Quality Assurance Project Plan

Riparian Monitoring for the Restoration Projects in the Wenatchee River Watershed

December 2024

Publication Information

Each study conducted for the Washington State Department of Ecology (Ecology) must have an approved Quality Assurance Project Plan (QAPP). This QAPP describes the data quality objectives and protocols for Riparian Planting Monitoring at Restoration Projects in the Wenatchee River Watershed.

Data for this project is unlikely to be posted on Ecology's Environmental Information Management (EIM). In the event the data are posted, they will be coded with Study ID WRSRP-2022-00188-003.

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Cover photo: View of typical planting setting in floodplain environments, captured by N. Legg

Quality Assurance Project Plan

Streamflow Monitoring for The Roaring Creek Restoration Project

Grant Agreement Number: WRSRP-2022-CascCD-00188

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1.0 Abstract

In 2022, Cascadia Conservation District (CCD) received a Streamflow Restoration Grant from the Ecology's Water Resources Program (WRSP-2022-CascCD-00188). The project involves instream and floodplain restoration components proposed at a series of sites in the Wenatchee and Entiat River Watersheds. These restoration projects intend to restore instream function, salmon habitat, and streamflow, using a combination of low-tech and full-floodplain restoration techniques. A portion of the grant includes development of a Monitoring and Adaptive Management Plan (MAMP) and proposed monitoring at these sites for effectiveness of restoration measures and in some cases, streamflow monitoring to assess potential changes in water storage resulting from restoration actions. The MAMP, which is available under separate cover, details several distinct protocols geared toward various site conditions, restoration techniques, and monitoring goals. Therefore, not all protocols are applied at all sites.

This Quality Assurance Project Plan (QAPP) details the protocols for monitoring of riparian planting and restoration at seven sites proposed for process-based restoration within Chelan County, Washington. The monitoring approach described here is identified as an Optional Protocol under the above referenced MAMP. The proposed monitoring approach involves ground-based observation of the success of plantings and riparian restoration efforts. The data collected are mostly qualitative and semi-quantitative in nature and intended to inform tracking and adaptive management of plantings. The proposed monitoring is planned to start in fall of 2024 and extend through the grant period ending in 2027. Implementation of restoration measures at the sites will occur in the summer-fall seasons of 2024 and 2025. The protocol involves data collection on structure installations and characteristics at the time of implementation and is followed by post-implementation monitoring in subsequent seasons.

2.0 Background

2.1 Introduction

In 2022, Cascadia Conservation District (CCD) received a Streamflow Restoration Grant from the Ecology's Water Resources Program (WRSP-2022-CascCD-00188). As part of this project, riparian plantings will be installed at seven sites in conjunction with instream and floodplain restoration components in the Wenatchee and Entiat River Watersheds. These restoration projects intend to restore instream function, salmon habitat, and streamflow, using a combination of low-tech restoration techniques and riparian revegetation.

This QAPP details the protocols for monitoring riparian planting success at the seven project sites within Chelan County, Washington. The monitoring approach is designed to track the establishment, survival, and growth of planted vegetation, as well as natural regeneration and potential impacts from invasive species or wildlife.

The proposed monitoring is planned to start in fall of 2024 and extend through the grant period ending in 2027. Implementation of restoration measures at the sites will occur in the summer-fall seasons of 2024 and 2025. The protocol involves data collection on structure installations and characteristics at the time of implementation and is followed by post-implementation monitoring in subsequent seasons.

2.2 Relevant QAPP

This QAPP drew elements from previous QAPPs where applicable. Those include:

- QAPP developed by Maloney et al. and approved by Ecology in March 2023 for the Icicle Creek Alluvial Water Storage Project Monitoring, with designated Ecology publication number 23-12-005.
- QAPP Develop by Whipple et al and approved by Ecology in October 2021 for the "Restoring Streamflow after Wildfire in Okanogan and Methow River Sub-Basins (agreement # WRSRP-2020-MSRF-00010)

In some cases, procedural descriptions were adapted directly from these previously approved QAPPs.

2.3 Study area and surroundings

The project area includes seven distinct restoration project sites in tributaries of the Wenatchee River within Chelan County, WA. The named tributaries include Eagle, Derby, and Little Chumstick Creeks. Each individual project area corresponds with a parcel or series of parcels owned by a single landowner. Figure 1 shows the general locations of these project sites and monitoring locations. These riparian plantings will be installed in concert with proposed instream restoration using low-tech restoration structures.

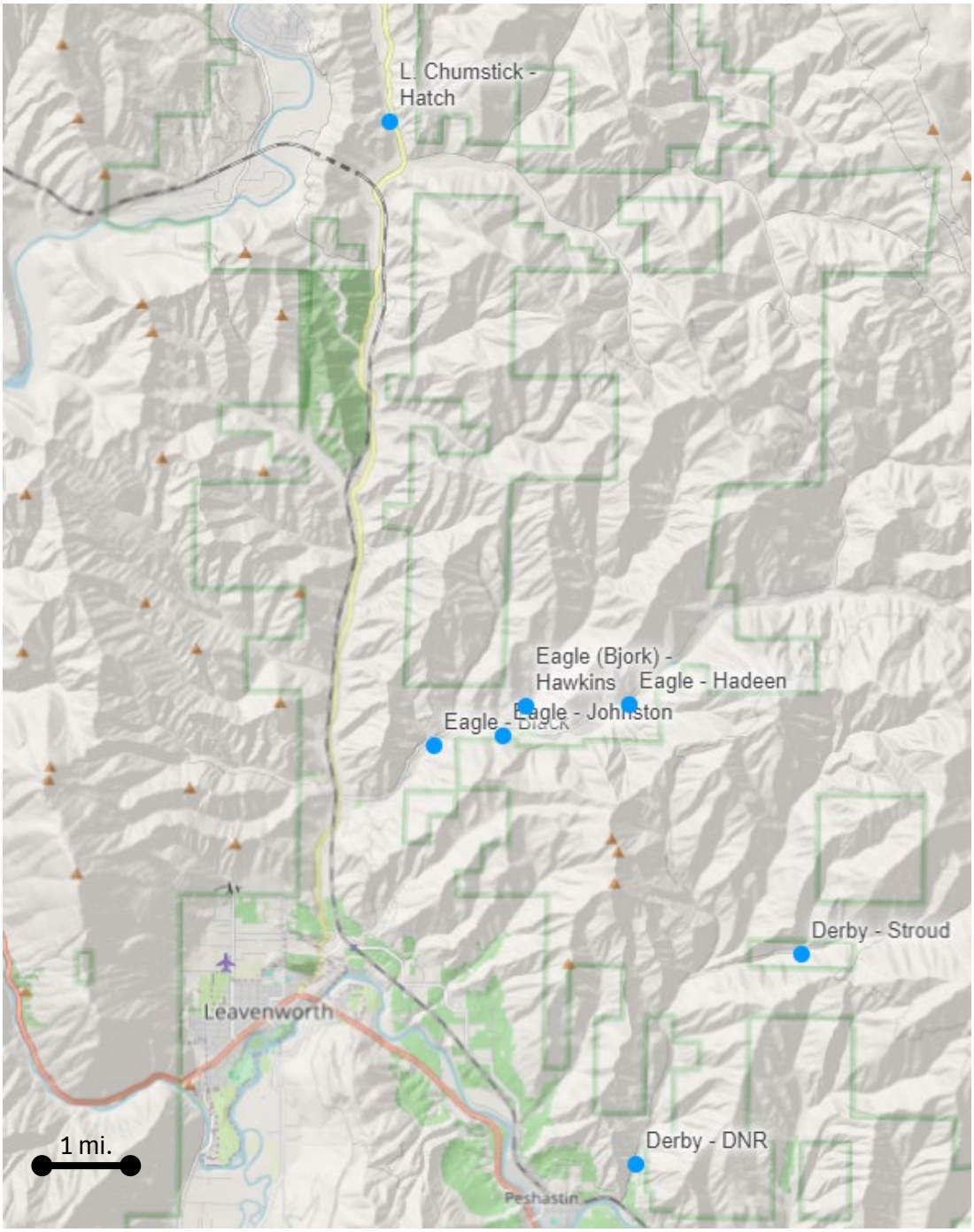


Figure 1. Specific project locations (blue) within the project area within Chelan County and the Wenatchee River watershed.

2.3.1 Summary of existing data

Not applicable.

2.3.2 Parameters of interest and potential sources

The monitoring parameters of interest for this protocol address key aspects of riparian planting success and information needed to inform adaptive management strategy:

- Plant survival and growth
- Natural regeneration
- Invasive species presence and extent
- Soil moisture and amendments
- Wildlife interactions
- Success criteria evaluation
- Adaptive management needs

The protocol takes the form of a checklist and data entry form, which is attached in Appendix A. The protocol is designed to be rapidly implemented (~10 minutes per planting area).

2.3.3 Regulatory criteria or standards

Not applicable

3.0 Project Description

3.1 Project goals

The overall goal of the proposed monitoring is to assess the success of riparian plantings installed as part of stream restoration project**s** and to inform adaptive management decisions to ensure long-term establishment of a healthy riparian zone.

