Green Point Consulting

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December 1, 2014

Dana Hicks
Oregon Department of State Lands
775 Summer Street N.E.
Department of State Lands
Salem, OR 97301

SUBJECT: 2014 Monitoring Report for Tamara Quays Project

Dear Dana:

Enclosed you will find the Year 5 (2014) monitoring report for the Tamara Quays tidal wetland restoration project. Our role in this project is to monitor plant community composition and plant community extent (vegetation mapping); to monitor soils, and to analyze and interpret hydrology data collected by USFS staff.

This year's report addresses performance standard 1 (wetland delineation "light"), and vegetation performance standards (standards 7.1 through 7.10). Documents provided directly to the Department of State Lands by the U.S. Forest Service, Siuslaw National Forest address the other currently applicable performance criteria. Under separate cover, we have also provided a functions and values assessment of the site using the ORWAP method.

Based on our monitoring this year, the project is currently meeting 9 out of the 10 applicable vegetation performance standards. In our professional judgment, the failure to meet Performance Standard 7.3 (>30% cover of native shrubs in the shrub zone) does not indicate any structural or functional problems with the project. Shrub and tree cover in the sample area has increased from 1% in 2010 to 5% in 2012 to 16% in 2014, and volunteer native shrubs and trees have become established. Native vegetation is establishing well throughout the site, the site has free tidal exchange, and natural processes are in place to re-establish tidal wetland functions.

This report also includes results of other monitoring performed at the site. Although these results are not required for Year 5 reporting, we include them to inform project partners on the progress of the overall effectiveness monitoring effort.

Please refer to the report for details on our findings and recommendations. If you have any questions, please contact me at (541) 752-7671 or by email at brophyonline@gmail.com.

Sincerely,

Laura A. Brophy

Laura Brophy
Principal

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2014 Monitoring Report: Tamara Quays Tidal Wetland Restoration

Tamara Quays restoration site: Rowdy Creek channel below former Kingfisher Lake, 7/1/14. Photo by L. Brophy.

December 1, 2014

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1. Mitigation Monitoring Report Cover Sheet
Oregon Department of State Lands

Block 1: Report Information

DSL Permit Number: 40400-GA	COE Permit Number: NWP-2007-01023	Permittee: USFS-Siuslaw NF
County: Lincoln	Report Date: Dec. 1, 2014	Monitoring Year: 5
Date Removal-Fill Activity Completed: September 2009		
Date mitigation was completed:	Grading: September 2009	Planting: Winter 2010
Report submitted by: Laura Brophy, Green Point Consulting, 541-752-7671		

Block 2: Monitoring Report Purpose

This monitoring report is for monitoring a project that includes: (check all that apply):

☐ Compensatory **freshwater** wetland mitigation for permanent wetland impacts.
☐ Compensatory **estuarine** wetland mitigation for permanent wetland impacts.
☐ **Only non-wetland** compensatory mitigation.
☐ **Only mitigation for temporary** impacts that had a monitoring requirement.
☐ **Voluntary** wetland enhancement, creation or restoration (General authorization or individual permit) not funded with money from our wetland mitigation revolving fund.
☒ Voluntary wetland enhancement, creation or restoration (General authorization or individual permit) funded with money from **our wetland mitigation revolving fund**.
☐ **Mitigation Bank** Report
☐ Other:

Block 3: Results

	Success Criteria	Met? (Y/N)	Comments/Reason for failure*[1]
1.	Re-establish wetland hydrology on approximately 6 acres of filled wetland consisting of the filled trailer park area to the NE of "Kingfisher Lake", and the dike. Criterion for success is for final elevations in all wetland removal/fill areas to be equal to the elevations on the grading plan in the approved pre-implementation report.	Y	Although our scope does not include measurements to evaluate this criterion, according to USFS "as-built" survey data, this criterion has been met.
2.	Restore tidal influence to the existing wetland (~6 acres). Criterion for success is for tidal inundation to be within tolerable limits of height, duration and frequency at established channel cross-sections. Tolerable limits will be described in the approved Pre-Implementation Report.	Y	Assessment of tidal hydrology conducted in 2011 showed full tidal reconnection (see 2011 report). Field observations in 2014 indicated the site is still fully connected to tidal influence; no barriers to tidal flow were observed.
3.	Re-establish native vegetation at the project site. Criterion for success is for invasive species control and native vegetation planting to be implemented as approved in the Pre-Implementation Report.	N	One of the 10 applicable vegetation performance standards was not met in 2014, but this does not indicate any problems with the project; no remedial action is recommended. The other 9 standards were met.

* Success criteria are excerpted from the Tamara Quays Grant Agreement provided by Dana Hicks on June 13, 2010. Performance Standards (next page) are from the Tamara Quays Mitigation Plan dated January 28, 2010. The Mitigation Plan does not contain Success Criteria.

Remedial work recommended?	Yes ☐	No X
Final Monitoring Report?	Yes ☐	No X

[1] See report for detailed information

Form Continued on Page 2

Block 4: Adaptive Management Performance Standards. This report addresses Performance Standards 1 and Standards 7.1 through 7.10 (following pages). Current year requirements are highlighted and underlined.

	Performance Standards	Met? (Y/N)	Comments/Reason for failure[2]
1.	*By year 5, a delineation "lite" will show that areas formerly occupied by dikes, borrow channels, and fill areas meet, or are likely to meet criteria for wetland vegetation and hydrology. If hydric soil field indicators are not present, but hydrology and vegetation indicators are positive, the plot may still be called wetland.*	Y	The whole tidal restoration site (14. 83 ac) met jurisdictional wetland criteria. An additional area of 0.56 ac above below the defined limit of tidal wetland hydrology (the biennial inundation elevation, 10.44 ft) met the wetland vegetation criterion. See Appendix 7 (**Wetland delineation light**) for details.
2.	*Elevations, as demonstrated in the as-built, are as outlined in the grading plan, or are graded to follow the historic marsh surface where apparent and noted.*	Y	This criterion will be addressed by USFS; the USFS as-built survey (Map 8, Appendix 4) shows that this criterion has been met.
3.	*There is a free exchange of tides, creating a tidal inundation regime similar to that of the reference site (after adjusting for relative elevations) as determined by data collected for at least one year using the existing tide gauge locations (one in reference marsh, one in project area).*	Y	Assessment of tidal hydrology conducted in 2011 showed full tidal reconnection (see 2011 report). Field observations in 2014 indicate this is still the case; no barriers to tidal flow were observed.
4.1	*The as-built and/or photo documentation will demonstrate that grading allows hillside drainages to flow into the project area.*	Y	See USFS as-built survey (Map 7, Appendix 4)
4.2	*In years 2, 4, 6, 8, and 9, visual inspection and photo or video documentation will show that surface water flowing from hillside drainages is entering the project area.*	N/A	This criterion will be addressed by USFS.
5.	*In years 2, 4, 6, 8, and 9, visual estimates and photo or video documentation taken during a mean high tide or higher will demonstrate that at least 75% of surface water on the site is connected to the stream channel rather than isolated in pools.*	N/A	This criterion will be addressed by USFS.

[2] See report for detailed information

6.	*In years 2, 4, 6, 8, and 9, visual estimates and photo or video documentation taken during a mean high tide or higher will demonstrate that at least 20 pieces of wood greater than 16" diameter are in contact with the water during mean high tide or higher.*	N/A	This criterion will be addressed by USFS.
7.1	*In shrub-dominated habitats the cover of native herbaceous species in the understory is at least 40% by year 1; at least 50% by year 3; and at least 60% by year 5.*	Y	Native herbaceous cover in the shrub-dominated habitat (Transect 5) was 67% in 2014, up from 53% in 2012.
7.2	*In shrub-dominated habitats the absolute cover of invasive herbaceous species, except for Phalaris arundinacea (reed canary grass), is no more than 10%. The absolute cover by P. arundinacea is no more than 40% by year 1; 30% by year 3; and 20% by year 5.*	Y	Cover of invasive herbaceous species, excluding *P. arundinacea,* in Transect 5 was 2.8%. Cover of *P. arundinacea* in Transect 5 was 1.6% in 2014, up slightly from 0.05% in 2012.
7.3	*In shrub-dominated habitats, the cover of native shrubs is at least 10% by year 3 and 30% by year 5. Native species volunteering on the site may be included, dead plants do not count.*	N	Native shrub cover was 16.4% in 2014, up from 5% in 2012. Although native shrub density declined in 2014, the remaining density is probably adequate to achieve 30% cover within a few more years.
7.4	*In shrub-dominated habitats the cover of invasive shrub or tree species is no more than 10% in all monitoring years.*	Y	No invasive shrub or tree species are present in shrub-dominated habitats (Transect 5).
7.5	*In shrub-dominated habitats, there are at least 3 different native species in all habitat types by year 5. To qualify, a species will have at least 5% average cover in the elevation class, and occur in at least 10% of the plots sampled.*	Y	In Transect 5, there are 3 native species that have at least 5% average cover and 10% occurrence in plots sampled. Those species are *Salix sitchensis* (5.8% average cover, present in 100% of shrub plots), *Juncus effusus* (66.4% average cover, present in 100% of herbaceous plots) and *Salix hookeriana* (10.0% average cover, present in 100% of shrub plots).
7.6	*In tidal areas, cover by invasive species relative to the total vegetation (not counting bare ground) is no more than 50% by year 1, 40% by year 3, and 30% by year 5.*	Y	Cover of invasive species, including *P. arundinacea*, averaged 22% in 2014, down from 27% in 2012. (This standard is applied to emergent tidal marsh.)
7.7	*In the tidal area, at least three of the species documented in the reference marsh occur in the project area by year 5.*	Y	Four of the species documented in the reference marsh occurred in the project area, including *Carex lyngbyei, Deschampsia cespitosa, Juncus balticus* and *Potentilla anserina.*
7.8	*In the tidal area, cover by native species is progressing toward reference conditions, currently measured at 86%, over the monitoring period.*	Y	Cover by native species averaged 54% in 2014, up from 35% in 2012. (This standard is applied to emergent tidal marsh).

7.9	*In the tidal areas, total plant cover is progressing toward reference conditions, currently measured at 95.7%, over the monitoring period.*	Y	Total plant cover averaged 96% in 2014, up from 84% in 2012. (This standard is applied to emergent tidal marsh).
7.10	*The moisture index total for all strata is <3.0 in all habitat types over the monitoring period.*	Y	In 2014, the moisture index (prevalence index) 2.03 for emergent marsh and 2.45 in shrub-dominated habitat.

2. Supporting Information

Background

This report describes results of effectiveness monitoring by our firm (Green Point Consulting) at the Tamara Quays tidal wetland restoration site. The site is located along the lower reaches of Rowdy Creek, where the creek enters the Salmon River estuary in Lincoln County, Oregon (Map 1, Appendix 4). Restoration was completed in fall 2009; the as-built survey (Map 7, Appendix 4) shows the final site elevations.

