Portland General Electric Harborton Restoration: Final Year 2 Monitoring Report

Portland General Electric

December 2022
Revised October 2023

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List of Acronyms and Abbreviations

ACM	Active Channel Margin
CPD	City of Portland Datum
DO	Dissolved Oxygen
EM	Effectiveness Monitoring
EMR	Effectiveness Monitoring Report
FWS	U.S. Fish and Wildlife Service
Harborton	PGE's Harborton Property
IMR	Implementation Monitoring Report
LWM	Large Woody Material
MAMP	Monitoring and Adaptive Management Plan
NMFS	National Marine Fisheries Service
NRD	Natural Resource Damage
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
OHW	Ordinary High-Water Elevation
OLW	Ordinary Low-Water Elevation
PGE	Portland General Electric
Project	PGE's Harborton Restoration Project
Property	PGE's Harborton Property
RCG	Reed canarygrass
Site	PGE's Harborton Restoration Project
Trustees	Portland Harbor Natural Resources Trustee Council

Executive Summary

In 2020, Portland General Electric (PGE) began construction of the Harborton Restoration Project (Project or Site) and finished the plantings in 2021. As part of the restoration work, PGE will perform monitoring and maintenance of the Site for ten years. Components of the project include:

Habitat Area (acres):	53.4
Off-channel Habitat (acres):	28
Riparian Buffer (acres):	13.5
Lowest Elevation/Highest Elevation (ft):	8/44
Large Wood Pieces:	438
Vertical Snags:	73
Mink Rock Piles:	12

The monitoring program covers the following elements:

- Geomorphology
- Hydrology and Hydraulics
- Sediment
- Vegetation
- Water Quality
- Fish and Wildlife

Monitoring results indicate the Site is meeting or exceeding performance standards for nearly all performance standards as summarized in the following table.

Table 1. 2022 Performance Standard Summary

Performance Standards	Met/Not Met	Adaptive Management Needed	Notes
Retention of Habitat Features/Elements	Met		
Extent of ACM Habitat	Met		
Extent and Stability of Channel, Streambank, and Floodplain Habitat	Met		
Preservation of Fish Passage/Fish Accessibility	Partially Met		
Retention of Wetland Hydrology/Habitat for Use by Northern Red-legged Frog	Met		
Extent of High Flow Inundation	Met		
Vegetation Density/Diversity/Cover	Met		
Riparian Forest, Scrub-shrub, and Upland	Not Met	Yes	Diversity std met; Density std not met
Reed Canarygrass (RCG) Across Relevant Habitats	Not Met	Yes	RCG management planned for 2023

1. Introduction

This document is the Year 2 Effectiveness Monitoring Report (EMR) prepared for the Portland General Electric Harborton Restoration Project (Project). This report documents habitat conditions for the PGE Harborton Habitat Restoration Project (Harborton). The Portland Harbor Natural Resources Trustee Council (Trustee Council) developed the Portland Harbor Natural Resources Damages (NRD) Monitoring and Stewardship Framework (M&S Framework; Trustee Council 2014) to aid Project Implementers (PIs) in designing site-specific monitoring and stewardship plans for NRD restoration projects. As part of the guidance, the Trustee Council presented an EMR model detailing required monitoring over an initial performance period of 10 years following construction/implementation or as needed until performance standards are met. This EMR presents performance goals, monitoring methods and monitoring results, management efforts, and adaptive management strategies to promote and improve ecological functions.

Background

Habitat restoration activities at the 53.4-acre Site occurred from June 2020 to February 2021 (Figure 1). Restoration activities included earthwork to create Willamette River floodplain and a new stream channel, upland forest habitat, native plant installation, weed management, and wildlife structural habitat. Supplemental restoration work not in the approved Harborton Habitat Development Plan but performed at the request of the Trustee Council included placing additional large woody material in July 2021 and adding two mink rock piles in October 2021. Year 2 site effectiveness monitoring commenced in January 2022 and was complete in November 2022.

The Project's restoration goals are:

- Provide seasonal fish passage opportunities between Sub Areas 3, 4, and the Willamette River through construction of the new North Channel
- Provide 28 acres of seasonally available off-channel habitat associated with the North Channel, and an additional 13.5 acres of riparian buffer within the floodplain for out-migrating juvenile Chinook salmon (*Oncorhynchus tshawytsch)* through excavation and re-grading of portions of the Site.
- Enhance aquatic, riparian, and upland habitat in and proximate to the new North Channel through installation of habitat enhancement features/elements, invasive species management, and re-vegetation with native emergent, herbaceous, shrub, and tree species.
- Preserve existing wetland in areas utilized by northern red-legged frogs (*Rana aurora aurora*) and other wildlife.
- Create new wetland in upland areas adjacent to known red-legged frog habitat through excavation and removal of historically imported fill in Sub Area 3, installation of aquatic and riparian habitat enhancement features/elements, management of invasive plant species, and re- vegetation with native emergent, herbaceous, shrub, and tree species.

This report is organized into sections that generally follow the order of monitoring elements described in the Monitoring and Adaptive Management Plan (MAMP) (PGE 2021). Monitoring elements defined in the MAMP but not required for study and reporting in 2022 are omitted.

2. Monitoring Requirements

2.1 EFFECTIVENESS MONITORING

The objective of effectiveness monitoring (EM), as described in the MAMP, is to document the change in habitat conditions occurring as habitat enhancement measures mature and evolve. The EM was designed in accordance with the "Monitoring Plan Study Design" guidance provided by the Trustee Council (Trustee Council 2014) with some modifications approved by the Trustee Council and additional minor adjustment described in the sections below. The MAMP describes specific methods and performance standards used to measure and evaluate habitat elements. The EM study examined the following monitoring elements:

- Geomorphology
- Hydrology and Hydraulics
- Sediment
- Vegetation
- Water Quality
- Fish and Wildlife

The following section includes descriptions of each monitoring element, methods, results, performance standards, and a discussion of findings. Fixed monitoring points in key locations, and aerial orthomosaic images were the basic tools used to collect site data.

2.2 GEOMORPHOLOGY

Geomorphological features are those physical features that add complexity and dimension to Harborton. They include landscape patterns and irregularities, structures from natural materials, masses and voids that influence wind, water, temperature, and any number of other physical elements. Monitoring and assessment involve topographic surveys, photography, hydrology, hydraulics, and visual inspections to verify that the total quantity of habitats proposed occur on site, that there are no barriers to fish access, and that structural habitat features installed during Site construction remain functional. Descriptions of specific monitoring protocol are included in the following sections.

2.2.1 Retention of Installed Habitat Features/Elements

Retention of installed habitat features/elements is studied in years 1, 3, 5, 7, and 10. Details about habitat feature retention will be described in the 2023 Year 3 monitoring report.

2.2.2 Extent of ACM Habitat

Extent of ACM habitat is examined in years 0, 1, 3, 5, 7, and 10. Details describing ACM habitat extent will be included in the 2023 Year 3 monitoring report.

2.2.3 Extent and Stability of Channel, Streambank, and Floodplain Habitat

Extent and stability of channel streambank, and floodplain habitat is examined in years 0, 1, 3, 5, 7, and 10. Details describing such conditions will be included in the 2023 Year 3 monitoring report.

2.2.4 Preservation of Fish Passage /Fish Accessibility

EM of fish passage design features was documented by monitoring fish passable conditions in the North Channel from August to October. This assessment was based on observations at the confluence of the North Channel and Willamette River, and at the top end of North Channel looking for barriers such as accumulated debris, over-steep gradients, or head cuts. At the Trustee Council's Request, water temperature in the channel was noted and is discussed below in the context of suitability for fish during periods when the North Channel is disconnected from the Willamette River.

Methods

NOAA Fisheries' Anadromous Salmonid Passage Facility Design criteria (NOAA Fisheries 2008) was referenced to determine conditions needed for fish passage as applicable to the North Channel. Field observations were made to identify barriers. Observations of channel conditions were made 12 times during fieldwork in 2022 between August 1st and October 31st.

At the Trustee Council's request, PGE added observations of North Channel surface water depth and connectivity to Sub Area 4. Observations were initiated on May 3, 2022, following the Trustee request. Methods included visual observation of channel conditions and, when dry, measurement of dry channel length from Sub Area 4 to the closest North Channel surface waters.

Surface water temperatures in the North Channel were measured by remote, water data logging devices that measure depth and temperature. The devices were deployed at the upper and lower ends of the channel.

Results

High water in 2022 at Harborton occurred in mid-June. Backwater flooding from that event receded through July and into early August. Open water in the Sub Area 3 floodplain was present during this period, providing opportunity for fish access and movement.

As-built conditions were constructed so that fish passage into North Channel from the Willamette and from Sub Area 4 is not impeded due to excessive gradient, depth, and channel velocity. Field observations indicate no significant changes to as-built channel conditions, therefore slope and velocity conditions are assumed to be within acceptable fish passage ranges.

The confluence of the North Channel with the Willamette River is the primary dynamic, fluctuating feature along its entire length. Interaction with Willamette flow, tidal fluctuations, and backwater flooding create variations in sediment composition and distribution through the year. In mid-August, receding floodwater exposed a coarse gravel bar that formed perpendicular to the North Channel (i.e. parallel to the Willamette River). This feature diverted channel flow a short distance east, flanking the bar and forming a shallow, intermittent connection to the Willamette that likely prevented or inhibited fish movement (see Appendix A, Photographs 1-3). These conditions persisted from first observation on August 16 to September 28 when a minor rain event on September 27-28 caused an increase in North Channel flow sufficient to erode the gravel bar and create a narrow, less sinuous connection to the Willamette that has persisted to the present.

Observations of North Channel depth and extent noted that surface water connectivity to Sub Area 4 was lost between July 22 and July 24. Surface water connectivity had not re-established as of the writing of this report. Dry channel length was 18 feet on July 24 and increased to 270 feet by August 16 where it remained for the rest of the monitoring period.

Table 2. North Channel Maximum Water Depths (inches)

Station	25-May	17-Jun	6-Jul	16-Aug	12-Sep	25-Oct	9-Nov
1	6.5	*	17.5	5.5	7.75	4.25	4.25
2	5.0	*	5	3.5	2.75	2.0	2.0
3	1.25	29	2.5	dry	dry	dry	dry

*water measurement inaccessible - flood conditions

City water-system flushing was relocated away from Harborton wetlands on October 15. Subsequent channel depth measurements dropped in the following weeks, though correlation is difficult to establish because no direct connection from the stormwater system to Sub Area 3 has been confirmed and channel water levels were trending shallower prior to the relocation.

Water temperatures experienced a slight decline and cooling trend from August 16 to September 28, 2022, the period during which the North Channel connectivity to the Willamette River was interrupted. Peak water temperature in the channel was 70.3 deg F on August 8 (see Appendix C, Station 1). Temperatures on August 16 to September 28 were 68.2 and 60.1 deg. F, respectively.

Performance Standard

The performance standard is for the North Channel to not have fish passage barriers, as defined in NOAA Fisheries' Anadromous Salmonid Passage Facility Design (NOAA Fisheries 2008).

Discussion

The performance standard for fish passage was met except for a brief period in mid-August to September 28. During this time a mixed sand/gravel bar formed by the Willamette River caused deformation of the exposed Willamette riverbank, just outside the project area, from a single-thread channel to a shallow braided channel. However, speckled dace (*Rhinichthys osculus*) was observed in the North Channel during all 12 field observations made in August-October, indicating suitable conditions for fish to persist through a period when the channel was expected to be dry.

Formation of the gravel bar at the North Channel/Willamette River confluence is consistent with conditions observed at other Willamette River tributaries like the North Channel. Dynamic, constantly changing conditions will inevitably lead to temporary fish passage barriers in such streams that will, in time, be eroded and erased as the tributary regains competence (i.e. ability to move sediments) when discharges increase. Efforts to prevent such bar formations are inevitably likely to fail and would be counter to natural processes.

Periods where surface water is absent in the North Channel were expected. In fact, surface water persisting throughout the year was not anticipated. North Channel was designed to be fed by Sub Area 4 when surface water elevations in that area exceeded 15.4 feet CPD, and by Willamette River seasonal backwater flooding all other times. The fact that surface water has persisted since construction is a fortunate condition that increases the variety of ecological functions at Harborton.

The shallow braided channel that formed at the outlet limited water outflow to the Willamette River extending the duration of wetted channel during the hottest period of the year. This may have contributed to the warmer water temperature potentially providing refugia for organisms able to tolerate high water temperatures. These higher temperatures could cause stress or be lethal to species that prefer cooler water temperatures, if present.

Water temperatures in the North Channel showed no unusual spike or increase when the channel was disconnected from the Willamette River. Water monitoring Station 1 showed a relatively steady, stable temperature increase from January 1, 2022, to its peak on August 8, as expected in spring and summer months, followed by a similar, stable downward trend in water temperature from August 8 through October 1. The relative stability in temperature trend may indicate that water in the channel does not stagnate and become a thermal sink when disconnected from the Willamette River. This may be due to water contributions from groundwater sources that keep the channel wet during dry weather periods. City of Portland water system flushing, discussed in Section 2.3.1 below may also have contributed to a stable temperature trends.

2.3 HYDROLOGY AND HYDRAULICS

Water levels in the North Channel off-channel areas, ACM, and shallow water habitat are important to the overall habitat function of the Site. Many valuable habitat functions depend on the ways water functions and interacts at the Site. This section describes monitoring results for water depth and

surface water duration and extent in Sub Area 4 and a portion of Sub Area 3 wetlands from January to July, the key period for amphibian breeding and rearing. At the request of the Trustee Council following the review of the 2021 Year 1 Monitoring Report, PGE tracked North Channel connectivity to Sub Area 4, length of the dry channel, and made occasional measurements of water depth in the channel at Water Monitoring Stations (see Figure 2).

2.3.1 Retention of Wetland Hydrology/Habitat for Use by Northern Red-Legged Frog

Effectiveness Monitoring (EM) was conducted to ensure there was no substantial loss of wetland area, hydroperiod, and function, which are important for the existing population of northern red-legged frogs. EM of wetland hydrology included measurements to document the depth and areal extent of open water wetlands in Sub-Area 4 for the period of January through July to determine if wetlands persist at sufficient depths to support frog egg-laying and metamorphosis from the tadpole to froglet phase. EM of northern red-legged frog habitat will be achieved through monitoring hydroperiod, wetland/open water area and depth, and duration from Year 1 through Year 10 of the Performance Period. Suitable amphibian habitat within the property boundaries was quantified based on assessment of standing water (areal extent, duration, and depth) necessary for frog egg-laying and larva metamorphosis (transformation from tadpoles to frogs).

Methods

Water level data was collected using HOBO remote barometric pressure readers georeferenced to site-specific topographic data and to specific river discharge levels (i.e., OHW, OLW, flood stage, and low tide at MLW). An atmospheric HOBO was deployed to process and correct water elevations.

Two HOBO water level measuring devices were deployed to document water depth in Sub Area 4. The HOBO devices in Sub Area 4 wetland are in established, screened well casings used over the past several years. Depth readings were compared to Site elevations to determine average monthly surface water depths from January through July, and average weekly surface water elevations in June. Depth measurements were used to calculate areal extent of flooding and duration of surface water based on correlating depth to Site topography. Areal surface water extent was then compared to monthly/weekly averages established during baseline studies (see Table 3 below).

Two additional HOBO devices were deployed: one at the head of the North Channel and one at the downstream end near the channel confluence with the Willamette River. A third HOBO located mid-channel was not located and is considered lost.

Results

Table 3 below shows areal extent and water depths for Sub Area 4 for the monitoring period of January through July, with the critical development period in June shown week to week. Water depths from January through July were above normal. Data show that surface water persisted throughout the year in the section of wetland used by northern red-legged frog for breeding and

larval development (Appendix B). The lowest surface water elevation measured in 2022 was 0.76 feet on both August 27 and September 1. These results suggest that Sub Area 4 retained surface water throughout 2022. Water elevation data is included in Appendix B.

Bullfrog colonization is a risk to native fauna wherever open water is found. Given the excessively wet conditions in 2022, observations for evidence of bullfrog (egg masses, tadpoles, froglets and adult frog sightings or sounds) were performed during fieldwork. In 2022, one suspected bullfrog "peep" sound was noted along the Northern Channel in Sub Area 3 in mid-July. A search of the area on that occasion and on every subsequent field visit did not find evidence of bullfrog presence, nor were any other sounds of bullfrogs heard. PGE will continue to be vigilant for evidence of bullfrogs and will report any sightings or other evidence in subsequent reports. No other action is recommended at this time.

Table 3. Water Areal Extent and Depth

Month		Areal Extent (ac)			Depth (ft)		
		Perf. Standard (min)	Estimated	% of Std.	Perf. Standard (min)	Measured	% of Std.
Jan		9.4	12.0	127%	3.4	3.71	109%
Feb		10.03	10.7	106%	3.52	3.42	97%
Mar		10.55	11.7	111%	3.66	3.65	100%
Apr		9.55	11.7	123%	3.21	3.63	113%
May		8.01	11.9	149%	2.63	3.69	140%
June (week)	1	2.84	11.1	391%	1.4	3.52	251%
	2	1.76	13.6	772%	1.1	5.21	474%
	3	1.29	14.4	1,116%	0.88	4.53	515%
	4	1.02	12.1	1,186%	0.75	3.73	497%
July		0.11	9.9	9,000%	0.48	3.26	679%

Performance Standard

From January through May, areal extent and depth of the wetland should be no less than 80 percent of the baseline measurements (<20 percent change from baseline, defined by pre-project monthly averages). In June, the areal extent and depth of the wetland should be no less than 90 percent of the baseline measurements, as defined by pre-project weekly median (weeks 23-26 as defined in PGE's November 19, 2019 memo).