3.2 Project objectives

The objectives of this proposed monitoring are to:

- Document initial planting conditions, including species mix, planting methods, and site characteristics.
- Track plant survival, growth, and vigor over time.
- Assess natural regeneration within planting areas.
- Monitor the presence and impact of invasive species.
- Evaluate the effectiveness of protective measures and irrigation systems.
- Identify wildlife interactions (both positive and negative) with planted vegetation.
- Determine when success criteria have been met for each planting area.
- Inform adaptive management decisions to improve planting success and overall riparian restoration efforts.

3.3 Information needed and sources

The information needed for this project will be collected through field observations at planting areas. Two main data collection efforts will occur:

- Pre-project (implementation) data collection: Conducted during the installation of restoration structures.
- Post-project monitoring: Conducted at regular intervals following implementation.

3.4 Tasks required

Tasks required to collect necessary data include:

1. Develop field databases for pre-project and post-project data collection.
2. Conduct pre-project data collection during planting.
3. Conduct post-project monitoring of planting areas at specified intervals.
4. Manage and analyze collected data to inform effectiveness and adaptive management measures.

3.5 Systematic planning process

This QAPP represents the systematic planning process and include the key elements:

1. Description of the project, goals, and objectives.
2. Project organization, responsible personnel, and approximate schedule.
3. Study design to support the project goals/objectives and procurement of data.

4. Specification of quality assurance (QA) and quality control (QC) activities to assess the quality performance criteria.
5. Data analysis, data storage, and reporting of acquired data.

4.0 Organization and Schedule

4.1 Key individuals and their responsibilities

Table 1. Organization of project staff and responsibilities

Staff	Title	Responsibilities
Mark Ingman Cascadia Conservation District, Project Manager 509-906-1545 Mark Ingman marki@cascadiacd.org	Project Manager, Field Lead	Manages the grant and project. Leads restoration implementation and effectiveness monitoring. Leads field data acquisition and data management.
Ryan Williams Cascadia Conservation District, Executive Director RyanW@cascadiacd.org	Contract Management	Signs contracts and provides organizational oversight
Alex Harwell Cascadia Conservation District, Resource Specialist II alexh@cascadiacd.org	Co-Manager	Co-leads restoration implementation and effectiveness monitoring. Leads field data acquisition and data management.
Nick Legg, LG Lichen Land and Water Inc. 763-350-3052 nick@lichenlandwater.com	Technical Advisor, QAPP Author, Geomorphologist	Advises on the technical monitoring components. Drafts and finalizes QAPP. Reviews data. Analyzes and interprets data. Supports entry of data into EIM. May visit field
Jill Scheffer, WA Department of Ecology Water Resources Program jill.scheffer@ecy.wa.gov; (509) 907-1161	Streamflow Grant Manager	Grant administration

Staff	Title	Responsibilities
Christina Frans Department of Ecology Quality Assurance Office christina.frans@ecy.wa.gov (360) 995-2473	Christina Frans QA Officer	Reviews the draft QAPP and approves the final QAPP.

4.2 Special training and certifications

Mark Ingman has a master's degree in water policy and management and has managed water-related projects for over 10 years.

Alex Harwell holds a master's degree in environmental horticulture and ecological restoration and has led conservation and riparian restoration efforts for over 15 years

Nick Legg is a licensed geologist in Washington and has been working as a geomorphologist on stream restoration, monitoring, and assessment for over 15 years. He holds a master's degree in geology (geomorphology emphasis).

4.3 Proposed project schedule

Table 2 documents the proposed schedule for monitoring.

Table 2. Proposed schedule for monitoring

Task	Target date	Description
Monitoring preparation reports		
Final QAPP	October 20, 2024	Revised completed QAPP, responsive to all comments from Ecology's Designated Reviewer.
Restoration Implementation and Data Collection		
Install restoration projects and collect pre-project data concurrently	October 2024 to October 2025	Installation of plantings
Post Project Monitoring		
Collect post-project monitoring through grant period end	Summer-Fall 2025-2027	Monitoring frequency based on recommended frequencies below
Enter data into EIM database. Post-restoration report summarizes streamflow and temperature gaging data, and	2027	At completion of Streamflow grant funding

Task	Target date	Description
changes resulting from restoration		

5.0 Quality Objectives

5.1 Data quality objectives

The main data quality objective for this project is to collect riparian success data representative of the project locations in a manner consistent with the measurement quality objectives described below, and to analyze these data to inform the need and nature of adaptive management.

5.2 Measurement quality objectives

Given the qualitative and semi-quantitative nature of most measurements in this protocol, traditional measurement quality objectives (e.g., precision, bias, sensitivity) are less applicable. However, the following objectives will be pursued:

- Comparability: Field staff will adhere to common field protocols to improve comparability between this and similar studies. Overlapping team members will conduct duplicate data collection on at least 2 planting areas per year during any season when field team members change.
- Completeness: A target of 90% completeness will be set for all planned observations and measurements. Field staff will use established field database forms that record location data and observational data. The completeness target does not specify the percentage of planting areas to be monitored. Rather, it specifies the completeness of data collection for the monitored planting areas.

5.3 Acceptance criteria for quality of existing data

Not applicable

5.4 Model quality objectives

Not applicable.

6.0 Study Design

6.1 Study boundaries

See Figure 1 for an overview of the site locations and Appendix B for detailed site layouts.

6.2 Field data collection

6.2.1 Sampling locations

The study boundaries are defined by the seven project sites within the Wenatchee River watershed in Chelan County, WA, as described in Section 2.3. Each site will have one or more designated planting areas (plots) based on varying conditions, landscape positions, and restoration objectives. The estimated planting areas per site are listed in Table 3.

Table 3. Summary of restoration site locations and estimated (planned) planting areas at each site. Monitoring data will be collected at each planting area mapped and established during the plant installation effort.

		Coordinates (latitude, longitude)		Planned Planting Areas
Creek	Reach Name/ Landowner	Downstream End	Upstream End	(square feet)
Derby	DNR	47.57542, -120.58412	47.57966, -120.58236	25,500
Derby	Stroud	47.60506, -120.54966	47.60670, -120.54217	375,830 (total site)
Eagle	Black	47.63434, -120.62653	47.63520, -120.62201	27,000
Eagle (Bjork Creek Trib)	Hawkins	47.63904, -120.60804	47.64092, -120.60568	1,000
Eagle	Hedeen	47.64029, -120.58558	47.64109, -120.58463	22,100
Eagle	Johnston	47.63578, -120.61188	47.63584, -120.61125	500 (narrow band along creek)
Little Chumstick	Hatch	47.72221, -120.63578	47.72395, -120.63654	37,423

6.2.2 Sampling Frequency (Spatial and Temporal)

Suggested data collection will occur in two distinct phases:

- During planting/installation: Data will be collected for each planting area, including site characteristics, planting details, pre-treatment, and initial conditions.
- Post-project monitoring: Regular monitoring visits will occur according to the following schedule:
    - Years 1-3: Three visits per year (spring, mid-summer, and fall)

- Years 4-6 (or until success criteria are met): Two visits per year (spring and fall)

6.2.2 Field parameters to be measured

Parameters to be measured include both qualitative and semi-quantitative data, as outlined in the monitoring checklist (Appendix A). Key parameters include:

During planting/installation:

- General site conditions
- Establish goals and success criteria
- Plot characteristics (location, size, adjacent land uses)
- Existing vegetation cover and invasive species presence
- Soil and substrate conditions
- Planting details (species mix, count, size, method)
- Irrigation and protective measures implemented
- Weather and climate information
- Pre-treatment methods

Post-project monitoring:

- Plant survival percentage and vigor (by species)
- Plant growth (height and canopy girth)
- Natural regeneration extent and species
- Invasive species presence and extent
- Soil moisture levels (general observation)
- Wildlife interactions
- Success criteria evaluation
- Identify adaptive management needs and/or exit strategy

6.3 Modeling and analysis design

Not applicable

6.4 Assumptions underlying design

We assume that rapid data collection at each project area will be sufficient to inform the performance and adaptive management needs of planting areas. The data are not collected in a rigorous manner suitable for scientific research because that level of rigor is not economical for CCD and is also beyond the needs of typical adaptive management decision-making processes.

6.5 Possible challenges and contingencies

6.5.1 Field challenges

Logistical problems that interfere with measurement collection are likely to occur during field work. These problems may include inability to measure streamflow due to:

- Deep or high velocity water that pose a risk for personnel safety, although in most cases observations will be conducted in floodplain and adjacent riparian areas.

- Landowner coordination and access constraints is a factor that can influence data collection efforts
- Increasingly thick vegetation growth in planting areas can preclude consistent observation; however, this is usually a sign of success in riparian restoration goals and cessation of monitoring needs.

We will make measurements only where/when safe and effective to do so (USGS, 2014).

6.5.2 Practical constraints

Practical constraints that can interfere with project monitoring may include scheduling problems with personnel or availability of adequate resources, both human and budgetary.

6.5.3 Schedule limitations

CCD is an organization who is focused primarily on implementation of natural resources related projects. The purpose of this monitoring is to rapidly assess the effectiveness of those actions. The qualitative and rapid nature of this protocol is designed to work within those capacity constraints, although they may still arise and need to be managed at that time.