We began monitoring this site in 2007, and will continue our effectiveness monitoring work for 10 years after restoration (through 2019). Specifically, we are monitoring vegetation and soils, assisting USFS with water level data collection, and providing analysis and interpretation of tidal hydrology. The complete scope of work for our effectiveness monitoring at the site is provided in Appendix 1 of this report.

Reporting schedule

Table 1 shows the reporting schedule for monitoring at Tamara Quays, excerpted from the Tamara Quays Mitigation Plan (OR DSL 2010a). In addition, our scope of work for effectiveness monitoring (Appendix 1) includes a brief annual report describing “work completed, a summary of results, and problems or challenges encountered or anticipated.” These requirements are met in this report.

Table 1. Tamara Quays Reporting Schedule[1]

Report	Requirements	Schedule (estimated)
As-Built Elevations	Final surveyed grades and a brief narrative describing any changes from the approved plan	Estimated June 2010
Year 1 report	Vegetation Monitoring	December 1, 2010
Year 2 report	Tidal inundation regime, walk-through survey and photo points	December 1, 2011
Year 3 report	Vegetation Monitoring	December 1, 2012
Year 4 report	Walk-through survey and photo points	December 1, 2013
Year 5 report	Vegetation Monitoring Delineation "light"[2] Functions and Values Assessment[2]	December 1, 2014
Year 6 report	Walk-through survey and photo points	December 1, 2015
Year 7 report	Vegetation Monitoring	December 1, 2016
Year 8 report	Walk-through survey and photo points	December 1, 2017
Year 9 report	Walk-through survey and photo points	December 1, 2018
Year 10 report	Vegetation Monitoring	December 1, 2019

[1]Monitoring to demonstrate achievement of performance standards will take place for a minimum of five years. If the fifth year monitoring report indicates that the project is meeting its performance standards, the IRT may decide to reduce or waive the monitoring outlined in favor of that required by the long-term management plan.
[2]These requirements may be fulfilled any time during the monitoring period, but will be submitted no later than December 1, 2014. Delineation "light" will be conducted according to the DSL's Removal Fill Guidelines.

Methods

Summary

Monitoring methods and timeline are summarized in Tables 2 and 3. Monitoring in 2014 was conducted using the same methods as in 2010 and 2012. These methods are described in the Tamara Quays Mitigation Plan, with two minor exceptions:

- In herbaceous transects (T2, T3, T4, T6, and T7), instead of 10 plots per transect, we monitored 15 plots per transect. This decision was based on the use of DSL's Sample Size Calculator for plots monitored in 2007. In the single transect in shrub-dominated habitat (Transect 5), we counted stems and estimated percent cover of shrubs and trees in five randomly placed shrub/tree plots (15ft by 15ft each), and estimated percent cover of herbaceous species in 10 herbaceous plots of 1 sq m each, nested within the randomly placed shrub/tree plots.
- Elevation measurements of transects (study plots) and instrumentation were originally scheduled for 2014. However, these measurements were completed ahead of schedule (in 2011) and were not needed again in 2014, since no instrumentation was present in

2014 and elevations of study transects are not expected to have changed since 2011 (grading was completed in 2010).

As described in the Effectiveness Monitoring Scope of Work (Appendix 1), monitoring at the Tamara Quays site follows regional and national standards, allowing exchange of data and "lessons learned" with the tidal wetland restoration community. Monitoring also meets guidelines and requirements established in the following documents:

- The Tamara Quays Mitigation Plan (OR DSL 2010a)
- The Tamara Quays Grant Agreement (OR DSL 2010b)
- Routine Monitoring Guidance for Vegetation issued by the Department of State Lands (OR DSL 2009)
- Oregon DSL's Removal-Fill Guidance (http://www.oregon.gov/DSL/PERMITS/docs/cwm_rfg_feb2010.doc),

Table 2 summarizes monitoring methods at Tamara Quays; Table 3 shows the monitoring timeline. Further details on the monitoring program are found in Appendix 1.

Table 2. Tamara Quays: Monitoring methods summary

Indicator category	**Monitored metric**	**Data collection method(s)**
Hydrology	Surface water elevation	Automated level logger ("tide gauge")
Elevation	Elevation of study plots and instrumentation	Laser level, total station, or RTK-GPS
Vegetation	Plant community composition	Study plots located within elevation strata; visual estimate of percent cover within randomly located 1 sq m subplots; woody stem counts within randomly located 15 by 15 ft plots
Vegetation	Extent of plant communities	GIS mapping via heads-up digitization from orthorectified aerial photos provided by USFS
Soils	% organic matter, pH, electrical conductivity	Surface 30cm cores from sample plots; analysis at OSU Central Analytical Lab

Table 3. Tamara Quays: Monitoring timeline (Green Point Consulting activities)

#	Monitored metric	2007	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	Tidal inundation regime	X	X	X	X								
2	Elevations of instrumentation and study plots*		X	X				X					
3	Vegetation composition in transects	X		X		X		X		X			X
4	Vegetation mapping		X					X					X
5	Soil OM, pH, texture, EC	X		X									X
6	Wetland delineation		X					X					
7	Functional assessment		X					X					

* Elevation survey of instrumentation and study plots, originally scheduled for 2014, was completed in 2011.

Sample Transects

Table 4 shows characteristics of the sample transects, where data on vegetation and soils were collected. Transects 1-3 were established prior to restoration on areas that were not graded. Transects 4-7 are located on the area that was graded in summer 2009, so no baseline data were collected prior to restoration. (For these transects, grading removed all vegetation and surface soil – i.e., fill material -- so baseline data would not have been meaningful.) However, the pre-restoration delineation report (Brophy 2009a) provides detailed information on conditions in the area of Transects 4-7 prior to restoration.

Soil surface elevations for transects TQ T2 through TQ T7 were measured by a USFS survey crew in 2010. Seven to ten points were measured along each transect; the results were averaged for the data shown in Table 4. For TQ T1, soil surface elevations were averaged from just two points at the north and south end posts; the elevations were obtained by our team using a laser level in 2009 (for TQ T1 N) and RTK-GPS equipment in September 2014 (for TQ T1S). Transect endpost coordinates (Table 5) were obtained from these same data sources.

Table 4. Tamara Quays: Transect descriptions (for locations, see Map 4, Appendix 4). Endpost coordinates are in meters, UTM Zone 10N, NAD83.

Transect	Location	Average elevation (ft NAVD88)	Graded in 2009?	Years monitored	Vegetation type
TQ T1	Reference marsh (outside dike)	8.35	N	2007; 2010-2019*	Emergent tidal marsh
TQ T2	Old marsh surface, adjacent to Kingfisher Lake	7.58	N	2007, 2009, 2010-2019	Emergent tidal marsh
TQ T3	Old marsh surface, W of bypass canal levee	7.69	N	2009, 2010-2019	Emergent tidal marsh
TQ T4	Tidal marsh restoration area	8.01	Y	2010-2019	Emergent tidal marsh
TQ T5	Shrub zone, east side of site	11.35	Y	2010-2019	Willows
TQ T6	Tidal marsh restoration area	7.46	Y	2010-2019	Emergent tidal marsh
TQ T7	Tidal marsh restoration area	7.81	Y	2010-2019	Emergent tidal marsh

* Reference Transect 1 was monitored in 2007 and 2014 but not in 2010 or 2012. This transect will also be monitored in Year 10 (2019).

Table 5. Tamara Quays: Transect endpost coordinates (for locations, see Map 4, Appendix 4). Coordinates are in meters, UTM Zone 10N, NAD83.

Transect	Endpost position	Northing (m)	Easting (m)
TQ T1	north	4986072.02	422769.49
TQ T1	south	4985983.37	422790.02
TQ T2	north	4985874.89	422761.51
TQ T2	south	4985820.60	422805.12
TQ T3	north	4985831.28	422703.10
TQ T3	south	4985803.09	422756.74
TQ T4	east	4985827.97	422905.07
TQ T4	west	4985864.70	422829.14
TQ T5	north	4985767.76	423032.84
TQ T5	south	4985719.10	423064.34
TQ T6	north	4985714.24	423033.87
TQ T6	south	4985655.83	423047.01
TQ T7	north	4985787.05	422851.17
TQ T7	south	4985761.97	422893.62

Vegetation mapping

Our effectiveness monitoring program at Tamara Quays includes mapping of wetland types (Cowardin classes) at the restoration site at baseline (2009), and mapping of plant communities in Years 5 and 10 (2014 and 2019). In 2014, we mapped vegetation using aerial photography and field ground-truthing. High-resolution digital aerial photographs flown in 2012 were provided by USFS (Barb Ellis-Sugai, personal communication). We traversed the project site on foot to correlate field vegetation with patterns in the aerial photographs. Map units were delineated in the field on printouts of the aerials. Digital vegetation maps were created in ArcGIS 10.2 by georeferencing the field maps and tracing the map unit boundaries into the GIS at a consistent onscreen scale of 1:1000. For the ungraded areas, a digital elevation model (DEM) built from LIDAR acquired in 2009 by the Oregon LIDAR Consortium (Watershed Sciences 2009) was used to assist boundary placement, since elevation (and the resulting tidal inundation regime) are controlling factors in plant community development. (The LIDAR was flown before grading, so it could not be used for the graded areas.) The polygon size threshold was about 0.02 A (about 30 by 30 ft). The vegetation map was saved as a shapefile (TQ_2014_VegMap_FINAL_20141130_LSB.shp).

Following the National Vegetation Classification Standard (The Nature Conservancy 1994), we used a two-level hierarchical vegetation classification scheme. Plant associations represented fine gradations of dominant species; these were finely divided to reflect small differences in community composition. Plant association names reflect the relative dominance of species. For example, in the “soft rush - Baltic rush - reed canarygrass” association, soft rush has higher cover than reed canarygrass, whereas the opposite is true for the “reed canarygrass - soft rush - Baltic rush - creeping spikerush” association. Alliances, the coarser level, were described by a single major dominant species that characterized a larger area. This two-level classification allows flexibility in tracking future vegetation change.

We also characterized plant communities as native-dominated or non-native-dominated, based on the alliance level classification. Native-species alliances such as Baltic rush and soft rush were considered native-dominated, and non-native alliances such as tall fescue were considered non-native-dominated. The percent cover of native species versus non-native species varied within these alliances.

3. Summary Data: Monitoring Results

Tidal inundation regime (hydrology)

As described in the 2011 monitoring report (Brophy 2011), tidal hydrology was successfully restored at Tamara Quays. Project performance standards require a free exchange of tides at the Tamara Quays site, with a tidal inundation regime in the restoration area that is similar to that in the reference area (after adjusting for elevation). Results from tidal hydrology monitoring during 2009-2011 indicate that this standard was achieved; high tide levels at the restoration site and reference site were nearly identical during the entire monitoring period. Field observations in 2014 indicate this is still the case; no barriers to tidal flow were observed. Therefore, no further information is provided regarding this performance standard.

