5321

RINEARSON NATURAL AREA RESTORATION MONITORING REPORT

YEAR 3 (2021)

Prepared for
Columbia Restoration Group, LLC

Submitted January 2022;
Revised September 2022

ESA

In

Rinearson Natural Area Restoration Monitoring – Cover Sheet

Owner/Permittee: Columbia Restoration Group
Report Prepared By: Environmental Science Associates (ESA)
City/County: Gladstone/Clackamas County
Report Date: January 20, 2022
Monitoring Year: 3
Date Restoration was Completed: Fall 2018
Planting: Fall 2018
Date(s) of Data Collection: January through October 2021; December 2021 (bald eagle monitoring)

	Performance Standards (required by the HDP)	Fully Met?	Comments/Reason for Shortfall
1	**Geomorphic:** 100% of installed large wood pieces will be retained downstream of the remnant pond outlet.	Yes	100% of structures were recorded in September 2021. This standard is met.
2	**Geomorphic:** 80% of placed large wood pieces and structures will be retained upstream of the remnant pond outlet.	Yes	> 80% of structures were recorded in September 2021. This standard is met.
3	**Riparian/Upland:** 80% of placed terrestrial habitat structures will be retained within upland and riparian areas.	Yes	> 80% of structures were recorded in September 2021. This standard is met.
4	**Active Channel Margin:** ACM acreage will not decrease by more than 10% compared to as-built drawings.	Yes	ACM acreage has remained within 10% of as-built drawings. This standard is met.
5	**Fish Passage:** Jump height will not exceed 6 inches.	No	Jump height (from the surface of the roughened channel to the top of the pond outlet) regularly exceeded 6 inches during a majority of the year. Jump height of the lower beaver dam in Meldrum Bar Channel also exceeded the minimum jump height. Jump heights were zero during the high-water event on December 21, 2021.
6	**Fish Passage:** Remnant pond outlet will discharge continuously.	TBD	Water flow was low but present in September 2021.
7	**Fish Passage:** Thalweg downstream of the remnant pond outlet will remain wetted during low water conditions.	Yes	Water flow was low, but thalweg was wetted in September 2021.
8	**Hydrology and Hydraulics:** Remnant pond outlet will be overtopped by the Willamette River when stage height >14 feet NGVD29 (17.5 feet NAVD88).	TBD	A high-water event observed mid-day on December 21, 2021 overtopped the remnant pond outlet by several inches and inundated approximately 9.5 acres of the site. Willamette River stage during this event was 19.97 feet NAVD88, as measured at the Oregon City USGS gauge.
9	**Hydrology and Hydraulics:** No less than 8.5 acres of the site will be inundated when stage height on the Willamette River >21.76 feet NGVD29 (25.25 feet, NAVD88).	Yes	Based on the fact that the approximately 9.5 acres of the site was inundated when the gauge height was 19.97 feet NAVD88, we anticipate that this performance standard would be met with a larger storm event that measures 25.25 feet NAVD88, although no such event occurred during the 2021 monitoring year.
10	**Emergent Marsh – Native Species Cover:** 30% or greater cover by native herbaceous species Y2–5. 50% or greater in Y7; 70% in Y10.	**No**	Mean native herbaceous cover was 27%; the site is trending toward not meeting future native cover standards.
11	**Emergent Marsh – Invasive Species Cover:** Less than or equal to 20% cover by invasive herbaceous species Y2–10.	**No**	Mean invasive herb cover was 22%, exceeding the maximum threshold. This standard is not met.
12	**Emergent Marsh - Diversity:** At least 5 species of herbaceous plants that provide at least 5% cover and are present in at least 10% of the plots.	**No**	Only 1 native species, *Juncus effusus*, met the abundance and frequency thresholds.

13	**Riparian Forest Restoration – Woody Species Density:** At least 1,200 living native stems/ac in Y2–5.	Yes	Density of woody vegetation was 5,432 living native stems per acre and substantially exceeded the performance standard.
14	**Riparian Forest Restoration – Invasive Cover:** 30% or less cover by invasive herbaceous species Y2–5.	Yes	Mean invasive herb cover was 18%. This standard is met.
15	**Riparian Forest Restoration – Shrub Species Richness:** At least 5 native shrub species present in Y2–5.	Yes	10 native shrub species were present. This standard is met.
16	**Riparian Forest Restoration – Tree Species Richness:** At least 3 native tree species present in Y2–5.	Yes	4 native tree species were present: red alder, Oregon ash, cottonwood, and Pacific willow. This standard is met.
17	**Riparian Forest Enhancement – Invasive Cover:** 30% or less cover by invasive herbaceous species Y2–5.	Yes	Mean invasive herb was 20%, within the maximum threshold. This standard is met.
18	**Upland/Riparian Forest Invasive – Invasive Cover:** 30% or less cover by invasive herbaceous species Y2–5.	**No**	Mean invasive herb was 24%, but CI >±10 units; standard is not met.

Remedial Work Recommended Yes ☒ No ☐

Refer to the Adaptive Management Section in this report.

	Monitoring Questions	Comments/Conclusions
1.	Are native fish using the restored site? What size salmon and/or lamprey are using the site?	2021 snorkeling surveys did not yield any native or non-native fish detections due to poor visibility in the remnant pond and stream channels. Direct sampling (e.g., seining) was not permitted in 2021. Environmental DNA or eDNA may be a more appropriate non-contact method for sampling native fish presence in the project area.
2.	What birds are using the site? Do changes in the bird diversity and abundance indicate habitat improvement?	32 bird species were detected in 2021 compared to 26 species observed in 2014. The yellow warbler, strongly associated with riparian habitats, was observed in 2021 but not 2014, possibly due to the planted willows becoming established on site. The common yellowthroat, a bird of thickets, grasslands, and emergent wetlands, was also observed in the restored areas on-site.
3	How much time are eagles spending on-site and vicinity and for which activities (perching, nesting)? Which features (riparian, upland)?	Bald eagles nested on the west bank of the Willamette River across from the site, although the nest shifted north compared to its location in 2014. The project area is considered part of the eagles' territory. Adult eagles spent a total of 1 hour and 9 minutes perching on site, mostly at the west end in the cottonwood trees during the January-August and December monitoring season and spent limited time foraging in Meldrum Bay. In contrast, juvenile eagles spent 7 hours and 55 minutes on site, primarily perching near the remnant pond or at the west end of the site. A juvenile eagle was observed hunting a great blue heron at the remnant pond outlet with a trail camera. No adult eagles were seen foraging in the remnant pond. The nesting attempt was deemed a failure, possibly due to extreme heat.
4	Are mink using the site (presence/absence)? Has mink abundance at the site increased?	Mink were photo-documented on-site two times in 2021 for an average of 0.11 mink per station, compared to 0.10 mink per station during baseline surveys (pre-construction). When accounting for level of survey effort between baseline and Year 3, mink use of the site stayed approximately the same; however, the installed large woody debris in the roughened channel appears to have enhanced the migration corridor of mink by providing suitable cover.
5	Is water quality (temp, DO, pH, cond.) improving over time?	Water quality data collected in late April 2021 show that conditions for water temperature, DO, pH, and conductivity were similar to those measured at the site in April 2020. The April 2021 data for all monitoring stations show that temperature and pH met Oregon water quality standards for those parameters. DO levels at the Rinearson Creek stations above the pond (WQS 8-11) were below the 11 mg/L standard for trout spawning periods, in a range of 9.5 to 10.4 mg/L. Measured DO concentrations at the other stations (WQS-1 to WQS-7) were above the 11 mg/L minimum standard for trout spawning. Additional years of water quality monitoring are needed to draw conclusions about trends (improvement) over time.
6	Has the benthic macroinvertebrate community improved (species abundance and diversity/richness)	Total number of taxa present at all four sites and habitat types in 2021 was 47, a decline of 23 tax compared to 2020. Annual variation is expected, especially considering that only four composite samples were taken; however, a drop from 70 to 47 total taxa is substantial. Of particular note: there were eight mollusk taxa in 2020, and only one in 2021; three caddisfly taxa in 2020, and none in 2021; four beetle taxa in 2020, and none in 2021; and 16 Diptera taxa found only in 2020 versus four dipteran taxa found only in 2020. Case studies from the Willamette Valley are lacking for these habitat types to assess whether this amount of annual variation is unusual or not. The sharp decline may be drought related.

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LIST OF ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
µS/cm	microsiemens per centimeter
ACM	active channel margin
CI	confidence interval
DO	dissolved oxygen
DSL	Department of State Lands
eDNA	Environmental DNA
ESA	Environmental Science Associates
GPS	global positioning system
HDP	Habitat Development Plan
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NGVD	National Geodetic Vertical Datum
OAR	Oregon Administrative Rules
OLW	ordinary low water
PCS	Point Count Station
S.U.	standard units
Trustee Council	Portland Harbor Natural Resource Trustee Council
WQS	water quality station

1 INTRODUCTION – MONITORING OVERVIEW

At the request of the Columbia Restoration Group, Environmental Science Associates (ESA) conducted Year 3 (2021) monitoring at the Rinearson Natural Area Restoration Project as part of a 10-year adaptive management and monitoring effort. This annual report describes monitoring results and whether post-construction performance standards are being met as defined in the Rinearson Natural Area Habitat Development Plan (HDP) prepared in 2017 and updated in 2018. The HDP details protocol methods, benchmark metrics, and monitoring questions to evaluate restoration success over a 10-year monitoring window (Proutt 2018).

The Rinearson Natural Area is an aquatic, wetland, floodplain, and riparian restoration and enhancement project that was developed with technical assistance from the Portland Harbor Natural Resource Trustee Council (Trustee Council) as part of a regional restoration plan for the Lower Willamette River to provide ecological services to compensate for natural resource damages incurred as a result of industrial contamination of the Portland Harbor.

Baseline surveys for the project were conducted in 2013 and 2014 and are described in a report by Cascade Environmental Group (2016). Restoration activities were completed in 2018, and Year 1 and 2 monitoring was completed in 2019 and 2020 (Cardno 2020). Additional background information is located in these documents as well as the HDP.

1.1 Project Area

The project area covers approximately 33 acres in Gladstone, Oregon and encompasses Rinearson Creek, a small tributary of the Willamette River. The site is bordered by high-density residential development to the north and east, a developed city park to the south (Meldrum Bar Park), and the Willamette River to the west. Rinearson Creek begins at the Boardman Wetlands within the City of Gladstone. From the wetlands, the creek passes through ditches and pipes near Gladstone High School and the Gladstone Senior Center. It then passes through the Olson Wetlands before it enters a pipe on the east side of McLoughlin Boulevard and flows into the Willamette River floodplain in the project area. Rinearson Creek joins the mainstem Willamette River at river mile 24 just downstream from the mouth of the Clackamas River.

1.2 Photo Monitoring

Permanent photo points were established at 16 locations during baseline surveys, and an additional four were added in 2021 to document special features of the site (**Figure 1-1**). These photo points were visited April through September 2021 and are catalogued in **Appendix A.** Refer to **Figures 1-2 to 1-9** for selected photos comparing Year 3 with baseline.

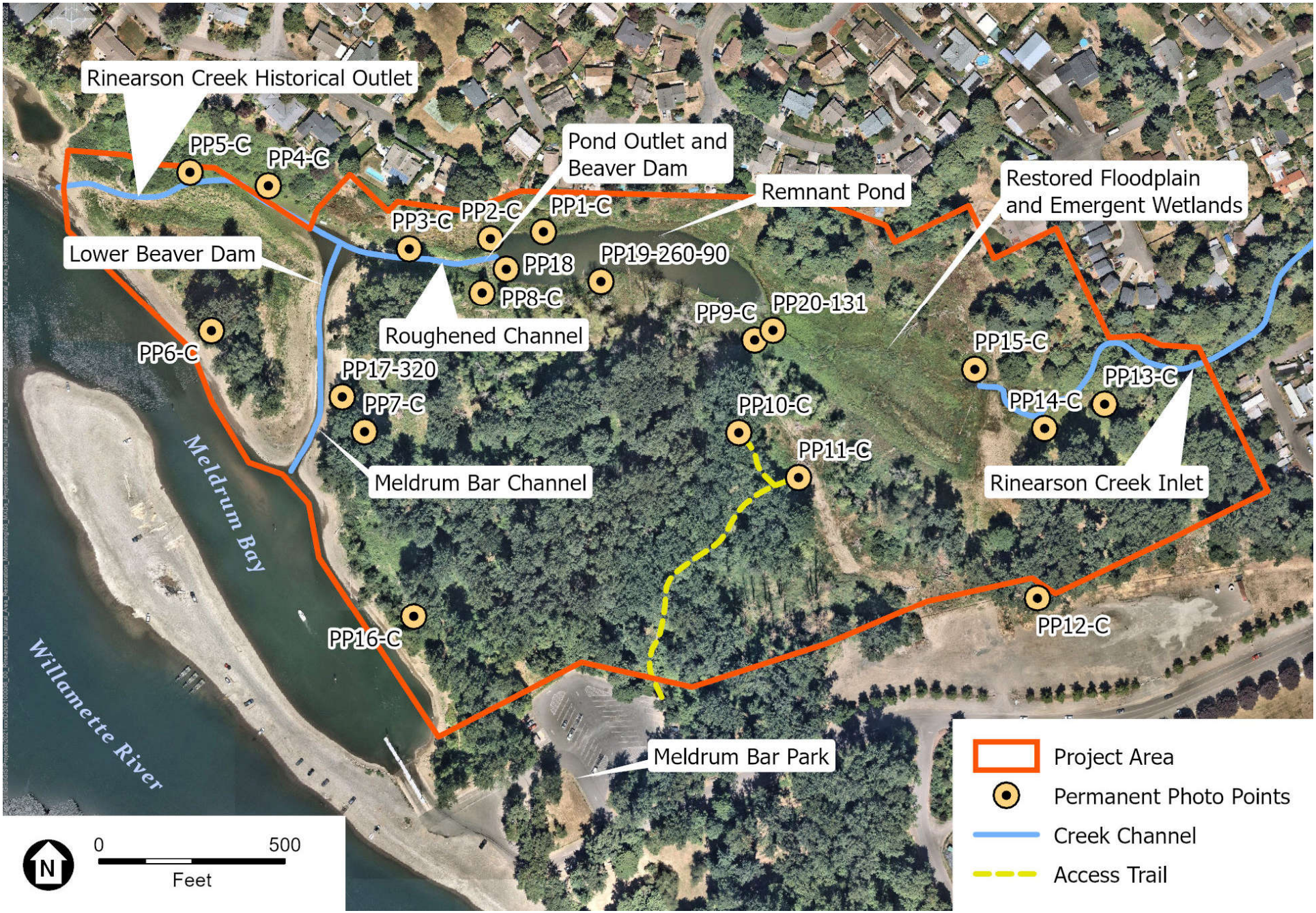


Figure 1-1. Project Area and Permanent Photo Points

Figure 1-2: PP2 baseline, north shore of pond.

Figure 1-3: PP2 2021, note dense willow growth on north bank.

Figure 1-4: PP3 baseline, ruderal, weedy area near dam.

Figure 1-5: PP3 2021, dense willow thickets on streambanks.

Figure 1-6: PP4 baseline, looking north.

Figure 1-7: PP4 2021, looking north with dense willow growth.

Figure 1-8: PP9 baseline, yellow flag iris and jewelweed.

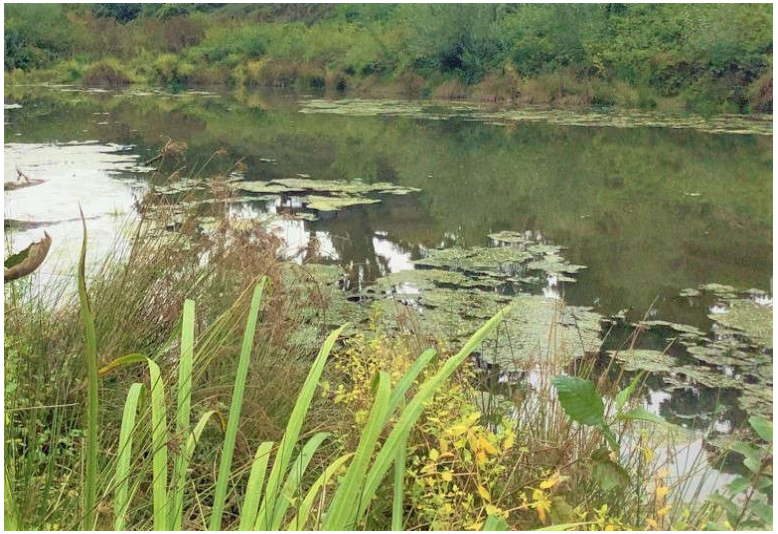


Figure 1-9: PP9 2021, yellow flag iris and jewelweed remain.

2 GEOMORPHIC AND STRUCTURAL HABITAT MONITORING

2.1 Habitat Structures and Large Woody Debris

Several habitat structures and large woody debris pieces were designed and installed to improve fish and wildlife habitat functions at the Rinearson Natural Area (**Figure 2-1**, on the next page). Those structures include wood/rock piles, snags, and wood debris and structures placed within both floodplain and upland regions of the project site. As part of the long-term habitat performance monitoring of the site, accounting for engineered structures by type and condition was conducted.

2.1.1 Log Structures below the Remnant Pond Outlet

Four log structures were installed in the roughened channel downstream of the remnant pond outlet, and all four were recorded in 2021, indicating that the site requirement of 100% of as-built structures to remain, was met. A typical log structure is shown in **Figure 2-2**.

Figure 2-2. Typical Log Structure Installed and Retained Downstream of the Remnant Pond Outlet

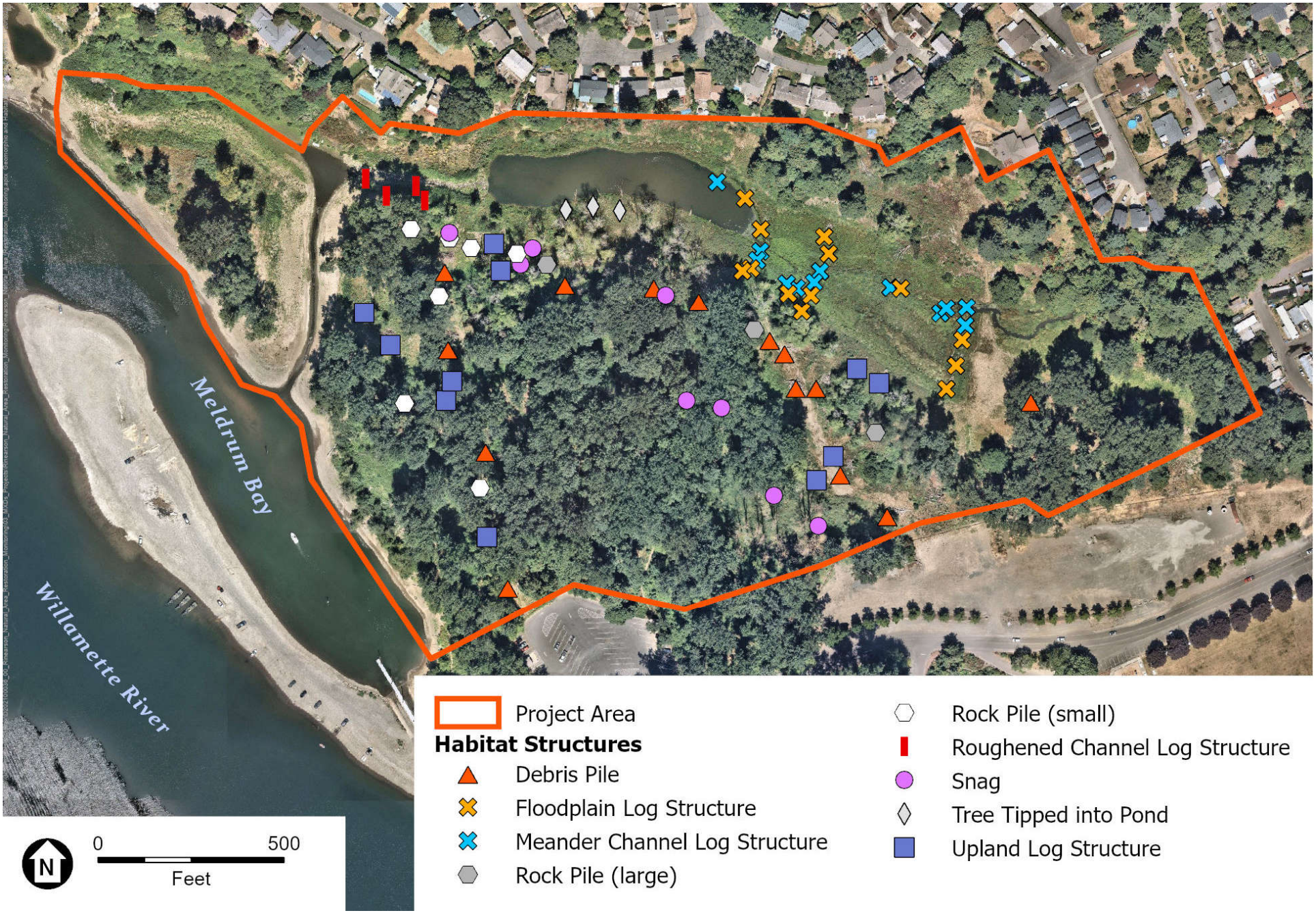


Figure 2-1. Geomorphic and Habitat Structures

2.1.2 Structures and Large Woody Debris within the Active Channel Margin (ACM)

Both aquatic and terrestrial wood structures in the upstream area of the remnant pond were surveyed (**Figure 2-3**). As-built plans show 13 floodplain structures, 12 meander channel structures as well as 3 trees tipped into the remnant pond. All but two large wood structure was located, indicating the site requirement of 80% of as-built structures to remain was met. One floodplain log was not located and a second structure was in poor condition, considered absent. A third floodplain log shifted location and is considered present. Refer to **Appendix B** for photo documentation and data sheets of aquatic and terrestrial wood structures.

Figure 2-3. Typical Wood Structure Installed Upstream of the Remnant Pond Outlet

2.1.3 Upland Structures

Upland habitat structures were monitoring according to the HDP. As-built plans show 11 upland log structures, 13 debris piles, 7 small rock piles, 4 large rock piles, and 8 snags for a total of 43 features. All but 6 features were located, indicating greater than 80 percent retention was achieved and the performance standard met (**Figure 2-4**). Features that were not located due to extensive blackberry cover or in poor condition due to either being dismantled or degraded were considered absent.

Figure 2-4. Typical Upland Wood Structure

2.2 Active Channel Margin (ACM)

An analysis for ACM areas was completed comparing the Year 2 (2020) ACM to the 2019 ACM area. It was determined that no significant change in ACM had occurred and that it is within 10% of as-built conditions. The 2020 cross-section survey confirmed that ordinary low water (OLW) was very similar to the OLW line observed in the 8/13/2020 aerial photo, which was also a close approximation of the OLW extracted from the Year 1 8/26/2019 aerial photo. This OLW analysis did not trace the small threaded channels above the remaining pond since there are many and they vary depending on beaver activity. Small threaded side channels above the remnant pond are developing network complexity due to beaver activity. The 2019 ACM area was 9.8 acres, and the 2020 ACM area was 9.7 acres within the project boundary, which is a change of 1%. Hence, no appreciable change in ACM area was detected for Year 2020, which was also confirmed via site observations of no appreciable erosion or sedimentation. In 2021, ESA surveyed 10 site cross-sections in the same location as the previous monitoring year. The site cross-sections were compared to previous years' survey section (**Appendix C**). Small amounts of sedimentation and erosion have caused minor alterations to the channel cross-sections, but these do not appear to be significant enough to alter the active channel margin area beyond the allotted 10% change from as-built conditions.

2.3 Fish Passage

The HDP focuses on the remnant pond outlet, slope of the engineered channel, and water availability and depth as measurement criteria for fish passage. The jump height of the remnant pond outlet and the lower beaver dam in the Meldrum Bar Channel were measured April to October and determined to exceed the maximum jump height of 6 inches indicated in the HDP (Table 2-3). It is important to note that the measurements in Table 2-3 are a snapshot of one location in time along the pond outlet and lower beaver dam and that the conditions of these features are continuously changing with beaver activity, vegetation growth, human activity (people walking across the dams and compressing or crushing the structures), and tidal cycle (the lower beaver dam).

TABLE 2-3
JUMP HEIGHT AND WATER DEPTH SUMMARY AT THE POND OUTLET AND THE LOWER BEAVER DAM

	Apr	May	Jun	Jul	Aug	Sept	Oct
Jump height (difference between the surface of water in the roughened channel to the top of the pond outlet)[a]	10 inches	12 inches	15 inches	15 inches	1.5 feet	1.5 inches	13 inches
Photo documentation?	Yes	Yes	Yes	Yes	Yes	Yes	--
Water depth in the roughened channel just downstream of the pond outlet.	6 inches	5 inches	4 inches	3 inches	3 inches	4 inches	5 inches
Jump height (difference between the surface of water in Meldrum Bar Channel to the top of the lower beaver dam)[a]	2 to 3 feet	2 to 3 feet	2 feet	2.5 feet	2.5 feet	31 inches	2 feet
Photo documentation?	Yes	--	Yes	--	--	Yes	--
Water depth in the side channel just downstream of the lower beaver dam.	~ 2 to 3 feet	~ 2 feet	1 foot	6 inches	6 inches	2 inches	6 inches

[a]Pond outlet height varied due to beaver and human activity on-site.
[b]Jump height of the lower beaver dam varies with the tidal cycle and due to beaver and human activity on-site.

Refer to Appendix D for photos of the pond outlet and the lower beaver dam.

The beaver dam documented in the previous year's monitoring report (Cardno 2020) is still in place with water draining through the dam during low water (**Figure 2-5**).

Figure 2-5: Water trickles through the beaver dam at the remnant pond outlet, August 3, 2021.

Survey grade global positioning system (GPS) equipment was used to take elevation points along the channel profile of the remnant pond outlet. The upstream most point was measured at 17.25 feet North American Datum 1988 (NAVD88), and the point farthest downstream was measured at 9.36 feet NAVD88 (**Figure 2-6**). This elevation change was measured over a horizontal distance of 255 feet; therefore, the slope of the channel was determined to be 0.03 or 3%. The HDP

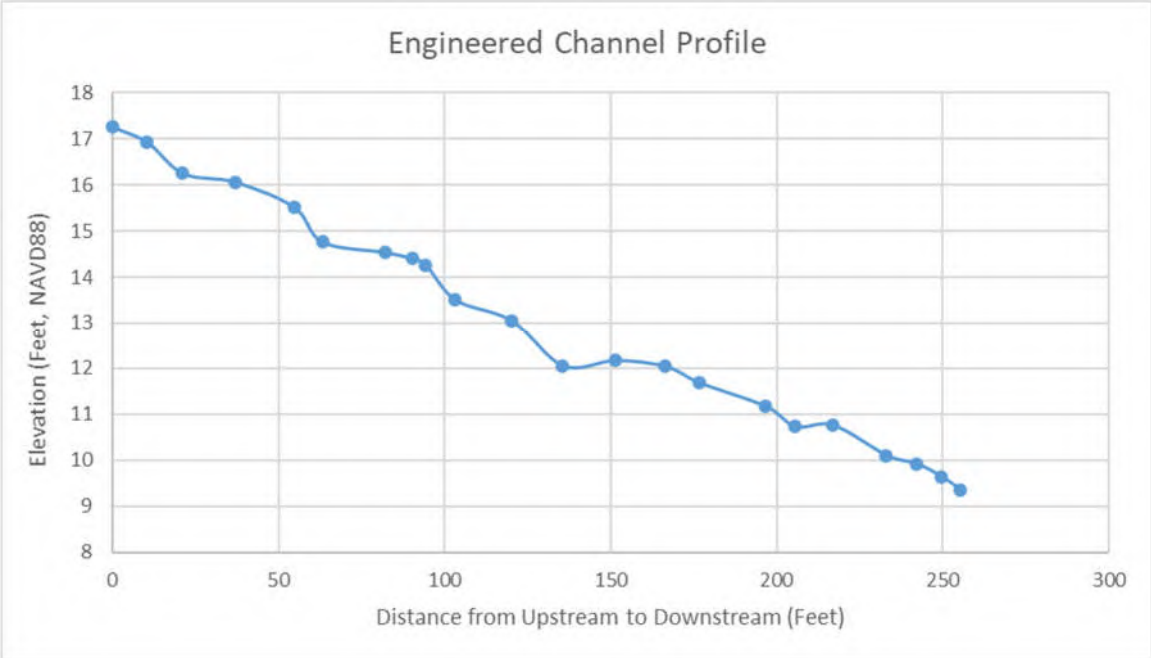


Figure 2-6. Engineered Channel Profile

indicates that water availability will be assessed visually by observing the wetted area in the channel and the discharge at the remnant pond outlet. During the 2021 survey, very little discharge was observed from the remnant pond outlet into the engineered channel. The channel appeared to be experiencing subsurface flow beneath the majority of the large rocks in the roughened channel with very little flow in the thalweg established to allow for fish passage.

2.4 Hydrology and Hydraulics

The performance standards for hydrology and hydraulics as outlined in the HDP require that the Willamette River overtop the remnant pond sill when the river stage height at the Oregon City gauge station exceeds 17.85 feet (NAVD88) and that a minimum of 8.5 acres is inundated when the gauge station exceeds 25.25 feet (NAVD88). In the monitoring year 2021, the logger recording period missed the freshet or high-flow event in which the Willamette River exceeded the 17.85 feet benchmark. **Figure 2-7** below depicts the water level data collected during the monitoring window compared to the 17.85-foot depth flow event.

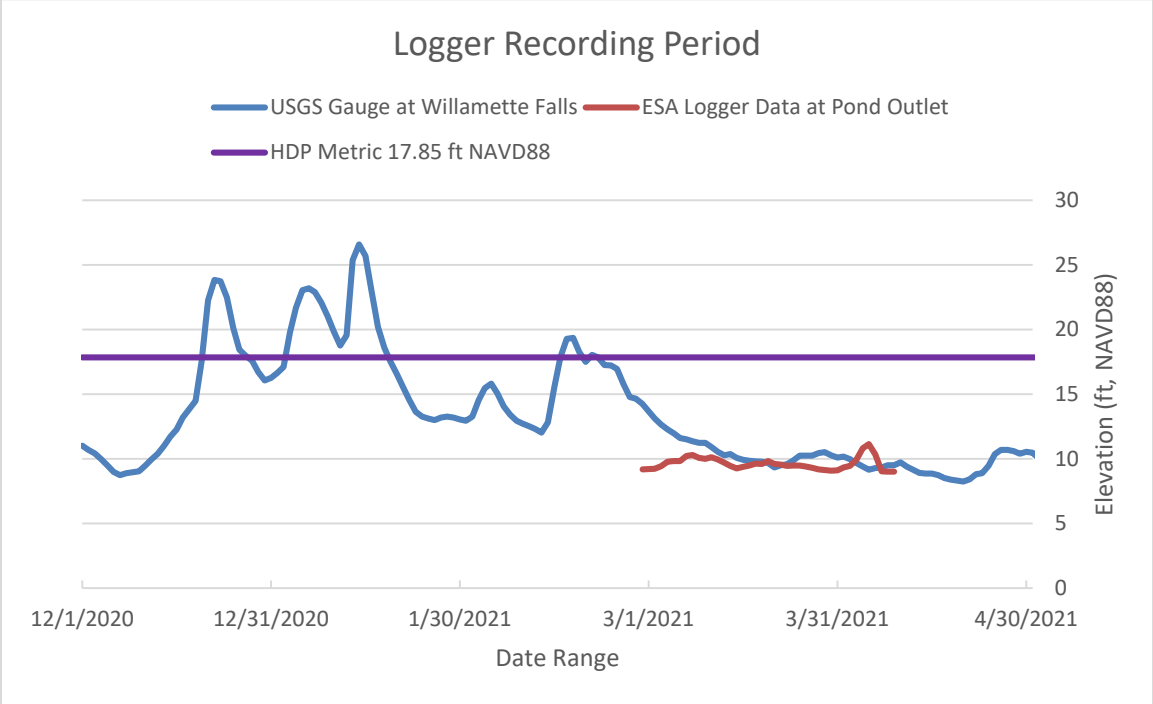


Figure 2-7. Logger Recording Period

A storm event on December 21, 2021 caused the Willamette River to overtop the sill by approximately 0.5 to 1 foot and inundated 9.5 acres of the site (Figure 2-8). The extent of the inundation was measured based on the flooding of a known point on the ground (Trail Camera #2 located north of the pond outlet) and extrapolated as shown in **Figure 2-8.** Refer to **Figure 2-9** for an image of the inundation on December 21, 2021.

Figure 2-8: A high-water event observed on December 21, 2021 inundated approximately 9.5 acres of the site when the Oregon City gauge station was at 19.97 feet (NAVD88).

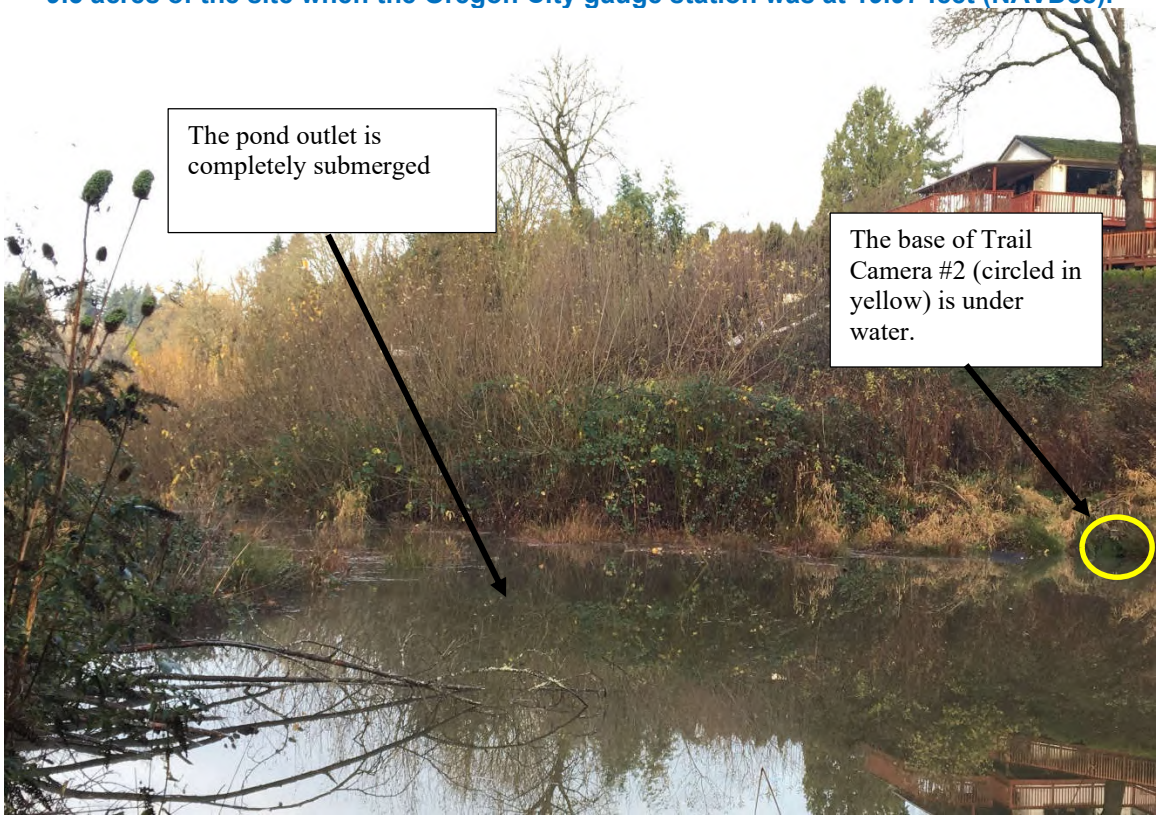


Figure 2-9: Looking northwest at the pond outlet which was submerged during a high-water event 12/21/2021 that inundated about 9.5 acres of the site. Calculations were based on flooding at a known point, Trail Camera 2.

No storm event in 2021 caused the Willamette River to exceed 25.25 feet (NAVD88) (USGS 2022), but based on a high-water event at 19.97 feet (NAVD88) that inundated an estimated 9.5 acres, we anticipate that a higher storm event would inundate at least 8.5 acres, thus meeting the performance standard.

3 VEGETATION MONITORING

This chapter compares the 2021 vegetation survey results with the required performance standards described in the HDP (Proutt 2018). ESA staff monitored four habitat types or categories (emergent marsh, riparian forest restoration, riparian forest enhancement, and upland/riparian forest invasive species management) in July, August, and September (revised plots 9 and 10) 2021 according to methods in the HDP, which in turn follows guidance by the Department of State Lands (DSL 2009) for monitoring wetlands and riparian/upland buffers. Herbaceous plots were 1 m² in all habitat types. Percent cover (absolute) of herbaceous species including native, non-native/non-management species, and invasive species was estimated. The number and type of installed woody species in the riparian restoration areas was tallied in 2 m x 10 m plots for analysis.

Performance standards are listed for each of the four habitat types, followed by a brief statement of the results. The sample mean and confidence interval (CI) for each performance standard involving cover (native, invasive, bare ground, etc.) are presented. The objective is to be 80% confident that the estimate reported is within ±10 units of the true population. Summary data to support these results are included in **Appendix D**.

Additional sample plots were added in 2021 using a randomized grid to increase the confidence of results from 2020. Refer to **Figure 3-1** for a depiction of the sample plots. **Table 3-1** summarizes the number of sample plots visited in 2021. The Trustees have indicated in a letter dated April 5, 2022 that the number and location of monitoring plots used in 2021 should remain the same for future monitoring efforts.

TABLE 3-1
VEGETATION SAMPLE PLOT SUMMARY

Habitat Type/Category	#Plots - 2021
Emergent marsh	17
Riparian forest restoration	18
Riparian forest enhancement	18
Upland/Riparian forest invasive	12

3.1 Emergent Marsh

Performance Standard – Native Species: The cover of native species, as defined by the City of Portland Native Plant List, in the herbaceous stratum is 30% or greater for Years 2–5. In Year 7, the standard increases to 50% or greater and to 70% or greater in Year 10.

Result: Mean native herbaceous cover was 27% (CI_{80} = 18% to 36%; CI = ±9). This performance standard is not met. The most common native herbaceous species was *Juncus effusus* (soft rush), which averaged 20% cover across the 17 plots. Other native species such as *Leersia oryzoides* (rice cutgrass), *Scirpus microcarpus* (small-fruited bulrush),

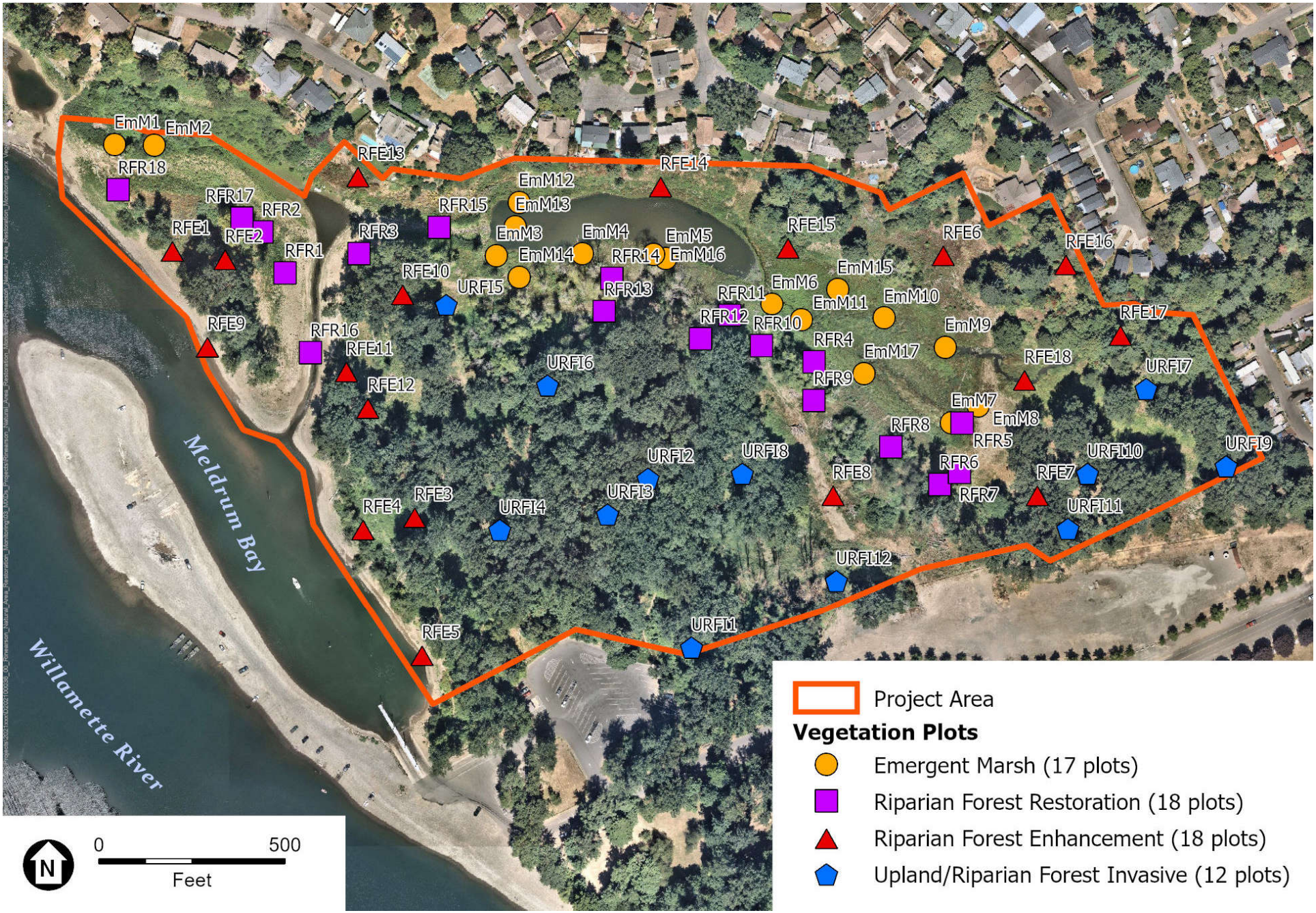


Figure 3-1. Vegetation Monitoring Plots

Veronica americana (American speedwell), and *Typha latifolia* (common cattail) were present but only in small patches scattered throughout the site. Dominant species in the emergent marsh include *Impatiens capensis* (spotted jewelweed) and *Lotus corniculatus* (bird's-foot trefoil), both non-native species.

