North Fork Walla Walla River RM 4.3-6.3 Floodplain Restoration

Private Forest Accord Grant - Fall 2023 Solicitation

Walla Walla Basin Watershed Council

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FollowUp Form

Introduction

The information you provide will be used for accountability and reporting and may be displayed to the general public.

Additional Tips:

- Provide clear and concise answers that are easy to understand.
- Use data and evidence to support your claims.
- Highlight the successes of your project, but also be honest about any challenges you faced.

Project Name*

Insert the full project name assigned by ODFW, including the unique code before the Project Tite that was given in the agreement.

North Fork Walla Walla River RM 4.3-6.3 Floodplain Restoration

PFA Tracking Number?*

Please list your PFA Tracking Number here, Example PFA2024-01.

This tracking number is found in your project agreement.

PFA2023-21

Select project type*

Implementation

Future funding*

Would you be interested in applying for funding for future projects to this grant program?

Yes

Total Restored Impact Measurement Area*

Enter the number of total restored area. The measurement unit selected on the application is visible below.

Insert "0" if not applicable to your project type.

1

Anticipated Impact Measurement Unit*

Stream Miles

Other Unit

Describe and define the other unit for the *Anticipated Impact Measurement*

In the initial application submitted by WWBWC, 1 mile of construction for RM 4.3-5.3 ($819,209) and 1 mile to design RM 5.3-6.3 ($170,000) were proposed. The WWBWC and ODFW agreed to remove the design aspect to dedicate more dollars to other projects below the funding line to provide more potential benefit to ESA salmonids by funding additional projects. The WWBWC fully agreed to voluntarily remove the design aspect of the project and reduce the amount sought in the application by $170,000.

Habitat Conservation Plan Covered Species*

Check all of the Habitat Conservation Plan Covered Species the Project benefited.

Bull trout (Salvelinus confluentus)
Mountain whitefish (Prosopium williamsoni)
Native Salmon or Trout Species

Native Salmon or Trout Species*

Specify native salmon or trout species from above. Enter NA if not applicable.

Mid-Columbia Steelhead Trout & Chinook Salmon.

Final Report Questions

Financial Closeout Notice: Once this Final Report is complete and submitted, ODFW staff will conduct their review. After approval, you will have access to submit the final financial closeout report. The financial closeout report cannot be submitted until ODFW marks this Final Report as complete.

Project Statement*

Briefly describe what the project accomplished and the problem(s) it addressed. Make a clear and concise statement; avoid jargon and acronyms.

The flood of 2020 caused a significant reduction of habitat suitability for salmonids listed under the Endangered Species Act. The project restored riverine health and function. The channel was converted from straightened single flume channel type to multi-channel networks and from a transport to accumulation reach to rebuilding incised channels, and developing vegetative components, currently underperforming in the riparian area. Anthropogenic levees were setback or perforated. The expanded floodplain has increased interaction between surface and groundwater during base flow, and increased capacity during high water events to minimize detrimental effects on physical habitat features. A properly functioning, self-sustaining channel form with diverse habitat complexity features will address limiting factors including off channel microhabitats significantly reduced from historic levels to address all life stages to contribute towards delisting of ESA salmonids.

Project Activities and Outcomes*

Answer the following questions in your response:

- Did you achieve the objectives and goals outlined in your original proposal?
- What major activities did you complete during the project period?
- What were the key outcomes and findings of your project?
- How did your project address the problem or need that it was designed to address?
- Discuss any measurable and achieved benefits (stream miles opened, acreage restored, fish passage achieved, retrofits, planning documents created, research results, etc.).

The following project objectives were identified and addressed within the 1-mile project reach:

1) Design-produce permissible concepts to restore riverine function
Designs were developed by certified engineers. Internal and external reviews were conducted at the conceptual 15% level, 30% 80% and 100% levels of advancement. Final designs were approved and stamped. Associated implementation reports supplemented the 100% design package.
2) Construct-restore multi-channel floodplain, salmonid habitat complexity
An additional 0.3-miles of additional channel length was created by adding sinuosity and secondary channels. The addition of hundreds of whole trees and boulders to the river channel improved overall habitat complexity metrics. Snorkel surveys showed up to an 11-fold increase by juvenile salmonids in treated versus untreated river sections within the project reach.
3) Inundation capacity, side channels, sheet flow, frequency, duration
Levee setback and perforation combined with reactivation of archaic side channels resulted in a significant increase in River Complexity Index values as well as ability of the system to accommodate high water events most effectively and reduce potential detriments to habitat quality. A decrease in slope, conversion of white water to sheet water, and activation potential of an expanded floodplain have improved ecosystem health and indicators of a system that is healing and self-sustaining long-term.
4) Improve riparian attributes through tree planting, grazing enclosure
Multiple tree planting efforts and strategies were utilized to improve vegetative components. Trenching in multiple species of native willow and cottonwood trees using heavy equipment was conducted in the fall. Supplemental hand planting of trees occurred in the spring. A total of 1500 trees were planted. Early indications of survival reveal an estimated 67% success rate. Planting during dormancy has provided the most favorable results. Grazing reduction enclosures comprised of 8 whole trees, double-stacked and positioned in a rectangular configuration have proven feasible and effective at protecting tree investments from big game and domestic cattle grazing impacts, while taking on a biomimicry appearance. Solar powered, temporary electric fences erected in the project area have proven very effective as well, but are more labor intensive, require more labor, monitoring and maintenance, and removal while appearing unnatural.
5) Improve base flow, connectivity, water quality, temperature, turbidity
Increased interaction between ground and surface waters, spring reconnection, protection and expansion, increased shading due to improvements in vegetative components, combined with the relocation of channels

exposed to excessive open sky conditions into more favorable areas having desirable vegetative attributes. The actions to address limiting factors associated with elevated water temperature and low base flows directly contribute towards salmonid suitability improvements. Improvement of physical habitat attributes addresses factors limiting salmonid production by increasing carrying capacity and reducing population bottlenecks for all age classes of salmonids.

Lessons Learned*

Answer the following questions in your response:

- What were the most important lessons you learned from working on this project and the challenges you faced?
- Were there any unexpected challenges or setbacks that you encountered? If so, how did you address them?

Plant trees during dormancy periods. Monitor and maintain plantings while supplementing each fall and spring season until desired results are achieved. Grazing protection utilizing whole trees with root wads to physically create a physical, natural-appearing barrier between browsers and planted stock is underutilized and very effective. Make sure side channels inlets are designed, constructed, and maintained appropriately and properly. assume inlets will become somewhat obstructed by gravel accumulation and/or woody debris. Flow of side channel typically reduces over time. Therefore, plan for flow reduction by initially allowing more water into side channels in the interim and anticipate that they will naturally size-down. Make frequent field visits to the project site under various flow regimes for the purpose of educating future decisions regarding timely adaptive management for optimal project performance.

Implementation Monitoring Plan Discussion*

If your project used an implementation monitoring plan, please describe your monitoring results.

Type N/A if not applicable to your project type.

Water Temperature and Flow-Analyze gauge data from two locations on the North Fork.

Physical Habitat-Cross sectional data and Wolman pebble counts are inventoried pre-construction for every reach. Aquatic Habitat Inventory methodology (ODFW) is conducted pre and post implementation.

Wetland Inventory-Surveyed by licensed professionals and combined with the National Wetland Inventory database to document historical conditions and inform design development.

Redd Surveys-24 steelhead nests were counted in the overall 5-mile project area during spring of 2025. Surveys are in progress for 2026 with nests and adults being observed within the RM 4.3-5.3 reach. Results will become available upon conclusion of the spawning season.

Snorkel Counts-Initiated during the late summer of 2025 and will continue annually to determine presence/absence and abundance of biota within treated project areas and compared with control locations to identify population trends. A portion of each habitat unit type is sampled to determine relative use and help identify preferred habitats to be designed into future implementation plans.

Riparian Vegetation

Metrics such as river shading, ground cover, native species composition, canopy closure are measured in the monitoring transects. Riparian transect inventories will be conducted within the project area as well as upstream and downstream. Grazing enclosures are observed to ensure operations are continuous.

Photo/Video Points-Establishment and repeating photo points annually at locations utilizing drone and ground sourced imagery is an essential tool to document project progression over time. Imagery will be archived for comparison of project response to restoration actions. Annual photo points are established and repeated to document project maturation over time. Aerial drone footage techniques are also utilized to provide visual documentation of side channel inundation frequency, the approximate portion of floodplain activation following a high flow event, and low flow conditions, are useful for educating design formulation as well as documenting project progress over time.

Watershed Context*

Answer the following questions in your response:

- Describe how effective the project was in its larger watershed context. What are the long-term benefits of your project?
- Who benefited from your project? How many people or organizations were impacted?
- Describe if you have, or plan to, disseminate your findings and outcomes.

The 1-mile treatment reach is part of an overall 5-mile treatment plan to be conducted in phases. The magnitude of the project regarding holistic floodplain treatment strategy and overall river area provides rare opportunity to make significant impact by providing large scale improvements of physical habitat features to initiate and benefit biological response in a priority area as categorized by a multitude of natural resource management entities in the region. Timber stand management in the adjacent uplands occurred when project materials were sourced in a timber stand health improvement manner as selective harvest techniques were utilized. The project was performed on private land but benefits public land interests located both upstream and downstream due to the anadromous migratory nature of the trout and salmon species targeted. Various outreach, reporting and presentation forums are emphasized to showcase the project of which has already been awarded Restoration Project of the Year in 2024 by the State Land Board and Project of the Month by River Restoration Northwest.

Next Steps*

Describe any next steps for the project, if any, and if you developed any plans to sustain the project or its outcomes beyond the grant period?

A total of 3 phases of the overall project is complete, with 3 more phases planned to be implemented in the next 5 years. Permit conditions and adaptive management scenarios are allowed over time. Monitoring project performance will continue to dictate future actions to ensure ultimately that self-sustaining optimal performance is achieved. Strategic planning included the securement of monitoring funding from external sources to allow such managerial actions to be conducted in the best interest of the project.

HCP covered species benefit*

Describe how the project provided conservation uplift to one or more of the HCP-covered species.

The following results were determined by pre versus post implementation data analyzed from Aquatic Habitat Inventory surveys; 4.5-fold increase in the number of habitat-units within the same river length, riffle habitat was reduced from 46% to 23%, pocket habitat increased by 13%, gravel substrate increased from 29% to 50% to provide more suitable spawning conditions, significant increase in wood rating, stream shading, undercut/overhead cover, 40 new pools created.

Additional Information

Are there any additional comments or feedback you would like to share to help improve this grant program?

No suggestions due to the ODFW PFA process being the most effective, efficient grant opportunity in the region and most beneficial to contributing directly to the resource and providing the best chance for recovery of ESA salmonids.

Restoration Inventory Uploads

ODFW COMPASS SWAP Tool*

Provide documentation/proof (Screenshot works) that you've uploaded your project to the ODFW COMPASS SWAP Tool.

Please use your PFA Tracking number and project title in the system when uploading your project. (Example PFA2024-01 Floodplain Restoration and Habitat Project)

SWAP ODFW PFA2023-21 NFWWR RM 4.3 Project WWBWC.pdf
See attachment for ODFW SWAP documentation.

Oregon Watershed Restoration Inventory Upload*

Provide documentation showing that your project has been uploaded to the *Oregon Watershed Restoration Inventory (OWRI)*. This is a required condition of your grant agreement.

When uploading your project in OWRI, use your **PFA Grant Tracking Number** (for example, PFA2024-01) **in the Grant Number field associated with ODFW**, not on the Create or Select Project page.

The PFA Grant Tracking Number will **not** appear in the Project Number or OWEB or OSWB Grant Number fields on the Create or Select Project page. This is expected.

To correctly enter the PFA Tracking Number:
- Add **ODFW** as a participant to your project
- Enter the **PFA Grant Tracking Number** in the **Grant Number** field for ODFW

After saving, the PFA Grant Tracking Number can be viewed in the **Participants** tab, the **View Entire Report** screen, and the downloadable **PDF**.

See an example here.

ODFW PFA 2023-21 OWRI Documentation WWBWC NFWWR RM 4.3 Project.pdf
ODFW PFA 2023-21 project metrics were loaded into the Oregon Watershed Restoration Inventory (OWRI) system with guidance from OWRI coordinator Bobbi Riggers of whom approved and finalized the Walla Walla Basin Watershed Council submittal for the North Fork Walla Walla River RM 4.3 Floodplain Restoration Project. Documentation is provided in the attached PDF.

Attachments

Include all project data collected, such as surveys, reports, PDF maps, photo monitoring and planning documents. Upload any color photographs of the Project area(s) before and after the Project completion taken at the pre-set photo points as one document.

Optional Document URL

If documents are stored in an accessible location such as Dropbox, you may enter the url here.

Attachment 1

PFA 2023-21 Final Report WWBWC NFWWR RM 4.3 Restoration.pdf

Attachment 2

Attachment 3

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Final Draft Implementation Monitoring Plan*

Upload a final draft of the implementation monitoring plan for your project for the Department to review.

All monitoring plans should reference the [Template Implementation Monitoring Plan Document.]

NFWWR RM 4.3 Project Monitoring Plan WWBWC.pdf
See attached PFA 2023-21 monitoring plan which was previously approved by ODFW.
A subsequent PFA2024-14 monitoring plan elaborated further on attached 2023-21 version and was updated & reviewed by ODFW to be attached with future final report.

File Attachment Summary

Applicant File Uploads

- SWAP ODFW PFA2023-21 NFWWR RM 4.3 Project WWBWC.pdf
- ODFW PFA 2023-21 OWRI Documentation WWBWC NFWWR RM 4.3 Project.pdf
- PFA 2023-21 Final Report WWBWC NFWWR RM 4.3 Restoration.pdf
- NFWWR RM 4.3 Project Monitoring Plan WWBWC.pdf

Share Your SWAP-related Projects

Add your project to Compass to help showcase the incredible work being done across the state to protect Species of Greatest Conservation Need and their habitats. Sharing your efforts helps track progress on Oregon's State Wildlife Action Plan, highlights opportunities for collaboration, and shows where conservation investments are being made. By contributing information on your projects, you support a statewide view of restoration and monitoring efforts, help identify priority areas, and elevate the success stories of partners working toward shared conservation goals in Oregon.