Tidal datums such as Mean Higher High Water (MHHW) and Highest Measured Tide (HMT) provide useful benchmarks for understanding of site development. Although our scope of work does not include calculation of tidal datums at Tamara Quays, others have calculated tidal datums for the Salmon River estuary and nearby areas (see Appendix 6).

Elevation

Project performance standards specify that "Elevations, as demonstrated in the as-built, are as outlined in the grading plan, or are graded to follow the historic marsh surface where apparent and noted." USFS provides information to DSL for evaluation of this standard. However, as described in the 2010 monitoring report (Brophy 2010a), the as-built survey provided to us by USFS shows that these standards have been met; elevations at the Tamara Quays site have been successfully restored as outlined in the grading plan. Therefore, no further information is provided regarding this performance standard.

Vegetation composition in transects

Performance standards

The vegetation performance standards for the Tamara Quays site (OR DSL 2010a) are based on plant community composition. As shown on the cover sheet for this report and in Tables 6 and 7 below, nine of the ten performance standards that are applicable in 2014 were met. In herbaceous and shrub habitats, native plant cover is high, cover of invasives is below specified levels; and the prevalence index is low, indicating predominance of hydrophytic (wetland) species.

The only standard that was not met was Performance Standard 7.3 (Table 6), which calls for more than 30% cover of native shrubs within the shrub-dominated habitats (Transect 5). In our professional judgment, the failure to meet this standard does not indicate any structural or functional problems with the project, and no remedial action is recommended. Although shrub density decreased in 2014 (Table 14), shrub cover continued to increase, more than doubling in 2014 (16.4%) compared to 2012 (6.5%) (Table 13). Although this is still below the standard of 30% shrub cover by year 5, the steady increase in cover suggests the willows are now well established in this zone, and will continue to increase over the next few years. It is not uncommon for willows to take more than 5 years to develop substantial cover, based on our experience at similar sites (Brophy 2005, Brophy 2012a).

Table 6. Tamara Quays: Summary of vegetation monitoring and performance standards for shrub-dominated habitats, 2010-2014.

Parameter	Native cover (herbaceous) *(standard 7.1)*			Invasive cover excluding *Phalaris arundinacea* *(standard 7.2a)*			Cover of *Phalaris arundinacea* *(standard 7.2b)*			Cover of native shrubs *(standard 7.3)*			Cover of invasive trees and shrubs *(standard 7.4)*			Native Diversity *(standard 7.5)*	Prevalence Index *(standard 7.10)*		
Performance Standard for Year 5	>60%			<10%			<20% by Year 5			30% by Year 5			<10%			At least 3 species by Year 5	<3.0		
Meeting Standard?			**YES**			**YES**			**YES**			**NO**			**YES**	**YES**			**YES**
	2010	2012	**2014**	2010	2012	**2014**	2010	2012	**2014**	2010	2012	**2014**	2010	2012	**2014**	**2014**	2010	2012	**2014**
TQT5	5	53	**67**	2	2	**3**	0	0	**2**	1	5	**16**	0	0	**0**	**3**	2.65	2.05	**2.24**

Table 7. Tamara Quays: Summary of vegetation monitoring and performance standards for herbaceous (tidal marsh) areas, 2010-2014.

Parameter	Invasive Cover			Native Diversity	Native Cover			Total Plant Cover			Prevalence Index		
Performance Standard for Year 5	<30% by Year 5 *(standard 7.6)*			At least 3 species also found in reference marsh (*standard 7.7)*	Progressing toward 86% *(standard 7.8)*			Progressing toward 95.7% *(standard 7.9)*			<3.0 *(standard 7.10)*		
	2010	2012	**2014**	**2014**	2010	2012	**2014**	2010	2012	**2014**	2010	2012	**2014**
Meeting Standard?			**YES**	**YES**			**YES**			**YES**			**YES**
TQT2	6	36	**24**	**3**	25	17	**7**	74	99	**99**	1.89	2.45	**2.68**
TQT3	19	71	**65**	**2**	4	14	**35**	44	90	**100**	1.95	1.83	**1.72**
TQT4	0	0	**3**	**3**	1	24	**69**	2	60	**88**	1.70	2.26	**1.94**
TQT6	0	19	**4**	**4**	3	64	**79**	4	87	**94**	1.92	1.68	**1.74**
TQT7	2	7	**13**	**2**	10	57	**80**	17	85	**99**	1.92	2.15	**2.08**
Average	5	27	**22**	**4 (total)**	9	35	**54**	28	84	**96**	1.88	2.07	**2.03**

Plant community composition

In this section, we provide details on plant community composition – the data used to evaluate the vegetation performance standards described above. Table 8 shows scientific names, common names, and native/non-native status for the wetland plants commonly found at Tamara Quays. These are the species shown in the tables and figures below.

Table 8. Scientific names, common names, and native/non-native status for wetland plant species commonly found at Tamara Quays.

Scientific name	Common name	Native status*
Achillea millefolium	common yarrow	N
Agrostis stolonifera	creeping bentgrass	NN
Alnus rubra	red alder	N
Anthoxanthum odoratum	sweet vernal grass	I
Carex lyngbyei	Lyngbye's sedge	N
Deschampsia cespitosa	tufted hairgrass	N
Eleocharis palustris	common spikerush	N
Epilobium ciliatum	fringed willowherb	N
Festuca rubra	red fescue	NN
Galium trifidum	three-petal bedstraw	N
Glaux maritima	sea milkwort	N
Holcus lanatus	velvet grass	I
Hordeum brachyantherum	meadow barley	N
Juncus balticus	Baltic rush	N
*Juncus effusus***	soft rush	N
Lathyrus palustris	marsh vetchling	N
Lotus uliginosus	greater birdsfoot trefoil	NN
Oenanthe sarmentosa	water parsley	N
Phalaris arundinacea	reed canarygrass	I
Poa sp.	bluegrass	Unk
Potentilla anserina	Pacific silverweed	N
Salix hookeriana	Hooker willow	N
Salix sitchensis	Sitka willow	N
Schedonorus arundinaceus	tall fescue	NN
Symphyotrichum subspicatum	Douglas' aster	N
Triglochin maritima	seaside arrowgrass	N
Typha latifolia	common cattail	N

* N = native, NN = non-native, I = invasive. Invasive species are defined by the Oregon Department of State Lands as those on the Oregon Department of Agriculture noxious weeds lists. They may be native or non-native.
** Both native and non-native subspecies of soft rush exist on the Oregon coast (see **Soft rush: Native and non-native subspecies** below). Due to time and budget limitations, we were not able to determine native vs. non-native status for the soft rush at Tamara Quays.

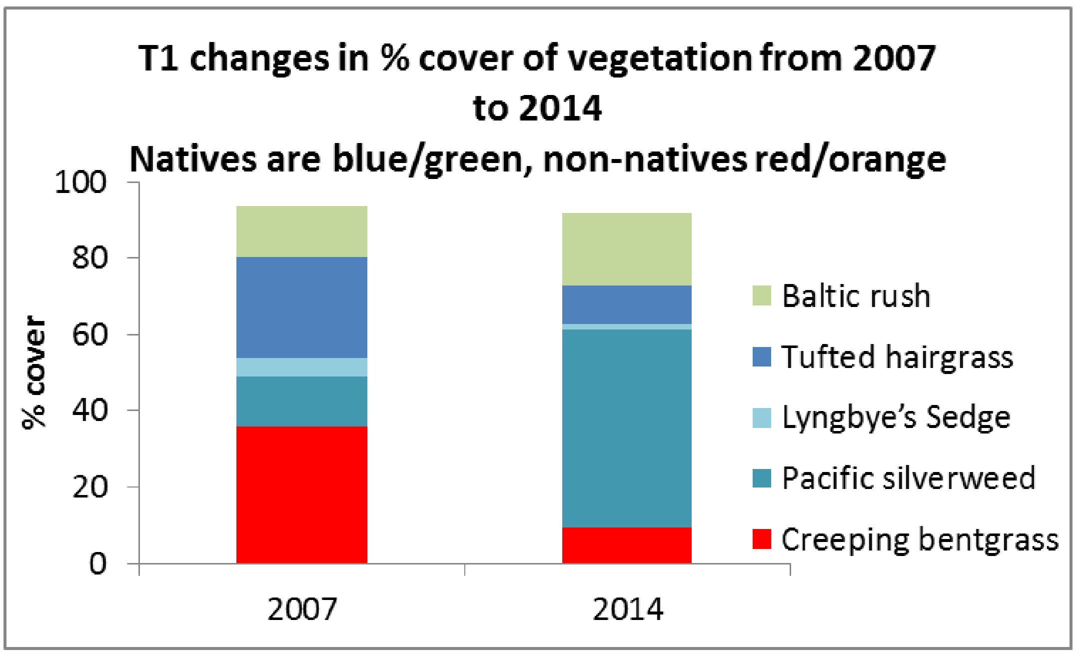
Reference marsh

Due to time and budget limitations, the reference transect in the undiked marsh adjacent to the Tamara Quays site (Transect 1, Map 4) was only monitored in 2007 and 2014, but not monitored in 2010 or 2012. Table 9 and Figure 1 show percent cover for all species in Transect 1 that had cover greater than 5% in any monitoring year; Table 9 also shows total vegetation cover and bare ground. Percent cover values shown are the average of ten 1 sq m plots per transect in 2007 and 15 plots the same size in 2014.

Table 9. Tamara Quays: Changes in plant community composition and bare ground, Transect 1, 2007-2014 (species over 5% in any monitoring year)

	% cover	
Common name	**2007**	**2014**
Creeping bentgrass	36.0	9.27
Tufted hairgrass	26.6	10.4
Baltic rush	13.2	18.9
Pacific silverweed	12.8	51.8
Lyngbye's sedge	5.0	1.47
total vegetation cover	*96.5*	*95.7*
bare ground	*3.5*	*4.3*

Figure 1. Tamara Quays: Changes in plant community composition, Transect 1, 2007-2014 (species over 5% in any monitoring year)



Tufted hairgrass was the dominant native species in 2007 with 26.6% cover, but dominance shifted to Pacific silverweed in 2014 (51.8%). In our experience, year-to-year changes in cover of Pacific silverweed in Oregon high marsh may be due to interannual variations in precipitation and temperature, since this species is very responsive to dessication, senescing early when conditions are hot and dry. By contrast, in favorable years, this species produces a very dense layer of foliage, which can overtop lower-growing species such as creeping bentgrass. Such overtopping may explain the decrease in cover of the non-native species creeping bentgrass (from 36% in 2007 to 9.3% cover in 2014). The reduction in tufted hairgrass cover is less easily explained; future monitoring will reveal whether this is a trend or simply interannual variability. The overall variation observed at this reference transect between 2007 and 2014 is not unusual compared to other projects (Brophy and Christy 2009, Brophy *et al*. 2014).

