may be progressing towards recovery, too many are still in crisis with an uncertain future. The 5-year status reviews offer us an opportunity to assess the status of our populations, determine what they need, marshal the necessary resources and partnerships, and set a course for action. I would like to use this opportunity over the next year as you develop the 5-year status reviews, to strengthen our partnerships and collaboration, and to pull in state agencies, tribes, and stakeholders, so that we are proceeding with a unified front to recover salmon and steelhead in Washington.

To assist in this effort, I have the following requests:

Work directly with the regional salmon recovery organizations across Washington as you proceed through the status review. It is these organizations who are responsible for developing and implementing the federally approved salmon recovery plans. These regional recovery organizations engage a multitude of partners, including tribes, and state and federal agencies. Working directly with these organizations and coordinating through my office will ensure that NOAA's 5-year status reviews accurately reflect the work of local partners and organizations throughout Washington.

Engage the Washington Department of Fish and Wildlife and keep GSRO apprised of your activities. This will ensure that NOAA has direct access to the state's most current information on hatcheries, harvest, and population viability, and GSRO can fulfill its role of coordinating with the state agencies, stakeholders, and partners.

Keep GSRO informed and updated on issues or developments, as appropriate, as NOAA fulfills its federal role and legal obligation to work directly with tribes and tribal organizations in Washington. This is especially important on topics where my office or

regional recovery organizations may offer some assistance, or where it impacts state commitments such as the Centennial Accord or other tribal agreements. Tribes and tribal organizations are leaders in salmon recovery and hold centuries of knowledge and expertise. Ensuring that NOAA incorporates this knowledge, data, and expertise into the 5-year status reviews, directly from individual tribes, is a priority for GSRO and Washington State.

Be aware that Washington State is in the process of updating the state's salmon recovery strategy called, "Extinction is Not an Option," which forms the foundation for salmon recovery in Washington. As the state proceeds with updating this strategy, I want to make sure that there are no glaring inconsistencies between the strategy and the 5-year status reviews, and that we are fully leveraging our collective resources to make progress on salmon recovery.

The 5-year status reviews offer an opportunity to evaluate our overall progress towards recovery, and to lay the necessary groundwork for changes that may be needed. I look forward to working together in a collaborative, coordinated, and transparent manner to better align the salmon recovery work we are doing in Washington State with NOAA's goals and obligations to complete the 5-year status reviews.

Thank you for considering this request and I look forward to hearing from you.

Sincerely,

Erik Neatherlin, Executive Coordinator
Governor's Salmon Recovery Office

cc: Rob Markle
JT Austin
Kaleen Cottingham
Kelly Susewind
Carol Smith
Laura Watson
Laura Blackmore
Mara Zimmerman
Melody Kreimes
Alex Conley
Scott Brewer
Steve Manlow
Amber Moore
John Foltz
Joe Maroney

Council of Regions June 2020 Update to the SRFB

To be presented by Alex Conley, COR Chair, on the June 11, 2020 SRFB Call

The Council of Regions (COR) brings together the state's seven Salmon Recovery Regions to 1) share information among the regions, GSRO and RCO, 2) provide input to the Salmon Recovery Funding Board and 3) coordinate activities that address shared needs of the regional organizations. The Council of Regions would like to thank GSRO and RCO staff and our many partners for keeping so much on the table and moving forward during a pandemic. It has been impressive to see the adaptability of all involved!

Today, the Council of Regions notes that:

1. On May 22, WDFW gave COR an update on their Hatchery Policy Updates that engaged a broad range of senior WDFW staff and Fish and Wildlife Commission members. We really appreciated the opportunity to learn more from WDFW about their proposals and looking forward to providing focused input on the proposed policies this summer. Thanks to Erik Neatherlin for creating this opportunity!
2. We appreciate the chance to work with GSRO and RCO staff to refine the Regional Monitoring Proposal review and funding process. Together we've identified potential changes to Manual 18 for next year and identified options to full fund the regional monitoring project request in 2020. We continue to work together to discuss how to evaluate and fully fund regional monitoring projects in the future. Thanks to all involved for a productive discussion.
3. We are excited to work together with RCO, GSRO and the SRFB over to highlight the value of the SRFB Program and provide specific examples of the work it supports to policy makers;
4. The Regions and GSRO have met and are working together to coordinate our participation in the current NOAA and USFWS Five-year Reviews of Listed Salmon, Steelhead and Bull Trout.
5. We have continued our productive monthly Council of Regions calls, and would like to thank Kaleen for welcoming us to join her for a quarterly informal check-in call.
6. The Columbia Regions have also initiated a monthly call focused on working together and engaging with key partners on shared Columbia River Policy issues.
7. Our permitting discussions with the Corps of Engineers and Ecology are on hold until late summer/fall, when we hope to be able to schedule an in-person meeting.