Table 4. June Minimum Open Water and Depth Standards

June (week)	June Minimum Areal Extent 90% of median open water (acres)	June Minimum Depths- 90% of median depth (ft)
1	2.84	1.4
2	1.76	1.1
3	1.29	0.88

4	1.02	0.75

Discussion

Performance standards were met for all of 2022. A record wet spring in 2022 is reflected at the site by persistent, extensive surface water into July. The high-water event in 2022 occurred on June 15 when water levels in both the Willamette River and Columbia River were relatively high, causing floodwaters to back into Harborton. Fieldwork conducted over the summer months confirmed via direct observation that Sub Area 4 retained surface water through the summer, though a rapid drawdown occurred through July and into August.

Factors that may have contributed to persistent surface water include the City of Portland's flushing their water system via a fire hydrant located along NW Marina Way. Hydrant flushing in 2022 began in April and continued through October 15 when the flushing system was relocated away from the Site wetland. During that period, the flushing system operated at a rate of 160 gallons per minute for 6 hours each day (equivalent to 403,200 gallons per week). Water from the City drains to a stormwater system that outfalls directly into Sub Area 4. PGE and the City have agreed to use the new flushing location in 2023 to help manage excessive standing water in Sub Area 4. Should 2023 be an excessively dry spring, however, PGE can request the system be temporarily located at its original location to provide supplemental water to Harborton wetlands.

2.3.2 Extent of High Flow Inundation

Extent of high flow inundation is used to assess the extent of Active Channel Margin (ACM). ACM is that portion of the river's edge that is located at the interface of unwetted shoreline and shallow water and occurs from the OHW mark to OLW. Young-of-the-year Chinook move in association with the shoreline edge, thus areal extent of inundation is important.

Methods

High flow inundation was assessed by taking the highest water depth reading from HOBOs deployed to the site and creating an orthophoto image showing open water extent correlated to that site elevation.

Results

The highest measured water elevation was 17.98 feet CPD on June 15, 2022, which is 99.9 percent of the expected 18.0-foot elevation.

Performance Standard:

The Performance Standard for this monitoring element is <20% reduction from baseline.

Discussion

The performance standard was met. High water inundation in 2022 was 17.98 feet, which is 99.9 percent of the baseline high flow of 18.0 feet defined in the HDP. The observed high flow elevation correlated to an estimated surface water area of 27.9 acres, which is 99.6 percent of the estimated 28 acres of ACM at 18.0 feet CPD.

2.4 SEDIMENT

Sediment monitoring occurs in years 1, 3, 5, 7, and 10. Details describing such conditions will be included in the 2023 Year 3 monitoring report.

2.5 VEGETATION

EM of vegetation consisted of sampling across the entire Site to evaluate establishment, enhancement, and conservation of native vegetation. Vegetation assemblage/starting conditions that were monitored and evaluated include the following:

- Upland Forest Establishment
- Upland Scrub-Shrub Establishment
- Riparian Forest Establishment
- Riparian Forest Enhancement/Conservation
- Wetland (ACM) Establishment
- Wetland (ACM) Enhancement/Conservation

2.5.1 Vegetation Assessment Methods

EM of vegetative community development employed 2 line-intercept transect approaches. The first approach collected data on all habitats across the Site equally using the general habitat assessment configuration of the line-intercept methodology (Figure 3). The second approach gathered vegetative data specifically within the ACM of the North Channel on Site using the stream habitat assessment configuration of the line-intercept method (Figure 4). Methods and results for each of the two line-intercept transects approaches are described in the following sections.

The Trustee Council's Monitoring & Stewardship Framework guidance document suggests using belt transects to estimate shrub cover. In the MAMP, PGE instead proposed using 100-meter line-intercept sample transects (Bonham 1989) as described in the Methods section below.

Each habitat class has a minimum of 10 permanent monitoring plots located along linear transects, except for Upland Forest and Upland Scrub-Shrub which has a combined 10 monitoring plots due to limited acreage. A base transect was located along the southwestern border of the Site, parallel to NW Marina Way. Survey transects were established perpendicular to the base transects, at fixed 100-meter intervals. The location of the first survey transect was randomly established between 0-50 meters from the southeastern end of the base transect (Elzinga et al. 1998; Figure 3).

Establishment of specific plot locations were along parallel, equally spaced transects. The first plot in the transect was randomly located and subsequent plots were spaced at equal intervals along the transect. Interval spacing distances were adjusted for each habitat class to provide a minimum of 10 plots per class.

Areas not covered by vegetation were recorded as bare substrate. Notation was made as to whether the bare substrate was open water, litter, duff, wood, bare soil, or rock. Total cover in a plot was recorded as absolute values and therefore may exceed 100 percent due to layering.

For shrub and tree cover, the crowns are projected vertically. Distinct holes in the canopy were subtracted from the estimate. Plants overhanging into the sample plot, but that are rooted in an area that does not represent plot conditions or habitat classification, were subtracted from cover estimates. Plants that overhang into the sample plot that have the same habitat classification and plot condition were included in cover estimates. For example, a plot in emergent wetland that has overhanging canopy from a nearby upland area would not record canopy cover from those trees rooted in the upland area.

In shrub-dominated and forested systems, the number of live stems emerging from the ground for shrubs and the number of live stems for trees were counted. A plant counted if any part of the stem lies within the plot. Shrub and forested habitat classes are distinguished for stratification based on potential height, not actual height. Seedlings and woody sprouts will be counted as shrubs or trees. Areas with a predominance of tree species, regardless of current size, will be considered forested habitat.

Data for each plot was entered into an excel spreadsheet that included the following elements:

- Plot ID
- Plant species
- Plant strata (herb, shrub, tree)
- Plant classification
    - Native
    - Non-native, not listed
    - invasive
- Percent absolute cover
- Number of plants (woody species only)

The current Oregon Department of Agriculture (ODA) Noxious Weed list and the Portland Plant List (Rank A, B, and C lists) were referenced to identify “invasive” non-native plants. These plants were categorized separately from other non-native plants, which were termed ”non-native, not listed” to distinguish them from invasive species. The distinction between these two categories (“invasive” and “non-native, not listed” was incorporated into plant tables in Appendices D and E.

The sample mean and confidence interval were calculated and compared to each performance standard to determine if action is necessary or if the objective has been reached. The objective is to be 80 percent confident that the estimate reported is within ±10 units of the true population. Values for vegetation performance standards (excluding diversity) will be reported as Mean (CIx = Y1-Y2), where:

CI = confidence interval
x = 80% confidence level
Y1 = low estimate
Y2 = high estimate

Y1 and Y2 are calculated as Mean ± (standard error * t-factor 80%). Standard error is calculated as the standard deviation divided by the square root of the number of samples taken in the habitat unit (stdev/sqrt(n)). The t-factor for an 80 percent confidence level is 1.282.

Sample plots for each habitat type were compared to performance standards separately. Table 5 below describes which habitat type each sample plot represents.

Table 5. Sample Plots in Each Habitat Type

Upland Forest Establishment	Upland Scrub-Shrub Establishment	Riparian Forest Establishment	Riparian Forest Enhancement/ Conservation	Wetland (ACM) Establishment	Wetland (ACM) Enhancement/ Conservation
T06-2, 3, 4	T06-1	T04-1, 2, 7, 8, 9, 10	T01-2	T04-3, 4, 5, 6	T01-1
T07-2, 3, 4	T07-1	T05-1, 6, 9, 10	T02-4, 6, 7	T05-2, 3, 4, 5, 7, 8	T02- 5
T08-2	T08-1		T03-5, 6, 8, 9, 10		T03-7
			T04-11		
			T05-11		
			T06-5		
			T07-5		
			T08-3		
			T09-1		

Fieldwork was performed on July 13, 18, 20-22, 24 and August 18-19.

2.5.2 Performance Standards and Results

Vegetation monitoring results are included below. Each of the following habitat-type subsections includes performance standards and results. Vegetation monitoring results for each transect and sample plot can be found on data sheets in Appendix D.

2.5.2.1 Upland Forest Establishment

Performance standards for Upland Forest Establishment include the following:

- Density: ≥1,200 native woody plants per acre – NOT MET
- Diversity: ≥3 native tree species and ≥5 native shrubs - MET
- Cover: ≥10% native herbaceous; ≤10% invasive herbaceous (excluding RCG) and ≤10% invasive shrub cover standard - MET

The density of native tree and shrub species in the seven sample plots was 1,153 per acre, a reduction of 15 percent from 2021 (1,355/ac). Six native tree and five native shrub species were recorded in the sample area. Cover of native plants averaged 98 percent in the sample area. Large-leaved lupine (*Lupinus polyphyllus*) and riverbank lupine (*L. rivularis*) comprised the greatest percent of native groundcover at 83 percent aggregated. Invasive herbaceous cover was negligible, with Queen-Anne's lace (*Daucus carota*) covering 2 percent of one plot and hairy-cat's ears (*Hypochaeris radicata*) covering 1 percent of one plot.

2.5.2.2 Upland Scrub-Shrub Establishment

Performance standards for Upland Scrub-Shrub Establishment include the following:

- Density: ≥1,200 native woody plants per acre – NOT MET
- Diversity: ≥5 native shrubs – NOT MET
- Cover: ≥10% native herbaceous; ≤10% invasive herbaceous cover standard (excluding RCG) and ≤10% invasive shrubs cover standard. - MET

Stem density was 739 stems per acre for the three scrub-shrub sample plots. Four native shrub taxa were represented in the three sample plots, falling short of the diversity criterion. Native herbaceous groundcover was 98 percent and comprised primarily of lupine. Invasive cover, included hairy-cat's ears and Canada thistle (*Cirsium arvense*) averaging 1 percent over the three sample plots. Himalayan blackberry (*Rubus armeniacus*) comprised 5 percent cover in one of the sample plots and was absent from the other two.

2.5.2.3 Riparian Forest Establishment

Performance standards for Riparian Forest Establishment include the following:

- Density: ≥1,200 native woody plants per acre – NOT MET
- Diversity: ≥3 native tree species and ≥5 native shrubs - MET
- Cover: ≥10% native herbaceous; ≤10% invasive herbaceous cover standard (excluding RCG) and ≤10% invasive shrub cover standard – MET

Woody plant density was 1,060 per acre, which is below the performance criterion. Tree distribution over the fifteen sample plots was relatively even; trees were recorded in all but two plots (Transect 04, Plot 9 and Transect 05, Plot 9). Nootka rose (*Rosa nutkana*), and Saskatoon serviceberry (*Amelanchier alnifolia*) also occurred in four of the ten sample locations. Overall, six native tree and 10 native shrub taxa were recorded in the sample plots, meeting the diversity criterion.

Cover of native, non-native (not listed), and invasive herbaceous species was 51 percent, 8 percent, and 2 percent, respectively, excluding RCG. Predominant native herbaceous cover was yarrow, tall bentgrass (*Agrostis exarata*), riverbank and large leaved lupine, and yarrow which were found in 8, 7, 7 and 6 sample plots, respectively. Non-native (not listed) perennial ryegrass (*Lolium perenne*) is the principal non-native (not listed) herbaceous plants which occurred in 6 of the 10 plots. The principal invasive herbaceous species was white clover (*Trifolium repens)* which occurred in 5 of 10 sample plots, and averaged 2 percent cover in those 5 plots. Himalayan blackberry was found in 7 of the 10 sample plots and Scot's broom (*Cytisus scoparius*) was recorded in 5 of 10. .

2.5.2.4 Riparian Forest Enhancement/Conservation

Performance standards for Riparian Forest Enhancement/Conservation include the following:

- Density: ≥1,200 native woody plants per acre – MET
- Diversity: ≥3 native tree species and ≥5 native shrubs - MET
- Cover: ≥10% native herbaceous; ≤10% invasive herbaceous (excluding RCG) and ≤10% invasive shrub/tree cover – MET

Woody plant density was 1,384 woody plants per acre. Five native tree and 11 native shrub taxa were recorded in the study area. Native herbaceous cover averages 22 percent in this habitat zone; invasive herbaceous cover, excluding RCG, is 1 percent. Principal native herbaceous species include slough sedge (*Carex obnupta*) and yarrow. The majority of non-native (not listed) cover is perennial ryegrass and predominant invasive herbaceous plants are Canada thistle (*Cirsium arvense)* and Queen-Anne's lace (*Daucus carota)*. Invasive shrub/tree cover consisted of Himalayan blackberry with 8 percent total cover.

2.5.2.5 Wetland (ACM) Establishment

Performance standards for Wetland Establishment include the following:

- Diversity: >5 herbaceous species (occupying >5% cover in at least 10% of sample plots) - MET
- Cover: ≥30% native herbaceous; ≤10% invasive herbaceous (excluding RCG) – MET

There were 12 native herbaceous plants occupying >5 percent cover in at least 10 percent of sample plots, which exceeds the >5 minimum. The herbaceous taxa most frequently found in sample plots are water foxtail (*Alopecurus geniculatus;* 8 plots), water plantain (*Alisma plantago-aquatica;* 6 plots) and American sloughgrass (*Beckmannia syzigachne;* 8 plots).

Native herbaceous cover is 79 percent and invasive herbaceous cover is 4 percent. Invasive cover is comprised primarily of white clover (*Trifolium repens*) and bird's-foot trefoil (*Lotus corniculatus*), both of which were found in 4 of the 10 sample plots.

2.5.2.6 Wetland (ACM) Enhancement/Conservation

Performance standards for Wetland Enhancement/Conservation include the following:

- Diversity: >5 herbaceous species (occupying >5% cover in at least 10% of sample plots) – NOT MET
- Cover: ≥30% native herbaceous (NOT MET); ≤10% invasive herbaceous (excluding RCG) (MET)

Native herbaceous diversity is minimal in the three monitoring sample plots in this habitat zone. Small-fruited bulrush (*Scirpus microcarpus*) at 8 percent cover is the only taxon that meets the diversity occupation standard of >5 percent. Two native species, slough sedge (*Carex obnupta*) and trailing blackberry, occur in two plots at 5 percent, which falls just below the criterion standard.

Invasive Himalayan blackberry was recorded at 2 percent cover in one sample plot.

. RCG is the primary herbaceous ground cover in this habitat zone, comprising 45 percent cover on average over the three sample plots. No non-native (not listed) herbaceous species were observed.
Northern Red-legged Frog Wetlands

There are no performance standards for habitat in the Northern Red-legged Frog breeding area, which is the portion of Sub Area 4 with a surface elevation below 15 feet CPD. RCG is the dominant plant cover with an average of 79 percent cover. Four of seven sample locations have 100 percent RCG cover. The outlier is transect 2, plot 3 which has only 5 percent RCG cover. Predominant groundcover in this area is meadow foxtail (*Alopecurus pratensis*; 30 percent) and bluegrass (*Poa pratensis*; 40 percent). It is not clear why this area is different other than it occurs near the Olympic pipeline easement and may have been disturbed and reseeded in the past. Why RCG has shown no noticeable encroachment into this area over the short monitoring period may be of interest in restoring RCG-infested areas. Slough sedge is the only native groundcover observed in this area, occurring at 3 percent cover in one of the seven sample plots (Transect 3, Plot 3).

2.5.3 Discussion

Performance standards for plant diversity and cover in all established habitat areas were met, except for the diversity criterion in Upland Scrub-Shrub Establishment habitat. Diversity and cover of herbaceous vegetation were not met in Enhancement/Conservation wetlands, mostly due to reed canarygrass cover and/or dense tree canopy. Woody vegetation in established habitat falls short of the performance criterion of ≥1,200 woody stems/acre (density). Shortfalls appear due to browsing by deer and general mortality. Supplemental plantings in early 2022 contributed to better performance but will need to be supplemented with additional woody plantings in winter 2022/23. On the upland berm in Sub Area 2, dense, tall lupine growth likely obscured several woody plants, causing an undercount of woody plants. Supplemental plantings, however, are planned in 2023.

The current herbaceous vegetation composition in enhancement/conservation areas comes close but does not meet diversity and cover performance standards. Herbaceous plantings and weed management to encourage natural recruitment are planned for 2023 to meet performance standards.

Shortfalls in herbaceous density and diversity cover standards can almost entirely be attributed to RCG. RCG persists as the predominate groundcover (45 percent) in the Wetland Enhancement/Conservation areas and is a significant component (22 percent) of the Riparian Forest Enhancement/Conservation zone. Dense Himalayan blackberry was an existing site characteristic before habitat work and is a weed management issue rather than a new, emerging issue. Weed management to reduce RCG and blackberry cover is planned for 2023. Blackberry management will include hand cutting and, if allowed by the DSL (Oregon Department of State Lands) permit, herbicide application in Sub Area 4. RCG control will include herbicide and possibly solarization measures. Solarization involves covering areas of RCG with black plastic to create heat, block sunlight, and limit water from precipitation to stress or desiccate the plant.

Table 6 below summarizes site performance for Site Vegetation Monitoring.

Table 6. Site Vegetation Perf. Summary

	Habitat Type					
Perf. Standard	**Upland Forest Estab.**	**Upland Scrub-Shrub Estab.**	**Riparian Forest Estab.**	**Riparian Forest Enhancem./Cons.**	**Wetland (ACM) Estab.**	**Wetland (ACM) Enhancem./Cons.**
Density	NOT MET	NOT MET	NOT MET	MET	n/a	n/a
Diversity	MET	NOT MET	MET	MET	MET	NOT MET
Cover	MET	MET	MET	MET	MET	NOT MET

2.5.4 North Channel ACM Habitat Vegetation Assessment Method

Methods were slightly modified following field trials, which found overlap with the general plant community sample plots and gaps that missed significant plant assemblages.