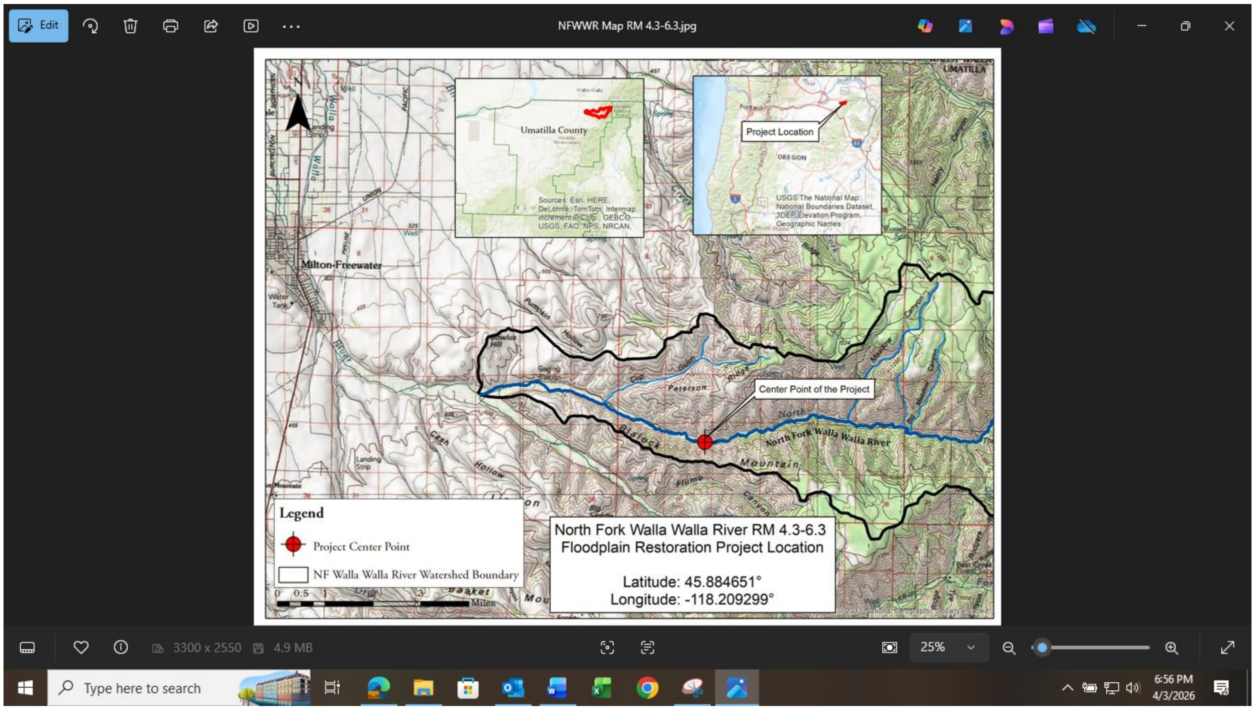
Your Name*

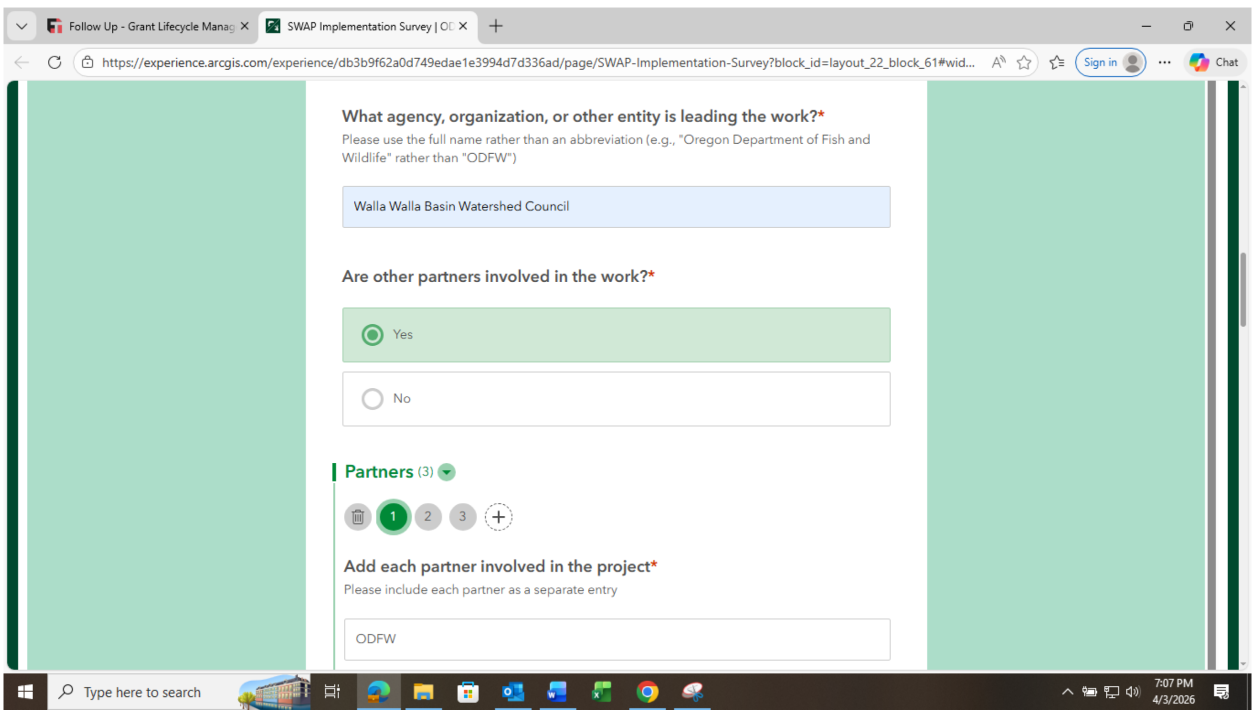
Eric Hoverson

Project Name*

(if your project doesn't have an official title, please create one)

PFA2023-21 North Fork Walla Walla River RM 4.3 Restoration Project WWBWC




Follow Up - Grant Lifecycle Manag
SWAP Implementation Survey | OD
https://experience.arcgis.com/experience/db3b9f62a0d749edae1e3994d7d336ad/page/SWAP-Implementation-Survey?block_id=layout_22_block_61#wid...

What agency, organization, or other entity is leading the work?*

Please use the full name rather than an abbreviation (e.g., "Oregon Department of Fish and Wildlife" rather than "ODFW")

Walla Walla Basin Watershed Council

Are other partners involved in the work?*

- (•) Yes
- ( ) No

Partners (3)

1 2 3 +

Add each partner involved in the project*

Please include each partner as a separate entry

ODFW

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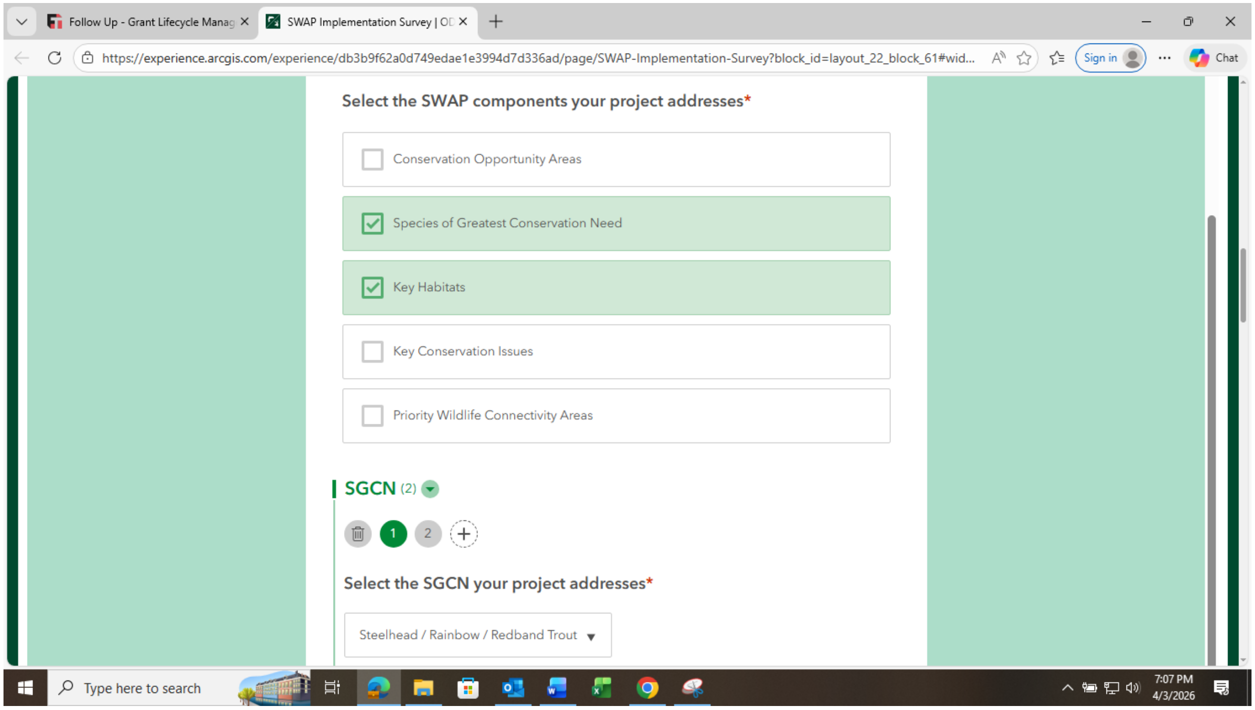
4/3/2026



Select the SWAP components your project addresses*

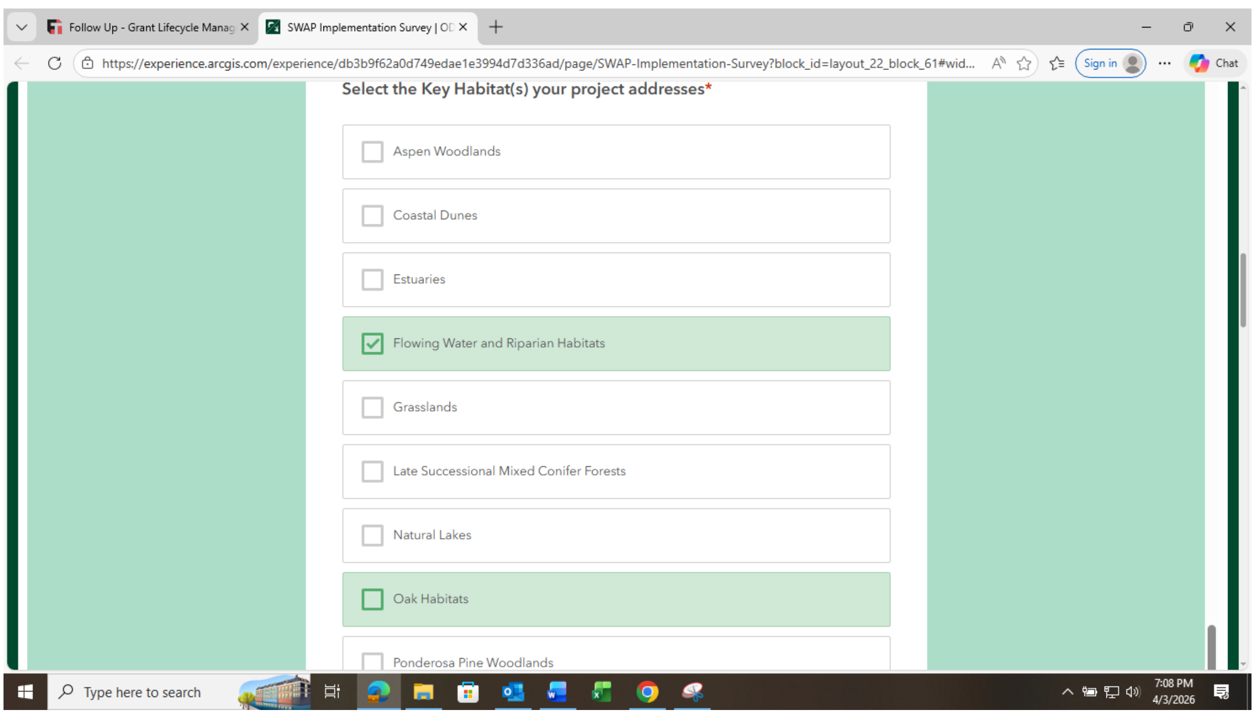
- [ ] Conservation Opportunity Areas
- [x] Species of Greatest Conservation Need
- [x] Key Habitats
- [ ] Key Conservation Issues
- [ ] Priority Wildlife Connectivity Areas

SGCN (2)

1 2

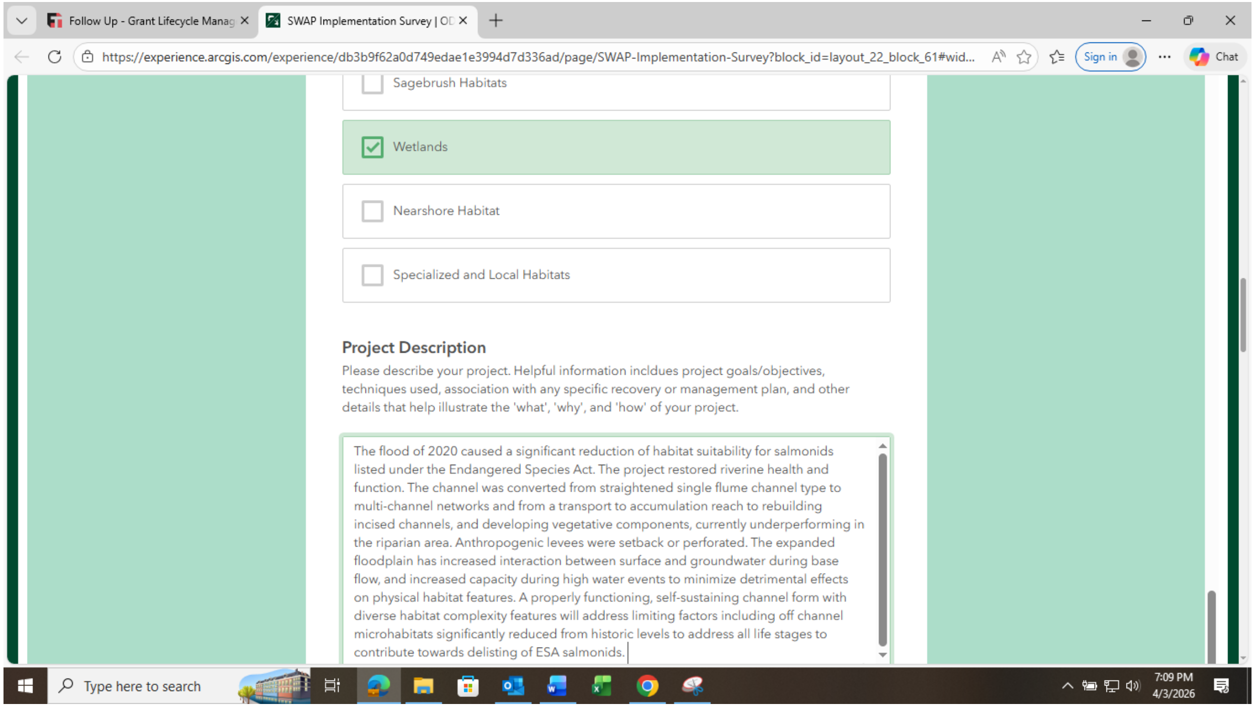
Select the SGCN your project addresses*

Steelhead / Rainbow / Redband Trout



Select the Key Habitat(s) your project addresses*

- [ ] Aspen Woodlands
- [ ] Coastal Dunes
- [ ] Estuaries
- [x] Flowing Water and Riparian Habitats
- [ ] Grasslands
- [ ] Late Successional Mixed Conifer Forests
- [ ] Natural Lakes
- [ ] Oak Habitats
- [ ] Ponderosa Pine Woodlands