7.0 Field Procedures

7.1 Invasive species evaluation

Field staff will follow the Ecology Environmental Assessment Program (EAP's) SOP EAP070 on minimizing the spread of invasive species (Parsons et al. 2012). At the end of each field visit, field staff will clean field gear in accordance with the SOP for minimizing the spread of invasive species for areas of both moderate and extreme concern. Areas of extreme concern have or may have invasive species, such as New Zealand mud snails, which are very difficult to clean off equipment and are especially disruptive to native ecological communities.

Field staff will minimize the spread of invasive species after conducting field work by:

- Inspecting and cleaning all equipment by removing any visible soil, vegetation, vertebrates, invertebrates, plants, algae, or sediment. If necessary, a scrub brush will be used and then rinsed with clean water either from the site or brought for that purpose. The process will be continued until all equipment is clean.
- Draining all water in samplers or other equipment that may harbor water from the site. This step will take place before leaving the sampling site or at an interim site. If cleaning after leaving the sampling site, field staff will ensure that no debris will leave the equipment and potentially spread invasive species during transit or cleaning.

Staff will follow established Ecology procedures if an unexpected contamination incident occurs.

7.2 Measurement and sampling procedures

Field procedures will follow the riparian planting monitoring checklist as detailed in the protocol. This includes:

- Pre-planting site assessment and plan development

- Data collection during planting/installation
- Post-project monitoring visits

Field staff will use ESRI Field Maps on mobile devices to record data, ensuring consistent and geo-referenced data collection. The general procedure for each monitoring visit is as follows:

- Navigate to the designated planting area (plot)
- Complete all relevant sections of the monitoring form in Field Maps
- Take photographs at established photo points
- Assess plant survival, growth, and overall site conditions
- Evaluate success criteria and identify any needed adaptive management actions

7.3 Equipment and Supplies

Required equipment and supplies include:

- Mobile device with ESRI Field Maps app installed and basemaps and layers cached
- GPS unit (if not using mobile device for location)
- Digital camera
- Measuring tape or range finder
- Plant identification guides for general reference (detailed plant identification is not required, beyond distinguishing the species of plantings)

7.4 Containers, preservation methods, holding times

Not applicable

7.5 Equipment decontamination

Not applicable

7.6 Sample ID

Not applicable

7.7 Chain of custody

Not applicable

7.8 Field log requirements

Data will be recorded in an electronic GIS-based database that allows users to record data consistently, completely, and in a geolocated format. The MAMP developed in concert with this QAPP included the development of a field database template in ESRI® Field Maps. This template allows for consistent data management and streamlined export/storage.

7.9 Other activities

No other activities not included in previous sections are anticipated at this time.

8.0 Laboratory Procedures

8.1 Lab procedures table

Not applicable

8.2 Sample preparation method(s)

Not applicable

8.3 Special method requirements

Not applicable

8.4 Laboratories accredited for methods

Not applicable

9.0 Quality Control Procedures

Implementing quality control (QC) procedures provides the information needed to assess the quality of the data that is collected. These procedures also help identify problems or issues associated with data collection while the project is underway.

Quality control for this project will focus on consistent application of the protocol and thorough documentation of observations.

9.1 Field and laboratory quality control

The following measures will be implemented:

1. Training: All field staff will receive training on the monitoring protocol, basic plant identification, and use of the Field Maps app before conducting surveys. In the event that monitoring staff are individuals who were not involved in the restoration implementation, they will be provided project background and information on the original riparian objectives and planting details.
2. Data completeness and review checks: The project manager will check for completion of field databases within approximately two week of field data acquisition. They will identify data anomalies requiring a field revisit.
3. Photo documentation: Consistent photo point monitoring will provide visual verification of site conditions and plant growth.
4. Duplicate observations: At least 5% of plots will have duplicate observations made by different team members to assess consistency in qualitative assessments.

5. Data review: The Project Manager or designated QA officer will review all collected data within one week of each monitoring visit to identify any anomalies or inconsistencies.
6. Managing monitoring staff turnover: At the beginning of each monitoring season, or when field staff change, a set of replicate data (3 planting plots minimum) will be collected independently by field staff for comparison and quality control of data collection procedures. The project manager will maintain involvement in this QC effort in all cases.

9.2 Corrective action processes

QC results may indicate problems with data during the course of the project. Corrective action processes will be used if any of the following occur:

- Activities are inconsistent with the QAPP.
- Results do not meet MQOs or performance expectations.
- Missing data fields

In general, these errors will be addressed through re-collection of data, where necessary to inform project-level decision making. In some cases, data collection may be deferred to the following year depending on the visual recollection of observed stream changes and/or needed adaptive management.

10.0 Data Management Procedures

Field technicians will record all field data in the electronic collection platform described above, ESRI Field Maps. Before leaving each site, staff will check the database for missing or improbable measurements. Field technicians will ensure these data sync with CCD's online ESRI account when returning from the field. This online platform provides backup. At the end of each field season, the staff will download all field data from the online database for storage and analysis. Raw data files will be stored separate from processed data files.

Staff will keep all final spreadsheet files, paper field notes, and final products created as part of the data collection and data QA process with the project data files.

10.1 Data recording and reporting requirements

Data collected under this QAPP will be transferred annually to Ecology's EIM database via coordination with Ecology staff. Data will be reviewed for accuracy prior to submission to EIM by graphing the data to assess outliers; querying the data to detect ranges, averages, and other statistical quantification to assess the accuracy of the data against itself and other data loggers.

10.2 Laboratory data package requirements

Not applicable.

10.3 Electronic transfer requirements

This process involves simple download of field data from the ESRI online application.

10.4 EIM data upload procedures

Staff may formulate and submit applicable data funded by Ecology into Ecology's EIM data system. Staff will use EIM templates found in the EIM help center (https://apps.ecology.wa.gov/eim/help/HelpDocuments) to submit data including, location of monitoring data points and the associated parameters, as described in Appendix A. However, the data are anticipated not to be applicable for entry in EIM.

10.5 Model information management

Not applicable.

11.0 Audits and Reports

11.1 Field, laboratory, and other audits

No formal audits will be conducted.

11.2 Responsible personnel

Not applicable.

11.3 Frequency and distribution of reports

Results of the field data collection, data quality assessment, and any data analysis will be documented in annual and final (end of grant) reports and submitted to the project grant page in Ecology's Administration of Grants and Loans (EAGL) system. Staff will also distribute all final reports to all other stakeholders involved or interested in the study as determined by CCD and Ecology.

11.4 Frequency and distribution of reports

The Field Lead (Table 1) will be responsible for analyzing data and preparing the draft final report. The Field Lead will also be responsible for verifying data completeness and usability before the data are used in the technical report and entered into EIM. The Project Manager will review the draft and coordinate internal review. The Project Manager will be responsible for assigning a peer reviewer with the appropriate expertise for the technical report. The final report will go through an internal (CCD) and external (Ecology) review process. The peer reviewer is responsible for working with the report author to resolve or clarify any issues with the report.

12.0 Data Verification

12.1 Field data verification, requirements, and responsibilities

CCD staff will check field notebooks and electronic information storage for missing or improbable measurements and verify initial data before leaving each site. This process involves checking the data sheet (written or electronic) for omissions or outliers. If measurement data are missing or a measurement is determined to be an outlier, the measurement will be flagged in the data sheet and repeated if possible. The field lead is responsible for in-field data verification.

Upon returning from the field, staff will either manually enter (data recorded on paper) or download from instruments all data and then upload it into the appropriate database or project folder (see Data Management Section). Manually entered data will be verified/checked by a staff member who did not enter the data. Downloaded electronic data files will also be checked for completeness and appropriate metadata (e.g., filename, time code).

12.2 Laboratory data verification

Not applicable.

13.0 Data Quality (Usability) Assessment

13.1 Process for determining if project objectives were met

The field lead will assess all data (qualified and unqualified), results or verification, compliance with MQOs, and the overall quality of the data set to provide a final determination regarding usability in the context of the project-specific goals and objectives. The final report will document whether the final, acceptable-quality data set meets the needs of the project (i.e., allows desired conclusions/decisions to be made with the desired level of certainty).

13.2 Data analysis and presentation methods

Data found to be of acceptable quality for project objectives will be analyzed before being summarized. Any relevant and interesting data analysis will be presented in the final report using a combination of tables and plots of various kinds, such as time series plots, histograms, and box plots.

Data analysis will include calculation of summary statistics and creation of visualizations to track changes over time. Because the monitoring approach relies on indicators of change, as opposed to detailed change detection, the summary statistics will not necessarily require direct comparability between repeat monitoring datasets.

13.3 Sampling design evaluation

The project manager will assess whether (1) the data package meets the MQOs, and criteria for completeness, representativeness, and comparability and (2) meaningful conclusions can be drawn from data visualizations and summary statistics.

Given that the monitoring effort is designed to rapidly and coarsely provide data to inform effectiveness tracking and adaptive management decision making, the burden of data quality is not as high as research-grade studies and evaluations.

Compliance with this QAPP helps ensure that data collected during this project, will meet project goals and objectives.

13.4 Documentation of assessment

Team members will document the data usability assessment in the final report for the project.

14.0 References

Lichen Land and Water Inc., 2024. Monitoring and Adaptive Management Plan for Process-Based Stream Restoration Projects. Submitted to Cascadia Conservation District. Draft version dated June 2024.