2.5.4.1 Methods

Vegetation species composition and approximate groundcover were recorded within the riparian zone of the North Channel. The riparian zone is defined as the vegetation within 15 meters of the North Channel's thalweg. The line-intercept method was employed for this study, with 10 transects oriented perpendicular to the North Channel thalweg (Figure 4). Transects extend from top to top of the Sub Area 3 channel excavation. Transects are unevenly spaced so that various orientations of the transects do not cross and transects vary in length depending on the extent of the floodplain area they span.

Transect endpoints are marked with 4-foot fiberglass rods. The rod tips are painted either orange or blue, alternating each rod to avoid error while following a transect line. Percent cover of herbaceous species was visually estimated, and number of woody plants was recorded in a contiguous plot measuring 1 meter wide and extending 15 meters perpendicular from on each side of the thalweg along the 10 transect lines. Fieldwork was performed August 16, 19, and 26, 2022.

2.5.4.2 Results

Vegetation within 15 meters of the channel is mostly planted or seeded species; little evidence of native plant recruitment is reflected in the sample plots. Volunteer cottonwood seedlings, however, are abundant along the North Channel and are expected to spread in the coming years.. Seven invasive plant species (including RCG), and six non-native (not listed) herbaceous plants were recorded along the transects. Of the thirteen, barnyard grass (*Echinochloa crus-galli;* 5 percent in two plots), annual bluegrass (*Poa annua;* 10 percent in one plot) and RCG (5 percent in two plots) were of any significance.

Native herbaceous plants occupying >5 percent cover in at least 10 percent of sample plots include the following:

- Yarrow (*Achillea millefolium)*
- Tall bentgrass (*Agrostis exarata)*
- Water plantain (*Alisma plantago-aquatica)*
- Water foxtail (*Alopecurus geniculatus)*
- American sloughgrass (*Beckmannia syzigachne)*
- Slough sedge (*Carex obnupta)*
- Western mannagrass (*Glyceria occidentalis)*
- Meadow barley (*Hordeum brachyantherum)*
- Spreading rush (*Juncus patens)*
- Large-leaved lupine (*Lupinus polyphyllus)*
- Riverbank lupine (*Lupinus rivularis)*
- Wapato (*Sagittaria latifolia)*
- Small-fruited bulrush (*Scirpus microcarpus)*

Native herbaceous cover averaged 43 percent, and non-native (not listed) herbaceous cover averaged 5 percent over the ten transects. Invasive herbaceous cover averaged 3 percent in the study area.

Performance Standard

The performance standards for ACM vegetation are:

- Diversity: >5 herbaceous species (occupying >5% cover in at least 10% of sample plots) - MET
- Cover: ≥30% native herbaceous and ≤ 10% invasive herbaceous (excluding RCG) - MET

2.5.4.3 Discussion

Riparian area conditions meet the Diversity and Cover performance criteria (Appendix E). Twenty-two different native plant species were observed in the areas monitored. Native areal cover

appeared to increase through the 2022 growing season, especially along transects 2 and 3 which retained shallow surface water into late summer.

Floating primrose is a pernicious, aggressive aquatic weed species. If left unchecked, it could quickly colonize and choke the North Channel. This plant spreads through stem and root fragments, so pulling as a management approach poses some risk of not resolving and possibly promoting propagation. PGE took an aggressive management approach by applying herbicide to all six of the individual plants discovered in the channel and will continue to monitor this plant to try to avoid its establishment.

2.5.5 Reed Canarygrass (RCG) Across Relevant Habitats (Wetlands)

Detailed data on RCG cover was assessed for all wetland areas at Harborton, except for 5.16 acres of Sub Area 4 wetlands that are excluded/prohibited from RCG management activities. Wetlands in RCG-managed areas include 6.62 acres in Sub Area 3 and 8.31 acres in Sub Area 4. Table 7 below presents sample plots located in wetlands that are managed for RCG:

Table 7 – Monitoring Plots in RCG-managed Areas

Transect	Plots
T1	1, 2
T2	5
T3	7
T4	3, 4, 5, 6, 8, 11
T5	2, 3, 4, 5, 7, 8, 11

Methods

Assessment methods included mapping RCG in the field by walking wetland areas while performing visual cover estimates, then mapping findings. Orthomosaic images were used to support interpretation of findings. Portions of Sub Area 4 below the 15-foot elevation are prohibited from RCG management and were not included in areal calculations.

Results

RCG cover in wetlands is estimated to be 34 percent across managed areas of the Site. RCG is mostly absent from the 6.62-acre wetland in Sub Area 3, though scattered RCG bunches are showing up in the North Channel and other areas. New RCG growth in Sub Area 3 is likely due to seed from Sub Area 4 seed sources. Because there is no foreseeable means to eradicate this seed source, control and management of small infestations is anticipated. RCG in Sub Area 3 will be aggressively treated in 2023 via hand digging and/or herbicide.

RCG in Sub Area 4 wetlands includes a range of conditions from emergent areas with an estimated 90 percent RCG cover to shrub and forested areas with an estimated 46 percent RCG cover. Table 8 below describes cover in each habitat area and provides an overall estimate based on weighing the percent RCG cover by wetland type. Herbicide applied to approximately 0.5 acres of RCG in the Sub Area 4 forested habitat in fall 2021 appeared to retard but not eliminate RCG growth. If allowed under DSL permit conditions, additional herbicide application coupled with mechanical clearing will be attempted in 2023.

Table 8. RCG Coverage in Managed Wetlands

Sub Area	Wetland	Acreage	Est. % RCG	Acres RCG
3	Emergent/Shrub/Forest	6.62	trace%	<0.01
4	Forested	4.37	46%	2.01
4	Scrub-shrub	1.1	46%	0.51
4	Emergent	2.84	90%	2.56
	Total Acres	**14.93**		**5.07**
			Percent RCG in Managed Wetlands:	**34%**

Performance Criteria

Performance criteria for RCG cover:

Years 1-5: ≤ 30% RCG
Year 7: ≤ 25% RCG
Year 10: ≤ 20% RCG

Discussion

The majority of RCG cover is in Sub Area 4 wetlands, much of which is utilized by northern red-legged frogs for breeding and, consequently, is not included in current management plans (Figure 5). Estimated RCG cover in managed wetlands for 2022 was 34 percent and does not meet the performance standard of less than 30 percent cover. The wetland removal-fill permit issued by Oregon Department of State Lands (DSL) ties herbicide use in Sub Area 4 to frog egg mass numbers. PGE has consulted with DSL to remove or modify this condition to allow better management of RCG in Sub Area 4. Discussions are on-going. Attempting to manage RCG in areas surrounded by RCG that cannot be managed will continue to present challenges for this standard.

PGE is considering installing black visqueen (plastic) sheets over sections of Sub Area 4 RCG in 2023 as a weed control alternative to herbicide application in case DSL restrictions on herbicide use remain in place. Black visqueen is used in "solarization" methods for managing reed canarygrass; the plastic sheets limit precipitation reaching the ground, obscure sunlight, and elevate surface temperatures, all intended to stress or desiccate the plants they cover. Such an approach is expected to have limited effect in Sub Area 4 for myriad reasons: areas not shaded by overhead canopy and

also not used by northern red-legged frog for breeding are limited, and groundwater is shallow and persistent late into the growing season so desiccation will be harder to achieve. Nevertheless, experimentation over a limited (est. 0.1-acre area) is planned for 2023. If shown to be effective in managing RCG additional areas may be treated in 2024 and beyond.

2.6 WATER QUALITY

EM of water quality criteria included measurements of temperature and dissolved oxygen (DO) in the North Channel. The purpose is to better understand conditions under which juvenile salmonids and other fish are expected to be on site.

Methods

Two long-term temperature monitoring sensors are installed in fixed locations in the North Channel. Temperature sensors gathered temperature data in one-hour intervals. One sensor is installed near the channel outlet near the Willamette River (Station 1; see Figure 2); the other is installed at the upstream entry to the channel adjacent to Sub Area 4 (Station 3).

DO was measured using a hand-held meter (Milwaukee MW600). Prior to use, the device was calibrated per manufacturer specifications. Readings were collected at three locations within North Channel (Figure 2) except during periods of flooding when readings were done along the shoreline as close to the monitoring station as possible.

Results

Table 9 below shows dissolved oxygen levels for the months surveyed to date. Tables 10 and 11 show temperature readings for Stations 1 and 3, respectively.

Table 9. Dissolved Oxygen (mg/L)

Station	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov
1	13.6	12.3	12.4	11.7	11.6	11.7	8.4	8.6	8.7	9.8	12.4
2	13.1	13.0	12.3	12.2	11.6	11.7	8.1	8.0	7.9	9.3	12.1
3	13.2	12.9	12.7	12.2	11.5	11.7	7.7	dry	dry	dry	dry

Table 10. Temperature at Water Monitoring Station 1

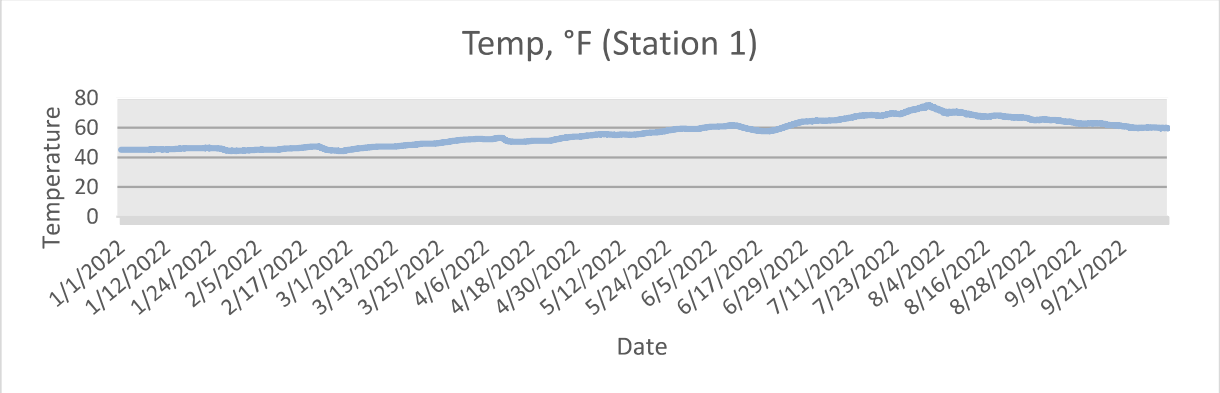
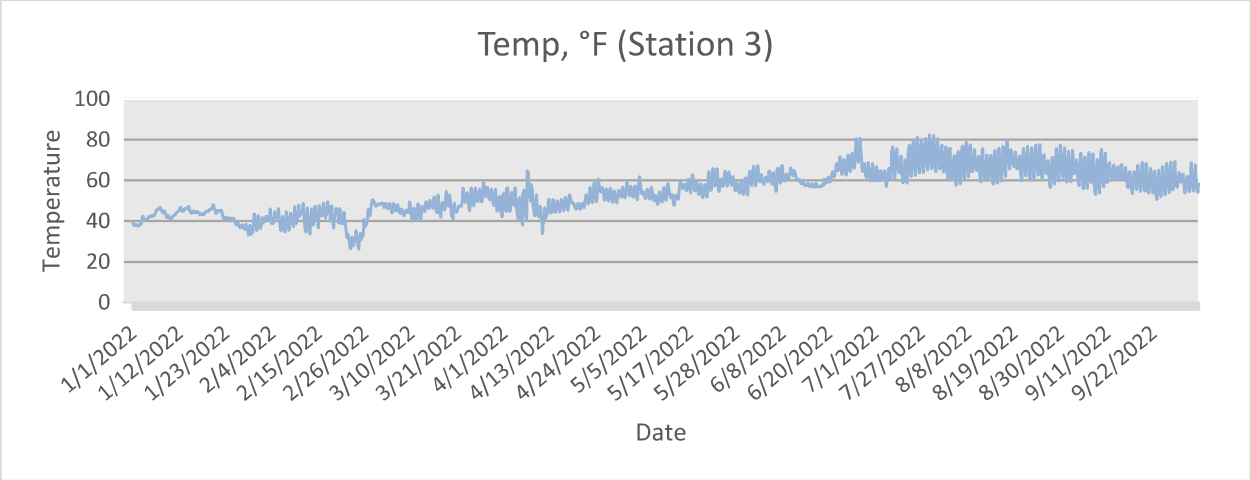


Table 11. Temperature at Water Monitoring Station 3



Performance Standard

There is no required performance standard for this monitoring element.

Discussion

Dissolved oxygen levels in the North Channel waters are adequate to support aquatic life, including salmonids (USGS 2022). DO levels below 6.5-8.0 mg/L are considered low but non-lethal. Levels below 2 mg/L are considered anoxic and potentially lethal to aquatic organisms. Maximum temperature readings appear to reflect that the probes were deployed on the channel surface in shallow water and were affected by ambient temperatures and direct sunlight on the probe casing. Redeployment of North Channel HOBOs using slotted casing installed just below the channel bottom, as is the configuration for the Sub Area 4 probes, is planned for 2023.

2.7 FISH AND WILDLIFE

Monitoring for fish and wildlife is not required in 2022 with the exception of amphibian egg masses and tadpole observations. Detailed fish and wildlife observations will be included in the 2023 Year 3 monitoring report.

Monitoring for northern red-legged frog (*Rana aurora aurora;* RAAU) egg masses occurred on February 11, 2022. Table 12 summarizes egg mass findings over the past 5 years. PGE enquired about amphibian egg-mass data collected by others in nearby wetlands to serve as reference but was unable to acquire that data at the writing of this report.

Table 12. Sub-Area 4 Amphibian Egg Mass Counts
Rana aurora aurora

Date	Developing	Hatched	Bleached	Total
2/28/2018	137	0	21	158
3/14/2019	144	46	4	194
2/20/2020	1387	0	5	1392
2/27/2021	411	23	1	435
2/11/2022	168	4	0	172

Observations of tadpole development on March 31 noted evidence of leg buds on RAAU tadpoles. Efforts to collect tadpoles on May 25 were unsuccessful and flooding in June prevented further sampling. Table 13 below compares Harborton egg mass numbers to those found in Northern Multnomah Channel during Metro's annual survey.

Table 13a. Northern Red-legged Frog Regional Survey

Year	Harborton (PGE)	N. Mult. Channel (Metro)
2018	158	35
2019	194	56
2020	1392	64
2021	435	29
2022	172	n/a

Harborton and N. Multnomah Channel annual surveys essentially show parallel trends in numbers year-to-year. That is, when Harborton egg mass numbers increase compared to the previous year, so do Metro's; similarly, a decline from 2020 to 2021 is reflected in both sets of data. Drawing comparisons, however, should be done with caution, and any statistical analysis comparing the two data sets would be difficult because of differences in survey methods. For example, Metro conducts multiple counts at the same location in a given year; the 2018 survey included eleven field days while 2021 included two. Data for 2022 was not available at the writing of this report.

Other key 2022 Harborton observations worth noting include juvenile salmonid use of the site (documented in an earlier PGE memorandum) and the discovery of a turtle nest in Sub Area 3 wetlands. According to ODFW (Oregon Department of Fish and Wildlife), turtles were not expected to inhabit Harborton based on several factors including turtle distribution and population density, habitat access and others. The nest was discovered December 15 when eggshells from the scavenged nest were observed. ODFW herpetologist Susan Barnes collected the eggshells for examination and identification. The viability of Sub Area 3 for turtles is questionable given that persistent ponding, a habitat requirement, is not expected in this area.

3. Results and Discussion

3.1 SUMMARY OF RESULTS

Monitoring results indicate the Site is meeting or exceeding performance standards for nearly all subject areas and disciplines. Table 13 below summarizes monitoring elements with performance standards, and a determination of whether standards are met or not met for the 2021 monitoring period.

Table 14. 2022 Performance Standard Summary

Section	Performance Standards	Met/Not Met	Adaptive Management Needed	Notes
	Retention of Habitat Features/Elements			n/a
	Extent of ACM Habitat			n/a
	Extent and Stability of Channel, Streambank, and Floodplain Habitat	Met		
	Preservation of Fish Passage/Fish Accessibility	Partially Met	No	Temporary blockage observed
	Retention of Wetland Hydrology/Habitat for Use by Northern Red-legged Frog	Met		
	Extent of High Flow Inundation	Met		
	Vegetation Density/Diversity/Cover	Partially Met	Yes	See Table 6.
	Riparian Forest, Scrub-shrub, and Upland	Not Met	Yes	Diversity Standard met; Density standard not met
	RCG Across Relevant Habitats	Not Met	Yes	RCG management planned for 2023

3.2 ADAPTIVE MANAGEMENT

When monitoring results demonstrate that the site does not meet performance standards and restoration goals, PGE will adjust monitoring or management activities in consultation with the Trustee Council as necessary to meet the goals and objectives of the HDP. The following description include areas not meeting performance standards and proposed measures for addressing shortfalls.

Upland Forest Establishment, Upland Scrub-shrub Establishment, and Riparian Forest Establishment Woody Stem Density

Monitoring data in 2022 indicated that performance standards were close but not met for woody stem density. In response, supplemental plantings are proposed for 2023 that include native tree and shrub installation. Species composition will be informed by observations of which species are

thriving and at what locations. A preliminary list of plants to be added may include Oregon white oak, bigleaf maple, Douglas fir, red alder, Nootka rose, snowberry, red elderberry, and twinberry. Numbers of each will depend on nursery availability. Approximately 2,000 – 4,000 plants may be added in locations determined in the field.