Council of Regions Input for the December SRFB Meeting

For Item #5: Monitoring Program

The Council of Region notes:

1) Our appreciation for GSRO and RCO staff's efforts to identify a way to fully fund the suite of 2020 regional monitoring proposals using unobligated monitoring program funds (as included in the staff funding recommendations under Item 6);

2) Our appreciation for RCO/GSRO staff's ongoing work with us to improve the Regional Monitoring Program and update related sections of Manual 18 for 2021 and beyond. We look forward to discussing these improvements with you at the September SRFB meeting.

3) Our hope that the SRFB will allocate the remaining $133,622 in unobligated monitoring funds and any funding freed up from other monitoring projects to the 2021 regional monitoring proposal process as part of the September SRFB decisions on monitoring.

4) Our hope that RCO and the SRFB will consider moving funds within the monitoring elements in future PCSRF applications to increase the amount available for regional monitoring proposals as shifting priorities and future project needs allow, without increasing the overall Priority 2 ask in the annual PCSRF Application to NOAA.

5) Our commitment to working with the SRFB and others to identify other promising ways to fund key monitoring needs (new and existing) at the regional and state levels.

We look forward to the September SRFB Meeting discussion of the 'monitoring pivot.' We are working with RCO/GSRO staff to develop proposed policies and funding strategies for the Regional Monitoring Program for 2021 and beyond and will be sharing examples with you of how this enhanced program would address specific monitoring needs. Do let us know if there is any specific input from COR that is useful to you as you consider the monitoring program policy and funding decisions before you in September.

For Item #6: 2020 Funding Decisions:

The Council of Regions thanks the Board for its ongoing support of the SRFB Grant Program and the Lead Entity and Regional capacity needed to implement it. We also thank RCO and GSRO staff for their creative efforts to find ways to fully fund 2020 Regional Monitoring Projects, and encourage the Board to allocate the unobligated monitoring funds as proposed by staff.

For Item #7: Targeted Investments

The Council of Regions would like to thank Katie Pruit for reaching out to us repeatedly over the course of the development of the policy before you and taking our comments and concerns into consideration. While we acknowledge that more details about how to implement this policy will need to be determined in the future, we thank the SRFB for taking a big picture look at creative new ways to make sure SRFB funding helps make big steps to move salmon recovery forward.

Washington Salmon Coalition Update for the Salmon Recovery Funding Board Meeting, June 11, 2020

Thank you for the opportunity to provide an update from the Washington Salmon Coalition. WSC has been busy since our last SRFB meeting, including running our normal grant round and adapting to the new challenges of COVID-19.

- Firstly, we'd like to say a huge thanks to both Kaleen Cottingham and Jeannie Abbott for engaging WSC in discussions related to potential budget cuts and their work to keep Lead Entities whole. It is very much appreciated and WSC looks forward to continue to coordinate as future budget discussions evolve.
- Our grant rounds are well underway and Lead Entities are adapting to both the new schedule, which includes a change in our processes, and the new challenges of COVID-19. Many of us had to pivot to virtual site tours and are figuring out how to run virtual meetings with our committees, etc. WSC has spent time pulling together best practices related to these changes (i.e. virtual facilitation, virtual site tours.)
- Lead Entities continue to work on pulling together our Planned Project Forecast Lists (PPFL) and have had opportunities to discuss and compare the processes we are using to develop these lists at our last in-person meeting, as well as virtually.
- Many Lead Entities have put additional effort into legislative outreach and WSC looks forward to continued coordination on these efforts as RCO gears up for future budget discussions.
- As part of our commitment to provide training and learning opportunities to support Lead Entities, WSC co-hosted a webinar in April on Incorporating Climate Change Data into Riparian Restoration with Dr. Meade Krosby, UW Climate Impacts Group, and Greer Maier, Upper Columbia Salmon Recovery Board that was well-attended. A recording was also made for folks who weren't able to jump on live.
- WSC has hosted bi-weekly calls to check-in with Lead Entities during the pandemic. These calls have included a general topic (e.g., virtual site tours, PPFL) and an opportunity for Lead Entities to learn from each other and also highlight any specific challenges folks are facing. I think they've provided a great deal of value to Lead Entities and have helped WSC to understand the individual challenges folks are facing.