Performance Standard – Invasive Species: Less than or equal to 20% cover by invasive herbaceous species in Years 2 through 10.

Result: Mean invasive herbaceous cover was 22% (CI_{80} = 15% to 30%; CI = ±7.5). This performance standard is not met, and invasive cover is trending toward increasing unless more intensive and regular maintenance is conducted in 2022. The most abundant and widespread weed present is *Phalaris arundinacea* (reed canarygrass) observed in 40% of the sample plots. *Dipsacus fullonum* (teasel) was abundant at plot 3, and *Circium arvense* (Canada thistle) had a relatively high cover at plot 15.

Performance Standard – Diversity: Plant species will include at least five native species of herbaceous plants with 5% cover present in at least 10% of the monitored plots.

Result: Only one native species meets the abundance and frequency threshold – *Juncus effusus*. This performance standard is not met. The emergent marsh is dominated by a mix of non-native and invasive species. Refer to **Figures 3-2 and 3-3** for representative plots.

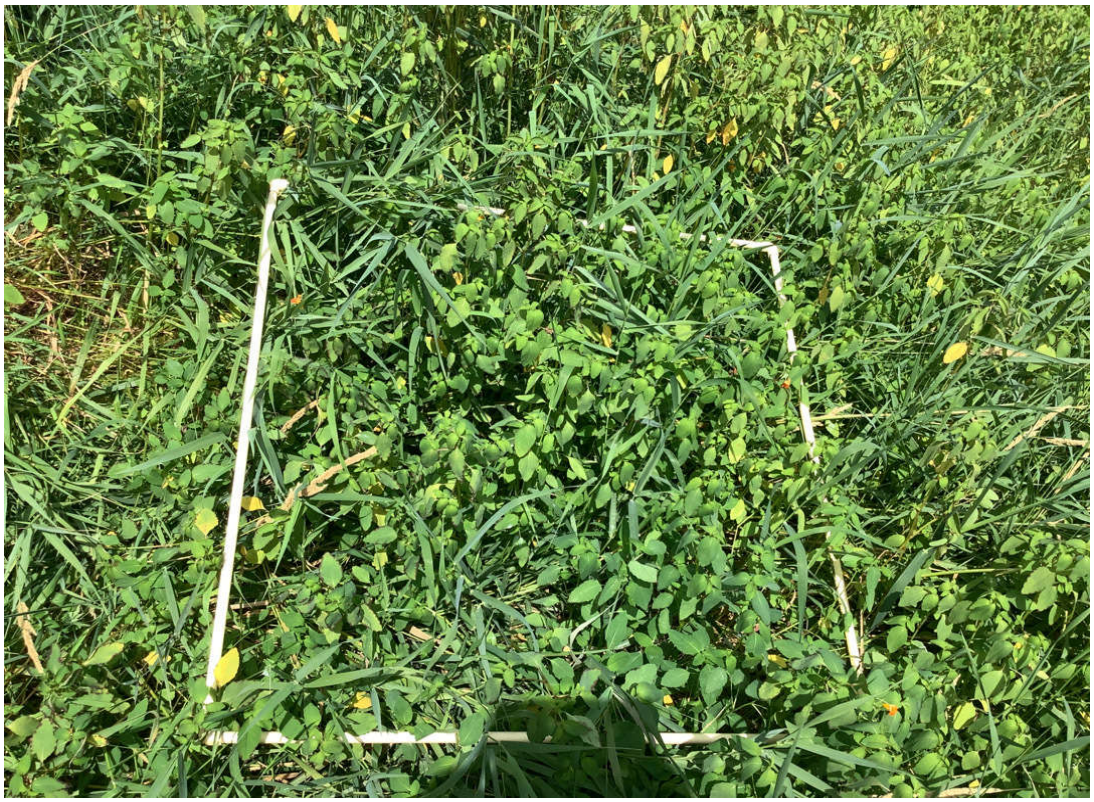


Figure 3-2. Plot EM11 – Note High Cover of Spotted Jewelweed along with Reed Canarygrass, August 2021

Figure 3-3. Plot EM10 - Yellow Flag Iris (foreground), Jewelweed, Cattail, and a Small Amount of Soft Rush, September 2021

3.2 Riparian Forest Restoration Area

Performance Standard – Woody Vegetation Density: The density of woody vegetation is at least 1,200 living native stems per acre for Years 2–5.

Result: Woody stem density averaged 5,432 living native stems per acre and substantially exceeded the minimum requirement. This performance standard is met. Refer to **Figures 3-4 and 3-5** for typical plots. Living native woody stems averaged 27 (raw count) across 18 plots with a standard deviation of 19.64.

Performance Standard - Invasive Species: The cover of invasive herbaceous species is 30% or less in Years 2 through 5.

Result: Mean invasive herbaceous cover was 18% (CI_{80} = 11% to 26%; CI = $\pm$7.5). This performance standard is met; however, continued maintenance is recommended in 2022 to reduce weed populations, which include: *Circium arvense*, *Phalaris arundinacea*, *Hedera helix* (English ivy), and *Convulvulus arvense* (bindweed).

Figure 3-4. Plot RFR10 – Looking Northwest; Remnant Pond in the Background.
Note Dense Elderberry, Mock-Orange, Rose, Spirea, etc., August 2021.

Figure 3-5. Plot RFR18 – Woody Plot and Herb Plot are Approximated by the White Lines.
Dense Willows and Cottonwood at Top of Slope, August 2021.

Performance Standard – Shrub Species Richness: At least five native shrub species present in Years 2 through 5.

Result: Ten different native shrub species were present in 2021: *Cornus sericea* (red-osier dogwood), *Lonicera involucrata* (twinberry), *Berberis (Mahonia) aquilinum* (tall Oregon grape), *Philadelphus lewisii* (mock-orange), *Rosa pisocarpa* (cluster rose), *Salix geyeriana* (Geyer willow), *Sambucus racemose* (red elderberry), *Spirea douglasii* (spirea), *and Symphoricarpos albus* (common snowberry). This performance standard is met.

Performance Standard – Tree Species Richness: At least three native species present in Years 2 through 5.

Result: Four different native tree species were present in 2021: *Alnus rubra* (red alder), *Fraxinus latifolia* (Oregon ash), *Populus balsamifera ssp. trichocarpa* (black cottonwood), *Salix lasiandra* (Pacific willow), This performance standard is met.

Performance Standard – Species Diversity: Although species diversity is not identified explicitly in the HDP for the riparian forest restoration area, performance standards for native herbaceous species, native shrub species and native tree species are as follows:

- Plant species will include at least five native herbaceous species with 5% cover present in at least 10% of monitored plots.

  Result: Only four native herbaceous species met the abundance and frequency threshold: *Epilobium watsonii* (6 of 18 plots), *Juncus effusus* (3 of 18 plots), *Polystichum munitum* (2 of 18 plots) and *Rubus ursinus* (5 of 18 plots). *Agrostis exarata* almost met the threshold for diversity. The Portland Plant List identifies *Rubus ursinus* as an herbaceous species. This standard is not met.

- Plant species will include at least five native shrub species with 5% cover present in at least 10% of monitored plots.

  Result: Five native species met the abundance and frequency threshold – *Cornus sericea* (2 of 18 plots), *Lonicera involucrata* (2 of 18 plots), *Philadelphus lewisii* (2 of 18 plots), *Salix sitchensis* (5 of 18 plots) and *Symphoricarpos albus* (4 of 18 plots). This standard is met.

- Plant species will include at least three native tree species with 10% cover present in at least 10% of monitored plots.

  Results: Two native tree species met the abundance and frequency threshold: *Alnus rubra* (2 of 18 plots) and *Populus balsamifera ssp. Trichocarpa* (6 of 18 plots). This standard is not met.

3.3 Riparian Forest Enhancement Area

Performance Standard - Invasive Species: The cover of invasive herbaceous species is 30% or less in Years 2 through 5.

Result: Mean invasive herbaceous cover was 20% (CI_{80} = 14% to 26%; CI = ±6). This performance standard is met; however, continued maintenance is recommended in 2022 to reduce weed populations, which include: a large population of *Lythrum salicaria* (purple loosestrife) at plot 4 in an area that receives overbank flooding from the Willamette River; *Circium arvense* at plots 11 and 15; *Hedera helix* at plots 2, 7, 12, and 16; and *Dipsacus fullonum* at plot 1. *Phalaris arundinacea* is also present in six of the plots (30% of the sample size).

Performance Standard – Species Diversity: Although species diversity is not identified explicitly in the HDP for the riparian forest enhancement area, performance standards for native herbaceous species, native shrub species and native tree species are as follows:

- Plant species will include at least five native herbaceous species with 5% cover present in at least 10% of monitored plots.

  Result: Only four native herbaceous species met the abundance and frequency threshold: *Agrostis exarata* (2 of 18 plots), *Epilobium watsonii* (3 of 18 plots), *Juncus effusus* (2 of 18 plots), and *Rubus ursinus* (5 of 18 plots). This standard is not met.

- Plant species will include at least five native shrub species with 5% cover present in at least 10% of monitored plots.

  Result: Two native shrub species met the abundance and frequency threshold – *Cornus sericea* (2 of 18 plots) and *Rosa pisocarpa* (2 of 18 plots). This standard is not met.

- Plant species will include at least three native tree species with 10% cover present in at least 10% of monitored plots.

  Results: No native tree species met the abundance and frequency threshold. *Salix lasiandra* had 15% cover in one of 18 plots. This standard is not met.

3.4 Upland / Riparian Forest Invasive Management Area

Performance Standard – Invasive Species: The cover of invasive herbaceous species is 30% or less in Years 2 through 5.

Result: Mean invasive herbaceous cover was 24% (CI_{80} = 12% to 35%; CI = ±12). The invasive cover is below the maximum threshold; however, the CI is greater than 10 units; therefore, the performance standard is not met. Weed control and replacement with native species is recommended in 2022 to reduce weed populations, which include: extensive growth of *Hedera helix* at more than 50% of the plots, and *Geranium robertianum* (Herb Robert) at plots 2 and 8. *Phalaris arundinacea* is also present at plots 10 and 12.

Performance Standard – Species Diversity: Although species diversity is not identified explicitly in the HDP for the upland / riparian invasive management area, performance standards for native herbaceous species, native shrub species and native tree species are as follows:

- Plant species will include at least five native herbaceous species with 5% cover present in at least 10% of monitored plots.

  Result: Only three native herbaceous species met the abundance and frequency threshold: *Galium aparine* (2 of 12 plots), *Rubus ursinus* (4 of 12 plots), and *Urtica dioca* (2 of 12 plots). This standard is not met.

- Plant species will include at least five native shrub species with 5% cover present in at least 10% of monitored plots.

  Result: One native shrub species met the abundance and frequency threshold: *Symphoricarpos albus* (5 of 12 plots). This standard is not met.

- Plant species will include at least three native tree species with 10% cover present in at least 10% of monitored plots.

  Results: No native tree species met the abundance and frequency threshold. *Thuja plicata* had 20% cover in one of 12 plots. This standard is not met.

4 FISH AND WILDLIFE MONITORING

4.1 Fish Monitoring: Snorkel Surveys

Snorkel surveys were conducted in February, March, and April 2021 to determine if native fish species are using the restored site. Seining was not permitted because juvenile salmonids were caught in seine nets during 2020 surveys, and non-contact methods were recommended for Year 3. Snorkeling was concluded to be the best non-contact method for sampling native fish. Refer to **Figure 4-1** for a depiction of snorkel survey locations.

Survey areas included: the remnant pond (**Figure 4-2**), the roughened channel below the remnant pond outlet (**Figure 4-3**), Rinearson Creek through the restored floodplain, Meldrum Bay, and the Meldrum Bay backwater channel. Snorkel surveys were conducted by one fish biologist in a dry suit with one technician on the shore for safety. Meandering surveys were conducted according to methods outlined by Johnson et al. (2007).

No fish species were observed during snorkel surveys due to poor visibility (**Table 4-1**). Three flushes or glimpses of movement in the water were detected and classified as unknown. Non-fish aquatic species detected included a crayfish (unknown species) in the roughened channel and two rough-skinned newts in the remnant pond (Table 4-1). Environmental DNA (eDNA) sampling is recommended for future surveys instead of snorkeling. A proposed methodology for conducting eDNA analysis was submitted as part of an addendum to the 2020 monitoring report.

TABLE 4-1
SNORKEL SURVEY RESULTS

Sate	Areas Surveyed	Observed Aquatic Species			Notes – Visibility and Whether
		Crayfish	Rough-skinned new (*Taricha granulosa*)	Unknown aquatic organism	
2/9/2021	Meldrum Bay and back channel; roughened channel, remnant pond, floodplain	--	--	--	< 1 m visibility; cloudy
2/24/2021	Meldrum Bay and back channel; roughened channel, remnant pond, floodplain	--	--	1 – roughened channel	< 1 m visibility; cloudy
3/17/2021	Meldrum Bay back channel; roughened channel, remnant pond, floodplain	1 – roughened channel	--	1 – roughened channel	< 1 m visibility; sunny
3/30/2021	Roughened channel, remnant pond, floodplain	--	2 – remnant pond	1 – remnant pond	1 m visibility; sunny
4/13/2021	Roughened channel, remnant pond[a]	--	--	--	< 1 m visibility; sunny

NOTES:

[a] Water was too low and muddy to snorkel the back channel and the floodplain.

Figure 4-1. Fish Monitoring – Snorkel Locations

Figure 4-2. Snorkeling the Remnant Pond, March 30, 2021

Figure 4-3. Snorkeling the Roughened Channel, Looking Upstream, March 30, 2021

4.2 Breeding Birds

Breeding bird surveys were conducted at seven point count stations based on methods outlined in Huff et al. (2000). The number of survey stations visited in 2021 was reduced from the 15 baseline surveys conducted in 2014 to minimize the potential for double-counting species and overestimating the number of birds detected on-site. Refer to **Figure 4-4** for a depiction of the revised number of survey stations. To compare results, detections are presented as birds per station within 50 meters and include adults and juveniles as well as birds flushed between stations and observed as associated flyovers. Auditory or visual detections beyond 50 meters from a point count station were recorded on the data sheets, but not included in the results. Only seven of the 15 baseline stations closest to the revised point count stations were re-analyzed and are used for comparison with current data.

A summary table comparing the relative abundance of birds detected in 2021 versus 2014 is included in **Appendix E**. Thirty-two bird species were detected in 2021, an increase of six species compared to the total number recorded in 2014. The top five most commonly detected species in 2021, in decreasing order of abundance, were: mallard, song sparrow, American crow, spotted towee, and European starling and cedar waxwing (the latter two tied for 5th most abundant). In 2014, the top five most commonly detected species, also in order of decreasing relative abundance, were: song sparrow, spotted towhee, mallard, black-chickadee, and Bewick's wren. The reason for a decrease in black-capped chickadees and Bewick's wrens, both cavity-nesting species, in 2021 is unclear. A possible reason is due to the relatively high abundance of European starlings in 2021 that may outcompete native songbirds for cavity nests sites. However, the downy woodpecker, also a cavity-nesting species, increased slightly in 2021.

Twenty-five species were either newly detected or increased in abundance compared to 2014. The most substantial jump in numbers was a threefold increase in mallard detections, likely due to the high number of mallard adults and chicks observed in the remnant pond and Meldrum Bay. Species typically associated with ponds, emergent wetlands, scrub-shrub wetlands, and thickets (similar to the areas that have been restored on-site) that were detected post-construction include: common yellowthroat, yellow warbler, and violet green swallow (foraging habitat). The 2021 detection of the yellow warbler, which is strongly associated with riparian habitats, may indicate that the planted willows are becoming established on-site and are trending toward providing sufficient breeding opportunities.

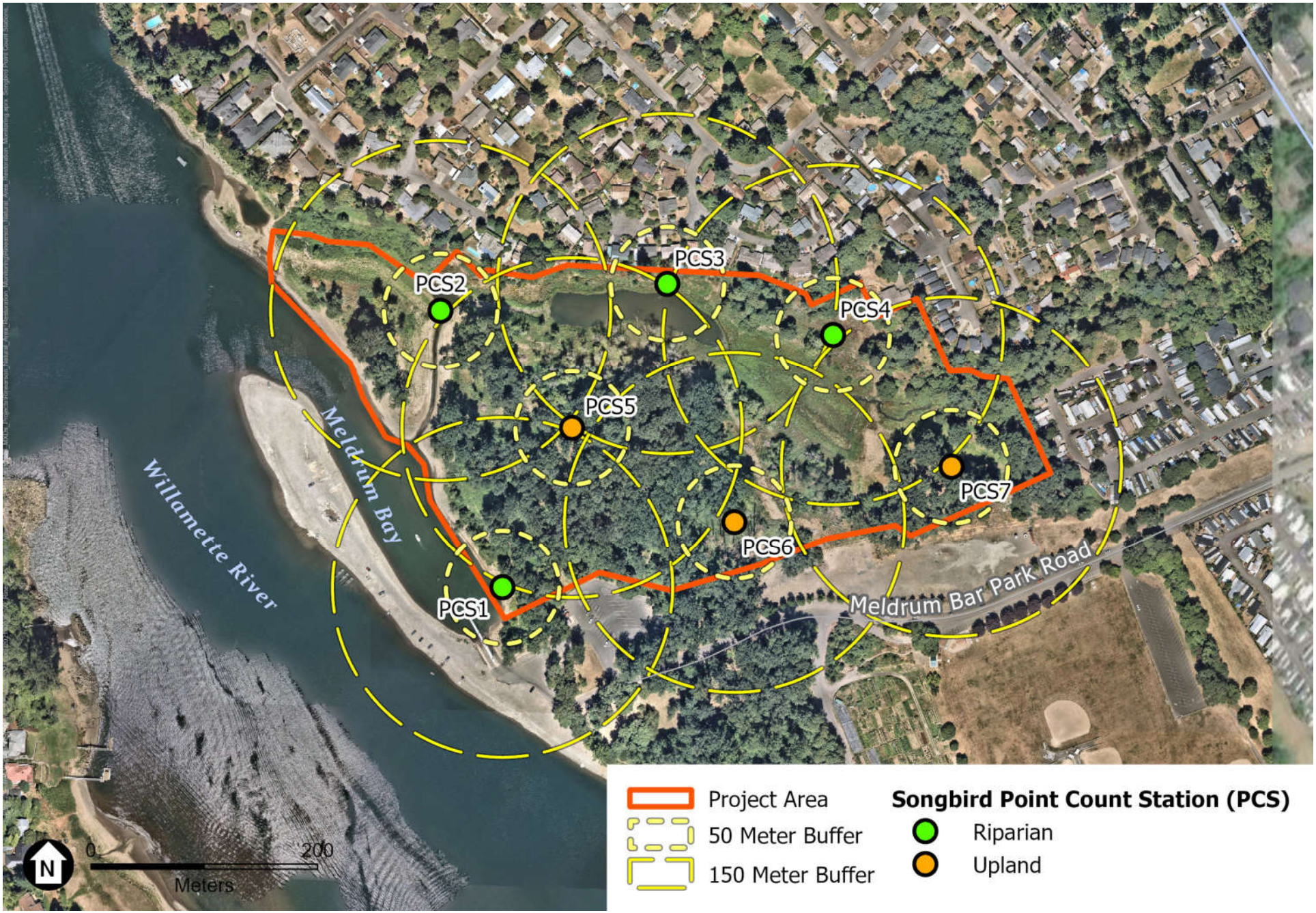


Figure 4-4. Breeding Bird Point Count Stations

4.3 Bald Eagles

Bald eagle activity was observed on and near the project area from January through August and in December 2021. Weekly observations were conducted for two hours each visit using 10x40 binoculars and alternated between dawn and dusk to capture a range of activities. Refer to **Appendix F** for a summary table and bald eagle observation data sheets.

A pair of bald eagles has nested on the west bank of the Willamette River across from the site **(Figure 4-5**), and the nest shifted north compared to its location in 2014. Adult eagles spent a total of 1 hour and 9 minutes perched at the west end of the site for the monitoring season and spent limited time foraging in Meldrum Bay. A juvenile eagle was observed hunting a great blue heron at the remnant pond outlet; otherwise, no eagles were observed foraging in the remnant pond. The presence of private residences at the top of the slope north and west of the remnant pond diminishes the suitability of the site as eagle foraging habitat. Despite the relatively close proximity of people in the neighborhood to the north as well as visitors at Meldrum Bar Park, the project site appears to be within the territory of the west bank eagles.

When present in the vicinity, the west bank eagles spent most of their time perched in various tall Douglas fir trees near their nest or in the nest tree. The nesting attempt appears to have failed, as no large nestlings were ever observed. The failure could possibly be due to extreme air temperatures in late June and early July. Bald eagle monitoring survey stations are shown in **Figure 4-6.**

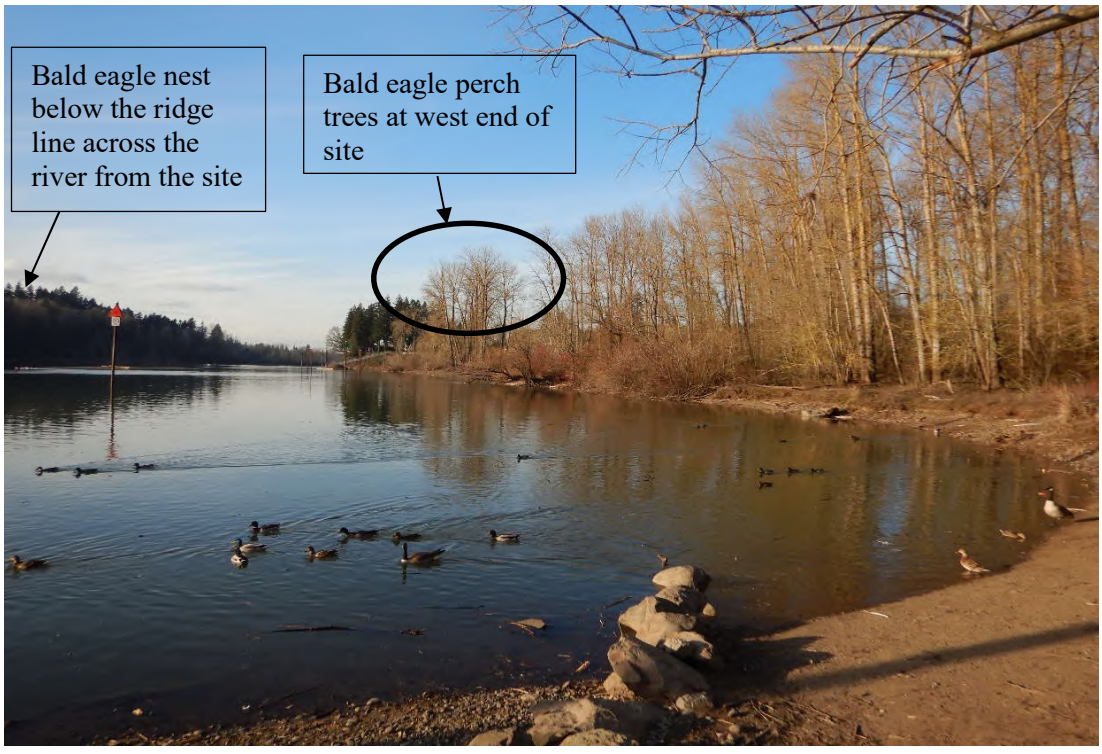


Figure 4-5. Looking N/NW and Downstream from Bald Eagle Station #1.
Adult bald eagles periodically perched in the cottonwood trees at the west end of the site, but spent more time perched on the west bank of the Willamette River near their nest.

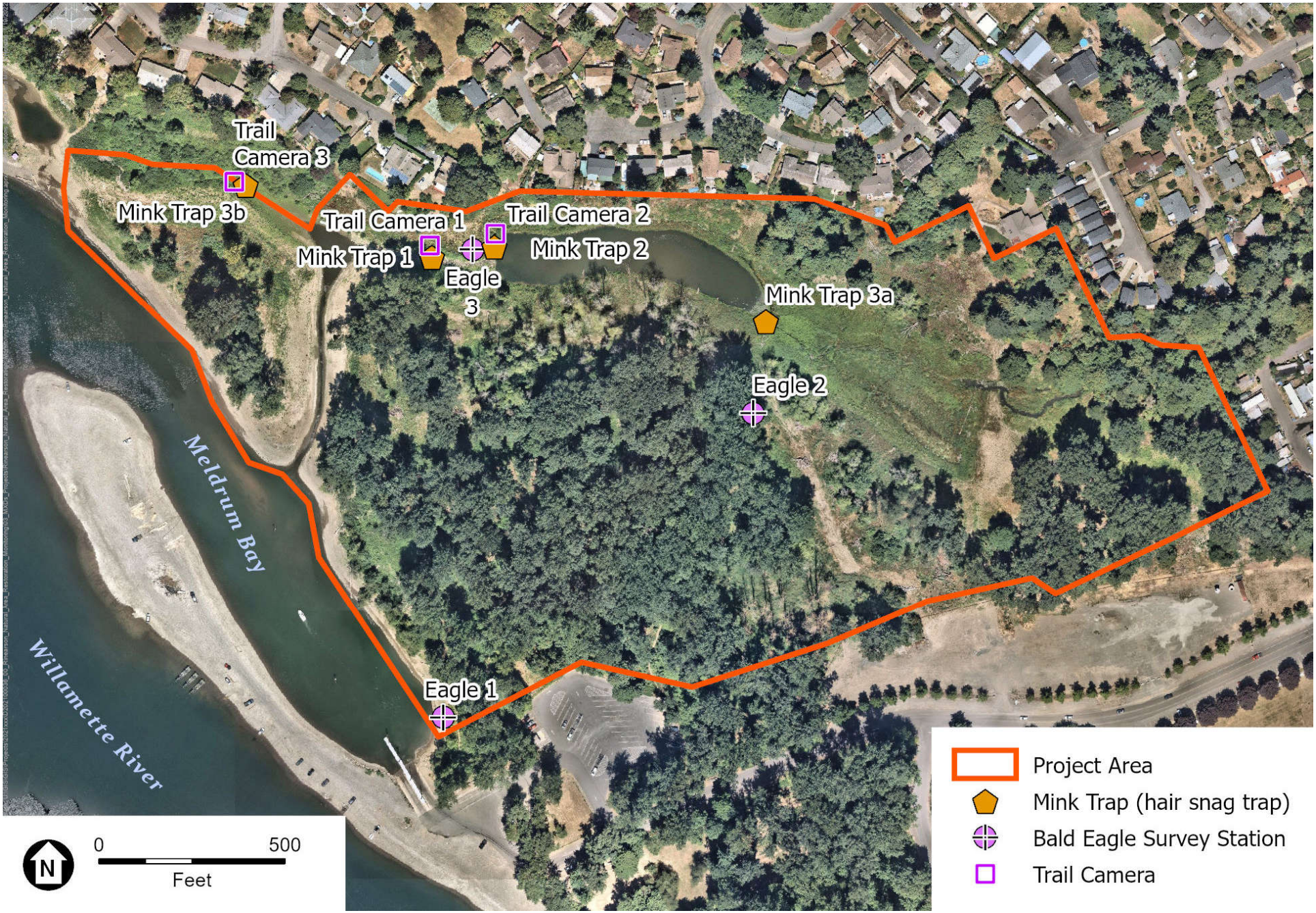


Figure 4-6. Wildlife Survey Stations – Bald Eagle and Mink

4.4 Mink

The presence of mink, a semi-aquatic carnivore and member of the weasel family, was monitored twice monthly from April to August to determine the frequency of use of the site and if use is increasing post-construction. Refer to the baseline report for more background information on its ecology and why mink was selected as a target species (Cascade Environmental Group 2016). No monitoring was conducted in late June due to high air temperatures. Monitoring visits totaled eight (every other week for 4 months, excluding the previously mentioned dates). Mink was monitored using the following methods: three camera trap stations; visual searches for tracks and scat; and three hair-snag traps sized for mink **(Figure 4-6**). Camera trap stations were checked bi-weekly and memory cards were downloaded to review images. Three Rivers mink scent was applied to three camera stations for the two visits in August. Two camera stations were active for 6 survey weeks and were not baited with mink scent. The three hair-snag traps were sized for mink (long, narrow body type) and baited with anchovy paste.

Mink were photo-documented on-site two times in 2021 for an average of 0.11 mink per station. No mink tracks were detected and no fur samples were obtained in the hair-snag traps. The first detection was on July 17 and the second was on August 7 (**Figures 4-7 and 4-8**). Both detections were at Trail Camera 1 in a gap of one of the installed large wood pieces. In comparison, mink were photo-documented on-site four times during baseline surveys for an average of 0.10 mink per station. Five camera stations baited with mink scent were used in the baseline study, whereas three cameras were used in 2021.

When accounting for level of survey effort between baseline and Year 3, mink use of the site stayed approximately the same. The fact that mink were detected at Trail Camera 1 where a large log structure is embedded with and without the use of mink scent indicates that the large wood structures installed in the roughened channel provide suitable cover along the stream banks and enhance the area as a movement corridor for numerous species, including mink.

Figure 4-7. Mink Detected at Trail Camera 1 in the Gap of an Installed Log Structure on July 17, 2021.

Mink scent was not in use at the trap station at this time.

Figure 4-8. Mink Detected at Trail Camera 1 on August 7, 2021.

Mink scent was applied.

5 WATER QUALITY MONITORING

Water quality monitoring was conducted in April 2021 at 11 locations across the project area. The 2021 monitoring stations were located to approximate those of the 2020 monthly water quality monitoring effort, based on mapping from the 2020 Rinearson Monitoring Annual Report (Figure 4-1 in Cardno [2020]). The 11 monitoring stations (WQS-1 through WQS-11) encompass the four primary habitat types of the restoration project; they also cover a portion of Upper Rinearson Creek upstream of the restoration project and the Willamette River (Meldrum Bar Bay) at and upstream of the Rinearson Creek confluence. The 2021 water quality monitoring locations are shown in **Figure 5-1** and described in **Table 5-1** below.

TABLE 5-1. WATER QUALITY MONITORING LOCATIONS

Monitoring Station ID	Location Description
WQS-1	Willamette River/Meldrum Bay: End of Boat Ramp Dock at Meldrum Bar Park
WQS-2	Willamette River/Meldrum Bay: Shoreline on South Side of Rinearson Creek/ Meldrum Bar Channel confluence
WQS-3	Meldrum Bar Channel – Upper Section
WQS-4	Engineered Riffle – Lower Section
WQS-5	Engineered Riffle – Middle Section
WQS-6	Engineered Riffle – Upper Section near Remnant Pond Outlet
WQS-7	Remnant Pond – Middle Section, South Side
WQS-8	Remnant Pond – East End, South Side
WQS-9	Emergent Marsh Channel – Lower Section
WQS-10	Emergent Marsh Channel – Upper Section
WQS-11	Upper Rinearson Creek

A YSI 556 multi-parameter sonde with handheld display was used to collect water temperature, pH, dissolved oxygen (DO), and conductivity data at the 11 monitoring locations on April 27, 2021. The water quality meter was calibrated with standards of known values for pH and conductivity, and with known percent saturation for DO, prior to field data collection. Consistent with the 2020 monitoring program, data were collected from late morning through early afternoon, beginning at station WQS-1 in the Willamette River and moving upstream through the project area, finishing at WQS-11 in Upper Rinearson Creek. The sensor placement at each monitoring station was typically approximately mid-depth in the water column.

5.1 Results

The water temperature, pH, dissolved oxygen, and conductivity data collected during the April 27, 2021 monitoring are presented in **Table 5-2**. Weather conditions on the date of data collection were partly to mostly sunny, with air temperatures ranging from a low of 6.7 °C (44 °F) to a high of 21.1 °C (70 °F), based on continuous air temperature data collected at the site during the monitoring period.

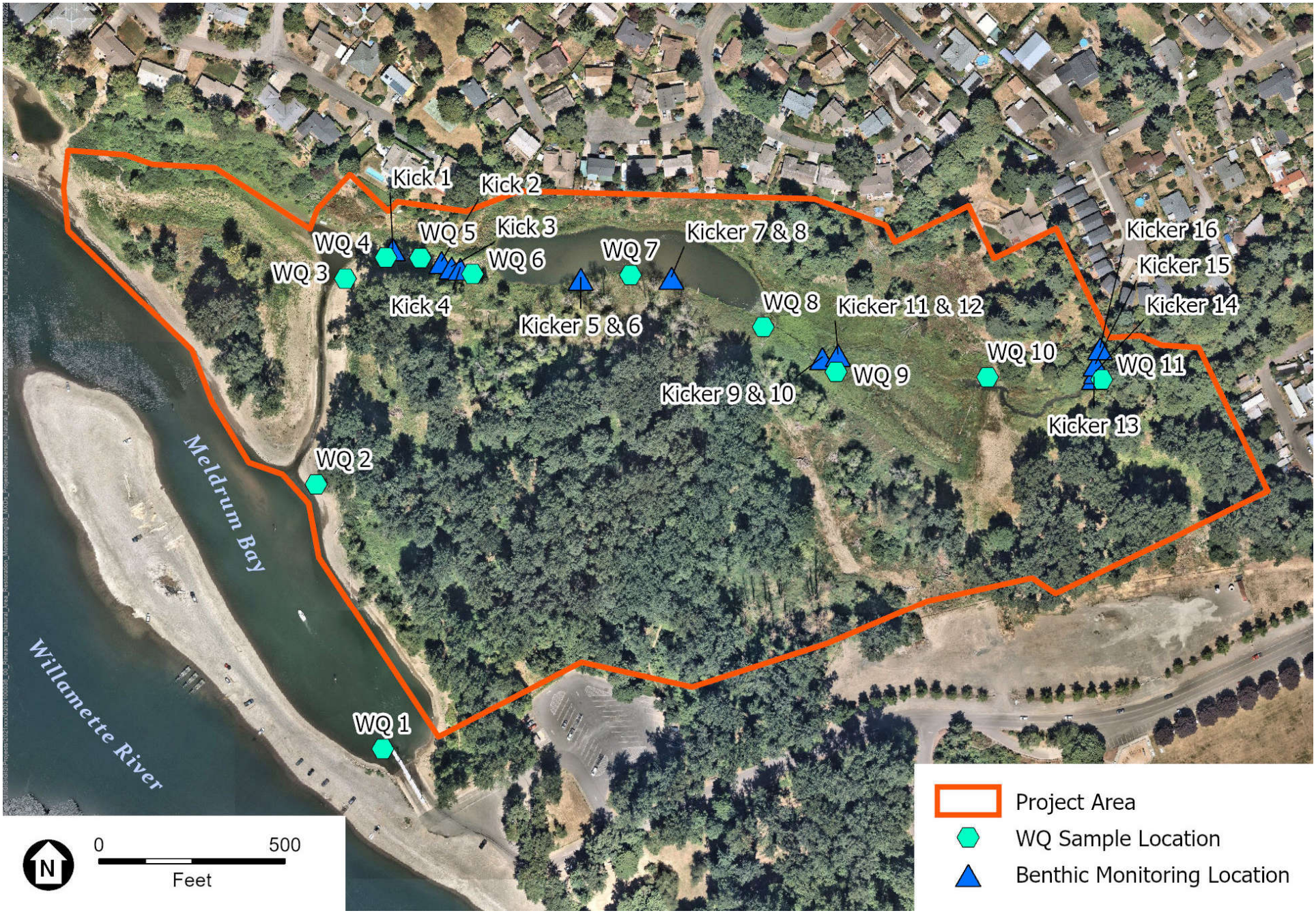


Figure 5-1. Water Quality and Benthic Monitoring Locations

TABLE 5-2
SUMMARY OF WATER QUALITY RESULTS

Station ID	Sample Time	Temperature	pH (S.U.)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)
WQS-1	11:27:33	10.8 °C 51.4 °F	6.8	12.2	61
WQS-2 (first)	12:04:21	10.7 °C 51.2 °F	*10.2* (error)*	12.8	60
WQS-2 (second)	14:41:14	11.8 °C 53.2 °F	8.3	12.7	55
WQS-3	12:18:17	14.0 °C 57.1 °F	7.7	12.9	143
WQS-4	12:27:42	15.1 °C 59.2 °F	7.5	11.7	160
WQS-5	12:38:39	15.6 °C 60.1 °F	7.6	12.0	160
WQS-6	12:57:27	15.8 °C 60.4 °F	7.5	12.8	159
WQS-7	13:15:54	15.6 °C 60.1 °F	7.8	15.1	157
WQS-8	13:24:22	16.3 °C 61.4 °F	7.3	9.5	165
WQS-9	13:32:39	16.4 °C 61.4 °F	7.4	9.5	165
WQS-10	13:43:57	15.0 °C 59.1 °F	7.5	10.0	161
WQS-11	13:52:03	13.5 °C 56.4 °F	7.8	10.4	154

*Note: The first pH reading taken at WQS-2 was identified in the field as an outlier and rejected due to an apparent communication issue between the sensor cable and handheld display. The issue was resolved at WQS-3. WQS-2 was revisited at the end of the monitoring circuit to obtain a valid pH measurement.

5.2 Temperature

The data show that water temperatures on the date of monitoring were generally lowest at stations in the Willamette River/Meldrum Bay (WQS-1, 2) and highest at stations within the remnant pond and the lower section of the emergent marsh channel (WQS-7, 8, 9). The lowest temperature recorded was 10.7 °C (51.2 °F) at WQS-2, in Meldrum Bay just after noon, and the highest temperature measured was 16.4 °C (61.4 °F) at WQS-9, in the lower section of the emergent marsh channel in early afternoon.

Water temperature at WQS-11, in Upper Rinearson Creek just upstream of the project area, was 13.5 °C (56.4 °F), which was cooler than temperatures at all other locations with the exception of the Willamette River stations. Temperatures downstream of the remnant pond showed a

decreasing trend from upstream to downstream, ranging from 15.8 °C (60.4 °F) at WQS-6 at the remnant pond outlet to 14.0 °C (57.1 °F) at WQS-3 in the lower section of the Meldrum Bar Channel.

Overall, the data appeared to indicate relatively cool water in the forested portion of Rinearson Creek upstream of the project area, some warming of water temperatures in the emergent marsh channel and remnant pond, and then some moderation of temperatures between pond outlet flows and the Meldrum Bar Channel discharge to the Willamette River, with measured temperature differences of 0.5 °C between the Upper Rinearson Creek reference point (WQS-11, 13.5 °C) and the lower section of the Meldrum Bar Channel (WQS-3, 14.0 °C).

The April 2021 temperature data showed overall site patterns similar to the data collected at the same locations in April 2020, with relatively lower temperatures in Upper Rinearson Creek and the Willamette River and higher temperatures in the remnant pond and emergent marsh channel. The water temperatures recorded during the April 2020 monitoring were in a similar range but had less variability across the study area than those recorded in April 2021, ranging from a low of approximately 11.7 °C (53 °F) at WQS-1 and WQS-11 to a high of approximately 14.4 °C (58 °F) at WQS-8 (Cardno 2020).

Oregon's water quality standards for temperature (OAR 340-041-0028) prescribe that the 7-day-average maximum temperature of a stream identified for salmon and trout rearing and migration use may not exceed 18.0 °C (64.4 °F). Water temperatures measured during the April 27, 2021 monitoring in the project area were all below this level, but were approaching it in the remnant pond and lower section of the emergent marsh channel (16.3 to 16.4 °C in the afternoon at WQS-8 and WQS-9, respectively).