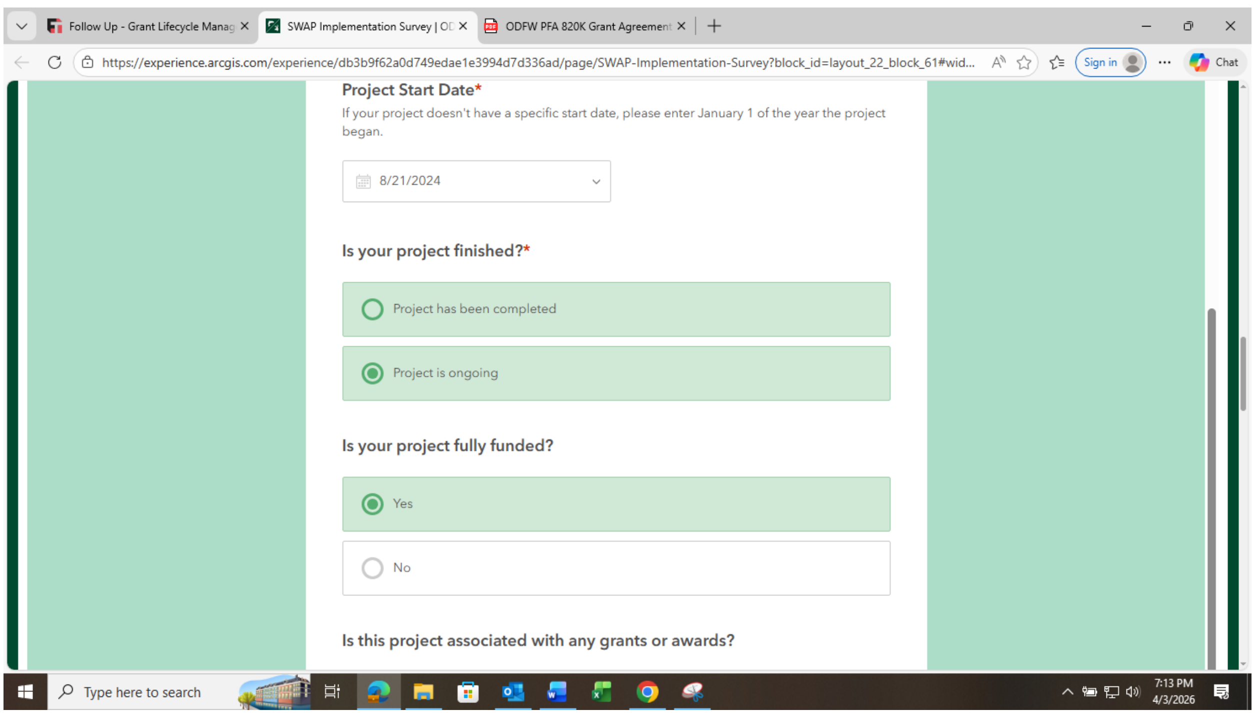


- [ ] Sagebrush Habitats
- [x] Wetlands
- [ ] Nearshore Habitat
- [ ] Specialized and Local Habitats

Project Description

Please describe your project. Helpful information incldues project goals/objectives, techniques used, association with any specific recovery or management plan, and other details that help illustrate the 'what', 'why', and 'how' of your project.

The flood of 2020 caused a significant reduction of habitat suitability for salmonids listed under the Endangered Species Act. The project restored riverine health and function. The channel was converted from straightened single flume channel type to multi-channel networks and from a transport to accumulation reach to rebuilding incised channels, and developing vegetative components, currently underperforming in the riparian area. Anthropogenic levees were setback or perforated. The expanded floodplain has increased interaction between surface and groundwater during base flow, and increased capacity during high water events to minimize detrimental effects on physical habitat features. A properly functioning, self-sustaining channel form with diverse habitat complexity features will address limiting factors including off channel microhabitats significantly reduced from historic levels to address all life stages to contribute towards delisting of ESA salmonids.



Project Start Date*

If your project doesn't have a specific start date, please enter January 1 of the year the project began.

8/21/2024

Is your project finished?*

- ( ) Project has been completed
- (•) Project is ongoing

Is your project fully funded?

- (•) Yes
- ( ) No

Is this project associated with any grants or awards?

Follow Up - Grant Lifecycle Manag | SWAP Implementation Survey | OD | ODFW PFA 820K Grant Agreement

https://experience.arcgis.com/experience/db3b9f62a0d749edae1e3994d7d336ad/page/SWAP-Implementation-Survey?block_id=layout_22_block_61#wid...

Is this project associated with any grants or awards?

- (●) Yes
- ( ) No

Grants and Awards (3)

1 2 3

Add the name of each grant or award funding the work

Please include each individual grant or award as a separate entry

ODFW PFA Grant

Are there opportunities for other partners to expand the scope of work at the site?

- (●) Yes

Type here to search

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Follow Up - Grant Lifecycle Manag | SWAP Implementation Survey | OD | ODFW PFA 820K Grant Agreement

https://experience.arcgis.com/experience/db3b9f62a0d749edae1e3994d7d336ad/page/SWAP-Implementation-Survey?block_id=layout_22_block_61#wid...

Please describe opportunities to expand on the work being done.

Currently working on private lands working our way upstream towards public lands to be assessed and for potential projects and expanded partnerships around year 2030.

89

Does the project have a website or social media account that you'd like to share?

- (●) Yes
- ( ) No

Link to website or social media account:

https://search.yahoo.com/search?fr=mcafee&type=E210US739G0&p=wwbwc

Images (1)

Type here to search

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Follow Up - Grant Lifecycle Ma | SWAP Implementation Survey | ODFW PFA 820K Grant Agreem | SWAP ODFW PFA NFWWR RM | ODFW PFA2023-21 NFWWR R

https://experience.arcgis.com/experience/db3b9f62a0d749edae1e3994d7d336ad/page/SWAP-Implementation-Survey?block_id=layout_22_block_61#wid...

Sign in | Chat

1

Are there any photos of the work you'd like to share?

IMG_3698.jpg	480.6KB	•••
ODFW PFA2023-21 NFWWR Map RM 4.3 WWBWC.jpg	515.5KB	•••

3 Drop image here or select image

Please provide an email contact for the project*

eric.hoverson@wwbwc.org

Do you consent for this project to be added to ODFW's SWAP Implementation map?*

The map can be viewed here

Yes

Type here to search

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4/3/2026

ODFW PFA 2023-21 project metrics were loaded into the Oregon Watershed Restoration Inventory (OWRI) system with guidance from OWRI coordinator Bobbi Riggers of whom approved and finalized the Walla Walla Basin Watershed Council submittal for the North Fork Walla Walla River RM 4.3-6.3 Floodplain Restoration Project. Documentation is provided below;

OWRI Online! Review

View the entire report.

Project Number: 20240121 Project ID: 29197

Project Name: North Fork Walla Walla River RM 3.6-4.3 Floodplain Restoration Construction

Project Total Costs: Cash: $1,194,296.00 Inkind: $0.00

Project Dates: Start Month: 09 Year: 2024 Completion Month: 10 Year: 2024

Is this an update for a multi-year project? Yes No

If the project was selected/prioritized with a Watershed Assessment/Action Plan please fill out the following

Name: NF Walla River Aquatic Habitat Inventory Assessment

Conducted By: WWBWC

Year: 2020

Other project site selection description

Is this project intended to result in direct benefits to certain fish or wildlife species? Yes No

Were permits or notifications applicable to this project? Yes No

Subbasin Name: Walla Walla | 8 digit HUC: 17070102 | If the subbasin is unknown, list main river body: North Fork Walla Walla R

Stream Name: North Fork Walla Walla R | Tributary of: Walla Walla R

Township: 05n | Range: 37e | Section: 29

County: Umatilla

Participant	Contact	Email	Additional	Program	Grant Nbr	Cash	Inkind	Roles
BPA	Lindsey Arotin					$77,624.00	$0.00	Funder
ODFW	Andy Spyrka			Private Forest Accord (PFA)	2023-21	$819,209.00	$0.00	Funder
OWEB	Amy Charette				222-6025	$297,463.00	$0.00	Funder
Private Landowner	Daryl Sams					$0.00	$0.00	Landowner
Private Landowner	Duane & Dennis Sams					$0.00	$0.00	Landowner
Walla Walla Basin Watershed Council	Eric Hoverson	eric.hoverson@wwbwc.org	Milton Freewater, OR	Watershed Enhancement		$0.00	$0.00	Respondent, OWEB grantee

Activity Type Costs

Activity Type	Cash	InKind
Fish Passage	$500.00	$0.00
Instream	$1,154,296.00	$0.00
Riparian	$14,500.00	$0.00
Road	$24,275.00	$0.00
Upland	$725.00	$0.00

Results

Activity Type	Result	Quantity	Unit
Fish Passage	Total miles of fish habitat made accessible by the removal of barriers other than at road/stream crossings	12.00	mile
Fish Passage	Miles of habitat opened- previously inaccessible for juveniles, accessible for adults	12.00	mile
Fish Passage	Total number of non-road crossing barriers improved for fish passage	1.00	non-road crossing barrier
Instream	Total miles of stream treated (instream activities)	1.60	mile
Instream	Total number of habitat structures placed in channel	47.00	structure
Instream	Total number of pools expected to be created by channel structure placement treatments	47.00	pool
Riparian	Total linear stream miles treated (riparian activities)	0.30	mile
Riparian	Total acres treated (riparian activities)	5.00	acre
Road	Total number of stations improved by rocking for surface drainage	11.00	station
Upland	Total acres treated (upland activities)	0.20	acre

Activity Type	Activity	Treatment	Quantity	Unit	Detail
Fish Passage	Non-crossing improvement	Push-up dams permanently removed: Surface water diversion for seasonal irrigation comprised of river gravel	1.00	push-up dam	No
Instream	Channel alteration	Main stream channel modified / created	3000.00	feet	No
Instream	Channel alteration	Main stream channel modified / created	1.00	main channel	No
Instream	Engineered structures	Flow deflector installed: log and rock/boulder	32.00	structure	No
Instream	Instream habitat (anchored): Structure placement	Anchored habitat structures placed	15.00	structure	View
Instream	Off-channel habitat	Alcoves created with tributary/spring input	14.00	alcove	No
Instream	Off-channel habitat	Side channels reconnected to stream or access improved	7920.00	feet	No
Instream	Off-channel habitat	Side channels reconnected to stream or access improved	18.00	side channel	No
Riparian	Riparian tree planting	Riparian trees planted: conifer and hardwood	5.00	acre	View
Riparian	Riparian tree planting	Riparian trees planted: conifer and hardwood	2.00	side	View
Riparian	Riparian tree planting	Riparian trees planted: conifer and hardwood	0.30	mile	View
Road	Surface drainage improvement	Road durable rocking or quality hard road rocking prior to haul	11.00	station	No
Upland	Upland tree planting	Upland trees planted	0.20	acre	View

Spatial Data Information

Spatial Data Status	Notes	Points	Lines	Polygons
Mapped	4/8/2025 - unsure where the road and upland treatments were done. Some treatments not marked on the uploaded map were mapped from grant application materials.	Y	Y	Y

Uploaded Project Files

File Type	File Name	Description	View
OWRI Map	Map Troy RM 3.6-4.3 2022_NFWWR_ConstructionProject.pdf	NFWWR RM 3.6-4.3 Restoration Area Map	View or Save

ODFW PFA 2023-21 Final Report

Increase Aquatic and/or Floodplain Complexity

Floodplain Restoration North Fork Walla Walla River RM 4.3 Implementation

Introduction

The North Fork Walla Walla River (NFWWR) is an 18-mile tributary of the Walla Walla River (WWR) near river mile (RM) 52 located near Milton Freewater, Oregon (Figure 1). The NFWWR is described in the Walla Walla Sub-Basin Plan (WWSBP) as a Priority Protection and Restoration Area based upon Ecosystem Diagnosis and Treatment analysis. The NFWWR is categorized as a Strategic Implementation Area by the Department of Agriculture and listed on the Department of Environmental Quality (DEQ) 303d list for high water temperature and categorized in various natural resource management guides as essential, critical habitat for Endangered Species Act (ESA) listed salmonids. Projections disclosed in the WWSBP estimate that a potential 52% increase in steelhead populations can be achieved with improvements to passage and habitat in tributaries of the Columbia River system. A multitude of NFWWR assessments combined with analysis of post flood aquatic habitat inventory data indicated significant underperformance in regard to salmonid habitat suitability and identified areas in need of restoration, enhancement, and protection with the goal of approaching historic conditions, while considering restrictive parameters of current conditions. Watershed studies conducted by the WWBWC and project partners identified a 5.2-mile treatment area (RM 3.6-8.8) that would benefit from holistic floodplain restoration utilizing the following scientifically defensible strategies; preservation, restoration, enhancement and expansion of habitats for the purpose of expanding limits of distribution, abundance, density, biomass, population size, and increased fitness. The treatment area was broken into 6 phases including reaches of varying stream lengths to be restored over a 10-year period in a down to upstream manner as directed by BPA funding representatives. This section of the report is focused on results of phase 3 (RM 4.3-5.2). Further study of hydrology and valley form indicated that the correct channel form for the NFWWR valley type should be multi-threaded, not a single-threaded, forced flume channel that exists currently due to anthropogenic activity associated with flood response and protection.

Historic floods in the year 2020 were the largest on record and coupled with emergency flood response actions resulted in a leveed, single-flume channel which created excessive shear stress and resulted in expansive areas erosion in the riparian and floodplain areas (Figures 2-3). Fertile top soils were stripped along with vegetative components, resulting in an expansive field of barren cobbles in excess of ten times the width of the wetted channel (Figures 4-5). In-stream habitat became simplified and was dominated by unproductive plain bed-form riffles (Figure 6). Down cutting of the stream channel has resulted in more pronounced disconnection between surface and groundwater as evidenced by high terraced, eroded banks (Figure 7). Bank erosion conditions were improved by the placement of large woody debris and boulder configurations (Figures 8-9). The disconnected riparian and abrupt changes to streambed elevation resulted in the mortality of several galleries of mature alder trees in the riparian area and is creating a favorable environment for non-preferred vegetative components throughout the floodplain. The effects on the vegetative components coupled with disconnected water interchange between surface, ground and spring flows along with climate change has resulted in an abrupt increase of stream temperature and turbidity post 2020-flood as demonstrated by WWBWC water quality monitoring data. Flood impacts reduced habitat complexity resulting in simplification of habitat features and subsequent lowering of salmonid carrying capacity. The flood of 2020 albeit detrimental from an environmental impact standpoint, offered opportunity for WWBWC involvement as many landowners reached out for professional advice and assistance due to being overwhelmed by the magnitude of the historic flooding. Detrimental effects from high water also offered a starting point and justifiable utilization of funding source to rebuild a superior system to function efficiently and be self-sustainable over time. WWBWC strives to educate the community on watershed management strategies and how they are a proactive means of protection against future catastrophic events and how improvements to ecosystem health relate to the health of the human environment. Education efforts also teach how holistic restoration treatments have positive effects on water conservation and non-target species of interest to the public as well.