Maloney, B.; Holland, M; and Dickerson-Lange, 2023. Quality Assurance Project Plan for the icicle Creek Alluvial Water Storage Project, EIM Study ID: WROCR-2123-00025, Ecology publication No. 23-12-005, March 2023

Parsons J., D. Hallock, K. Seiders, B. Ward, C. Coffin, E. Newell, C. Deligeannis, and K. Welch. 2012. Standard Operating Procedure to Minimize the Spread of Invasive Species. Version 2.0. Washington State Department of Ecology, Olympia, WA. SOP Number EAP070.

USGS, 2014, Safety and Health for Field Operations, Handbook 445-3-H; https://www.usgs.gov/media/files/445-3-h-safety-and-health-field-operations

Whipple, A. 2021. Quality Assurance Project Plan for the Restoring Streamflow after Wildfire in Okanogan and Methow River Sub-Basins, Agreement ID: WRSRP-2020-MSRF-00010, October 2021

15.0 Appendices

Appendix A – Detailed Description of Monitoring Parameters
Appendix B – Project Area Specific Planting Plans

Appendix A – Methods for Monitoring Data Collection – Riparian Plantings Monitoring

1 Overview

The following is a description of data collection considerations for the riparian planting protocol. The protocol is intended to track the success of riparian plantings in association with stream restoration projects.

Field data and observations will be will be collected via an ESRI Field Maps database. The user will use the Field Maps platform to map out planting area polygons and then enter basic data for each defined polygon, as described below. The user may define multiple planting areas (plots) in a given project are based on landscape positions, site conditions, restoration objectives, and planting strategies. In the case of having multiple defined planting areas within a project area, the field form would be filled out for each individual polygon.

The protocol addresses data collection (1) during plant installation and (2) post-project monitoring visits.

This monitoring approach was developed based on experienced input from Camden Shaw, PlantasCo., who has run a riparian restoration business in the Methow River Valley for over a decade. The intent was to develop a protocol for practical data collection that focuses on tracking success and adaptive management needs for planting areas.

2 Monitoring Frequency

After the initial planting and data collection, the following are recommended minimum monitoring frequencies:

- Year 1-3: Three visits per year (spring, mid-summer, and fall)
- Year 4-6 (or until success criteria are met): Two visits per year (spring and fall)

3 Implementation (Pre-Project) Data Collection

Pre-project data are collected in concert with planting efforts. The data collection serves as a documentation of planting efforts and captures relevant climate and planting area conditions to contextualize port-project monitoring.

The user may define multiple planting areas (plots) in a given project based on varying conditions, landscape positions, site conditions, and objectives. In that case, the form would be filled out for each individual planting area or plot.

3.1 Location and Project Description

General Description: Accurate documentation of the location and project details is fundamental for tracking the progress and effectiveness of riparian restoration efforts. This information provides a clear reference for the specific planting area, ensuring consistent data collection over time and facilitating comparisons across different project sites.

Data Name	Details of Data Collection
Project/Reach ID	Name of project or reach
Plot ID	Identifier of planting area or plot
Date of Installation	Date of installation
Planting area (plot) description (if needed)	Description as needed. User may include specific rationale for distinguishing this planting area from others within the project
Adjacent vegetation conditions	Generally describe adjacent vegetation conditions as needed
Adjacent Land Uses	*What to Collect:* User notes the dominant land uses surrounding the planting area ☑ Natural/Undeveloped – Unmanaged natural area ☑ Natural/Undeveloped – Managed forest ☑ Natural/Undeveloped – Rangeland/grazing land ☑ Agricultural – Dryland crops ☑ Agricultural – Irrigated crops ☑ Agricultural – Orchard/vineyard ☑ Residential – Rural ☑ Residential – Suburban ☑ Residential – Urban ☑ Commercial/Industrial ☑ Recreational (e.g. parks, sports fields) ☑ Infrastructure (e.g., roads, railways) ☑ Other (specify)
Riparian Restoration Objectives	*What to Collect:* User selects the desired restoration outcomes ☑ Restoring riparian forest and understory ☑ Floodplain revegetation ☑ Bank stabilization ☑ Engineered or placed logjam vegetation ☑ Beaver co-existence ☑ Vegetated island formation ☑ Upland restoration ☑ Shading ☑ Revegetation after construction disturbance ☑ Additional or more specific goals:
Describe Associated Stream Restoration Elements	*What to Collect:* User to note associated stream restoration efforts.
Success Criteria	*What to Collect:* Success criteria define when caging/fencing/irrigation can be removed, and monitoring can stop. These criteria define an exit strategy ☑ Natural regeneration takes over planting site ☑ Invasive species shaded by native tree species ☑ Invasive species crowded out by dense cover of native shrubs/grasses native ☑ Trees grow above deer browse height (5-7 ft)/weed height ☑ Density of native species precludes damaging browse ☑ Good trajectory (sufficient growth and water availability, low browse pressure) ☑ Other: _____
Historical Factors	*What to Collect:* User to note the historical factors influencing current restoration action

	☑ Historic land clearing ☑ Invasive species ☑ Floodplain disconnection ☑ Fire ☑ Construction disturbance ☑ Other: _____

3.2 Photo Monitoring

General Description: Photo monitoring is an essential part of documenting the condition and progress of riparian plantings. The photos taken at established points serve as a visual record, helping to track changes over time, evaluate the effectiveness of restoration measures, and inform future management decisions.

Data Name	Details of Data Collection
Number of Photo Points Established	*What to Collect:* Note the number of photos taken at the planting site.
Description of Photo Points	*What to Collect:* Include relative location, direction, and marking features

3.3 Invasive Species Management

General Description: Monitoring the presence and extent of invasive species is critical to assessing the success of restoration efforts. Observations help to determine if invasive species are encroaching on the planting area, which could affect the survival of native plants and the overall ecological health of the site.

Data Name	How to Collect the Data
Extent/cover of invasive species	*What to Collect:* User to note the percentage of planting area covered by invasive species ☑ 0% - No invasives present ☑ >25% ☑ 25-50& ☑ 50-75% ☑ >75%
Presence of Invasive Plant Species	*What to Collect:* User to note the dominant species of invasive plants, if present
Treatment Method	*What to Collect:* User to note treatment method for controlling invasive species, if present
Herbicide application type	*What to Collect:* User to note the type and rate of herbicide treatment, if applicable
Treatment Timing	*What to Collect:* User to note the timing and frequency of invasive plant treatment, if applicable

3.4 Weather Climate Conditions

General Description: Documenting weather and climate conditions before, during, and after planting provides important context for understanding plant survival and growth. This data helps in correlating plant performance with climatic factors such as temperature, precipitation, and drought conditions, which influence restoration outcomes.

Data Name	How to Collect the Data
Average Daily Temperature Range in previous week	*What to Collect:* User to note the average daily maximum and minimum temperature for the preceding week in the format “Low Temp/High Temp”

Predicted average daily temperature range in next week	*What to Collect:* User to note the average predicted daily maximum and minimum temperature for the following week in the format "Low Temp/High Temp"
Precipitation in last 2 weeks	*What to Collect:* Record the amount of precipitation near the project site within the past two weeks, measured in inches.
Notable weather events and seasonal rain amounts	*What to Collect:* Note any significant weather event or trends in the year of planting.
Snowpack effects	*What to Collect:* Notes on relevant snowpack conditions in the prior spring
Drought Conditions	*What to Collect:* Note the current drought conditions at time of planting. ☑ Light ☑ Moderate ☑ Severe
Other regional climate factors	*What to Collect:* User to take note of any other climate factors that could impact planting success

3.5 Planting Area Conditions

General Description: Evaluating the conditions within the planting area, including soil type, moisture, and vegetation cover, helps to determine the suitability of the site for specific plant species. These observations guide adaptive management decisions and improve the likelihood of successful establishment of riparian vegetation.

Data Name	**How to Collect the Data**
Existing Vegetation Cover	*What to Collect:* Note the current ground cover in the planting area ☑ Bare soil ☑ Sparse Cover of Natives ☑ Moderate Cover of Natives ☑ Dense Cover of Natives ☑ Sparse Cover of Invasives ☑ Moderate Cover of Invasives ☑ Dense Cover of Invasives
	What to Collect: Note dominant species present
Shade Conditions	*What to Collect:* User to note the shade level within the planting area ☑ Limited to no shade ☑ Shade-producing canopy cover exists within planting area ☑ Shade-producing canopy cover exists immediately to the south ☑ Shade-producing canopy cover exists immediately to the west ☑ Shade-producing canopy cover exists immediately to the east
Topsoil/Top-substrate type	*What to Collect:* Note the dominate substrate type of the within the topsoil/top-substrate horizon. ☑ Sands and/or Fines, Low Organics (Mineral) ☑ Sands and/or Fines, High Organics ☑ Sands-Gravel ☑ Gravel-Cobble ☑ Other: _____

Data Name	How to Collect the Data
Topsoil/Top-substrate thickness	*What to Collect:* User to note depth of topsoil/top-substrate in inches.
Substrate type below topsoil	*What to Collect:* User to note the dominate substrate type below the topsoil/top-substrate horizon. ☑ Sands and/or Fines, Low Organics (Mineral) ☑ Sands and/or Fines, High Organics ☑ Sands/Gravel ☑ Gravel/Cobble ☑ Other: _____
Soil Moisture Level	*What to Collect:* User to note if the soil at planting depth is dry, moist or saturated ☑ Dry ☑ Moist ☑ Saturated

3.6 Landform Conditions

General Description: Understanding the landform characteristics of the planting area, such as slope, aspect, and geomorphic position, is crucial for assessing the site's hydrological dynamics and potential for erosion. These factors influence water availability, soil stability, and overall plant health.