3.2.1 RCG Across Relevant Habitat

RCG cover is an on-going issue that will require persistent management. RCG performance standards were not met in 2022; cover exceeded the Year 1-5 standard of less than 30 percent by about 4 percentage points. Adaptive management measures for RCG include assessment of measures taken in 2021 and 2022, including herbicide application, sod removal (Sub Area 3) and mechanical clearing, to inform and refine RCG management for 2023. Successes over the past year will be replicated in areas not managed in prior years and other potential measures, such as solarization, may be considered. If RCG management is shown to be effective and beneficial in targeted areas, PGE's long-term aspiration is to extend RCG management into frog breeding areas on a limited, trial basis and under the approval and oversight of the Trustee Council.

3.3 SITE MANAGEMENT AND ACTIVITIES

Various Site management actions were performed following construction. Below is a list with brief descriptions of activities performed in 2022 to date:

- Weed management via mechanical clearing and herbicide application over a total of approximately 10 acres in Sub Areas 1, 2, and 3
- Installation of 3,400 woody-stem plants in late winter
- Hydrant flushing relocation
- "Do Not Enter – Sensitive Habitat Area" signs posted
- Barriers placed to prevent unauthorized vehicles entering the site
- Site tours provided to multiple interested parties (City of Portland and Metro staff, neighborhood frog volunteer group, DSL, ODFW, PGE staff)

Actions anticipated for 2023 include the following:

- Supplemental woody plant installation (January-February, late fall/winter)
- Weed management (spring/summer/fall)
- Third annual community volunteer event (summer)
- Additional Site security measures (on-going)
- Site tours (as requested and appropriate)

3.4 PHOTO MONITORING POINTS

Eight permanent photo monitoring points were established as shown in Appendix F. The locations were selected based on importance and interest of Site features, such as the North Channel, anticipated wildlife movement corridors, large wood components, and northern red-legged frog

habitat. Appendix F includes photographs from the monitoring point locations as well as photos from around the site. Permanent monitoring points were marked with etched aluminum tags affixed to the ground with a long nail. Monitoring locations were recorded using a hand-held GPS unit accurate to within 5 feet.

Four game cameras were located at the site (Figure 6). The four camera locations were selected based on observations of wildlife tracks, proximity to habitat features and/or water features, and paths and passages likely to be used by wildlife. Two of the four cameras were damaged by the high-water event in June and will be replaced in 2023.

Orthomosaic images collected by drone at various times during the year show habitat development and maturation through the year. Drone-captured Orthomosaic images from December 2020 to November 2022 are included in Appendix G.

3.5 DISCUSSION

Ecological functions at Harborton continue to improve year-to-year, consistently exceeding baseline conditions. Forty-three bird species, 133+ identified plant species, fish, mammals, amphibians, reptiles, and insects are frequent visitors or have become established at Harborton.

Our understanding of hydrologic conditions at the site continues to evolve. The high-water event in 2022 occurred in mid-June, reaching 17.98 feet CPD on June 15th. Based on baseline data, high water at Harborton was expected to occur in February-March period. Surface water in 2021 tracked closely to baseline conditions with high water events occurring in January and February of that year.

Persistent surface water over the lower 1,550 linear feet of North Channel continues to be a fortunate, unexpected site feature. Surface water in the channel was expected to be seasonal, with conditions driven by precipitation, high water levels in Sub Area 4, and by Willamette River backwater flooding. The upper 250-300 feet of channel lost surface water connection to Sub Area 4 in early July and remained so through the drafting of this report (mid-December).

Site trespass was an issue in 2022 though less so with implemented prevention measures. Instances of encroachment by vehicles were down but not eliminated. The addition of a cable barrier and selectively placed large boulders are expected to further reduce unauthorized vehicle entry.

RCG cover in wetlands was anticipated to be a continued major issue. Constraints on RCG management in Sub Area 4 due to amphibian habitat create a large segment of RCG habitat that will remain static and will continue to pose a risk of spreading to other wetland areas. PGE is in discussions with ODFW and DSL to craft approaches that would move Harborton closer to meeting performance standards without posing risk to amphibian habitat.

Community outreach and collaboration continues to be a key component of Harborton. PGE is in frequent contact with frog shuttle organizers about activities and observations at the Site. PGE plans to hold annual volunteer events in 2023 and to look for other opportunities to provide site access when appropriate.

4. References

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Site Location Map

Map Features

- Habitat Area
- Non-Habitat Area
- Survey Transect
- Property Line
- Olympic Pipeline
- Sub-Area Boundary

0 115 230

Feet

Portland General Electric

Portland, Oregon

Figure 1

Harborton Habitat Site

Harborton Restoration Project

Date:	Drawn By:	Rev.:
7/4/2020	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Hab_Fig3.mxd

Site Location Map

Map Features

- Habitat Area
- Non-Habitat Area
- Survey Transect
- Property Line
- Olympic Pipeline
- Water Level / Water Monitoring Station
- Fish Passage Structure/Fish Accessibility (WMS)
- Bald Eagle Monitoring Station
- Mink Scent Station/ Photmonitoring
- Mink Track and Scent Monitoring Routes
- Extent of High Flow Inundation
- S Water Level Staff Gauge
- TC Trail Camera

0 115 230
Feet

Portland General Electric
Portland, Oregon

Figure 2
Fixed Monitoring Stations

Harborton Restoration Project

Date:	Drawn By:	Rev.:
7/4/2020	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Hab_Fig5.mxd

Site Location Map

Map Features

- Survey Transect
- Habitat Area
- Non-Habitat Area
- Upland Forest Establishment
- Upland Scrub-Shrub Establishment
- Riparian Forest Establishment
- Riparian Forest Enhancement/Conservation
- Wetland (i.e., ACM) Establishment
- Wetland (i.e., ACM) Enhancement/Conservation
- Property Line
- Olympic Pipeline
- Sample Plot Location (approximate)

0 115 230
Feet

Portland General Electric
Portland, Oregon

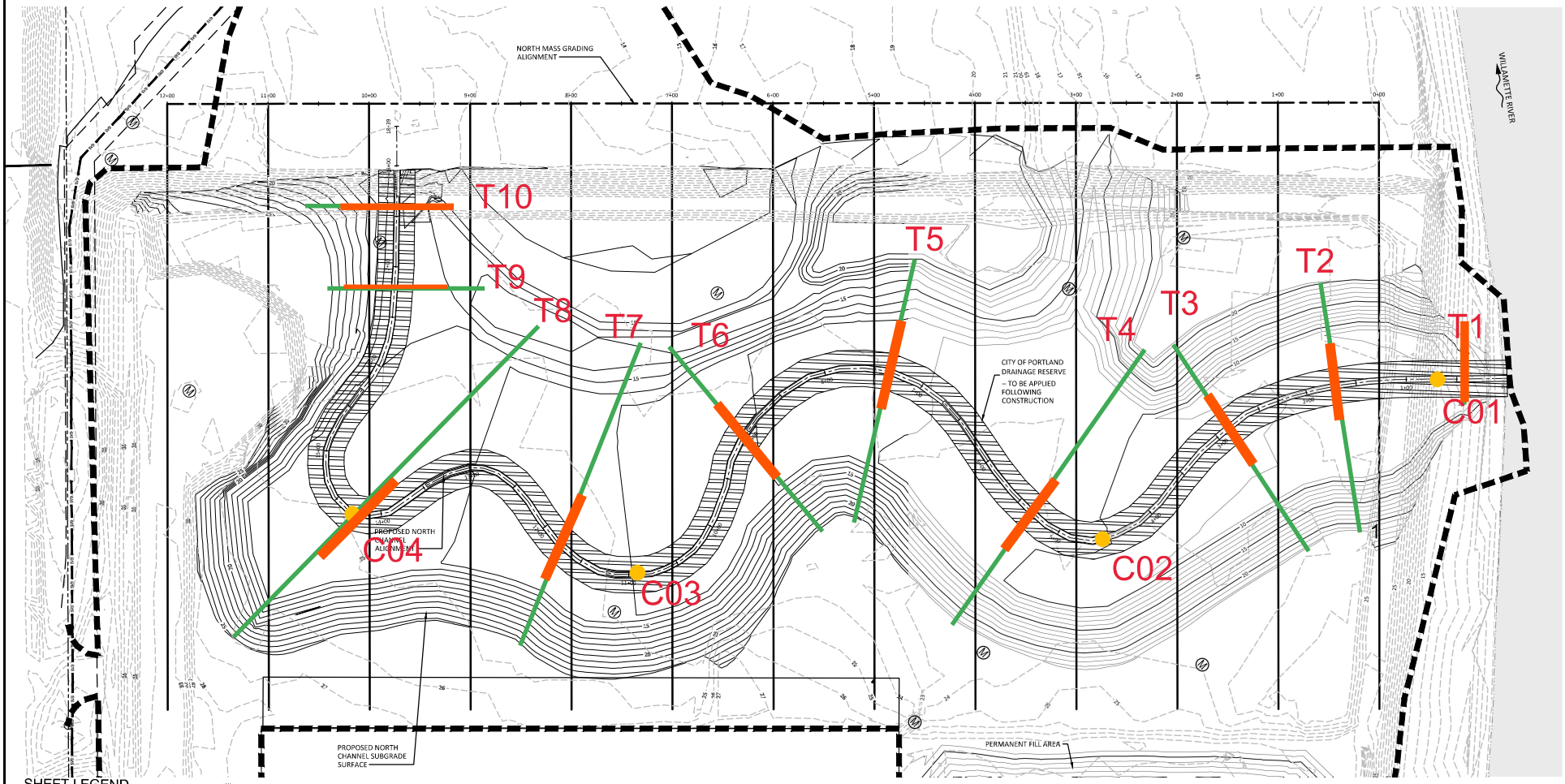
Figure 3

Sample Line-intercept Vegetation Assessment Plots

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/14/2020	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Hab_Fig6_Upd.mxd



SHEET LEGEND

- MONITORING PLOT
- MONITORING TRANSECT
- SEDIMENT GRAB SAMPLE
- BLACK = PROPOSED ELEVATION
- GRAY = EXISTING ELEVATION
- DRAINAGE RESERVE

SCALE IN FEET: 0, 50, 100

NOTES:

1. SEE SHEET 6 FOR SITE ACCESS.
2. SEE SHEET 7 FOR EROSION CONTROL BMP'S.

PI Station	Northing	Easting
0+00.00	719,549.02	7,614,601.26
0+51.97	719,510.48	7,614,566.39
0+78.95	719,490.80	7,614,547.93
1+11.48	719,466.61	7,614,526.19
1+37.42	719,446.52	7,614,509.78
1+63.59	719,425.20	7,614,494.60
1+90.67	719,402.24	7,614,480.24
2+16.72	719,379.28	7,614,467.94
2+42.73	719,355.38	7,614,457.67
2+62.96	719,336.29	7,614,450.97
2+93.81	719,305.56	7,614,448.35
3+20.75	719,278.63	7,614,447.37
3+53.83	719,245.76	7,614,451.00

PI Station	Northing	Easting
3+86.66	719,213.42	7,614,456.71
4+14.38	719,185.71	7,614,457.23
4+40.86	719,160.17	7,614,450.23
4+64.56	719,139.24	7,614,439.11
4+87.35	719,124.85	7,614,421.44
5+13.80	719,116.42	7,614,396.37
5+39.06	719,114.05	7,614,371.22
5+61.42	719,113.41	7,614,348.87
5+88.05	719,115.28	7,614,322.30
6+18.77	719,120.08	7,614,291.96
6+47.16	719,124.25	7,614,263.88
6+73.80	719,124.78	7,614,237.25
7+03.62	719,119.19	7,614,207.95

PI Station	Northing	Easting
7+36.46	719,105.63	7,614,178.05
7+59.83	719,090.59	7,614,160.16
7+84.88	719,071.89	7,614,143.48
8+16.35	719,044.26	7,614,128.44
8+49.01	719,012.09	7,614,122.74
8+81.98	718,979.12	7,614,123.14
9+09.85	718,951.84	7,614,128.83
9+32.38	718,930.86	7,614,137.04
9+57.81	718,910.30	7,614,152.01
9+90.96	718,880.58	7,614,166.70
10+13.92	718,858.83	7,614,174.04
10+29.04	718,843.91	7,614,176.45
10+46.74	718,826.28	7,614,174.84

PI Station	Northing	Easting
10+62.09	718,811.46	7,614,170.84
10+77.40	718,797.39	7,614,164.81
10+94.48	718,784.17	7,614,153.99
11+12.89	718,770.96	7,614,141.17
11+29.80	718,760.94	7,614,127.54
11+54.25	718,753.67	7,614,104.20
11+81.69	718,750.46	7,614,076.95
12+08.64	718,752.87	7,614,050.10
12+29.69	718,756.65	7,614,029.40
12+51.48	718,757.45	7,614,007.62
12+70.91	718,754.00	7,613,988.50
12+86.51	718,746.79	7,613,974.67
12+99.68	718,737.48	7,613,965.35

PI Station	Northing	Easting
13+20.98	718,718.60	7,613,955.49
13+43.84	718,696.57	7,613,949.38
13+62.02	718,678.52	7,613,947.26
13+92.31	718,648.53	7,613,943.01
14+12.99	718,631.38	7,613,931.45
14+31.67	718,620.56	7,613,916.23
14+52.77	718,619.87	7,613,895.14
14+70.15	718,625.41	7,613,878.67
14+86.36	718,635.03	7,613,865.62
15+00.77	718,645.30	7,613,855.50
15+13.54	718,656.55	7,613,849.47
15+36.73	718,678.44	7,613,841.80
15+54.58	718,696.06	7,613,838.97

PI Station	Northing	Easting
15+71.69	718,712.87	7,613,835.75
15+88.00	718,729.03	7,613,833.60
16+05.37	718,745.53	7,613,828.16
16+26.87	718,764.50	7,613,818.06
16+48.10	718,781.46	7,613,805.27
16+78.93	718,804.01	7,613,784.25
17+01.84	718,820.66	7,613,768.52
17+22.31	718,834.75	7,613,753.67
17+76.94	718,872.54	7,613,714.22
18+39.07	718,914.77	7,613,668.64

REGISTERED PROFESSIONAL ENGINEER — 19089PE — OREGON — JULY 15, 1997 — DANIEL S. MILLER — EXPIRES: 12/31/2020

NO.	BY	DATE	REVISION DESCPRIPTION

RP, CP	DM,JG,CM	DM,CM
DRAWN	DESIGNED	CHECKED
APPROVED	DATE	160218 PROJECT

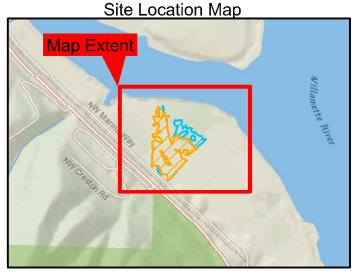
PORTLAND GENERAL ELECTRIC
HARBORTON RESTORATION PROJECT
PORTLAND, OREGON

Interfluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

MONITORING TRANSECTS - NORTH CHANNEL

FIGURE 4

Site Location Map



Map Features

- 15 ft Elevation
- Upland RCG Area - Managed
- Wetland RCG Area - Managed
- Wetland RCG Area - Not Managed
- Red-legged Frog Breeding Habitat
- PGE Property

FIGURE 5

Treatment	Acres
Upland RCG Area - Managed	1.97
Wetland RCG Area - Managed	2.84
Wetland RCG Area - Not Managed	5.18

0 100 200
Feet

N
W E
S

Portland General Electric
Portland, Oregon

Harborton Reed Canarygrass Treatment and Nontreatment Area

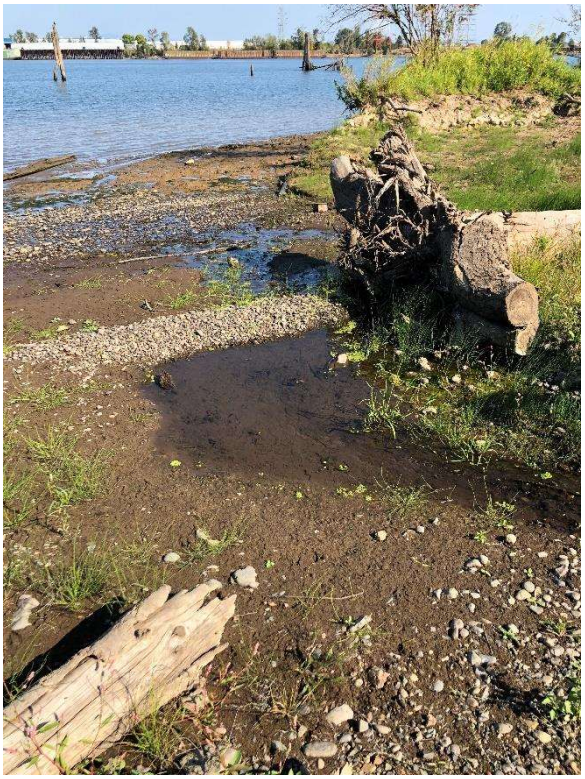
Harborton

Date:	Drawn By:	Rev.:
4/18/2018	Brad Wymore	

Drawing File:

Appendix A - North Channel-Willamette River Fish Passage Photomonitoring

Channel Photo 1. North Channel outlet July 2022 during receding June flooding

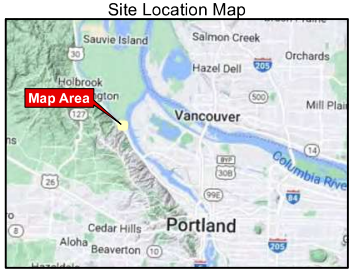


Channel Photo 2. North Channel outlet (facing upstream) on August 5, 2022. Note gravel bar formed at outlet.