Pre-restoration condition of the NFWWR was considered a dysfunctional system. The majority of the NFWWR project reach has been manipulated with heavy equipment for flood repair purposes as well for anthropogenic development within the floodplain, which has resulted in a significant decrease in channel meandering and thus a disharmony and imbalance of river energy. Extensive pushup levee networks exist in the project area, harnessing the river into a constricted single flume type of channel, instead of the multi-threaded channels appropriate for the valley type. As a result, the reach has experienced flashy hydrologic conditions and subsequent impacts to the aquatic system and adjacent properties. The levees do not provide the river with adequate capacity for handling future high water events without legitimate threat of avulsion and extensive subsequent damage. Lack of off-channel habitat is considered a limiting factor to salmonid production in the basin as only a minority of such habit as remain from historical status. Interruption of natural riverine processes resulted in reduced ability to manage energies effectively, which makes the system more vulnerable to future impacts from anticipated high water events of which are expected to occur more frequently as predicted by climate change scientists.

Impacts of the 2020 flood resulted in significant impacts to the NFWWR resulting in both take and significantly reduced habitat suitability for ESA Threatened wild steelhead and bull trout populations, native red band rainbow trout, chinook salmon and mountain whitefish. The RM 4.3-5.2 reach sustained extensive damage to the riverine system as result of the 2020 flood and subsequent infrastructure protection actions. Summer water temperatures can approach 24 Celsius, which is categorized as marginal, approaching lethal in terms of salmonid tolerance threshold. Therefore, it is imperative that all cold water inputs are connected, protected and enhanced. Base flow in the project area ranges is approximately 10 cubic feet per second during the Summer months. Addressing water quality and quantity will be an important aspect of each restoration phase and will have direct benefit to fish. Red band trout populations with maximum fork lengths of 11 inches appear stable in the upper NFWWR as habitat values continue to be most suitable as the upper reaches are stable and functioning properly and have experienced minimal alteration of habitat. Red band populations are underperforming in the project reach due to significant reduction of available habitat. Status of ESA-listed steelhead in the Walla Walla Basin in regard to population size and risk of extinction are considered as moderate, but trending towards high risk of extinction as evidenced by historically low counts of adults passing McNary Dam. The discovery of 13 inch, adipose fin clipped steelhead smolts in the project area was somewhat alarming as the size of these fish dominated the natural component and due to correct seeding of existing habitat, seemed unnecessary to support the introduction of hatchery stock in to the NWWR due to potential impacts on the wild stock. Bull trout suitability is marginal due to lack of streamflow and elevated water temperatures during the summer months. Several bull trout were observed in the 8-12" size range and appeared to be experiencing some degree of stress due to slender appearance and were all located near spring inputs where water temperatures were cool. Significant declines have been trending in the basin and coincidentally coincide with the onset of a significant study of the species in the early 2000's as dozens of mature adults were sacrificed during research efforts. Declines in redd counts have been trending for decades. Juvenile spring chinook salmon juveniles of excellent fitness were observed in deep pool habitats with large woody debris present. No adult salmon were observed during the spawning season so it is theorized that the unclipped juveniles resulted from reintroduced hatchery stock adults that spawned naturally in the adjacent main stem or South Fork WWR and swam upstream 8-miles up the NFWWR. Mountain whitefish numbers appear extremely suppressed as quantity of pool habitat was significantly reduced as result of flood waters that upon receding deposited excessive gravel and cobble and replaced pools with riffles. Low numbers of juvenile whitefish were captured during surveys in the early 2000's in the NFWWR, but none observed recently. This salmonid species is an indicator of favorable water quality and should be focused upon more as it is feared the fish are on a precipitous decline.

The entire project area is under private land ownership and located behind a locked gate. The WWBWC formulated a cooperative partnership with the landowners for access and to restore river processes and improve watershed health. Effective discussions and successful negotiations were effective in establishing a signed, cooperative restoration agreement effort for the duration of the multi-phased project. There are no dwellings within the project areas. A lone agricultural access road is located against the eastern base of the Blue Mountains therefore the majority of the valley width is available for floodplain restoration. There are approximately 15 miles of suitable habitat (Figure 10) located upstream from the project area, which includes habitats within tributaries. Public properties owned by BLM and the USFS are located adjacent and upstream of the upper extent of the project areas. Overall habitat and salmonid suitability is in good condition in the public waters of the upper NFWWR. Inventory results of project reaches are categorized as poor and in need of restoration to provide a safe migratory corridor to favorable conditions in the headwaters in addition to transforming into year-round, suitable habitat for all age classes of salmonid target species.

Restoration of this multi-phased project is underway as the initial phase was completed in 2022, involving the re-connection of 15 springs to the main stem NFWWR that were isolated from the NFWWR due to the flood of 2020 disconnecting the waterways across the agricultural road prism where sedimentation, thermal input and potential take of ESA listed species could occur (Figures 11-14). Improvements to juvenile salmonid habitats through accessibility to quality off-channel habitats has resulted from reconnection efforts. Full connection to the main stem NFWWR across the riparian and floodplain areas will be accomplished during future restoration phases and will include enhancement of habitat conditions by increasing complexity features within and beyond the wetted channel. Phase 2 was effectively implemented in 2023 and involved restoring RM 3.6-4.3 of the NFWWR (Figures 15-18). Phase 3 restoration occurred in 2024 for the RM 4.3-5.2 reach and resulted in the following improvements; restored proper riverine function, added hundreds of 3' boulders and 35' whole trees with root wads to improve to physical habitat complexity for target fish species, restored 17 acres of floodplain, reduced dominant substrate size by reducing stream slope, increased undercoat and overhead cover metrics, significantly improvement to habitat complexity as the number of habitat units and edge effect habitats improved dramatically.

Creation of new wetlands with increase in vibrant vegetative components such as native sedge, rushes, duckweed, watercress to provide diverse food, hiding cover for wetland related species such as beaver and a multitude of animals while also providing a conversion from brown to green riparian attributes to provide additional fire resilience (Figure 19). Converting the anthropogenic, flumed channel to a complex network of braided side channels with beneficial attributes (Figures 20-24) has resulted in beaver inhabitance as dams quickly began to appear (Figure 25) in the newly establish braided channel network. Engineered log jams (ELJ) were constructed to provide habitat complexity features and improve bank and instream overhead cover, while creating pools as suitable holding cover for several age classes of salmonids (Figures 26-29).

Objectives of our restoration efforts extend beyond the NFWWR and involve improving water quality conditions and connectivity between salmonid bearing waterways to provide buffering and resilience during catastrophic events and increasingly concerning changes to environmental conditions as projected due to climate change. WWBWC philosophy is to exercise holistic restoration, enhancement and protection of watersheds to address causes of dysfunction as opposed to masking of symptoms. This approach maximizes habitat uplift and environmental project benefits that extend beyond fisheries emphasis and into various forms of biota to add resilience to potential detrimental impacts associated with climate change. The WWBWC actively conducts monitoring and maintenance actions at the project site to track project progress and steer adaptive management actions to ensure optimal project performance over time. The WWBWC will continue to monitor water temperature, turbidity, water quantity, and overall project performance to steer potential adaptive management actions. The WWBWC has given considerable effort to showcasing the positive results of the overall project through various reports, presentations, videos and media releases to bring awareness to project accomplishments.

The results of the initial phases of the NFWWR project are perceived very favorably as evidenced by receiving the Oregon State Land Board Restoration Project of the Year and River Restoration Northwest project of the month awards in 2024. Dramatic improvements to salmonid habitat conditions are shown in Figures 30-37 as before and after restoration imagery. Future phases of the project will involve further improving watershed function, floodplain connectivity and habitat suitability for salmonids in effort to approach carrying capacity in reaches currently underperforming.

Figure 1. Map of the overall 5.2-mile project area of the NFWWR RM 3.6-8.8

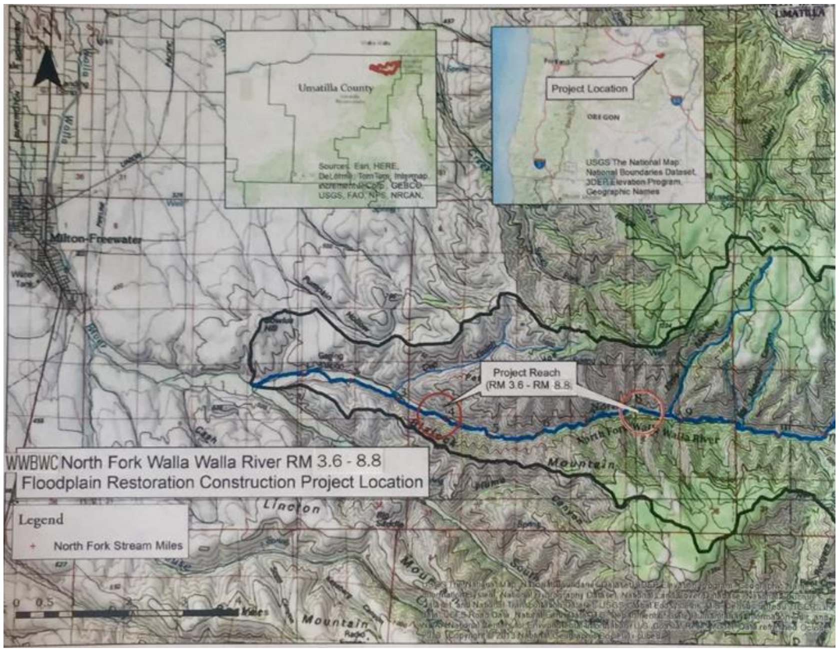

Figure 2. Anthropogenic change resulted in several areas within the project reach being leveed in response to flooding.

Figure 3. Push up levees to be perforated and/or setback in RM 4.3-5.2 reach.

Figure 4. Post 2020 flood response footprint remains evident throughout the project area.

Figure 5. Expansive deposition of barren gravel and cobble substrates are common throughout the treatment area.

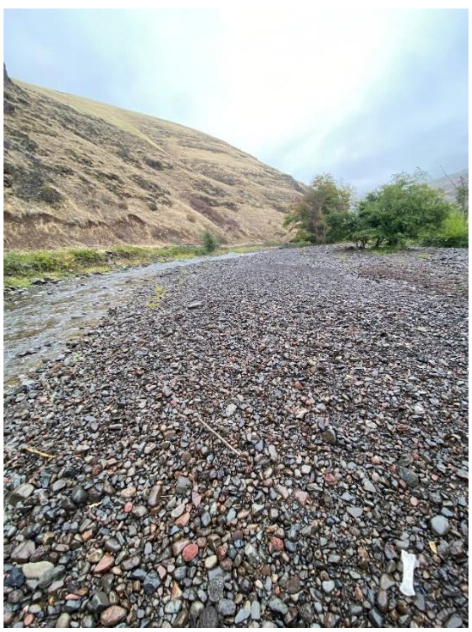

Figure 6. Habitat simplification resulted in several areas within the project reach.

Figure 7. North Fork Walla Walla River RM 4.9 actively eroding bank and down-cutting incision

Figure 8. Rectification bank treatment and overhead cover implemented 2024, RM 5.0.

Figure 9. Rectification bank treatment and overhead cover implemented 2024, RM 5.2.

Figure 10. 15 miles of suitable habitat on public and private properties upstream of degraded project area.

Figure 11. Turbidity, sedimentation, and elevated water temperature impacts associated with road prism.

Figure 12. Unprotected springs were vulnerable to vehicle traffic and potential take of salmonids.

Figure 13. Culvert crossings were installed at the largest spring locations to provide juvenile habitat.

Figure 14. Direct re-connection and expansion of vibrant spring habitat is a primary objective of the NFWWR project.

Figure 15. Phase 2 RM 3.6-3.8 before restoration.

Figure 16. Phase 2 RM 3.6-3.8 after restoration.

Figure 17. Phase 2 RM 4.1-4.3 before restoration.

Figure 18. Phase 2 RM 4.1-4.3 after restoration.

Figure 19. One of many springs beyond the road prism expanding due to 2023 floodplain restoration.

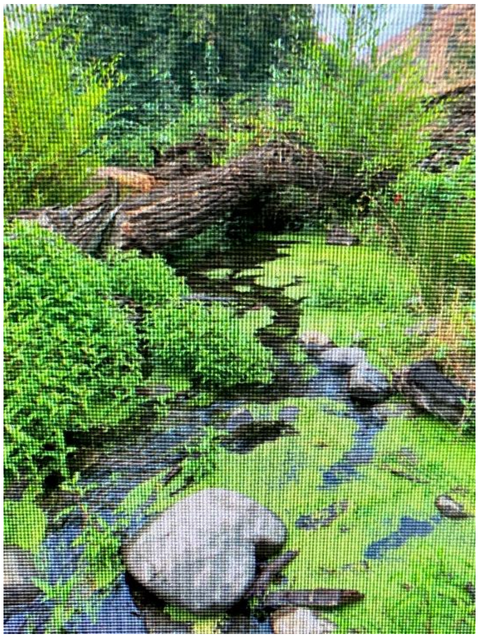

Figure 20. Establishment of self-maintaining side channel networks bring numerous benefit and vibrant diversity to the project.

Figure 21. Newly created side channels are routed through dense riparian vegetation for habitat complexity and thermal benefit.

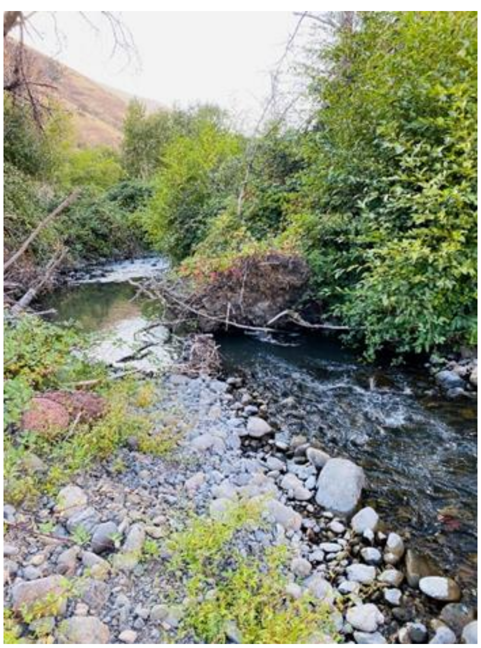

Figure 22. Newly inundated secondary and tertiary channel network in expanded floodplain.

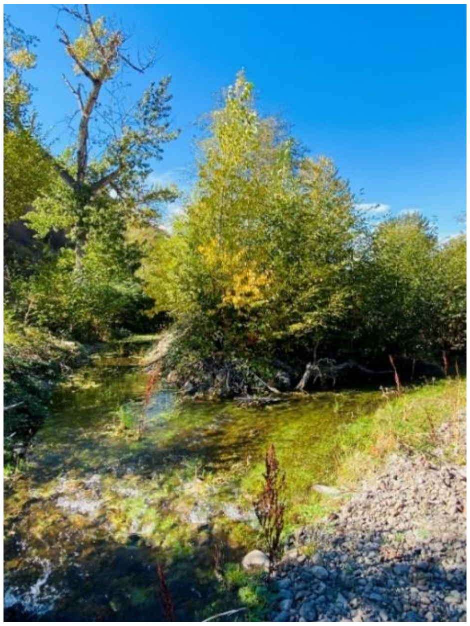

Figure 23. Habitat unit complexity abundant in side channels as pools are frequent.