Data Name	How to Collect the Data
Slope	*What to Collect:* User to note the slope of the planting area ☑ <5% ☑ 5-10% ☑ 10-20% ☑ 20-30% ☑ >30%
Aspect	*What to Collect:* User to note the dominant aspect of the planting area ☑ N ☑ NE ☑ E ☑ SE ☑ S ☑ SW ☑ W ☑ NW
Depth to Water Table	*What to collect:* Note estimated depth to water table or height above low flow water level in feet
Geomorphic Position	*What to Collect:* Note the geomorphic position of the planting area ☑ Active Channel ☑ Low Floodplain or Wetland ☑ High or Vertically Disconnected Floodplain ☑ Terrace ☑ Hillslope/Upland

3.7 Planting Details

General Description: Detailed information about the planting methods, species selection, and soil amendments used at the site provides a baseline for evaluating growth and survival rates. This data supports decision-making for future planting efforts and maintenance activities.

Data Name	How to Collect the Data
Plant Species 1 Details	*What to Collect:* Note the species, count and typical plant height and/or pot size
Soil Amendments	*What to Collect:* User to select soil amendments associated with species plantings ☑ Wood Chips ☑ Composted Material Mix ☑ Compost Tea ☑ Backfilled Native Material (no amendment) ☑ Other
Top Dress Mulch	*What to Collect:* User to select the top dress mulch associated with species plantings ☑ Bark ☑ Wood Chips ☑ Woven Mat ☑ Gravel-Cobble ☑ Other
Planting Method	*What to Collect:* Note planting method used (e.g., hand, auger, excavator)
Typical Planting Hold Size	*What to Collect:* Note typical planting hole size in multiples of pot size
Irrigation Method	*What to Collect:* User to note irrigation methods used. Note none if the site will not be irrigated
Frequency/Timing of Irrigation	*What to Collect:* User to note the planned frequency and timing of irrigation
Protective Measures	*What to Collect:* User to note the protective measures used to prevent animal browse ☑ None ☑ Individual Cages ☑ Fenced pods around groups of plantings ☑ Full enclosure of planting area
Plant Species 2 – Details	*What to Collect:* User to note species, quantity, and size of plantings for the most dominant species planted.
Plant Species 3 – Details	*What to Collect:* User to note species, quantity, and size of plantings for the second most dominant species planted.
Plant Species 4 – Details	*What to Collect:* User to note species, quantity, and size of plantings for the third most dominant species planted.
Plant Species 5– Details	*What to Collect:* User to note species, quantity, and size of plantings for the fourth most dominant species planted.

4 Post-Project Data Collection

After the initial planting and data collection, the following are recommended minimum monitoring frequencies:

- Year 1-3: Three visits per year (spring, mid-summer, and fall)
- Year 4-6 (or until success criteria are met): Two visits per year (spring and fall)

4.1 Adjacent Land Use Changes

General Description: Regular checks on the functionality of equipment like irrigation systems and protective fencing are necessary to ensure that they continue to support plant health and survival. Prompt maintenance and repairs prevent disruptions to the growth of riparian vegetation.

Data Name	How to Collect the Data
Adjacent Land Uses	*What to Collect:* User to note any adjacent land use changes surrounding the planting area since planting ☑ Natural/Undeveloped – Unmanaged natural area ☑ Natural/Undeveloped – Managed forest ☑ Natural/Undeveloped – Rangeland/grazing land ☑ Agricultural – Dryland crops ☑ Agricultural – Irrigated crops ☑ Agricultural – Orchard/vineyard ☑ Residential – Rural ☑ Residential – Suburban ☑ Residential – Urban ☑ Commercial/Industrial ☑ Recreational (e.g. parks, sports fields) ☑ Infrastructure (e.g., roads, railways) Other (specify)
Potential Impacts on Restoration Site	*What to Collect:* User to note the potential impacts of land use changes on the Restoration Site and/or Plantings

4.2 Equipment Functionality Check

General Description: Regular checks on the functionality of equipment like irrigation systems and protective fencing are necessary to ensure that they continue to support plant health and survival. Prompt maintenance and repairs prevent disruptions to the growth of riparian vegetation.

Data Name	How to Collect the Data
Irrigation System Functionality	*What to Collect:* User to note whether the irrigation system is functioning properly. ☑ Maintenance Needed ☑ No Maintenance Needed ☑ Other
Protective Cages/Fencing	*What to Collect:* User to note whether protective cages and/or fencing need maintenance ☑ Maintenance Needed ☑ No Maintenance Needed ☑ Other

Data Name	How to Collect the Data
Other equipment	*What to Collect:* User to note if any other equipment has maintenance needs. Specify the equipment type.

4.3 Weather Climate Conditions

General Description: Documenting weather and climate conditions before, during, and after planting provides important context for understanding plant survival and growth. This data helps in correlating plant performance with climatic factors such as temperature, precipitation, and drought conditions, which influence restoration outcomes.

Data Name	How to Collect the Data
Notable weather events and seasonal rain amounts	*What to Collect:* Note any significant weather event or trends in since planting or the last monitoring event, whichever is more recent.
Snowpack effects	*What to Collect:* ☑ Light ☑ Moderate ☑ Severe
Drought Conditions	*What to Collect:* Note the current drought conditions at time of planting. ☑ Light ☑ Moderate ☑ Severe
Soil Moisture Level	*What to Collect:* User to note if the soil at planting depth is dry, moist or saturated ☑ Dry ☑ Moist ☑ Saturated
Other regional climate factors	*What to Collect:* User to take note of any other climate factors that could impact planting success

4.4 Plant Survival and Growth

General Description: Assessing plant survival and growth rates helps to measure the effectiveness of restoration efforts and guides future management actions. Understanding factors affecting plant vigor and mortality enables more targeted interventions to support ecosystem recovery.

Data Name	How to Collect the Data
Plant Death – Dominant Cause	*What to Collect*: User to note dominant cause of plant death ☑ Desiccation ☑ Crowding by Invasives ☑ Browse by Ungulate ☑ Browse by Rodent ☑ Winter Snow Impacts ☑ Other ☑ None
Plant Death – Sub-Dominant Cause	*What to Collect*: User to note sub-dominant cause of plant death ☑ Desiccation ☑ Crowding by Invasives ☑ Browse by Ungulate

Data Name	How to Collect the Data
	☑ Browse by Rodent ☑ Winter Snow Impacts ☑ Other ☑ None
Plant Survival	*What to Collect*: Note what percentage of plantings have survived as an overall proportion for the planting area ☑ >75% Survival ☑ 50-75% Survival ☑ 25-50% Survival ☑ <25% Survival ☑
Size of Surviving Plantings – Height	*What to Collect*: User to note average height (ft) of plantings by species for the planting area
Size of Surviving Plantings – Girth	*What to Collect*: User to note girth (ft) of plantings, including healthy branches, at the widest point in inches for the planting area
Natural Regeneration – Extent	*What to Collect*: User to note the extent of natural regeneration in the planting area ☑ Sparse (<25% cover) regeneration between plantings ☑ Moderate (25-50% cover) regeneration between plantings ☑ Dense (>50% cover) regeneration between plantings
Natural Regeneration – Species	*What to Collect*: User to note species observed naturally regenerating
Natural Regeneration - Source	*What to Collect:* User to note the sources of natural regeneration ☑ Legacy Seed ☑ Local Seed Source ☑ Vegetative ☑ Other
Plant Species 1 – Survival and Growth	*What to Collect*: User to note the species-specific estimates of survival rate (%), height (ft), girth (ft) for the for the most dominant species planted
Plant Species 2 – Survival and Growth	*What to Collect*: User to note the species-specific estimates of survival rate (%), height (ft), girth (ft) for the for the second most dominant species planted
Plant Species 3 – Survival and Growth	*What to Collect*: User to note the species-specific estimates of survival rate (%), height (ft), girth (ft) for the for the third most dominant species planted
Plant Species 4 – Survival and Growth	*What to Collect*: User to note the species-specific estimates of survival rate (%), height (ft), girth (ft) for the for the fourth most dominant species planted

4.5 Invasive Species

General Description: Tracking the presence and spread of invasive species within the planting area is key to protecting native vegetation. Effective management of invasive species is essential to maintain the ecological balance and success of riparian restoration projects.

Data Name	How to Collect the Data
Extent/cover of invasive species	*What to Collect:* User to note the percentage of planting area covered by invasive species ☑ 0% - No invasives present

Data Name	How to Collect the Data
	☑ >25% ☑ 25-50% ☑ >75%
Presence of Invasive Plant Species	*What to Collect:* User to note the dominant species of invasive plants, if present
Impacts of invasive species on plantings	*What to Collect:* User to note any impacts of invasive species on desired vegetation

4.6 Wildlife Interactions

General Description: Observing wildlife interactions in the planting area provides insight into the ecological benefits and challenges posed by local fauna. Positive interactions like pollination enhance plant growth, while negative interactions such as browsing may require management actions.