Restoration site: Old marsh surface

Our monitoring includes two transects on the "old marsh surface" within the Tamara Quays restoration area (Transects 2 and 3). These are areas of former tidal marsh that were not graded, so they allow us to track vegetation change as freshwater wetland plant communities are replaced by brackish-tolerant tidal marsh communities. These transects also offer a unique opportunity to observe differences in plant community development on the original marsh soils (which were never filled), *versus* the filled, graded areas found on the remainder of the restoration site. The history of land use and hydrologic modification at Transects 2 and 3 is described in the 2010 report (Brophy 2010a).

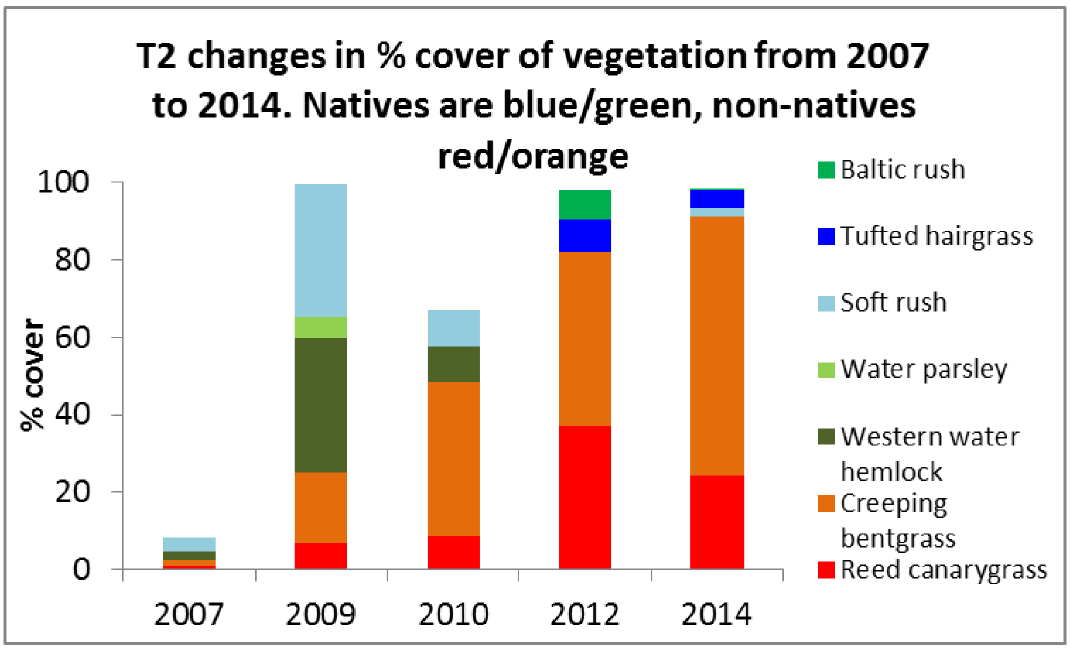
Transect 2

Table 10 and Figure 2 show percent cover for all species in Transect 2 that had cover greater than 5% in any monitoring year; Table 10 also shows total vegetation cover and bare ground. Percent cover values shown are the average of ten 1 sq m plots per transect in 2007 and 2009, and 15 plots the same size in 2010, 2012 and 2014.

Table 10. Tamara Quays: Changes in plant community composition and bare ground, Transect 2, 2007-2014 (species over 5% in any monitoring year)

	% cover				
Common name	**2007**	**2009**	**2010**	**2012**	**2014**
Creeping bentgrass	1.7	18.1	39.5	45.1	66.9
Western water hemlock	1.9	34.6	9.2	0.0	0.0
Tufted hairgrass	0.0	0.0	0.0	8.3	4.7
Baltic rush	0.0	0.0	0.0	7.7	0.3
Soft rush	3.7	34.0	9.7	0.0	2.3
Water parsley	0.0	5.8	0.0	0.0	0.0
Reed canarygrass	0.9	6.9	8.8	37.0	24.3
total vegetation cover	*11.1*	*97.5*	*73.6*	*99.1*	*98.7*
bare ground	*88.9*	*2.5*	*31.5*	*1.7*	*1.3*

Figure 2. Tamara Quays: Changes in plant community composition, Transect 2, 2007-2014 (species over 5% in any monitoring year)



To review previous years' results (as described in Brophy 2010a and 2012b), water levels within Kingfisher Lake had a strong influence on vegetation at Transect 2 during 2007-2009. In 2007, Transect 2 had a high proportion of bare ground; dead remnants of previous vegetation (cattails) were still visible, apparently killed by the sequence of flooding and drainage of Kingfisher Lake that had occurred in the previous few years. By 2009 (still prior to restoration), stabilized water levels in the lake had allowed a freshwater plant community to develop at Transect 2, dominated by soft rush and Western water hemlock. In 2010, after nine months of tidal inundation by brackish water, this freshwater plant community was rapidly giving way to brackish-tolerant species, particularly creeping bentgrass. Creeping bentgrass is a typical early dominant in brackish tidal wetland restoration sites (Brophy 2010b, 2009b, 2007b, 2004, 2002; Brophy and Christy 2009; Cornu and Sadro 2002); this species is also present in the reference marsh (Transect 1). By 2012, soft rush had completely disappeared from the Transect 2 plots with two native species (tufted hairgrass and Baltic rush) becoming newly established, though not widespread. Non-native creeping bentgrass increased from 2010 to 2012, as did the invasive reed canarygrass.

In 2014, non-native species continue to dominate this transect. Creeping bentgrass has become pervasively dominant (67% in 2014 compared to 45% in 2012), and in 2014 was present in all 15 plots, compared to only 11 plots in 2012. Invasive reed canarygrass has decreased only slightly (24% cover in 2014, down from 37% cover in 2012), and was present in nearly as many plots as in 2012 (10 of 15 plots versus 11 of 15 plots in 2012). Two typical native brackish marsh species (tufted hairgrass and Baltic rush) both decreased in cover since 2012, from 8.3 to 4.7% for tufted hairgrass and 7.7 to 0.3% for Baltic rush. Soft rush increased from 0% in 2012 to 2.3%, but it only occurred in 1 of 15 plots.

Restoration of brackish flows at the site will likely continue to suppress the reed canarygrass in the long term. At a Yaquina tidal marsh restoration site with summer salinities around 5 to 8 PSU, reed canarygrass was strongly suppressed within 6 years after restoration (Brophy 2004; Cornu *et al*. 2011). June peak salinities at the upstream end of Tamara Quays (~20 PSU) were three times that of the Yaquina site. However, the elevation of the Yaquina site (about 4 to 5 ft NAVD88) is considerably lower than the 8ft marsh surface at Tamara Quays, so frequency of inundation by brackish water is much higher at the Yaquina site. Still, the prospects for long-term suppression of reed canarygrass by salinity at Tamara Quays appear reasonable.

By contrast, creeping bentgrass is very tolerant of brackish water, and its prominence in the reference transect (TQ T1) and other least-disturbed sites (e.g. Brophy *et al*. 2014, 2011; Brophy 2009b) suggests it could remain dominant in this area for some time. Seeding tufted hairgrass and other native brackish-tolerant graminoids in this area could help restore some diversity and suppress the creeping bentgrass.

Transect 3

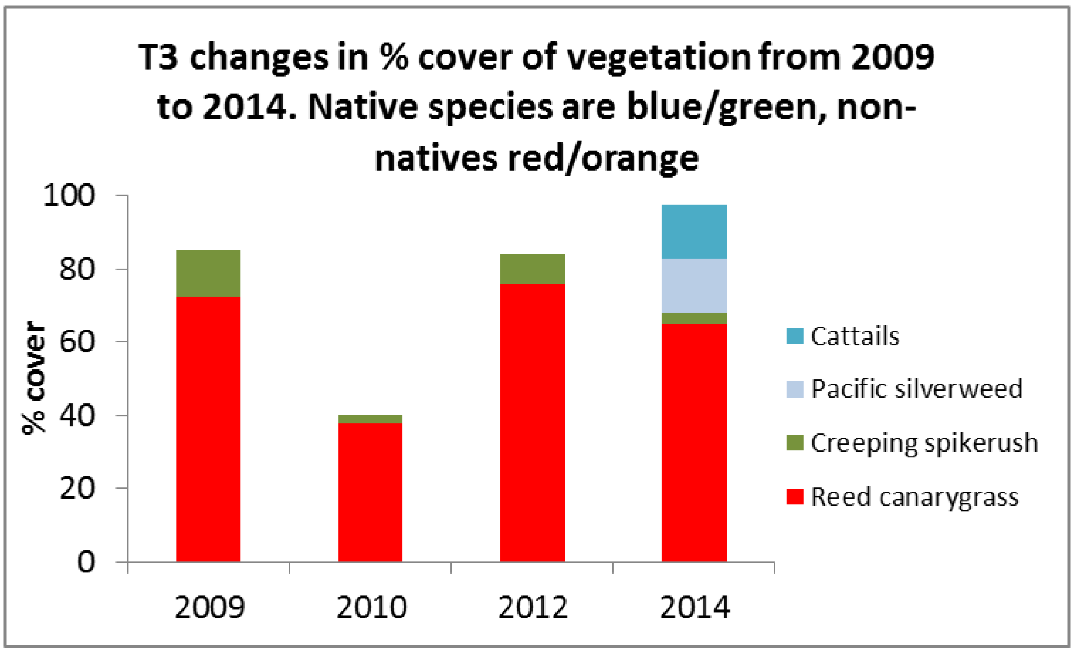
In 2009, we added a second transect on the old marsh surface, west of the bypass canal levee (Transect 3). This transect was heavily dominated by reed canarygrass prior to restoration, and was not scheduled for grading, offering a chance to track effects of increased salinity on this common invasive species.

Table 11 and Figure 3 show percent cover for all species in Transect 3 that had cover greater than 5% in any monitoring year; Table 11 also shows total vegetation cover and bare ground. Percent cover values shown are the average of ten 1 sq m plots per transect in 2009, and 15 plots the same size in 2010, 2012 and 2014.

Table 11. Tamara Quays: Changes in plant community composition and bare ground, Transect 3, 2009-2014 (species over 5% in any monitoring year)

	% cover			
Common name	**2009**	**2010**	**2012**	**2014**
Creeping spikerush	13.0	2.4	8.0	3.3
Reed canarygrass	72.2	37.5	75.7	64.7
Pacific silverweed	0.0	0.0	0.0	14.7
Common cattail	0.0	0.0	0.0	14.7
total vegetation cover	*92.8*	*44.3*	*89.6*	*100.0*
bare ground	*16.4*	*58.9*	*10.5*	*0.0*

Figure 3. Tamara Quays: Changes in plant community composition, Transect 3, 2009-2014 (species over 5% in any monitoring year)



In 2014, T3 showed an increase in Pacific silverweed and common cattail since 2012 (0.0 to 14.7% for both species). Based on our field observations and those of others (Adamus 2005), both of these species are more tolerant of brackish conditions than reed canarygrass, which may explain their increase. Reed canarygrass cover decreased from 75.7% in 2012 to 64.7% in 2014, and also showed an overall decrease since 2009 (72.2% cover). In previous years, reed canarygrass cover fluctuated greatly (from 72% in 2009 to 38% in 2010, then back up to 76% in 2012). We believe the low value in 2010 may have been partly due to variation between observers. It can be challenging to distinguish standing dead material from senescent stems of reed canarygrass, particularly when salt stress causes chlorosis of living material.