Figure 24. Additional channel network was added through the riparian area, providing suitable habitat for juvenile salmonids.

Figure 25. 1 month after new channel expanded through the riparian area, beaver moved in.

Figure 26. The intrusion of root wads into the wetted channel margin provides overhead cover for fish.

Figure 27. ELJ Bank Structure near RM 4.1 provided quality fish habitat uplift.

Figure 28. ELJ Bank Structure near RM 5.2 provided quality fish habitat uplift.

Figure 29. ELJ configurations were strategically constructed to reduce buoyancy and remain intact during high flow events.

Figure 30. Before restoration RM 4.3.

Figure 31. After restoration RM 4.3.

Figure 32. North Fork Walla Walla River RM 4.9 before construction condition.

Figure 33. North Fork Walla Walla River RM 4.9 before construction condition.

Figure 34. NFWWR RM 5.1 side channel before construction.

Figure 35. NFWWR RM 5.1 side channel following construction.

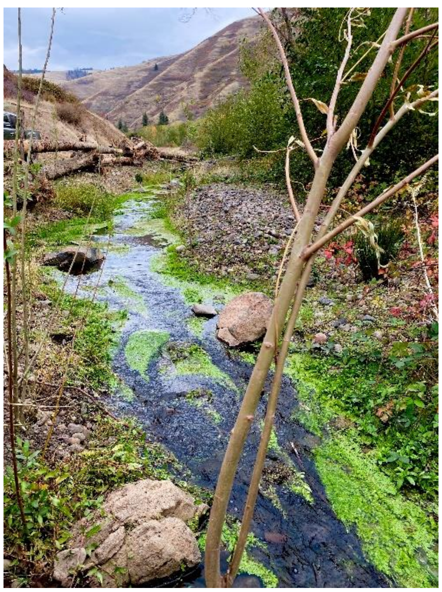

Figure 36. NFWWR RM 5.2 prior to restoration.

Figure 37. North Fork Walla Walla River RM 5.2 after implementation.

Vegetation

Long term restoration actions are holistic and therefore extend beyond the wetted channel into the riparian area, and throughout the expanding floodplain to utilize river dynamics for the role of delivering water and depositing fine sediments to provide an environment favorable for vegetative re-establishment. In the interim, until natural regeneration transforms the vegetative landscape, mechanical trenching methods are utilized during restoration implementation activities. Trenching is conducted in strategic areas where plants are underperforming, for the purpose of providing sustain contact between water table and plantings for optimizing survival of vegetation planted during the in-stream work window (July-September) in vegetation to a depth in contact with base flow groundwater levels in strategic areas void of vegetation (Figures 38-39). In addition to mechanical planting methods, trees are routinely planted by hand during Spring and Fall dormancy periods until a desired level of riparian growth is established. Opportunistically planting vegetation within ELJ configurations provides optimal conditions for growth and survival (Figure 40). Relocation of salvaged native tree stock was replanted away from construction areas (Figure 41). Additional woody debris was strategically placed on barren point bars as roughness elements to promote vegetative recovery (Figure 42). Using the combination of planted and natural regeneration of trees, the WWBWC will continue to monitor and adaptively manage riparian areas until the preferred level of vegetative growth is established. Natural propagation and supplemental tree planting combined with the reduced need and frequency of landowner's intervention via emergency flood protection and/or response actions will improve long term functionality of the project reach.

Figure 38. Trenching technique for planting willow and cottonwood cuttings in contact with water table.

Figure 39. Willow and cottonwood whips were planted to supplement natural regeneration.

Figure 40. Rooted alder trees gathered from immediate area were planted within constructed ELJ's.

Figure 41. Salvaged alder trees were replanted if disturbed by construction activities.

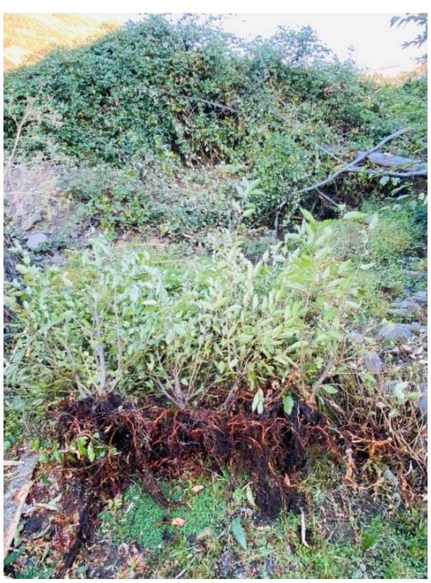

Figure 42. Roughness elements added to barren gravel bars to promote retention of fine sediments, point bar development, and riparian recovery.

Enclosures

Protecting excessive grazing of sensitive spring seep and planted vegetation was accomplished with the installation of several restrictive barriers made of natural wood materials (Figures 43-45) as well as traditional wire strand fencing in combination with solar panels to provide electric boundary establishment (Figures 46-47), or in combination of the two methods (Figure 48). The function of temporary grazing enclosures is to reduce detrimental grazing impacts during vulnerable stages of vegetation development in effort to optimize long-term survival and establishment of vegetation. Enclosures are intended to protect vegetation from both domestic cattle and big game impacts. Protective measures will continue to be taken to ensure sensitive wetland and tree regeneration areas are established to buffer effects of global warming impacts as forecasts project a 33% reduction in spring flow and increase of 2.4 degrees Fahrenheit over the next several decades.

Figure 43. Whole trees and wooden fence enclosures decreased grazing of delicate, vibrant vegetation.

Figure 44. Enclosure to protect hundreds of naturally regenerating cottonwood and alder tree saplings.

Figure 45. Whole tree protective enclosure around sensitive surface spring vegetation.

Figure 46. Temporary electric fence for protecting trenched vegetation panted during implementation.

Figure 47. Effectiveness of solar electric grazing deterrent protecting trenched trees.

Figure 48. Combining natural fence and man-made materials to protect adjacent areas of recovering riparian and wetland vegetation.

Design

Restoration designs were advanced from the conceptual 15% alternatives level initiated in 2021, to the 30% level on October 31, 2024. In developing restoration design alternatives, no action was perceived as immediate threat to jeopardizing fish health and continued potential for take of ESA salmonids. On the other end of the spectrum, a heavy-handed approach would be expensive and unnecessary while causing much disturbance. A tier-based priority system was developed to allow some degree of latitude for quantity of treatment to be conducted annually. Adopting a restoration philosophy involving letting the river do much of the work after jump-starting the restoration process with strategic placement of essential structures conducted. Successful and sustainable restoration of the NFWWR will require a long-term perspective that works with, not against, natural disturbance processes. The overarching design approach is to jump-start physical processes that initiate a self-sustaining positive feedback loop that will gradually improve channel and floodplain function, stability, and habitat. The design incorporates elements that decrease velocity and shear stress in the main channel, secondary channels, and floodplain. Passive and active restoration elements can be implemented to jump-start hydraulic, geomorphic, and vegetative processes. reconnecting the floodplain and water table to surface flow through levee setback and perforation. Designs were completed to the 80% development level on March 31, 2024, to allow ample time to process required permit permissions. Final designs were completed in 2024 for phase 3 (RM 4.3-5.3) and were used to guide construction during September and October of 2025 with permission received to conduct work during an extension made necessary by a combination of permit processing timelines and construction team availability. Engineered designs were successfully constructed in the field and built to design specification. Designs emphasized strategic in-stream placement of wood and boulder, along with tree planting to address factors limiting salmonid production. Off-channel habitat is identified as a limiting factor to salmonid production in the basin therefore, design plans addressed the lack of quality off-channel rearing areas, which is identified as a population bottleneck for young of the year age classes of salmonids. It is estimated that approximately 90% of off-channel rearing areas had been eliminated from historical levels due to anthropogenic simplification of riverine channels. Emphasis will be focused upon achieving perennial, connected flows over the entire length of secondary and spring fed channels to create maximum direct connectivity to the main stem and provide suitable habitat and attraction flows to recruit inhabitation into micro-habitats to fully-seed all age classes of the population dynamic in the NFWWR.
Design development was focused on restorative actions at the project site aimed to improve physical conditions and riverine processes to contribute towards DEQ 303d de-listing for temperature status and ultimately trigger positive biological response of ESA-Listed salmonid populations. Much of the philosophy of the design process centers around letting the river do the work after priority areas are addressed with strategic restoration techniques to jump start proper function and watershed recovery processes. Project site evaluation based upon historical, current and potential status drives design development. Designs were focused on restoring proper riverine processes by converting the anthropogenic flume to the appropriate channel form for the valley type of which is a multi-threaded network of channels, resulting in an increase in River Complexity Index values. Strategies for holistic floodplain restoration treatments were devised to address degraded habitats for the purpose of improving physical habitat suitability for ESA listed salmonids. Designs were effectively advanced through engineer review stages at the 15%, 30%, 80% and 100% levels. Initial conceptual design alternatives were developed and circulated to review teams to solicit professional direction and attain decisions in regard to choice of preferred alternative chosen. As part of the alternative design assessment process, a matrix was developed to encompass the attributes and drawbacks to each. Preliminary designs concepts were presented early in the development process to review teams and landowners to assure timely utilization of resources towards developing a viable design that could be approved, permitted and implemented. Upon receiving decisions in regard to the chosen alternative, the designs were advanced to the 30% level. Engineer teams provided input through BPA's comment tracker system, which were utilized towards the development of 80% designs. Upon acceptance of the 80% design package by review entities, permitting was initiated. Input from the BPA review team at the 80% design level was used to shape development of the 100% final design level. Final designs were stamped by certified engineers to guide implementation activities afield.

Conclusions

Current timing for restoration actions is favorable at the project site as it approaches a stage zero restoration process due to detrimental flood impacts. Ecosystem health should improve due to improved function of the river reach and resiliency against future channel breaching and subsequent loss off ESA-Listed salmonids. Additional restoration phases for RM 5.3-8.8 are to be designed in a similar manner to those developed for RM 3.6-5.2. Knowledge gained from lessons learned from monitoring the performance of restored reaches will formulate future designs in effort to develop the most effective designs for promoting recovery of ESA-listed salmonids. BPA, OWEB, ODFW and the McNary Fund are active financial contributors of the NFWWR project for both past, present and future design, monitoring and construction phases. Subsequent improvements to salmonid habitat suitability are expected to increase over time as the project matures and additional phases are completed. Improvements to water quality are expected in addition to sustainable base flow conditions. Project efforts concentrate on addressing causes of detriment instead of masking ongoing symptoms. Designs promote and endorse improvements to salmonid suitability as well as holistic ecosystem benefit of fish and wildlife biota through the protection, enhancement and restoration of proper riverine function and self-sustaining processes across an expansive floodplain. To achieve this, design plans outline solutions to address dysfunctional attributes with the strategic placement of boulders and woody debris and by channel shaping to restore sinuosity as well as activation of complex side channels to improve riverine habitat by way of complexity features, sinuosity, side channels, off-channel micro-habitats, connectivity and riparian tree plantings across an expanded floodplain with connection improved between surface and groundwater sources.

Results from the completed phases of the project show significant improvements regarding salmonid habitat suitability (Figures 49-54). Habitat uplift has translated to use of the project reach by adult steelhead trout for spawning (Figure 55), as well as juvenile abundance where results showed up to an 11-fold increase in presence of juvenile salmonids in treated versus adjacent untreated river sections (Figure 56). The cooperative efforts of all project partners working together in an area of thew watershed identified in numerous regional natural resource guideline managerial documents have translated to award winning results (Figure 57).

Figure 49. RM 4.2-4.5 pre-construction imagery taken during low September 2025 showing habitat simplification.

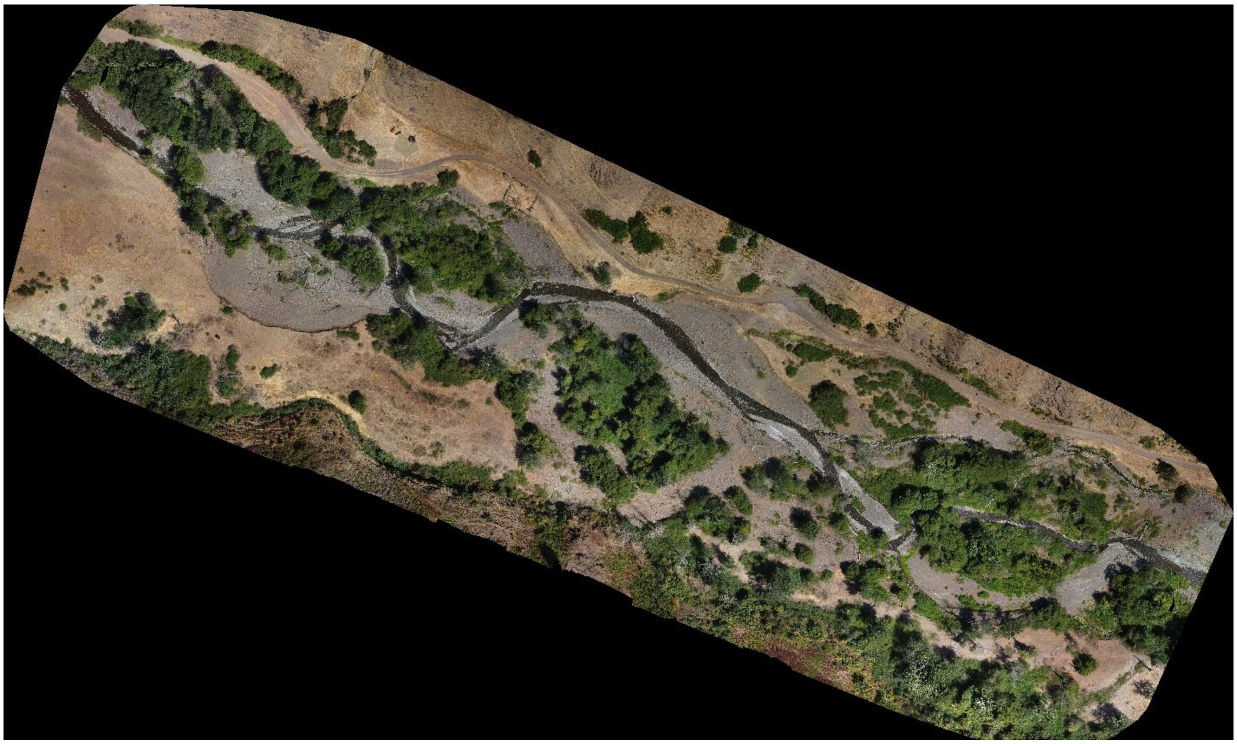

Figure 50. RM 4.2-4.5 post-implementation imagery taken during high flow event, March 2026 showing multi-channel diversity.

Figure 51. RM 4.5-4.8 pre-construction imagery taken during low September 2025 showing habitat simplification.