5.3 Dissolved Oxygen (DO)

The DO readings on April 27, 2021 showed values ranging from a low of 9.5 mg/L at WQS-8 and WQS-9 (east end of remnant pond and lower section of emergent marsh channel), to a high of 15.1 mg/L at WQS-7 (middle section of remnant pond). Readings at all other stations were within a range of 10.0 mg/L (WQS-10, upper section of emergent marsh channel) to 12.8 mg/L (lower section of Meldrum Bar Channel). The high DO reading in the middle section of the remnant pond (15.1 mg/L at 1:16 PM) likely reflects photosynthetic activity of algae and aquatic plants in the pond, which can produce more oxygen than is consumed. Dissolved oxygen levels in ponds typically increase during the day as photosynthetic activity increases, and decrease at night as respiration exceeds photosynthesis.

The DO measurements taken in April 2021 show similar values and patterns across the site when compared to the April 2020 readings. Similar to 2021, the April 2020 data show the lowest DO reading at WQS-9 (~9.5 mg/L) and the highest reading at WQS-7 (~16 mg/L), with values at other stations generally in the 10 – 14 mg/L range (Cardno 2020).

Oregon water quality standards for dissolved oxygen (OAR 340-041-0016) state that DO should not be less than 6.5 mg/L in waters designated for cool water aquatic life, which includes

Rinearson Creek and the Willamette River in its vicinity. The DO values measured on April 27, 2021 at all stations were well above the minimum needed to meet the water quality standard.

Water quality standards for dissolved oxygen are more stringent for certain aquatic life uses, including trout spawning. As described in the HDP, cutthroat trout were observed in Rinearson Creek before the construction of the dam. Oregon's water quality standards for dissolved oxygen state that for any active spawning area used by resident trout species, dissolved oxygen may not be less than 11.0 mg/L during the time of trout spawning through fry emergence, with the exception that if minimum inter-gravel DO is 8.0 mg/L or greater, then the DO criterion is 9 mg/L (OAR 340-041-016(1)).

Based on the April 2021 monitoring, DO levels at the Rinearson Creek stations above the pond (WQS 8-11) were below the 11 mg/L standard for trout spawning periods, in a range of 9.5 to 10.4 mg/L. Measured DO concentrations at the other stations (WQS-1 to WQS-7) were above the 11 mg/L minimum standard for trout spawning.

5.4 pH

The water pH measurements on April 27, 2021 showed values ranging from a low of 6.8 Standard Units (S.U.) at WQS-1 to a high of 8.3 S.U. at WQS-2, with readings at all other stations in the range of 7.3 – 7.8 S.U. These data are generally in line with the April 2020 monitoring data collected at the same locations, which showed pH ranging from 6.5 S.U. to 8.0 S.U., with the exception of one outlier value of 3.0 S.U. recorded at WQS-1 in April 2020 (Cardno 2020).

Oregon's water quality standards for pH in the Willamette Basin (OAR 340-041-0345) prescribe that pH values should not fall outside the range of 6.5 to 8.5 S.U. The pH values measured on April 27, 2021 at all stations were within the range of the water quality standard.

5.5 Conductivity

Conductivity measurements taken on April 27, 2021 show the lowest levels in the study area at the Willamette River/Meldrum Bay stations (WQS-1, 2), with values at those locations ranging from 55 to 61 μS/cm. Conductivity readings were higher and relatively consistent across all other stations, ranging from 143 μS/cm at WQS-3 to 165 μS/cm at WQS-8 and WQS-9.

The April 2021 conductivity data are generally similar to the reported April 2020 conductivity data. The Rinearson Monitoring Year 2020 report describes the lowest conductivity readings of less than 100 μS/cm consistently found at WQS-1 and WQS-2 throughout the year, with values at other stations consistently between 100 and 200 μS/cm, averaging around 150 μS/cm (Cardno 2020).

Oregon does not have water quality standards for conductivity, but it is useful as a general measure of stream quality and for tracking over time, as changes in stream conductivity at a site could indicate a change in pollution sources.

6 BENTHOS MONITORING

Benthic invertebrates were sampled at four sites in the project area according to methods outlined in the HDP (**Figure 5-1**). Samples were sieved and bottled on site and delivered to Aquatic Biology Associates for analysis. The summary below is provided by Aquatics Biology. Refer to Appendix G for benthic invertebrate data results and results.

Total number of taxa present at all four sites and habitat types in 2020 was 70 taxa. In 2021, it was 47. Annual variation in whether rare and occasional taxa are present or absent is expected, especially considering that only four samples were taken, and about 2,000 total invertebrates were assessed each year. However, a drop from 70 to 47 total taxa is substantial. Of particular note: there were eight mollusk taxa in 2020, and only one in 2021; three caddisfly taxa in 2020, and none in 2021; four beetle taxa in 2020, and none in 2021; and 16 Diptera taxa found only in 2020 versus four dipteran taxa found only in 2020. Case studies from the Willamette Valley are lacking for these habitat types to assess whether this amount of annual variation is unusual or not. The sharp decline is highly unusual and maybe drought related.

Total taxa richness in 2020–21 dropped the most in the emergent marsh (47 to 14 taxa), and upper control site (33 to 15 taxa). Total richness declined slightly at the remnant pond, and rose slightly in the engineered riffle.

Total abundance (relative) declined 2020–21 at all sites. The marked reduction from 2020–21 at the engineered riffle was primarily associated with sharp declines in blackfly and midge densities. These can be bloom taxa—i.e., achieving high population densities in newly disturbed sites (after riffle construction), and then falling sharply. Total abundance at the upper control site fell from 1,911 to 264, from 2020 to 2021, a very sharp decline.

EPT taxa richness (mayflies, stoneflies, and caddisflies) is a commonly tracked metric for assessing stream samples. EPT taxa richness was very low both years, but fell from 1–3 taxa in 2020 to 0–1 taxon in 2021 across all four habitat types.

Warm and cold-water biota. Results indicated a generally high richness and % contribution of warm water biota, and low richness and % contribution of cold-water biota. There are some anomalies in the data caused by specific taxa. Prodiamesa was considered a cold-water midge in this analysis and was a dominant taxon in the emergent marsh. It is no longer considered a cold-water taxon in a thermal analysis being prepared by the EPA for maritime Pacific Northwest taxa. The increase from 14 to 58.6% warm water taxa at the engineered riffle from 2020–21 was due to the blackfly and some midge taxa (not classified as warm water) dominating the 2020 community.

Life cycle duration: Multivoltine taxa comprise 71–98% of the community at the four habitat types, which is considered high. Semivoltine (long-lived) taxa richness is a commonly tracked

metric for stream BIBI indices. It varied from 1–5 taxa across all habitats/years. That is comparatively low for both marshes and streams in the Pacific Northwest. Semivoltine taxa richness dropped significantly 2020–21 at the emergent marsh and upper control sites, with drought impacts being the likely cause.

Taxonomic group composition: Non-insects and the insect order Diptera dominate the four habitat types. Dominance by these two groups is generally considered to reflect low biotic integrity. Percent mollusks declined significantly in three habitat types, and in particular went from 20.6 to 0% of the community at the emergent marsh (possibly because of drought conditions). Crustacea are extremely dominated by highly tolerant Caecidotea, Lirceus, and Crangonyx. Crustacea increased in dominance 2020–21 in three habitat types, but declined as a % of the community in the upper control site. Chironomidae (midges) were the dominant dipterans present, and many of the midges present were tolerant taxa in the subfamily Chironominae.

Feeding groups: A high percentage of predators is considered desirable in benthic communities. For mid-order streams in the Pacific Northwest, 0–9% predators is low, 10–19% is moderate, and >20% is high. Both the engineered riffle and upper control stream sites are low % predator (4.6–7.7%). Collector dominance is high (>60%) at the engineered riffle. High collector dominance is regarded as a negative sign for biotic integrity in streams. Shredder % is very low in all habitat types/years (0–1.4%), also a negative sign. Scraper % at the stream sites is generally low (<10%), another negative sign.

Biological Condition Gradient (BCG): A team of invertebrate specialists is working with the EPA to develop BCG models for the maritime Pacific Northwest (Stamp et al., 2022, in progress). This will include a model for low gradient, valley streams. Final classification of maritime Pacific Northwest taxa into their attribute type may differ slightly from this analysis, but not by much. Version 1 of the low gradient stream model was applied to the Rinearson Creek data.

Tolerant taxa (IV, V, and VI) make up 86.8–94.1% of the taxa present across all habitat types/years, and comprise 95.2–100% by abundance. This is extremely high for stream communities, but perhaps not unexpected for the marsh and pond habitats.

Using Version 1 of the low gradient stream BCG model, the engineered riffle and upper control sites are classified as level 5 and 6 (highly disturbed). Note that this model is calibrated on mid-order, perennial, low gradient streams. The stream sites at Rinearson Creek are small streams, and possibly seasonal or intermittent during drought years.

Data are available from a wetland survey performed in 2007–08 in the Willamette Valley from sites representing a range in human disturbance. These data would need to be re-entered and rerun through updated metric package. It would be good comparative information for the remnant pond and emergent marsh habitats at Rinearson Creek for future monitoring.

7 ADAPTIVE MANAGEMENT

7.1 Head-cuts

Head-cut heights are summarized in **Table 7-1**.

TABLE 7-1
HEAD-CUT HEIGHT SUMMARY

	Height (2019)	Height (2020)	Height (2021) [a]
Head-cut 1 (45.37948056, -122.61365000)	18 inches	14 inches	NA
Head-cut 2 (45.37951944, -122.61363611)	14 inches	9 inches	NA

[a] No head-cuts were detected at these locations.

No head-cuts were detected where they had been previously recorded possibly due to deposition of silt and fines, vegetative growth and/or the channel section in question (shown below) has stabilized to a certain degree as there is a series of log jams and in-stream wood in this area. Water depth in the channel section shown below in **Figure 7-1** (upstream of the pond inlet) varied from 12 to 27 inches, with the thalweg averaging 24 inches depth.

Figure 7-1. Floodplain channel section where head-cuts were previously reported but not found in Year 3 monitoring.

7.2 Maintenance

Maintenance records will be or have been addressed by CRG separately.

7.3 Emergent Marsh Vegetation and Hydrology

Any adaptive management related to emergent marsh vegetation and hydrology will be or has been addressed by CRG separately.

8 LITERATURE CITED

Cardno. 2020. Rinearson Monitoring Annual Report. Dated December 2020. Prepared for: Columbia Restoration Group, LLC.

Cascade Environmental Group. 2016. Rinearson Natural Area Baseline Monitoring Report. Dated January 2016. Prepared for: Rinearson Natural Area, LLC.

DSL (Department of State Lands). 2009. Routine Monitoring Guidance for Vegetation. September 23, 2009 Interim Review Draft version 1.0. URL: https://www.oregon.gov/dsl/WW/Documents/dsl_routine_monitoring_guidance.pdf.

Hayslip, G. (ed.). 2007. Methods for the Collection and Analysis of Benthic Macroinvertebrate Assemblages in Wadeable Streams of the Pacific Northwest. Cook, WA: Pacific Northwest Aquatic Monitoring Partnership.

Huff, Mark H., Kelly A. Bettinger, Howard L. Ferguson, Martin J. Brown, and Bob Altman. 2000. A habitat-based point-count protocol for terrestrial birds, emphasizing Washington and Oregon. Gen. Tech. Rep. PNW- G T R - 5 0 1. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 39 p.

Johnson, D.H., B.M. Schreir, J.S. O'Neal, J.A. Knutzen, X. Augerot, T.A. O'Neil, and T.N. Pearsons. 2007. Salmonid Field Protocols Handbook: Techniques for assessing status and trends in salmon and trout populations. American Fisheries Society in Association with State of the Salmon.

Proutt, B. 2018. Rinearson Natural Area Habitat Development Plan. Dated October 5, 2017, updated December 2018. Portland, OR: Rinearson Natural Area, LLC.

Stamp, J., S. Jackson, R. Wisseman, S. Sullivan et al. 2022, in progress. Biological Condition Gradient models for the maritime Pacific Northwest. Low gradient, valley streams version 1.

USGS (U.S. Geological Survey). 2022. National Water Information System: Gauge station #14207770 Oregon City below the falls. Available at: https://waterdata.usgs.gov/nwis

Appendix A
Photo Monitoring

ESA

Site	PP1
Photographer	JBB
Date	April 20, 2021
Time	16:38

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP1
Photographer	Sarah Hartung
Date	June 18, 2021
Time	11:05

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP1
Photographer	SCH
Date	July 16, 2021
Time	18:09

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP1
Photographer	SCH
Date	August 11, 2021
Time	10:40

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	Pp1
Photographer	Mariah
Date	September 30, 2021
Time	11:08

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP2
Photographer	JBB
Date	April 20, 2021
Time	16:43

Photo Point - North

Photo Point - East

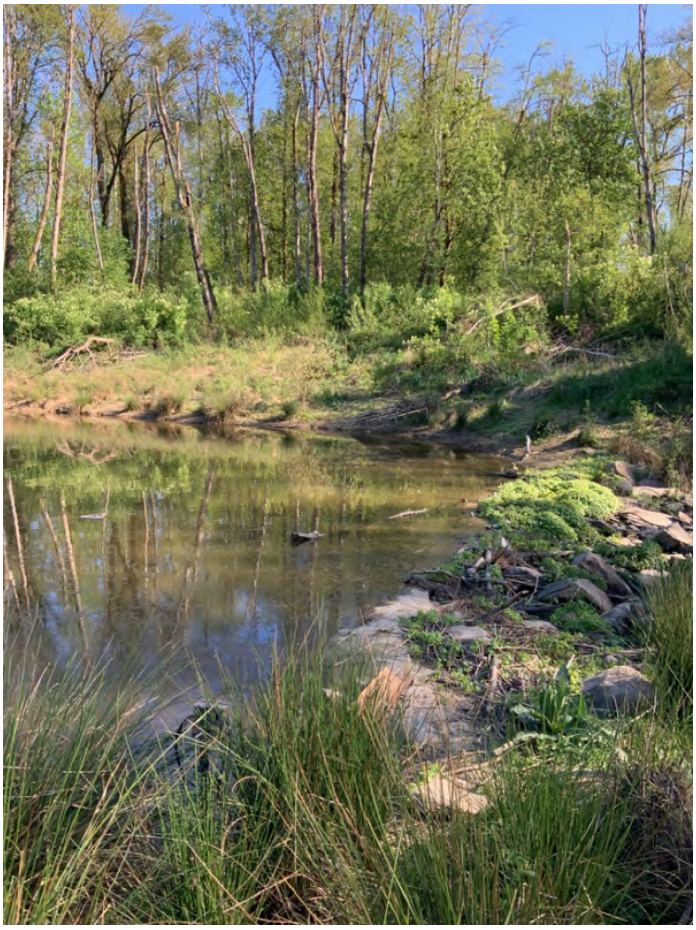


Photo Point - South

Photo Point - West

Site	PP2
Photographer	Sarah Hartung
Date	June 15, 2021
Time	20:45

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP2
Photographer	SCH
Date	July 16, 2021
Time	18:02

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP2
Photographer	SCH
Date	August 11, 2021
Time	10:36

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP2
Photographer	Mariah
Date	September 30, 2021
Time	11:00

Photo Point - North

Photo Point - East

Photo Point - South

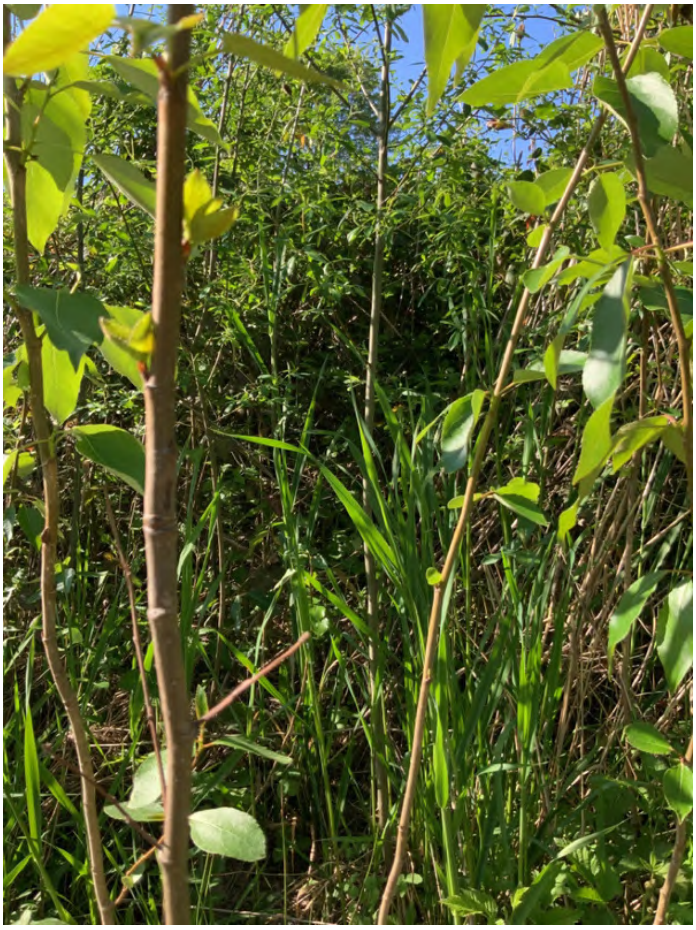
Photo Point - West

Site	PP3
Photographer	JBB
Date	April 20, 2021
Time	16:52

Photo Point - North

Photo Point - East

Photo Point - West



Site	PP3
Photographer	Sarah Hartung
Date	June 18, 2021
Time	10:43

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP3
Photographer	SCH
Date	July 16, 2021
Time	18:25

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP3
Photographer	SCH
Date	August 11, 2021
Time	10:29

Photo Point - North

Photo Point - East

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Photo Point - South

Photo Point - West

Site	PP3
Photographer	Mariah
Date	September 30, 2021
Time	10:45

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP5
Photographer	JBB
Date	April 20, 2021
Time	17:10

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP5
Photographer	Mariah
Date	June 15, 2021
Time	10:47

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP5
Photographer	SCH
Date	July 16, 2021
Time	18:43

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP5
Photographer	SCH
Date	August 11, 2021
Time	09:11

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP5
Photographer	Mariah
Date	September 30, 2021
Time	10:09

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP6
Photographer	JBB
Date	April 20, 2021
Time	14:38

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP6
Photographer	Mariah
Date	June 15, 2021
Time	10:34

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP6
Photographer	SCH
Date	July 16, 2021
Time	18:36

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP6
Photographer	SCH
Date	August 11, 2021
Time	08:58

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP6
Photographer	Mariah
Date	September 30, 2021
Time	09:50

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP7
Photographer	JBB
Date	April 20, 2021
Time	14:04

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	Pp7 Nasir Osman
Photographer	Nasir
Date	June 15, 2021
Time	10:01

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP7
Photographer	SCH
Date	July 16, 2021
Time	19:10

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP7
Photographer	Hs
Date	August 10, 2021
Time	09:58

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	Pp7
Photographer	Mariah
Date	September 30, 2021
Time	11:21

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP8
Photographer	JBB
Date	May 2, 2021
Time	14:37

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	Pp8
Photographer	Nasir
Date	June 15, 2021
Time	11:28

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP8
Photographer	SCH
Date	July 16, 2021
Time	17:44

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP8
Photographer	SCH
Date	August 11, 2021
Time	10:50

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP8
Photographer	SCH
Date	September 30, 2021
Time	12:42

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP9
Photographer	JBB
Date	April 20, 2021
Time	15:37

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP9
Photographer	Mariah
Date	June 15, 2021
Time	11:56

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP9
Photographer	SCH
Date	July 16, 2021
Time	17:21

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP9
Photographer	SCH
Date	September 30, 2021
Time	12:54

Photo Point - North

Photo Point - East

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Photo Point - South

Photo Point - West

Site	PP10
Photographer	JBB
Date	April 20, 2021
Time	16:23

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP10
Photographer	Mariah
Date	June 15, 2021
Time	12:14

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP10
Photographer	SCH
Date	July 16, 2021
Time	19:44

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP10
Photographer	SCH
Date	August 11, 2021
Time	13:37

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP10
Photographer	SCH
Date	September 30, 2021
Time	13:54

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP11
Photographer	JBB
Date	April 20, 2021
Time	16:14

Photo Point - North

Photo Point - East

Photo Point - South

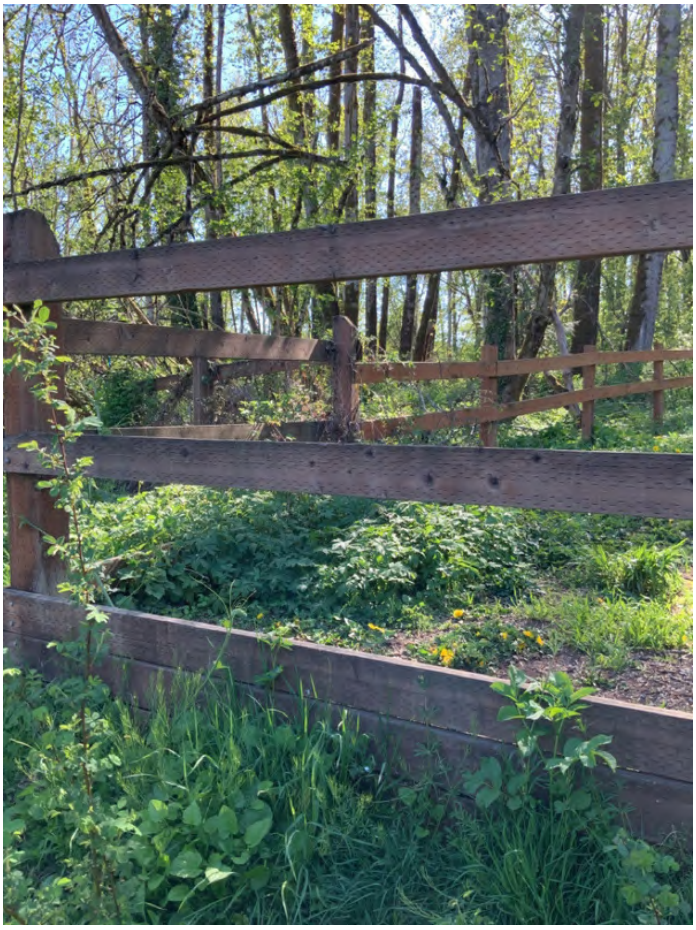


Photo Point - West

Site	PP11
Photographer	Mariah
Date	June 15, 2021
Time	12:10

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP11
Photographer	SCH
Date	July 16, 2021
Time	19:33

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP11
Photographer	SCH
Date	August 11, 2021
Time	13:43

Photo Point - North

Photo Point - East

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Photo Point - South

Photo Point - West

Site	PP11
Photographer	SCH
Date	September 30, 2021
Time	13:58

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP12
Photographer	JBB
Date	April 27, 2021
Time	14:32

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP12 update
Photographer	Sarah Hartung
Date	June 15, 2021
Time	19:32

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP12
Photographer	SSH
Date	July 16, 2021
Time	15:45

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP12
Photographer	SCH
Date	August 11, 2021
Time	12:14

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP12
Photographer	SCH
Date	September 30, 2021
Time	14:22

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP13
Photographer	JBB
Date	April 27, 2021
Time	16:30

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP13
Photographer	Sarah Hartung
Date	June 15, 2021
Time	19:57

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

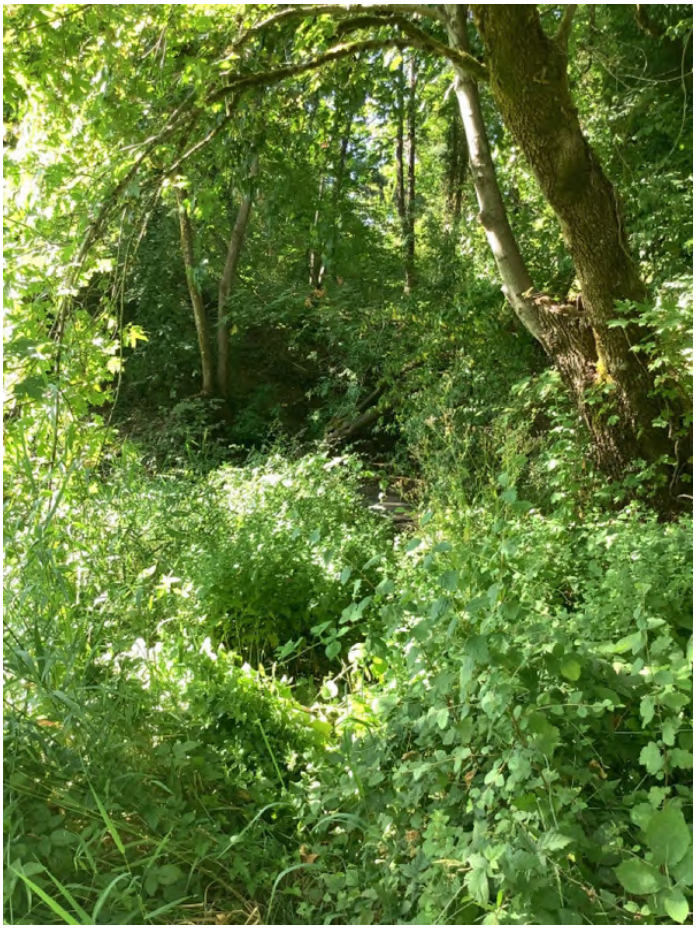
Site	PP13
Photographer	SCH
Date	July 16, 2021
Time	16:29

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West



Site	PP13
Photographer	SCH
Date	August 11, 2021
Time	11:56

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP13
Photographer	SCH
Date	September 30, 2021
Time	13:12

Photo Point - North

Photo Point - East

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Photo Point - South

Photo Point - West

Site	PP14
Photographer	JBB
Date	April 27, 2021
Time	16:37

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP14
Photographer	Sarah Hartung
Date	June 15, 2021
Time	19:43

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP14
Photographer	SCH
Date	July 16, 2021
Time	16:00

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP14
Photographer	SCH
Date	August 11, 2021
Time	12:04

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP14
Photographer	SCH
Date	September 30, 2021
Time	13:16

Photo Point - North

Photo Point - East

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Photo Point - South

Photo Point - West

Site	PP15
Photographer	JBB
Date	April 27, 2021
Time	16:14

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP15
Photographer	Sarah Hartung
Date	June 15, 2021
Time	20:10

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP15
Photographer	SCH
Date	July 16, 2021
Time	16:49

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP15
Photographer	SCH
Date	August 11, 2021
Time	11:38

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP15
Photographer	SCH
Date	September 30, 2021
Time	13:04

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP16
Photographer	JBB
Date	April 27, 2021
Time	14:43

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	Pp16
Photographer	Mariah
Date	June 15, 2021
Time	09:39

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP16
Photographer	SCH
Date	July 16, 2021
Time	19:26

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	PP16
Photographer	SCH
Date	August 11, 2021
Time	15:13

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Site	Pp16
Photographer	Mariah
Date	September 30, 2021
Time	11:26

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	Pp17
Photographer	Nasir
Date	June 15, 2021
Time	10:14

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Photo Point - Other Direction

Site	PP17
Photographer	SCH
Date	August 10, 2021
Time	10:05

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP17
Photographer	Mariah
Date	September 30, 2021
Time	11:18

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP18
Photographer	JBB
Date	April 20, 2021
Time	15:15

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP18
Photographer	Sarah Hartung
Date	June 15, 2021
Time	20:36

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Photo Point - Other Direction

Site	PP18
Photographer	SCH
Date	August 11, 2021
Time	10:45

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP18
Photographer	SCH
Date	September 30, 2021
Time	12:39

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP19
Photographer	JBB
Date	April 20, 2021
Time	15:27

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP19
Photographer	Sarah Hartung
Date	June 15, 2021
Time	20:29

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Photo Point - Other Direction

Site	PP19
Photographer	SCH
Date	August 11, 2021
Time	10:57

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP19
Photographer	SCH
Date	September 30, 2021
Time	12:48

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP20
Photographer	JBB
Date	April 20, 2021
Time	15:44

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Photo Point - Other Direction

Site	PP20
Photographer	SCH
Date	July 16, 2021
Time	17:16

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	PP20
Photographer	SCH
Date	September 30, 2021
Time	12:57

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Appendix B

Habitat Structures and Large Woody Debris Monitoring Data

ESA

Date	August 30, 2021
Time	11:40
Feature ID	Debris pile, natural
Observer	Sarah Hartung
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	5 large logs and a snag

Photos

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Date	August 30, 2021
Time	11:40
Feature ID	Debris pile, undoc?
Observer	Sarah Hartung
Type of feature	Debris Pile
Condition of feature	NA
Recommendation	None
General Notes	15+ logs, several small logs

Photos

Date	August 31, 2021
Time	09:40
Feature ID	8
Observer	Sarah Hartung
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	25 pieces, Himalayan blackberry.

Photos

Date	August 31, 2021
Time	09:40
Feature ID	8
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	35 pieces

Photos

Date	August 31, 2021
Time	09:40
Feature ID	17
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	3 wood, 25 rocks.

Photos

Date	August 31, 2021
Time	09:40
Feature ID	17
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	Two trunks, bird perch

Photos

Date	August 31, 2021
Time	09:40
Feature ID	21
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	20 pieces

Photos

Date	August 31, 2021
Time	09:40
Feature ID	23
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	25 pieces

Photos

Date	August 31, 2021
Time	09:40
Feature ID	25
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	Rootwad, 35 rocks

Photos

Date	August 31, 2021
Time	09:40
Feature ID	26
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	30 pieces

Photos

Date	August 31, 2021
Time	09:40
Feature ID	Debris pile 27
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	30 pieces, lots of jewel weed

Photos

Date	August 31, 2021
Time	09:40
Feature ID	Debris pile 28
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	30 pieces

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Debris pile 31
Observer	Sarah Hartung
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	25+ logs, several small logs

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Debris pile 32
Observer	Sarah Hartung
Type of feature	Debris Pile
Condition of feature	Good
Recommendation	None
General Notes	25-30 logs

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Debris pile 33
Observer	Sarah Hartung
Type of feature	Debris Pile
Condition of feature	Unknown
Recommendation	N/A
General Notes	Unable to count logs, covered under blackberry thicket

Photos

Date	August 31, 2021
Time	09:40
Feature ID	43
Observer	Hannah Smiley
Type of feature	Debris Pile
Condition of feature	Marginal
Recommendation	None
General Notes	1 visble large piece, many small pieces, looks like brush pile, does not look engineered, 50ft away on trail looks like dismantled debris piles, nearby log/branch structure

Photos

Date	August 31, 2021
Time	14:07
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two pieces

Photos

Date	August 31, 2021
Time	14:12
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	three pieces

Photos

Date	August 31, 2021
Time	14:56
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Absent
Recommendation	Replace
General Notes	log piece found downstream

Photos

Date	August 31, 2021
Time	13:48
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two pieces

Photos

Date	August 31, 2021
Time	13:41
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	13:39
Feature ID	floodplain log
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	14:55
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Poor
Recommendation	Replace
General Notes	wood member from missing upstream structure

Photos

Date	August 31, 2021
Time	13:28
Feature ID	floodpain structure
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Absent
Recommendation	Replace
General Notes	pinning stakes present no large wood members

Photos

Date	August 31, 2021
Time	15:00
Feature ID	floodplain log
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	one member

Photos

Date	August 31, 2021
Time	12:06
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	12:07
Feature ID	floodplain wood
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	twopeices

Photos

Date	August 31, 2021
Time	13:13
Feature ID	floodplain log
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	twopeices

Photos

Date	August 31, 2021
Time	13:21
Feature ID	floodplain log
Observer	Alaina Floor
Type of feature	Floodplain Log Structure
Condition of feature	Good
Recommendation	None
General Notes	twopeices

Photos

Date	August 31, 2021
Time	13:56
Feature ID	channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	three pieces

Photos

Date	August 31, 2021
Time	13:54
Feature ID	channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two pieces

Photos

Date	August 31, 2021
Time	13:54
Feature ID	channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	13:59
Feature ID	channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	13:49
Feature ID	channel jam
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two pieces

Photos

Date	August 31, 2021
Time	13:35
Feature ID	meander channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	12:08
Feature ID	channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	one piece. could be flood plain structure member from missing upstream structure

Photos

Date	August 31, 2021
Time	11:56
Feature ID	meander structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	12:00
Feature ID	meander channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	three peices

Photos

Date	August 31, 2021
Time	13:11
Feature ID	channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 31, 2021
Time	13:10
Feature ID	channel structure
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	one peice

Photos

Date	August 31, 2021
Time	14:28
Feature ID	channel jam
Observer	Alaina Floor
Type of feature	Meander Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two peices

Photos

Date	August 30, 2021
Time	16:05
Feature ID	roughened channel log jam 1
Observer	Alaina Floor
Type of feature	Roughened Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two rootwads

Photos

Date	August 30, 2021
Time	16:07
Feature ID	roughened channel log jam 2
Observer	Alaina Floor
Type of feature	Roughened Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two rootwads and toe log

Photos

Date	August 30, 2021
Time	16:10
Feature ID	roughened channel log jam three
Observer	Alaina Floor
Type of feature	Roughened Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two rootwads and a sill log

Photos

Date	August 30, 2021
Time	16:12
Feature ID	roughened channel log jam4
Observer	Alaina Floor
Type of feature	Roughened Channel Log Structure
Condition of feature	Good
Recommendation	None
General Notes	two rootwads and sill logs

Photos

Date	August 31, 2021
Time	09:40
Feature ID	16
Observer	Hannah Smiley
Type of feature	Rock Pile (large)
Condition of feature	Good
Recommendation	None
General Notes	25 pieces.

Photos

Date	August 31, 2021
Time	09:40
Feature ID	24
Observer	Hannah Smiley
Type of feature	Rock Pile (large)
Condition of feature	Good
Recommendation	None
General Notes	35 pieces

Photos

Date	August 30, 2021
Time	12:14
Feature ID	Rock pile, large, 34
Observer	Sarah Hartung
Type of feature	Rock Pile (large)
Condition of feature	Good
Recommendation	None
General Notes	3 large logs at base

Photos

Date	August 31, 2021
Time	09:40
Feature ID	42
Observer	Hannah Smiley
Type of feature	Rock Pile (large)
Condition of feature	Maybe absent
Recommendation	None
General Notes	Lots of woody debris and human disturbence,I stomped down a bunch of plants, under bushes , needs machete

Photos




Date	August 30, 2021
Time	12:14
Feature ID	Rock pile, small
Observer	Sarah Hartung
Type of feature	Rock Pile (small)
Condition of feature	Good
Recommendation	None
General Notes	2 logs on top, not in as-built

Photos

Date	August 31, 2021
Time	09:40
Feature ID	5
Observer	Hannah Smiley
Type of feature	Rock Pile (small)
Condition of feature	Good
Recommendation	None
General Notes	14

Photos

Date	August 31, 2021
Time	09:40
Feature ID	6
Observer	Hannah Smiley
Type of feature	Rock Pile (small)
Condition of feature	Maybe absent
Recommendation	Maintenance
General Notes	Hard to see, needs machete, did not find, maybe under blackberry, maybe same as debris pile

Photos

Date	August 31, 2021
Time	09:40
Feature ID	9
Observer	Sarah Hartung
Type of feature	Rock Pile (small)
Condition of feature	Good
Recommendation	None
General Notes	5 rocks, Himalayan blackberry

Photos

Date	August 31, 2021
Time	09:40
Feature ID	10
Observer	Hannah Smiley
Type of feature	Rock Pile (small)
Condition of feature	Good
Recommendation	None
General Notes	10 rocks, covered in blackberry

Photos

Date	August 31, 2021
Time	09:40
Feature ID	14
Observer	Hannah Smiley
Type of feature	Rock Pile (small)
Condition of feature	Good
Recommendation	None
General Notes	8 pieces of rock, over grown with blackberry

Photos

Date	August 31, 2021
Time	09:40
Feature ID	7
Observer	Hannah Smiley
Type of feature	Snag
Condition of feature	Good
Recommendation	None
General Notes	Large, I think it's an optical illusion that the snag has leaves, 3 snags nearby

Photos

Date	August 31, 2021
Time	09:40
Feature ID	13
Observer	Hannah Smiley
Type of feature	Snag
Condition of feature	Good
Recommendation	None
General Notes	bird perch, medium

Photos

Date	August 31, 2021
Time	09:40
Feature ID	22
Observer	Hannah Smiley
Type of feature	Snag
Condition of feature	Good
Recommendation	None
General Notes	Multiple stems, two trunks, bird perch

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Snag 28
Observer	Sarah Hartung
Type of feature	Snag
Condition of feature	Good
Recommendation	None
General Notes	7 large snags in area

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Snag 37
Observer	Sarah Hartung
Type of feature	Snag
Condition of feature	Good
Recommendation	None
General Notes	7 large snags in area

Photos

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Date	August 30, 2021
Time	11:40
Feature ID	Snag 39
Observer	Sarah Hartung
Type of feature	Snag
Condition of feature	Good
Recommendation	None
General Notes	Medium snag, 10” dbh, plus medium log on ground

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Snag 40
Observer	Sarah Hartung
Type of feature	Snag
Condition of feature	Good
Recommendation	None
General Notes	Medium snag, 10” dbh

Photos

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Date	August 30, 2021
Time	15:49
Feature ID	pond log 1
Observer	Alaina Floor
Type of feature	Tree Tipped into Pond
Condition of feature	Good
Recommendation	None
General Notes	three pieces

Photos

ESA
550 Kearny Street, Suite 800
San Francisco, CA 94108

Date	August 30, 2021
Time	15:54
Feature ID	pond log 2
Observer	Alaina Floor
Type of feature	Tree Tipped into Pond
Condition of feature	Good
Recommendation	None
General Notes	one log piece

Photos

Date	August 30, 2021
Time	15:56
Feature ID	pond log 3
Observer	Alaina Floor
Type of feature	Tree Tipped into Pond
Condition of feature	Good
Recommendation	None
General Notes	ONE LOG

Photos

Date	August 31, 2021
Time	09:40
Feature ID	11
Observer	Hannah Smiley
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	2 logs

Photos

Date	August 31, 2021
Time	09:40
Feature ID	12
Observer	Sarah Hartung
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	A few logs, covered in blackberry

Photos

Date	September 30, 2021
Time	13:29
Feature ID	29
Observer	Sarah Hartung
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	Overgrown

Photos

Date	August 31, 2021
Time	09:40
Feature ID	Upland log structure 30
Observer	Hannah Smiley
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	Rootwad, lots of vegetation,

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Upland log structure, 35
Observer	Sarah Hartung
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	1 large log

Photos

Date	August 30, 2021
Time	11:40
Feature ID	Upland log structure, 36
Observer	Sarah Hartung
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	1 root wad

Photos

Date	August 31, 2021
Time	09:40
Feature ID	41
Observer	Hannah Smiley
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	Log and three boulders. Other woods debris in area but it looks natural

Photos

Date	August 31, 2021
Time	09:40
Feature ID	45
Observer	Hannah Smiley
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	1 large log, covered in vegetation.

Photos

Date	August 31, 2021
Time	09:40
Feature ID	46
Observer	Hannah Smiley
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	1 large log, lots of woody debris.