Channel Photo 3. Outlet of North Channel (facing upstream) following September rain event. Note channel morphology – loss of channel sinuosity and erosion/transport of the gravel bar formed in July/August (see Photo 2.)

Appendix B - Standing Water Areal Extent, January-July 2022

Site Location Map



Map Features

- Wetland Boundary
- Jan Average Depth 3.71 Ft. - 12.0 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

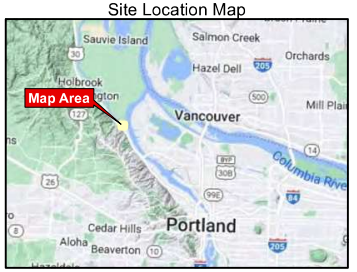
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

Wetland Boundary

February Average Depth
3.42 Ft. - 10.7 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

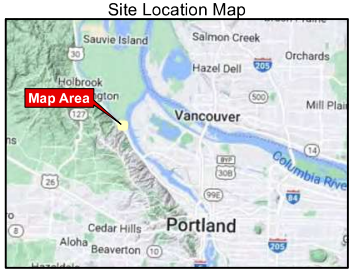
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

- Wetland Boundary
- March Average Depth 3.65 Ft. - 11.7 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

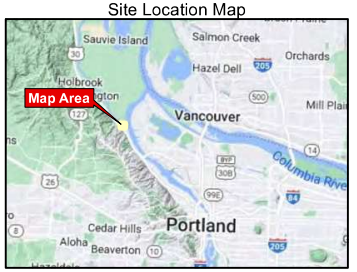
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

Wetland Boundary

April Average Depth
3.63 Ft. - 11.65 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

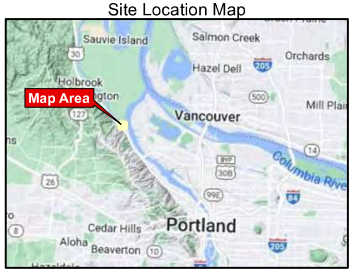
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

Wetland Boundary

May Average Depth
3.69 Ft. - 11.9 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

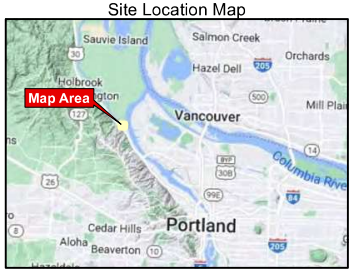
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

Wetland Boundary

Week 1 June Average Depth
3.52 Ft. - 11.1 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

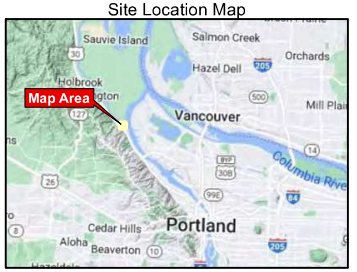
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

- Wetland Boundary
- Week 2 June Average Depth 4.21 Ft. - 13.6 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

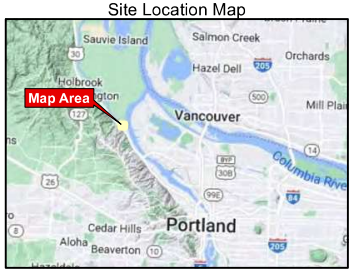
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

Wetland Boundary

Week 3 June Average Depth
4.53 Ft. - 14.4 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

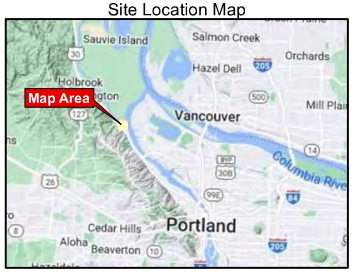
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

Wetland Boundary

Week 4 June Average Depth
3.73 Ft. - 12.1 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

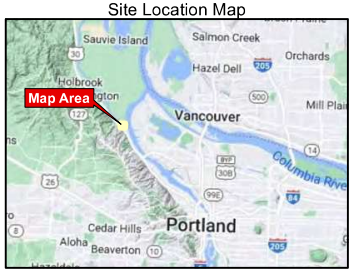
Harborton Inundation Study

PGE Environmental Services

Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Site Location Map



Map Features

Wetland Boundary

July Average Depth
3.26 Ft. - 9.9 Acres

Note:
Site aerial photo date - 07/22/22

0 70 140
Feet

Portland General Electric
Portland, Oregon

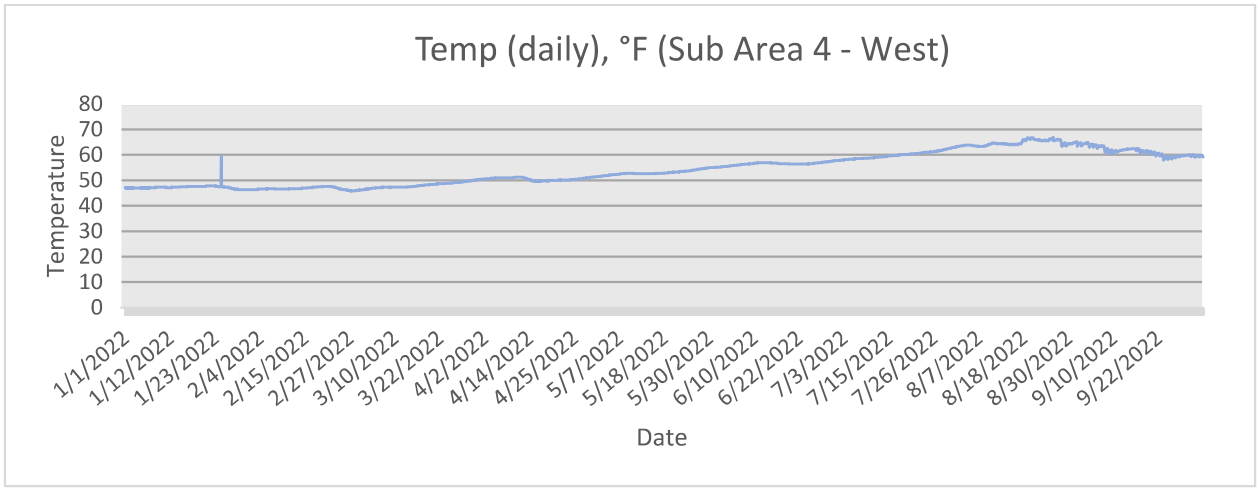
Harborton Inundation Study

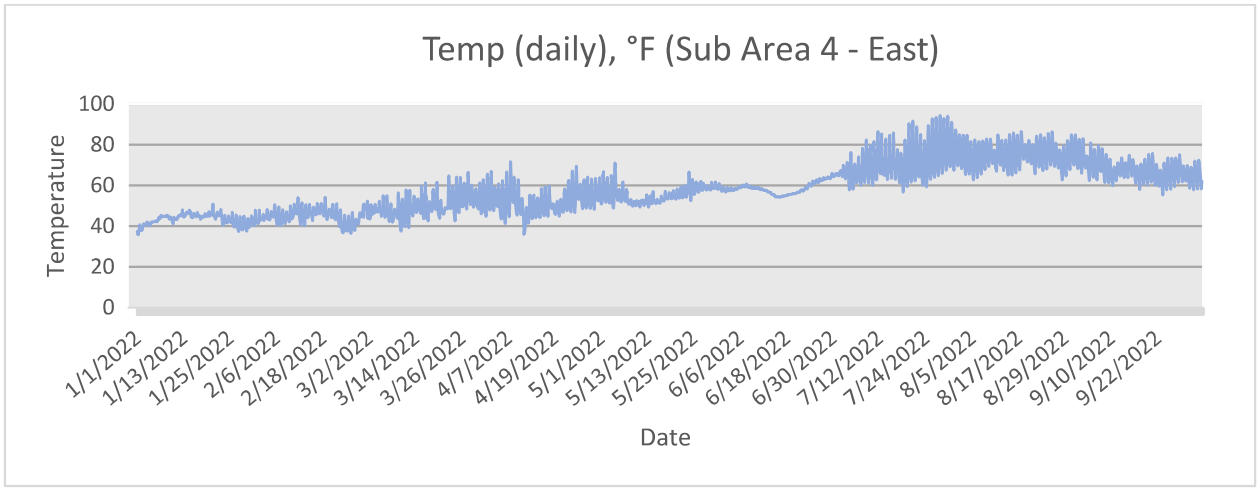
PGE Environmental Services

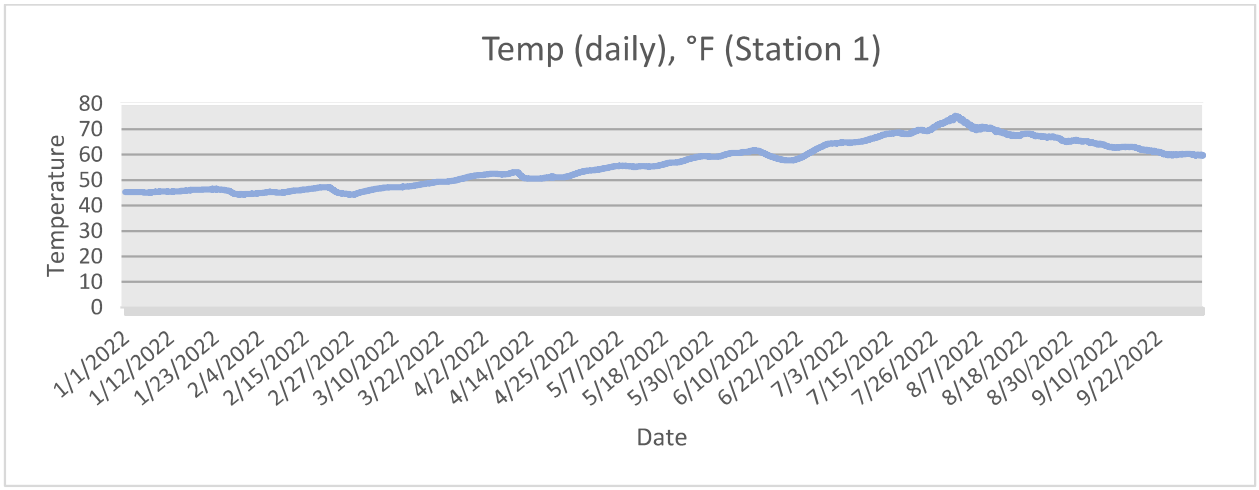
Date:	Drawn By:	Rev.:
12/21/2022	J.B. Hoy	

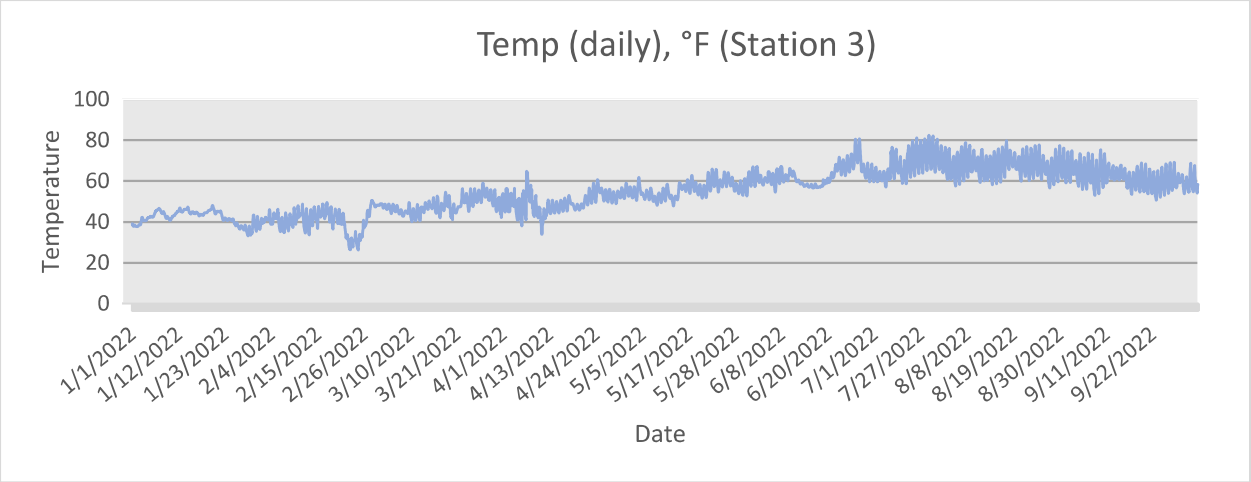
Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Depths_122022.mxd

Appendix C - Water Temperature Data


Temp (daily), °F (Sub Area 4 - West)
Temperature
80
70
60
50
40
30
20
10
0
1/1/2022
1/12/2022
1/23/2022
2/4/2022
2/15/2022
2/27/2022
3/10/2022
3/22/2022
4/2/2022
4/14/2022
4/25/2022
5/7/2022
5/18/2022
5/30/2022
6/10/2022
6/22/2022
7/3/2022
7/15/2022
7/26/2022
8/7/2022
8/18/2022
8/30/2022
9/10/2022
9/22/2022
Date


Temp (daily), °F (Sub Area 4 - East)
Temperature
100
80
60
40
20
0
1/1/2022
1/13/2022
1/25/2022
2/6/2022
2/18/2022
3/2/2022
3/14/2022
3/26/2022
4/7/2022
4/19/2022
5/1/2022
5/13/2022
5/25/2022
6/6/2022
6/18/2022
6/30/2022
7/12/2022
7/24/2022
8/5/2022
8/17/2022
8/29/2022
9/10/2022
9/22/2022
Date


Temp (daily), °F (Station 1)
Temperature
80
70
60
50
40
30
20
10
0
1/1/2022
1/12/2022
1/23/2022
2/4/2022
2/15/2022
2/27/2022
3/10/2022
3/22/2022
4/2/2022
4/14/2022
4/25/2022
5/7/2022
5/18/2022
5/30/2022
6/10/2022
6/22/2022
7/3/2022
7/15/2022
7/26/2022
8/7/2022
8/18/2022
8/30/2022
9/10/2022
9/22/2022
Date


Temp (daily), °F (Station 3)
Temperature
100
80
60
40
20
0
1/1/2022
1/12/2022
1/23/2022
2/4/2022
2/15/2022
2/26/2022
3/10/2022
3/21/2022
4/1/2022
4/13/2022
4/24/2022
5/5/2022
5/17/2022
5/28/2022
6/8/2022
6/20/2022
7/1/2022
7/27/2022
8/8/2022
8/19/2022
8/30/2022
9/11/2022
9/22/2022
Date

Appendix D - Vegetation Data - Site Transects

Site: Harborton
Habitat: Upland Forest Establishment

Species	Origin (N, NN, I)	Wetland Status (1 - 5)	Transect T06 2	T06 3	T06 4	T07 2	T07 3	T07 4	T08 2	Row Average
Native Herbaceous Species										
Achillea millefolium	N	4	5	5	20	5	5	10	5	8
Agrostis exarata	N	3	0	5	0	0	5	5	0	2
Bromus carinatus	N	4	0	0	5	0	5	5	0	2
Clarkia amoena	N	4	0	0	0	1	0	0	0	0
Epilobium congesta	N	3	0	0	0	0	0	0	1	0
Lupinus polyphyllus	N	3	60	60	40	60	75	50	25	53
Lupinus rivularis	N	3	40	30	30	40	15	35	20	30
Polystichum munitum	N	5	0	0	0	0	0	0	20	3
Non-Native (Not Listed) Herbaceous Species										
Festuca rubra	NN	4	0	0	0	0	0	0	0	0
Holcus lanatus	NN	2	0	2	0	0	0	0	0	0
Lolium multiflorum	NN	4	1	1	5	0	0	0	0	1
Invasive Herbaceous Species										
Cirsium arvense	I	3	1	0	0	0	0	0	0	0
Daucus carota	I	5	0	0	0	0	2	0	0	0
Hypochaeris radicata	I	3	0	1	0	0	0	0	0	0
Reed Canarygrass										
Phalaris arundinacea	I	2	0	0	0	0	0	0	0	0
Native Shrub and Tree Species (Form)										
Acer macrophyllum (T)	N	4	1	5	3	0	5	0	60	11
Alnus rubra (T)	N	2	2	2	4	10	5	0	0	3
Cornus alba (S)	N	2	0	0	0	0	0	0	0	0
Frangula purshiana (T)	N	3	0	2	2	0	0	3	0	1
Mahonia nervosa (S)	N	4	0	3	0	0	0	0	0	0
Pinus contorta (T)	N	3	1	4	0	0	2	6	0	2
Pseudotsuga menziesii (T)	N	4	3	2	2	0	4	2	25	5
Quercus garryana (T)	N	5	4	0	5	0	3	3	0	2
Rosa nutkana (S)	N	3	0	1	0	0	0	0	0	0
Salix lasiandra (S)	N	3	0	0	0	0	0	0	0	0
Sambucus racemosa (S)	N	3	2	0	0	1	0	0	0	0
Symphoricarpos albus (S)	N	4	1	0	1	2	2	1	25	5
Non-Native Shrub and Tree Species										
Invasive Shrub and Tree Species										
Rubus armeniacus	I	4	0	0	0	0	0	0	0	0
Crataegus monogyna	I	3	0	0	0	0	0	0	1	0
Bare Substrate			0	0	0	10	20	10	10	7
Native Shrub and Tree Count										
Acer macrophyllum			1	3	3	0	4	0	3	2
Mahonia nervosa			0	3	4	0	0	0	0	1
Alnus rubra			2	2	0	6	2	3	0	2
Cornus alba			0	0	2	0	0	0	0	0
Frangula purshiana			0	2	0	0	0	3	1	1
Pinus contorta			1	4	4	0	1	3	0	2
Pseudotsuga menziesii			3	2	2	0	3	2	25	5
Quercus garryana			0	5	6	0	3	3	0	2
Rosa nutkana			0	1	0	0	0	0	0	0
Salix lasiandra			0	0	0	0	0	0	2	0
Sambucus racemosa			2	0	0	1	0	0	0	0
Symphoricarpos albus			1	0	1	2	1	1	11	2