Figure 52. RM 4.5-4.8 post-implementation imagery taken during high flow event, March 2026 showing multi-channel diversity.

Figure 53. RM 4.9.5.2 pre-construction imagery taken during low September 2025 showing habitat simplification.

Figure 54. RM 4.9-5.2 post-implementation imagery taken during high flow event, March 2026 showing multi-channel diversity.

Figure 55. 12 fish observed on 24 steelhead nests during redd surveys conducted by the WWBWC during spring 2025

Figure 56. Snorkel surveys were conducted by the WWBWC to count juvenile salmonid abundance in October 2025 in treated and untreated reaches.

Figure 57. The WWBWC NFWWR project received Restoration Project of the Year from the State Land Board.

North Fork Walla Walla River RM 4.3 Floodplain Restoration Project Monitoring Plan

Based Upon ODFW Implementation Project Monitoring Plan Guide Template

Oregon Department of Fish and Wildlife Private Forest Act (PFA) 2023-21

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1. Project Information

The North Fork Walla Walla River (NFWWR) is an 18-mile tributary of the Walla Walla River (WWR) located near Milton Freewater, Oregon (Figure 1). The WWR confluence with the Columbia River is at River Mile (RM) 315, a distance of 23 miles upstream of McNary Dam. The mouth of the NFWWR is at river mile (RM 52) of the Walla Walla River. In 2020, the NFWWR was severely impacted by the historic, 100+-year flood as well as by subsequent emergency, in-river flood repair activities which has been subject to anthropogenic confinement as a means of protecting an agricultural road prism, of which is to remain as the lone property access. The WWBWC partakes in management strategies designed to protect, restore, enhance and expand natural resource assets. The Walla Walla Basin Watershed Council (WWBWC) collected pre-implementation data and conducted several assessments of the NFWWR before and after the floods and concluded that a project comprising RM 3.6-8.8 would benefit from holistic floodplain restoration activities to be conducted in a 6-phase manner proceeding in an upstream fashion over a 10-year period. Applicable language from a multitude of natural resource management reference documents as shown in the appendices was used to formulate restoration plans. Each phase of the project has excellent potential in regard to contributing towards ESA salmonid recovery due to the magnitude of the project, holistic treatment approach, qualifications of WWBWC staff, and demonstrated success Implementing similar projects in the region. The WWBWC strategic approach is to identify and address areas via protection, restoration, enhancement, and expansion of suitable habitats for ESA salmonid species. Landowner agreements were secured for the duration of the project and allows restoration activities to occur across the entire valley floor. Phase 1 was implemented in 2022 and involved the reconnection of 15 springs to the NFWWR. Phase 2 was constructed in 2023 from RM 3.6-4.3. Phase 3 of the NFWWR project was funded by the Oregon Department Fish and Wildlife PFA grant process along with contributions from Bonneville Power Administration (BPA) and the Oregon Watershed Enhancement Board (OWEB). All three of the main funding entities have toured the project site as a means of external quality assurance/quality control (QA/QC) monitoring. Phase 3 extends from RM 4.3-5.3 and was successfully implemented in October of 2024 and will be described in this document. The RM 5.3-6.3 portion proposed for design was mutually removed from consideration for funding. 300 whole trees (15" DBH) with root wads were placed in strategically areas as engineered log jams (ELJ's) for the purpose of improving riverine function and salmonid habitat suitability. 500 boulders, 2.5" in diameter were added for ballast and to create pocket water microhabitat. The re-activation of archaic side channels was accomplished by excavation of inlets to restore a multi-threaded channel configuration across an expanded floodplain. Trenching was conducted with heavy machinery to groundwater depth and planted with 250 cotton wood, alder and willow trees. Supplemental hand planting of 250 willow was done by threading whips into engineered log jam configurations at water's edge. Grazing enclosures were erected to protect riparian vegetative attributes by reducing pressure from livestock and big game. The primary objective of the project was to restore proper riverine function and improve physical habitat suitability for various life stages of salmonids listed under the Endangered Species Act (ESA), secondarily for mountain whitefish, chinook salmon, tailed frogs, and to provide tertiary benefit for a multitude of preferred species of biota.

Designs were developed based upon holistic knowledge of the watershed derived from assessing basin characteristics. Analysis and understanding of the driving forces within the watershed are necessary for identifying the cause of the issue and the proper remedy to rectify with the most effective treatment strategy. Understanding processes necessary to achieve proper self-sustaining watershed function is essential for achieving optimal success of an effective restoration project. Using this approach as it relates to coarse understanding of watershed characteristics and how they may relate to project performance over time, educates finite and precise treatment strategies at a reduced scale with understanding of the link between macro and micro cohesiveness during treatment and subsequent response. Monitoring and re-treating as necessary is not only responsible resource management from a professional perspective, but offers highest probability for effective project performance over time. Ongoing project monitoring and evaluation of pre and post implementation data will be conducted to measure project effectiveness over time. Utilization of project maintenance and re-treatment techniques is emphasized for the purpose of re-establishing the correct riverine ecosystem function in a self-sustaining manner riverine processes and utilizing adaptive management for optimal project performance for the benefit of ESA salmonids at each stage throughout their life cycle.

The NFWWR project aligns with following PFA grant program goals in the following manner;

1) Restoring degraded habitat to natural condition/function or a condition likely to improve climate resiliency: Conversion of detrimental anthropogenic changes resulting in single flume, incised channel and categorized transport reach back to back to a multi-channel, naturally functioning accumulation reach. Reconnecting and expanding the current high-terraced floodplain into a vibrant landscape through surface to ground water reconnection and subsequent vegetative response of vibrant wetland species to improve Summer base flow attributes and offers, shading benefit to a system classified on the Department of Environmental Quality (DEQ) for elevated water temperature and offers improved conditions as they pertain to fire resilience as air temperatures are projected to rise significantly due to climate change.

2) Preserving land, water, and habitat:
An important aspect of holistic restoration plans is to identify areas within the project area classified as functioning properly and therefore categorized as non-treatment areas with management emphasis being placed on protection.

3) Habitat enhancement:
Assessment of pre-project condition identifies areas within the project area underperforming. Designs are developed to address deficiencies and achieve habitat uplift of physical habitat features for the purpose of improving suitability conditions for ESA salmonids. Managerial actions extend from the river channel into the riparian, across the floodplain to address direct causes of degradation and beyond symptoms in a holistic manner. Monitoring and maintenance are essential components of the process required to achieve self-sustaining and properly functioning projects over time.

4) Reducing or eliminating threats to Habitat Conservation Plan covered species:
Factors limiting ESA salmonid habitat suitability and population status are identified in a multitude of assessments and studies and addressed with the most appropriate remedies through professionally engineered design plans. Bottlenecks are identified that potentially limit ESA salmonid population at specific life stages/age class and are addressed through effective implementation and adaptive management of natural resource management plans.

5) Creating new habitats or new populations:
Connectivity is an overall theme of the restoration effort occurring on the NFWWR. From a physical habitat to a population standpoint. Improving conditions in the NFWWR will offer migratory species a destination other than the South Fork Walla Walla River for ESA salmonids to inhabit if conditions in adjacent sub-watersheds are less favorable. This is an evolutionary strategy for fish that seek refuge during catastrophic events as to not put all eggs in one basket so to speak and increase the probability of extinction.

2. Monitoring Objectives

a. Primary Objectives

1) Add 0.3-miles of stream length to 3 new, multi-threaded, perennial side channels to benefit all salmonid life stages via excavation of specific areas to encourage activation of historic channels through inlet reformation, add five alcoves for juvenile salmonid rearing benefit, improve sheet water inundation capacity/duration/frequency intervals across an expanded 17-acres of new floodplain. Utilize heavy equipment to place 250 whole trees and 500 boulders in strategic areas while utilizing river flows to naturally accentuate the fluvial dynamics of the system following levee perforation or setback. Construct 23 ELJ's to split and direct flow, and to increase habitat complexity for all salmonid age classes. All measures are to provide improved physical habitat complexity and salmonid suitability for ESA salmonids. Side and off-channel habitats are aimed to benefit young of the year juvenile salmonids, whereas ELJ structures are intended to provide preferred habitat attributes such as overhead cover, pool depth and tail out features suitable for spawning.

2) Improve riparian attributes by planting 500 trees during implementation via track hoe trenching and hand planting of whips and rooted cottonwood stock. Plant an additional 500 supplemental plantings total by hand as whips during Fall and Spring dormancy periods until a desired level of survival (75%) and multi-story canopy is achieved within 6 grazing enclosures that were installed and within ELJ's. The function of riparian vegetation improvement is to provide nutrient input and channel shading to reduce water temperatures.

3) Improve water quality, increase base flow by 3 CFS within a 10-year timeframe, increase ground water table height by 2' to increase connectivity with between ground and surface flow, decrease Summer base flow water temperature by 2 degrees Fahrenheit over a 10-year period, reduce turbidity, detrimental erosional shear stress and transport of substrate beyond the project area by restoring the system from a transport to accumulation reach. Expand wetland surface spring habitats and wetland vegetation by 33% and reconnect surface springs with improved cover to the main stem NFWWR flows for juvenile salmonid inhabitance improvement. Continue WWBWC water quality monitoring protocols to compare pre-post construction comparisons of water quantity and quality to gage project effectiveness:

b. Secondary Objectives

1) Monitor and maintain the project to attain optimal performance over time by establishing proper riverine processes and function through restoration of a multi-threaded channel network that is self-sustaining: Meet primary objectives using adaptive management strategies when necessary with the ultimate goal of achieving proper riverine function and a self-sustaining, productive environment for ESA listed salmonid species through physical habitat uplift and suitability.

3. Monitoring Activities

a. What will be monitored

The most important activities are to assure that engineered designs are implemented accurately and effectively in the field and monitored and maintained over time. A variety of physical channel and habitat components are part of an extensive monitoring schedule of activities with associated timelines as shown in Tables 1-2.

b. How will it be monitored

Construction oversight on a daily basis is performed by the WWBWC WRS.

c. When will monitoring occur

The objective of presence throughout the implementation window is to assure that minimal, short-term environmental impact occurs and that optimal habitat suitability for ESA salmonids is achieved.

d. Who will conduct monitoring

These actions are the responsibility of the WWBWC Watershed Restoration Specialist (WRS) and hydrology staff.

e. Monitoring procedure and methodology

Water Temperature Monitoring

Collect 15-minute seasonal water temperature data the following NFWWR watershed gage locations as shown in Figure 2; 1). NFWWR RM 0.5, 2). RM 4, 3). Little Meadow Canyon, 4). Cup Gulch, 5). Little Meadow Canyon tributary. The NFWWR is listed on the Department of Environmental Quality 303d list for elevated water temperature. Water temperatures reach 24 Celsius, approaching lethal levels for bull trout and chinook, while hindering health of rainbow/steelhead and whitefish.

Turbidity Monitoring

Collect turbidity data via water sample analysis at five sites described above. Measurements taken monthly and during high flow.

Streamflow Monitoring

Collect year-round 15-minute streamflow data at the NFWWR RM 0.5 gaging station managed by the WWBWC. Some additional data is accessible for a gage located near RM 6 managed by the Oregon Department of Water Resources. This gage does not operate at the frequency of the RM 0.5 gage and is considered as a secondary source for supplemental data when available. As part of the holistic treatment of the project area, 20.2 acres of surface water irrigation rights were leased back to instream flow. Phase 1 was completed in 2021 and involved re-connection of 15 springs with the NFWWR. These two completed actions are expected to add up to 3 CFS to base flow during critical Summer months. Monitoring flow data will quantify changes in flow trends.

Physical Habitat

Cross sectional data and Wolman pebble counts are inventoried pre-construction for every reach. Physical habitat attributes will be inventoried by trained, experienced WWBWC staff utilizing ODFW Aquatic Habitat Inventory methodology at 5-year intervals to compare pre-project baseline results of physical habitat attributes to post-restoration metrics to determine magnitude of change. The following physical habitat metrics are to be inventoried and categorized; unit type, length, width, depth, channel type, slope, shade, eroding bank, undercut, riparian vegetation, active channel width and height, and terrace height. Counts and sizing of wood and boulder will be recorded. Calculations of the following will be determined; valley width index, sinuosity, width to depth ratio, entrenchment ratio, habitat complexity per 100m, pool frequency, and wood rating as it pertains to providing varying degrees of fish habitat. Summarization of data inventory results are then categorized using ODFW criteria shown in Table 3. Additional physical habitat features will be monitored to track project performance over time as shown in Tables 4-5.

Wetland Inventory

was conducted in 2023 and 2024 for the entire 5.2-mile project area prior to restoration actions. Study of existing National Wetland Inventory data bases is being used to document historical conditions prior to restoration and inform design strategies. Repeating wetland inventory 10-years after project onset is advisable with anticipation of increased wetland creation due to reconnective floodplain and surface to groundwater interaction strategies and anticipation of expanded and enhanced vibrancy of wetlands and associated vegetative components.

Redd Surveys

Monitoring the fish component within and adjacent to the project reaches allows for comparison of treated versus non-treated control areas to gage biotic response with changes in physical habitat restoration. A variety of fish and wildlife monitoring strategies will be utilized by WWBWC staff (Table 6, Figure 3). Steelhead spawning ground surveys will be conducted on an annual basis by WWBWC staff during March and April. WWBWC will monitor numbers of steelhead adults navigating through McNary Dam on the Columbia River and Nursery Bridge on the main stem Walla Walla River to correlate spawning ground survey timing with to potential fish movement and presence. In addition, monitoring of flow, temperature and turbidity will be done on a daily basis to refine field survey timing. Target water temperatures approaching 53 degrees Fahrenheit will be sought for estimating the onset of spawning timing and subsequent surveys. There may be overlap of spawning timing between steelhead and red band trout, therefore differentiation of O. mykiss will be tabulated separately for analysis and reporting. Experienced surveyors will walk the entire 5.2-mile stream length over a 2-day period every two weeks if water conditions are suitable for accurate assessment. Polarized glasses will be used to improve visual identification of redds, of which will be assigned GPS coordinates. Physical habitat attributes will be recorded at each redd location to associate degree of fish use with specific types of habitats. If there is a determination of positive association between habitat type and nest abundance, emphasis will be placed upon creating more of the preferred spawning habitats with future restoration actions. It is somewhat challenging to correlate physical habitat restoration impact upon biotic response of can have on life history stages of anadromous species that migrate to and from project areas due to the potential effects of external factors such as environmental conditions, harvest etc., on populations that migrate away from the project site as part of their life cycle. It is scientifically defensible to demonstrate effect on resident species and physical habitat suitability, therefore these monitoring actions will be part of our overall plan.