For item #6: Thanks to the Board, RCO staff, and GSRO staff for all the efforts to keep Lead Entities whole!

For item #7: Thanks to Katie Pruit for engaging Lead Entities in this discussion. WSC would like to clarify a couple of things in our feedback:

- We hope the importance of the Lead Entity program is added into any adopted Targeted Investment Policy but are not advocating for Lead Entity, rather than Regional, endorsement of projects;
- There is not consensus from Lead Entities on whether the Board should identify one priority or allow multiple per biennium and WSC has encouraged Lead Entities to comment individually;
- Lead Entities suggest a defined process that allows re-evaluation of the policy, following a discussion on implementation.

SALMON RECOVERY FUNDING BOARD SUMMARIZED MEETING AGENDA AND ACTIONS

THURSDAY, JUNE 11, 2020

Item	Formal Action	Follow-up Action
OPENING AND MANAGEMENT REPORTS		
Call to Order • Roll Call and Determination of Quorum • Overview of Webinar Protocols • Roll Call and Determination of Quorum • Approve March 2020 Minute • Remarks of the Chair	**Decision** Approval of June 2020 Agenda **Moved by:** Member Breckel **Seconded by:** Member Endresen Scott **Decision:** Approved **Decision** Approval of March 2020 Minutes **Moved by:** Member Bugert **Seconded by:** Member Breckel **Decision:** Approved	
1. Director's Report A. Director's Report B. Legislative Update C. Performance Update D. Fiscal Report		**Task:** Send out draft 2021 board calendar and approve final calendar at the August 12 budget meeting.
2. Salmon Recovery Management Report A. Governor's Salmon Recovery Office Report B. Salmon Section Report		
3. Reports from Key Partners • Council of Regions • WA Salmon Coalition		
BOARD BUSINESS: BRIEFINGS		

4. Recommendations for Setting Funding Request Levels for2021-2023 • SRFB Funding • PSAR Funding • Other Salmon Funding Requests in the RCO Budget		
5. Monitoring Panel Update		**Task:** Schedule in depth conversation in September or November about monitoring priorities.
BOARD BUSINESS: DECISIONS		
6. Allocate Funding for 2020 Grant Round, FY 2021 Capacity Funding and FW 2021 Monitoring Funding • Grant Round Amount • Cost Increases • Regional Organization Capacity Funding • Lead Entity Capacity Funding • Monitoring Contracts	**Decision** Set a Grant Round amount of $18 million for 2020 Grant Round. Allocated funding for capacity to Regions and Lead Entities. Allocated funding for monitoring. (for allocation amounts see Item 6 below) **Moved by:** Member Breckel **Seconded by:** Member Endresen Scott **Decision:** Approved	
BOARD BUSINESS: DECISIONS		

7. Criteria for Future Targeted Investments		**Task:** Send the draft policy out for public review, conduct additional stakeholder outreach and then present policy for potential adoption at the September SRFB meeting.
ADJOURN		

Next Meeting: August 12, 2020- Conference Call- Natural Resources Building, Room 172, Olympia, WA 98501

SALMON RECOVERY FUNDING BOARD SUMMARY MINUTES

Date: June 11, 2020

Place: Online

Salmon Recovery Funding Board Members:

Phil Rockefeller, Chair	Bainbridge	**Annette Hoffman**	Designee, Washington Department of Ecology
Jeff Breckel	Stevenson	**Stephen Bernath**	Designee, Department of Natural Resources
Bob Bugert	Wenatchee	**Brian Cochrane**	Designee, Washington State Conservation Commission
Chris Endresen-Scott	Conconully	**Jeff Davis**	Designee, Department of Fish and Wildlife
Jeromy Sullivan	Kingston (**Excused**)	**Susan Kanzler**	Designee, Washington Department of Transportation

This summary is to be used with the materials provided in advance of the meeting. The Recreation and Conservation Office (RCO) retains a recording as the formal record of the meeting.