Photos

Date	August 31, 2021
Time	09:40
Feature ID	48
Observer	Sarah Hartung
Type of feature	Upland Log Structure
Condition of feature	Good
Recommendation	None
General Notes	2 pieces, lots of dense blackberry, needs machete, lots of woody debris

Photos

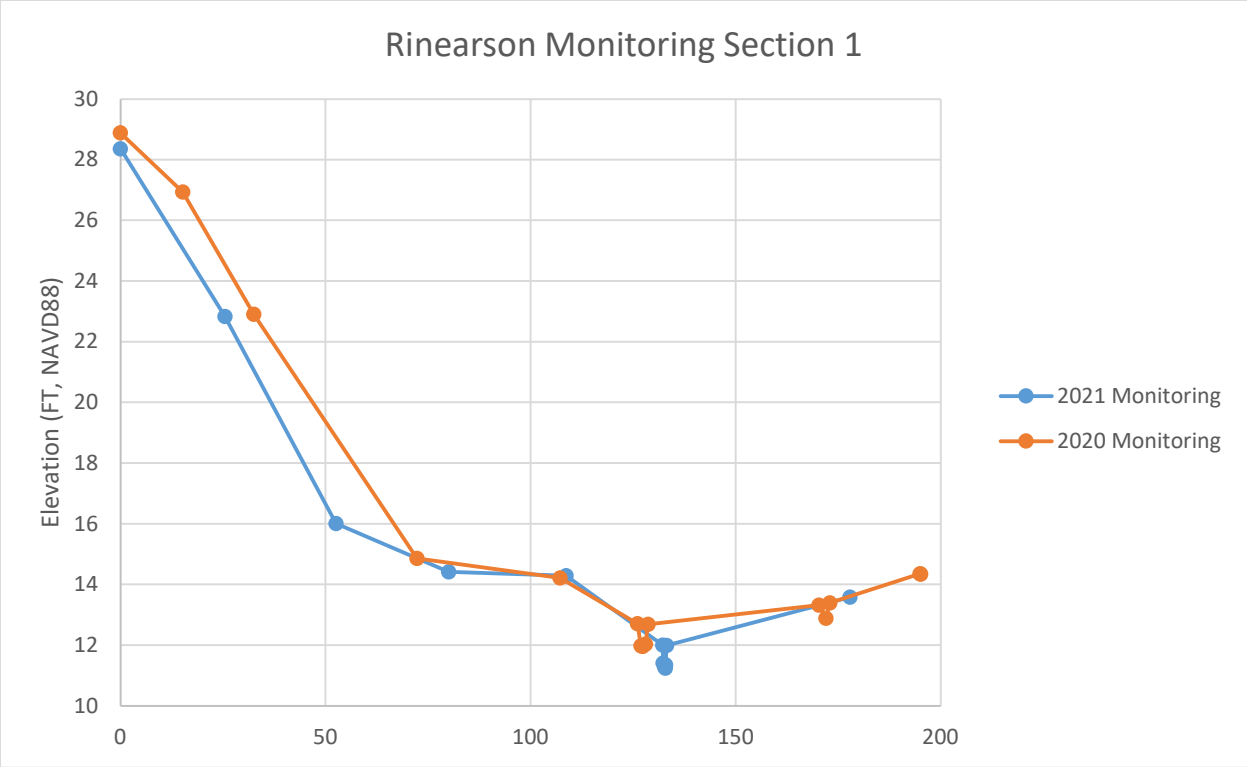
Date	August 31, 2021
Time	09:40
Feature ID	49
Observer	Hannah Smiley
Type of feature	Upland Log Structure
Condition of feature	Marginal
Recommendation	None
General Notes	2pieces, stood a big pile of blackberry, maybe a log structure was under it veg, needs machette

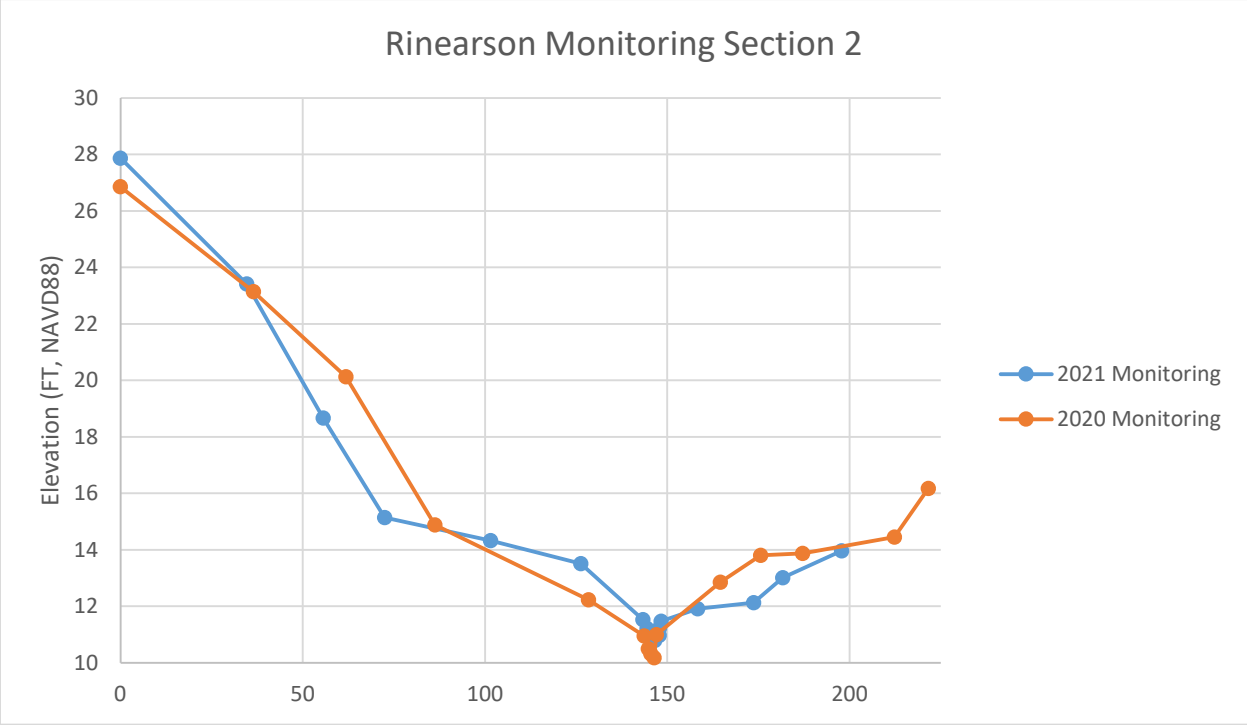
Photos

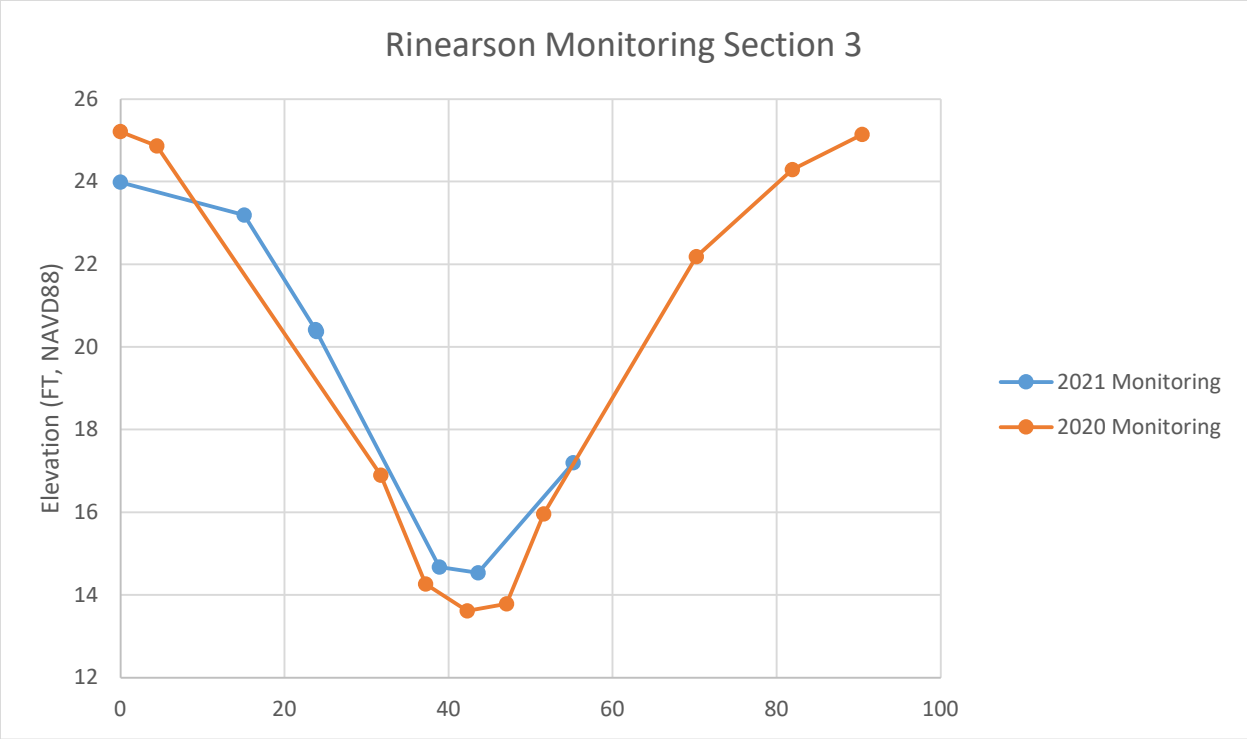
Appendix C
Survey Cross-Sections

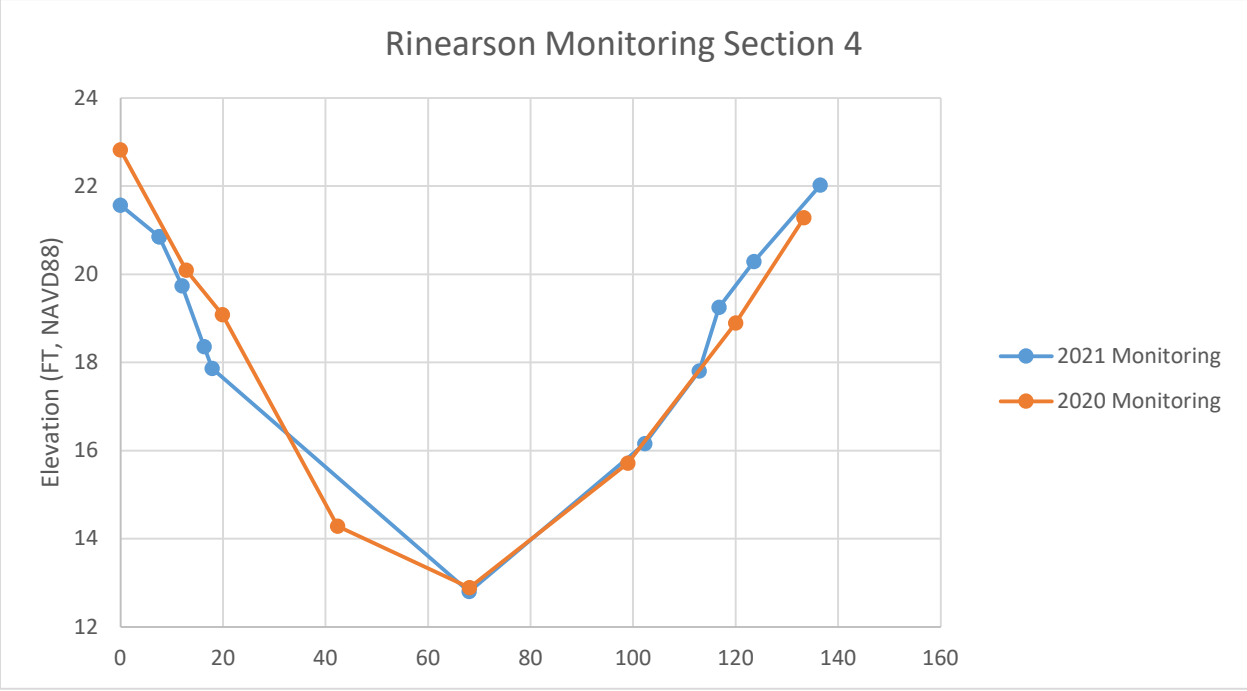
ESA

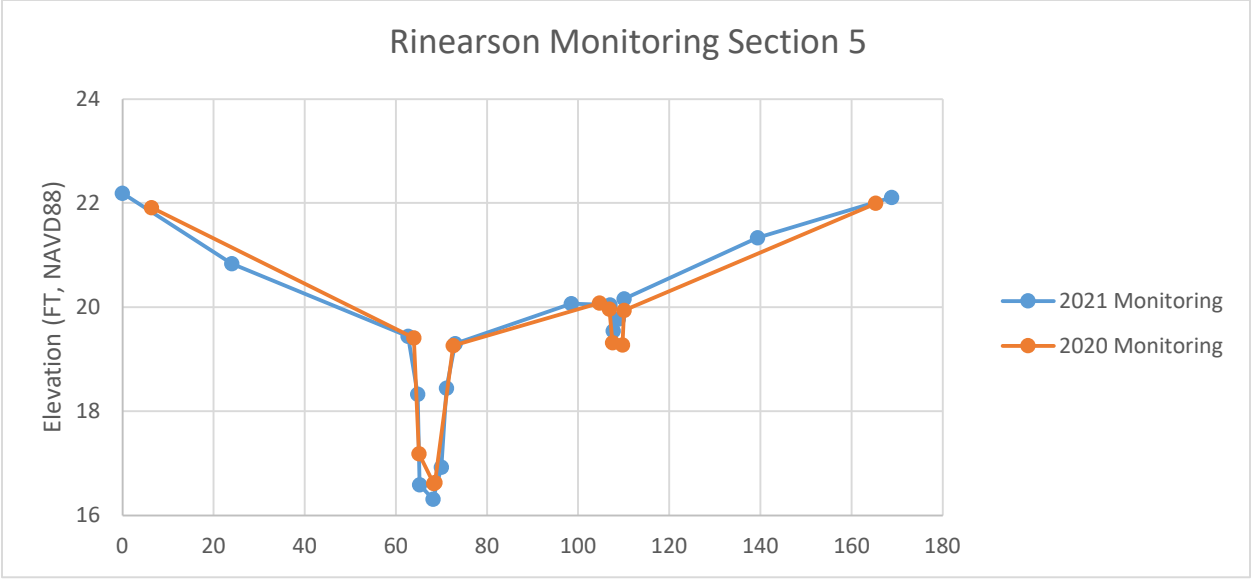
Figure C-1 Cross Section Locations, Endpoints, and Survey Points

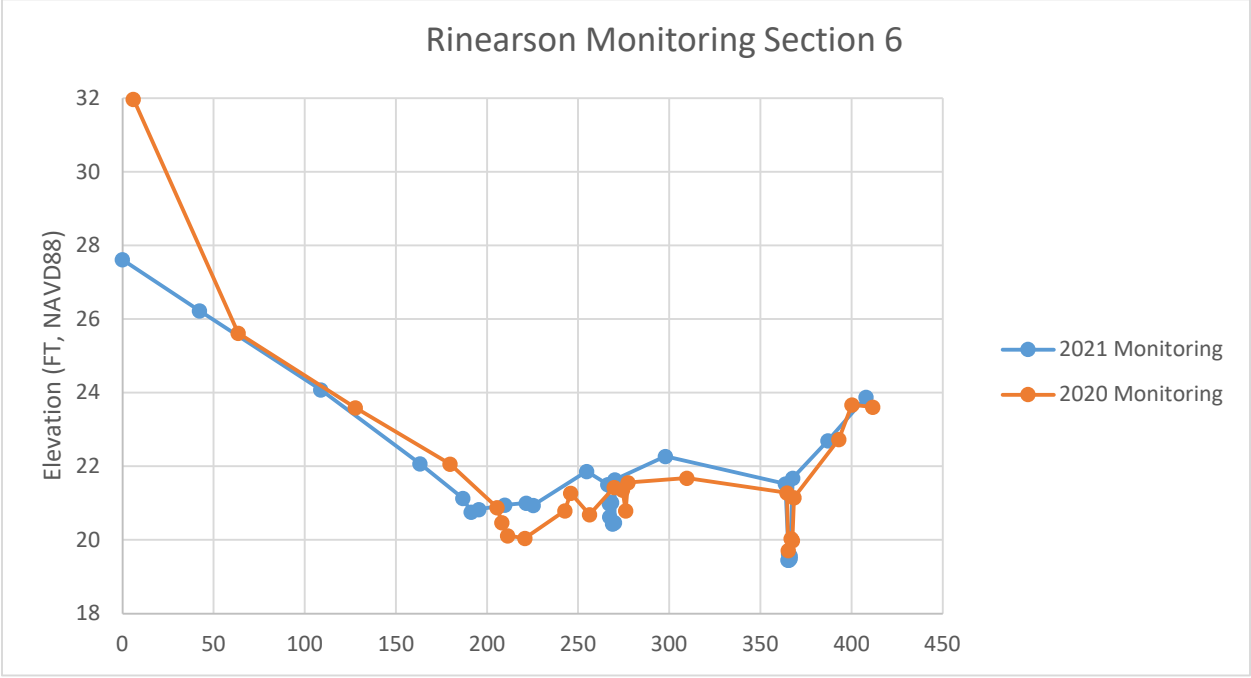

Rinearson Monitoring Section 1
Elevation (FT, NAVD88)
30
28
26
24
22
20
18
16
14
12
10
0
50
100
150
200
2021 Monitoring
2020 Monitoring

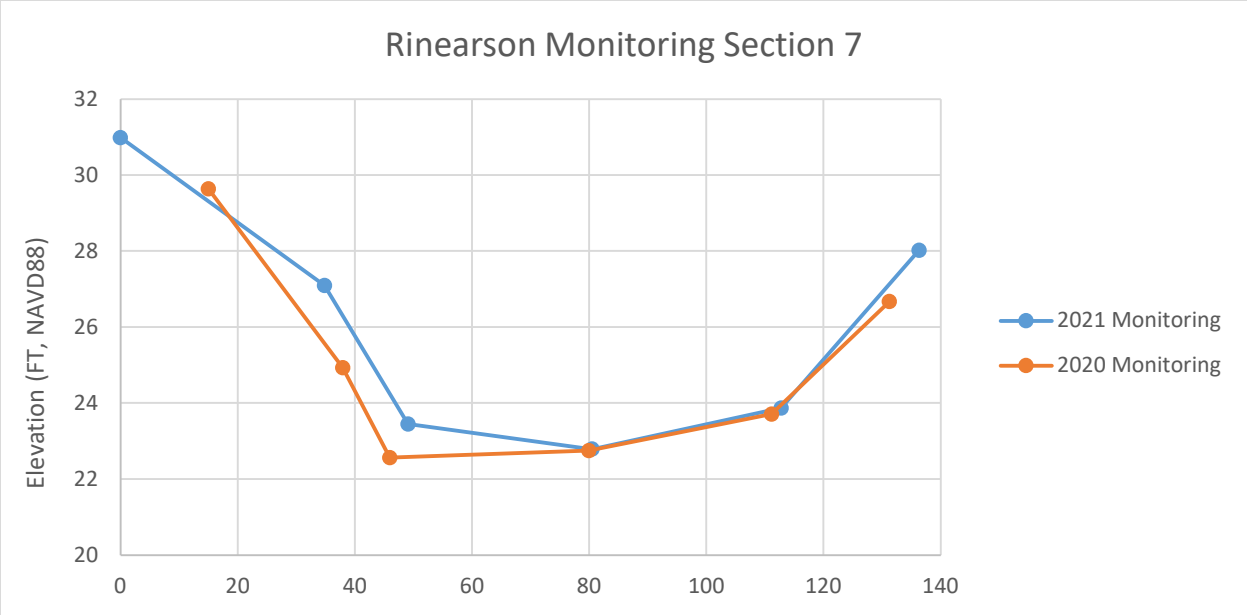

Rinearson Monitoring Section 2
Elevation (FT, NAVD88)
30
28
26
24
22
20
18
16
14
12
10
0
50
100
150
200
2021 Monitoring
2020 Monitoring

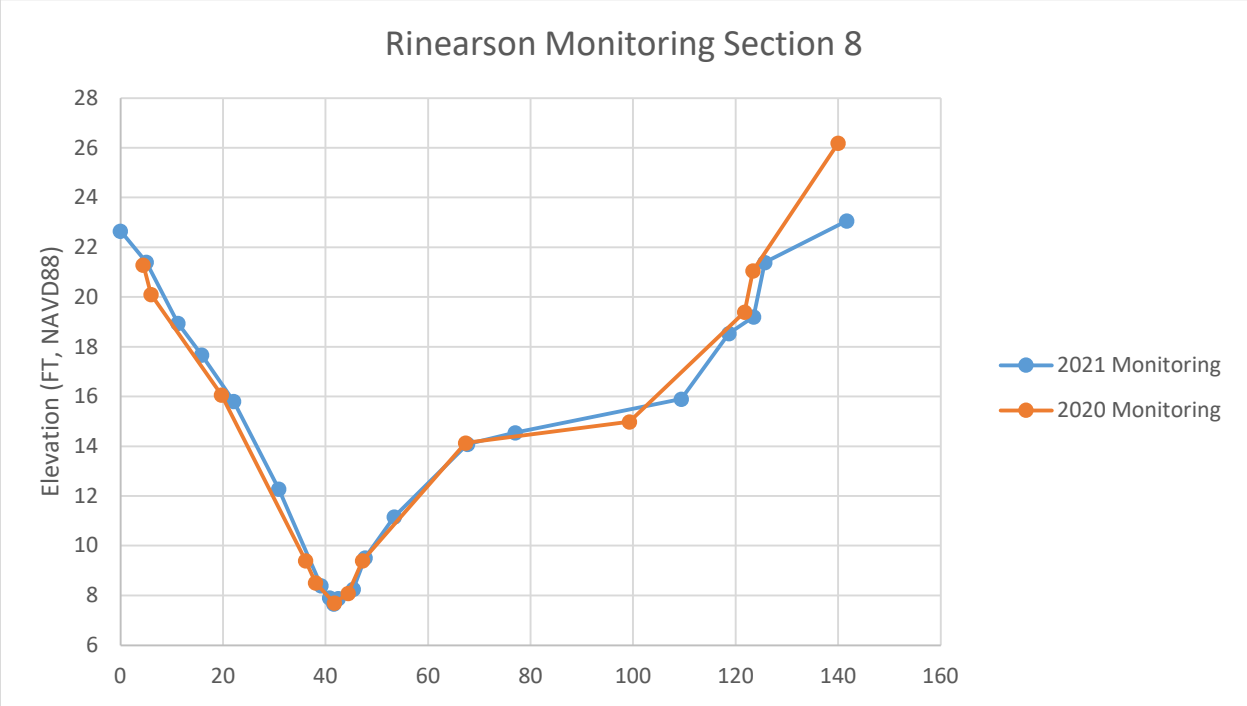

Rinearson Monitoring Section 3
Elevation (FT, NAVD88)
26
24
22
20
18
16
14
12
0
20
40
60
80
100
2021 Monitoring
2020 Monitoring

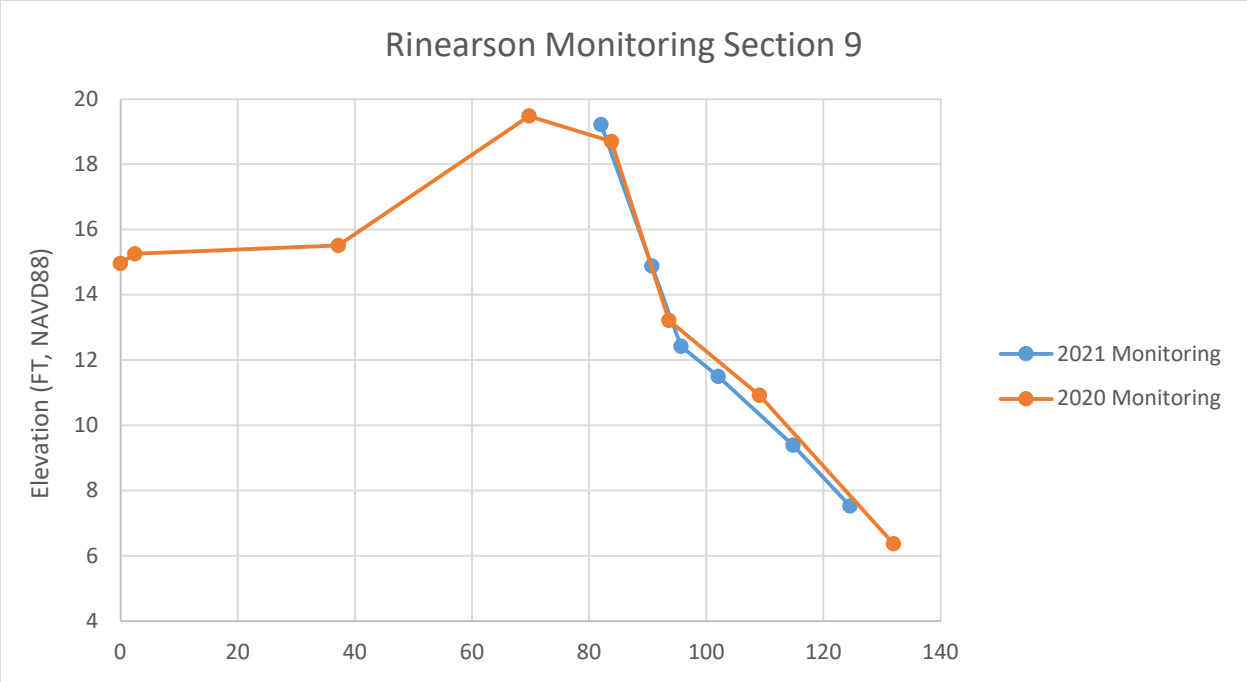

Rinearson Monitoring Section 4
Elevation (FT, NAVD88)
24
22
20
18
16
14
12
0
20
40
60
80
100
120
140
160
2021 Monitoring
2020 Monitoring

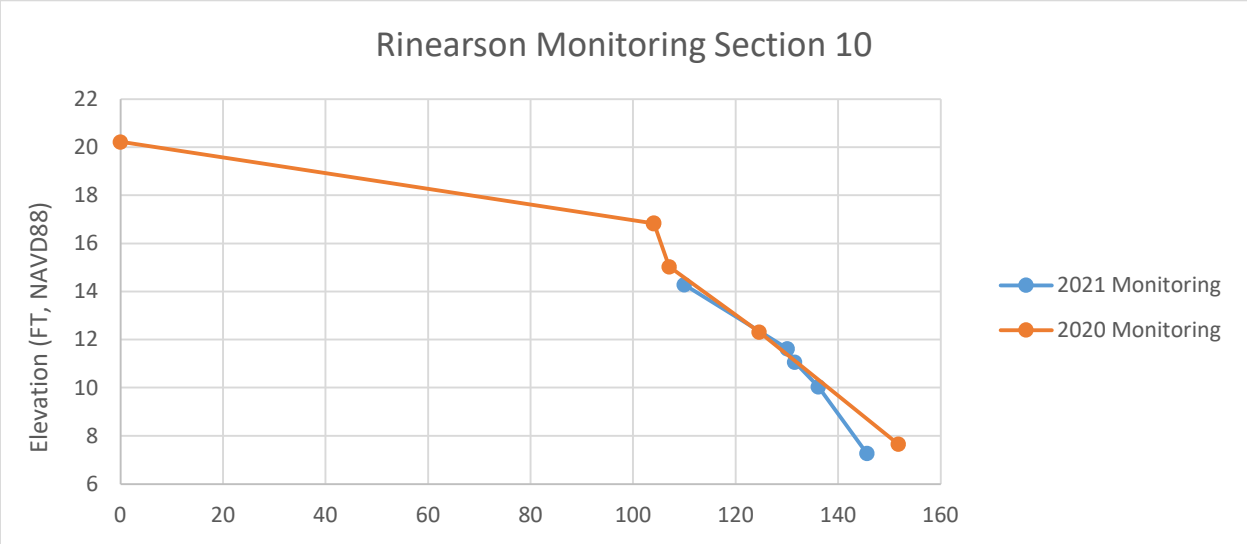

Rinearson Monitoring Section 5
Elevation (FT, NAVD88)
24
22
20
18
16
0
20
40
60
80
100
120
140
160
180
2021 Monitoring
2020 Monitoring


Rinearson Monitoring Section 6
Elevation (FT, NAVD88)
32
30
28
26
24
22
20
18
0
50
100
150
200
250
300
350
400
450
2021 Monitoring
2020 Monitoring


Rinearson Monitoring Section 7
Elevation (FT, NAVD88)
32
30
28
26
24
22
20
0
20
40
60
80
100
120
140
2021 Monitoring
2020 Monitoring


Rinearson Monitoring Section 8
Elevation (FT, NAVD88)
28
26
24
22
20
18
16
14
12
10
8
6
0
20
40
60
80
100
120
140
160
2021 Monitoring
2020 Monitoring


Rinearson Monitoring Section 9
Elevation (FT, NAVD88)
20
18
16
14
12
10
8
6
4
0
20
40
60
80
100
120
140
2021 Monitoring
2020 Monitoring


Rinearson Monitoring Section 10
Elevation (FT, NAVD88)
22
20
18
16
14
12
10
8
6
0
20
40
60
80
100
120
140
160
2021 Monitoring
2020 Monitoring

Appendix D
Fish Passage Photos

ESA

Figure D-1: Conditions at the pond outlet, April.

Figure D-2: Conditions at the pond outlet looking upstream from the roughened channel, April. Note the turtle on the short log behind the outlet.

Figure D-3: Conditions at the pond outlet, May.

Figure D-4: Conditions at the pond outlet, June.

Figure D-5: Conditions at the pond outlet, July.

Figure D-6: Conditions at the pond outlet looking upstream, July.

Figure D-7: Conditions at the pond outlet, August.

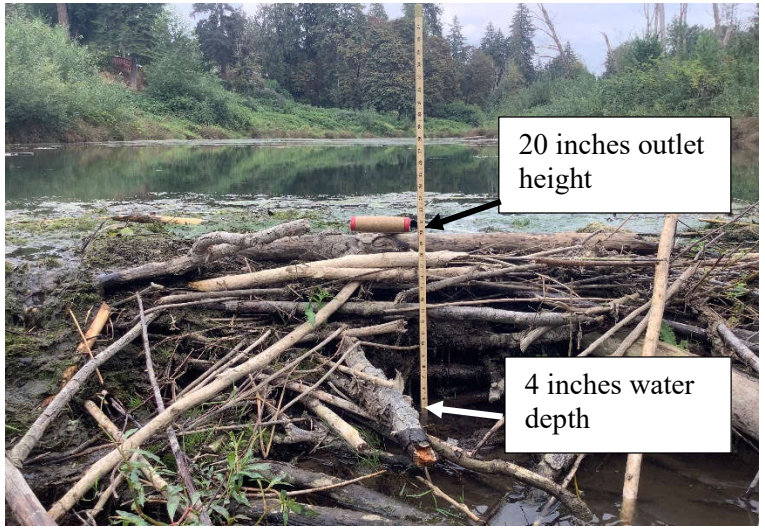


Figure D-8: Conditions at the pond outlet looking upstream, September. Jump height is 20 minus 4 inches or 1.5 feet.

Figure D-9: Looking upstream at the lower beaver dam, April.

Figure D-10: Lower beaver dam, June. Note willow growth on top of the dam.

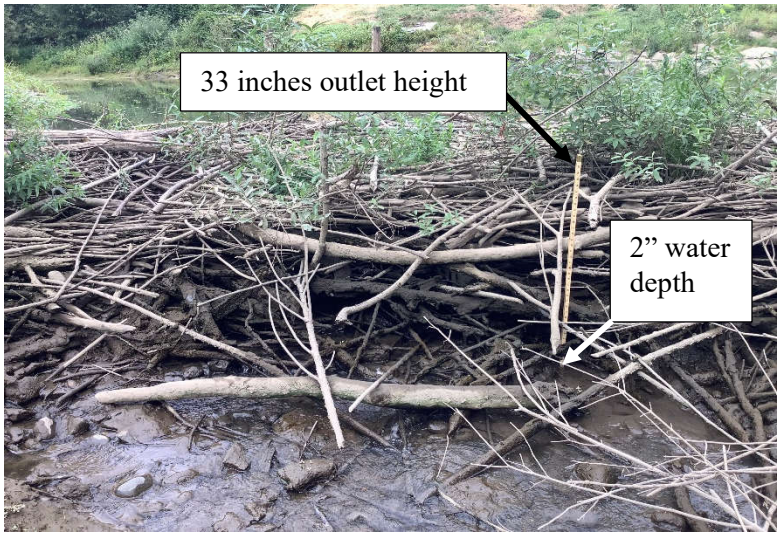


Figure D-11: Lower beaver dam looking upstream. Jump height is 31 inches or approximately 2.5 feet.

Appendix E
Vegetation Monitoring Data

ESA

Site: Rinearson Natural Area	Sample Date(s): July 27, August 10 and 11, and September 21, 2021																			
Emergent Marsh (EM)		**Percent Cover per Sample Plot**																		
Species	Origin (N, NN, I)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Row Average	
Native Herbaceous Species																				
Chamerion angustifolium (Fireweed)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	1	
Epilobium watsonii (Watson's willow herb)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Equisetum arvense (Common horsetail)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Juncus effusus (Soft rush)	N	0	0	0	50	0	10	60	0	15	5	0	70	90	15	30	0	0	20	
Leersia oryzoides (Rice cut-grass)	N	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	1	
Polygonum hydropiperoides (Common waterpepper)	N	3	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Rubus ursinus (Trailing blackberry - vine)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	1	
Scirpus microcarpus (Panicled bulrush)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	2	
Typha latifolia (Common cattail)	N	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	1	
Veronica americana (American brooklime)	N	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Invasive Herbaceous Species																				
Cirsium arvense (Canada thistle)	I	0	0	10	0	10	0	0	0	0	0	0	0	0	0	40	0	0	4	
Cirsium vulgare (Bull thistle)	I	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
Convulvulus arvensis (Bindweed)	I	0	0	0	0	3	0	0	0	0	0	0	0	0	5	0	0	0	0	
Dipsacus fullonum (Teasel)	I	5	0	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	
Geranium robertianum (Herb robert)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Iris pseudacorus (Yellow flag iris)	I	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	1	0	2	
Lythrum salicaria (Purple loosestrife)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Phalaris arundinacea (Reed canarygrass)	I	0	0	0	0	20	30	10	20	30	0	30	0	0	0	0	20	0	9	
Solanum dulcamara (Bittersweet nightshade)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	2	
Non-Native Herbaceous Species																				
Impatiens capensis (Spotted jewelweed)	NN	0	0	10	50	10	75	65	0	85	75	90	5	5	45	0	0	80	35	
Lapsana communis (Nipplewort)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lolium sp. (Ryegrass)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lotus corniculatus (Bird's foot trefoil)	NN	2	30	5	15	60	0	0	0	0	10	0	25	20	30	50	0	0	15	
Leucanthemum vulgare (Oxeye daisy)	NN	2	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	1	
Mentha pulegium (Pennyroyal)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tanacetum vulgare (Common tansy)	NN	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Trifolium repens (White clover)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Invasive Shrub and Tree Species																				
Buddleja davidii (Butterfly bush)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rubus bifrons (Himalayan blackberry - shrub/vine)	I	10	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	1	
Native Shrub and Tree Species (Short growth / saplings only)																				
Alnus rubra (Red alder) - tree	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	1	
Populus balsamifera ssp. trichocarpa (Black cottonwood) - tree	N	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cornus sericea (Red-osier dogwood) - shrub	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lonicera involucrata (Twinberry) - shrub	N	0	0	5	0	0	0	0	0	0	0	0	0	0	10	0	5	0	1	
Oemlaria cerasiformis (Osoberry) - shrub	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Physocarpus captitatus (Ninebark) - shrub	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Salix lasiandra (Pacific willow) - tree	N	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Salix sitchensis (Sitka willow) - shrub	N	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	1	
Thuja plicata (Western red cedar) - tree	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Routine Performance Standards		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species		3	35	0	50	0	10	60	0	15	15	0	80	90	15	30	30	30	27	6.8
Lower CI (80%)																			18	
Upper CI (80%)																			36	
Cover of Invasive Herbaceous Species		5	0	90	0	33	30	10	22	30	30	30	0	0	5	40	51	0	22	6
Lower CI (80%)																			15	
Upper CI (80%)																			30	
Cover of Invasive Shrubs and Trees		10	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	1	1
Lower CI (80%)																			0	
Upper CI (80%)																			2	
Native Diversity (herbs)																			1	Only JUEF mee
																				freq & abund
Sum of plant cover (absolute cover)		42	70	110	115	103	115	135	45	130	130	120	115	120	105	120	101	110		

Site: Rinearson Natural Area	**Sample Date(s): August 10 and 11, 2021**																				
Riparian Forest Restoration (RFR)		**Percent Cover per Sample Plot**																			
Species	Origin (N, NN, I)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Row Average	
Native Herbaceous Species																					
Agrostis exarata (Spike bentgrass)	N	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	4	1	
Carex obnupta (Slough sedge)	N	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	1	
Epilobium watsonii (Watson's willow herb)	N	0	5	0	0	0	4	0	8	5	0	0	55	0	0	10	0	0	8	5	
Geum macrophyllum (Largeleaf avens)	N	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	
Juncus effusus (Soft rush)	N	0	0	0	4	0	0	0	30	0	0	12	0	30	0	0	0	0	0	4	
Polygonum hydropiperoides (Common waterpepper)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	1	
Polystichum munitum (Sword fern)	N	0	0	0	0	0	0	0	10	0	0	0	15	0	0	0	0	0	0	1	
Rubus ursinus (Trailing blackberry - vine)	N	0	0	0	0	0	20	0	12	20	50	0	0	0	50	0	0	0	0	8	
Urtica dioca (Stinging nettle)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Invasive Herbaceous Species																					
Brachypodium sylvaticum (False brome)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cirsium arvense (Canada thistle)	I	0	0	0	0	0	0	0	5	0	0	0	0	0	35	0	0	0	0	2	
Convulvulus arvensis (bindweed)	I	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	
Hedera helix (English ivy, vine)	I	0	0	12	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	
Phalaris arundinacea (Reed canarygrass)	I	0	0	0	9	30	0	40	0	0	0	40	0	0	12	85	0	0	55	15	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Non-Native Herbaceous Species																					
Agrostis stolonifera (Bentgrass)	NN	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	8	1	
Brassica sp. (Common mustard)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Chichorium intybus (Chicory)	NN	0	0	0	0	0	0	18	0	10	0	0	0	0	0	0	0	0	0	2	
Digitalis purpurea (Foxglove)	NN	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	2	
Impatiens capensis (Spotted jewelweed)	NN	0	0	0	85	35	0	0	0	0	0	0	0	0	0	0	0	0	0	7	
Lapsana communis (Nipplewort)	NN	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	1	
Lolium sp. (Ryegrass)	NN	0	0	0	0	0	0	0	0	20	0	0	0	0	0	5	0	0	0	1	
Lotus corniculatus (Bird's foot trefoil)	NN	35	40	0	0	30	0	0	0	25	0	35	0	5	0	0	0	40	30	13	
Leucanthemum vulgare (Oxeye daisy)	NN	8	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	4	
Mentha pulegium (Pennyroyal)	NN	45	50	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0	7	
Plantago major (English plantain)	NN	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rumex obtusifolius (Bitter dockweed)	NN	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Stellaria media (Common chickweed)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
Tanacetum vulgare (Common tansy)	NN	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	3	
Trifolium repens (White clover)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	2	
Invasive Shrub and Tree Species																					
Buddleja davidii (Butterfly bush)	I	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	
Rubus bifrons (Himalayan blackberry - shrub/vine)	I	0	0	0	5	0	14	0	4	45	8	0	30	35	8	0	0	0	3	8	
Native Shrub and Tree Count		**Plant Count (Shrubs) + Stem Count (Trees)**																			
Cornus sericea (Red-osier dogwood) - shrub	N	20	10	0	0	0	0	3	2	0	0	0	0	0	0	0	0	2	2	2	
Crataegus douglasii (Douglas' hawthorn) - tree	N	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	
Lonicera involucrata (Twinberry) -shrub	N	0	0	0	0	0	0	11	0	0	0	5	0	0	0	0	0	0	0	1	
Berberis (Mahonia) aquilinum (Tall Oregon grape) - shrub	N	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	
Philadelphus lewisii (Mock orange) - shrub	N	0	0	0	0	0	0	0	5	0	9	0	4	3	0	0	0	0	0	1	
Rosa pisocarpa (Clustered wild rose or swamp rose) - shrub	N	0	0	0	0	0	0	0	0	0	2	0	2	13	0	0	0	0	0	1	
Salix geyeriana (Geyer willow) - shrub	N	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	
Salix sitchensis (Sitka willow) - shrub	N	11	0	8	12	0	0	2	0	0	0	1	0	0	0	3	0	8	13	3	
Sambucus racemosa (Red elderberry) - shrub	N	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	
Spiraea douglasii (Douglas spirea) - shrub	N	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	
Symphoricarpos alba (Common snowberry) - shrub	N	0	0	0	0	0	0	0	3	4	5	5	30	5	3	0	0	0	0	3	
Alnus rubra (Red alder) - tree	N	0	0	0	4	0	2	3	3	3	0	4	10	3	40	0	0	3	0	4	
Fraxinus latifolia (Oregon ash) - tree	N	0	0	0	0	0	0	0	3	0	2	0	0	3	2	0	0	0	0	1	
Populus balsamifera ssp. trichocarpa (Black cottonwood) - tree	N	42	5	12	0	0	0	3	0	2	0	0	1	1	0	10	8	12	39	8	
Salix lasiandra (Pacific willow) - tree	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	1	1	0	2	
Routine Performance Standards		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species		0	5	0	4	0	24	16	60	30	50	27	70	30	50	10	0	25	12	23	5.2
Lower CI (80%)																				16	
Upper CI (80%)																				30	
Cover of Invasive Herbaceous Species		0	0	12	9	30	4	40	10	0	0	40	0	0	47	85	0	0	55	18	6
Lower CI (80%)																				11	
Upper CI (80%)																				26	
Cover of Invasive Shrubs and Trees		0	0	0	5	0	14	0	4	45	8	0	30	36	8	0	0	0	4	9	3
Lower CI (80%)																				4	
Upper CI (80%)																				13	
Native Diversity (all layers)																					N/A
Sum of plant cover (absolute cover)		98	100	87	103	95	54	78	74	130	88	87	100	71	105	100	37	105	153		
Sum of woody stems		73	15	23	16	0	2	22	16	9	31	16	49	29	47	43	9	29	54		
Density of living native woody stems - average per acre		14776	3036	4656	3239	0	405	4453	3239	1822	6275	3239	9918	5870	9514	8704	1822	5870	10930	5432	N/A
Plot Area (native stems/plot) 215.3 sf or 2mx10m	215.2																				
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet	43560																				