Snorkel Counts

Additional fish counting exercises will be conducted by trained WWBWC staff via snorkeling on an annual basis during the Summer to determine presence/absence and abundance of biota within project areas and compared with control locations to identify population trends. Field crews will snorkel all pools and at least 25% of non-pool habitat units, of which will be inventoried and classified by trained staff. Using an online random number generator, we will randomly select the unit numbers in sufficient number to survey 25% of non-pool units. The survey will observe all microhabitats: behind log jams, in pocket waters behind boulders, stream margins, etc. All salmonids will be counted and assigned a size class. Non-salmonids will be documented as present/absent. Snorkelers enter the stream a short distance below the downstream end of the channel unit to be surveyed, slowly and quietly assuming the face-down snorkeling position. After scanning the channel unit for fish from a stationary position, begin surveying in an upstream direction. The snorkeler will zigzag upstream, counting all salmonids and calling out numbers of species and size classes to a note taker on the streambank downstream of the snorkeler. WWBWC will monitor water temperature data in order to schedule snorkel surveys during the target range of 14-18°C. Basic Snorkel Survey Procedures will follow protocols established by the American Fisheries Society, O'Neal, 2007. At sites where pre/post treatment data comparisons can be made, salmonid abundance data will help evaluate project effectiveness.

Riparian Vegetation

Transects were established prior to implementation and will be utilized for documenting re-establishment of vegetative growth across an expanded floodplain as response to holistic restoration actions and performed at 5-year intervals as to allow vegetation to grown and result in measurable physical habitat uplift towards positive impact to project performance. Metrics such as river shading, ground cover, native species composition, canopy closure are measured in the monitoring transects. Riparian transect inventories will be conducted within the project area as well as upstream and downstream. Grazing enclosures comprised of natural woody materials were installed to reduce livestock and big game grazing pressure and ultimately improve overall survival of willow whips and rooted cottonwood trees sourced from a neighboring sub-watershed. Enclosures were comprised of 25' whole trees placed in square or rectangular configurations or as temporary, solar-powered electric, high-tinsel fencing strategies are being implemented to allow for grazing pressure rotation at selected areas while avoiding the high cost of installation and maintenance of traditional static fencing (Figure 4). Monitoring and evaluation of these tactics will dictate future installation guidance while performing implementation on remaining phases to be constructed. Photo points were established at various grazing enclosure areas protecting a wide variety of vegetative growth from sedges to naturally propagated saplings and planted tree stock for the purpose of documenting effectiveness.

Photo Points

Establishment and repeating photo points annually at locations utilizing drone and ground sourced imagery to document project progression over time. Imagery will be archived for comparison of project response to restoration actions. Annual photo points were already established using OWEB protocol (Figure 5). Drone footage, which provides visual documentation of side channel inundation frequency, the approximate portion of floodplain activation following a high flow event, and low flow conditions, will be useful monitoring data for this project on an annual basis to approximate whether target objectives are being met regarding floodplain and side channel activation.

f. Data management

WWBWC staff will continue to be the responsible party for collecting, analyzing, archiving and sharing all data associated with monitoring activities mentioned in this report. Internal processing is conducted during the initial phases of the process, which includes quality assurance checks throughout the data summarization process. Ultimately, results are released to a variety of online forums such as the WWBWC website, funding entity sites and presented formally via in-person presentations to inform interested parties of project status and accomplishments.

4. Use of Monitoring data

a. Analysis and reporting plan

Monitoring project performance over time ensures optimal performance. Projects are evaluated to identify areas properly functioning and therefore to be protected and preserved versus areas underperforming and requiring additional treatments through adaptive management strategy as the proper remedy is addressed to restore, enhance and expand areas of need. Ongoing analysis of water quality and quantity monitoring results in real time allow for timely monitoring and management of conditions related to these metrics. Conducting pre and post habitat inventory surveys and analyzing the data results informs adaptive management decisions to be made. Frequency and duration of monitoring activity schedules are ultimately determined by funding availability. Monitoring for the Project is intended to provide insight into an overall trend toward or away from project objectives. Monitoring will also inform the need to maintain project features in the near or long term. Based on the project goals, and in compliance with the programmatic physical and biological parameters will be monitored using standard data-collection field techniques. Monitoring activity will depend on capacity and funding available to collaborators.

b. How findings will be used

Data summation and interpretation inform the project adaptive management plan (Table 4) and help determine if project actions are achieving optimal project performance and self-sustainability over time, and if retreatment is necessary. Data findings from various assessments monitoring and evaluation practices and studies inform adaptive management actions and dictate project direction, treatment and progression as the objective process evolves. Learning from past project experience and applying the lessons and knowledge to subsequent project efforts is an effective strategy to optimize project results.

c. Sharing and disseminating Information

Data sharing with natural resource management partners is standard operating procedure for the WWBWC as we are considered a networking conduit between project partners. Monitoring data is archived and made public on the WWBWC website as well as through various quarterly and annual project reporting forums as required by individual funding entities such as the BPA Columbia Basin Fish & Wildlife Program and OWEB Oregon Watershed Restoration Inventory processes as required per ODFW PFA contractual agreement. The NFWWR restoration project has been featured in the Walla Walla Bulletin newspaper, Elkhorn Media internet article, PFA Board feature project presentation during November of 2024 on You Tube, River Restoration Northwest project of the month for November 2024, Department of State Lands State Land Board restoration project award winner for 2024 for phase 2, RM 3.6-4.4). The NFWWR project has 22 cooperating partners and growing as sequential phases become completed and momentum increases as accolades are accumulated. The WWBWC will continue to thoroughly promote the successful maturation of project progression by various means through expanded media resources.

A multitude of presentations and public outreach activities express project results to a variety of widespread audiences. The WWBWC has an expanding public relations focus, utilizing an increasing variety of media to educate and inform interested community and professional entities about project results. The NWWR project manager has given approximately 15 presentations on the topic to landowners, community groups and to natural resource partners. Several reports of various degree of detail have been completed and are available for public record. WWBWC strives to educate the community on watershed management strategies and how they are a proactive means of protection against future catastrophic events and how improvements to ecosystem health relate to the health of the human environment. Education efforts also teach how holistic restoration treatments have positive effects on water conservation and non-target species of interest to the public as well. The WWBWC has given considerable effort to showcasing the positive results of the overall project through various reports, presentations, videos and media releases to bring awareness to what is being done proactively to buffer effects from future flood events as well as to provide assistance towards recovery of ESA salmonids, which is an asset to the community. The WWBWC employs a full-time outreach specialist to promote project results.

5. Resources and Capacity for Monitoring

a. Staffing expertise and experience-

Qualified and experienced WWBWC staff lead project planning, permitting, implementation, monitoring, reporting and management activities;

WWBWC Staff- WRS Project Manager-Eric Hoverson, BS Biology with fisheries emphasis, water resources minor, University Wisconsin Stevens Point, 35-years applicable experience working with habitat requirements and population assessments of pacific northwest salmonids in the inland eastern portion of Oregon and Washington. Taught at the 200 level of college for 3 years teaching Watershed Processes and Restoration. Conducts grant funding processes, design review and advancement, permitting and construction oversight on a daily basis to assure design elements are implemented afield in an accurate manner.

WWBWC Staff- Executive Director-Troy Baker, BS degree in natural science with 25-years of experience as a consultant and with the WWBWC dealing with water related natural resources conservation topics, excelling in mapping, drone imagery monitoring and GIS. Conducts and assimilates drone imagery and develops short film media for project promotion.

WWBWC Staff-Project Manager-Tara Patton, BS degree Environmental Science, 15-years related experience with specialization in water quality and riparian monitoring and natural resource project management. Supervises the collection and advanced analysis of water quality and quantity data prior to releasing information to interested natural resource managers and public.

WWBWC Staff-Luke Adams-Watershed Technician Associates degree in Water Management, 10 years of related experience leading weekly field activities involving the collection and initial processing of water quantity and quality data.

The WWBWC trains and incorporates new staff into assisting with a variety of project monitoring activities to ensure seamless transition into the future for data gathering continuity and comparative repeatability, QA/QC, processing precision and standardization protocols.

b. Contractor expertise and experience-

Subcontractor specialists are recruited as necessary if additional experience/credentials are required in conduct of project duties;

Design Team- Cramer Fisheries-Phil Roni, published author and renown expert in the discipline of Pacific Northwest salmonids for 2 decades. Engineer Tyler Rockhill provides support through field assessment in development of designs and have related master's degrees and required professional certifications and excellent performance over a 10-year time period.

Design Team- Jacobs Engineering-Lisa Hall and Steve Clayton provide engineering expertise, project management, and have decades of experience.

Construction Team- Entities are selected through the WWBWC request for proposal bidding process to perform each annual phase of implementation and must meet required qualifications and possess applicable experience constructing similar natural resource restoration projects benefitting watershed ecosystems with demonstrated performance capabilities that emphasize enhancement of riverine systems across expansive floodplains of relatively large magnitude.

c. Training needs-

The WWBWC has a very experienced professional staff that conduct the majority of all actions. If there is a need for external expertise, the WWBWC secures subcontractors to participate in achieving program objectives.

d. Budget and funding sources-

BPA provides stable funding to the WWBWC for ongoing monitoring activities. OWEB has provided supplemental funding to expand monitoring and evaluation programs. ODFW PFA funding compensates staff time to assist in completion of monitoring.

6. Appendices

a. Detailed monitoring schedule

Table 1. Physical habitat ESA salmonid suitability monitoring activities for NFWWR RM 4.3-6.3 Floodplain Restoration.

Functional	Indicator	Units	Metrics	Analysis	Timing	Frequency	Duration
Floodplain	Inundation	Elevation	Modeling & Imagery	Frequency & Area of 2 & 5-Year Event	OHWM Exceedance	# Events Meeting Criteria	Based on Crest
Channel	Primary/2ndary Form	Hab. Units Per Ch. Form	Length, Width, Depth, Area	Primary/2ndary Channel Length, VWI	Summer	Pre/Post Construction	5-Year
Substrate	Gravel & Silt Abundance	% Size Class Composition	% Sz Class x Cumulative Unit Dimension	Changes to Area m2 Value	Summer	Pre/Post Construction	5-Year
Instream	Complex Suitability	Aq Inventory Category	Habitat, Undercut, Wood Rating, Pool	Cumulative & Categorical Rank	Summer	Pre/Post Construction	5-Year
Riparian	Vegetation	% & Degrees	Shade, Species, Canopy/Ground Cover	Transect Inventory, Photo Points	Summer	Once Per Year	2 Days
H20 Quality	Temperature	Degrees Celcius	Beyond OHWM Measurement	Suspended Solids Turbidity	High Flow	Opportunistic	Annual
H20 Quantity	Flow	CFS	Automated Intervals & Manual	Max/Min/Mean Determination	Continuous & Opportunistic	15-Minute Intervals	Annual

Table 2. Monitoring activities and timeline for the NFWWR conducted by WWBWC.

Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Frequency
Aquatic Habitat Inventory										X			5-Year
Channel Cross Section						X							1-Year
Pebble Count						X							1-Year
Photo Points													1-Year
Redd Survey			X	X									1-Year
Snorkel Survey						X							1-Year
Water Quality				X				X			X		1-Year
Water Quantity	X	X	X	X	X	X	X	X	X	X	X	X	1-Year

b. Supporting documents

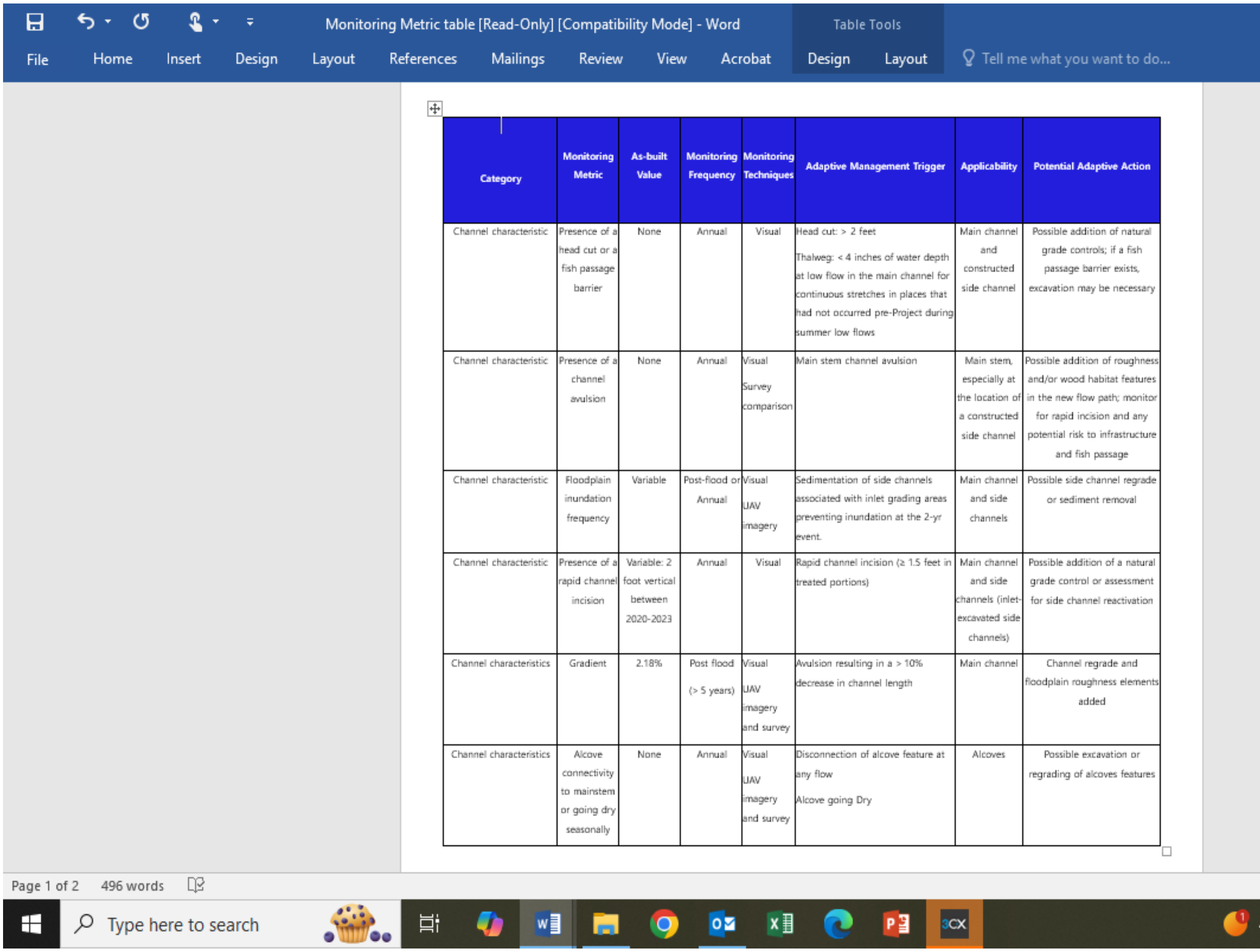
Table 3. Physical habitat ranking criteria established by ODFW.

Table 3. ODFW Aquatic Inventory and Analysis Project: Habitat Benchmarks.