Call to Order

Chair Phil Rockefeller opened the meeting at 9 am and explained the meeting changes associated with the webinar platform. RCO Director, **Kaleen Cottingham** would be acting as the meeting facilitator with the assistance of RCO Board Liaison, **Wyatt Lundquist**. Following roll call and quorum determination, Mr. Lundquist relayed webinar instructions and etiquette.

Chair Rockefeller moved for approval of the March 2020 minutes and the June 2020 agenda.

Motion: Approval of June 11, 2020 Agenda
Moved by: Member Breckel
Seconded by: Member Endresen Scott
Decision: Approved

Motion: Approval of March 2020 Minutes
Moved by: Member Bugert
Seconded by: Member Breckel

Decision: Approved

Item 1: Director's Report

Director's Report

Director Cottingham briefed the Salmon Recovery Funding Board (SRFB) on the Recreation and Conservation Office (RCO) on-goings and activities.

RCO staff has and may continue to work from home, even after Thurston county moves into Phase 3. During Phase 3, a limited number of staff will be allowed to travel and work from the office by following proper COVID-19 protocols.

Director Cottingham relayed that after Legislature closed the 2020 supplemental budget session Governor Jay Inslee vetoed approximately $400 million of new expenditures, which effected RCO's recreation side. All State agencies were also directed to implement a hiring freeze, contracting freeze and to limit equipment purchases.

Director Cottingham explained that the RCO salmon side may also be affected by a 15 percent budget reduction to the general fund, totaling in $244,200. More information on these potential cuts can be found in Item 4 of the materials.

Director Cottingham also mentioned that RCO went through a state audit in which there were no findings, but there was a recommendation to improve record keeping on contracting. Concerning the federal audit, Director Cottingham relayed that there was an opportunity to use state funds to fund previously reviewed projects as a means to address the conclusions of the federal audit of the award of Pacific Coastal Salmon Recovery Funding (PCSRF). The board agreed with the Director's proposed strategy, once NOAA determines the final outcome of RCO's appeal of the audit findings.

Closing, Director Cottingham informed the SRFB of the upcoming budget meeting in August, the potential travel meeting in September and the creation of the 2021 meeting calendar by Mr. Lundquist that will need SRFB approval at the August meeting.

Legislative Update

Wendy Brown, RCO Policy Director, deferred her comments until Item 4 on the agenda.

Item 2 Salmon Recovery Management Report

Governor's Salmon Recovery Office Report

Erik Neatherlin, Executive Coordinator of the Governor's Salmon Recovery Office (GSRO), gave an update on GSRO activities. Mr. Neatherlin expressed that the Puget Sound Partnership and the Northwest Indian Fisheries Commission collaborated to set

up virtual Puget Sound Days on the Hills in June 2020 and will continue this through July. Mr. Neatherlin also relayed that Triangle Associates was summarizing materials from all past workshops, webinars and surveys concerning the Statewide Salmon Strategy update. Following Triangle Associates summarization, the Washington State Academy of Sciences will review the document, and then will begin working with the Governor's Office and the Natural Resources subcabinet agencies. There will be continuing and ongoing engagement with the individual tribes as the strategy update proceeds.

Closing his update, Mr. Neatherlin gave a detailed report on the Chehalis Basin Strategy and the Department of Ecology's State Environmental Impact Statement (EIS) in response to the Flood District's proposed project involving a flood retention dam and levees. Mr. Neatherlin relayed that according to the draft EIS, the levees would have significant impacts on fish and wildlife habitat, fish species, wildlife species, water, wetlands, recreation, land use, and increase greenhouse gas emissions. After hearing concerns from the tribes, Washington State Department of Fish and Wildlife (WDFW), and the Coastal Salmon Partnership, the Chehalis Basin Board decided to examine new or revised alternatives without the building of a dam. Alongside the state EIS, the Army Corps of Engineers are also developing a National EPA EIS that will come out later in 2020.