Site: Rinearson Natural Area	**Sample Date(s): August 10 and 11, 2021**																				
Riparian Forest Enhancement (RFE)		**Percent Cover per Sample Plot**																			
Species	Origin (N, NN, I)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Row Average	
Native Herbaceous Species																					
Agrostis exarata (Spike bentgrass)	N	0	0	0	0	0	0	30	15	0	0	0	0	0	0	0	0	0	0	3	
Epilobium watsonii (Watson's willow herb)	N	20	20	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	3	
Juncus effusus (Soft rush)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	55	5	
Marah oreganus (Manroot)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Polystichum munitum (Sword fern)	N	3	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rubus ursinus (Trailing blackberry - vine)	N	0	0	0	5	0	0	0	0	50	100	0	0	0	0	0	10	70	0	13	
Invasive Herbaceous Species																					
Cirsium arvense (Canada thistle)	I	0	0	0	0	0	0	0	0	0	0	20	0	0	0	60	0	0	0	4	
Cirsium vulgare (Bull thistle)	I	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	
Dipsacus fullonum (Teasel)	I	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Hedera helix (English ivy, vine)	I	0	10	0	0	0	0	15	0	0	0	0	10	0	0	0	10	0	0	3	
Hypericum perforatum (St. John's wort)	I	0	0	0	0	35	0	0	0	5	0	0	0	0	0	0	0	0	0	2	
Lythrum salicaria (Purple loosestrife)	I	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
Phalaris arundinacea (Reed canarygrass)	I	25	4	0	0	0	0	0	40	0	0	0	8	0	10	0	0	0	15	6	
Solanum dulcamara (Bittersweet nightshade)	I	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
Non-Native Herbaceous Species																					
Agrostis stolonifera (Bentgrass)	NN	0	0	0	0	5	0	12	0	0	0	0	0	0	0	0	0	0	0	1	
Brassica sp. (Common mustard)	NN	0	5	0	0	0	0	0	0	0	0	0	3	0	0	0	15	10	0	2	
Impatiens capensis (Spotted jewelweed)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	15	2	
Lapsana communis (Nipplewort)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lolium sp. (Ryegrass)	NN	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	1	
Lotus corniculatus (Bird's foot trefoil)	NN	20	0	0	0	0	0	0	10	0	0	0	0	0	30	0	0	0	0	3	
Leucanthemum vulgare (Oxeye daisy)	NN	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	1	
Mentha pulegium (Pennyroyal)	NN	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Plantago lanceolata (English plantain)	NN	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	1	
Plantago major (Common plantain)	NN	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	
Rumex crispus (Curly dock)	NN	0	0	0	0	0	0	0	5	8	0	0	0	5	0	0	0	0	0	1	
Sonchus arvensis (Perennial sowthistle)	NN	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	
Stellaria media (Common chickweed)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tanacetum vulgare (Common tansy)	NN	0	10	0	0	15	0	0	0	10	0	0	0	0	0	0	0	0	0	2	
Trifolium repens (White clover)	NN	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	
Invasive Shrub and Tree Species																					
Buddleja davidii (Butterfly bush)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rubus bifrons (Himalayan blackberry - shrub/vine)	I	3	7	0	0	15	25	20	0	10	3	0	15	100	0	60	0	0	5	15	
Native Shrub and Tree Species (Short growth / saplings only)																					
Cornus sericea (Red-osier dogwood) - shrub	N	0	0	40	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	3	
Physocarpus captitatus (Ninebark) - shrub	N	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rosa pisocarpa (Clustered wild rose) - shrub	N	0	0	0	0	0	20	0	2	0	0	0	25	0	0	0	0	0	0	3	
Sambucus racemosa (Red elderberry) - shrub	N	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	1	
Salix lasiandra (Pacific willow) - tree	N	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Salix sitchensis (Sitka willow) - shrub	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	
Thuja plicata (Western red cedar) - tree	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Routine Performance Standards		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species		23	20	0	5	0	5	38	15	50	100	0	0	0	30	0	10	70	55	23	6.8
Lower CI (80%)																				15	
Upper CI (80%)																				32	
Cover of Invasive Herbaceous Species		45	14	0	60	35	3	15	40	5	0	25	18	0	10	60	10	0	15	20	5
Lower CI (80%)																				14	
Upper CI (80%)																				26	
Cover of Invasive Shrubs and Trees		3	7	0	0	15	25	20	0	10	3	0	15	100	0	60	0	0	5	15	6
Lower CI (80%)																				7	
Upper CI (80%)																				22	
Native Diversity (all layers)																					N/A
Sum of plant cover (absolute cover)		91	81	40	65	70	73	85	92	83	103	65	61	105	90	135	35	80	95		

Site: Rinearson Natural Area	Sample Date(s): August 10 and 11, 2021														
Upland / Riparian Forest Invasive (URFI)		**Percent Cover per Sample Plot**													
Species	Origin (N, NN, I)	1	2	3	4	5	6	7	8	9	10	11	12	Row Average	
Native Herbaceous Species															
Agrostis exarata (Spike bentgrass)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	
Carex obnupta (Slough sedge)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	
Epilobium watsonii (Watson's willow herb)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	
Galium aparine (cleavers)	N	30	5	0	0	0	0	0	0	0	0	0	0	3	
Geum macrophyllum (Largeleaf avens)	N	0	0	0	0	0	0	10	0	0	0	0	0	1	
Juncus effusus (Soft rush)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	
Marah oreganus (Manroot)	N	0	25	0	0	0	0	0	0	0	0	0	0	2	
Polygonum hydropiperoides (Common waterpepper)	N	0	0	0	0	0	0	0	0	0	0	0	0	0	
Polystichum munitum (Sword fern)	N	0	0	0	0	0	5	0	0	0	0	0	0	0	
Rubus ursinus (Trailing blackberry - vine)	N	0	0	20	30	60	30	0	0	0	0	0	0	12	
Tolmiea menziesii (Piggyback plant)	N	0	0	0	0	0	0	0	40	0	0	0	0	3	
Urtica dioca (Stinging nettle)	N	0	0	0	0	0	10	0	0	0	0	0	10	2	
Invasive Herbaceous Species															
Brachypodium sylvaticum (False brome)	I	0	0	0	0	0	0	0	0	0	0	15	0	1	
Cirsium arvense (Canada thistle)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	
Convulvulus arvensis (bindweed)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	
Geranium robertianum (Herb robert)	I	0	5	0	0	0	0	0	10	0	0	0	0	1	
Hedera helix (English ivy, vine)	I	0	4	70	5	0	15	0	5	5	0	45	0	12	
Phalaris arundinacea (Reed canarygrass)	I	0	0	0	0	0	0	0	0	0	15	0	90	9	
Non-Native Herbaceous Species															
Agrostis stolonifera (Bentgrass)	NN	0	0	0	0	0	0	10	0	0	0	0	4	1	
Brassica sp. (Common mustard)	NN	0	8	0	0	0	0	0	10	0	0	0	0	2	
Chichorium intybus (Chicory)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Digitalis purpurea (Foxglove)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Impatiens capensis (Spotted jewelweed)	NN	0	0	0	3	5	0	0	0	0	0	0	0	1	
Lapsana communis (Nipplewort)	NN	0	0	0	0	0	0	0	0	5	0	0	0	0	
Lolium sp. (Ryegrass)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lotus corniculatus (Bird's foot trefoil)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Leucanthemum vulgare (Oxeye daisy)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Plantago major (English plantain)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rumex obtusifolius (Bitter dockweed)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stellaria media (Common chickweed)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tanacetum vulgare (Common tansy)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Trifolium repens (White clover)	NN	0	0	0	0	0	0	0	0	0	0	0	0	0	
Invasive Shrub and Tree Species															
Buddleja davidii (Butterfly bush)	I	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rubus bifrons (Himalayan blackberry - shrub/vine)	I	0	0	0	0	40	0	60	0	15	0	15	0	11	
Native Shrub and Tree Species (Short growth / saplings only)															
Berberis (Mahonia) aquilinum (Tall Oregon grape) - shrub	N	0	0	0	0	0	0	0	20	0	0	0	0	2	
Oemlaria cerasiformis (Osoberry) - shrub	N	0	0	0	0	0	0	0	3	0	0	0	0	0	
Physocarpus captitatus (Ninebark) - shrub	N	0	0	0	0	0	0	10	0	0	0	0	0	1	
Sambucus racemosa (Red elderberry) - shrub	N	0	7	0	0	0	0	0	0	0	0	0	0	1	
Symphoricarpos alba (Common snowberry) - shrub	N	30	15	20	10	0	10	0	0	0	0	0	0	7	
Thuja plicata (Western red cedar)	N	0	0	0	0	0	0	20	0	0	0	0	0	2	
Routine Performance Standards		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species		30	30	20	30	60	45	10	40	0	0	0	10	23	5.7
Lower CI (80%)														16	
Upper CI (80%)														30	
Cover of Invasive Herbaceous Species		0	9	70	5	0	15	0	15	5	15	60	90	24	9
Lower CI (80%)														12	
Upper CI (80%)														35	
Cover of Invasive Shrubs and Trees		0	0	0	0	40	0	60	0	15	0	15	0	11	6
Lower CI (80%)														4	
Upper CI (80%)														18	
Native Diversity (all layers)															N/A
Sum of plant cover (absolute cover)		60	69	110	48	105	70	110	88	25	15	75	104		

Site	EmM1
Photographer	MB
Date	July 27, 2021
Time	12:32
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM2
Photographer	MM
Date	July 27, 2021
Time	12:39
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM3
Photographer	SCH
Date	July 27, 2021
Time	10:41

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Wildlife Photos

Wildlife Tracks Photos

General Notes

Vegetation

Vegetation Photos

Site	EmM4
Photographer	MM
Date	July 27, 2021
Time	10:57
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM5
Photographer	MB
Date	July 27, 2021
Time	11:11
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM6
Photographer	MB
Date	July 27, 2021
Time	11:25
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM7
Photographer	MB
Date	July 27, 2021
Time	11:47
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM8
Photographer	MB
Date	July 27, 2021
Time	11:53
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM9
Photographer	MM
Date	July 27, 2021
Time	11:36
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EMM9-rev
Photographer	Mariah
Date	September 21, 2021
Time	16:19
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM10
Photographer	MB
Date	July 27, 2021
Time	11:39
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EMm10-rev
Photographer	Mariah
Date	September 21, 2021
Time	16:05
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM11
Photographer	MM
Date	July 27, 2021
Time	11:24
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

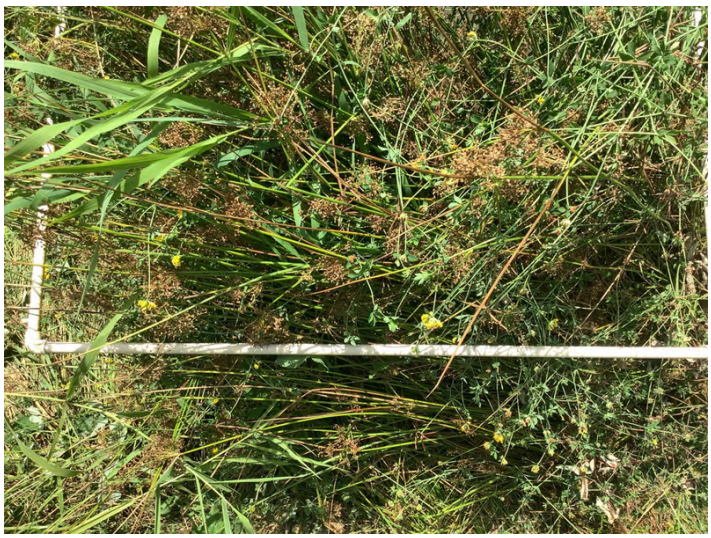
Vegetation

Vegetation Photos

Site	EmM12
Photographer	SCH
Date	July 27, 2021
Time	12:13
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos



Site	EmM13
Photographer	SCH
Date	July 27, 2021
Time	12:14
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM14
Photographer	MM
Date	July 27, 2021
Time	10:51
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM15
Photographer	MB
Date	July 27, 2021
Time	11:00
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	EmM16
Photographer	MM
Date	July 27, 2021
Time	11:16
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	Em17
Photographer	SCH
Date	July 27, 2021
Time	12:03
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE1
Photographer	SCH
Date	August 11, 2021
Time	08:49
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE2
Photographer	SCH
Date	August 11, 2021
Time	09:22
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE3
Photographer	SCH
Date	August 11, 2021
Time	14:43
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE4
Photographer	SCH
Date	August 11, 2021
Time	14:50
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

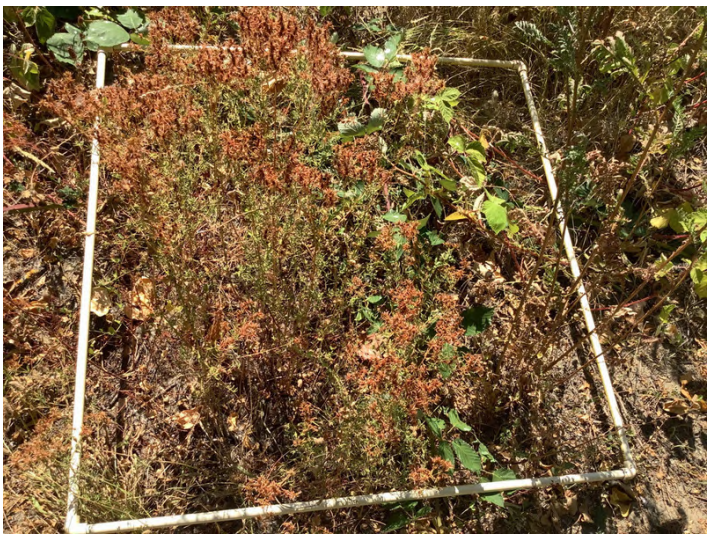
Vegetation

Vegetation Photos

Site	RFE5
Photographer	SCH
Date	August 11, 2021
Time	15:15
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos



Site	RFE6
Photographer	SCH
Date	August 11, 2021
Time	11:30
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE8
Photographer	SCH
Date	August 11, 2021
Time	15:37
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE9
Photographer	SCH
Date	August 11, 2021
Time	09:03
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE10
Photographer	SCH
Date	August 11, 2021
Time	10:01
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos




Site	RFE11
Photographer	SCH
Date	August 11, 2021
Time	09:31
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE12
Photographer	SCH
Date	August 11, 2021
Time	09:41
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE13
Photographer	SCH
Date	August 11, 2021
Time	10:20
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE14
Photographer	SCH
Date	August 11, 2021
Time	11:00
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE15
Photographer	SCH
Date	August 11, 2021
Time	11:15
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE16
Photographer	SCH
Date	August 11, 2021
Time	11:49
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE17
Photographer	SCH
Date	August 11, 2021
Time	11:59
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFE18
Photographer	SCH
Date	August 11, 2021
Time	12:07
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFUI9
Photographer	HGS
Date	August 11, 2021
Time	16:19

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Site	RFR2
Photographer	HS
Date	August 10, 2021
Time	11:38
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFR03
Photographer	TGP
Date	August 11, 2021
Time	09:07

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Site	RFR04
Photographer	TGP
Date	August 11, 2021
Time	11:34

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Site	RFR06
Photographer	TGP
Date	August 11, 2021
Time	14:54

Photo Point - North

Photo Point - East

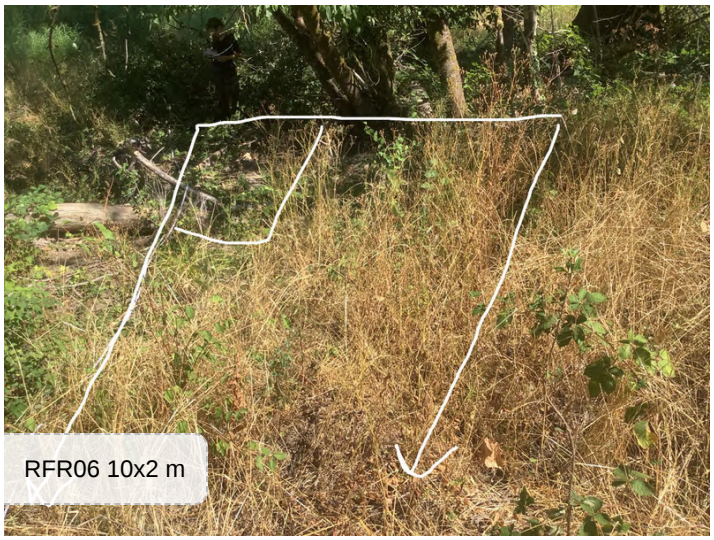


Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Site	RFR07
Photographer	TGP
Date	August 11, 2021
Time	14:21

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Site	RFR08
Photographer	TGP
Date	August 11, 2021
Time	11:02

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Plant List

Site	RFR09
Photographer	TGP
Date	August 11, 2021
Time	10:29

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes	

Site	RFR10
Photographer	SCH
Date	August 10, 2021
Time	12:52
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFR11
Photographer	SCH
Date	August 10, 2021
Time	12:32
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

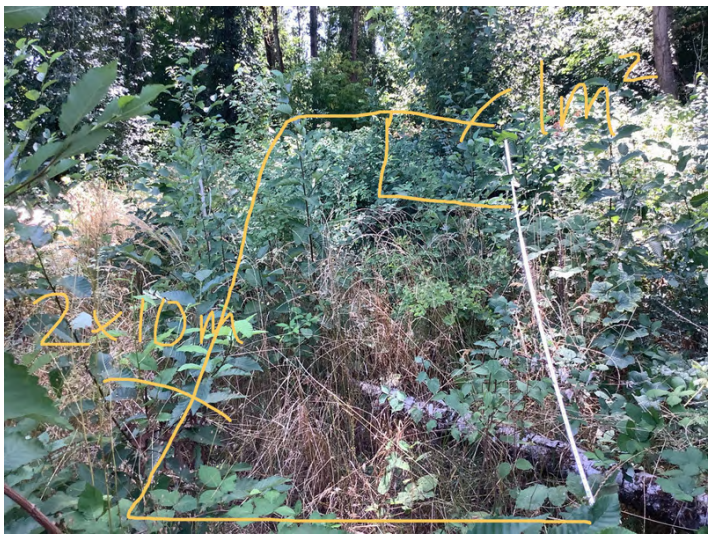
Vegetation

Vegetation Photos

Site	RFR12
Photographer	SCH
Date	August 10, 2021
Time	13:10
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos



Site	RFR13
Photographer	SCH
Date	August 10, 2021
Time	13:30
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFR14
Photographer	SCH
Date	August 10, 2021
Time	13:58
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFR15
Photographer	TGP
Date	August 11, 2021
Time	09:45

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Site	RFR16
Photographer	HS
Date	August 10, 2021
Time	10:16

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Site	RFR17
Photographer	HS
Date	August 10, 2021
Time	11:03
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	RFR18
Photographer	SCH
Date	August 11, 2021
Time	08:18
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI1
Photographer	SCH
Date	August 11, 2021
Time	15:26
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI2
Photographer	SCH
Date	August 11, 2021
Time	14:02
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI3
Photographer	SCH
Date	August 11, 2021
Time	14:08
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI10
Photographer	HGS
Date	August 11, 2021
Time	16:06

Photo Point - North

URFI10 1by1 meter

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Site	URFI11
Photographer	TGP
Date	August 11, 2021
Time	15:44

Photo Point - North

Photo Point - East

Photo Point - South

URFI11 1x1 m

Site	URFI12
Photographer	TGP
Date	August 11, 2021
Time	13:48

Photo Point - North

Photo Point - East

Photo Point - South

Photo Point - West

Photo Point - Other Direction

Bald Eagle Photos

Habitat Features Photos

Geomorphic Features Photos

Wildlife Photos

Wildlife Tracks Photos

General Notes

Site	URFI4
Photographer	SCH
Date	August 11, 2021
Time	14:17
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI5
Photographer	SCH
Date	August 11, 2021
Time	10:11
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI6
Photographer	SCH
Date	August 11, 2021
Time	14:31
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI7
Photographer	SCH
Date	August 11, 2021
Time	16:11
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Site	URFI8
Photographer	SCH
Date	August 11, 2021
Time	13:47
Photo Point - North	
Photo Point - East	
Photo Point - South	
Photo Point - West	
Photo Point - Other Direction	
Bald Eagle Photos	
Habitat Features Photos	
Geomorphic Features Photos	
Wildlife Photos	
Wildlife Tracks Photos	
General Notes	

Vegetation

Vegetation Photos

Appendix F

Bird Survey Field Notes and Summary

ESA

Rinearson Natural Area Avian Survey

Species Name	Birds per Station (2021)	Birds per Station* (2014)	Increase or decrease from baseline	Habitat Type Observed	
				Riparian	Upland
American Crow - Corvus brachyrhynchos	1.05	0.47	(+)	X	X
American Goldfinch - Spinus tristis	0	0.38	(-)	X	X
American Robin - Turdus migratorius	0.43	0.38	(+)	X	X
Anna's Hummingbird - Calypte anna	0.19	0	(+)	X	X
Bald Eagle - Haliaeetus leucocephalus	0.10	0	(+)	X	
Bewick's Wren - Thryomanes bewickii	0.19	0.52	(-)	X	X
Black-capped Chickadee - Poecile atricapillus	0.19	0.71	(-)	X	X
Black-headed Grosbeak - Pheucticus melanocephalus	0.24	0.28	(-)	X	X
Black-throated Gray Warbler - Setophaga nigrescens	0	0.05	(-)	X	X
Brown Creeper - Certhia americana	0.29	0.29	0	X	X
Brown-headed Cowbird - Molothrus ater	0	0.19	(-)	X	
Bushtit - Psaltriparus minimus	0	0.09	(-)	X	X
California Scrub-Jay - Aphelocoma californica	0.19	0	(+)	X	
Cedar Waxwing - Bombycilla cedrorum	0.62	0.28	(+)	X	
Common Yellowthroat - Geothlypis trichas	0.10	0	(+)	X	
Dark-eyed Junco - Junco hyemalis	0.10	0	(+)	X	X
Downy Woodpecker - Picoides pubescens	0.38	0.14	(+)	X	X
European Starling - Sturnus vulgaris	0.62	0	(+)	X	X
Great Blue Heron - Ardea herodias	0.29	0.23	(+)	X	
Glaucous Gull - Larus hyperboreus	0.10	0	(+)	X	
House Finch - Haemorhous mexicanus	0.38	0.05	(+)	X	
Mallard - Anas platyrhynchos	3.71	1.33	(+)	X	
Muscovy Duck - Cairina moschata	0.05	0	(+)	X	
Northern Flicker - Colaptes auratus	0.29	0.05	(+)	X	
Osprey - Pandion haliaetus	0.05	0	(+)	X	
Red-breasted Sapsucker - Sphyrapicus ruber	0.1	0.05	(+)	X	X
Red-winged Blackbird - Agelaius phoeniceus	0	0.23	(-)	X	
Rufous Hummingbird - Selasphorus rufus	0	0.05	(-)	X	
Song Sparrow - Melospiza melodia	1.38	2.05	(-)	X	X
Spotted Towhee - Pipilo maculatus	0.81	1.38	(-)	X	X
Steller's jay - Cyanocitta stelleri	0.14	0	(+)	X	X
Swainson's Thrush - Catharus ustulatus	0	0.05	(-)	X	X
Townsend's warbler	0.05	0	(+)		X
Turkey Vulture - Cathartes aura	0.05	0	(+)	X	
Vaux's swift - Chaetura vauxi	0.1	0	(+)	X	
Violet-green Swallow - Tachycineta thalassina	0.1	0	(+)	X	
White-breasted Nuthatch - Sitta carolinensis	0.29	0.19	(+)	X	X
Willow Flycatcher - Empidonax traillii	0.05	0.19	(-)	X	X
Wilson's Warbler - Cardellina pusilla	0	0.14	(-)	X	
Wood Duck - Aix sponsa	0	0.05	(-)	X	
Yellow Warbler - Setophaga petechia	0.05	0	(+)	X	

*Seven stations were analyzed for 2014

Bird Indicators

Point Count Data Form

DATE:	21-May-2021	**OBSERVER:**	Sarah Hartung
SITE:	Rinearson Natural Area	**START TIME:**	5:40 am
		END TIME:	7:40 am

CLD: <10% | 50-90% | Drizzle | 10-50% | >90%

WIND: Calm-Low (0-5mph) | Moderate (5-10mph)

Human Dist. Low | Moderate | High

Low

FIELD NOTES:

Cool morning.

				TYPICAL DETECTION		FLYOVERS				
STN#	HABITAT CODE	START TIME	SPP. CODE	0 to 50m	>50m	ASSOC.	IND.	JUV	FLUSH	FIELD NOTES
1	R	5:40	SOSP	2						
1	R	5:40	AMRO	1						
1	R	5:40	GBHE				1			
1	R	5:40	MALL	1						
1	R	5:40	BEWR	1						
1	R	5:40	DOWO	1						
2	R	6:26	SPTO	2						
2	R	6:26	YEWA	1						
2	R	6:26	MALL	5						
2	R	6:26	CASJ	1						
2	R	6:26	DEJU	1						
2	R	6:26	EUST	1						
2	R	6:26	GBHE	1						
2	R	6:26	HOFI	1						
2	R	6:26	TUVU	1						
2	R	6:26	AMCR	2						
2	R	6:26	SOSP	1						
2	R	6:26	STJA	1						
3	R	6:54	BHGR	1						
3	R	6:54	CASJ	1						
3	R	6:54	SOSP	1						
3	R	6:54	MALL	2				4		
3	R	6:54	AMCR	3						
3	R	6:54	EUST	2						
3	R	6:54	WBNU	1						
3	R	6:54	SPTO	2						
3	R	6:54	CEWA	1						
5	UF	6:07	EUST	1						
5	UF	6:07	BEWR	1						
5	UF	6:07	AMCR		1					
5	UF	6:07	SOSP	1						
5	UF	6:07	SPTO	1						
5	UF	6:07	STJA	1						
5	UF	6:07	BRCR	1						
4	R	7:10	SOSP	2						
4	R	7:10	BCCH	1						
4	R	7:10	COYE	1						

4	R	7:10	CASJ	1						
4	R	7:10	ANHU	1						
4	R	7:10	BHGR		1					
4	R	7:10	HOFI	5						
4	R	7:10	CEWA	3						
4	R	7:10	SPTO	1						
4	R	7:10	AMRO			5				
6	UF	7:25	RBSA	2						
6	UF	7:25	NOFL	1						
6	UF	7:25	SOSP	2						
6	UF	7:25	CEWA	4						
6	UF	7:25	HOFI	1						
6	UF	7:25	DOWO	1						
6	UF	7:25	WBNU	2						
7	UF	7:41	MALL	2						
7	UF	7:41	SOSP	2						
7	UF	7:41	AMCR	1						
7	UF	7:41	BHGR	1						
7	UF	7:41	DEJU	1						

Bird Indicators

Point Count Data Form

DATE:	8-Jun-2021	**OBSERVER:**	Sarah Hartung		
SITE:	Rinearson Natural Area	**START TIME:**	5:30 AM	**END TIME:**	7:30 AM
CLD:	<10% 50-90% Drizzle 10-50% >90%	**WIND:**	Calm-Low (0-5mph)	Moderate (5-10mph)	
Human Dist.	Low Moderate High	Low human dusturbance			

FIELD NOTES:

Water was high this day and the gravel bar in the river was completely submerged.

				TYPICAL DETECTION		FLYOVERS				
STN#	HABITAT CODE	START TIME	SPP. CODE	0 to 50m	>50m	ASSOC.	IND.	JUV	FLUSH	FIELD NOTES
1	R	7:30	SOSP	1						
1	R	7:30	MALL	8				2		
1	R	7:30	AMCR	2						
1	R	7:30	HOFI	1						
1	R	7:30	GBHE			1				
1	R	7:30	SPTO	1						
1	R	7:30	SPTO						1	
1	R	7:30	SOSP						1	
1	R	7:30	DOWO						1	
1	R	7:30	OSPR						1	
7	R	7:30	SPTO	1						
7	UF	7:46	SOSP	2				2		
7	UF	7:46	AMRO	1						
7	UF	7:46	AMCR	2						
7	UF	7:46	BHGR		1					
6	UF	8:02	DOWO	1						
6	UF	8:02	EUST	5						
6	UF	8:02	BHGR	1						same as at PCS 7
6	UF	8:02	SOSP	2						
6	UF	8:02	BRCR	2						
6	UF	8:02	BEWR	1						
6	UF	8:02	AMCR	2	1					
6	UF	8:02	SPTO	1						
6	W	8:02	COYE	1						Seen at PCS 5 when walking to PCS 4 from 6
4	R	8:22	CASJ	1						
4	R	8:22	DOWO	2						
4	R	8:22	NOFL	1						
4	R	8:22	AMRO	2						
4	R	8:22	WBNU	1						
3	R	8:45	WBNU	2						
3	R	8:45	DOWO	1						
3	R	8:45	NOFL	1						
3	R	8:45	BCCH	1						
3	R	8:45	SOSP	1						
3	R	8:45	STJA	1						
3	R	8:45	BHGR		1					

3	R	8:45	BEWR		1					
3	R	8:45	MALL	16				10		
3	R	8:45	EUST	3						
3	R	8:45	SPTO	1						
3	R	8:55	CEWA	5						
5	R	9:01	SPTO	2						
5	R	9:01	SOSP	2						
5	R	9:01	AMRO	1						
5	R	9:01	BRCR	1						
5	R	9:01	AMCR	1						
5	R	9:01	BHGR	2						
2	R	9:17	VGSW	2						
2	R	9:17	BAEA	1				1		
2	R	9:17	BEWR	1						
2	R	9:17	SPTO	1						
2	R	9:17	AMCR	2						
2	R	9:17	SOSP	2						
2	R	9:17	VASW	2						
2	R	9:17	AMRO	2						
2	R	9:17	DOWO	1						
2	R	9>17	GBHE						2	

Bird Indicators

Point Count Data Form

DATE:	29-Jun-2021		**OBSERVER:**	SMM and JBB		
SITE:	Rinearson		**START TIME:**	5:30 AM	**END TIME:**	8:00 AM
CLD:	<10%	50-90%	Drizzle	**WIND:**	Calm-Low (0-5mph)	Moderate (5-10mph)	Calm-Low wind
	10-50%	>90%					
Human Dist.	Low	Moderate	High				

Moderate human disturbance near point 1, man on beach and boats unloading from boat ramp. Low human disturbance at all other points

FIELD NOTES:

Sunny and hot humid day. Saw a racoon, male and female deer and a fawn

				TYPICAL DETECTION		FLYOVERS				
STN#	HABITAT CODE	START TIME	SPP. CODE	0 to 50m	>50m	ASSOC.	IND.	JUV	FLUSH	FIELD NOTES
1	ow	5:30 AM	MALL	22						Mallards swimming in water and on shoreline
1	ow	5:30 AM	MUDU	1						Mallard and domestic duck hyrbid
1	R	5:32 AM	GBHE	1						Standing on shore, flew away when boat passed
1	R	5:32 AM	GLGU	2		1				Two gulls on shore and one fly over
1	UF	5:33 AM	AMCR	6						Crows perched in the cottonwoods along the shore
1	UF	5:36 AM	SOSP	2						Calling from forest
1	UF	5:37 AM	BCCH		1					Calling from forest
4	W	5:53	SOSP	1						Acting territorial, indicating nest may be in area
4	W	5:53 AM	ANHU	2						Flying through area
4	W	5:54 AM	GBHE			1				Flew over wetland
4	W	5:54 AM	BCCH	1						Flying between oak and elderberries
4	UF	5:56 AM	STJA		1					Heard calling in distance
4	UF	5:56 AM	PIWO		1					Heard calling in distance
4	UF	5:58	AMCR		1					Heard calling in distance
7	UF	6:13 AM	SPTO	2						Seen moving between trees and calling
7	UF	6:13 AM	ANHU	1						Seen moving between trees and calling
7	UF	6:14 AM	NOFL	2						In large cottonwood
7	UF	6:15 AM	CEDW		1					Heard in canopy
7	UF	6:17 AM	SOSP		3					Heard calling in distance
7	UF	6:17	AMCR		4					Heard calling in distance
6	UF	6:33 AM	BRCR	2						Saw on tree
6	UF	6:33 AM	NOFL	1						Saw flying between trees
6	UF	6:33 AM	SOSP	2						Heard calling
6	UF	6:33 AM	WIFL	1						Saw in tree
6	UF	6:33 AM	DOWO		1					Heard calling
6	UF	6:35 AM	AMRO	2						Seen flying in canopy
6	UF	6:36 AM	EUST	1						Seen on cottonwood snag
5	UF	6:57 AM	DOWO	1						Heard calling
5	UF	6:57 AM	SOSP	1						Heard calling
5	UF	6:57 AM	AMCR	1						Heard calling
5	UF	7:00 AM	AMRO	1						Heard calling
5	UF	7:00 AM	BCCH	1						Heard calling
5	UF	7:00 AM	TOWA	1						Heard calling
2	W	7:34 AM	MALL	1				4		One mallard in creek with four ducklings
2	UF	7:34 AM	AMCR		3					Heard in trees along banks closest to housing
2	UF	7:34 AM	GLGU		2					Heard calling near river
2	UF	7:36	DEJU		1					Heard calling on island
2	UF	7:36 AM	SOSP		2					Heard calling from both sides of forest
2	UF	7:36 AM	AMCR			1				Seen flying over site
2	UF	7:36 AM	SPTO	2	2					Two heard in forest, two seen on island
3	UF	7:49 AM	WIFL		1					

3	UF	7:49 AM	SOSP		5					
3	UF	7:49 AM	AMCR		5					
3	UF	7:49 AM	SPTO		1					
3	W	7:49 AM	MALL	1						
3	UF	7:49 AM	AMGO		2					
3	UF	7:52 AM	AMGO		1					being chased by cowbird
3	UF	7:52 AM	NOFL		1					Seen in canopy across pond
3	UF	7:52 AM	EUST		1					Seen in snag across pond
3	UF	7:52 AM	BHCO		1					Seen chasing american goldfinch
3	UF	7:52 AM	SOSP		2					Seen chasing each other in juncus

Appendix G
Bald Eagle Data Sheets

ESA

TABLE G-1
EAGLE ACTIVITIES OBSERVED IN PROJECT AREA AND VICINITY

Eagle Activity within Project Area		Eagle Activity within the Vicinity of the Project Area	
Activity Description	**Total Time Activity Observed**	**Activity Description**	**Total Time Activity Observed**
Adult Eagle Activities			
Adults Perched or Flying Between Perches	1 hours 9 mins	Adults Perched or Flying Between Perches	24 hours 5 mins
Adult Fly Through	N/A	Adult Fly Through	5 mins
Adults Hunting/Foraging	N/A	Adults Hunting/Foraging	6 mins
Adults Displaying Territorial Behavior	N/A	Adults Displaying Territorial Behavior	34 mins
Adults Displaying Mating Behavior	N/A	Adults Displaying Mating Behavior	2 mins
Adults Observed in Nest	N/A	Adults Observed in Nest	2 hours 46 mins
Juvenile Eagle Activities			
Juvenile Perched or Flying Between Perches	7 hours 55 mins	Juvenile Perched or Flying Between Perches	1 hour 38 mins
Juvenile Fly Through	N/A	Juvenile Fly Through	2 mins
Juvenile Hunting/Foraging	2 mins	Juvenile Hunting/Foraging	N/A
Juvenile Sparring	2 mins	Juvenile Sparring	N/A

Rinearson Bald Eagle Monitoring
1/11/2021

3:00 Arrive on site.
3:10 2 Large Bald eagle perching on large cottonwood adjacent to W river and Rinearson Creek outlet.

Bird count:

70 mallard > boat launch
2 Canada goose
2 Bald eagle
Annas hummingbird
25 Red winged blackbird
10 crow
Hairy woodpecker
Gull w/ black beak, narrow body
4 american robin
Black cap chick
White breasted nuthatch
3 Song Sparrow
Ruby crowned kinglet
Northern Flicker
Lincolns Sparrow - smaller, Grain head
Towhee

Scale: 1 square = _____

3:25 Bald Eagles perched ~15' min on cottonwood located on island West of Rinearson outlet. Then flew west over river.

3:30 Footprint of mink along shore of Rinearson creek.

5:00 Depart site

Scale: 1 square = _____

Rite in the Rain

Rineerson Nat Area 1/20/2021
S. Hartung Dawn

7:50 - 8:13 = BAEA perched on med. sized Black cottonwood at SW tip of delta, just downstr. of channel marker 2 Facing upstr / south on the Willi. River

Disturbed by my movements, it flew N over the neighborhood.

8:40 am Heard 2 BAEA vocalizing from across the river

Pot. prey: CAGO, COME, MALL (in R-pond), gulls (?), DCCO

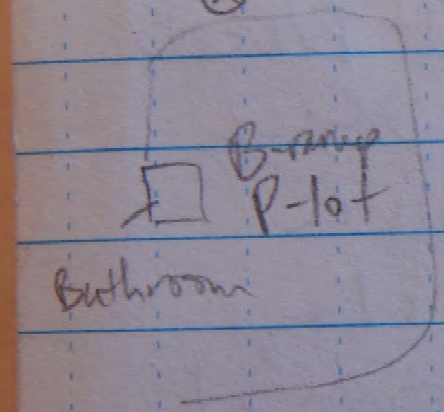
other birds in area on-site
AMRO, BCCH, AMCR, BEKI (pond)
HOWR, BEWR, DOWO, NOFL,
RCKI, RBNU, SOSP, STJA,
EUST, RWBB, BRCR.

Scale: 1 square = _____

Rite in the Rain

S. Hartwig

Rinearson Nat Area 1/28/21
juv BAEA 3:30pm



16" POBA overlooking the WM + mouth of Rinearson Ck

2 adult BAEA across the river on the tallest Doug fir - overlooking the Willamette
~50 gulls/geese/ducks near boat ramp.
- mallards, CAGO, Glaucous-winged
- white spot near bill, green head, white body

Rite in the Rain

Rineanson - 1-28-2026
crows perched in POBA
at Delta.

4:17 - Jury is gone
5:00 p.m adult BAEA's
still on high perch
across the river
4:30 = RTHA is large
POBA SE portion of
site
one left @ 5:10 pm
5:00 p.m = GBH in
POBA at Delta

Rinearson 2-4-2021, Dawn, S. Hartung

7:11am Ad. BAEA flew from N + perched on POBA (cottonwood tree at Rinearson Delta)

7:12am 2nd Ad. BAEA flew to same tree, perched just above the 1st

7:13am 2nd BAEA changed perches ~50' NW

Both observing the waterfowl at the boat ramp

Delta cottonwood trees

~~20~~-30 DCCO - cormorants

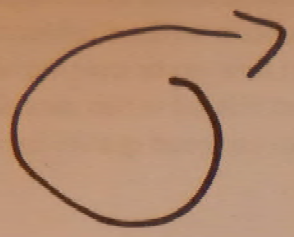
15 Mallard

~~25~~ CAGO - Canada geese

40

Rinearson 2-4-2021

7:21 am – 1st BAEA made a flight over the waterfowl, flew low behind the delta + cont'd NE – out of site.



7:25 am waterfowl flushed
7:30 am Both ad BAEA in flight circling above the cove over the Willamette River
7:32 – BAEA perched in Delta cottonwood
7:43 – BAEA took flight, looped N + the other BAEA that must have been perched to the N (out of sight) also took flight. they both flew N out of range.

* 7:50 BAEA perched on tall conifer across river, leaning Doug. N of the taller, straighter Doug fir to the south, in line w/ a private dock
8:10 am, leaning Doug fir BAEA left perch, flying S, 2nd BAEA appeared + joined the first, a third BAEA flushed + was being chased S by the 2 BAEA's

↳ No eagles visible Both on-site from Nature Walk

Rinearson Nat. Area
S. Hartung

2-10-2021
Dusk

Arrive 3:45pm
Depart 5:45pm

Observed western edge of site from boat ramp, also used the nature trail. Kids playing in the woods in the SW corner of site.

4:56pm 2 adult BAEA perched within 10 ft. of each other at the tip of "tilted top" Doug. fir across the river from the delta (western edge of site) facing east towards the site

5:09 - one adult BAEA Δed perch, same tree

5:11 A third adult BAEA flew south over the ridge line after circling above / near "tilted top"

5:18 - The BAEA that changed perches, left the tree flying NE, out of site

One BAEA still in tilted top

2-10-2021

5:26pm 2nd BAEA flew from the south, W side of Willamette R. & perched on tilted top near first BAEA.

5:32pm 2nd one shifted closer to first BAEA.