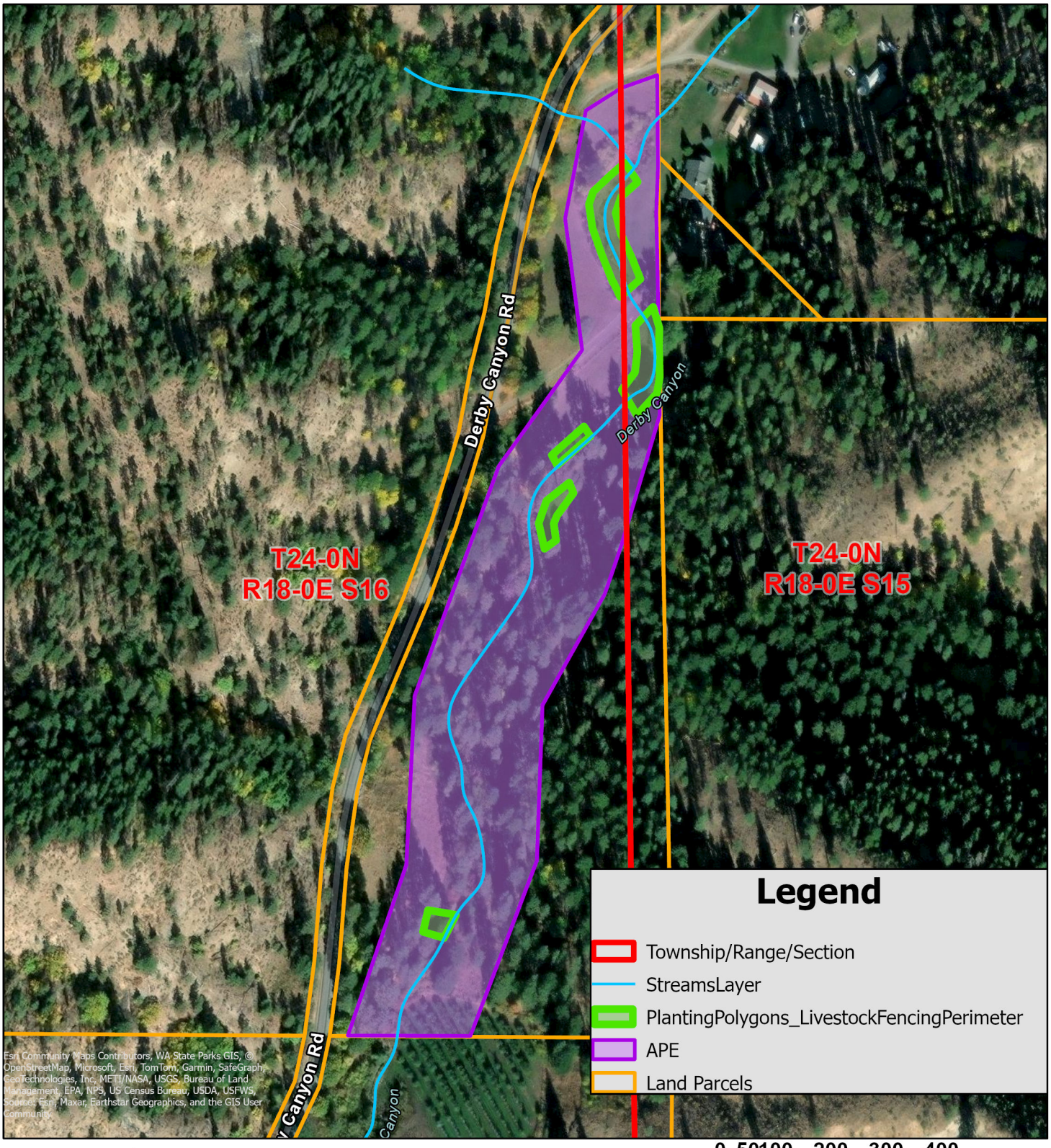
Data Name	How to Collect the Data
Observed wildlife species	*What to Collect:* User to note wildlife or evidence of wildlife activity observed in the area by species
Positive Interactions	*What to Collect:* Note all evidence of positive wildlife interactions (e.g., pollination, seed dispersal, beaver ponding): Leave blank if none.
Negative Interactions	*What to Collect:* Note all evidence of negative wildlife interactions (e.g., ungulate browsing, trampling, beaver chew). Leave blank if none.

4.7 Success Criteria Evaluation

General Description: Evaluating success criteria helps to determine whether the riparian restoration project is meeting its objectives. This assessment guides decisions on when to cease monitoring or implement additional management actions to achieve the desired ecological outcomes.

Data Name	How to Collect the Data
Success Evaluation Criteria	*What to Collect:* User to determine if the planting area is meeting restoration success criteria ☑ Natural regeneration takes over planting site ☑ Invasive species shaded by native tree species ☑ Invasive species crowded out by dense cover of native shrubs/grasses native ☑ Trees grow above deer browse height (5-7 ft)/weed height ☑ Density of native species precludes damaging browse ☑ Good trajectory (sufficient growth and water availability, low browse pressure) ☑ Other: _____
Exit strategy actions needed	*What to Collect:* User to note any exit strategy actions needed in the short term (e.g., cage removal, irrigation line removal, etc.)
Cage/Fencing Removal Required	*What to Collect:* User to note whether planting cages or fences need to be removed. ☑ Cage/fencing removal needed No removal needed

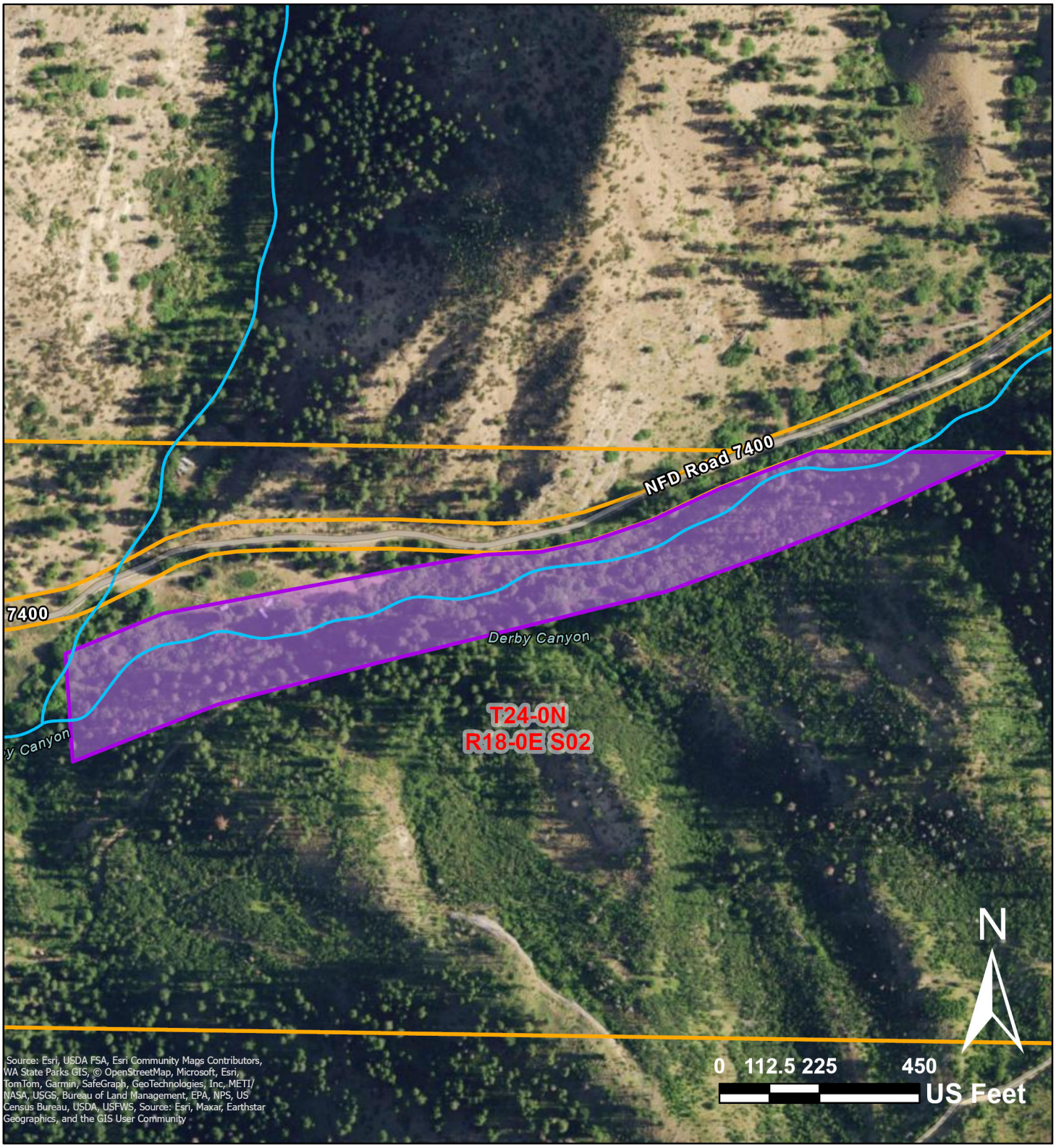
Data Name	How to Collect the Data
Adaptive Management Actions	*What to Collect:* User to note any other adaptive management actions needed



CASCADE FISHERIES

DNR Parcel- APE Map 2024

DISCLAIMER: While every precaution was taken in preparing this map, the publisher disclaims any warranty of fitness or accuracy of the data. The map is approximate in nature, based on compilation of data from multiple sources, and should not be relied upon or referenced in legal documents, including property deeds, title reports, and contract documents, nor substituted for appropriate survey and\or engineering analysis. The user of the map acknowledges its limitations, assumes all responsibility for its use, and agrees to hold the publisher harmless for any damages that may result from the use of this map. This map is subject to change without notice.