Following his briefing, Mr. Neatherlin opened discussion to the Board. Member Bernath, Chehalis Basin Board member, assisted in answering questions. During the discussion, Mr. Neatherlin informed SRFB that GSRO was not directly associated with the EIS, but indirectly involved through conversations with other regional salmon recovery organizations. Director Cottingham relayed that any funding associated with the Chehalis River Basin is managed by RCO through a partnership with the Washington Department of Ecology but clarified that RCO does not function in a policy role. While Mr. Neatherlin had relayed all negative associations with the levee, Chair Rockefeller had a follow-up question regarding positive impacts from the mitigation measures concerning the system. He wanted to know whether they could outweigh the negative impacts. Mr. Neatherlin explained, with assistance from Member Bernath, that mitigation will be handled outside of the EIS and that there currently wasn't enough detail in a mitigation plan to appropriately provide this information. However, next steps include gathering further information on mitigation benefits.

Salmon Section Report

Tara Galuska, RCO's Salmon Section Manager, gave an update on the Salmon Section's activities, highlighting the 2020 grant round. As of June 2020, there were 210 salmon applications, with 8 being Puget Sound Acquisition and Restoration (PSAR) large grant program projects. Following the implementation of the LEAN study resulted in a new grant timeline, fewer review panel feedback loops, and earlier project clear status to sponsors following the first SRFB Review Panel feedback call. For projects of concern (POC), Ms. Galuska explained that sponsors were given phone calls with the review panel to address issues with their projects in order to correct them before submitting their final application on PRISM. Because of the LEAN implementation, Ms. Galuska explained that projects will now be on the ground two months earlier than in the past.

As of June, all site visits had been completed either in person or through video calls, by following a "best practice's" protocol created by the lead entities. After the review and evaluation of the first 101 projects by staff and the SRFB Review panel, close to 30% of the projects had been cleared.

Closing, Ms. Galuska explained that RCO has been asked by National Ocean and Atmosphere Administration (NOAA) to apply for $11 million in funding through a new grant called the Pacific Salmon Treaty Orca Conservation fund, which would be devoted to habitat projects. A limited amount would also be contributed to hatchery projects to increase the chinook population as prey for orca whales.

Following Ms. Galuska's briefing, Chair Rockefeller asked how PSAR large capital grants qualify for consideration, to which Ms. Galuska explained that the qualifications are determined by the Puget Sound Partnership.

Public Comment: no public comment.

Item 3: Reports from Key Partners:

Council of Regions

Alex Conley, on behalf of the Council of Regions (COR), gave a summarized report of the COR's activities. This included weekly discussions lead by Erik Neatherlin, Steve Manlow, and Washington Department of Fish and Wildlife (WDFW), concerning the regional salmon recovery role in broader salmon recovery. The most recent discussion focused on WDFW's hatchery policy changes.

Concerning COVID-19, Mr. Conley relayed that COR faced deferment of the Clean Water Act permission discussions with the Army Corps of engineers and the Department of Ecology.

Mr. Conley outlined two of CORs future interests, which included Manual 18's update concerning monitoring projects and the SRFB's funding request, which will be determined in the September SRFB meeting.

Concerning subsequent work within COR, Mr. Conley relayed that NOAA and US Fish and Wildlife Service had begun their 5-year review for all listed salmon, steelhead and bull trout on the west coast. This process will involve the CORs assistance as well as WDFW and GSRO. It is expected to take approximately one year.

WA Salmon Coalition

Tricia Snyder, Washington Salmon Coalition (WSC), opened her briefing expressing thanks to Director Cottingham and Jeannie Abbott, GSRO, for working with WSC on potential budget cuts that may have affected lead entities. Ms. Snyder then moved on to recognize the changes made during this year's grant round concerning different processes and virtual meeting successes.

Ms. Snyder informed SRFB that WSC's most recent activities included a training webinar concerning the consideration of climate change during riparian restoration, the creation of the lead entities planned project forecast list, and bi-weekly check-in calls with the lead entities in the face of COVID-19.

Closing, Ms. Snyder thanked Katie Pruit for her work on the targeted investment policy. While displaying gratitude, Ms. Snyder also expressed the importance in including all lead entities in the policy process, as there was not a consensus on whether only one targeted investment should be tackled per biennium. Ms. Snyder also expressed the lead entities concern with separating the policy discussion from the policy implementation discussion.

Item 4: Recommendations for Setting Funding Request Levels for 2021-2023

Wendy Brown, RCO Policy Director, gave a funding overview for both this biennium as well as the 2021-2023 biennium.