Rinearson - Bald Eagles — Dawn
S. Hartung — 2-19-2021

Start Survey: 6:55am
End Survey: 8:55am
Boat ramp location;
6:55am - 2 BAEA, adult, perched at the heron rookery (active) upstream of boat ramp. Adults perched ~200' apart on east side of rookery island.

7:10am - 1 BAEA, juv. flew from the west & perched on tilted top Doug fir, across river from mouth of Rinearson.

7:22am - Both BAEA changed perches to a tree across river from boat ramp. Cuddi 10' of each other) - vocalizing as they flew up & landed.

7:55am Both BAEA gone from perch (didn't see where)
7:57am BAEA juv left tilted top, replaced by adult BAEA
8:10am - ad. BAEA still on tilted top, left boat ramp to walk nature trail. - no BAEA on-site, end survey 8:55am

Rite in the Rain

2-25-2021 Dusk
S. Hartwig w/ J.R
Start 4:15 pm
End 6:15 pm

5:20 pm 2 BAEA harassing a sea lion in Meld. Bay - just W of "Delta" cottonwoods, then they perch on trees in the Delta.

5:28 1 BAEA leaves its perch & circles up & around to the branch above the 2nd one, steps onto the back of the 2nd one momentarily, but is rebuffed (failed mating attempt?) A minute later it flys away, ~~East~~ North, low over the E. shoreline

5:34 The 2nd (remaining) eagle changes perches to the North-N. side of dead-end / overflow channel in cottonwood

5:40 2nd eagle left perch, didn't see where it went.

Date:	3/12/2021				**Page:**	**1**
Name:	S. Hartung				**Start:**	4:45pm
					End:	6:45pm

Observations:

Time	**Age***	**Notes**
5:30pm	A	Perched in delta cottonwoods, west side of site on river side. Watched from the boat ramp until 6:00pm, then walked into the interior to observe any activity on-site.
6:07pm	J	Juvenile eagle perched in snags along south shore of remnant pond. Flushed to the northwest after 5 minutes. A few mallards were in the pond.

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.
Observation points:
Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.
Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.
Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	**Age**	**Notes**

Other Observations:

Status of heron rookery:
Adult herons at rookery - about 10

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):
Mallards - 15; Canada geese - 30

On-site Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching	30	1	in cottonwoods, west side
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	5	1	Flushed after 5 min.
Total	35	2	

Vicinity Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching	0		
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	0		
Total	0		

*A (Adult), J (Juvenile)

Date:	**3/17/2021**		**Page:**	**1**	
Name:	**Luke Johnson**		**Start:**	**7:00**	
			End:	**9:00**	
Observations:					
Time	**Age***	**Notes**			
7:14	**J**	SW cottonwood near rinearson outlet (east bank)			
7:17	A	SW cottonwood near rinearson outlet (east bank)			
7:18	A	alder on west bank N of mansions			
7:29	A	flushed from rinearson to west bank			
7:32	A, A	pair flushed south on west bank (unseen)			
7:40	A, A	observed in west bank alder stand			
7:48	J	flushed to SW bank in alder stand w/adults			
7:53	A, A, J	all three flushed to lone fir near mansions			
9:00	A	one adult remains seen on lone fir, NW bank			

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points:

Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.

Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	**Age**	**Notes**

Other Observations:

Status of heron rookery: 3 GBHE perched near nests

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

20+ mallards, 8 crows, 9, CAGO, 1 unknown duck, northern flcker, 1 GBHE. 1 BEKI

On-site Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching	15	1	
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	5		
Juvenile bald eagle: other	34	1	
Total			

Vicinity Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching	100	2	
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	20	1	
Total			

*A (Adult), J (Juvenile)

Rinearson Natural Area

Bald Eagle Monitoring

Date:	3/26/2021	Page:	1
Name:	Sierra McComas	Start:	6:10
		End:	8:10

Observations:

Time	Age*	Notes
~~6:25~~	~~Adult~~	~~4 mallards, 1 domestic~~
7:12	Adult	2 adults perched in tilted top (loafing)
7:53	Adult	Flew to lower cottonwood and circled each other w/talons out during flight (potential roost in cottonwood)
8:00		End - still in cottonwood

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points:

Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.

Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) Page: 2

Time	Age	Notes

Other Observations:

Status of heron rookery: Rookery still active, several pairs obs.
Boat ramp high use
Human w/dog walking in nature area W.
Dog walker in E. Site flushed 2 CAGO

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

GBHE = IIII
CAGO = IIII
Mallard = IIII IIII IIII IIII
AMCR = IIII
Song Sparrow - III
Downy Woodpecker
Black Cap Chickadee - 2C

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	49	2	2 adults perched/loafing in tilted tree, cotton wood
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total			

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total			

*A (Adult), J (Juvenile)

Date:	4/1/2021		Page:	1
Name:	Luke Johnson		Start:	6:35
			End:	

Observations:

Time	Age*	Notes
6:40	J	at cottonwood on NW side of Rinearson confluence - east bank
6:42	A,A	cottonwood - west bank
7:00		No eagles observed
7:20	J	perched on snag near pond
8:02	A	west bank rounded top
8:40		no action

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points:

Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.

Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Age	Notes

Other Observations:

Status of heron rookery:

3 GBHE perched near nests

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

12 mallards, fulls, 12 CAGO, 1 GBHE

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	0		
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	60	1	
Total	60		

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	58	2	
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	0		
Total	58		

*A (Adult), J (Juvenile)

Rinearson Natural Area

Bald Eagle Monitoring

Date:	4/05/2021	**Page:**	1
Name:	Sierra McComas	**Start:**	6:14
		End:	8:14

Observations:

Time	Age*	Notes
7:04-7:08	A	3 bald eagles on far side of river Alternated between pair chasing single to single chasing pair & pair chasing single again. Flew into trees near sun where visibility was lost
7:10-7:11	A	2 eagles seen past turned top tree flying separately. Flew behind treeline where visibility was lost
7:19	A	2 eagles seen flying away from treeline ~~towards~~ away from river & park & out of site past houses to the West
7:20 ~~7:29~~	A	1 eagle seen loafing in tree N of crooked /twisted top that has Y shape near top
7:29	A	↑ 1 adult eagle flew W away from river, out of tree where it was perched
7:30		- Eagle flew back & perched in cottonwood under Y tree
7:30	A	1 Eagle flew across river & perched in cottonwood in natural area (not eagle perched in cottonwood below Y tree)

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points:

Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.

Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.

Use binoculars: 8x20, 8x40, or 10x40.

*A (Adult), J (Juvenile)

Observations: (Continued) **Page:** 2

Time	Age	Notes
7:31	A	Eagle flew out of cottonwood & down & towards pond/backwater area in nature area & out of sight
7:37-7:45	A	2 Eagles flying around Y tree. One chasing the other til they went out of sight
7:45	A	1 adult still sitting in cottonwood under the Y tree. Is there a nest there? Can't tell/see
7:52	A	1 eagle returns from W & lands in top of twisted top tree
8:04	A	Adult in twisted top tree flew away & out of sight to the

Other Observations: 8:04 A - Adult in cottonwood followed 1

Status of heron rookery: 6 herons perched in rookery at 6:32 (2 on nests

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.): Mallards: ||||-||||-||||-|||| Canadian Geese: |||| 1 Crows: ||||-||||-||||-||| Chickadee: || Song Sparrow: || Herons: ||||-|| Vulture: 1 Robin: 1 Hummingbird: 1

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total			

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total			

General Notes: ducks and geese congregated near boat dock eating seed someone put out could hear woodpecker in trees in nature area

- 8:09 A 1 Adult seen flying far away in NW flew behind tree line

Date:	4/16/2021		Page:	1
Name:	Luke Johnson		Start:	6:05
			End:	

Observations:

Time	Age*	Notes
6:25	A	2 cottonwoods N of mansions - west bank
6:33	A	moved to lone fir
7:40	A,A	one foraged (dived) second came out of lone fir and retreated
8:15	A,A	eagles remain in lone fir and adjacent alder

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points:

Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.

Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Age	Notes

Other Observations:

Status of heron rookery:

8 GBHE observed flying N-S towards rookery, most with nesting material

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

1 wood duck, 12 CAGO, 20 mallards - ducklings in pond

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	0		
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	0		
Total	0		

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	110	2	
Adult bald eagle foraging	5	1	
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	0		
Total	115		

*A (Adult), J (Juvenile)

Date:	4/27/2021	Page:	1
Name:	Luke Johnson	Start:	5:30
		End:	7:45

Observations:

Time	Age*	Notes
5:50	J	flight NE to SW out of sight
6:17	J	N of mansions in cottonwoods, perched
6:15	A	1 adult on NW bank - crooked top perched
6:23	J	Juvie fledgged from cottonwoods to conifer on E bank SW of Rinearson
6:45	J,J	In natural area 2 juvies sparring and returning to snags
6:51	J	3rd Juvie in sigh, perched on snag south of pond
6:57	J, J	2 juvies flushed, 1 S and 1 N - 1 juvie remains perched on snag
7:10	J	1 juvie from N flies into sight, circles, and returns out of sight
7:45		No BAEA observed at ramp, 1 juvie assumed perched at natural area

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points:

Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.

Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Age	Notes

Other Observations:

Status of heron rookery: 5 GBH observed

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other	93	3	
Total	93		

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	30	1	
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	30		

*A (Adult), J (Juvenile)

Date:	5/4/2021		Page:	1
Name:	Luke Johnson		Start:	19:15
			End:	

Observations:

Time	Age*	Notes
19:36		22 cars parked on bar, 8 cars parked on south shore
19:38	A	adult on crooked top
19:42	A	second adult observed next to adult on crooked top
19:50	A, A	pair flushed from crooked top, circlided north of bar,
		cruised and perched out of sight
		hybrid duck carcass observed adjacent to beaver dam,
		potential food source
20:30	J	juvie observed flying north to south

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points:

Spend 1 hr near the boat ramp to observe BAEA activity at the western edge of site.

Spend 1 hour at the Nature Trail / Interior; be careful not to flush eagles.

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Age	Notes

Other Observations:

Status of heron rookery:

3 GBH observed flyign N to S

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

8 CAGO, 12 mallards

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	0		
Adult bald eagle foraging	0		
Adult bald eagle nesting/mating	0		
Adult bald eagle: other	0		
Juvenile bald eagle: other	0		
Total	0		

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	12	2	
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other	2	2	
Juvenile bald eagle: other	1	1	
Total	15		

*A (Adult), J (Juvenile)

Date:	**5/18/2021**			**Page:**	**1**
Name:	**Luke Johnson**			**Start:**	**19:30**
Dusk				**End:**	**20:30**

Observations:

Time	Station	Age*	Notes
7:15	1	A	perched on broken top tree on W bank
7:51	1	A	flushed N out of view
			No other eagles observed at all other stations

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Stations: Divide 2 hrs at 3 Observation Points:

1) Near the boat ramp (not on the bar); 2) The nature trail cul-de-sac and 3) Near the pond outlet

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Station	Age	Notes

Other Observations:

Status of heron rooker 4 GBHs observed flying through site from/to rookery

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

On-site summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1							
Eagle #2							
Eagle #3							
Eagle #4							
Eagle #5							
#Min							

Vicinity summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1	36			4			
Eagle #2							
Eagle #3							
Eagle #4							
Eagle #5							
#Min							

*A (Adult), J (Juvenile)

Rinearson Natural Area Bald Eagle Monitoring

Date:	6/1/2021		Page:	1
Name:	Luke Johns		Start:	7:15
Dusk			End:	9:15

Observations:

Time	Station	Age*	Notes
7:39	X	A	1 Adult observed north of Rinearson area on cottonwood located on east bank "point", which is accessed from residential area via River Road
9:15	X	A	Adult still perching on cottonwood

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.
Stations: Divide 2 hrs at 3 Observation Points:
1) Near the boat ramp (not on the bar); 2) The nature trail cul-de-sac and 3) Near the pond outlet
Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) Page: 2

Time	Station	Age	Notes

Other Observations:

Status of heron rookery:

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

On-site summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1	96						
Eagle #2							
Eagle #3							
Eagle #4							
Eagle #5							
#Min							

Vicinity summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1							
Eagle #2							
Eagle #3							
Eagle #4							
Eagle #5							
#Min							

*A (Adult), J (Juvenile)

Date:	6/8/2021			Page:	1
Name:	Luke Johnson			Start:	5:05
Dawn				End:	7:00

Observations:

Time	Station	Age*	Notes
5:26	1	A	2 Adults and 2 Juveniles surrounding boat launch. Appeared to be fishing; also sparring; J and J fled to tree at southwest corner of Rinearson confluence and A and A fled to remote control car area
5:26	1	J	
5:40	1	A/A	Pair of osprey observed and immediately A and A fled cottonwood on west bank south of mansions (6th bald eagle) . Both balds confronted osprey and then continued soaring the Willamette perhaps in search for food.
5:41	1	A/A	A an A fled cottonwood near remote control car area and headed south towards McDonald's
6:10	1	J	1 J fled from island perch to cottonwood near confluence
6:13	1	J	moved back to oak on island
6:46	1	J	1 of 2 Js fled Rinearson area and headed to cottonwoods on W bank south of mansions

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.
Stations: Divide 2 hrs at 3 Observation Points:
1) Near the boat ramp (not on the bar); 2) The nature trail cul-de-sac and 3) Near the pond outlet
Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) Page: 2

Time	Station	Age	Notes

Other Observations:

Status of heron rooker: 4 GBHs observed flying through site from/to rookery
7 GBHs
Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):
Osprey II,

On-site summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1	15			4			
Eagle #2	15			4			
Eagle #3					80		5
Eagle #4					90		7
Eagle #5							
#Min							

Vicinity summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1							
Eagle #2							
Eagle #3							
Eagle #4							
Eagle #5	41	3					
Eagle #6	41	3					
#Min							

*A (Adult), J (Juvenile)

Rinearson Natural Area

Bald Eagle Monitoring

Date:	6-15-2021	**Page:**	1
Name:	Sarah Hartung	**Start:**	7:30 pm
		End:	9:30 pm

Observations:

Time	Age*	Notes
		No evening bald eagle activity, but was on-site in the morning & saw two Ad. BAEA's flying South from down-river to up river. Juv. BAEA perched above the RC campark getting harassed by a crow 9:00-9:15am
		- checked the "McDonalds" nest near I-205 for ~10 min before the site survey - it does not appear active, But it has a similar disheveled look to the Rhody Garden eagle nest which is active this year (& it was in 2020 + previous yrs.)

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

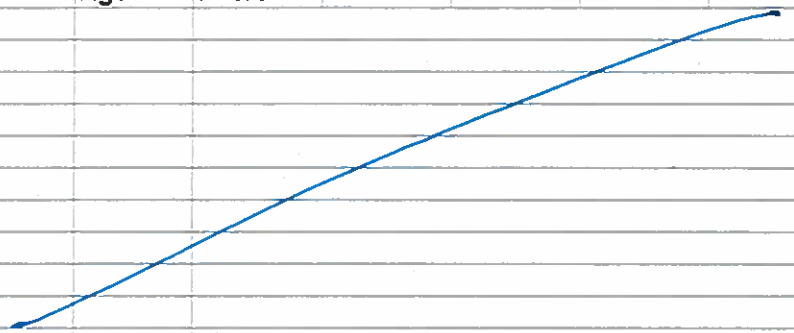
Observation points: 3 Observation Points:

1) Spend 35-40 min near the boat ramp; 2) 35-40 min at the nature trail cul-de-sac and 3) 35-40 min near the pond outlet for a total of 120 minutes (includes walking)

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page:** 2

Time	Age	Notes



Other Observations:

Status of heron rookery: GBHE flying in vicinity of rookery, could not see adults on nest.

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

Osprey foraging in Meldrum Bay 9:15pm - caught a fish. ~15 mallards in pond on-site ~10 mallards in inlet @ ~9:00pm

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	0	0	No evening activity.
Adult bald eagle foraging	0	0	
Adult bald eagle nesting/mating	0	0	
Adult bald eagle: other	0	0	—
Juvenile bald eagle: other			
Total	0		

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	0	0	—
Adult bald eagle foraging	0	0	—
Adult bald eagle nesting/mating	0	0	—
Adult bald eagle: other	0	0	—
Juvenile bald eagle: other			
Total	0		

*A (Adult), J (Juvenile)

Date:	6/29/2021	Page: 1
Name:	SMM	Start: 7:30
		End: 9:30

Observations:

Time	Age*	Notes
8:36	J	Between site one and two at 8:36 PM saw first year juvenile bald eagle fly from where wetland meets river back towards wetland and around Island about 30 feet above ground
8:38	J	At 8:38 the juvenile bald eagle flew back around Island towards parking Lot near where wetland inlet meets river
8:42	J	Juvenile eagle landed in snag near the entrance of where the wetland meets the river and is perched there
8:50	J	Juvenile still perched in tree preening his wings
8:57	J	Juvenile flew from perch after trucks and boats make a motion nearby flew towards parking Lot and back into upland Forest and out of sight

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.
Observation points: 3 Observation Points:
1) Spend 35-40 min near the boat ramp; 2) 35-40 min at the nature trail cul-de-sac and 3) 35-40 min near the pond outlet for a total of 120 minutes (includes walking)
Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) Page: 2

Time	Age	Notes

Other Observations:

Status of heron rookery:

One great blue Heron observed perched in trees of rookery And one great blue Heron observed flying away from the rookery at 7:34 PM
One Seagull seen flying overhead at 7:30 near rookery

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

During the morning reading bird survey one adult eagle was seen flying from the parking lot towards the wetland at approximately 8 am. At 7:30 pm 12 mallards near boat launch including one duckling. Song sparrows her along the shoreline and seen on the shoreline.

Lots of human activity around the boat launch in Shoreline 100 people and 30 cars parked on the gravel bar

3 spotted towhee, Turkey vulture, 4 crows, 6 chickadees, at site three at 7:44 PM. At 7:51 PM site 8 turkey vultures circling near wetland. 7:57 PM one Willow flycatcher at site three. One doe at site three at 7:58 PM. Site one at 8:20 PM six crows, one Willow flycatcher, three song sparrows, One northern flicker and one Anna's hummingbird, one spike point buck. One Mallard flying overhead at 8:28 PM at site one and 4 swallows. At 8:30 two Cedar waxwings landed in alder tree at site one and two turkey vultures circled the area. At 9:04 PM at site one there are approximately 50 mallards with seven ducklings and 40 Canadian geese. At 9:10 PM one great blue Heron flying towards the rookery. At 9:11 PM one great blue Heron flying away from rookery towards boat ramp. At 9:12 PM at a third great blue Heron landed on the shoreline at Eagle survey site 2. At 9:14 PM a fourth great blue Heron approached from down river and landed in the Cottonwood rookery.

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other	21	1	When juvenile bald eagle approximately 1 to 1 1/2 years old seen flying around the island near wetland Delta and landed in a tree where it preened and then flew away after about 20 minutes
Total	21		

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	0		

*A (Adult), J (Juvenile)

Rinearson Natural Area — Bald Eagle Monitoring

Date:	**07 27 2021**		**Page:**	**1**
Name:	**Hannah Smiley, Susan Hartung**		**Start:**	**7:15**
			End:	**9:20**

Observations:

Time	Age*	Notes
7:50		Vocalization, a titter
		Sun setting behind making observation challenging.

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.
Observation points: 3 Observation Points:
1) Spend 35-40 min near the boat ramp; 2) 35-40 min at the nature trail cul-de-sac and 3) 35-40 min near the pond outlet for a total of 120 minutes (includes walking)
Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) — **Page: 2**

Time	Age	Notes

Other Observations:

Status of heron rookery:
Unknown, none observed at cottonwoods

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):
12 Mallards, 70 Canada Geese, 5-10 turkey vultures flying over head
Osprey perched on cottonwoods at edge the boat ramp, likely hunting

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	0	0	

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other	2		vocalizing
Juvenile bald eagle: other			
Total	2	1	

*A (Adult), J (Juvenile)

Date:	3-Aug-21				Page:	1
Name:	Hannah Smiley				Start:	5:35am
					End:	7:35

Observations:

Time	Age*	Notes
5:56	Adult	Perched in the nest. Bobbing up and down.
5:48	Adult	2nd adult perched in nest . Lost track of
6:15	Adult	Adult circled nest then perchered.
6:15	Adult	Other adult perched in nest
7:30	Juvinile	flying across channel

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points: 3 Observation Points:

1) Spend 35-40 min near the boat ramp; 2) 35-40 min at the nature trail cul-de-sac and 3) 35-40 min near the pond outlet for a total of 120 minutes (includes walking)

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Age	Notes

Other Observations:

Status of heron rookery:

Unknown, none observed at cottonwoods

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

Spotted Towee, 4 turkey vultures roosting, 6 crows, 20 ducks, Osprey soaring

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other	5	1	
Total			

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching	30	2	
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total			

*A (Adult), J (Juvenile)

Date:	August 9 2021				Page:	1
Name:					Start:	1855
					End:	2055

Observations:

Time	Age*	Notes
		no eagles

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points: 3 Observation Points:

1) Spend 35-40 min near the boat ramp; 2) 35-40 min at the nature trail cul-de-sac and 3) 35-40 min near the pond outlet for a total of 120 minutes (includes walking)

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Age	Notes

Other Observations:

Status of heron rookery:

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

Seagle flying east to west across bay, 20 mallards swimming 4 turkey vultures cicling cottonwoods, osprey flying

On-site Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	0		

Vicinity Summary:	# Min.	# eagles	Notes
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	0		

*A (Adult), J (Juvenile)

Date:	**August 23 2021**				**Page:**	**1**
Name:	**Hannah Smiley**				**Start:**	**1836**
					End:	**2036**
Observations:						
Time	**Age***	**Notes**				
1849	Adult	Circling over bay flew east				

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.

Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.

Observation points: 3 Observation Points:

1) Spend 35-40 min near the boat ramp; 2) 35-40 min at the nature trail cul-de-sac and 3) 35-40 min near the pond outlet for a total of 120 minutes (includes walking)

Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page:** **2**

Time	**Age**	**Notes**

Other Observations:

Status of heron rookery:

Unkown, none seen at cottonwoods

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

30 mallard swimming, 6 turkey vultures flying, 30 geese swimming, Heron standing at shore likely hunting, 20 crows sitting in trees

On-site Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	0		

Vicinity Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching	10	1	
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	10		

*A (Adult), J (Juvenile)

Date:	**8/31/2021**			**Page:**	**1**	
Name:	**Hannah Smiley**			**Start:**	**6:15**	
				End:	**8:15**	
Observations:						
Time	**Age***	**Notes**				
7:54	Adult	hunting and bay, flew from West low near water disapeared in rocks				

Protocol:						
Dawn surveys: Start 15 min before sunrise, total time 2 hrs.						
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.						
Observation points:	3 Observation Points:					
1) Spend 35-40 min near the boat ramp; 2) 35-40 min at the nature trail cul-de-sac and 3) 35-40 min near the pond outlet for a total of 120 minutes (includes walking)						
Use binoculars: 8x20, 8x40, or 10x40.						

Observations: (Continued)					**Page:**	**2**
Time	**Age**	**Notes**				

Other Observations:

Status of heron rookery:

Abundance / species of birds in Meldrum Bay and vicinity (# Canada goose, mallard, American wigeon, domestic waterfowl, etc.):

1 Osprey Flying, 40 mallards swimming, 16 geese flying, 20 crows flying, 3 seagulls flying, 1 dove flying, I heron hunting

On-site Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other			
Juvenile bald eagle: other			
Total	0		

Vicinity Summary:	**# Min.**	**# eagles**	**Notes**
Adult bald eagle perching			
Adult bald eagle foraging			
Adult bald eagle nesting/mating			
Adult bald eagle: other	8	1	
Juvenile bald eagle: other			
Total	8		

*A (Adult), J (Juvenile)

Date:	12/21/2021				**Page:**	**1**	
Name:	S. Hartung				**Start:**	7:32	
Dusk					**End:**	9:32	

Observations:

Time	Station	Age*	Notes
7:50	1	Adult	Didn't see where this eagle came from, just saw it perched on top of tall Douglas fir SW of the heron rookery upstream of the boat launch. Perched until 8:25 am, until the next observation station was visited. (35 min)
8:35	2	Adult	Two adults flew from the north, one vocalizing while it landed on top of a Douglas fir, about 300 feet north of the NE end of the pond. The second eagle flew over the east end of the pond/floodplain and cont' flying south towards Meldrum Bar Park. The first eagle perched until 8:50 am (15 min), until the next station.
8:55	3		No eagles.

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.
Stations: Divide 2 hrs at 3 Observation Points:
1) Near the boat ramp (not on the bar); 2) The nature trail cul-de-sac and 3) Near the pond outlet
Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Station	Age	Notes

Other Observations:

Status of heron rookery: Dormant, 2 GBHE on/near the study area

Abundance / species of birds in Meldrum Bay and vicinity:
Canada geese near p-lot (10)
In the remnant pond: Hooded mergansers (pair); common merganser (pair); Double-crested cormorant (2); In Meldrum bay: mallards and domestic ducks (20)

Cool morning, frost on vegetation. Water is high; pond outlet is flooded/back-watered b about 1 foot (pic). Cormorants and mergansers diving/foraging in the pond.
Pair of pileated woodpeckers on the south side of the pond on snags.

On-site summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1				1			
Eagle #2							
Eagle #3							
Eagle #4							
Eagle #5							
#Min				1			

Vicinity summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1	35						
Eagle #2	15						
Eagle #3							
Eagle #4							
Eagle #5							
#Min	50						

*A (Adult), J (Juvenile)

Date:	12/29/2021				**Page:**	**1**	
Name:	S. Hartung				**Start:**	3:00pm	
Dusk					**End:**	5:00pm	

Observations:

Time	Station	Age*	Notes
3:00pm	1	Adult	Perched on top of "tilted top" - tall Doug fir just south of nest location.
			Adult was there when survey started.
3:15pm			2nd adult joined the first adult on tilted top. They remained perched through change of stations.
4:00pm	2		No eagles
4:40pm	3		No eagles

Protocol:

Dawn surveys: Start 15 min before sunrise, total time 2 hrs.
Dusk surveys: Start 1.5 hours before sunset, total time 2 hrs.
Stations: Divide 2 hrs at 3 Observation Points:
1) Near the boat ramp (not on the bar); 2) The nature trail cul-de-sac and 3) Near the pond outlet
Use binoculars: 8x20, 8x40, or 10x40.

Observations: (Continued) **Page: 2**

Time	Station	Age	Notes

Other Observations:

Status of heron rookery: Dormant

Abundance / species of birds in Meldrum Bay and vicinity:
Several mallards ~ 75

On-site summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1				1			
Eagle #2							
Eagle #3							
Eagle #4							
Eagle #5							
#Min				1			

Vicinity summary: Minutes per activity

	Adult				Juvenile		
	Perching	Foraging	Nest/Mating	Flying/Other	Perching	Foraging	Flying/Other
Eagle #1	60						
Eagle #2	45						
Eagle #3							
Eagle #4							
Eagle #5							
#Min	60	Only 60 min recorded b/c 2nd eagle overlapped with 1st.					

*A (Adult), J (Juvenile)

Appendix H
Benthic Invertebrates

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Sheet Explanations

- This explanation is included as a reference for the conventions used in the data analysis.
- Refer to the "Documentation" sheet for specifics about the project.
- Short descriptions will be written at the top of metrics and summary sheets where clarification is needed.
- Bolded titles in this document correspond to sheet names. The exact sheet names may differ based on the type of analysis performed, whether or not replicates were present, and whether or not biomass was calculated.

Documentation

- Includes project information, client and laboratory contact information, overview of specifications, notes on missing or empty samples, and any irregularities encountered.
- Scroll down to the bottom of this page to see the date and time the analysis was run.

Metrics

- Provides an overview of relevant sample descriptors broken down by site.
- If replicates are present in the data, then this sheet will use the mean values for a given site calculated from the total number of replicates present for that site.
- A replicate is considered present if it is listed as empty, in which case it will be included in the mean calculations as zeros for all taxa.
- A replicate that is missing, decayed, or otherwise damaged will be omitted from the mean calculations.

(Mean) Summary Sheets:

- Named with "Mean" if replicates are present in the data set.
- Provides summaries of all the taxa found at each site.
- The rules for calculating the means are the same as those for the metrics sheet.

Mean abundance or **Abundance**

- Abundances are converted to a full sample basis (if subsampled) and to a standard area or volume unless otherwise specified. Refer to the bolded header line at the top of the sheet for the units used to express abundances.
- For benthic analysis, the abundances will be expressed as per m^2.
- For drift analysis, the abundances will be expressed as per 100 m^3 of water filtered.

Mean percent abundance or **Percent abundance**

- Summarizes the percentage of each taxa in the sample based on the abundance of the taxa.

Mean biomass or **Biomass**

- Biomass is calculated via length-weight regression of the form (dry mass in mg) = a*(body length in mm)^b.
- To verify the coefficients used for this particular analysis, see the "Traits" sheet columns "a" and "b".
- See the "Documentation" sheet for details on the length measurements.
- Biomass values are expressed in milligrams (mg) on a full sample basis (if subsampled) and converted to a standard area or volume unless otherwise specified. Refer to the bolded header line at the top of the sheet for the units used to express biomass.
- For benthic analysis, the biomass values are expressed as (mg) per m^2.
- For drift analysis, the biomass values are expressed at (mg) per 100 m^3 water filtered.

Mean percent biomass or **Percent biomass**

- Summarizes the percentage of each taxon in the sample based on the biomass of the taxa.

If the data set includes replicates:

Replicate metrics

- Provides an overview of relevant sample descriptors broken down by site and replicate.
- Any site for which the entire column below the sample identification is blank represents a sample that was empty. It is included here for reference and to facilitate the checking of the mean calculations.

Replicate Summary Sheets:

- Included when replicates are present in the data set, except for the case of Diet analyses.
- Provides summaries of all the taxa found at each site broken down by the individual replicates.
- If a column is entirely blank below the site identification, then it represents a sample that was empty. It is included here for reference and to facilitate the checking of the mean calculations.
- Sheets are otherwise the same as the Summary Sheets listed above.

Replicate abundance

Replicate percent abundance

Replicate biomass

Replicate percent biomass

Long output

- Provides a format that is easier to import to a database than the summary sheets.
- The "Abundance" column here may represent a raw count, an abundance per m^2 in the case of a benthic analysis, or an abundance per 100 m^3 water filtered in the case of a diet analysis. See the summary sheets for details.
- The "Biomass" column (if present) is reported in the same manner as the abundance (raw, per m^2, or per 100 m^3) in milligrams (mg). See the summary sheets for details.
- No rounding is performed on this sheet other than the number of decimals Excel maintains.

Long mean output

- Virtually identical to the "Long output" sheet with the values reported being mean values for the site across all the replicates.
- "MeanAbun" is the mean abundance, and "MeanBiom" is the mean biomass value reported in the same manner as in "Long output". The standard deviations are included for both of these values.

Traits

- Provides a snapshot of the coded life-history traits that were used to calculate the metrics for all of the taxa present in the data set.
- The "a" and "b" columns are the coefficients used to calculate biomass. See the explanation above for the "Mean Biomass" sheet for further details.

Metric explanation

- Provides a more detailed description of what each metric is calculating.

Record file

- This is the raw data as it was entered.
- Of note is the "Incidental" column (if present). Taxa marked "incidental" on this sheet will be omitted entirely from the analysis (these taxa will not appear on any other sheet in the file other than the "Taxa notes" sheet). Taxa marked "large/rare" will be included in the analysis and are treated specially in the calculation of the total biomass (on the metrics sheets) - total biomass is given both with and without these taxa due to their propensity to dominate the sample biomass.
- Also of note is the "Unique" column (if present) indicating whether a taxa that was identified at a higher classification level is believed to represent a taxa that is already listed in the sample. If a taxa is marked as not unique (N), then it is not counted in any of the richness metrics.
- The STE column stands for Standard Taxonomic Effort. This column will have a code entered that describes why a taxa was not identified to the standard taxonomic effort, e.g. if it was identified to family when the STE is genus.

Taxa notes

- Lists taxa identified in the sample that are excluded from the analysis (incidental taxa).
- Lists taxa identified to a higher classification level than the standard specification because of the specimen condition that are not believed to be unique from other taxa identified in the sample.
- This sheet may not be present for all data sets.

Additional notes

- Other documentation that may not have fit elsewhere.

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Client

Columbia Restoration Group, Portland, OR

Client contact	Evan Ocheltree, Evan@Columbia RestorationGroup.com
Project	Rinearson Creek Restoration Monitoring
Project location near	Medrum Bar Park, Rinearson Creek Natural Area, Clackamas County, in Gladstone, confluence Willamette River, 45.37958 N, -122.61722 W, <10 m elevation.
Project objectives	Restoration project as wetland mitigation for Portland Harbor plan. Start of a 10 year monitoring project.

Laboratory

Contact

Robert Wisseman	James DiGiulio	Jon Lee
General taxonomy	Chironomidae taxonomy	Mite taxonomy
bobwisseman@mac.com	digiulio@peak.org	jlee@humboldt1.com

Sampling protocol

Sampling gear	D-frame net
Mesh size	500 micron
Square area sampled	8 square feet
Habitat sampled	Includes engineered riffle, low gradient stream below remnant beaver pond, beaver pond, and emergent wetland. Pond and wetland samples are more semi-quantitative.

Laboratory protocol

Mesh size	500 micron
Subsampling target count	500 organism minimum
Subsampling device	Caton tray
Sorting efficacy	95+%
Taxa abundances	converted to a full sample and 1 square meter basis

Identification protocol

Standard taxonomic effort	PNAMP level 2
Chironomidae (midges)	genus/species group
Oligochaeta (segmented worms)	class Oligochaeta
Acari (mites)	genus

Life stages:

U	unknown (for non-insects)
L	larvae
LE	Larval exuvia
P	pupae
PE	pupal exuvia
A	adult
E	egg

Biomass determination

Published length weight regressions used to calculate biomass.
Length of all macroinvertebrates measured to nearest 0.5 mm if individual <5 mm, or nearest 1 mm if > 5 mm.
Reported as the biomass corresponding to the taxa abundances (see laboratory protocol above).

Data analysis

Standard taxonomic effort (STE)	Version 2 ABA
Taxa traits (e.g. feeding group, etc.)	Version 2 ABA (see "Traits" tab in this output for documentation)

Programmed in R by Adam and Robert Wisseman
Version 2 of ABA STE and taxa traits is a draft version still under development.
Abundances converted to a standard full sample (if subsampled) and one square meter basis.

Date run:
'2022-01-18
Analysis program in developmental phase.

Rinearson Creek summary metrics for May 2020 and 2021. Abundances are relative.

	Beaver Pond		Emergent marsh		Engineered riffle		Upper control	
	2020	2021	2020	2021	2020	2021	2020	2021
Biological Condition Gradient Level	NA	NA	NA	NA	5	6	6	6
(tentative, based on maritime Pacific Northwest model currently under development)								
Gross community metrics								
Total taxa richness	36	32	47	14	30	33	33	15
Total abundance	1676	1168	1073	768	10542	1860	1911	264
EPT taxa richness	1	1	1	0	3	2	2	1
% Top 3 taxa	55	47	45	70	78	52	67	87
Warm and cold water biota								
Warm water biota taxa richness	21	19	25	7	13	12	11	6
% Warm water biota	52.5	65.6	47.7	51.7	14.0	58.6	62.9	24.0
Cold water biota taxa richness	1	1	2	1	0	1	2	1
% Cold water biota	0.3	1.7	10.9	26.4	0.0	1.2	3.5	63.8
Life cycle duration (voltinism)								
% Semivoltine (> 1 year life cycle) by abunda	2	2	16	1	1	1	2	2
% Univoltine (1 year life cycle) by abundance	22	15	13	1	2	5	10	4
% Multivoltine (< 1 year life cycle) by abundai	76	83	71	98	97	94	88	94
Taxonomic group composition								
% Non-insect invertebrates by abundance	21.4	29.1	56.2	31.5	6.3	49.5	68.8	23.0
% Mollusca (snails and bivalves) by abunc	0.0	1.2	20.6	0.0	1.7	0.0	3.5	1.0
% Crustacea by abundance	2.6	22.2	27.5	30.5	3.2	44.9	58.4	19.4
% Ephemeroptera (mayflies) by abundance	0.2	0.2	0.8	0.0	0.9	0.8	1.8	0.5
% Odonata (damsel- and dragonflies) by abu	0.2	0.3	0.2	0.0	0.0	0.2	0.0	0.0
% Hemiptera (true bugs) by abundance	3.7	1.5	1.8	0.0	0.0	0.0	0.0	0.0
% Trichoptera (caddisflies) by abundance	0.0	0.0	0.0	0.0	1.4	0.3	0.2	0.0
% Coleoptera (beetles) by abundance	0.8	0.0	0.8	0.0	0.0	0.0	0.2	0.0
% Diptera (true flies) by abundance	73.8	69.0	40.2	68.5	91.5	49.2	29.1	76.5
% Chironomidae (midges) by abundance	67.3	57.8	37.4	67.6	29.1	46.2	26.5	74.0
% Chironominae by abundance	37.6	43.2	12.7	21.2	6.3	27.8	7.9	5.6
% Tanytarsini by abundance	7.5	25.4	9.1	1.4	2.2	11.4	6.7	1.5
% Orthocladiinae by abundance	21.2	2.0	7.9	1.8	18.2	10.8	8.1	0.0
% Prodiamesinae by abundance	0.3	3.3	11.7	26.4	0.0	1.7	3.1	63.8
% Tanypodinae by abundance	4.8	2.8	5.1	15.9	3.2	1.7	5.1	4.1
Feeding groups								
% Predator by abundance	12.5	29.4	8.3	17.3	4.8	4.6	7.5	7.7
% Parasite by abundance	0.0	1.0	3.8	0.2	0.2	1.0	0.0	0.0
% Collector-gatherer by abundance	68.2	33.6	42.2	56.4	25.5	62.6	34.4	69.9
% Collector-filterer by abundance	9.6	26.0	13.3	0.9	64.3	8.1	2.0	2.0
% Collector (total) by abundance	77.9	59.6	55.5	57.3	89.8	70.7	36.4	71.9
% Piercer herbivore by abundance	3.5	1.5	1.8	0.0	0.2	0.0	0.0	0.0
% Macrophyte herbivore by abundance	3.2	1.3	0.8	0.0	3.6	0.0	0.2	1.0
% Shredder by abundance	1.4	0.0	0.8	0.0	0.3	0.2	0.6	0.0
% Scraper by abundance	1.0	1.3	5.1	0.0	0.7	8.6	1.8	0.5
% Omnivore by abundance	0.5	5.8	23.8	25.2	0.5	14.9	53.6	18.9
% Unknown feeding group by abundance	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Biological Condition Gradient Attributes % by taxa richness								
intermediate sensitive taxa (III)	0.0	3.0	4.3	0.0	0.0	2.9	5.9	0.0
intermediate tolerant taxa (IV)	57.9	54.6	68.1	60.0	67.7	73.5	70.6	68.8
tolerant native taxa (V)	29.0	33.3	23.4	33.3	25.8	20.6	17.7	25.0
tolerant non-native taxa (VI)	0.0	0.0	2.1	0.0	0.0	0.0	2.9	0.0
Tolerant taxa total (IV, V & VI)	86.8	87.9	93.6	93.3	93.6	94.1	91.2	93.8
Biological Condition Gradient Attributes % by abundance								
intermediate sensitive taxa (III)	0.0	1.3	0.6	0.0	0.0	4.8	0.6	0.0
intermediate tolerant taxa (IV)	60.8	56.1	59.4	67.8	94.2	42.4	39.5	78.6
tolerant native taxa (V)	34.8	40.7	33.9	32.2	4.8	52.8	59.1	21.4
tolerant non-native taxa (VI)	0.0	0.0	4.4	0.0	0.0	0.0	0.8	0.0
Tolerant taxa total (IV, V & VI)	95.7	96.8	97.6	100.0	99.0	95.2	99.4	100.0

Benthic macroinvertebrate % contribution at Rinearson Creek in May 2020 and 2021.