The slightly decreased cover of reed canarygrass in 2014, along with the increase of brackish-tolerant Pacific silverweed and common cattail, suggests that restored brackish water may be helping to reduce cover of this reed canarygrass at T3. Based on data from other sites, we expect the strongly brackish salinities at Tamara Quays to suppress reed canarygrass in the long term.

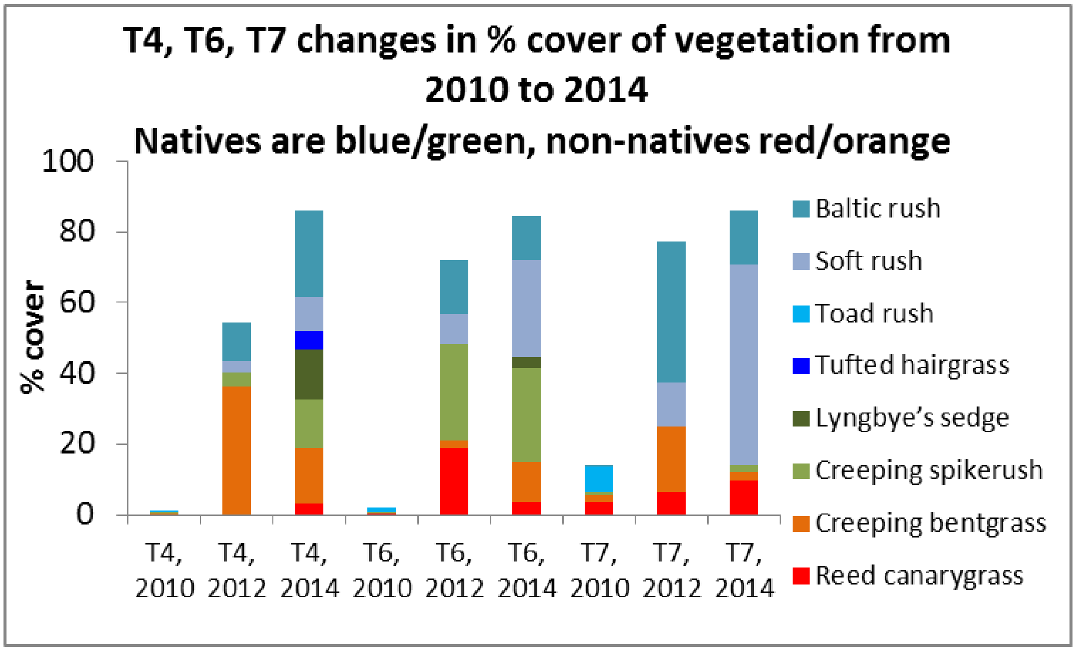
Graded areas (tidal marsh restoration area)

Transects 4, 6 and 7 are located within the graded tidal marsh restoration area. Because the 2009 grading removed surface soils (i.e., fill material) and all pre-existing vegetation, 2010 was the first year for monitoring at these transects. Table 12 and Figure 4 show percent cover for all species in Transect 4, 6 and 7 that had cover greater than 5% in any monitoring year; Table 12 also shows total vegetation cover and bare ground.

Table 12. Tamara Quays: Changes in plant community composition and bare ground, graded emergent transects (T4, T6, and T7), 2010-2014 (species over 5% in any transect in any monitoring year)

	% cover								
Common name	**T4, 2010**	**T4, 2012**	**T4, 2014**	**T6, 2010**	**T6, 2012**	**T6, 2014**	**T7, 2010**	**T7, 2012**	**T7, 2014**
Creeping bentgrass	0.5	36.0	15.6	0.2	2.1	11.6	1.9	18.7	2.2
Creeping spikerush	0.2	4.1	13.9	0.2	27.1	26.5	0.6	0.0	2.0
Lyngbye's sedge	0.0	0.0	14.1	0.0	0.0	2.9	0.0	0.0	0.0
Baltic rush	0.0	10.7	24.3	0.0	15.1	12.3	0.2	39.7	15.5
Toad rush	0.2	0.0	0.0	1.2	0.0	0.0	7.4	0.0	0.0
Soft rush	0.0	3.4	9.8	0.0	8.7	27.5	0.0	12.4	56.7
Tufted hairgrass	0.0	0.0	5.0	0.0	0.0	0.2	0.0	0.0	0.0
Reed canarygrass	0.0	0.1	3.3	0.3	19.0	3.5	3.8	6.4	9.8
Common cattail	0.0	0.1	0.0	0.0	4.3	6.7	0.0	4.7	0.2
total vegetation cover	*2.1*	*59.7*	*87.7*	*4.3*	*86.5*	*94.3*	*16.7*	*84.8*	*99.3*
bare ground/debris	*98.9*	*41.0*	*12.7*	*96.7*	*13.6*	*5.7*	*84.9*	*15.3*	*0.7*

Figure 4. Tamara Quays: Changes in plant community composition, graded emergent transects (TQ T4, T6 and T7, 2010-2014 (species over 5% in any monitoring year)



In 2014, all of the graded transects (TQ T4, T6 and T7) continued to show increased plant cover (85 to 99%) and decreased bare ground relative to the graded condition in 2009 (Table 12). Soft rush was dominant at T6 and T7 (27.5% and 56.7% respectively, with creeping spikerush also dominant at T6 (26.5%). By contrast, at Transect 4, Baltic rush increased and became dominant from 2012 to 2014 (10.7% to 24.3% cover respectively). Other native tidal marsh species, including Lyngbye's sedge and tufted hairgrass, were present at these transects in 2014, indicating the introduction of typical native brackish marsh species to the site. However, these two native species are not yet widespread, found in less than 50% of the plots in Transects 4 and 6.

Though all graded transects had an overall decrease in non-native species cover from 2012 to 2014, Transect 4 and 7 showed a slight increase in reed canarygrass cover (0.1% in 2012 to 3.3% in 2014 for Transect 4, and 6.4% in 2012 to 9.8% in 2014 for Transect 7), while Transect 6 showed a slight increase in creeping bentgrass cover from 2012 to 2014 (2.1% to 11.6%)). While non-native species have increased in certain transects, they are still below the 30% threshold required to meet standard 7.6. Restoration of brackish flows at the site is likely to suppress the reed canarygrass in the long term, while creeping bentgrass is a typical early dominant in brackish tidal wetland restoration sites (Brophy 2010b, 2009b, 2007b, 2004, 2002; Brophy and Christy 2009; Cornu and Sadro 2002). Creeping bentgrass is also prominent in the reference marsh (Transect 1), so it may be present for many years to come.

Due to the grading in 2009, we expect vegetation at Transects 4, 6 and 7 to be dynamic for many years. Grading removes surface soils; therefore there are no pre-existing roots or buried seeds for rapid revegetation. In the case of an area dominated by reed canarygrass, removal of the root mat may be an advantage, but bare ground is always first colonized by opportunistic species. Many of these are non-native ephemerals that give way to longer-term dominants after several years (Cornu and Sadro 2002). The presence of a broad range of plant types shows the dynamic condition at these transects; species with over 5% cover in 2014 included native freshwater wetland plants (common cattail, soft rush), early colonizers (creeping spikerush, creeping bentgrass), the invasive reed canarygrass, and typical native tidal marsh dominants (Baltic rush, tufted hairgrass and Lyngbye's sedge).

Shrub zone

Transect 5 is located on the upper margin of the graded tidal marsh surface in the southeast part of the Tamara Quays restoration area, at an elevation of about 11 ft NAVD88. Table 13 shows percent cover for those herbaceous species that had more than 5% cover, and for all shrubs and trees (whether planted or volunteer). Table 14 shows stem counts for all shrubs and trees (whether planted or volunteer).

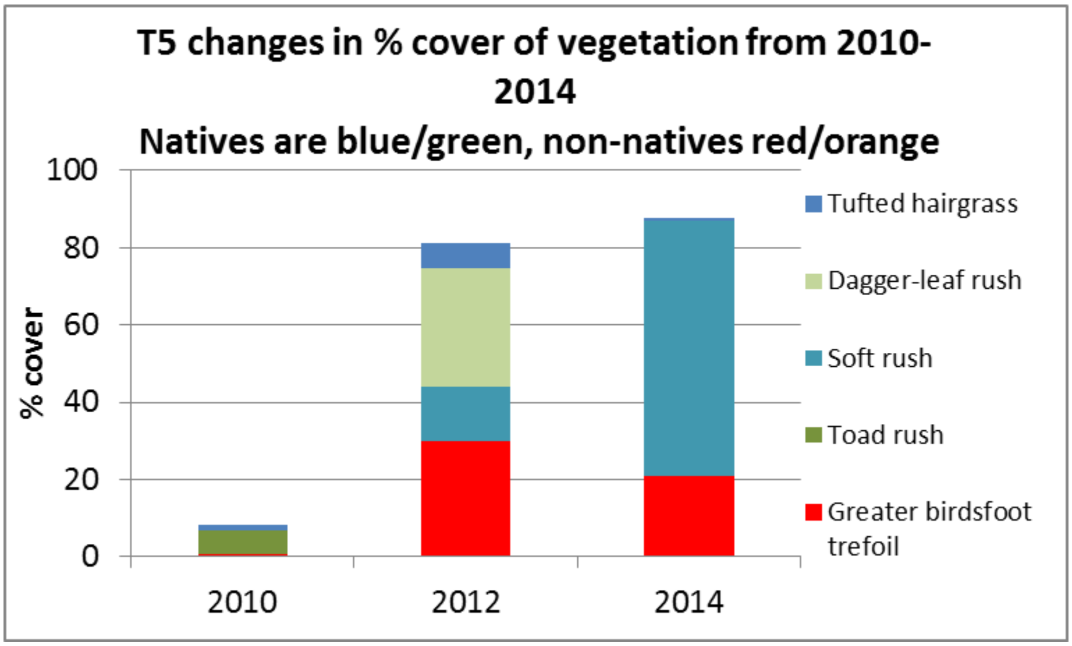
Table 13. Tamara Quays: Changes in plant community composition and bare ground, Transect 5, 2010-2014. For herbaceous species, species with more than 5% cover in any year are shown. Percent cover is shown for all shrub and tree species in the plots.