In April, the Economic Revenue Forecast Council predicted that there will be a $7.1 billion reduction in collections affecting both the current biennium as well as the 2021-2023 biennium. Because of these reductions, Ms. Brown explained that the Legislature might return for a special session in August 2020 leading to further changes in the RCO's budget.

Ms. Brown then addressed the 15 percent general fund reduction exercise directed by the Office of Financial Management (OFM) that Director Cottingham mentioned in Item

1. For the RCO, staff determined that this reduction would come from not filling the Orca Recovery Coordinating position, reducing the Nisqually watershed Plan implementation, reducing the Hood Canal Bridge design, and not filling the position associated with the implementation of House Bill 2311 (climate change).

Concerning the 2021-2023 budget, Ms. Brown explained that the RCO is expecting that the operating budget will either be at the status-quo level or have a reduction in general funds. The capital budget request will also be submitted in September of 2020 following a decision by the SRFB in August. RCO staff suggested building the list of potential projects based on a $60 million funding request. These potential projects will be entered into the new Planned Project Forecast List. The final budget request number will be decided by the SRFB in August.

Following Ms. Brown's briefing, SRFB discussed a potential funding range of $60 to $80 million.

Break: 11:03-11:15

Item 5: Monitoring Panel Update

Keith Dublanica, Science Coordinator for GSRO, and **Pete Bisson**, SRFB Monitoring Panel Chair, gave an update on monitoring activities, including the Intensively Monitored Watershed Program (IMW), status and trends monitoring (Fish in/ Fish out), project effectiveness funding options, and regional monitoring proposals. A summary of the 2019 annual reports was provided by Mr. Bisson

Mr. Bisson discussed the six IMW and Fish In/Fish out projects that the monitoring panel had reviewed, in which two projects were clear with no recommendations while the remaining four had specific conditions to be applied to their new contracts.

Mr. Dublanica spoke about the IMW monitoring funding gaps specific to the habitat status and trends. Without proper funding to move toward project completion, Mr. Dublanica explained that there would be a delay of the post-treatment monitoring. Because of COVID-19, Mr. Dublanica explained that there will also be delays to restoration projects.

Mr. Bisson moved forward speaking on the proposed effectiveness "pivot" study, where there was a request for proposal (RFP) to use new LiDAR (Light imaging, detection, and ranging) technology for evaluation of floodplain and riparian restoration project effectiveness. The final study plan created by Cramer Fish Sciences will be completed in mid-June, with briefings and recommendations to SRFB in September and November.

Concerning the 2020 Regional Monitoring Projects, Mr. Dublanica conveyed that there are 7 projects with a total request of $622K. Each project had been reviewed by the Monitoring Review Panel. The Monitoring Review Panel has made their reviews available to the sponsors so they can ask questions and fix project aspects before the June 29th application due date.

When SRFB discussed the briefing, Member Breckel expressed concern with the future of IMW projects, as there are many issues associated with them. Mr. Bisson ensured that data retrieved by these types of projects cannot be gathered in any other way. Mr. Bisson also relayed that all 2020 IMW projects should move forward, unless funding is cut causing only essential projects to carry forward.

Public Comment:

Alex Conley, Yakima Basin Fish and Wildlife Recovery Board, conveyed appreciation for the Board's discussion about the future of IMWs. Concerning the Fish-in/Fish-out monitoring, the Council of Regions has started working on a gap analysis of critical needs across the state and matching them to the different state agencies programs.

Closing, **Director Cottingham** assisted in the formation of a monitoring subcommittee that included Member Hoffman, Member Breckel, and Chair Rockefeller. This committee would hold discussion concerning forward moment and end strategies of IMW's. The goal of a subcommittee would be to answer these questions:

- What is the end strategy for IMW?
- What is the pivot?
- Is it a pivot to a different kind of effectiveness monitoring or towards the needs of the region?

Item 6: Allocate Funding for 2020 Grant Round, FY 2021 Capacity Funding and FY 2021 Monitory Funding

Tara Galuska, **Jeannie Abbott** and **Keith Dublanica** gave a high-level overview of the 2020 Grant round, 2021 Capacity funding and 2021 monitoring funding.