Routine Performance Standards	T06 2	T06 3	T06 4	T07 2	T07 3	T07 4	T08 2	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species	105	100	95	106	105	105	71	98	4.8
Lower CI (80%)								92	
Upper CI (80%)								104	
Cover of Non Native Herbaceous Species	1	3	5	0	0	0	0	1	0.7
Lower CI (80%)								0	
Upper CI (80%)								2	

Cover of Invasive Herbaceous Species			1	1	0	0	2	0	0	1	0
Lower CI (80%)										0	
Upper CI (80%)										1	
Cover of Reed Canarygrass			0	0	0	0	0	0	0	0	0
Lower CI (80%)										0	
Upper CI (80%)										0	
Cover of Invasive Shrubs and Trees			0	0	0	0	0	0	1	0	0
Lower CI (80%)										0	
Upper CI (80%)										0	
Bare Substrate			0	0	0	10	20	10	10	7	3
Lower CI (80%)										3	
Upper CI (80%)										11	
Native Diversity (all layers)										5	N/A
Sum of plant cover			116	118	97	114	123	110	177		
		Average									
Density of Woody Vegetation		per acre	616	1355	1355	555	863	924	2588	1179	N/A
Plot Area (shrub/tree plot)	707										
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet	43560										
Cover of Native Shrubs and Trees			13	14	14	13	16	15	50	19	5
Lower CI (80%)										13	
Upper CI (80%)										26	

Site: Harborton
Habitat: Scrub/Shrub Establishment

Species	Origin (N, NN, I)	Wetland Status (1 - 5)	Transect T06 1	T07 1	T08 1	Row Average
Native Herbaceous Species						
Achillea millefolium	N	4	10	5	5	7
Agrostis exarata	N	3	0	0	5	2
Bromus carinatus	N	4	0	0	0	0
Lupinus polyphyllus	N	3	40	60	60	53
Lupinus rivularis	N	3	40	40	30	37
Non-Native (Not Listed) Herbaceous Species						
Festuca rubra	NN	4	10	0	0	3
Holcus lanatus	NN	2	1	0	2	1
Lolium multiflorum	NN	4	5	1	1	2
Invasive Herbaceous Species						
Cirsium arvense	I	3	0	1	0	0
Daucus carota	I	5	0	0	0	0
Hypochaeris radicata	I	3	0	0	1	0
Reed Canarygrass Cover						
Phalaris arundinacea	I	2	0	0	0	0
Native Shrub and Tree Species (Form)						
Acer macrophyllum (T)	N	4	0	1	5	2
Alnus rubra (T)	N	2	2	2	2	2
Cornus alba (S)	N	2	0	0	0	0
Frangula purshiana (T)	N	3	0	0	2	1
Mahonia nervosa (S)	N	4	0	0	3	1
Pinus contorta (T)	N	3	0	1	4	2
Pseudotsuga menziesii (T)	N	4	0	3	2	2
Quercus garryana (T)	N	5	0	4	0	1
Rosa nutkana (S)	N	3	0	0	1	0
Salix lasiandra (S)	N	3	0	0	0	0
Sambucus racemosa (S)	N	3	1	2	0	1
Symphoricarpos albus (S)	N	4	0	1	0	0
Non-Native (Not Listed) Shrub and Tree Species						
Invasive Shrub and Tree Species						
Rubus armeniacus	I	4	5	0	0	2
Bare Substrate			5	25	10	13
		Plant Count (Shrubs) + Stem Count (Trees)				
Native Shrub and Tree Count						
Acer macrophyllum			0	0	5	2
Mahonia nervosa			0	0	0	0
Alnus rubra			2	0	0	1
Cornus alba			0	0	0	0
Frangula purshiana			0	0	0	0
Pinus contorta			0	0	0	0
Pseudotsuga menziesii			0	0	0	0
Quercus garryana			0	0	0	0

Rosa nutkana	0	0	0	0	
Salix lasiandra	0	0	0	0	
Sambucus racemosa	1	2	0	1	
Symphoricarpos albus	2	5	19	9	

Routine Performance Standards	**1**	**2**	**3**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species	90	105	100	98	4.4
Lower CI (80%)				93	
Upper CI (80%)				104	
Cover of Non Native Herbaceous Species	16	1	3	7	4.7
Lower CI (80%)				1	
Upper CI (80%)				13	
Cover of Invasive Herbaceous Species	0	1	1	1	0
Lower CI (80%)				0	
Upper CI (80%)				1	
Cover of Reed Canarygrass	0	0	0	0	0
Lower CI (80%)				0	
Upper CI (80%)				0	
Cover of Invasive Shrubs and Trees	5	0	0	2	2
Lower CI (80%)				0	
Upper CI (80%)				4	
Bare Substrate	5	25	10	13	6
Lower CI (80%)				6	
Upper CI (80%)				21	
Native Diversity (all layers)				5	N/A
Sum of plant cover	104	116	118		

		Average per acre				
Density of Woody Vegetation			308	431	1479	739	N/A
Plot Area (shrub/tree plot)	707					
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet	43560					
Cover of Native Shrubs and Trees			3	13	14	10	4
Lower CI (80%)						5	
Upper CI (80%)						15	

Site: Harborton
Habitat: Riparian Forest Establishment

Species	Origin (N, NN, I)	Wetland Status (1 - 5)	Transect T04 1	T04 2	T04 7	T04 8	T04 9	T04 10	T05 1	T05 6	T05 9	T05 10	Row Average
Native Herbaceous Species													
Achillea millefolium	N	4	0	2	15	5	1	2	5	5	5	0	4
Agrostis exarata	N	3	2	20	25	10	10	20	0	20	0	0	11
Carex obnupta	N	2	0	0	0	0	0	0	0	0	0	0	0
Epilobium ciliatum	N	2	1	0	0	0	10	0	0	0	2	0	1
Equisetum arvense	N	3	0	0	0	0	0	0	0	0	0	10	1
Galium aparine	N	4	0	0	0	0	2	0	0	0	0	0	0
Hordeum brachyantherum	N	2	3	0	0	0	0	0	0	0	0	0	0
Lupinus polyphyllus	N	4	5	20	30	20	0	0	20	40	30	0	17
Lupinus rivularis	N	3	0	50	10	25	0	10	5	0	20	0	12
Madia gracilis	N	5	25	0	0	0	0	0	0	10	0	0	4
Plagiobothyrus figuratus	N	3	0	2	2	0	0	0	0	0	0	0	0
Potentilla gracilis	N	3	3	0	0	2	0	0	0	0	0	0	1
Rumex acetosa	N	3	0	0	0	0	0	3	0	0	0	0	0
Rumex aquaticus var *fenestratus*	N	2	0	0	0	0	1	0	0	0	0	0	0
Trifolium wormskjoldii	N	3	2	0	0	1	0	0	0	0	0	0	0
Non-Native (Not Listed) Herbaceous Species													
Lolium multiflorum	NN	4	0	5	0	5	0	10	10	10	5	0	5
Poa annua	NN	3	0	10	0	2	0	0	20	0	0	0	3
Polypogon monspeliensis	NN	2	0	0	2	0	0	0	0	0	0	0	0
Vicia sativa	NN	5	0	3	0	0	0	0	1	0	0	0	0
Invasive Herbaceous Species													
Cirsium arvense	I	3	0	0	0	1	5	0	0	0	0	0	1
Daucus carota	I	5	0	0	0	1	1	0	0	0	0	0	0
Hypochaeris radicata	I	3	1	0	2	0	0	0	0	0	0	0	0
Senecio jacobaea	I	4	0	0	0	0	2	0	0	0	0	0	0
Trifolium repens	I	3	0	1	2	5	0	2	0	0	1	0	1
Reed Canarygrass Cover													
Phalaris arundinacea	I	2	0	0	0	0	60	0	0	0	0	0	6
Native Shrub and Tree Species (Form)													
Acer macrophyllum (T)	N	4	0	0	0	0	0	0	0	0	0	25	3
Alnus rubra (T)	N	2	0	0	0	1	0	5	0	1	0	0	1
Amelanchier alnifolia (S)	N	4	5	2	10	7	0	0	10	1	1	0	4
Cornus alba (S)	N	2	0	0	10	0	15	0	0	0	0	0	3
Crataegus douglasii (S)	N	3	0	0	0	3	0	0	5	3	0	0	1
Fraxinus latifolia (T)	N	2	0	0	0	1	0	0	3	4	0	0	1
Physocarpus capitatus (S)	N	2	0	0	0	0	0	0	0	1	0	0	0
Pinus contorta (T)	N	3	0	0	0	2	0	3	3	0	0	0	1
Populus balsamif. var. *trichocarpa (T)*	N	2	0	0	10	2	6	12	0	6	6	0	4
Pseudotsuga menziesii (T)	N	4	5	0	0	4	0	2	0	5	4	0	2
Rosa nutkana (S)	N	3	6	8	6	0	0	5	5	5	0	0	4
Salix fluviatilis (S)	N	2	0	0	0	0	0	0	0	0	0	0	0
Salix lasiandra (S)	N	2	0	0	0	0	0	0	0	0	2	35	4
Salix sitchensis (S)	N	2	5	5	10	0	0	0	2	0	2	0	2
Sambucus racemosa (S)	N	3	0	0	0	3	0	0	0	0	8	0	1
Spiraea douglasii (S)	N	2	0	10	0	0	0	1	0	5	0	0	2
Symphoricarpos albus (S)	N	4	0	5	5	1	0	0	0	3	0	0	1
Non-Native Shrub and Tree Species													
			0	0	0	0	0	0	0	0	0	0	0
Invasive Shrub and Tree Species													
Cytisus scoparius	I	5	3	1	0	0	0	1	1	0	10	0	2
Rubus armeniacus	I	3	3	0	5	5	25	15	0	0	10	5	7
Bare Substrate			30	0	10	15	5	15	5	5	0	30	12
			Plant Count (Shrubs) + Stem Count (Trees)										
Native Shrub and Tree Count (Form)													
Acer macrophyllum (T)			0	0	0	0	0	0	0	0	0	1	0
Alnus rubra (T)			0	0	0	1	0	2	0	1	0	0	0
Amelanchier alnifolia (S)			5	1	3	7	0	0	7	1	1	0	3
Cornus alba (S)			0	0	4	0	3	0	0	0	0	0	1
Crataegus douglasii (S)			0	0	0	3	0	0	4	3	0	0	1
Fraxinus latifolia (T)			0	0	0	1	0	0	2	4	0	0	1
Pinus contorta (T)			0	1	0	2	0	1	0	0	0	0	0
Populus balsamif. var *trichocarpa (T)*			0	0	2	2	0	2	0	0	0	0	1
Pseudotsuga menziesii (T)			11	0	4	4	0	2	0	0	0	0	2
Physocarpus capitatus (S)			0	0	0	0	0	0	0	1	0	0	0
Rosa nutkana (S)			6	4	3	0	0	5	5	5	0	0	3
Salix fluviatilis (S)			0	0	0	0	0	0	0	0	0	0	0
Salix lasiandra (S)			0	0	0	0	0	0	0	0	2	2	0
Salix sitchensis (S)			1	5	4	0	0	0	2	0	2	0	1
Sambucus racemosa (S)			0	0	0	3	0	0	0	0	8	0	1
Spiraea douglasii (S)			0	11	0	0	0	1	3	1	0	0	2
Symphoricarpos albus (S)			0	2	5	1	0	0	0	3	2	0	1
Routine Performance Standards			**1**	**2**	**7**	**8**	**9**	**10**	**1**	**6**	**9**	**10**	**Habitat Average**	**Standard Error**

Cover of Native Herbaceous Species		41	94	82	63	24	35	30	75	57	10	51	8.7
Lower CI (80%)												40	
Upper CI (80%)												62	
Cover of Non Native (Not Listed) Herbaceous Species		0	18	2	7	0	10	31	10	5	0	8	3.1
Lower CI (80%)												4	
Upper CI (80%)												12	
Cover of Invasive Herbaceous Species		1	1	4	7	8	2	0	0	1	0	2	0.9
Lower CI (80%)												1	
Upper CI (80%)												4	
Cover of Reed Canarygrass		0	0	0	0	60	0	0	0	0	0	6	6.0
Lower CI (80%)												-2	
Upper CI (80%)												14	
Cover of Invasive Shrubs and Trees		6	1	5	5	25	16	1	0	20	5	8	3
Lower CI (80%)												5	
Upper CI (80%)												12	
Bare Substrate		30	0	10	15	5	15	5	5	0	30	12	4
Lower CI (80%)												7	
Upper CI (80%)												16	
Native Diversity (all layers)												5	N/A
Sum of plant cover		69	142	129	101	137	89	85	114	101	75		
	Average per acre												
Density of Woody Vegetation		1417	1479	1540	1479	185	801	1417	1171	924	185	1060	N/A
Plot Area (shrub/tree plot)	707												
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet	43560												
Cover of Native Shrubs and Trees		21	30	51	24	21	28	28	34	23	60	32	4
Lower CI (80%)												27	
Upper CI (80%)												37	

Site: Harborton
Habitat Type: Riparian Forest Enhancement/Conservation

			Transect															
			T01	T02			T03					T04	T05	T06	T07	T08	T09	
	Origin (N, NN, I)	Wetland Status (1 - 5)	2	4	6	7	5	6	8	9	10	11	11	5	5	3	1	Row Average
Native Herbaceous Species																		
Achillea millefolium	N	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	1
Agrostis exarata	N	2	20	30	0	0	0	0	40	0	0	0	0	0	0	0	0	6
Carex obnupta	N	2	0	0	0	35	0	0	40	0	0	25	0	0	0	0	0	7
Epilobium ciliatum	N	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Epilobium congesta	N	4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Equisetum arvense	N	2	0	0	0	0	0	0	0	0	0	10	10	0	0	0	0	1
Equisetum fluviatile	N	1	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Galium aparine	N	4	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
Lupinus polyphylla	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
Polystichum munitum	N	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	1
Potentilla gracilis	N	3	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	2
Rubus ursinus	N	4	0	5	5	0	0	15	15	0	0	0	0	0	0	0	3	0	3
Urtica dioica	N	2	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Non-Native (Not Listed) Herbaceous Species																		
Holcus lanatus	NN	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Invasive Herbaceous Species																		
Cirsium arvense	I	3	0	0	0	0	0	0	0	0	0	0	0	5	0	0	3	1
Daucus carota	I	5	0	0	0	0	0	0	0	0	4	0	0	5	0	0	0	1
Geranium robertianum	I	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Invasive Herbaceous Species																		
Phalaris arundinacea	I	2	40	15	50	2	65	60	2	40	3	5	20	5	20	10	0	22
Native Shrub and Tree Species (Form)																		
Acer macrophyllum (T)	N	4	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	5
Alnus rubra (T)	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	1
Cornus alba (S)	N	2	0	1	0	0	0	0	0	0	20	10	0	20	30	0	0	5
Crataegus douglasii (S)	N	3	0	0	5	0	0	0	2	0	0	0	0	0	0	0	0	0
Frangula purshiana (T)	N	4	0	0	0	0	0	0	0	0	0	0	0	5	0	2	10	1
Fraxinus latifolia (T)	N	2	20	50	10	10	0	40	50	20	10	0	0	0	0	0	0	14
Oemleria cerasiformis (S)	N	4	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physocarpus capitatus (S)	N	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Populus balsamif. var. trichocarpa (T)	N	2	5	5	50	80	0	40	20	60	30	0	25	0	0	0	40	24
Ribes divaricatum (S)	N	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa nutkana (S)	N	3	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Salix fluviatilis (S)	N	1	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	1
Salix hookeriana (S)	N	2	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	1
Salix lasiandra (S)	N	2	0	0	0	0	0	0	0	0	0	0	60	60	70	0	0	13
Salix sitchensis (S)	N	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Symphoricarpos albus (S)	N	4	0	40	10	50	0	4	15	20	25	0	0	0	0	4	0	11
Non-Native Shrub and Tree Species																		
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Invasive Shrub and Tree Species																		
Cytisus scoparius	I		0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Rubus armeniacus	I		2	2	0	0	0	0	0	0	0	0	0	50	50	0	10	8
Bare Substrate			20	30	40	60	20	30	25	50	70	20	5	80	80	40	15	39
			Plant Count (Shrubs) + Stem Count (Trees)															
Native Shrub and Tree Count																		
Acer macrophyllum			0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
Alnus rubra			0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Amelanchier alnifolia			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cornus alba			1	1	0	0	0	0	0	0	12	2	0	9	6	0	0	2
Crataegus douglasii			0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0
Frangula purshiana			0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0
Fraxinus latifolia			7	8	1	3	12	10	17	7	3	0	0	0	0	0	0	5
Oemleria cerasaiformis			0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physocarpus capitatus			0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Populus balsamif. var trichocarpa			1	2	11	10	0	7	3	6	4	0	5	0	0	0	3	3
Ribes divaricatum			0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa nutkana			2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Salix fluviatilis			0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	1
Salix hookeriana			0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Salix lasiandra			0	0	0	0	0	0	0	0	0	0	10	2	3	0	0	1
Salix sitchensis			2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sambucus racemosa			0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Symphoricarpos albus			0	30	6	40	0	2	11	14	20	0	0	0	0	2	0	8