Taxon	Common name	Beaver Pond 2020	Beaver Pond 2021	Emergent marsh 2020	Emergent marsh 2021	Engineered riffle 2020	Engineered riffle 2021	Upper control 2020	Upper control 2021	New taxa 2021	Absent 2021
Trepaxonemata	flat worms	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	Yes	
Nemata	round worms	0.0	0.0	**3.8**	0.2	0.0	0.3	0.0	0.0		
Oligochaeta	segmented worms	**18.1**	1.3	**3.0**	0.4	1.0	2.8	**6.7**	1.5		
Erpobdella	leeches	0.6	0.8	1.4	0.5	0.2	0.2	0.2	1.0		
Helobdella	leeches	0.0	2.5	0.0	0.0	0.0	0.3	0.0	0.0	Yes	
Fluminicola	snails	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0		Yes
Potamopyrgus antipodarum	snails	0.0	0.0	4.4	0.0	0.0	0.0	0.8	0.0		Yes
Lymnaeidae	snails	0.0	0.0	1.2	0.0	0.2	0.0	0.0	0.0		Yes
Physella	snails	0.0	0.5	1.4	0.0	0.9	0.0	0.0	0.0		
Ferrissia	snails	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0		Yes
Gyraulus	snails	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0		Yes
Menetus	snails	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0		Yes
Juga	snails	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0		Yes
Sphaeriidae	pea clams	0.0	0.3	**11.3**	0.0	0.5	0.0	1.6	1.0		Yes
Musculium	pea clams	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	Yes	
Chydoridae	water fleas	0.6	0.3	0.0	0.0	1.0	0.0	0.0	0.0		
Ostracoda	seed shrimp	0.0	1.0	0.0	0.0	0.0	0.2	0.0	0.0	Yes	
Crangonyx	scuds	1.4	**14.4**	**4.0**	**3.5**	1.7	**28.6**	**4.7**	0.5		
Caecidotea	aquatic sow bugs	0.5	**5.8**	**23.4**	**25.2**	0.3	**14.7**	**53.4**	**18.9**		
Lirceus	aquatic sow bugs	0.0	0.7	0.2	1.8	0.0	1.2	0.0	0.0		
Pacifastacus	crayfish	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.0		
Trombidiformes	mites	0.0	1.0	0.0	0.0	0.0	0.7	0.0	0.0	Yes	
Sperchon	mites	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0		Yes
Aeshnidae	dragonflies	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Yes
Libellulidae	dragonflies	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	Yes	
Coenagrion/Enallagma	damselflies	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0		
Baetis tricaudatus complex	mayflies	0.0	0.0	0.8	0.0	0.9	0.8	1.8	0.5		
Callibaetis	mayflies	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0		
Corixidae	water boatman	**3.6**	1.5	1.8	0.0	0.0	0.0	0.0	0.0		
Notonecta	back swimmers	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Yes
Cheumatopsyche	caddisflies	0.0	0.0	0.0	0.0	1.2	0.3	0.0	0.0		Yes
Hydroptila	caddisflies	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0		
Lepidostoma	caddisflies	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0		Yes
Dytiscidae	predaceous diving beetles	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0		Yes
Lara	riffle beetles	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0		Yes
Peltodytes	crawling water beetles	0.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0		Yes
Hydrophilidae	water scavenger beetles	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Ceratopogoninae	no-see-um midges	2.8	**11.2**	0.4	0.9	1.2	1.7	1.6	2.6		
Dixella	dixid midges	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0		Yes
Dolichopodidae	long-legged flies	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Yes
Clinocera	dance flies	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0		Yes
Neoplasta	dance flies	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0		Yes
Psychodini	moth flies	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Yes
Simulium	black flies	2.1	0.0	0.0	0.0	**60.9**	1.1	0.4	0.0		
Tipuloidea	crane flies	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0		Yes
Tipula	crane flies	1.4	0.0	0.8	0.0	0.3	0.2	0.2	0.0		

Chironomidae pupae	midges	**3.4**	**6.3**	0.0	2.3	1.4	**4.3**	2.4	0.5		
Alotanypus	midges	0.0	0.7	1.4	**15.9**	0.0	0.5	0.8	4.1		
Brillia	midges	0.3	0.0	2.8	0.0	0.0	0.0	2.8	0.0		Yes
Chironomus	midges	**22.8**	1.8	0.2	1.2	0.0	**7.5**	0.2	1.0		
Cladopelma	midges	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	Yes	
Corynoneura	midges	0.3	0.0	0.8	0.0	0.3	0.0	0.4	0.0		Yes
Cricotopus	midges	**13.6**	0.7	1.8	1.8	**9.7**	**3.1**	0.0	0.0		
Cryptochironomus	midges	**3.5**	**11.7**	0.6	0.0	0.2	0.0	0.2	0.0		
Dicrotendipes	midges	0.0	0.7	0.2	0.0	0.0	0.0	0.0	0.0		
Endochironomus	midges	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Yes
Eukiefferiella claripennis group	midges	0.6	0.0	0.6	0.0	**7.0**	1.8	1.2	0.0		
Heterotrissocladius marcidus group	midges	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0		Yes
Limnophyes	midges	0.3	0.0	0.8	0.0	0.0	0.3	0.6	0.0		
Micropsectra	midges	0.0	0.0	**7.1**	0.5	0.5	**4.8**	**6.7**	0.5		
Nanocladius	midges	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	Yes	
Odontomesa	midges	0.0	1.7	1.2	0.0	0.0	0.5	0.0	0.0		
Orthocladius	midges	0.0	1.3	0.0	0.0	0.0	**4.8**	0.0	0.0	Yes	
Parachironomus	midges	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	Yes	
Parametriocnemus	midges	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.0		Yes
Paratanytarsus	midges	0.6	**4.5**	1.8	0.0	0.5	**3.5**	0.0	0.0		
Paratendipes	midges	0.0	0.7	0.4	**18.6**	0.0	0.0	0.0	1.5		
Phaenopsectra	midges	1.0	1.3	2.0	0.0	0.3	**8.6**	0.6	0.5		
Polypedilum	midges	1.0	1.3	0.2	0.0	**3.6**	0.0	0.2	1.0		
Procladius	midges	**3.2**	2.2	0.8	0.0	0.0	0.0	0.4	0.0		
Prodiamesa	midges	0.3	1.7	**10.5**	**26.4**	0.0	1.2	**3.1**	**63.8**		
Psectrocladius	midges	**4.5**	0.0	0.2	0.0	0.9	0.0	0.0	0.0		Yes
Psectrotanypus	midges	1.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0		Yes
Pseudosmittia	midges	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Yes
Rheotanytarsus	midges	0.3	0.0	0.0	0.0	1.2	0.0	0.0	0.0		Yes
Smittia	midges	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0		Yes
Tanytarsus	midges	**6.6**	**20.9**	0.2	0.9	0.0	**3.1**	0.0	1.0		
Thienemannimyia complex	midges	0.6	0.0	1.6	0.0	**3.2**	1.2	**3.9**	0.0		
Tvetenia bavarica group	midges	0.0	0.0	0.2	0.0	0.2	0.3	2.4	0.0		
		Percent contribution >3% highlighted									

Biological Condition Gradient taxa attributes
Response to human disturbance gradient

not rated	
intermediate sensitive taxa (III)	ubiquitous taxa; somewhat sensitive; gradual decline with increasing human disturbance
intermediate tolerant taxa (IV)	ubiquitous taxa; common across the whole range of human disturbance
tolerant native taxa (V)	tolerant of a wide range of environmental conditions and tend to increase with increasing levels of human disturbance
tolerant non-native taxa (VI)	non-native, invasive taxa that are tolerant and increase with increasing levels of human disturbance

1/11/2022 Version of Biological Condition Gradient Model under development for the maritime Pacific Northwest by US EPA

Low gradient, Low Elevation rules

VERSION 1.1

BCG level 1: Natural or native condition								
No quantitative rules. See narrative description in Section 4 of the Phase 1 PL/WV report								
BCG level 2: Minimal changes in structure of the biotic community and minimal changes in ecosystem function - virtually all native taxa are maintained with some changes in biomass and/or abundance; ecosystem functions are fully maintained within the range of natural variability.								
Narrative Descriptions	**Metric**	**(11/8)**	**(1/7)**	**(1/11)**		Engineered riffle 2020	Engineered riffle 2021	Upper control 2020	Upper control 2021
		HiGrad LoElev	**HiGradHiElev**	**LoGrad LoElev**					
Diverse assemblage with moderate to high numbers of total taxa	Number of total taxa	≥ 50 (45-55)	≥ 45 (40-50)	≥ 50 (45-55)					
Sensitive EPT taxa are present in high numbers	Number of Attribute Ii+II+III EPT taxa	≥ 20 (15-25)	≥ 18 (13-23)	≥ 18 (13-23)					
A fair number of highly sensitive taxa are present	Number of Attribute Ii+II taxa	≥ 3 (1-5)	≥ 6 (3-9)	≥ 3 (1-5)					
not just singletons	% Attribute Ii+II % individuals	≥ 2% (1-3)	≥ 5% (3-7)	≥ 2% (1-3)					
Sensitive taxa comprise half or more of total taxa	% Attribute Ii+II+III % taxa	≥ 45% (40-50)	≥ 45% (40-50)	≥ 45% (40-50)					
Sensitive taxa comprise a quarter or more of the individuals	% Attribute Ii+II+III % individuals	≥ 30% (25-35)	≥ 35% (30-40)	≥ 30% (25-35)					
Tolerant non-insects comprise a small percentage of the taxa	% Attribute IV+V+VI non-insect taxa	≤ 15% (10-20)	≤ 15% (10-20)	≤ 15% (10-20)					
Tolerant non-insect taxa comprise a small percentage of the individuals	% Attribute IV+V+VI non-insect individuals, excluding Juga and mites	≤ 15% (10-20)	--	--					
	% Attribute V+VI individuals	--	--	< 1% (0-1)					
High diversity of predators (which feed on other consumers), scrapers (which consume algae and associated material) and shredders (which consume leaf litter or other coarse particulate organic matter (CPOM), including wood) indicate healthy stream function	Number of predator+scraper+shredder taxa	≥ 30 (25-35)	≥ 25 (20-30)	≥ 30 (25-35)	Best two of three (the model uses the second worst score across these three metrics)	Pass	Pass	Pass	Fail
Diverse, well-balanced assemblage with high richness and evenness	Shannon-Wiener diversity index (base 2)	≥ 4.5 (4.3-4.7)	≥ 4.0 (3.8-4.2)	≥ 4.5 (4.3-4.7)		Fail	Fail	Fail	Fail
High numbers of semivoltine taxa indicate perennial flow and low levels of disturbance	Number of semi-voltine taxa	≥ 15 (10-20)	≥ 12 (9-15)	≥ 15 (10-20)		Fail	Fail	Partial	Fail

BCG level 3: Evident changes in structure of the biotic community and minimal changes in ecosystem function - Some changes in structure due to loss of some rare native taxa, shifts in relative abundance of taxa but intermediate sensitive taxa are common and abundant; ecosystem functions are fully maintained through redundant attributes of the system.								
Narrative rules and comments	**Metric**	**Numeric Rules**						
		HiGrad LoElev	**HiGrad HiElev**	**LoGrad LoElev**				
Diverse assemblage with moderate to high numbers of total taxa	Number of total taxa	≥ 40 (35-45)	≥ 35 (30-40)	≥ 40 (35-45)				
EPT taxa are present in high numbers	Number of EPT taxa	≥ 20 (15-25)	≥ 15 (10-20)	≥ 15 (10-20)				
A fair number of highly sensitive taxa are present	Number of Attribute Ii+II taxa	--	≥ 1	--				
not just singletons	% Attribute Ii+II % individuals	--	--	--				
Sensitive taxa comprise a moderate proportion of the assemblage	% Attribute Ii+II+III % taxa	≥ 20% (15-25)	≥ 30% (25-35)	≥ 20% (15-25)				
Sensitive taxa comprise at least a tenth of the individuals	% Attribute Ii+II+III % individuals	≥ 10% (5-15)	≥ 20% (15-25)	≥ 10% (5-15)				
Tolerant non-insects comprise a small to moderate percentage of the taxa	% Attribute IV+V+VI non-insect taxa	≤ 20% (15-25)	≤ 15% (10-20)	≤ 20% (15-25)				
Tolerant non-insect taxa comprise a small to moderate percentage of the individuals	% Attribute IV+V+VI non-insect individuals, excluding Juga and mites	≤ 20% (15-25)	--	--				
	% Attribute V+VI individuals	--	--	< 5% (3-7)				
Sensitive EPT taxa are present in moderate numbers	Number of Attribute Ii+II+III EPT taxa	≥ 10 (5-15)	≥ 10 (5-15)	≥ 10 (5-15)	Best two of three (the model uses the second worst score across these three metrics)	Pass	Pass	Pass	Fail
High diversity of predators, scrapers and shredders indicate healthy stream function	Number of predator+scraper+shredder taxa	≥ 25 (20-30)	≥ 20 (15-25)	≥ 25 (20-30)		Fail	Fail	Fail	Fail
Diverse, well-balanced assemblage with high richness and evenness	Shannon-Wiener diversity index (base 2)	≥ 4 (3.8-4.2)	≥ 3.5 (3.3-3.7)	≥ 4 (3.8-4.2)		Fail	Fail	Partial	Fail

BCG level 4: Moderate changes in structure of the biotic community and minimal changes in ecosystem function - Moderate changes in structure due to replacement of some intermediate sensitive taxa by more tolerant taxa, but reproducing populations of some sensitive taxa are maintained; overall balanced distribution of all expected major groups; ecosystem functions largely maintained through redundant attributes.

Narrative Descriptions	**Metric**	**Numeric Rules**						
		HiGrad LoElev	**HiGrad HiElev**	**LoGrad LoElev**				
Moderate number of total taxa	Number of total taxa	≥ 30 (25-35)	≥ 25 (20-30)	≥ 30 (25-35)				
EPT taxa are present in moderate numbers	Number of EPT taxa	≥ 9 (6-12)	≥ 9 (6-12)	≥ 9 (6-12)				
Sensitive taxa comprise at least a tenth of the assemblage	% Attribute Ii+II+III % taxa	≥ 10% (5-15)	≥ 10% (5-15)	≥ 10% (5-15)				
Tolerant non-insects comprise no more than a quarter of the taxa	% Attribute IV+V+VI non-insect taxa	≤ 25% (20-30)	≤ 20% (15-25)	≤ 25% (20-30)				

Tolerant non-insect taxa comprise no more than half of the individuals	% Attribute IV+V+VI non-insect individuals, excluding Juga and mites	≤ 50% (45-55)	--	--					
Enough predators, scrapers and shredders to maintain ecosystem function	Number of predator+scraper+shredder taxa	≥ 15 (10-20)	≥ 15 (10-20)	≥ 15 (10-20)		Fail	Partial	Partial	Fail
	% Attribute V+VI individuals	--	--	< 15% (10-20)		Pass	Fail	Fail	Fail
BCG level 5: Major changes in structure of the biotic community and moderate changes in ecosystem function - Sensitive taxa are markedly diminished; conspicuously unbalanced distribution of major groups from that expected; organism condition shows signs of physiological stress; system function shows reduced complexity and redundancy; increased build-up or export of unused materials									
Narrative Descriptions	**Metric**	**Numeric Rules**							
		HiGrad LoElev	**HiGrad HiElev**	**LoGrad LoElev**					
At least -20% of the subsampling target is achieved (based on 500-count samples)	Number of total individuals	≥ 400 (390-410)	≥ 400 (390-410)	≥ 400 (390-410)		Pass	Pass	Pass	Fail
At least three EPT taxa are present	Number of EPT taxa	≥ 3 (1-5)	≥ 3 (1-5)	≥ 1 (0-1)		Pass	Pass	Pass	Pass
Tolerant non-insects comprise a third or less of the taxa	% Attribute IV+V+VI non-insect taxa	≤ 35% (30-40)	≤ 25% (20-30)	≤ 35% (30-40)		Pass	Fail	Fail	Pass
Predators, scrapers and shredders still present but in reduced numbers, to the extent that indicates moderate changes in ecosystem function	Number of predator+scraper+shredder taxa	≥ 5 (3-7)	≥ 5 (3-7)	≥ 5 (3-7)		Pass	Pass	Pass	Pass
Moderate number of total taxa	Number of total taxa	≥ 15 (10-20)	≥ 15 (10-20)	≥ 25 (20-30)		Pass	Pass	Pass	Fail
	% Attribute V+VI individuals	--	--	≤ 30% (25-35)	Best two of three	Pass	Fail	Fail	Pass
	% Attribute Ii+II+III % individuals	--	--	≥ 1% (0-1)		Fail	Pass	Partial	Fail

Tentative Biological Condition Gradient level based on maritime PNW low gradient, low elevation stream model under development

5	**6**	**6**	**6**
Engineered riffle		Upper control	
2020	2021	2020	2021

The Biological Condition Gradient: Biological Response to Increasing Levels of Stress

Levels of Biological Condition

Level 1. Natural structural, functional, and taxonomic integrity is preserved.

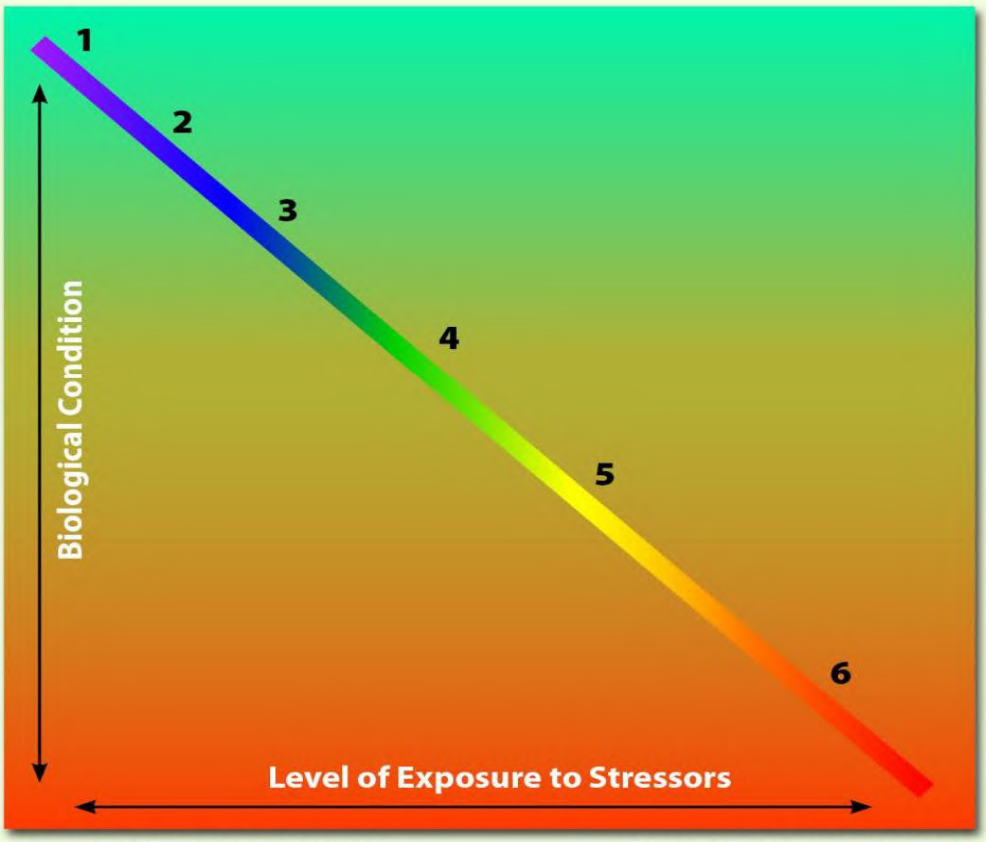
Level 2. Structure & function similar to natural community with some additional taxa & biomass; ecosystem level functions are fully maintained.

Level 3. Evident changes in structure due to loss of some rare native taxa; shifts in relative abundance; ecosystem level functions fully maintained.

Level 4. Moderate changes in structure due to replacement of some sensitive ubiquitous taxa by more tolerant taxa; ecosystem functions largely maintained.

Level 5. Sensitive taxa markedly diminished; conspicuously unbalanced distribution of major taxonomic groups; ecosystem function shows reduced complexity & redundancy.

Level 6. Extreme changes in structure and ecosystem function; wholesale changes in taxonomic composition; extreme alterations from normal densities.



Watershed, habitat, flow regime and water chemistry as naturally occurs.

Chemistry, habitat, and/or flow regime severely altered from natural conditions.

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

Waterbody	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek
Site	beaver pond	beaver pond	emergent marsh	emergent marsh	engineered riffle	engineered riffle	upper control	upper control
Date	2020-05-19	2021-05-04	2020-05-19	2021-05-04	2020-05-19	2021-05-04	2020-05-19	2021-05-04
Subsample count	623	599	505	571	588	604	509	196
Subsample correction factor to full sample	2	1.45	1.58	1	13.33	2.29	2.791	1
Area correction factor to square meter	1.345	1.345	1.345	1.345	1.345	1.345	1.345	1.345
SUMMARY METRICS								
Total taxa richness	36	32	47	14	30	33	33	15
Total abundance	1675.87	1168.2	1073.18	768	10542.16	1860.35	1910.73	263.62
EPT taxa richness	1	1	1	0	3	2	2	1
EPT abundance	2.69	1.95	8.5	0	233.08	21.56	37.54	1.34
Hilsenhoff Biotic Index (WY DEQ version)	7.44	6.66	6.69	6.37	6.33	7.06	7.06	4.61
DOMINANCE AND DIVERSITY								
% Dominant taxa	22.79	20.87	23.37	26.44	60.88	28.64	53.44	63.78
% Subdominant taxa	18.14	14.36	11.29	25.22	9.69	14.74	6.68	18.88
% Top 3 taxa	54.57	46.91	45.15	70.23	77.55	51.99	66.8	86.73
% Top 5 taxa	65.65	64.44	56.63	89.67	84.35	64.24	75.44	90.82
% Top 10 taxa	80.58	81.3	72.08	97.55	90.99	83.11	87.82	96.43
Shannon-Weaver Diversity (loge)	2.67	2.7	2.97	1.87	1.7	2.58	2.03	1.32
Shannon Evenness Index	0.74	0.78	0.77	0.71	0.5	0.74	0.58	0.49
TOLERANT AND INTOLERANT TAXA								
Total tolerant taxa richness	21	19	25	7	13	12	11	6
Total tolerant abundance	879.63	766.45	512.15	396.77	1470.17	1090.34	1201.25	63.22
% Total tolerant by abundance	52.49	65.61	47.72	51.66	13.95	58.61	62.87	23.98
Highly tolerant taxa richness	8	9	9	4	4	5	5	3
Highly tolerant abundance	497.65	171.62	348.52	220.58	161.36	443.53	1051.09	55.15
% Highly tolerant by abundance	29.7	14.69	32.48	28.72	1.531	23.84	55.01	20.92
Moderately tolerant taxa richness	13	10	16	3	9	7	6	3
Moderately tolerant abundance	381.98	594.83	163.63	176.19	1308.81	646.81	150.16	8.07
% Moderately tolerant by abundance	22.79	50.92	15.25	22.94	12.41	34.77	7.859	3.061
Total intolerant taxa richness	1	1	2	1	0	1	2	1
Total intolerant abundance	5.38	19.5	116.88	203.09	0	21.56	67.57	168.12
% Total intolerant by abundance	0.321	1.669	10.89	26.44	0	1.159	3.536	63.78
Highly intolerant taxa richness	0	0	0	0	0	0	0	0
Highly intolerant abundance	0	0	0	0	0	0	0	0
% Highly intolerant by abundance	0	0	0	0	0	0	0	0
Moderately intolerant taxa richness	1	1	2	1	0	1	2	1
Moderately intolerant abundance	5.38	19.5	116.88	203.09	0	21.56	67.57	168.12
% Moderately intolerant by abundance	0.321	1.669	10.89	26.44	0	1.159	3.536	63.78
VOLTINISM (length of life cycle)								
TAXA RICHNESS								
Semivoltine (> 1 year life cycle) taxa richness	3	4	5	1	4	4	5	2
Univoltine (1 year life cycle) taxa richness	6	4	10	3	2	5	6	2
Multivoltine (< 1 year life cycle) taxa richness	27	24	32	10	24	24	22	11
ABUNDANCE								
Semivoltine (> 1 year life cycle) abundance	37.66	19.5	170.01	4.04	125.5	12.32	45.05	5.38

Univoltine (1 year life cycle) abundance	365.84	177.47	140.26	10.76	233.08	101.64	183.94	10.76
Multivoltine (< 1 year life cycle) abundance	1272.37	971.22	762.91	753.2	10183.59	1746.39	1681.74	247.48
PERCENTAGE BY ABUNDANCE								
% Semivoltine (> 1 year life cycle) by abundance	2.247	1.669	15.84	0.5254	1.19	0.6623	2.358	2.041
% Univoltine (1 year life cycle) by abundance	21.83	15.19	13.07	1.401	2.211	5.464	9.627	4.082
% Multivoltine (< 1 year life cycle) by abundance	75.92	83.14	71.09	98.07	96.6	93.87	88.02	93.88
GROWTH AND DEVELOPMENT								
% Fast seasonal life cycle by abundance	75.92	70.62	41.39	68.48	92.01	49.83	30.26	77.04
% Slow seasonal life cycle by abundance	23.76	28.71	47.13	31.52	6.122	49.67	67.78	21.94
% Nonseasonal life cycle by abundance	0.321	0.6678	11.49	0	1.871	0.4967	1.965	1.02
OCCURRENCE IN DRIFT								
% Rare in drift by abundance	30.5	40.73	59.21	32.4	6.803	50.83	71.32	25.51
% Common in drift by abundance	0.1605	1.503	1.584	0	2.381	0.9934	0	0
% Abundant in drift by abundance	69.34	57.76	39.21	67.6	90.82	48.18	28.68	74.49
SIZE AT MATURITY								
TAXA RICHNESS								
Small size at maturity taxa richness	23	20	30	6	20	19	21	9
Medium size at maturity taxa richness	11	10	14	7	7	10	9	5
Large size at maturity taxa richness	3	2	3	1	3	4	3	1
ABUNDANCE								
Small size at maturity abundance	858.11	705.99	633.28	509.75	9789.15	773.09	611.88	196.37
Medium size at maturity abundance	780.1	450.51	412.27	254.21	681.3	1074.94	1287.59	64.56
Large size at maturity abundance	37.66	11.7	27.63	4.04	71.72	12.32	11.26	2.69
PERCENTAGE BY ABUNDANCE								
% Small size at maturity by abundance	51.2	60.43	59.01	66.37	92.86	41.56	32.02	74.49
% Medium size at maturity by abundance	46.55	38.56	38.42	33.1	6.463	57.78	67.39	24.49
% Large size at maturity by abundance	2.247	1.002	2.574	0.5254	0.6803	0.6623	0.5894	1.02
RHEOPHILY AND HABITAT AFFINITY								
% Depositional only by abundance	34.03	18.2	5.941	19.79	0.5102	16.39	0.9823	3.061
% Depositional and erosional by abundance	63.88	81.8	94.06	80.21	37.41	82.12	98.62	96.94
% Erosional by abundance	2.087	0	0	0	62.07	1.49	0.3929	0
THERMAL PREFERENCE								
% Cold stenothermal and cool eurythermal by abundance	0.321	3.506	12.08	26.44	0	1.821	3.536	63.78
% Cool/warm eurythermal by abundance	98.88	95.83	83.56	73.56	98.81	98.18	96.46	36.22
% Warm eurythermal by abundance	0.8026	0.6678	4.356	0	1.19	0	0	0
NON-INSECT AND INSECT ORDERS								
TAXA RICHNESS								
Non-insect invertebrates taxa richness	5	12	12	6	11	11	9	5
Ephemeroptera (mayflies) taxa richness	1	1	1	0	1	1	1	1
Odonata (damsel- and dragonflies) taxa richness	1	2	1	0	0	1	0	0
Plecoptera (stoneflies) taxa richness	0	0	0	0	0	0	0	0
Hemiptera (true bugs taxa richness	2	1	1	0	0	0	0	0
Megaloptera (alderflies and hellgramites) taxa richness	0	0	0	0	0	0	0	0
Trichoptera (caddisflies) taxa richness	0	0	0	0	2	1	1	0
Lepidoptera (moths) taxa richness	0	0	0	0	0	0	0	0
Coleoptera (beetles) taxa richness	3	0	2	0	0	0	1	0
Diptera (total)(true flies) taxa richness	24	16	30	8	16	19	21	9
Chironomidae (midges) taxa richness	19	15	24	7	13	16	16	8
Chironomidae (midges -Nostoc midge) taxa richness	19	15	24	7	13	16	16	8

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

							Waterbody	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek
							Site	beaver pond	beaver pond	emergent marsh	emergent marsh	engineered riffle	engineered riffle	upper control	upper control
							Date	2020-05-19	2021-05-04	2020-05-19	2021-05-04	2020-05-19	2021-05-04	2020-05-19	2021-05-04
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance
Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	0	0	0	0	0	6.16	0	0
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	0	0	40.38	1.34	0	6.16	0	0
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	303.97	15.6	31.88	2.69	107.57	52.36	127.63	4.04
Erpobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Erpobdellidae	leeches	10.76	9.75	14.88	4.04	17.93	3.08	3.75	2.69
Helobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Glossiphoniidae	leeches	0	29.25	0	0	0	6.16	0	0
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	0	0	21.25	0	0	0	0	0
Potamopyrgus antipodarum	U	non-insect	Aquatic	Mollusca: Gastropoda	x	uncertain status	snails	0	0	46.75	0	0	0	15.02	0
Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	0	0	12.75	0	17.93	0	0	0
Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	0	5.85	14.88	0	89.64	0	0	0
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	0	0	0	0	0	3.75	0
Gyraulus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	0	0	0	17.93	0	0	0
Menetus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	0	0	0	0	0	18.77	0
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	0	0	4.25	0	0	0	0	0
Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	0	3.9	121.13	0	53.79	0	30.03	2.69
Musculium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	0	3.9	0	0	0	0	0	0
Chydoridae	U	non-insect	Aquatic	Crustacea: Cladocera	x	Chydoridae	water fleas	10.76	3.9	0	0	107.57	0	0	0
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	0	11.7	0	0	0	3.08	0	0
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	24.21	167.72	42.5	26.9	179.29	532.85	90.09	1.34
Caecidotea	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	8.07	68.26	250.76	193.68	35.86	274.12	1021.06	49.77
Lirceus	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	0	7.8	2.13	13.45	0	21.56	0	0
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	0	0	0	0	17.93	3.08	3.75	0
Trombidiformes	U	non-insect	Aquatic	Arachnida: Acari	Trombidiformes	x	mites	0	11.7	0	0	0	12.32	0	0
Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	0	0	0	0	17.93	0	0	0
Aeshnidae	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Aeshnidae	dragonflies	2.69	0	0	0	0	0	0	0
Libellulidae	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Libellulidae	dragonflies	0	1.95	0	0	0	3.08	0	0
Coenagrion/Enallagma	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Coenagrionidae	damselflies	0	1.95	2.13	0	0	0	0	0
Baetis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0	0	8.5	0	89.64	0	33.79	0
Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0	0	0	0	0	15.4	0	1.34
Callibaetis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	2.69	1.95	0	0	0	0	0	0
Corixidae	L	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Corixidae	water boatman	29.59	17.55	19.13	0	0	0	0	0
Cenocorixa	A	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Corixidae	water boatman	29.59	0	0	0	0	0	0	0
Notonecta	L	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Notonectidae	back swimmers	2.69	0	0	0	0	0	0	0
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	0	0	0	0	125.5	6.16	0	0
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	0	0	0	0	17.93	0	0	0
Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	0	0	0	0	0	0	3.75	0
Dytiscidae	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Dytiscidae	predaceous diving beetles	2.69	0	2.13	0	0	0	0	0
Lara	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	0	0	0	0	0	0	3.75	0
Peltodytes	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	5.38	0	6.38	0	0	0	0	0
Peltodytes	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	2.69	0	0	0	0	0	0	0
Hydrophilidae	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Hydrophilidae	water scavenger beetles	2.69	0	0	0	0	0	0	0
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	43.04	128.72	4.25	6.72	107.57	30.8	30.03	6.72
Ceratopogoninae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	2.69	1.95	0	0	17.93	0	0	0
Dixella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dixidae	dixid midges	0	0	10.63	0	0	0	0	0
Dolichopodidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dolichopodidae	long-legged flies	2.69	0	0	0	0	0	0	0
Clinocera	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	0	0	2.13	0	0	0	3.75	0
Neoplasta	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	0	0	2.13	0	0	0	3.75	0
Psychodini	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	2.69	0	0	0	0	0	0	0
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	34.97	0	0	0	6418.53	15.4	7.51	0
Simulium	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	0	0	0	0	0	6.16	0	0
Tipuloidea	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	0	0	2.13	0	0	0	0	0
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	24.21	0	8.5	0	35.86	3.08	3.75	0
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	56.49	74.11	0	17.48	143.43	80.08	45.05	1.34
Alotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	7.8	14.88	122.39	0	9.24	15.02	10.76
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38	0	29.75	0	0	0	52.55	0
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	381.98	21.45	2.13	9.41	0	138.6	3.75	2.69
Cladopelma	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	3.9	0	0	0	0	0	0
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38	0	8.5	0	35.86	0	7.51	0
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	228.65	7.8	19.13	13.45	1021.94	58.52	0	0
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	59.18	136.52	6.38	0	17.93	0	3.75	0
Dicrotendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	7.8	2.13	0	0	0	0	0
Endochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	29.59	0	0	0	0	0	0	0
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	10.76	0	6.38	0	735.08	33.88	22.52	0
Heterotrissocladius marcidus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	4.25	0	0	0	7.51	0
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38	0	8.5	0	0	6.16	11.26	0
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	0	0	76.5	4.04	53.79	89.32	127.63	1.34
Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	0	0	0	6.16	0	0
Odontomesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	0	19.5	12.75	0	0	9.24	0	0
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	15.6	0	0	0	89.32	0	0
Parachironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	0	0	0	0	6.16	0	0
Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	0	0	17.93	0	7.51	0
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	10.76	52.66	19.13	0	53.79	64.68	0	0
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	7.8	4.25	142.57	0	0	0	4.04
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	16.14	15.6	21.25	0	35.86	160.16	11.26	1.34
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	16.14	15.6	2.13	0	376.51	0	3.75	2.69
Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	53.8	25.35	8.5	0	0	0	7.51	0
Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	5.38	19.5	112.63	203.09	0	21.56	60.06	168.12

Psectrocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	75.32	0	2.13	0	89.64	0	0	0
Psectrotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	16.14	0	14.88	0	0	0	0	0
Pseudosmittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	24.21	0	0	0	0	0	0	0
Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	5.38	0	0	0	125.5	0	0	0
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	4.25	0	0	0	0	0
Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	110.29	243.78	2.13	6.72	0	58.52	0	2.69
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	10.76	0	17	0	340.65	21.56	75.08	0
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	2.13	0	17.93	6.16	45.05	0

Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.

							Waterbody	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek	Rinearson Creek
							Site	beaver pond	beaver pond	emergent marsh	emergent marsh	engineered riffle	engineered riffle	upper control	upper control
							Date	2020-05-19	2021-05-04	2020-05-19	2021-05-04	2020-05-19	2021-05-04	2020-05-19	2021-05-04
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance	% abundance
Trepaxonemata	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	0	0	0	0	0	0.3311	0	0
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	0	0	3.762	0.1751	0	0.3311	0	0
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	18.14	1.336	2.97	0.3503	1.02	2.815	6.68	1.531
Erpobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Erpobdellidae	leeches	0.6421	0.8347	1.386	0.5254	0.1701	0.1656	0.1965	1.02
Helobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Glossiphoniidae	leeches	0	2.504	0	0	0	0.3311	0	0
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	0	0	1.98	0	0	0	0	0
Potamopyrgus antipodarum	U	non-insect	Aquatic	Mollusca: Gastropoda	x	uncertain status	snails	0	0	4.356	0	0	0	0.7859	0
Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	0	0	1.188	0	0.1701	0	0	0
Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	0	0.5008	1.386	0	0.8503	0	0	0
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	0	0	0	0	0	0.1965	0
Gyraulus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	0	0	0	0.1701	0	0	0
Menetus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	0	0	0	0	0	0.9823	0
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	0	0	0.396	0	0	0	0	0
Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	0	0.3339	11.29	0	0.5102	0	1.572	1.02
Musculium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	0	0.3339	0	0	0	0	0	0
Chydoridae	U	non-insect	Aquatic	Crustacea: Cladocera	x	Chydoridae	water fleas	0.6421	0.3339	0	0	1.02	0	0	0
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	0	1.002	0	0	0	0.1656	0	0
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	1.445	14.36	3.96	3.503	1.701	28.64	4.715	0.5102
Caecidotea	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	0.4815	5.843	23.37	25.22	0.3401	14.74	53.44	18.88
Lirceus	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	0	0.6678	0.198	1.751	0	1.159	0	0
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	0	0	0	0	0.1701	0.1656	0.1965	0
Trombidiformes	U	non-insect	Aquatic	Arachnida: Acari	Trombidiformes	x	mites	0	1.002	0	0	0	0.6623	0	0
Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	0	0	0	0	0.1701	0	0	0
Aeshnidae	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Aeshnidae	dragonflies	0.1605	0	0	0	0	0	0	0
Libellulidae	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Libellulidae	dragonflies	0	0.1669	0	0	0	0.1656	0	0
Coenagrion/Enallagma	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Coenagrionidae	damselflies	0	0.1669	0.198	0	0	0	0	0
Baetis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0	0	0.7921	0	0.8503	0	1.768	0
Baetis tricaudatus complex	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0	0	0	0	0	0.8278	0	0.5102
Callibaetis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0.1605	0.1669	0	0	0	0	0	0
Corixidae	L	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Corixidae	water boatman	1.766	1.503	1.782	0	0	0	0	0
Cenocorixa	A	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Corixidae	water boatman	1.766	0	0	0	0	0	0	0
Notonecta	L	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Notonectidae	back swimmers	0.1605	0	0	0	0	0	0	0
Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	0	0	0	0	1.19	0.3311	0	0
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	0	0	0	0	0.1701	0	0	0
Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	0	0	0	0	0	0	0.1965	0
Dytiscidae	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Dytiscidae	predaceous diving beetles	0.1605	0	0.198	0	0	0	0	0
Lara	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	0	0	0	0	0	0	0.1965	0
Peltodytes	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	0.321	0	0.5941	0	0	0	0	0
Peltodytes	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	0.1605	0	0	0	0	0	0	0
Hydrophilidae	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Hydrophilidae	water scavenger beetles	0.1605	0	0	0	0	0	0	0
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	2.568	11.02	0.396	0.8757	1.02	1.656	1.572	2.551
Ceratopogoninae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	0.1605	0.1669	0	0	0.1701	0	0	0
Dixella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dixidae	dixid midges	0	0	0.9901	0	0	0	0	0
Dolichopodidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dolichopodidae	long-legged flies	0.1605	0	0	0	0	0	0	0
Clinocera	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	0	0	0.198	0	0	0	0.1965	0
Neoplasta	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	0	0	0.198	0	0	0	0.1965	0
Psychodini	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	0.1605	0	0	0	0	0	0	0
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	2.087	0	0	0	60.88	0.8278	0.3929	0
Simulium	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	0	0	0	0	0	0.3311	0	0
Tipuloidea	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	0	0	0.198	0	0	0	0	0
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	1.445	0	0.7921	0	0.3401	0.1656	0.1965	0
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	3.371	6.344	0	2.277	1.361	4.305	2.358	0.5102
Alotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	0.6678	1.386	15.94	0	0.4967	0.7859	4.082
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.321	0	2.772	0	0	0	2.75	0
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	22.79	1.836	0.198	1.226	0	7.45	0.1965	1.02
Cladopelma	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	0.3339	0	0	0	0	0	0
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.321	0	0.7921	0	0.3401	0	0.3929	0
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	13.64	0.6678	1.782	1.751	9.694	3.146	0	0
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	3.531	11.69	0.5941	0	0.1701	0	0.1965	0
Dicrotendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	0.6678	0.198	0	0	0	0	0
Endochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	1.766	0	0	0	0	0	0	0
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.6421	0	0.5941	0	6.973	1.821	1.179	0
Heterotrissocladius marcidus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	0.396	0	0	0	0.3929	0
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.321	0	0.7921	0	0	0.3311	0.5894	0
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	0	0	7.129	0.5254	0.5102	4.801	6.68	0.5102
Nanocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	0	0	0	0.3311	0	0
Odontomesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	0	1.669	1.188	0	0	0.4967	0	0
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	1.336	0	0	0	4.801	0	0

Parachironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	0	0	0	0	0.3311	0	0
Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	0	0	0.1701	0	0.3929	0
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	0.6421	4.508	1.782	0	0.5102	3.477	0	0
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	0.6678	0.396	18.56	0	0	0	1.531
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0.9631	1.336	1.98	0	0.3401	8.609	0.5894	0.5102
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0.9631	1.336	0.198	0	3.571	0	0.1965	1.02
Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	3.21	2.17	0.7921	0	0	0	0.3929	0
Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	0.321	1.669	10.5	26.44	0	1.159	3.143	63.78
Psectrocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.494	0	0.198	0	0.8503	0	0	0
Psectrotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0.9631	0	1.386	0	0	0	0	0
Pseudosmittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1.445	0	0	0	0	0	0	0
Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	0.321	0	0	0	1.19	0	0	0
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	0.396	0	0	0	0	0
Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	6.581	20.87	0.198	0.8757	0	3.146	0	1.02
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0.6421	0	1.584	0	3.231	1.159	3.929	0
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	0	0.198	0	0.1701	0.3311	2.358	0