POOLS	UNDESIRABLE	DESIRABLE
POOL AREA (% Total Stream Area)	<10	>35
POOL FREQUENCY (Channel Widths Between Pools)	>20	5-8
RESIDUAL POOL DEPTH (m)		
SMALL STREAMS (<7m width)	<0.2	>0.5
MEDIUM STREAMS (≥ 7m and < 15m width)		
LOW GRADIENT (slope <3%)	<0.3	>0.6
HIGH GRADIENT (slope >3%)	<0.5	>1.0
LARGE STREAMS (≥15m width)	<0.8	>1.5
COMPLEX POOLS (Pools w/ LWD pieces ≥3) / km	<1.0	>2.5
RIFFLES		
WIDTH / DEPTH RATIO (Active Channel Based)		
EAST SIDE	>30	<10
WEST SIDE	>30	<15
GRAVEL (% AREA)	<15	≥35
SILT-SAND-ORGANICS (% AREA)		
VOLCANIC PARENT MATERIAL	>15	<8
SEDIMENTARY PARENT MATERIAL	>20	<10
CHANNEL GRADIENT <1.5%	>25	<12
SHADE (Reach Average, Percent)		
STREAM WIDTH <12 meters		
WEST SIDE	<60	>70
NORTHEAST	<50	>60
CENTRAL - SOUTHEAST	<40	>50
STREAM WIDTH >12 meters		
WEST SIDE	<50	>60
NORTHEAST	<40	>50
CENTRAL - SOUTHEAST	<30	>40
LARGE WOODY DEBRIS* (15cm x 3m minimum piece size)		
PIECES / 100 m STREAM LENGTH	<10	>20
VOLUME / 100 m STREAM LENGTH	<20	>30
"KEY" PIECES (>60cm dia. & ≥10m long)/100m	<1	>3
RIPARIAN CONIFERS (30m FROM BOTH SIDES CHANNEL)		
NUMBER >20in dbh/ 1000ft STREAM LENGTH	<150	>300
NUMBER >35in dbh/ 1000ft STREAM LENGTH	<75	>200

*Values for Streams in Forested Basins

Table 4. Additional channel characteristics physical habitat metrics to be monitored and adaptively managed.



Category	Monitoring Metric	As-built Value	Monitoring Frequency	Monitoring Techniques	Adaptive Management Trigger	Applicability	Potential Adaptive Action
Channel characteristic	Presence of a head cut or a fish passage barrier	None	Annual	Visual	Head cut: > 2 feet Thalweg: < 4 inches of water depth at low flow in the main channel for continuous stretches in places that had not occurred pre-Project during summer low flows	Main channel and constructed side channel	Possible addition of natural grade controls; if a fish passage barrier exists, excavation may be necessary
Channel characteristic	Presence of a channel avulsion	None	Annual	Visual Survey comparison	Main stem channel avulsion	Main stem, especially at the location of a constructed side channel	Possible addition of roughness and/or wood habitat features in the new flow path; monitor for rapid incision and any potential risk to infrastructure and fish passage
Channel characteristic	Floodplain inundation frequency	Variable	Post-flood or Annual	Visual UAV imagery	Sedimentation of side channels associated with inlet grading areas preventing inundation at the 2-yr event.	Main channel and side channels	Possible side channel regrade or sediment removal
Channel characteristic	Presence of a rapid channel incision	Variable: 2 foot vertical between 2020-2023	Annual	Visual	Rapid channel incision (≥ 1.5 feet in treated portions)	Main channel and side channels (inlet-excavated side channels)	Possible addition of a natural grade control or assessment for side channel reactivation
Channel characteristics	Gradient	2.18%	Post flood (> 5 years)	Visual UAV imagery and survey	Avulsion resulting in a > 10% decrease in channel length	Main channel	Channel regrade and floodplain roughness elements added
Channel characteristics	Alcove connectivity to mainstem or going dry seasonally	None	Annual	Visual UAV imagery and survey	Disconnection of alcove feature at any flow Alcove going Dry	Alcoves	Possible excavation or regrading of alcoves features

Table 5. Additional physical habitat metrics to be monitored and adaptively managed.

Category	Monitoring Metric	As-built Value	Monitoring Frequency	Monitoring Techniques	Adaptive Management Trigger	Applicability	Potential Adaptive Action
Habitat survey	Substrate size (D_{50})	Varies (refer to the values for locations 1-4)	Annual, post flood (> 5 years)	Visual Wolman pebble count	Significant increase in sediment size and decrease in gradation	Designed streambed substrate mixes in a constructed side channel and at monitoring locations	Possible incorporation of wood key pieces or beaver dam analogues for sediment aggradation
Habitat survey	Average residual pool depth and count	3-5 feet; varies	Annual	Visual Survey rod	Pools > 2 feet in deposition and an overall decrease in count by 50%	Main channel	Possible addition of wood structures in select locations to encourage scour
Habitat survey	Vegetation cover from plantings	Not yet measured	Annual, 1 month post planting	Visual UAV imagery	< 50% survival < 60% after year 5 < 70% after year 10	Willow trenching planted areas	Revegetation, additional irrigation, and exclusion fencing to be assessed by WWBWC (see Photo 1).
Habitat survey	Large wood structures	Not yet measured	Annual	Visual Photo comparison	Significant scour exceeding design values and loose logs that have been dislodged from the structure	Main channel habitat structures and Floodplain pinned logs	Structures to be repaired and the reason for damage to be assessed

Table 6. Fish and wildlife species in the NFWWR project area with associated monitoring actions.

Species	Survey Method	Indicator	Unit/Category	Metrics	Analysis	Timing	Frequency	Duration
Mid-Columbia Steelhead	Redds	Visual Observation	Nest Count	# Per 5.2-Miles	# Per Reach, GPS Location, Habitat-Type	March/April	Every 2 Weeks	60 Days
Redband Rainbow Trout	Snorkel	Visual Observation	Relative Abundance	# Each 100 Meter Site	# in Each Site & Cumulative	June	1 Day in Month	5 Days
Chinook Salmon	Snorkel	Visual Observation	Relative Abundance	# Each 100 Meter Site	# in Each Site & Cumulative	June	1 Day in Month	5 Days
Bull Trout	Snorkel	Visual Observation	Relative Abundance	# Each 100 Meter Site	# in Each Site & Cumulative	June	1 Day in Month	5 Days
Mountain Whitefish	Snorkel	Visual Observation	Relative Abundance	# Each 100 Meter Site	# in Each Site & Cumulative	June	1 Day in Month	5 Days
Mountain Sucker	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Largescale Sucker	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Bridgelip Sucker	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Northern Pikeminnow	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Chiselmouth Chub	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Longnose Dace	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Speckled Dace	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Redside Shiner	Snorkel	Visual Observation	Presence Absence	P/A Within Each 100 Meter Site	Yes or No Species Individuals Each Site	June	1 Day in Month	1 Day
Tailed Frogs	Visual	Visual Observation	Relative Abundance	# Each 100 Meter Site	# Per Reach	March/Apr, June, Sep/Oct	Each Day Site Visit	30 Days
Pacific & Brook Lamprey	Visual	Visual Observation	Relative Abundance	# Each 100 Meter Site	# Per Reach	March/Apr, June, Sep/Oct	Each Day Site Visit	30 Days
Freshwater Mussels	Visual	Visual Observation	Relative Abundance	# Each 100 Meter Site	# Per Reach	March/Apr, June, Sep/Oct	Each Day Site Visit	30 Days

Figure 1. Map of location of the North Fork Walla Walla River floodplain restoration project area and watershed boundary.

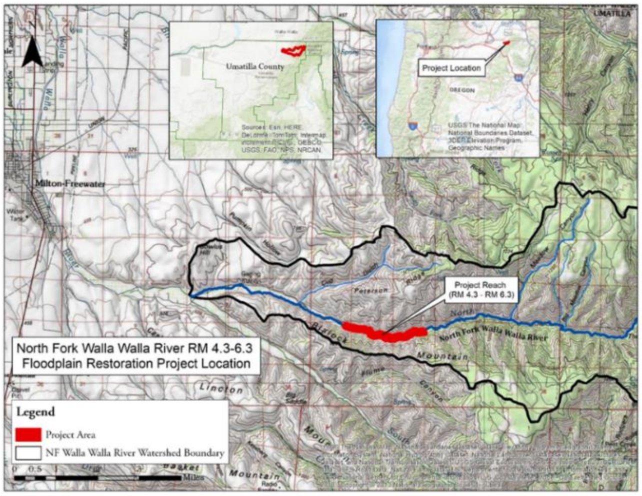


Figure 2. Map of locations of water quantity and quality, riparian transects, surface water shading inventory monitoring.

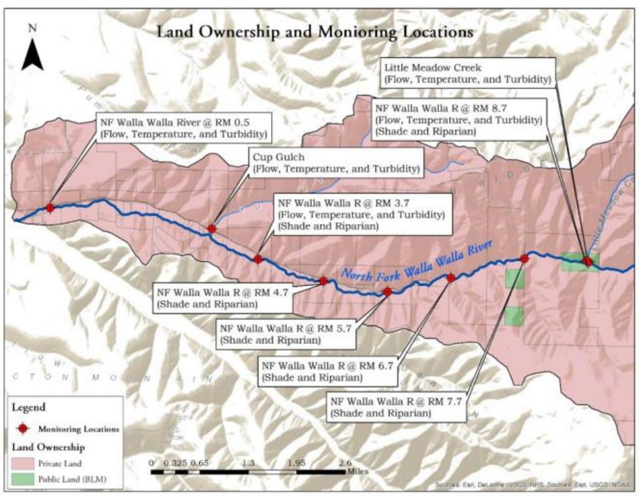


Figure 3. Map of identification of annual steelhead redd survey locations within project area and at external locations.

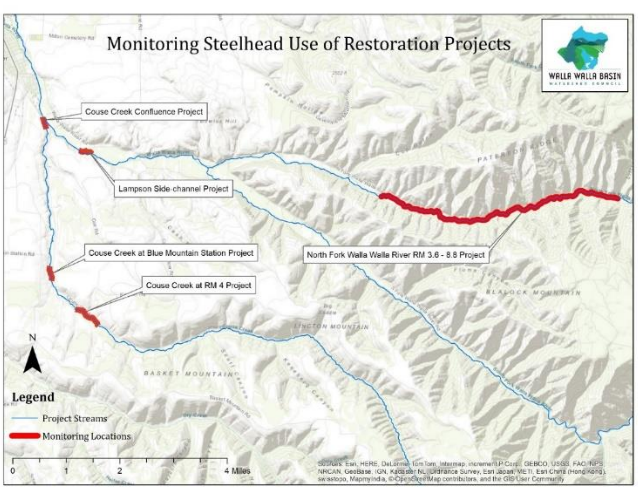
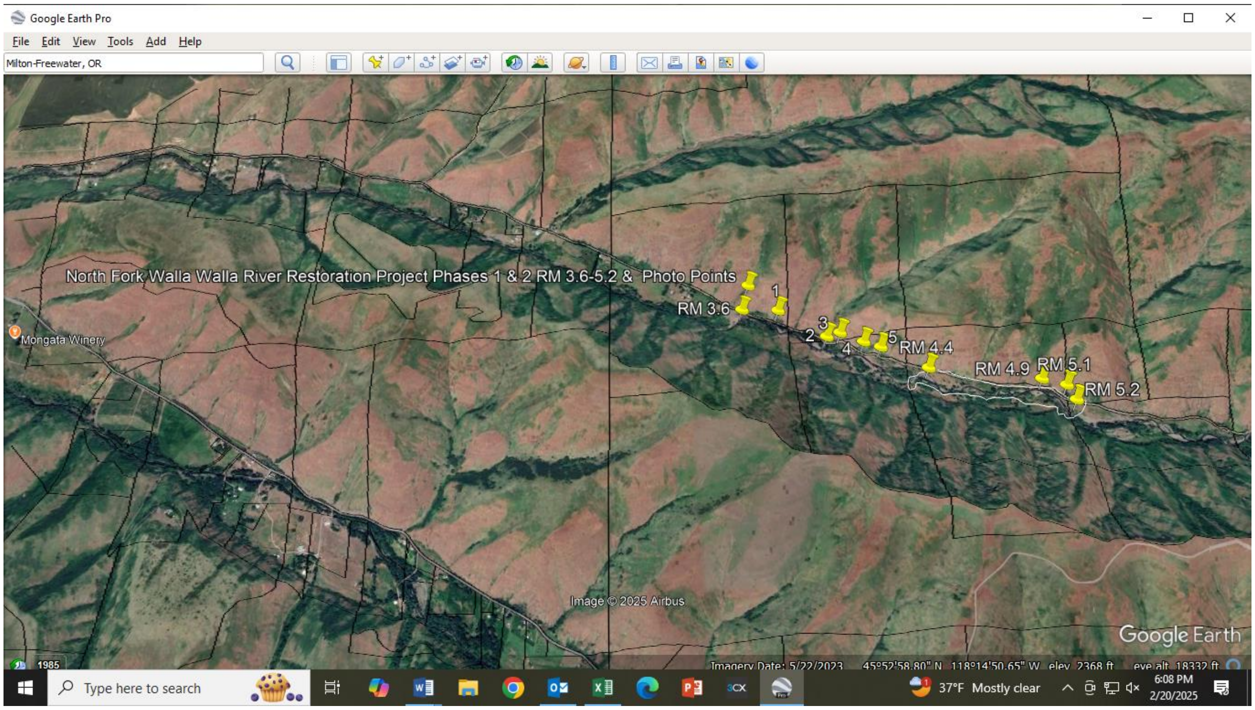


Figure 4. Photos of grazing enclosures to discourage impacts to riparian vegetation.

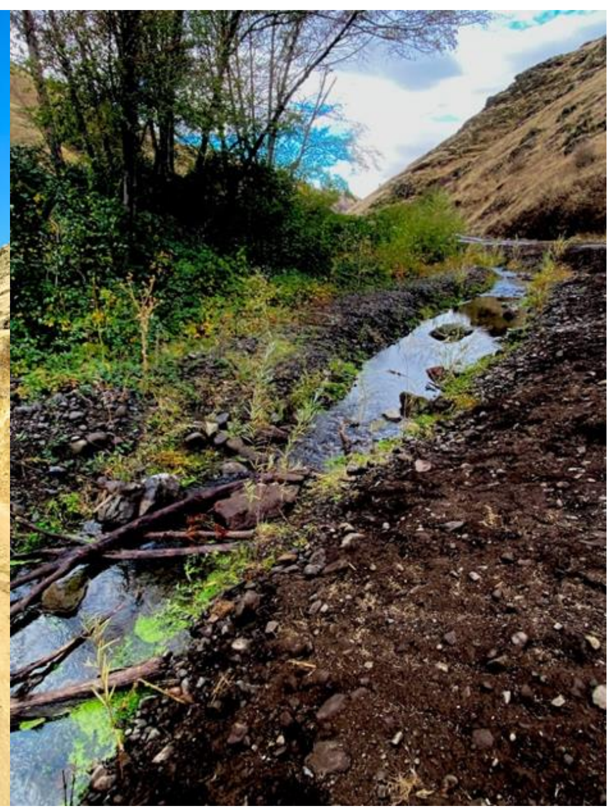
Figure 5. Pictures before and after restoration of the project area from downstream to upstream, RM 4.4, 4.9, 5.1, 5.2.



RM 4.4

RM 4.9

RM 5.1



RM 5.2

Reference Documents

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