CASCADE FISHERIES

Stroud Property- APE Map 2024

Legend

- Stream Layer
- APE
- Land Parcels
- Township/Range/ Section

0 50 100 200 Feet

N

Black Property Planting Map

CASCADIA CONSERVATION DISTRICT

2024

Legend

- Planting
- Eagle Creek
- Parcels

Cartographer: AlexH

Legend

- Parcel Layer
- BDAs
- Creek
- Planting

N

0 40 80 160 Feet

Hedeen Concept Map
Eagle Creek Restoration
Cascadia Conservation District

0 50 100 200 US Feet

N

Eagle Creek- Johnston Property Concept Map

CASCADIA CONSERVATION DISTRICT

2024

Legend

- Creek
- Parcels
- Planting

Cartographer: AlexH

BDA and Planting Project Hatch

CASCADIA CONSERVATION DISTRICT

2024

0 30 60 120 US Feet

Legend

- Little Chumstick Creek
- Hatch
- Planting

Cartographer: AlexH

DOE Streamflow Planting Plan

*See Corresponding Site Design Map for planting area

Native trees and shrubs will be planted to enhance and expand the existing riparian buffer. The appropriate native species will be selected based on conversations with landowners to meet restoration goals of increased shading along the creek and increased wildlife habitat.

Noxious Weed Reed Canary grass will be managed with both chemical and mechanical control prior to planting. Additional weed control will be site dependent.

Planting will consist of a mixture of container, bare root, and live stake material as appropriate for the site. Trees will be planted at 20 ft on center spacing and shrubs in groupings of 3-4 plants at 3 ft spacings.

When available 1 gallon Tree Pots are the preferred planting material as the roots are deeper than typical 1 gallon pots which is important for some of our dryer sites in plant establishment.

Site Specific Planting Species and Type

Black Property Planting area 33,000 sq ft

PLANTING SPECIES AND TYPE
Species: Aspen ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 g TP gallon Amount: 100
Species: Black Cottonwood ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: 1 gallon Amount: 300
Species: Willow spp. ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: gallon Amount: 500
Species: Douglas Spirea ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 250
Species: Twinberry ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 100
Species: red osier dogwood ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: 1 gallon Amount: 100
Species: Big leaf maple ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 100
Species: Water Birch ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 25

Hedeen Property planting area 13,000 sq ft**.**

PLANTING SPECIES AND TYPE
Species: Bigleaf Maple ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 g TP gallon Amount: 25
Species: Black Cottonwood ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 15
Species: Willow spp. ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: gallon Amount: 100
Species: Mock Orange ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 100
Species: Twinberry ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 25
Species: Golden Current ☐ Cuttings ☐ Bare root ☐ Pots Pot Size: 1 gallon Amount: 50

Species: Red flowering current ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 25
Species: Water Birch ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 25

Johnston Property planting area 4,500 sq feet

PLANTING SPECIES AND TYPE
Species: Black Cottonwood ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: 1 gallon Amount: 25
Species: Willow spp. ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: gallon Amount: 100
Species: Douglas Spirea ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 15
Species: Twinberry ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 15
Species: red osier dogwood ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: 1 gallon Amount: 20

Hatch Property – area 10,400 square feet

PLANTING SPECIES AND TYPE
Species: Aspen ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 g TP gallon Amount: 100
Species: Black Cottonwood ☒ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 100
Species: Willow spp. ☒ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 200
Species: Douglas Spirea ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 100
Species: Twinberry ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 50
Species: red osier dogwood ☒ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 100
Species: Big leaf maple ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 20
Species: Water Birch ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 15
Species: Western Red Cedar ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 20

Riparian Planting Plan -Derby Creek- DNR

AGREEMENT / RECIPIENT INFORMATION	
Grant Number: WRSRP-2022-CascCD-00188	Grant Recipient: Cascade Fisheries (subaward) Master Agreement recipient is Cascadia Conservation District
Project Manager / Contact: Phillip Klenke- 509.670.7411- phillip@ccfeg.org	
PROJECT INFORMATION	
Property / Site Name: DNR/ Derby Creek Habitat Restoration	Implementation Target Date: Planting in September 2025
Closest Water Body and Type: Derby Creek- tributary to the Wenatchee River	

RESTORATION GOALS

This project involves:

1) The installation of beaver dam analogs, post-assisted log structures, and large wood into the stream.
   -This will improve the streams groundwater recharge, baseflows, lateral connectivity of the floodplain, habitat quantity/quality for fish and wildlife, and capturing/sorting sediment that will in turn repair the streams incision.
2) Planting site-appropriate native shrubs and trees within the floodplain and riparian buffer zone in specific locations throughout the property.
   -This riparian planting will provide increased shade to the stream, reduce stream temperatures, filter runoff, increase bank complexity, enhance wildlife habitat, and provide stream cover habitat for fish species.
3) Livestock exclusionary fencing
   -Excluding livestock from grazing within the planted riparian plots will increase plant survival chances. After plants have matured, and no longer susceptible to grazing mortality, the livestock fencing will be removed.

GENERAL DESCRIPTION OF PLANTING

After planting, this site will have stream banks with increased species diversity and abundance, enhancing the existing riparian buffers. In the future once these plants mature, they will provide shading to the stream channel, and will be important resources for fish and wildlife species.

Planting polygons will primarily be placed alongside Derby Creek's banks, in areas that are currently dominated by pasture grasses. Polygons will range in sizes along the stream, taking into account the current land-use needs, stream access by cattle, and species-specific site goals.

A diversity of native species will be planted across the site, and species selection and placement will be guided by existing natural inventories, and site-specific factors (location relative to the waterline, water table, soil type, and local climate information). Trees will be

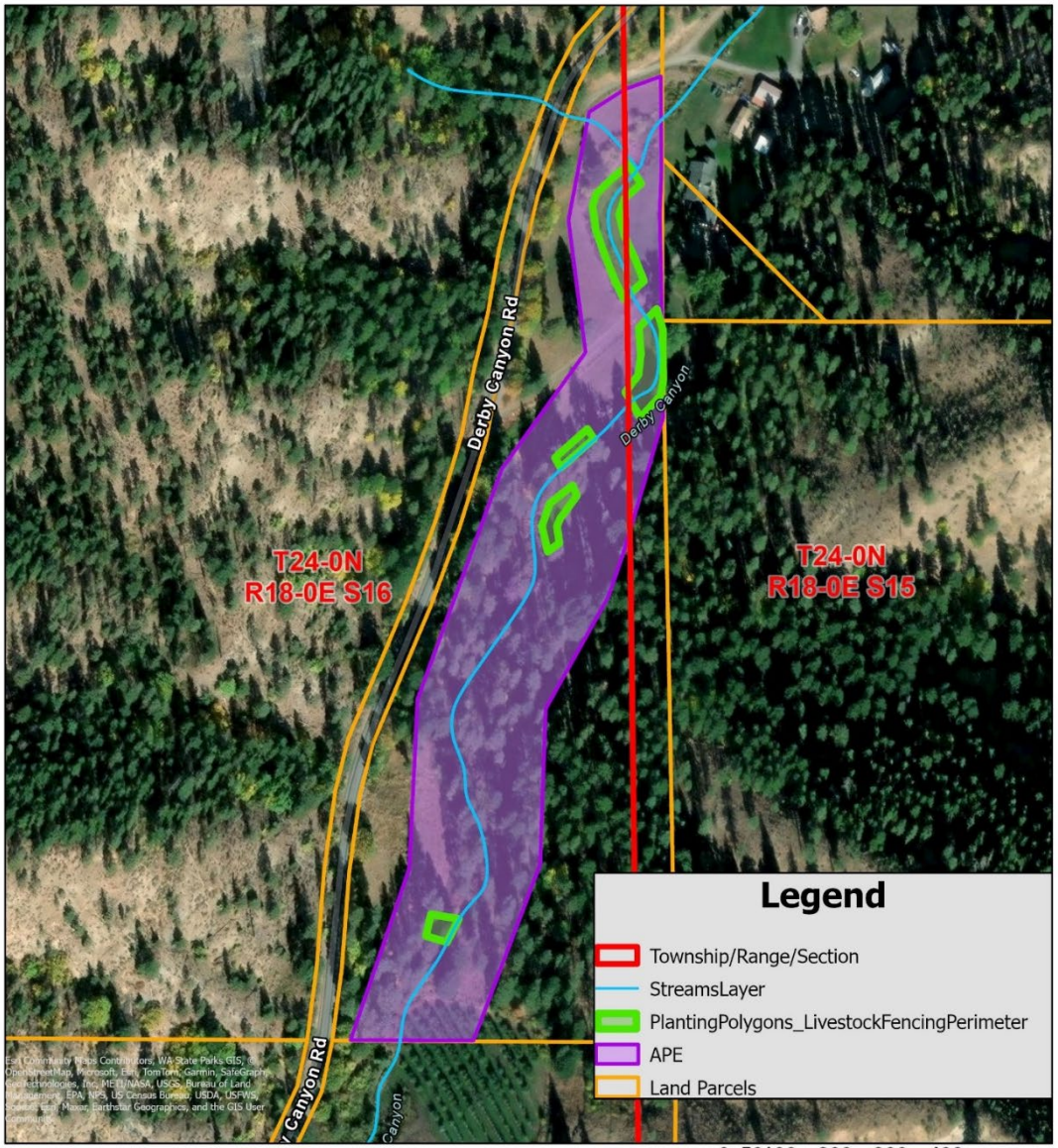
planted at 15ft on center with shrubs planted in groups of 2-4 plants roughly 8ft on center. Willow and cottonwood live stakes will be planted nearest to the stream at a 3-4ft on center spacing, depending on species.
: **Acres**: 0.6 (Planting) 8.4 (Total project site) **Square Feet**: 25,500 (Planting) 365,000 (Total project site) **Stream Feet**: 1,950 (Total project site)