Waterbody	Site	Date	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Rinearson Creek	beaver pond	2020-05-19	Caecidotea	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	8.07
Rinearson Creek	beaver pond	2020-05-19	Notonecta	L	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Notonectidae	back swimmers	2.69
Rinearson Creek	beaver pond	2020-05-19	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	34.97
Rinearson Creek	beaver pond	2020-05-19	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	24.21
Rinearson Creek	beaver pond	2020-05-19	Peltodytes	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	5.38
Rinearson Creek	beaver pond	2020-05-19	Peltodytes	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	2.69
Rinearson Creek	beaver pond	2020-05-19	Aeshnidae	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Aeshnidae	dragonflies	2.69
Rinearson Creek	beaver pond	2020-05-19	Erpobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Erpobdellidae	leeches	10.76
Rinearson Creek	beaver pond	2020-05-19	Dolichopodidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dolichopodidae	long-legged flies	2.69
Rinearson Creek	beaver pond	2020-05-19	Callibaetis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	2.69
Rinearson Creek	beaver pond	2020-05-19	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	56.49
Rinearson Creek	beaver pond	2020-05-19	Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	381.98
Rinearson Creek	beaver pond	2020-05-19	Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	59.18
Rinearson Creek	beaver pond	2020-05-19	Endochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	29.59
Rinearson Creek	beaver pond	2020-05-19	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	16.14
Rinearson Creek	beaver pond	2020-05-19	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	16.14
Rinearson Creek	beaver pond	2020-05-19	Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	10.76
Rinearson Creek	beaver pond	2020-05-19	Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	5.38
Rinearson Creek	beaver pond	2020-05-19	Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	110.29
Rinearson Creek	beaver pond	2020-05-19	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Rinearson Creek	beaver pond	2020-05-19	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Rinearson Creek	beaver pond	2020-05-19	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	228.65
Rinearson Creek	beaver pond	2020-05-19	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	10.76
Rinearson Creek	beaver pond	2020-05-19	Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.38
Rinearson Creek	beaver pond	2020-05-19	Psectrocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	75.32
Rinearson Creek	beaver pond	2020-05-19	Pseudosmittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	24.21
Rinearson Creek	beaver pond	2020-05-19	Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	5.38
Rinearson Creek	beaver pond	2020-05-19	Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	53.8
Rinearson Creek	beaver pond	2020-05-19	Psectrotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	16.14
Rinearson Creek	beaver pond	2020-05-19	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	10.76
Rinearson Creek	beaver pond	2020-05-19	Psychodini	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	2.69
Rinearson Creek	beaver pond	2020-05-19	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	43.04
Rinearson Creek	beaver pond	2020-05-19	Ceratopogoninae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	2.69
Rinearson Creek	beaver pond	2020-05-19	Dytiscidae	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Dytiscidae	predaceous diving beetles	2.69
Rinearson Creek	beaver pond	2020-05-19	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	24.21
Rinearson Creek	beaver pond	2020-05-19	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	303.97
Rinearson Creek	beaver pond	2020-05-19	Cenocorixa	A	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Corixidae	water boatman	29.59
Rinearson Creek	beaver pond	2020-05-19	Corixidae	L	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Corixidae	water boatman	29.59
Rinearson Creek	beaver pond	2020-05-19	Chydoridae	U	non-insect	Aquatic	Crustacea: Cladocera	x	Chydoridae	water fleas	10.76
Rinearson Creek	beaver pond	2020-05-19	Hydrophilidae	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Hydrophilidae	water scavenger beetles	2.69
Rinearson Creek	emergent marsh	2020-05-19	Caecidotea	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	250.7618
Rinearson Creek	emergent marsh	2020-05-19	Lirceus	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	8.5004
Rinearson Creek	emergent marsh	2020-05-19	Tipuloidea	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Peltodytes	A	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	6.3753
Rinearson Creek	emergent marsh	2020-05-19	Coenagrion/Enallagma	L	insect	Aquatic	Arthropoda: Insecta	Odonata	Coenagrionidae	damselflies	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Clinocera	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Neoplasta	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Dixella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dixidae	dixid midges	10.6255
Rinearson Creek	emergent marsh	2020-05-19	Erpobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Erpobdellidae	leeches	14.8757
Rinearson Creek	emergent marsh	2020-05-19	Baetis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	8.5004
Rinearson Creek	emergent marsh	2020-05-19	Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	6.3753
Rinearson Creek	emergent marsh	2020-05-19	Dicrotendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4.2502
Rinearson Creek	emergent marsh	2020-05-19	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	21.251
Rinearson Creek	emergent marsh	2020-05-19	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	76.5036
Rinearson Creek	emergent marsh	2020-05-19	Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	19.1259
Rinearson Creek	emergent marsh	2020-05-19	Tanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	29.7514
Rinearson Creek	emergent marsh	2020-05-19	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8.5004

Rinearson Creek	emergent marsh	2020-05-19	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	19.1259
Rinearson Creek	emergent marsh	2020-05-19	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	6.3753
Rinearson Creek	emergent marsh	2020-05-19	Heterotrissocladius marcidus group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.2502
Rinearson Creek	emergent marsh	2020-05-19	Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8.5004
Rinearson Creek	emergent marsh	2020-05-19	Psectrocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.2502
Rinearson Creek	emergent marsh	2020-05-19	Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Odontomesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	12.7506
Rinearson Creek	emergent marsh	2020-05-19	Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	112.6303
Rinearson Creek	emergent marsh	2020-05-19	Alotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	14.8757
Rinearson Creek	emergent marsh	2020-05-19	Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	8.5004
Rinearson Creek	emergent marsh	2020-05-19	Psectrotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	14.8757
Rinearson Creek	emergent marsh	2020-05-19	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	17.0008
Rinearson Creek	emergent marsh	2020-05-19	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	4.2502
Rinearson Creek	emergent marsh	2020-05-19	Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	121.1307
Rinearson Creek	emergent marsh	2020-05-19	Dytiscidae	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Dytiscidae	predaceous diving beetles	2.1251
Rinearson Creek	emergent marsh	2020-05-19	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	40.3769
Rinearson Creek	emergent marsh	2020-05-19	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	42.502
Rinearson Creek	emergent marsh	2020-05-19	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	31.8765
Rinearson Creek	emergent marsh	2020-05-19	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Hydrobiidae	snails	21.251
Rinearson Creek	emergent marsh	2020-05-19	Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	12.7506
Rinearson Creek	emergent marsh	2020-05-19	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	14.8757
Rinearson Creek	emergent marsh	2020-05-19	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	4.2502
Rinearson Creek	emergent marsh	2020-05-19	Potamopyrgus antipodarum	U	non-insect	Aquatic	Mollusca: Gastropoda	x	uncertain status	snails	46.7522
Rinearson Creek	emergent marsh	2020-05-19	Corixidae	L	insect	Aquatic	Arthropoda: Insecta	Hemiptera: Heteroptera	Corixidae	water boatman	19.1259
Rinearson Creek	engineered riffle	2020-05-19	Caecidotea	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	35.8577
Rinearson Creek	engineered riffle	2020-05-19	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	6418.5283
Rinearson Creek	engineered riffle	2020-05-19	Cheumatopsyche	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydropsychidae	caddisflies	125.50195
Rinearson Creek	engineered riffle	2020-05-19	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	35.8577
Rinearson Creek	engineered riffle	2020-05-19	Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Erpobdella	U	non-insect	Aquatic	Annelida: Hirudinea	miscellaneous non-insect	Erpobdellidae	leeches	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Baetis	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	89.64425
Rinearson Creek	engineered riffle	2020-05-19	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	143.4308
Rinearson Creek	engineered riffle	2020-05-19	Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	35.8577
Rinearson Creek	engineered riffle	2020-05-19	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	376.50585
Rinearson Creek	engineered riffle	2020-05-19	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	53.78655
Rinearson Creek	engineered riffle	2020-05-19	Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	53.78655
Rinearson Creek	engineered riffle	2020-05-19	Rheotanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	125.50195
Rinearson Creek	engineered riffle	2020-05-19	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	35.8577
Rinearson Creek	engineered riffle	2020-05-19	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1021.94445
Rinearson Creek	engineered riffle	2020-05-19	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	735.08285
Rinearson Creek	engineered riffle	2020-05-19	Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Psectrocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	89.64425
Rinearson Creek	engineered riffle	2020-05-19	Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	340.64815
Rinearson Creek	engineered riffle	2020-05-19	Sperchon	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	107.5731
Rinearson Creek	engineered riffle	2020-05-19	Ceratopogoninae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Sphaeriidae	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	53.78655
Rinearson Creek	engineered riffle	2020-05-19	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	179.2885
Rinearson Creek	engineered riffle	2020-05-19	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	107.5731
Rinearson Creek	engineered riffle	2020-05-19	Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Physella	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	89.64425
Rinearson Creek	engineered riffle	2020-05-19	Gyraulus	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	17.92885
Rinearson Creek	engineered riffle	2020-05-19	Chydoridae	U	non-insect	Aquatic	Crustacea: Cladocera	x	Chydoridae	water fleas	107.5731
Rinearson Creek	upper control	2020-05-19	Caecidotea	U	non-insect	Aquatic	Crustacea: Isopoda	x	Asellidae	aquatic sow bugs	1021.05944
Rinearson Creek	upper control	2020-05-19	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	7.50779
Rinearson Creek	upper control	2020-05-19	Lepidostoma	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	3.753895
Rinearson Creek	upper control	2020-05-19	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	3.753895
Rinearson Creek	upper control	2020-05-19	Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	3.753895
Rinearson Creek	upper control	2020-05-19	Clinocera	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Empididae	dance flies	3.753895

Taxon	Stage	Family	Common.name	Insect.	Higher.classification	Origin	Order	BCG.Attribute	Feeding.Group	CA.feeding.group	Habit	Tolerance	WY.HBI	PSSB.tolerance	CA.tolerance	Metals.tolerance	BCI.TV	PSSB.long.lived	Voltinism	Development	Occurrence.in.drift	Size.at.maturity	Rheophily	Thermal.p	a	b
Oligochaeta	U	x	segmented worms	non-insect	Annelida: Oligochaeta	Aquatic	miscellaneous non-insect	4	CG	CG	BU	0	5	0	5	11	108	0	2	2	1	2	2	2	0.0758	0.74
Erpobdella	U	Erpobdellidae	leeches	non-insect	Annelida: Hirudinea	Aquatic	miscellaneous non-insect	5	PR	PR	CL	HT	8	0	8	4	108	0	1	2	1	3	2	2	0.000102	3.25
Sphaeriidae	U	Sphaeriidae	pea clams	non-insect	Mollusca: Bivalvia	Aquatic	x	4	CF	CF	BU	0	8	0	8	3	108	0	1	3	1	1	2	2	0.0163	2.477
Ferrissia	U	Planorbidae	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	4	SC	SC	CL	MT	6	0	6	1	108	0	3	2	1	1	2	2	0.0208	3.03
Menetus	U	Planorbidae	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	4	SC	SC	CL	MT	8	0	6	11	108	0	3	2	1	1	2	2	0.0208	3.03
Potamopyrgus antipodarum	U	uncertain status	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	6	CG	SC	CL	HT	8	0	8	11	108	0	2	2	1	1	2	2	0.0208	3.03
Crangonyx	U	Crangonyctidae	scuds	non-insect	Crustacea: Amphipoda	Aquatic	x	5	CG	CG	SW	MT	11	0	4	11	108	0	3	2	1	2	2	2	0.0058	3.015
Caecidotea	U	Asellidae	aquatic sow bugs	non-insect	Crustacea: Isopoda	Aquatic	x	5	OM	CG	CM	HT	8	0	8	5	108	0	3	2	1	2	2	2	0.0054	2.948
Pacifastacus	U	Astacidae	crayfish	non-insect	Crustacea: Decapoda	Aquatic	x	4	OM	OM	SP	0	6	0	6	3	108	0	1	3	1	3	2	2	0.0147	3.626
Baetis	L	Baetidae	mayflies	insect	Arthropoda: Insecta	Aquatic	Ephemeroptera	4	CG	CG	CL	0	5	0	5	11	72	0	3	1	3	1	2	2	0.0053	2.875
Lepidostoma	L	Lepidostomatidae	caddisflies	insect	Arthropoda: Insecta	Aquatic	Trichoptera	4	SH	SH	CM	0	1	0	1	1	18	0	2	2	1	2	2	2	0.0079	2.649
Lara	L	Elmidae	riffle beetles	insect	Arthropoda: Insecta	Aquatic	Coleoptera	4	SH	SH	CL	0	4	0	4	11	104	0	1	3	1	2	2	2	0.0074	2.879
Clinocera	L	Empididae	dance flies	insect	Arthropoda: Insecta	Aquatic	Diptera	3	PR	PR	CL	0	6	0	6	4	95	0	2	2	1	2	2	2	0.0054	2.546
Neoplasta	L	Empididae	dance flies	insect	Arthropoda: Insecta	Aquatic	Diptera	4	PR	PR	SP	0	6	0	6	11	95	0	2	2	1	2	2	2	0.0054	2.546
Ceratopogoninae	L	Ceratopogonidae	no-see-um midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	PR	PR	SP	0	6	0	6	4	108	0	2	1	1	2	2	2	0.0025	2.469
Simulium	L	Simuliidae	black flies	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CF	CF	CL	0	6	0	6	11	108	0	3	1	3	1	3	2	0.002	3.011
Tipula	L	Tipulidae	crane flies	insect	Arthropoda: Insecta	Aquatic	Diptera	4	SH	SH	BU	0	4	0	4	11	36	0	1	2	1	3	2	2	0.0029	2.681
Chironomidae	P	Chironomidae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	BU	0	6	0	6	11	108	0	3	1	3	1	2	2	0.0018	2.617
Alotanypus	L	Chironomidae: Tanypodinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	PR	PR	BU	0	7	0	7	8	108	0	3	1	3	1	2	2	0.0018	2.617
Brillia	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	SH	SP	0	5	0	5	4	108	0	3	1	3	1	2	2	0.0018	2.617
Chironomus	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	5	CG	CG	BU	HT	10	0	10	7	108	0	3	1	3	2	1	2	0.0018	2.617
Corynoneura	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	0	7	0	7	4	108	0	3	1	3	1	2	2	0.0018	2.617
Cryptochironomus	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	5	PR	PR	SP	MT	8	0	8	5	108	0	3	1	3	1	1	2	0.0018	2.617
Eukiefferiella claripennis group	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	OM	SP	MT	8	0	8	11	108	0	3	1	3	1	2	2	0.0018	2.617
Heterotrissocladius marcidus group	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	3	CG	CG	SP	MI	0	0	0	11	108	0	3	1	3	1	2	1	0.0018	2.617
Limnophyes	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	MT	8	0	8	11	108	0	3	1	3	1	2	2	0.0018	2.617
Micropsectra	L	Chironomidae: Chironominae: Tanytarsini	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	CL	0	7	0	7	1	108	0	3	1	3	1	2	2	0.0018	2.617
Parametriocnemus	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	0	5	0	5	11	108	0	3	1	3	1	2	2	0.0018	2.617
Phaenopsectra	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	SC	SC	CL	0	7	0	7	4	108	0	3	1	3	1	1	2	0.0018	2.617
Polypedilum	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	MH	MH	CL	0	6	0	6	4	108	0	3	1	3	1	2	2	0.0018	2.617
Procladius	L	Chironomidae: Tanypodinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	5	PR	PR	SP	HT	9	0	9	5	108	0	3	1	3	1	2	2	0.0018	2.617
Prodiamesa	L	Chironomidae: Prodiamesinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	BU	MI	3	0	3	3	108	0	3	1	3	1	2	1	0.0018	2.617
Thienemannimyia complex	L	Chironomidae: Tanypodinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	PR	PR	SP	0	6	0	6	3	108	0	3	1	3	1	2	2	0.0018	2.617
Tvetenia bavarica group	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	0	5	0	5	4	108	0	3	1	3	1	2	2	0.0018	2.617
Lymnaeidae	U	Lymnaeidae	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	5	SC	SC	CL	MT	6	0	6	11	108	0	3	2	1	2	2	3	0.0208	3.03
Physella	U	Physidae	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	5	CG	SC	CL	HT	8	0	8	4	108	0	3	2	2	2	2	3	0.0208	3.03
Gyraulus	U	Planorbidae	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	5	SC	SC	CL	HT	8	0	8	3	108	0	3	2	1	1	2	3	0.0208	3.03
Chydoridae	U	Chydoridae	water fleas	non-insect	Crustacea: Cladocera	Aquatic	x	0	CG	CG	SW	MT	11	0	6	11	108	0	3	2	1	1	2	2	0.006753	2.27
Sperchon	U	x	mites	non-insect	Arachnida: Acari	Aquatic	x	4	PA	PR	SW	MT	5	0	8	11	108	0	3	2	2	1	2	2	0.053	2.494
Cheumatopsyche	L	Hydropsychidae	caddisflies	insect	Arthropoda: Insecta	Aquatic	Trichoptera	5	CF	CF	CL	MT	8	0	5	11	108	0	3	3	2	2	3	2	0.0046	2.926
Hydroptila	L	Hydroptilidae	caddisflies	insect	Arthropoda: Insecta	Aquatic	Trichoptera	4	PH	PH	CL	MT	6	0	6	4	108	0	3	2	2	1	2	2	0.0056	2.839
Ceratopogoninae	P	Ceratopogonidae	no-see-um midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	PR	PR	SP	0	6	0	6	4	108	0	2	1	1	2	2	2	0.0025	2.469
Cricotopus	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	CL	0	7	0	7	10	108	0	3	1	3	1	2	2	0.0018	2.617
Paratanytarsus	L	Chironomidae: Chironominae: Tanytarsini	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CF	CF	CL	0	6	0	6	3	108	0	3	1	3	1	2	2	0.0018	2.617
Psectrocladius	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	MT	10	0	8	11	108	0	3	1	3	1	2	2	0.0018	2.617
Rheotanytarsus	L	Chironomidae: Chironominae: Tanytarsini	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CF	CF	CL	0	6	0	6	11	108	0	3	1	3	1	2	2	0.0018	2.617
Aeshnidae	L	Aeshnidae	dragonflies	insect	Arthropoda: Insecta	Aquatic	Odonata	4	PR	PR	CM	MT	5	0	5	11	72	0	1	2	1	3	2	2	0.0082	2.813
Callibaetis	L	Baetidae	mayflies	insect	Arthropoda: Insecta	Aquatic	Ephemeroptera	5	CG	CG	SP	HT	9	0	9	11	72	0	3	1	1	2	1	2	0.0053	2.875
Notonecta	L	Notonectidae	back swimmers	insect	Arthropoda: Insecta	Aquatic	Hemiptera: Heteroptera	0	PR	PR	SW	0	7	0	5	11	72	0	3	2	1	2	1	3	0.0499	2.27
Corixidae	L	Corixidae	water boatman	insect	Arthropoda: Insecta	Aquatic	Hemiptera: Heteroptera	0	PH	PH	SW	MT	8	0	8	11	108	0	3	1	1	1	1	2	0.0031	2.904
Cenocorixa	A	Corixidae	water boatman	insect	Arthropoda: Insecta	Aquatic	Hemiptera: Heteroptera	0	PH	PH	SW	MT	8	0	8	11	108	0	3	1	1	1	1	2	0.0031	2.904
Hydrophilidae	L	Hydrophilidae	water scavenger beetles	insect	Arthropoda: Insecta	Aquatic	Coleoptera	4	PR	PR	CM	MT	5	0	5	11	72	0	2	3	1	2	1	2	0.0077	2.91
Dytiscidae	L	Dytiscidae	predaceous diving beetles	insect	Arthropoda: Insecta	Aquatic	Coleoptera	4	PR	PR	CM	MT	5	0	5	11	72	0	2	3	2	2	1	2	0.0077	2.91
Peltodytes	L	Haliplidae	crawling water beetles	insect	Arthropoda: Insecta	Aquatic	Coleoptera	5	MH	MH	CM	HT	5	0	5	11	54	0	2	2	1	2	1	3	0.0077	2.91
Peltodytes	A	Haliplidae	crawling water beetles	insect	Arthropoda: Insecta	Aquatic	Coleoptera	5	MH	MH	SW	HT	5	0	5	11	54	0	2	2	1	1	1	3	0.0271	2.744
Dolichopodidae	L	Dolichopodidae	long-legged flies	insect	Arthropoda: Insecta	Aquatic	Diptera	5	PR	PR	SP	MT	4	0	4	4	108	0	2	2	1	2	1	2	0.0054	2.546
Psychodini	L	Psychodidae	moth flies	insect	Arthropoda: Insecta	Aquatic	Diptera	5	CG	CG	BU	HT	10	0	10	11	36	0	3	1	1	1	1	3	0.0025	2.692
Endochironomus	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	5	MH	MH	CL	HT	10	0	10	6	108	0	3	1	3	1	1	2	0.0018	2.617
Pseudosmittia	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	0	6	0	5	11	108	0	3	1	3	1	2	2	0.0018	2.617
Psectrotanypus	L	Chironomidae: Tanypodinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	PR	PR	SP	MT	10	0	7	11	108	0	3	1	3	1	2	2	0.0018	2.617
Tanytarsus	L	Chironomidae: Chironominae: Tanytarsini	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CF	CF	CL	MT	6	0	6	3	108	0	3	1	3	1	2	2	0.0018	2.617
Nemata	U	x	round worms	non-insect	Nemata	Aquatic	miscellaneous non-insect	4	PA	PR	BU	0	5	0	6	11	108	0	2	2	1	2	2	2	0.0758	0.74
Juga	U	Pleuroceridae	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	4	OM	SC	CL	MT	7	0	7	11	108	0	1	2	1	3	2	2	0.0208	3.03
Fluminicola	U	Hydrobiidae	snails	non-insect	Mollusca: Gastropoda	Aquatic	x	4	SC	SC	CL	MT	8	0	6	11	108	0	1	2	1	1	2	2	0.0208	3.03
Lirceus	U	Asellidae	aquatic sow bugs	non-insect	Crustacea: Isopoda	Aquatic	x	5	CG	CG	CM	HT	8	0	8	5	108	0	3	2	1	2	2	2	0.0054	2.948
Coenagrion/Enallagma	L	Coenagrionidae	damselflies	insect	Arthropoda: Insecta	Aquatic	Odonata	5	PR	PR	CM	HT	8	0	9	11	72	0	2	2	1	2	2	3	0.0051	2.785
Tipuloidea	P	Tipulidae	crane flies	insect	Arthropoda: Insecta	Aquatic	Diptera	4	UN	UN	BU	0	3	0	3	11	72	0	2	2	1	2	2	2	0.0029	2.681
Dixella	L	Dixidae	dixid midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SW	MT	2	0	2	11	108	0	3	1	3	1	2	3	0.0018	2.617
Dicrotendipes	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	BU	MT	8	0	8	5	108	0	3	1	3	1	1	2	0.0018	2.617
Odontomesa	L	Chironomidae: Prodiamesinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	0	4	0	6	5	108	0	3	1	3	1	2	1	0.0018	2.617
Paratendipes	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	BU	MT	8	0	8	11	108	0	3	1	3	1	1	2	0.0018	2.617
Smittia	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	BU	MT	6	0	6	11	108	0	3	1	3	1	2	2	0.0018	2.617
Helobdella	U	Glossiphoniidae	leeches	non-insect	Annelida: Hirudinea	Aquatic	miscellaneous non-insect	5	PR	PR	CL	HT	6	0	6	4	108	0	2	2	1	2	2	2	0.000102	3.25
Musculium	U	Sphaeriidae	pea clams	non-insect	Mollusca: Bivalvia	Aquatic	x	4	CF	CF	BU	MT	8	0	8	3	108	0	1	3	1	1	2	2	0.0163	2.477
Ostracoda	U	x	seed shrimp	non-insect	Crustacea: Ostracoda	Aquatic	x	4	CG	CG	SW	0	8	0	6	11	108	0	3	2	1	1	2	2	0.006753	2.27
Trombidiformes	U	x	mites	non-insect	Arachnida: Acari	Aquatic	Trombidiformes	4	PA	PR	SW	0	5	0	5	11	108	0	3	2	2	1	2	2	0.053	2.494
Libellulidae	L	Libellulidae	dragonflies	insect	Arthropoda: Insecta	Aquatic	Odonata	4	PR	PR	SP	MT	9	0	9	11	72	0	1	2	1	3	2	1	0.0076	2.809
Cladopelma	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	BU	MT	9	0	6	11	108	0	3	1	3	1	1	2	0.0018	2.617
Orthocladius	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	3	CG	CG	SP	0	6	0	6	11	108	0	3	1	3	1	2	2	0.0018	2.617
Trepaxonemata	U	x	flat worms	non-insect	Turbellaria	Aquatic	miscellaneous non-insect	4	PR	PR	CL	0	4	0	4	11	108	0	2	2	1	2	2	2	0.0082	2.168
Baetis tricaudatus complex	L	Baetidae	mayflies	insect	Arthropoda: Insecta	Aquatic	Ephemeroptera	4	CG	CG	CL	0	6	0	6	11	72	0	3	1	3	1	2	2	0.0053	2.875
Simulium	P	Simuliidae	black flies	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CF	CF	CL	0	6	0	6	11	108	0	3	1	3	1	3	2	0.002	3.011
Nanocladius	L	Chironomidae: Orthocladiinae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	CG	CG	SP	0	3	0	3	11	108	0	3	1	3	1	2	2	0.0018	2.617
Parachironomus	L	Chironomidae: Chironominae	midges	insect	Arthropoda: Insecta	Aquatic	Diptera	4	PR	PR	SP	MT	10	0	10	4	108	0	3	1	3	1	1	2	0.0018	2.617

Explanation of metrics	All abundances and biomass converted to a full sample and 1 square meter basis.
Subsample count (raw)	Total count of subsample prior to correction factors being applied for subsampling and conversion to a 1 square meter basis.
Subsample correction factor to full sample	Multiplier to convert subsample abundances to a full sample basis, e.g. if 1/2 the sample was sorted, then the subsample correction is X2.
Area correction factor to square meter	Converts abundances of full sample to a 1 square meter basis, e.g. if 8 square feet was sampled, then the conversion to 1 square meter is X1.345
SUMMARY METRICS	
Total taxa richness	Total count of unique taxa in sample.
Total abundance	Total abundance in sample converted to a full sample and 1 square meter basis.
Total biomass (mg)	Total biomass in full sample adjusted to a 1 square meter basis as calculated by length/mass regressions.
Large/rare biomass (mg)	Biomass from taxa marked as "large/rare" in the "Incidental" column. These taxa may dominate the sample biomass.
Total biomass without large/rare (mg)	Total biomass - large/rare biomass
EPT taxa	Taxa in the insect orders Ephemeroptera+Plecoptera+Trichoptera, or mayflies+stoneflies+caddisflies.
Hilsenhoff Biotic Index (WY DEQ version)	
$HBI = \sum_{i=1}^{S} \frac{n_i \cdot a_i}{N}$	S is the number of taxa present. N is the total sample abundance. n_i is the abundance of the i-th taxa. a_i is the WY HBI index value (can be found on the Traits sheet). An index of 11 indicates a taxa that is discarded from the calculation.
DOMINANCE AND DIVERSITY	Metrics that examine how dominated the community is by a single or few taxa.
Dominant taxa	The most numerous taxon.
Subdominant taxa	The second most numerous taxon.
Shannon-Weaver Diversity (loge)	Information theory index that examines how evenly abundance is allocated among the taxa present in the community.
$H' = -\sum_{i=1}^{S} \frac{n_i}{N} \ln\left(\frac{n_i}{N}\right)$	S is the number of taxa present. N is the total sample abundance. n_i is the abundance of the i-th taxa.
Shannon-Weaver Diversity (log2)	
Shannon Evenness Index	
$E = H' / \ln(S)$	Where H' and S are defined above.
TOLERANT AND INTOLERANT TAXA	Based on habitat association and best professional judgement (Wisseman unpublished). Water temperature and dissolved oxygen are the dominant environmental factors.
Total tolerant taxa	Sum of the moderately and highly tolerant taxa. Taxa found frequently in habitats with warm water temperature and low dissolved oxygen. Eurythermal.
Highly tolerant taxa	Taxa highly tolerant of warm water and very low dissolved oxygen. Found often in stagnant and highly eutrophic habitat.
Moderately tolerant taxa	Taxa moderately tolerant of warm water and low dissolved oxygen.
Total intolerant taxa	Sum of moderately intolerant and highly intolerant taxa. Cool and cold water biota found in habitats with high dissolved oxygen.
Highly intolerant taxa	Taxa generally found in habitats with year-round cold water temperatures and very high dissolved oxygen. Indicative of bull trout zone. Cold water biota, cold stenotherms.
Moderately Intolerant taxa	Taxa generally found in cool water habitats, cold to cool water eurythermal. Indicative of general salmonid zone.
VOLTINISM (length of life cycle)	Modified from Poff et al. 2006
Semivoltine (> 1 year life cycle)	Taxa where a significant proportion of individuals require more than one year to complete their life cycle.
Univoltine (1 year life cycle)	Taxa where most individuals exhibit a one year life cycle.
Multivoltine (< 1 year life cycle)	Taxa where a significant proportion of the population has more than one generation a year.
GROWTH AND DEVELOPMENT	Modified from Poff et al. 2006
Fast seasonal life cycle	Taxa that grow and mature over a few months or a single season.
Slow seasonal life cycle	Taxa where growth and maturation extends over several seasons.
Nonseasonal life cycle	Taxa that exhibit asynchronous seasonal development, with multiple life stages present during most of the year.
OCCURRENCE IN DRIFT	Modified from Poff et al. 2006
Rare in drift	Found rarely in stream drift. Drift occurs during catastrophic events (e.g. floods).
Common in drift	Found commonly in stream drift.
Abundant in drift	Dominant in stream drift, behavioral drifters.
SIZE AT MATURITY	Modified from Poff et al. 2006
Small size at maturity	<9 mm long at maturity
Medium size at maturity	9-16 mm long at maturity
Large size at maturity	> 16 mm long at maturity

RHEOPHILY AND HABITAT AFFINITY	Modified from Poff et al. 2006
Depositional only	Occurs primarily in lentic habitats, stream pools and alcoves, or low gradient slowly flowing streams.
Depositional and erosional	Stream taxa found in both pools and riffles, though usually in protected pockets in riffles.
Erosional	Stream taxa associated with moderate to fast water current.
THERMAL PREFERENCE	Modified from Poff et al. 2006
Cold stenothermal and cool eurythermal	
Cool/warm eurythermal	
Warm eurythermal	
NON-INSECT AND INSECT ORDERS	
Non-insect invertebrates	Hydroids, vermiform taxa, mollusks, crustaceans and mites.
Ephemeroptera (mayflies)	
Odonata (damsel- and dragonflies)	
Plecoptera (stoneflies)	
Hemiptera (true bugs)	
Megaloptera (alderflies and hellgramites)	
Trichoptera (caddisflies)	
Lepidoptera (moths)	
Coleoptera (beetles)	
Diptera (total)(true flies)	Inclusive of the Chironomidae.
Chironomidae (true flies- midges)	Dominant and ubiquitous aquatic dipteran family.
INDICATOR TAXA	
Mollusca (snails and bivalves) taxa	
Crustacea taxa	Benthic taxa include Ostracoda, Amphipoda, Isopoda, Decapoda, and the Chydoridae (Cladocera), but not water column associated microcrustaceans (e.g. Daphnidae and C
Baetidae (mayfly) taxa	Common, ubiquitous and diverse family of minnow-like mayfles.
Ephemerellidae (mayfly) taxa	Common, ubiquitous and diverse family of mayflies with most taxa associated with cool-cold montane rivers. Many taxa intolerant.
Heptageniidae (mayfly) taxa	Common, ubiquitous and diverse family of mayflies. Rheophilic, scraper mayflies found over a broad longitudinal range in montane and foothill rivers and streams.
Nemouridae (stonefly) taxa	Common, ubiquitous, and diverse family of stoneflies. Broadly distributed along river systems with peak diversity in small, forested streams.
Rhyacophilidae (caddisfly) taxa	Common, ubiquitous and very diverse family of caddisflies. Primarily predators. Broadly distributed along river systems with peak diversity in small to mid-size, cool/cold monta
Hydropsychidae (caddisfly) taxa	Common, ubiquitous, and diverse family of net spinning caddisflies.
Elmidae (riffle beetle) taxa	Common, ubiquitous, and diverse family of aquatic beetles.
FEEDING GROUPS	Functional feeding groups based on the mechanism by which taxa feed. Modified from Merritt et al. 2008.
Predator taxa	Taxa that are primarily predators, consuming living animal tissue by engulfing prey or piercing prey tissues and sucking fluids. Excluding parasites.
Parasite taxa	External parasites of invertebrates (e.g. Acari or mites), or internal parasites (e.g. Nemata or roundworms).
Collector-gatherer taxa	Utilize mouthparts and other structures to "gather" fine particulate organic matter (FPOM) that is mostly detritus but may include algae, bacteria, small animals, etc.
Collector-filterer taxa	Utilize nets, mothparts or other structures to capture and consume FPOM suspended in the water column. FPOM may include algae, bacteria, small animals, etc.
Collector (total) taxa	Sum of the collector-gatherer and collector-filterer.
Piercer herbivore taxa	Also called Macrophyte piercers. Pierce living tissue of aquatic macrophytes and suck fluids, e.g. some Hydroptilidae.
Macrophyte herbivore taxa	Chewers and miners of living macrophytes. Considered a subclass of shredders in Merritt et al. 2008.
Shredder taxa	Consume (chew) coarse particulate organic matter (CPOM) such as decaying leaves and wood.
Scraper taxa	"Scrape" periphyton (attached algae) and associated material from hard surfaces.
Omnivore taxa	Taxa exhibiting multiple feeding mechanisms (above), with no one mechanism clearly dominant.
Unknown taxa	No information available on how and what taxon feeds on.
HABIT	Mode of existence.
Skater taxa	Adapted for "skating" on the wayter surface. Generally excluded from benthic data sets.
Planktonic taxa	Inhabit the water column in lentic water or slow moving streams. Generally excluded from benthic data sets.
Diver taxa	Swim in the water column and along the benthos, but return to the water surface to obtain oxygen. Gnerally excluded from benthic data sets.
Swimmer taxa	Exhibit fishlike swimming in lotic or lentic waters, but return to the benthos between bursts of swimming. Included in benthic data sets.
Clinger taxa	Taxa that have behavioral (e.g. net spinners) or morphological adaptations (e.g. claws) to attach to hard substrates in faster water current.
Sprawler taxa	Found on the surface of fine sediments or floating leaves of macrophytes.
Climber taxa	Found on leaves and stems of aquatic macrophytes or submerged branches and roots.
Burrower taxa	Burrow into fine sediments or tunnel into plant stems, leaves or roots (miners)

Waterbody	Site	Date	Taxon	Stage	Abundance	Subsample.correction.factor	Area.correction.factor	Unique	STE	Incidental	Comments
Rinearson Creek	upper control	5/19/2020	Oligochaeta	U	34	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Erpobdella	U	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Sphaeriidae	U	8	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Ferrissia	U	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Menetus	U	5	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Potamopyrgus antipodarum	U	4	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Crangonyx	U	24	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Caecidotea	U	272	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Pacifastacus	U	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Baetis	L	9	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Lepidostoma	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Lara	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Clinocera	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Neoplasta	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Ceratopogoninae	L	8	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Simulium	L	2	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Tipula	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Chironomidae	P	12	2.791	1.345	N		no	
Rinearson Creek	upper control	5/19/2020	Alotanypus	L	4	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Brillia	L	14	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Chironomus	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Corynoneura	L	2	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Cryptochironomus	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Eukiefferiella claripennis group	L	6	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Heterotrissocladius marcidus group	L	2	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Limnophyes	L	3	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Micropsectra	L	34	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Parametriocnemus	L	2	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Phaenopsectra	L	3	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Polypedilum	L	1	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Procladius	L	2	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Prodiamesa	L	16	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Thienemannimyia complex	L	20	2.791	1.345	Y		no	
Rinearson Creek	upper control	5/19/2020	Tvetenia bavarica group	L	12	2.791	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Oligochaeta	U	6	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Erpobdella	U	1	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Sphaeriidae	U	3	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Lymnaeidae	U	1	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Physella	U	5	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Gyraulus	U	1	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Chydoridae	U	6	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Crangonyx	U	10	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Caecidotea	U	2	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Pacifastacus	U	1	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Sperchon	U	1	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Baetis	L	5	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Cheumatopsyche	L	7	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Hydroptila	L	1	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Ceratopogoninae	L	6	13.33	1.345	Y		no	
Rinearson Creek	engineered riffle	5/19/2020	Ceratopogoninae	P	1	13.33	1.345	Y		no	

Rinearson Creek	engineered riffle	5/19/2020	Simulium	L	358	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Tipula	L	2	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Chironomidae	P	8	13.33	1.345	N	no
Rinearson Creek	engineered riffle	5/19/2020	Corynoneura	L	2	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Cricotopus	L	57	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Cryptochironomus	L	1	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Eukiefferiella claripennis group	L	41	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Micropsectra	L	3	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Parametriocnemus	L	1	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Paratanytarsus	L	3	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Phaenopsectra	L	2	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Polypedilum	L	21	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Psectrocladius	L	5	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Rheotanytarsus	L	7	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Thienemannimyia complex	L	19	13.33	1.345	Y	no
Rinearson Creek	engineered riffle	5/19/2020	Tvetenia bavarica group	L	1	13.33	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Oligochaeta	U	113	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Erpobdella	U	4	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Chydoridae	U	4	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Crangonyx	U	9	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Caecidotea	U	3	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Aeshnidae	L	1	2	1.345	Y	early instar no
Rinearson Creek	beaver pond	5/19/2020	Callibaetis	L	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Notonecta	L	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Corixidae	L	11	2	1.345	N	no
Rinearson Creek	beaver pond	5/19/2020	Cenocorixa	A	11	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Hydrophilidae	L	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Dytiscidae	L	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Peltodytes	L	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Peltodytes	A	2	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Dolichopodidae	L	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Ceratopogoninae	L	16	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Ceratopogoninae	P	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Psychodini	L	1	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Simulium	L	13	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Tipula	L	9	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Chironomidae	P	21	2	1.345	N	no
Rinearson Creek	beaver pond	5/19/2020	Brillia	L	2	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Chironomus	L	142	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Corynoneura	L	2	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Cricotopus	L	85	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Cryptochironomus	L	22	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Endochironomus	L	11	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Eukiefferiella claripennis group	L	4	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Limnophyes	L	2	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Paratanytarsus	L	4	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Phaenopsectra	L	6	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Polypedilum	L	6	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Procladius	L	20	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Prodiamesa	L	2	2	1.345	Y	no
Rinearson Creek	beaver pond	5/19/2020	Psectrocladius	L	28	2	1.345	Y	no

These samples were poorly preserved

Sphaeriidae	most specimens with shells partially decalcified. Many juveniles. Most are Pisidium, but Musculium also present, so roll ID up to family level
Lymnaeidae	Mostly juveniles, probablt Galba. Not Radix auricularia, the non-native species.
Asellidae	Almost all seen are Caecidotea, but there was one large (though damaged) specimen that differed significantly in appearance from Caecidotea and appears to be Lirceus. This may be the first record for the Willamette Valley. Rhithron Associates reports Lirceus from the Puget Lowlands and believes thay are probably introduced from eastern North America.
Baetis	Specimens damaged because of poor preservation. Color pattern variable. No apparent setae on antennal scapes, but they may have been rubbed off. Pronotum with kidney shaped dark marking. Color pattern varies from B. tricaudatus complex to closer to B. flavistriga complex. Cerci broken off, so can't look for dark bands. Roll up to Baetis until better preserved late-instar specimens are available.
Cenocorixa	tentative identification

Incidental taxa rejected from the analysis. Large/rare taxa treated specially for total biomass. Non-unique taxa omitted from richness metrics.

Waterbody	Site	Date	Taxon	Stage	Abundance	Subsample.correction.factor	Area.correction.factor	Unique	STE	Incidental	Comments
Rinearson Creek	upper control	05/19/2020 00:00:00	Chironomidae	P	12	2.791	1.345	N		no	
Rinearson Creek	engineered riffle	05/19/2020 00:00:00	Chironomidae	P	8	13.33	1.345	N		no	
Rinearson Creek	beaver pond	05/19/2020 00:00:00	Aeshnidae	L	1	2	1.345	Y	early instar	no	
Rinearson Creek	beaver pond	05/19/2020 00:00:00	Corixidae	L	11	2	1.345	N		no	
Rinearson Creek	beaver pond	05/19/2020 00:00:00	Chironomidae	P	21	2	1.345	N		no	
Rinearson Creek	beaver pond	05/04/2021 00:00:00	Chironomidae	P	38	1.45	1.345	N		no	
Rinearson Creek	emergent marsh	05/04/2021 00:00:00	Chironomidae	P	13	1	1.345	N		no	
Rinearson Creek	engineered riffle	05/04/2021 00:00:00	Chironomidae	P	26	2.29	1.345	N		no	
Rinearson Creek	upper control	05/04/2021 00:00:00	Chironomidae	P	1	1	1.345	N		no	

Appendix I
Maintenance