Ms. Galuska explained that $25,477,185 would be the total funding available for fiscal year 2021. This includes the state general fund to lead entities, state bond fund to lead entities, PCSRF funding, unobligated project funds available, and returned funds from previous projects. Ms. Abbott and Mr. Dublanica explained that from the total funding, $18 million would go to salmon recovery projects, $4.9 million would go to capacity funding, $2 million would go toward monitoring funding and $622,660 of new and

unobligated monitoring funding would also be put toward regional monitoring projects. As for the SRFB Review Panel support, $200,000 would be available. For cost increases during the year, $500,000 would be available.

Following the overview, Member Bernath asked for clarification on the regional allocation percent for each regional salmon recovery area, as the Hood Canal Coordinating Council and Northeast Washington regions both received under 3% worth of funding. Ms. Galuska explained that this allocation was agreed upon in 2017 and the percentages are based on the number of river miles in the region, the number of listed endangered fish and more. Ms. Galuska also explained that the regions were given the opportunity to come back with a better allocation formula, but this is yet to be completed. Director Cottingham also explained that federal funds and match to those funds cannot be used above Chief Joseph dam.

Table 1: Projected Available Funding for Year 2 of the 2019-2021 Biennium

Funding Available for the Year 2 of 2019-21 Biennium	State Fiscal Year 2021
State General Funds	$487,000
State Bond Funds Lead Entities	$1,226,500
Unobligated Project Funds Available (state and Federal)	$8,437,287
Returned funds	$62,713
PCSRF 2020 (includes Admin)	$15,263,685 [1]
Total Funds Available	**$25,477,185**

Table 2: Projected Funding Decisions/Uses for Year 2 of the 2019-2021 biennium

Funding Decisions	Amount
Project Funding for grant round	$17,700,000[2]
Regional monitoring projects to fill data gaps	$300,000
Technical Review Panel	$200,000
Regional Organizations	$2,878,685
Lead Entities (bond funds)	$1,226,500

[1] This amount is from the Federal Pacific Coastal Salmon Recovery Fund award for 2020. This figure does not include monitoring or hatchery reform funds to Northwest Indian Fisheries Commission and WDFW.

[2] This includes $62,713 in returned funds, $8,437,287 in unobligated funds, and $9,200,000 in PCSRF 2020 funds.

Lead Entities (general fund)	$487,000
Monitoring	$2,000,000
Subtotal Board Decisions	**$24,792,185**
PCSRF 2020 funds for RCO administration	*$555,000*
Communications	*$60,000*
Salmon Conference	*$70,000*
Total	**$25,477,185**

Table 3. Regional Allocations for Project Funding Using the New Interim Allocation Formula

Regional Salmon Recovery Area	Regional Allocation Percent of Total	2020 Allocation based on $18 million
Hood Canal Coordinating Council	2.40%	$432,000
Lower Columbia Fish Recovery Board	20.00%	$3,600,000
Northeast Washington	1.90%	$342,000
Puget Sound Partnership	38.00%	$6,840,000
Snake River Salmon Recovery Board	8.44%	$1,519,200
Upper Columbia Salmon Recovery Board	10.31%	$1,855,800
Washington Coast Sustainable Salmon Partnership	9.57%	$1,722,600
Yakima Basin Fish and Wildlife Recovery Board	9.38%	$1,688,400

Table 4. Proposed Lead Entity and Regional Organization Funding for Fiscal Year (FY) 2021

Purpose	Proposed Funding FY 2021
Lead Entities bond funds	$1,226,500
Lead Entities general funds	$487,000
Washington Salmon Coalition facilitator ($24,000)	
Lead Entity training ($8,000)	
WSC Chair stipend ($4,500)	
Regional Organizations	$2,878,685
TOTAL	**$4,592,185**

Table 5. Anticipated Monitoring needs for use of 2020 PCSRF funds

Monitoring Efforts	2020 Allocation
Washington Dept. of Fish and Wildlife Fish in / Fish out Monitoring	$208,000
Washington Dept. of Ecology IMW Status and Trend Habitat Monitoring	$699,639
Washington Dept. of Fish and Wildlife IMW Fish Monitoring	$489,000
Washington Dept. of Fish and Wildlife IMW Habitat Monitoring	$267,361
Project Effectiveness Monitoring "Pivot" (set aside for future board decision)	$236,000
Monitoring Panel	$100,00
Total	**$2,000,000**