PLANTING SPECIES AND TYPE
List each species (common or latin name), type of planting, and number (of each species, or combination of species if unknown). We understand that this may be an estimate only and species composition may change, as your understanding of the site conditions increases. Copy and paste more lines as needed.
Species: *Salix (spp)* ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: gallon Amount: 200
Species: *Populus trichocarpa* ☒ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 100 cuttings, 30 pots
Species: *Populus tremuloides* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
Species: *Thuja plicata* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
Species: *Acer circinatum* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
Species: *Acer macrophyllum* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
Species: *Cornus sericea* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 25
Species: *Prunus emarginata* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 25
Species: *Prunus virginiana* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 25
Species: *Philadelphus lewisii* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 25
Species: *Amelanchier alnifolia* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 25
Species: *Symphoricapus albus* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
Species: *Ribes aureum* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
Species: *Rosa (spp)* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 30
Species: *Lanicera involucrata* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 25

Species: *Sambuccus cerulea* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
Species: *Lonicera ciliosa* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1 gallon Amount: 15
Species: *Viburnum edule* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 15
*Species composition, type of planting, and amount are dependent on annual stocks from local suppliers.

PLANTING SITE PREPARATION
The site will be prepped for planting by installing in-stream habitat and water retention structures (BDAs, PALS, large wood) that will provide water to the planted vegetation and will increase their chances of survival for the first few years. Planting areas with non-native blackberry present will be prepped by digging out the blackberry bushes and planting native plants in their place. Livestock exclusionary fencing will be installed around planting polygons. All plants will have mulch applied around their bases.

Appendix A. Project Site Map



Riparian Planting Plan – Derby Creek Stroud

AGREEMENT / RECIPIENT INFORMATION	
Grant Number: WRSRP-2022-CascCD-00188	Grant Recipient: Cascade Fisheries (subaward) Master Agreement recipient is Cascadia Conservation District
Project Manager / Contact: Phillip Klenke- 509.670.7411- phillip@ccfeg.org	
PROJECT INFORMATION	
Property / Site Name: Stroud/ Derby Creek Habitat Restoration	Implementation Target Date: Planting in September 2025
Closest Water Body and Type: Derby Creek- tributary to the Wenatchee River	

RESTORATION GOALS

This project involves:

1) The installation of beaver dam analogs, post-assisted log structures, and large wood into the stream.
   -This will improve the streams groundwater recharge, baseflows, lateral connectivity of the floodplain, habitat quantity/quality for fish and wildlife, and capturing/sorting sediment that will in turn repair the streams incision.
2) Planting site-appropriate native shrubs and trees within the floodplain and riparian buffer zone in specific locations throughout the property.
   -This riparian planting will provide increased shade to the stream, reduce stream temperatures, filter runoff, increase bank complexity, enhance wildlife habitat, and provide stream cover habitat for fish species.

GENERAL DESCRIPTION OF PLANTING

After planting, this site will have stream banks with increased species diversity and abundance, enhancing the existing riparian buffers. In the future once these plants mature, they will provide increased shading to the stream channel, and will be important resources for fish and wildlife species.

Planting will enhance existing riparian buffer vegetation, by increasing species diversity and abundance. Planting will take place across the entire project site, but will not be very densely planted as the existed riparian areas are extensive and mature.

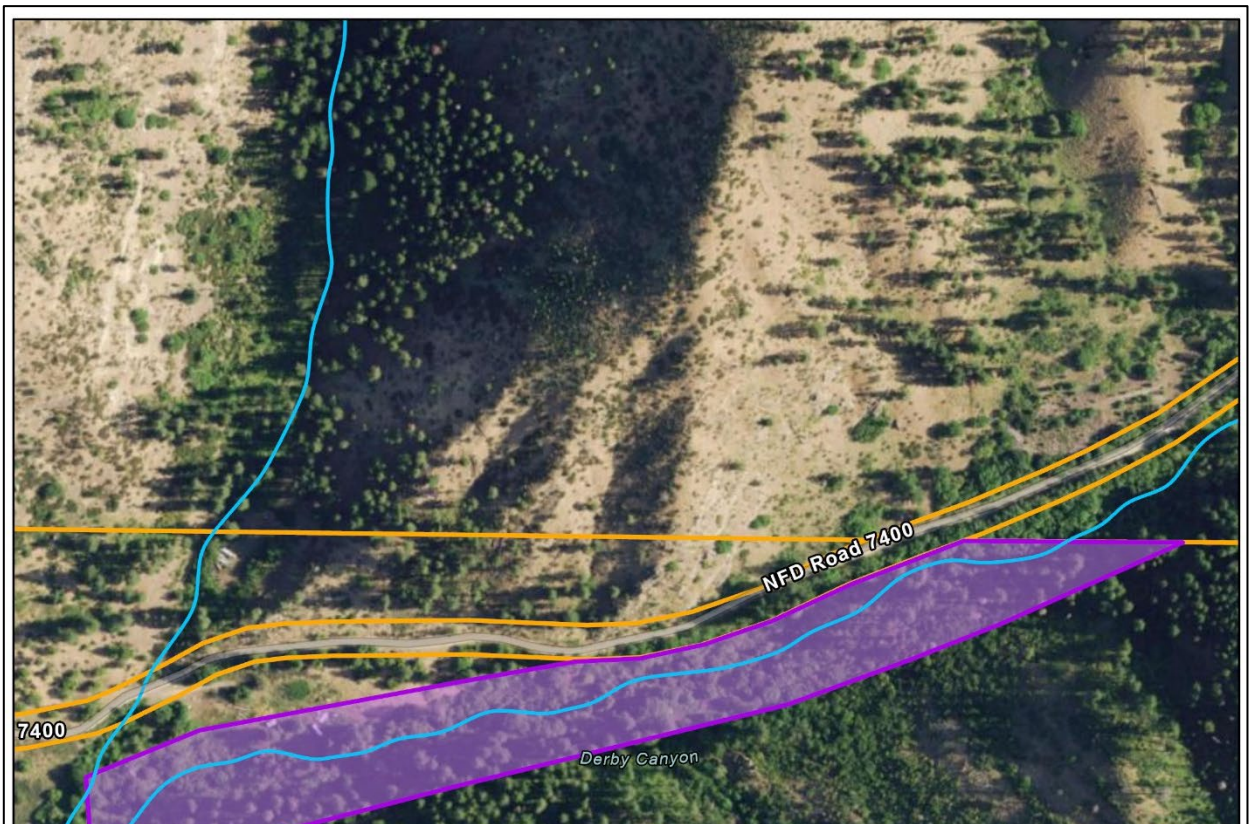
A diversity of native species will be planted across the site, and species selection and placement will be guided by existing natural inventories, and site-specific factors (location relative to the waterline, water table, soil type, and local climate information). Trees will be planted at 15ft on center with shrubs planted in groups of 2-4 plants roughly 8ft on center. Willow and cottonwood live stakes will be planted nearest to the stream at a 3-4ft on center spacing, depending on species.

PROJECT SIZE

: **Acres**: 8.6 (Total project site) **Square Feet**: 375,830 (Total project site) **Stream Feet**: 4,750 (Total project site)
1 or both sides of stream? One: Both: X Other:

PLANTING SPECIES AND TYPE
Species: *Salix (spp)* ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: gallon Amount: 200
Species: *Populus trichocarpa* ☒ Cuttings ☐ Bare root ☐ Pots Pot Size: 1-2 gallon Amount: 100
Species: *Populus tremuloides* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 10
Species: *Philadelphus lewisii* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 5
Species: *Amelanchier alnifolia* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 10
Species: *Rosa (spp)* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 10
Species: *Sambuccus cerulea* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 5
Species: *Thuja plicata* ☐ Cuttings ☐ Bare root ☒ Pots Pot Size: 1-2 gallon Amount: 5
*Species composition, type of planting, and amount are dependent on annual stocks from local suppliers.

Appendix A. Project Site Map



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Final Audit Report 2024-12-27

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