Routine Performance Standards	2	4	6	7	5	6	8	9	10	11	11	5	5	3	1	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species	20	40	5	35	0	20	96	1	6	60	10	0	0	15	15	22	6.9
Lower CI (80%)																13	
Upper CI (80%)																30	
Cover of Non Native (Not Listed) Herbaceous Species	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0.4
Lower CI (80%)																0	
Upper CI (80%)																1	
Cover of Invasive Herbaceous Species	0	0	0	0	0	0	0	0	8	0	0	10	0	0	3	1	1
Lower CI (80%)																0	
Upper CI (80%)																2	
Cover of Reed Canarygrass	40	15	50	2	65	60	2	40	3	5	20	5	20	10	0	22	6
Lower CI (80%)																15	
Upper CI (80%)																30	
Cover of Invasive Shrubs and Trees	2	2	0	0	0	0	0	0	0	0	0	50	50	0	15	8	5
Lower CI (80%)																2	
Upper CI (80%)																14	
Bare Substrate	20	30	40	60	20	30	25	50	70	20	5	80	80	40	15	39	6
Lower CI (80%)																31	
Upper CI (80%)																47	
Native Diversity (all layers)																5	N/A
Sum of plant cover	81	128	132	179	65	164	145	141	102	115	118	150	170	114	83		
	Average per acre																
Density of Woody Vegetation	801	2834	1355	3389	739	1171	2033	1725	2403	986	986	739	555	246	246	1347	N/A
Plot Area (shrub/tree plot) 707																	
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet 43560																	
Cover of Native Shrubs and Trees	37	101	77	142	0	84	87	100	85	50	88	85	100	6	50	73	10
Lower CI (80%)																60	

Upper CI (80%)	85

Site: Harborton
Habitat: Wetland Establishment

Species	Origin (N, NN, I)	Wetland Status (1 - 5)	Transect T04 3	T04 4	T04 5	T04 6	T05 2	T05 3	T05 4	T05 5	T05 7	T05 8	Row Average
Native Herbaceous Species													
Achillea millefolium	N	4	2	0	0	0	0	0	0	0	0	0	0
Agrostis exarata	N	3	10	0	0	0	0	0	0	0	25	5	4
Alisma plantago aquatica	N	1	15	35	15	2	2	0	15	0	0	0	8
Alopecurus geniculatus	N	2	10	2	3	30	5	5	0	40	0	7	10
Asclepias speciosa	N	5	0	0	0	0	0	0	0	0	0	0	0
Beckmannia syzigachne	N	2	2	8	0	25	40	40	40	30	0	15	20
Bidens frondosa	N	2	0	7	0	3	0	0	0	0	0	0	1
Bromus carinatus	N	4	0	0	0	0	0	0	0	0	0	0	0
Carex obnupta	N	2	0	0	0	0	0	10	0	0	0	7	2
Clarkia amoena	N	4	0	0	0	0	2	0	0	1	1	1	1
Eleocharis ovara	N	2	0	0	0	0	0	0	0	0	0	1	0
Epilobium ciliatum	N	2	0	0	0	0	0	0	0	0	0	0	0
Epilobium densiflorum	N	2	0	0	0	0	0	2	50	30	0	0	8
Equisetum arvense	N	3	0	0	0	0	10	10	0	10	0	0	3
Galium aparine	N	4	0	0	0	0	0	0	0	0	0	10	1
Glyceria occidentalis	N	2	0	0	0	15	0	0	0	1	0	3	2
Hordeum brachyantherum	N	2	0	5	0	5	0	0	0	0	0	5	2
Juncus bufonius	N	2	5	0	5	0	5	0	0	0	50	0	7
Juncus oxymeris	N	2	0	0	0	0	5	15	0	0	10	0	3
Juncus patens	N	2	0	0	0	0	5	0	0	0	0	0	1
Lupinus polyphyllus	N	4	0	0	0	0	3	0	0	0	2	0	1
Lupinus rivularis	N	3	0	0	0	0	0	2	0	0	0	20	2
Madia gracilis	N	5	0	0	0	0	0	0	0	0	0	0	0
Plagiobothyrus figuratus	N	3	2	0	0	0	5	10	5	0	0	10	3
Potentilla gracilis	N	3	0	0	0	0	0	0	0	0	0	0	0
Rumex acetosa	N	3	0	0	0	0	0	0	0	0	0	0	0
Rumex aquaticus var *fenestratus*	N	2	0	0	0	0	0	0	0	0	0	2	0
Sagiittaria latifolia	N	1	0	0	0	0	0	0	0	0	0	0	0
Scirpus microcarpus	N	1	0	0	8	0	0	0	0	0	0	0	1
Trifolium wormskjoldii	N	3	0	0	0	0	0	0	0	0	0	0	0
Non-Native (Not Listed) Herbaceous Species													
Alopecurus pratensis	NN	2	15	0	0	0	0	0	0	0	5	0	2
Echinochloa crus-galii	NN	3	3	0	0	0	0	0	0	0	0	0	0
Festuca rubra	NN	4	0	0	0	0	0	0	0	0	5	0	1
Holcus lanatus	NN	2	0	0	0	0	0	0	0	0	5	1	1
Lolium multiflorum	NN	4	0	0	0	0	10	0	0	5	5	0	2
Matricaria discoidea	NN	4	0	0	0	0	0	0	0	0	0	0	0
Poa annua	NN	3	0	0	0	0	0	0	0	0	0	0	0
Polypogon monspeliensis	NN	2	0	0	0	0	0	0	0	0	0	0	0
Vicia sativa	NN	5	0	0	0	0	0	1	0	0	0	0	0
Vicia tetrasperma	NN	5	0	0	0	0	0	0	0	0	0	0	0
Invasive Herbaceous Species													
Cirsium arvense	I	3	0	0	0	0	0	0	0	1	2	1	0
Daucus carota	I	5	0	0	0	0	0	0	0	0	0	0	0
Hypochaeris radicata	I	3	0	0	0	0	0	0	0	0	0	0	0
Lotus corniculata	I	3	0	0	0	0	6	5	5	5	0	0	2
Lythrum salicaria	I	2	0	0	0	0	0	0	0	0	0	0	0
Senecio jacobaea	I	4	0	0	0	0	0	0	0	0	5	0	1
Trifolium repens	I	3	0	0	0	0	2	3	0	4	1	0	1
Reed Canarygrass													
Phalaris arundinacea	I	2	0	0	0	0	0	0	0	0	0	20	2
Native Shrub and Tree Species (Form)													
Acer macrophyllum (T)	N	4	0	0	0	0	0	0	0	0	0	0	0
Alnus rubra (T)	N	2	0	0	0	0	0	0	0	0	0	0	0
Amelanchier alnifolia (S)	N	4	0	0	0	0	2	3	4	2	2	15	3
Cornus alba (S)	N	2	15	25	15	0	0	0	0	0	0	0	6
Crataegus douglasii (S)	N	3	0	0	0	0	0	0	0	0	0	0	0
Frangula purshiana (T)	N	3	0	0	0	0	0	0	0	5	1	0	1
Fraxinus latifolia (T)	N	2	0	0	0	0	0	0	0	0	0	0	0
Mahonia nervosa (S)	N	4	0	0	0	0	0	0	0	0	0	0	0
Physocarapus capitatus (S)	N	2	0	0	0	0	0	1	0	0	0	12	1
Pinus contorta (T)	N	3	0	0	0	0	0	2	0	4	2	3	1
Populus balsamif. var. *trichocarpa (T)*	N	2	10	0	0	0	7	6	12	8	2	3	5
Pseudotsuga menziesii (T)	N	4	0	0	0	0	0	0	0	1	5	0	1
Quercus garryana (T)	N	5	0	0	0	0	0	0	0	0	0	0	0
Rosa nutkana (S)	N	3	0	0	0	0	0	0	0	0	0	0	0
Rosa pisocarpa (S)	N	4	0	0	0	0	0	0	0	0	0	0	0
Salix fluviatilis (S)	N	2	0	0	0	0	0	0	0	0	0	0	0
Salix hookeriana (S)	N	2	0	0	10	0	0	0	0	0	0	0	1
Salix lasiandra (S)	N	2	0	0	5	0	7	6	12	8	12	2	5
Salix sitchensis (S)	N	2	15	0	0	0	0	0	0	0	3	2	2
Sambucus racemosa (S)	N	3	0	0	0	0	0	0	0	0	0	8	1
Spiraea douglasii (S)	N	2	0	0	20	0	0	0	0	1	0	0	2
Symphoricarpos albus (S)	N	4	0	0	0	0	5	10	5	5	5	20	5
Non-Native Shrub and Tree Species													
Invasive Shrub and Tree Species													

Cytisus scoparius	I	5	0	0	0	0	0	1	8	0	1	0	1
Rubus armeniacus	I	3	0	0	0	0	0	0	0	4	5	0	1
Bare Substrate			10	50	70	30	10	5	5	5	0	0	19
Native Shrub and Tree Count													
Acer macrophyllum			0	0	0	0	0	0	0	0	0	0	0
Alnus rubra			0	0	0	0	2	3	4	2	2	0	1
Amelanchier alnifolia			2	0	0	0	0	0	0	0	0	0	0
Cornus alba			13	22	14	0	0	0	0	0	0	0	5
Crataegus douglasii			0	0	0	0	0	0	0	5	1	0	1
Frangula purshiana			0	0	0	0	0	0	0	0	0	0	0
Fraxinus latifolia			0	0	0	0	0	1	0	0	0	5	1
Mahonia nervosa			0	0	0	0	0	2	0	4	2	0	1
Physocarpus capitatus			0	0	0	0	0	0	0	0	0	0	0
Pinus contorta			0	0	0	0	0	0	0	0	0	0	0
Populus balsamif. var trichocarpa			3	0	0	0	0	0	0	1	1	0	1
Pseudotsuga menziesii			0	0	0	0	0	0	0	0	0	0	0
Quercus garryana			0	0	0	0	0	0	0	0	0	0	0
Rosa nutkana			0	0	0	0	0	0	0	0	0	0	0
Rosa pisocarpa			0	0	0	0	0	0	0	0	0	0	0
Salix fluviatilis			0	0	0	0	0	0	0	0	0	0	0
Salix hookeriana			0	0	0	0	0	0	0	0	0	0	0
Salix lasiandra			0	0	0	0	0	2	0	4	0	12	2
Salix sitchensis			7	0	0	0	7	6	12	8	0	3	4
Sambucus racemosa			0	0	0	0	0	0	0	0	0	0	0
Spiraea douglasii			0	0	20	0	0	0	0	0	0	2	2
Symphoricarpos albus			0	0	0	0	0	0	0	0	0	0	0

Routine Performance Standards			**3**	**4**	**5**	**6**	**2**	**3**	**4**	**5**	**7**	**8**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species			46	57	31	80	82	94	110	112	88	86	79	8.4
Lower CI (80%)													68	
Upper CI (80%)													89	
Cover of Non Native (Not Listed) Herbaceous Species			18	0	0	0	10	1	0	5	20	1	6	2.5
Lower CI (80%)													2	
Upper CI (80%)													9	
Cover of Invasive Herbaceous Species			0	0	0	0	8	8	5	10	8	1	4	1
Lower CI (80%)													2	
Upper CI (80%)													6	
Cover of Invasive Herbaceous Species			0	0	0	0	0	0	0	0	0	20	2	2
Lower CI (80%)													-1	
Upper CI (80%)													5	
Cover of Invasive Shrubs and Trees			0	0	0	0	0	1	8	4	6	0	2	1
Lower CI (80%)													1	
Upper CI (80%)													3	
Bare Substrate			10	50	70	30	10	5	5	5	0	0	19	8
Lower CI (80%)													9	
Upper CI (80%)													28	
Native Diversity (all layers)													5	N/A
Sum of plant cover			102	82	81	80	121	132	156	165	154	173		
		Average per acre												
Density of Woody Vegetation			1540	1355	2095	0	555	863	986	1479	370	1355	1060	N/A
Plot Area (shrub/tree plot)	707													
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet	43560													
Cover of Native Shrubs and Trees			40	25	50	0	21	28	33	34	32	65	33	5
Lower CI (80%)													26	
Upper CI (80%)													40	

Site: Harborton
Habitat: Wetland Enhancement/Conservation

Species	Origin (N, NN, I)	Wetland Status (1 - 5)	Transect T01 1	T02 5	T03 7	Row Average
Native Herbaceous Species						
Achillea millefolium	N	4	0	0	0	0
Agrostis exarata	N	3	0	0	0	0
Alisma plantago aquatica	N	1	0	0	0	0
Alopecurus geniculatus	N	2	0	0	0	0
Asclepias speciosa	N	5	0	0	0	0
Beckmannia syzigachne	N	2	0	0	0	0
Bidens frondosa	N	2	0	0	0	0
Bromus carinatus	N	4	0	0	0	0
Carex obnupta	N	2	0	5	0	2
Clarkia amoena	N	4	0	0	0	0
Eleocharis ovara	N	2	0	0	0	0
Epilobium ciliatum	N	2	0	0	0	0
Epilobium densiflorum	N	2	0	0	0	0
Equisetum arvense	N	3	0	0	0	0
Galium aparine	N	4	1	0	3	1
Glyceria occidentalis	N	2	0	0	0	0
Hordeum brachyantherum	N	2	0	0	0	0
Juncus bufonius	N	2	0	0	0	0
Juncus oxymeris	N	2	0	0	0	0
Juncus patens	N	2	0	0	0	0
Lupinus polyphyllus	N	4	0	0	0	0
Lupinus rivularis	N	3	0	0	0	0
Madia gracilis	N	5	0	0	0	0
Plagiobothyrus figuratus	N	3	0	0	0	0
Potentilla gracilis	N	3	0	0	0	0
Rubus ursinus	N	4	0	2	5	2
Rumex acetosa	N	3	0	0	0	0
Rumex aquaticus var *fenestratus*	N	2	0	0	0	0
Sagiittaria latifolia	N	1	0	0	0	0
Scirpus microcarpus	N	1	0	0	8	3
Trifolium wormskjoldii	N	3	0	0	0	0
Non-Native (Not Listed) Herbaceous Species						
Alopecurus pratensis	NN	2	0	0	0	0
Echinochloa crus-galii	NN	3	0	0	0	0
Festuca rubra	NN	4	0	0	0	0
Holcus lanatus	NN	2	0	0	0	0
Lolium multiflorum	NN	4	0	0	0	0
Matricaria discoidea	NN	4	0	0	0	0
Poa annua	NN	3	0	0	0	0
Polypogon monspeliensis	NN	2	0	0	0	0
Vicia sativa	NN	5	0	0	0	0
Vicia tetrasperma	NN	5	0	0	0	0
Invasive Herbaceous Species						
Cirsium arvense	I	3	0	0	0	0
Daucus carota	I	5	0	0	0	0
Hypochaeris radicata	I	3	0	0	0	0
Lotus corniculata	I	3	0	0	0	0
Senecio jacobaea	I	4	0	0	0	0
Trifolium repens	I	3	0	0	0	0

Reed Canarygrass						
Phalaris arundinacea	I	2	15	70	50	45
Native Shrub and Tree Species (Form)						
Acer macrophyllum (T)	N	4	0	0	0	0
Alnus rubra (T)	N	2	0	0	0	0
Amelanchier alnifolia (S)	N	4	0	0	4	1
Cornus alba (S)	N	2	0	2	0	1
Crataegus douglasii (S)	N	3	0	0	0	0
Frangula purshiana (T)	N	3	0	0	0	0
Fraxinus latifolia (T)	N	2	100	40	40	60
Mahonia nervosa (S)	N	4	0	0	0	0
Physocarapus capitatus (S)	N	2	0	0	0	0
Pinus contorta (T)	N	3	0	0	0	0
Populus balsamif. var. *trichocarpa (T)*	N	2	0	20	20	13
Pseudotsuga menziesii (T)	N	4	0	0	0	0
Quercus garryana (T)	N	5	0	0	0	0
Rosa nutkana (S)	N	3	0	0	0	0
Rosa pisocarpa (S)	N	4	0	0	0	0
Salix fluviatilis (S)	N	2	0	0	0	0
Salix hookeriana (S)	N	2	0	0	0	0
Salix lasiandra (S)	N	2	0	0	0	0
Salix sitchensis (S)	N	2	0	0	0	0
Sambucus racemosa (S)	N	3	0	0	0	0
Spiraea douglasii (S)	N	2	0	0	0	0
Symphoricarpos albus (S)	N	4	0	0	15	5
Non-Native Shrub and Tree Species						
Invasive Shrub and Tree Species						
Cytisus scoparius	I	5	0	0	0	0
Rubus armeniacus	I	3	2	0	0	1
Bare Substrate			80	20	10	37
Native Shrub and Tree Count						
Acer macrophyllum			0	0	0	0
Alnus rubra			0	0	0	0
Amelanchier alnifolia			0	0	2	1
Cornus alba			0	1	0	0
Crataegus douglasii			0	0	0	0
Frangula purshiana			0	0	0	0
Fraxinus latifolia			8	5	7	7
Mahonia nervosa			0	0	0	0
Physocarpus capitatus			0	0	0	0
Pinus contorta			0	0	0	0
*Populus balsamif. v*ar *trichocarpa*			0	8	3	4
Pseudotsuga menziesii			0	0	0	0
Quercus garryana			0	0	0	0
Rosa nutkana			0	0	0	0
Rosa pisocarpa			0	0	0	0
Salix fluviatilis			0	0	0	0
Salix hookeriana			0	0	0	0
Salix lasiandra			0	0	0	0
Salix sitchensis			7	0	0	2
Sambucus racemosa			0	0	0	0