	% cover		
Common name	**2010**	**2012**	**2014**
Herbaceous species			
Tufted hairgrass	1.3	6.5	0.5
Toad rush	6.4	0.0	0.0
Soft rush	0.0	14.0	66.4
Dagger-leaf rush	0.0	30.6	0.0
Greater birdsfoot trefoil	0.5	30.0	20.7
Shrubs and trees			
Hooker willow	0.3	3.1	5.8
Sitka willow	0.3	1.6	10.0
Red alder	0.2	1.8	0.6
Sitka spruce	0.03	0.0	0.0
Total vegetation cover	*13.0*	*84.8*	*100.0*
[bare ground]	*85.3*	*16.1*	*0.0*

Table 14. Tamara Quays: Changes in tree and shrub stem counts, Transect 5, 2010-2014. Stem counts are shown for all shrub and tree species in the plots.

	stems/A		
Common name	**2010**	**2012**	**2014**
Hooker willow	1316.5	1548.8	890.6
Sitka willow	1200.3	464.6	851.8
Red alder	232.3	774.4	271.0
Sitka spruce	77.4	0.0	0.0
Total	*2826.5*	*2787.8*	*2013.4*

Figure 5. Tamara Quays: Changes in species composition of the herbaceous stratum, Transect 5, 2010-2014 (species over 5% in any monitoring year)



At Transect 5 (as at Transects 4, 6, and 7), grading removed all pre-existing vegetation, therefore this transect had a high proportion of bare ground in 2010 (85%); but plant cover increased rapidly to about 84% in 2012, then to 100% cover in 2014 (Table 13). Shrub density (willows) decreased in 2014 (Table 14); quite a few of the planted willow stakes were no longer alive in 2014. However, shrub cover continued to increase, more than doubling in 2014 (16.4%) compared to 2012 (6.5%) (Table 13). Although this is still below the standard of 30% shrub cover by year 5, the steady increase in cover suggests the willows are now well established in this zone, and will continue to increase over the next few years. It is not uncommon for willows to take more than 5 years to develop substantial cover, based on our experience at similar sites (Brophy 2005, Brophy 2012a).

Herbaceous dominants at Transect 5 include one native (soft rush) and one non-native species (greater birdsfoot trefoil). Native species dominance shifted from dagger-leaf rush in 2012 (30.6%) to soft rush in 2014 (66% cover, up from 14% in 2012). Greater birdsfoot trefoil is a common dominant in disturbed wetlands and areas that are transitional between wetland and upland; this species decreased from 2012 to 2014 (30% to 21% respectively), and it is likely to decrease further in the future as shading by shrubs increases. (Note that the nomenclature for birdsfoot trefoil was changed from *Lotus corniculatus* to *Lotus uliginosus* in 2014, based on identification of Pixieland specimens by Dick Brainerd of the Carex Working Group.)

Vegetation mapping

We mapped 10 vegetation alliances and 26 vegetation associations at Tamara Quays (Maps 5 and 6, Appendix 4; Tables 15-17). Native-dominated alliances occupied the majority (71%) of the site's area (Table 16); the soft rush, common cattail alliances occupied the greatest area (24.1% and 15.7% respectively), (Table 15). Photo 8 in Sub-Appendix 2 of Appendix 7 shows an overview of the soft rush and common cattail communities at the site.

Table 15. Tamara Quays vegetation mapping: Area of alliances, 2014.

Alliance	Acres	% of total area	Native-dominated?
creeping bentgrass	1.11	7.19	N
red alder	1.56	10.11	Y
Lyngbye's sedge	0.52	3.40	Y
tufted hairgrass	0.70	4.58	Y
creeping spikerush	0.07	0.43	Y
Baltic rush	1.15	7.47	Y
soft rush	3.71	24.10	Y
reed canarygrass	1.78	11.55	N
Sitka spruce	0.80	5.17	Y
common cattail	2.41	15.66	Y
water	1.59	10.34	n/a
Total	15.39	100.00	

Table 16. Tamara Quays: Area of native-dominated *versus* non-native-dominated vegetation alliances, 2014. Native-dominated alliances can contain non-native species, and vice versa.

Native-dominated?	Acres	% of area
Y	10.91	70.92
N	2.88	18.74
n/a (water)	1.59	10.34
Total	15.39	100.00

Table 17. Tamara Quays: Area of plant associations, 2014. Rows are shaded by alliance.

Map unit	Association name	Acres
1	Baltic rush - creeping spikerush - Pacific silverweed	0.22
2	Baltic rush - Lyngbye's sedge - creeping bentgrass	0.23
3	Baltic rush - Lyngbye's sedge - creeping bentgrass - creeping spikerush	0.70
4	common cattail	1.14
5	common cattail - Baltic rush - creeping spikerush - soft rush	0.45
6	common cattail - reed canarygrass - soft rush	0.82
7	creeping bentgrass - reed canarygrass	1.11
8	creeping spikerush	0.07
9	Lyngbye's sedge	0.05
10	Lyngbye's sedge - creeping bentgrass - Baltic rush	0.48
11	red alder / (Douglas' spiraea) / Slough sedge - Reed canarygrass	0.29
12	red alder / slough sedge - skunk cabbage	1.27
13	reed canarygrass	0.20
14	reed canarygrass - (common cattail)	0.72
15	reed canarygrass - Pacific silverweed - common cattail	0.73
16	reed canarygrass - soft rush - Baltic rush - creeping spikerush	0.13
17	Sitka spruce - red alder / slough sedge - skunk cabbage	0.80
18	soft rush - Baltic rush	0.23
19	soft rush - Baltic rush - creeping spikerush - Pacific silverweed	0.95
20	soft rush - Baltic rush - reed canarygrass	1.30
21	soft rush - Baltic rush - reed canarygrass - creeping bentgrass	0.24
22	soft rush - creeping spikerush - Baltic rush - creeping bentgrass	0.38
23	soft rush - greater birdsfoot trefoil	0.61
24	tufted hairgrass - Baltic rush - creeping bentgrass	0.33
25	tufted hairgrass - creeping bentgrass - reed canarygrass	0.18
26	tufted hairgrass - soft rush - Baltic rush - creeping bentgrass	0.19
27	water	1.59
	Grand Total	15.39

The areas dominated by non-native species were primarily in the ungraded portions of the site (Map 5), indicating the effectiveness of grading at removing reed canarygrass at this site and in this specific landscape setting. The two non-native alliances were reed canarygrass and creeping bentgrass; their distribution at the site reflects salinity gradients. Reed canarygrass is considerably less tolerant of salinity compared to creeping bentgrass (Adamus 2005); it predominated on ungraded surfaces in the south and west portions of the site, possibly due to freshwater input from Rowdy Creek and hillslope seepage. The creeping bentgrass alliance occupied the old marsh surface in the northwest of the site, where brackish tidal flows are the predominant source of wetland hydrology. Soil salinity data, which will be collected in Year 10 (2019), will be very helpful in interpreting these patterns of vegetation development.

Many of the associations mapped at the site are a mixture of native and non-native species (Table 17). We mapped these 26 associations separately based on the relative dominance of the species listed. This fine-grained separation of associations offers greater ability to interpret the trajectory of vegetation development at the site, particularly when combined with vegetation and soils data from the six monitoring transects. Re-mapping of vegetation, scheduled for Year 10 (2019) (Table 3), will provide the next important window into understanding overall vegetation development at Tamara Quays.

Soft rush: native and non-native subspecies

As described above and in **Vegetation mapping** below, soft rush has become dominant across much of the graded area in 2014. Both native and non-native subspecies of soft rush occur on the Oregon coast (Zika 2003). We examined a number of specimens for the key characteristics that distinguish the native from non-native subspecies (as listed in Zika, 2003), and found that many specimens had intermediate characteristics. Moreover, we could not determine any consistent relationship between gross plant morphology (plant stature, color, density of stems, etc.) and key characteristics. Given the extensive cover of this species across the site, it was therefore not possible within the scope of this project to determine whether all, some, or none of the soft rush cover was non-native. We discussed this with Department of State Lands staff, and they indicated that we should consider this species native for the purposes of this report in 2014 (Dana Field, personal communication, 7/7/14). We recommend further investigation into the extent of native *versus* non-native subspecies of soft rush at this site and others, to determine any functional differences. We also recommend investigation into possible reasons for intermediate morphological characteristics, such as potential hybridization.

Soils

Our effectiveness monitoring program at Tamara Quays includes soil sampling in 2007 (for ungraded transects) and 2010 (for graded transects), and re-sampling in 2019 for all transects. For information on soil characteristics from the 2007 and 2010 sampling, see the 2012 report (Brophy 2012b).

Water quality: salinity and temperature

Although our scope of work does not include water quality sampling at Tamara Quays, some water quality sampling at the site and nearby sites is conducted by the Salmon-Drift Creek Watershed Council. During 2011-2012, we provided technical input to the Council for salinity monitoring at Tamara Quays; some of the data from that period were provided to us by the

Council. The data showed strongly brackish salinity peaks (~20 PSU) at higher high tide in Rowdy Creek within Tamara Quays in June, and mesohaline surface water (~5 to 6 PSU) at lower high tide, with fresher flows during low tides. These June data suggest that salinities across the site are even more brackish in late summer/early fall. Salinities across the marsh surface probably vary by distance from Rowdy Creek, but nonetheless, brackish salinities should help control reed canarygrass and promote establishment of native tidal marsh species (such as tufted hairgrass) throughout the site. A more detailed summary is provided in the 2012 monitoring report (Brophy 2012b).

4. Maps – see Appendix 4

5. Conclusions and recommendations

Based on our monitoring at Tamara Quays in 2007 through 2014, we conclude that the restoration work has successfully re-established the natural forces that will build and sustain the desired wetland functions at the site. As described in the 2010 and 2012 report, the site was graded to specifications; free tidal exchange is occurring and the tidal inundation regime matches that of the reference area. This year's monitoring shows that plant cover has continued to increase rapidly since 2012, and typical native brackish tidal marsh species are dominant on most of the graded area.

Invasive reed canarygrass has decreased since 2012 in parts of the graded area, as has greater birdsfoot trefoil. The strongly brackish salinities measured at the site are likely to continue suppressing the reed canarygrass and favor native marsh vegetation in the long term. However, reed canarygrass continues to be present as a dominant in many parts of the site, and has even increased in some areas (e.g. TQ T7). Continued effectiveness monitoring during 2016-2019, as outlined in Table 3, will be very important to tracking this species' status at the site. Soil salinity data, combined with vegetation mapping and transect/quadrat monitoring, will be particularly helpful for understanding the patterns of invasive, non-native and native dominance.

Of the two sample transects in the ungraded areas, TQ T3 was still dominated by reed canarygrass (TQ T3), and TQ T2 was increasingly dominated by reed canarygrass and the brackish-tolerant non-native species, creeping bentgrass. Seeding tufted hairgrass and other native brackish-tolerant graminoids in these ungraded areas could help restore some diversity and suppress the non-natives.

This year's applicable performance standards have been met, with one exception – native shrub cover is not yet more than 30% within the shrub-dominated habitats (Transect 5). However, shrub densities are high and have held steady since 2010, and volunteer shrubs and trees are becoming established, indicating favorable conditions. Therefore, in our professional judgment, the failure to meet this standard does not indicate any structural or functional problems with the project, and no remedial action is recommended.

Appendix 1. Effectiveness Monitoring Scope of Work

*NOTE: This Appendix provides the scope of work established by contract between the Salmon Drift Creek Watershed Council and Green Point Consulting in 2009, as amended in January 2012.