Table 6. Unobligated Monitoring Funding

Proposed Unobligated Monitoring Funding Expenditures	Proposed Expenditures
Washington Dept. of Fish and Wildlife IMW Habitat Funding Gap	$149,557
Regional Monitoring Projects	$339,481
Set Aside for Project Effectiveness Pivot or Other Board Monitoring Priorities	$133,622
Total Unobligated Monitoring Funds	**$622,660**

Motion: Move to allocate $27,792,185 as noted in table 2 for the projects, capacity and monitoring identified in memo 6. In addition, allocate the unobligated monitoring funds as described in memo 6. This goes along with delegating authority to the RCO director to carry out all activities identified in the revised memo 6, including all the specific staff recommendations.

Moved by: Member Breckel

Seconded by: Member Endresen Scott

Decision: Approved

Item 7: Criteria for Future Targeted Investments

Katie Pruit, RCO Planning and Policy Analyst, gave a high-level briefing on the draft targeted investment policy requested by SRFB. During the creation of this policy, RCO staff collaborated with the lead entities as well as the regional recovery organizations. Ms. Pruit explained that a targeted investment is a project that addresses a board-

identified priority to accelerate progress toward achieving salmon recovery. From the draft policy, the board would adopt one priority per biennium from the following:

1. Approaching recovery
2. Southern resident orca whale recovery
3. Populations at risk
4. Future threat abatement
5. Emergency response priority

Ms. Pruit noted that regional recovery entities faced a divide in the decisions to have one or multiple priorities per biennium, but staff recommended keeping focus on only one priority.

Ms. Pruit presented qualifying criteria for future targeted investments. To qualify for funding a targeted investment must:

1. Address a board-identified priority for the current biennium
2. Improve long-term habitat quality and productivity, and therefore resiliency of listed salmonids
3. Advance a project that cannot be funded with the current allocation or sub-allocation
4. Leverage additional federal funds (other than PCSRF)
5. Restore and/or acquire habitat (does not include design)
6. Be endorsed and submitted by the salmon recovery region for funding

Ms. Pruit provided summary of stakeholder input on the policy draft and requested direction on minor amendments to the draft. During the discussion, Member Bernath inquired whether the priority choices were set or if there would be a chance to change them. Ms. Pruit explained that this would be the list used, but different priority or the same can be used each biennium. Member Bernath also asked for clarification on what an "emergency priority" would be. Stepping in, Ms. Galuska informed the SRFB that an emergency example would be a flood or catastrophic failure of sorts.

Public Comment:

Alicia Olivas, Hood Canal Coordinating Council, gave comment. She explained the development process of the SRFB Targeted Investments, as they gave more reasoning for the importance of salmon recovery in Washington state. She reminded the board of the two targeted projects they had approved last year for regions nearing delisting and applauded SRFB for focusing on salmon recovery priorities. Closing her comments, Ms.

Olivas relayed that SRFB needed to look beyond just funding and more at the implementation of policy.

Cheryl Baumann, North Olympic Lead Entity, shared her appreciation for the categories listed concerning the targeted investment policy as they are seemingly interconnected with lead entity work and the shared collective mission. She expressed the importance of saving both salmon and orca. Ms. Baumann believed that the targeted investment policy draft had gone above and beyond what salmon recovery has called for. Ms. Baumann encouraged the board not to limit the regions to one priority per biennium. If more options were available, Ms. Baumann expressed that a larger number of projects could be put forward leading to better projects being funded.

When opened to discussion, Member Bernath suggested taking the need for federal funding out, as it would unnecessarily limit projects that leverage non-federal funds. Following, both Member Endresen Scott and Member Breckel expressed concern in limiting the targeted investment priority to only one. Member Breckel also expressed disinterest in priority option one, as there are not any regions nearing delisting. Ms. Pruit ensured that she would take SRFB's recommendations into consideration when finishing the final draft of the targeted investment policy. There will be public review and a final policy decision requested at the next SRFB meeting in September 2020.

ADJOURN

Chair Rockefeller thanked Pete Bisson for his work on the SRFB Monitoring panel. He also thanked all meeting participants as this format can be challenging. Chair Rockefeller closed meeting at 1:05 pm.

The next meeting will be August 12, 2020 in-person, but due to COVID-19 it is subject to change.

Approved by:

Phil Rockefeller, Chair

8-12-2020

Date