Spiraea douglasii	0	0	0	0	
Symphoricarpos albus	0	0	5	2	

Routine Performance Standards	**1**	**5**	**7**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species	1	7	16	8	4.4
Lower CI (80%)				2	
Upper CI (80%)				14	
Cover of Non Native (Not Listed) Herbaceous Species	0	0	0	0	0.0
Lower CI (80%)				0	
Upper CI (80%)				0	
Cover of Invasive Herbaceous Species	0	0	0	0	0
Lower CI (80%)				0	
Upper CI (80%)				0	
Cover of Reed Canarygrass	15	70	50	45	16
Lower CI (80%)				24	
Upper CI (80%)				66	
Cover of Invasive Shrubs and Trees	2	0	0	1	1
Lower CI (80%)				0	
Upper CI (80%)				2	
Bare Substrate	80	20	10	37	22
Lower CI (80%)				9	
Upper CI (80%)				65	
Native Diversity (all layers)				5	N/A
Sum of plant cover	118	139	145		

		Average per acre				
Density of Woody Vegetation			924	863	1047	945 N/A
Plot Area (shrub/tree plot)	707					
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet	43560					
Cover of Native Shrubs and Trees			100	62	79	80 11
Lower CI (80%)						66
Upper CI (80%)						94

Site: Harborton
Habitat: Northern Red-legged Frog Bree

Species	Origin (N, NN, I)	Wetland Status (1 - 5)	Transect T02 1	T02 2	T02 3	T03 1	T03 2	T03 3	T03 4	Row Average
Native Herbaceous Species										
Achillea millefolium	N	4	0	0	0	0	0	0	0	0
Agrostis exarata	N	3	0	0	0	0	0	0	0	0
Carex obnupta	N	2	0	0	0	0	0	3	0	0
Epilobium ciliatum	N	2	0	0	0	0	0	0	0	0
Equisetum arvense	N	3	0	0	0	0	0	0	0	0
Galium aparine	N	4	0	0	0	0	0	0	0	0
Hordeum brachyantherum	N	2	0	0	0	0	0	0	0	0
Lupinus polyphyllus	N	4	0	0	0	0	0	0	0	0
Lupinus rivularis	N	3	0	0	0	0	0	0	0	0
Madia gracilis	N	5	0	0	0	0	0	0	0	0
Plagiobothyrus figuratus	N	3	0	0	0	0	0	0	0	0
Potentilla gracilis	N	3	0	0	0	0	0	0	0	0
Rumex acetosa	N	3	0	0	0	0	0	0	0	0
Rumex aquaticus var *fenestratus*	N	2	0	0	0	0	0	0	0	0
Trifolium wormskjoldii	N	3	0	0	0	0	0	0	0	0
Non-Native (Not Listed) Herbaceous Species										
Alopecurus pratensis	NN	3	2	0	30	0	0	0	0	5
Lolium multiflorum	NN	4	0	0	0	0	0	0	0	0
Poa pratensis	NN	3	0	0	40	0	0	0	0	6
Polypogon monspeliensis	NN	2	0	0	0	0	0	0	0	0
Vicia sativa	NN	5	0	0	0	0	0	0	0	0
Invasive Herbaceous Species										
Cirsium arvense	I	3	0	0	0	0	0	0	0	0
Daucus carota	I	5	0	0	0	0	0	0	0	0
Hypochaeris radicata	I	3	0	0	0	0	0	0	0	0
Senecio jacobaea	I	4	0	0	0	0	0	0	0	0
Trifolium repens	I	3	0	0	0	0	0	0	0	0
Reed Canarygrass Cover										
Phalaris arundinacea	I	2	70	80	5	100	100	100	100	79
Native Shrub (S) and Tree (T) Species										
Acer macrophyllum (T)	N	4	0	0	0	0	0	0	0	0
Alnus rubra (T)	N	2	0	0	0	0	0	0	0	0
Amelanchier alnifolia (S)	N	4	0	0	0	0	0	0	0	0
Cornus alba (S)	N	2	0	0	0	0	0	0	0	0
Crataegus douglasii (S)	N	3	0	0	5	0	0	0	0	1
Fraxinus latifolia (T)	N	2	80	20	0	0	20	0	0	17
Physocarpus capitatus (S)	N	2	0	0	0	0	0	0	0	0
Pinus contorta (T)	N	3	0	0	0	0	0	0	0	0
Populus balsamif. var. *trichocarpa (T)*	N	2	0	0	3	0	0	0	0	0
Pseudotsuga menziesii (T)	N	4	0	0	0	0	0	0	0	0
Rosa nutkana (S)	N	3	0	0	0	0	0	0	0	0
Salix fluviatilis (S)	N	2	0	0	0	0	0	0	0	0
Salix lasiandra (S)	N	2	0	30	0	0	0	0	0	4
Salix sitchensis (S)	N	2	0	0	0	0	0	0	0	0
Sambucus racemosa (S)	N	3	0	0	0	0	0	0	0	0
Spiraea douglasii (S)	N	2	0	0	0	0	0	0	0	0
Symphoricarpos albus (S)	N	4	0	0	0	0	0	0	0	0
Non-Native Shrub and Tree Species										
			0	0	0	0	0	0	0	0
Invasive Shrub and Tree Species										
Cytisus scoparius	I	5	0	0	0	0	0	0	0	0
Rubus armeniacus	I	3	0	0	0	0	0	0	0	0
Bare Substrate			20	10	5	0	0	0	0	5
			Plant Count (Shrubs) + Stem Count (Trees)							
Native Shrub and Tree Count										
Acer macrophyllum			0	0	0	0	0	0	0	0
Alnus rubra			0	0	0	0	0	0	0	0
Amelanchier alnifolia			0	0	0	0	0	0	0	0
Cornus alba			0	0	0	0	0	0	0	0
Crataegus douglasii			0	0	2	0	0	0	0	0

Fraxinus latifolia	7	7	0	0	11	0	0	4
Pinus contorta	0	0	0	0	0	0	0	0
Populus balsamif. v ar trichocarpa	0	0	3	0	0	0	0	0
Pseudotsuga menziesii	0	0	0	0	0	0	0	0
Physocarpus capitatus	0	0	0	0	0	0	0	0
Rosa nutkana	0	0	0	0	0	0	0	0
Salix fluviatilis	0	0	0	0	0	0	0	0
Salix lasiandra	0	2	0	0	0	0	0	0
Salix sitchensis	0	0	0	0	0	0	0	0
Sambucus racemosa	0	0	0	0	0	0	0	0
Spiraea douglasii	0	0	0	0	0	0	0	0
Symphoricarpos albus	0	0	0	0	0	0	0	0

Routine Performance Standards	**1**	**2**	**3**	**1**	**2**	**3**	**4**	**Habitat Average**	**Standard Error**
Cover of Native Herbaceous Species	0	0	0	0	0	3	0	0	0.4
Lower CI (80%)								0	
Upper CI (80%)								1	
Cover of Non Native (Not Listed) Herbaceous Species	2	0	70	0	0	0	0	10	10.0
Lower CI (80%)								-2	
Upper CI (80%)								23	
Cover of Invasive Herbaceous Species	0	0	0	0	0	0	0	0	0.0
Lower CI (80%)								0	
Upper CI (80%)								0	
Cover of Reed Canarygrass	70	80	5	100	100	100	100	79	13.2
Lower CI (80%)								62	
Upper CI (80%)								96	
Cover of Invasive Shrubs and Trees	0	0	0	0	0	0	0	0	0
Lower CI (80%)								0	
Upper CI (80%)								0	
Bare Substrate	20	10	5	0	0	0	0	5	3
Lower CI (80%)								1	
Upper CI (80%)								9	
Native Diversity (all layers)								5	N/A
Sum of plant cover	152	130	83	100	120	103	100		
Density of Woody Vegetation (Average per acre)	431	555	308	0	678	0	0	282	N/A
Plot Area (shrub/tree plot)	707								
Per acre multiplier: Input 4,047 if plot area entered in B84 is in sq.meters or 43,560 for sq.feet	43560								
Cover of Native Shrubs and Trees	80	50	8	0	20	0	0	23	12
Lower CI (80%)								8	
Upper CI (80%)								38	

Appendix E - Vegetation Data - Stream Transects

STREAM CHANNEL TRANSECTS

Site: Harborton **Sample Date(s):** August 18-19

Species (form)	Origin (N, NN, I)	Wetland Status (1 - 5)	Percent Cover 1	2	3	4	5	6	7	8	9	10	Row Average
Native Herbaceous Species													
Achillea millefolium	N	4	5	0	1	0	0	3	4	0	0	1	1
Agrostis exarata	N	3	0	5	0	5	10	5	0	0	0	0	3
Alisma plantago aquatica	N	1	0	5	0	0	0	0	0	5	0	0	1
Alopecurus geniculatus	N	2	0	5	0	5	7	0	5	0	0	0	2
Beckmannia syzigachne	N	2	2	25	10	5	5	2	4	10	5	3	7
Bromus carinatus	N	4	0	0	0	0	0	1	0	0	0	0	0
Carex obnupta	N	2	0	15	0	0	0	0	5	20	0	0	4
Eleocharis ovata	N	2	1	0	0	0	0	0	1	0	0	0	0
Epilobium ciliatum	N	2	0	0	0	0	0	1	1	0	1	1	0
Epilobium densiflorum	N	2	0	0	0	0	0	0	0	0	1	0	0
Equisetum arvense	N	3	2	0	0	0	0	0	0	0	0	0	0
Glyceria occidentalis	N	2	5	0	5	0	5	1	0	7	0	0	2
Hordeum brachyantherum	N	2	0	0	0	0	5	0	0	3	0	0	1
Juncus bufonius	N	2	0	0	0	0	2	0	0	2	1	0	1
Juncus oxymeris	N	2	0	0	1	0	0	0	1	0	0	0	0
Juncus patens	N	2	0	5	5	15	0	2	0	0	0	0	3
Lupinus polyphyllus	N	4	5	0	15	20	0	5	10	10	10	5	8
Lupinus rivularis	N	3	0	3	10	20	10	20	0	10	10	0	8
Plagiobothyrus figuratus	N	3	0	0	0	0	0	0	0	0	0	0	0
Sagiittaria latifolia	N	1	0	5	0	0	0	0	0	2	0	0	1
Scirpus microcarpus	N	1	0	0	0	0	0	0	0	5	0	0	1
Trifolium wormskjoldii	N	3	0	0	0	0	0	0	0	1	1	0	0
Non-Native (Not Listed) Herbaceous Species													
Echinochloa crus-galli	NN	4	0	0	0	3	0	5	0	5	0	0	1
Holcus lanatus	NN	2	0	0	2	0	0	1	2	0	0	2	1
Matricaria discoidea	NN	4	0	0	1	0	0	0	0	1	0	0	0
Poa annua	NN	3	0	0	0	0	0	0	4	10	0	0	1
Polypogon monspeliensis	NN	2	0	0	0	0	0	0	0	5	0	0	1
Vicia sativa	NN	5	2	0	0	1	0	0	1	0	0	0	0
Invasive Herbaceous Species													
Cirsium arvense	I	3	2	0	0	0	0	0	0	1	0	0	0
Daucus carota	I	5	0	1	0	0	1	1	1	1	0	0	1
Dipsacus fullonum	I	2	0	0	3	0	0	0	0	0	0	0	0
Hypericum perforatum	I	3	0	2	0	1	1	1	1	2	1	1	1
Lotus corniculata	I	3	0	0	0	0	2	4	0	0	0	0	1
Ludwigia peploides	I	2	0	0	0	0	0	0	0	0	0	0	0
Trifolium repens	I	3	2	1	0	1	1	1	0	1	0	0	1
Reed Canarygrass Cover													
Phalaris arundinacea	I	2	0	0	0	0	0	0	0	0	5	5	1
Native Shrub and Tree Species													
Alnus rubra (T)	N	2	0	0	0	1	0	0	0	0	0	0	0
Amelanchier alnifolia (S)	N	4	0	0	0	0	4	5	0	2	0	0	1
Cornus alba (S)	N	2	0	1	0	2	0	0	0	2	0	0	1
Frangula purshiana (T)	N	3	0	0	0	0	0	0	0	0	1	0	0
Fraxinus latifolia (T)	N	2	0	0	0	0	1	1	0	3	0	0	1
Physocarapus capitatus (S)	N	2	0	0	0	1	0	0	0	0	0	0	0
Populus balsamif. var. *trichocarpa (T)*	N	2	3	1	0	0	0	1	0	3	1	1	1
Rosa nutkana (S)	N	3	4	0	0	5	0	5	0	1	0	0	2
Salix lasiandra (S)	N	2	0	5	0	3	0	0	2	0	2	0	1
Sambucus racemosa (S)	N	3	0	0	0	2	0	0	1	0	0	0	0
Spiraea douglasii (S)	N	2	0	0	2	0	1	3	0	1	1	0	1
Non-Native Shrub and Tree Species													
			0	0	0	0	0	0	0	0	0	0	0
Invasive Shrub and Tree Species													
Cytisus scoparius (S)	I	5	0	0	0	0	0	1	1	1	0	0	0
Rubus armeniacus (S)	I	3	0	0	0	1	0	0	1	0	0	0	0
Bare Substrate			80	50	60	40	50	50	40	20	50	50	49

Routine Performance Standards	1	2	3	4	5	6	7	8	9	10	Habitat Average	Standard Error
Cover of Native Herbaceous Species	20	68	47	70	44	40	31	75	29	10	43	7.0

Lower CI (80%)											34	
Upper CI (80%)											52	
Cover of Non Native (Not Listed) Herbaceous Species	2	0	3	4	0	6	7	21	0	2	5	2.0
Lower CI (80%)											2	
Upper CI (80%)											7	
Cover of Invasive Herbaceous Species	4	4	3	2	5	7	2	5	1	1	3	1
Lower CI (80%)											3	
Upper CI (80%)											4	
Cover of Reed Canarygrass	0	0	0	0	0	0	0	0	5	5	1	1
Lower CI (80%)											0	
Upper CI (80%)											2	
Cover of Invasive Shrubs and Trees	0	0	0	1	0	1	2	1	0	0	1	0
Lower CI (80%)											0	
Upper CI (80%)											1	
Bare Substrate	80	50	60	40	50	50	40	20	50	50	49	5
Lower CI (80%)											43	
Upper CI (80%)											55	
Native Diversity (all layers)											5	N/A
Sum of plant cover	28	79	54	91	55	66	41	114	40	18		

Appendix F - Photomonitoring

Site Location Map

Map Features

- Habitat Area
- Non-Habitat Area
- Survey Transect
- Property Line
- Olympic Pipeline
- Water Level / Water Monitoring Station
- Photomonitoring Point
- Bald Eagle Monitoring Station
- Mink Scent Station/ Photmonitoring Mink
- Track and Scent Monitoring Routes
- S Water Level Staff Gauge

0 115 230
Feet

Portland General Electric
Portland, Oregon

Fixed Monitoring Stations

Harborton Restoration Project

Date:	Drawn By:	Rev.:
7/4/2020	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Hab_Fig5.mxd

PHOTOMONITORING POINT 01 - FACING SOUTH

PHOTOMONITORING POINT 02 - FACING SOUTHWEST

PHOTOMONITORING POINT 03 - FACING NORTHEAST

PHOTOMONITORING POINT 03 - FACING NORTHWEST

PHOTOMONITORING POINT 04 - FACING NORTH

PHOTOMONITORING POINT 05 - FACING WEST-SOUTHWEST

PHOTOMONITORING POINT 06 - FACING NORTHEAST

PHOTOMONITORING POINT 07 - FACING EAST

PHOTOMONITORING POINT 08 - PHOTO FACING NORTHEAST

Supplemental Photographs of Upstream End of North Channel

NORTH CHANNEL - PHOTO FACING UPSTREAM (JAN. 12, 2022)

NORTH CHANNEL - PHOTO FACING DOWNSTREAM/ EAST (FEB. 23, 2022)

NORTH CHANNEL - PHOTO FACING DOWNSTREAM (MAY 17, 2022)

NORTH CHANNEL - PHOTO FACING DOWNSTREAM (JUNE 5, 2022)

NORTH CHANNEL - PHOTO FACING DOWNSTREAM (JULY 14, 2022)

NORTH CHANNEL - PHOTO FACING DOWNSTREAM (OCT. 3, 2022)

Appendix G - Aerial Orthophoto Images

DECEMBER 2020

NOVEMBER 2021

JANUARY 2022

JUNE 2022

Appendix H - Herbicide Record

HARBORTON
Herbicide Record - 2022

Date	Location (Sub Area)	Area (ac.)	Product Name	EPA Registration #	Volume	Method
5/24/2022	SA3	4.5 ac	Element 3A	62719-37	60 oz	backpack sprayer
			Roundup Pro Concentrate	524-529	60 oz	
			Rainier-EA (surf)		n/a	
			Hi-Light Blue (indicator		n/a	
5/25/2022	SA1,2,3	4.5 ac	Element 3A	62719-37	60 oz	backpack sprayer
			Roundup Pro Concentrate	524-529	60 oz	
			Rainier-EA (surf)		n/a	
			Hi-Light Blue (indicator		n/a	
7/19/2022	SA3	4.5 ac	Element 3A	62719-37	68 oz	backpack sprayer
			Roundup Pro Concentrate	524-529	68 oz	
			Rainier-EA (surf)		n/a	
			Hi-Light Blue (indicator		n/a	
7/20/2022	SA3	4.5	Element 3A	62719-37	70 oz	backpack sprayer
			Roundup Pro Concentrate	524-529	70 oz	
			Rainier-EA (surf)		n/a	
			Hi-Light Blue (indicator		n/a	
10/20/2022	SA3	4.1	Element 3A	62719-37	64 oz	backpack sprayer
			Rodeo	62719-324	64 oz	
			Rainier-EA (surf)		n/a	
			Hi-Light Blue (indicator		n/a	