Project: Effectiveness Monitoring at the Tamara Quays Restoration Project, Salmon River Estuary, 2009-2014

Contact

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Goal

Track effectiveness of restoration investments and achievement of project goals through measurements of key ecological and physical parameters at Tamara Quays.

Ecological Significance

This project will evaluate the outcome of restoration investments at the Tamara Quays Restoration Project through quantitative monitoring of controlling factors and ecosystem services for 5 years after restoration. The Tamara Quays project is described in the Environmental Assessment for the Tamara Quays and Crowley Creek Restoration (USFS 2008). Restoration work includes removal of a dike and tide gate that currently block all tidal exchange from the site; filling of a bypass canal and removal of the bypass canal levee; removal of fill material from the former marsh surface; and grading of the surface to reference marsh elevation. The work will restore ecologically significant tidal wetland habitats which have been prioritized at national, regional and state scales (e.g. ODFW 2005, OWEB 2006, Brophy 2007a, Kagan *et al*. 2005).

Methods

Use standard monitoring protocols and analytical methods established in national and regional restoration monitoring guidance (Roegner *et al.* 2008, Rice *et al*. 2005, Thayer *et al.* 2005). Monitor both restoration and reference sites to help track systemwide changes. Monitor physical “controlling factors” (“ecosystem drivers”) that create desired wetland functions, and resulting biological characteristics. Compare baseline data to post-restoration data to document restoration trajectory.

Controlling and structural factors to be monitored include tidal inundation and soil characteristics. Biological characteristics to be monitored include plant community composition and plant community extent. The project will use stratified, randomized and replicated sample design to allow statistical analysis of ecological linkages and change over time. Practical, user-friendly analyses and products will be provided. All work will be compatible with regional and national standards and guidance, to maximize exchange of scientific knowledge.

Rationale

The physical and biological characteristics of tidal wetlands, and the ecosystem services they provide, are tightly linked. The most effective and sustainable restoration projects are those which, like the Tamara Quays project, restore natural forces ("controlling factors"). These natural forces structure and maintain wetland functions without further human intervention, maximizing the likelihood of longterm restoration success (Simenstad and Bottom 2005). Because of the importance of controlling factors, they should be monitored directly to document whether restoration has successfully restored these "ecosystem drivers." The controlling factors we will measure in this project are recognized as top priorities for effectiveness monitoring (Roegner *et al.* 2008, Rice *et al*. 2005, Thayer *et al.* 2005).

Along with ecosystem drivers, we will simultaneously measure biological characteristics (plant community composition and plant community extent). Vegetation forms the vital link between "controlling factors" and valued wetland functions and ecosystem services. Plant communities form the base of the food web, and they shelter, feed, and house valued fish and wildlife species. Vegetation processes and converts nutrients; traps sediment; and detains flood flows. Vegetation is a top priority monitoring parameter in regional and national monitoring guidance (Roegner *et al.* 2008, Rice *et al*. 2005, Thayer *et al.* 2005) because it is clearly visible, easily measured in one field session per year, and stabilizes relatively quickly following restoration.

Table 1. Monitoring methods summary

Indicator category	**Monitored metric**	**Data collection method(s)**
Hydrology	Surface water elevation	Automated level logger ("tide gauge")
Elevation	Elevation of study plots and instrumentation	Laser level or total station
Vegetation	Plant community composition	Study plots located within elevation strata; visual estimate of percent cover within randomly located subplots
Vegetation	Extent of plant communities	GIS mapping via heads-up digitization from orthorectified aerial photos provided by USFS
Soils	% organic matter, pH, electrical conductivity	Surface 30cm cores from sample plots; analysis at OSU Central Analytical Lab

Deliverables

Brief annual summary reports will be provided, describing work completed, a summary of results, and problems or challenges encountered or anticipated. A final report will be provided, including methods, results, statistical analysis, discussion, and recommendations for future work. All data collected will be delivered as electronic datafiles, JPGs (for photos), and shapefiles as appropriate.

Table 2. Timeline for Tamara Quays monitoring program (GPC activities)

#	Monitored metric	2007[1]	2009	2010	2011	2012	2014	2016	2019
1	Tidal inundation regime[2]	X	X	X	X				
2	Elevations of instrumentation and study plots[3]		X	X	X				
3	Vegetation composition in transects	X[4]		X[5]		X	X	X	X
4	Vegetation mapping		X[6]				X[7]		X[7]
5	Soil OM, pH, EC	X[8]							X
6	Wetland delineation		X[9]				X[10]		
7	Functional assessment[11]		X				X		

Notes on Green Point Consulting monitoring program:

1. Data collection in 2007 was completed under a separate USFS contract.
2. USFS staff downloaded water level data from tide gauges and provided it to GPC during 2009-2011. GPC completed data analysis, interpretation and reporting during 2010-2011 as required by the USFS-DSL Grant Agreement. Given the results, no further tidal inundation monitoring is required.
3. Elevation survey of transects and instrumentation was conducted during 2009-2011 by USFS, with technical liaison provided by GPC. Survey work was completed in 2011.
4. Under a separate contract with USFS, GPC monitored vegetation in 2007 at one transect in the reference area (T1) and one transect in the restoration area (T2). Vegetation monitoring follows the methods outlined in DSL's Routine Monitoring Guidance.
5. Five additional vegetation transects were added after grading in 2010. All seven transects will be monitored in 2012, 2014 and 2016. Vegetation monitoring follows the methods outlined in DSL's Routine Monitoring Guidance.

6. Baseline vegetation map (2009) used USFS 2008 aerial photos and identified general vegetation type (Cowardin class) and wetland status rather than specific plant communities for the area to be graded.
7. Post-restoration plant community mapping will be conducted in 2014 and 2019, and will be limited to wetlands. Budget assumes that USFS will provide recent, high resolution, orthorectified aerial photographs (ready for use in GIS) for 2014 and 2019 mapping.
8. Soil analysis was completed for 2007 under a separate contract with USFS.
9. Pre-project wetland delineation was funded through a separate contract between USFS and Cramer Fish Sciences.
10. Post-project wetland delineation in 2014 will follow DSL's "delineation lite" methods.
11. Functional assessment uses the ORWAP method to meet current state requirements.

References for Appendix 1 are included in Appendix 3 (References)

Appendix 2. Tamara Quays Project Goals and Objectives

(from Tamara Quays Mitigation Plan)

This appendix is a direct excerpt from the Tamara Quays Mitigation Plan (provided by Dana Hicks of DSL on January 28, 2010). This complete listing of project goals and objectives, with the corresponding Performance Standards, provides context for the performance standards listed on the cover sheet of this report.

Goal: Reconnect natural flows and tidal influence.
Objective 1—Restore 17 acres of wetland habitat.

Performance Standard 1— By year 5, a delineation "lite" will show that areas formerly occupied by dikes, borrow channels, and fill areas meet, or are likely to meet criteria for wetland vegetation and hydrology. If hydric soil field indicators are not present, but hydrology and vegetation indicators are positive, the plot may still be called wetland.

Objective 2— Elevations outside of Rowdy Creek are 5 to 5.5 ft (NGVD 29), or at the historic marsh surface where apparent.

Performance Standard 2— Elevations, as demonstrated in the as-built, are as outlined in the grading plan, or are graded to follow the historic marsh surface where apparent and noted.

Objective 3—The tidal flow regime is similar to that at the reference estuary, after adjusting for elevations.

Performance Standard 3—There is a free exchange of tides, creating a tidal inundation regime similar to that of the reference site (after adjusting for relative elevations) as determined by data collected for at least one year using the existing tide gauge locations (one in reference marsh, one in project area).

Objective 4—Small hillside drainages within the project drain to Rowdy Creek.

Performance Standard 4.1—The as-built and/or photo documentation will demonstrate that grading allows hillside drainages to flow into the project area.

Performance Standard 4.2— In years 2, 4, 6, 8, and 9, visual inspection and photo or video documentation will show that surface water flowing from hillside drainages is entering the project area.

Goal: Restore fish passage to the project area

See performance standards 2 and 3.

Objective 5—During the wettest time of the year, at least 75% of surface water is in or connected to a flowing channel that leaves the site.

Performance Standard 5—In years 2, 4, 6, 8, and 9, visual estimates and photo or video documentation taken during a mean high tide or higher will demonstrate that at least 75% of surface water on the site is connected to the stream channel rather than isolated in pools.

Objective 6—Large woody debris is present to provide microhabitats and cover for salmonids.

Performance Standard 6— In years 2, 4, 6, 8, and 9, visual estimates and photo or video documentation taken during a mean high tide or higher will demonstrate that at least 20 pieces of wood greater than 16" diameter are in contact with the water during mean high tide or higher.

Goal: Re-establish native estuarine vegetation

Objective 7—Vegetation is dominated by native species and invasive species are at a level that does not hinder the functionality of the site.

Performance Standard 7.1—In shrub-dominated habitats the cover of native herbaceous species in the understory is at least 40% by year 1; at least 50% by year 3; and at least 60% by year 5.

Performance Standard 7.2—In shrub-dominated habitats the absolute cover of invasive herbaceous species, except for Phalaris arundinacea (reed canary grass), is no more than 10%. The absolute cover by P. arundinacea is no more than 40% by year 1; 30% by year 3; and 20% by year 5.

Performance Standard 7.3— In shrub-dominated habitats, the cover of native shrubs is at least 10% by year 3 and 30% by year 5. Native species volunteering on the site may be included, dead plants do not count.

Performance Standard 7.4—In shrub-dominated habitats the cover of invasive shrub or tree species is no more than 10% in all monitoring years.

Performance Standard 7.5—In shrub-dominated habitats, there are at least 3 different native species in all habitat types by year 5. To qualify, a species will have at least 5% average cover in the elevation class, and occur in at least 10% of the plots sampled.

Performance Standard 7.6—In tidal areas, cover by invasive species relative to the total vegetation (not counting bare ground) is no more than 50% by year 1, 40% by year 3, and 30% by year 5.

Performance Standard 7.7—In the tidal area, at least three of the species documented in the reference marsh occur in the project area by year 5.

Performance Standard 7.8—In the tidal area, cover by native species is progressing toward reference conditions, currently measured at 60%, over the monitoring period.

Performance Standard 7.9—In the tidal areas, total plant cover is progressing toward reference conditions, currently measured at 94.8%, over the monitoring period.

Performance Standard 7.10— The moisture index total for all strata is <3.0 in all habitat types over the monitoring period.

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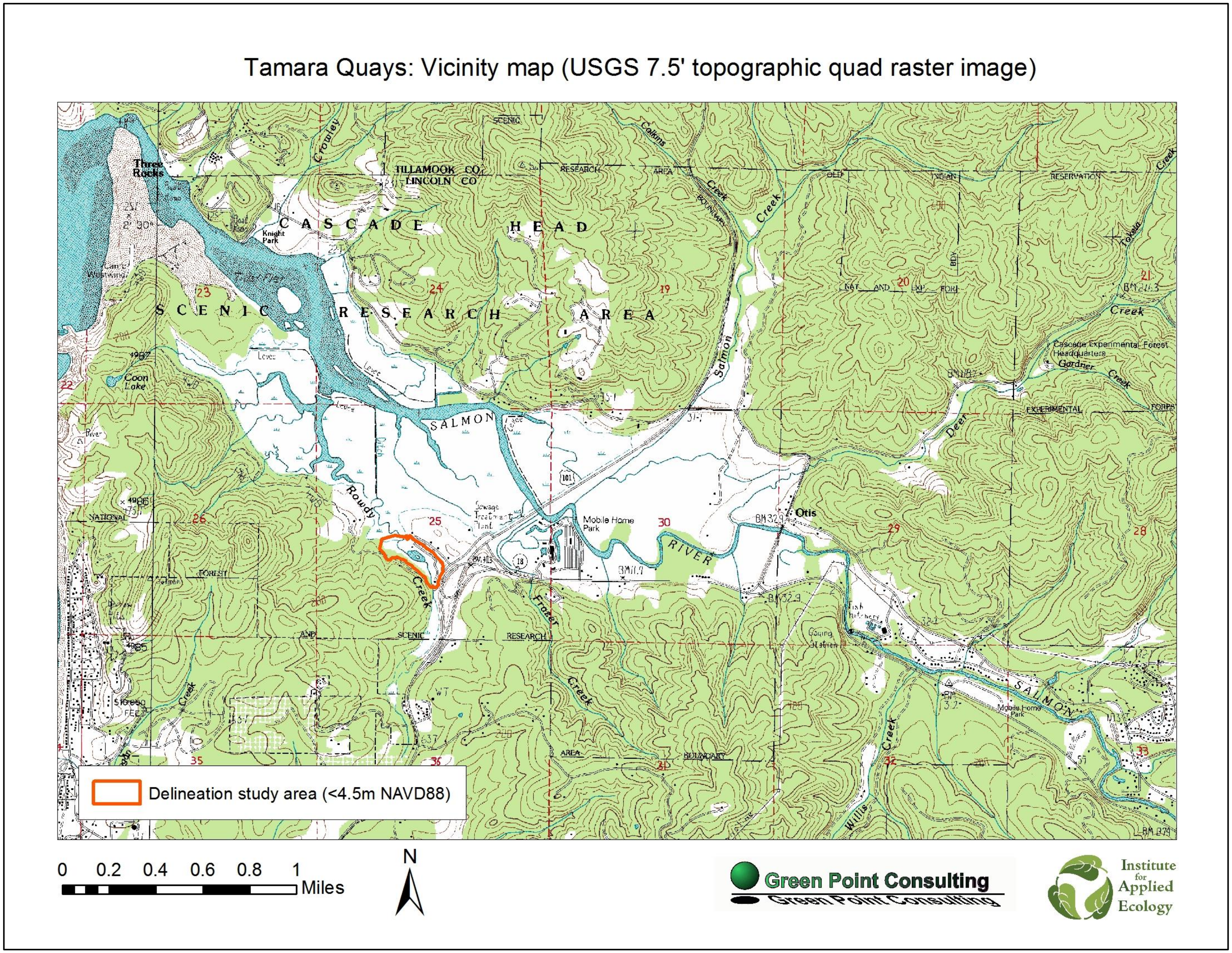
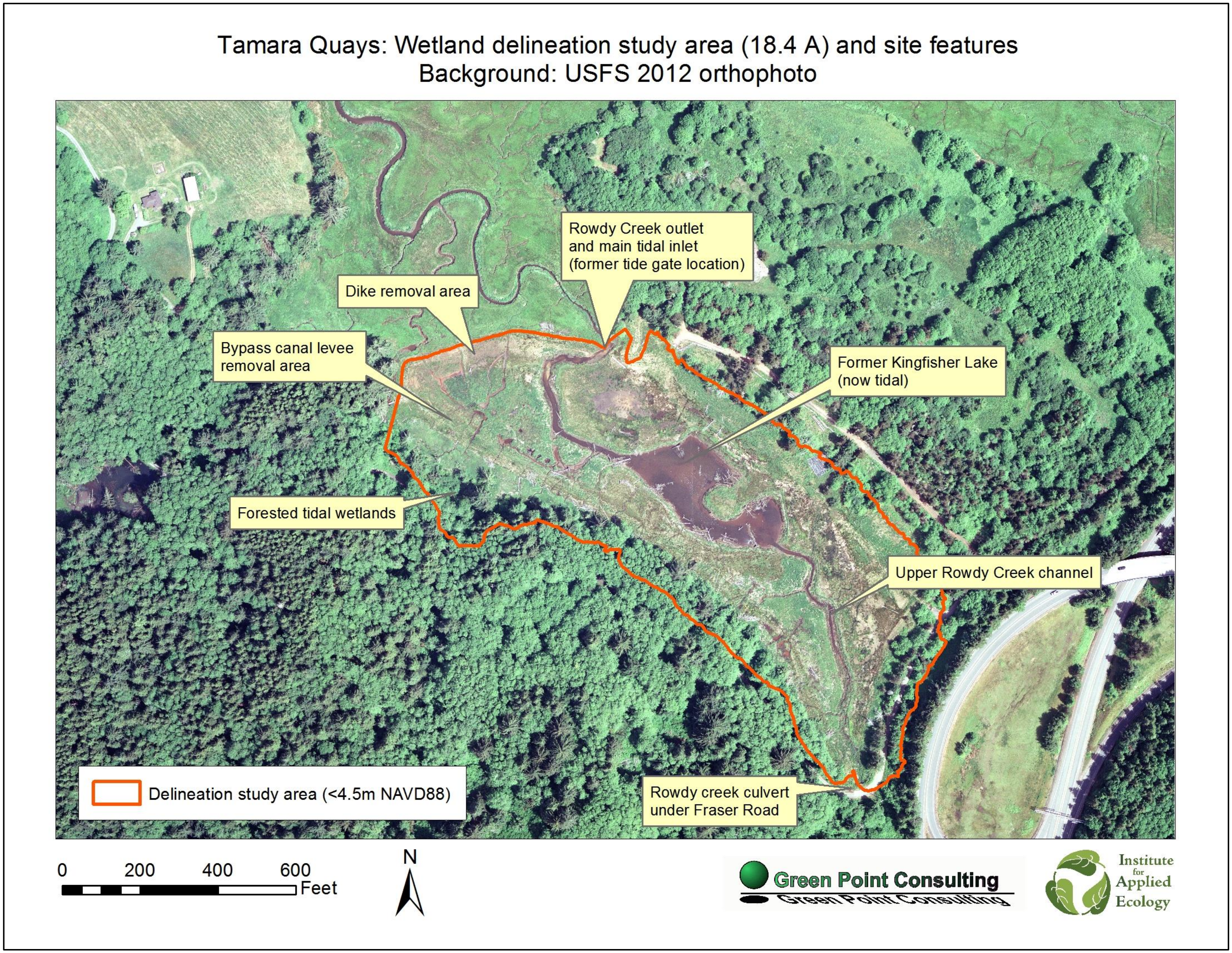
Appendix 4. Maps

(see following pages)

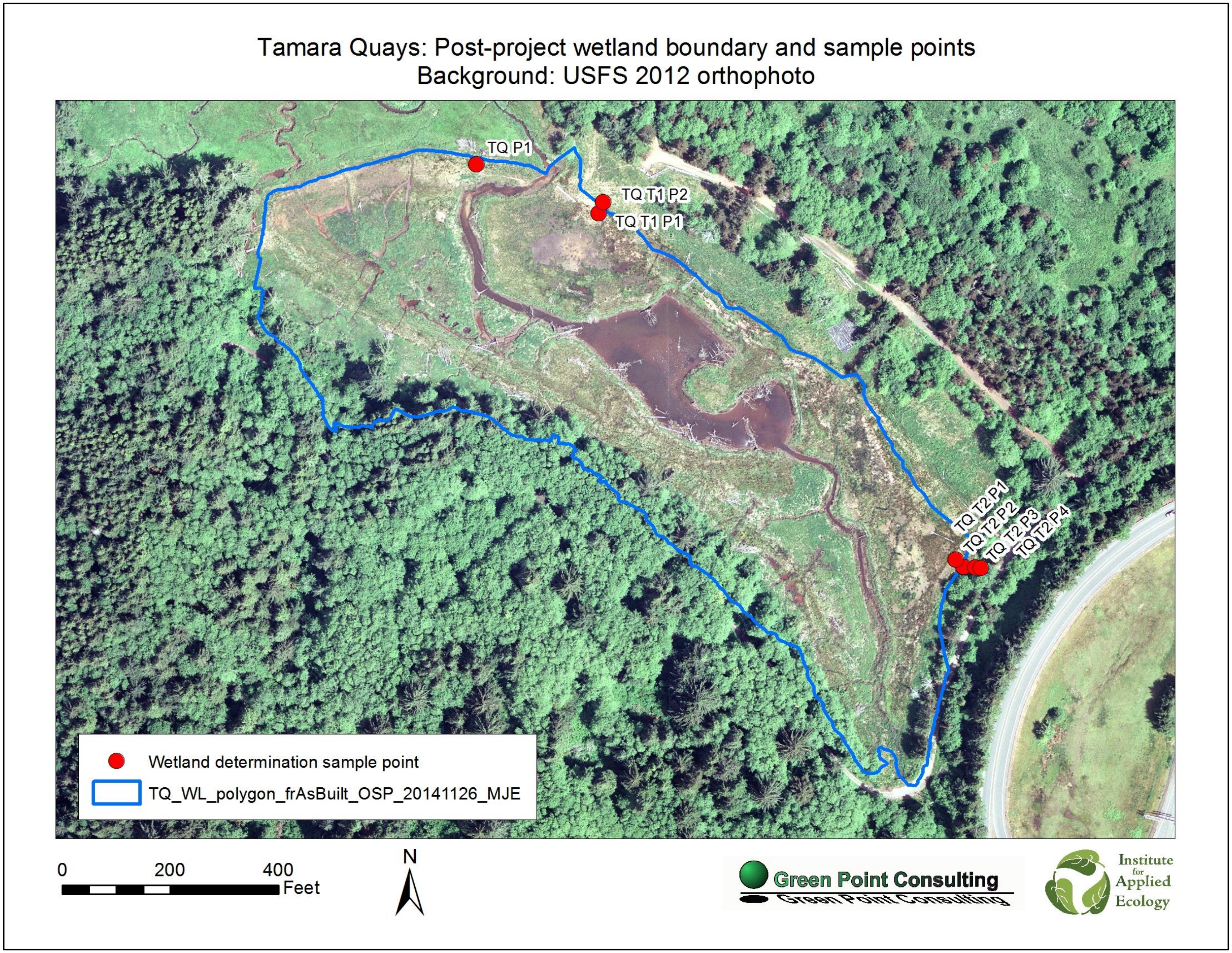
Map 1. Vicinity map



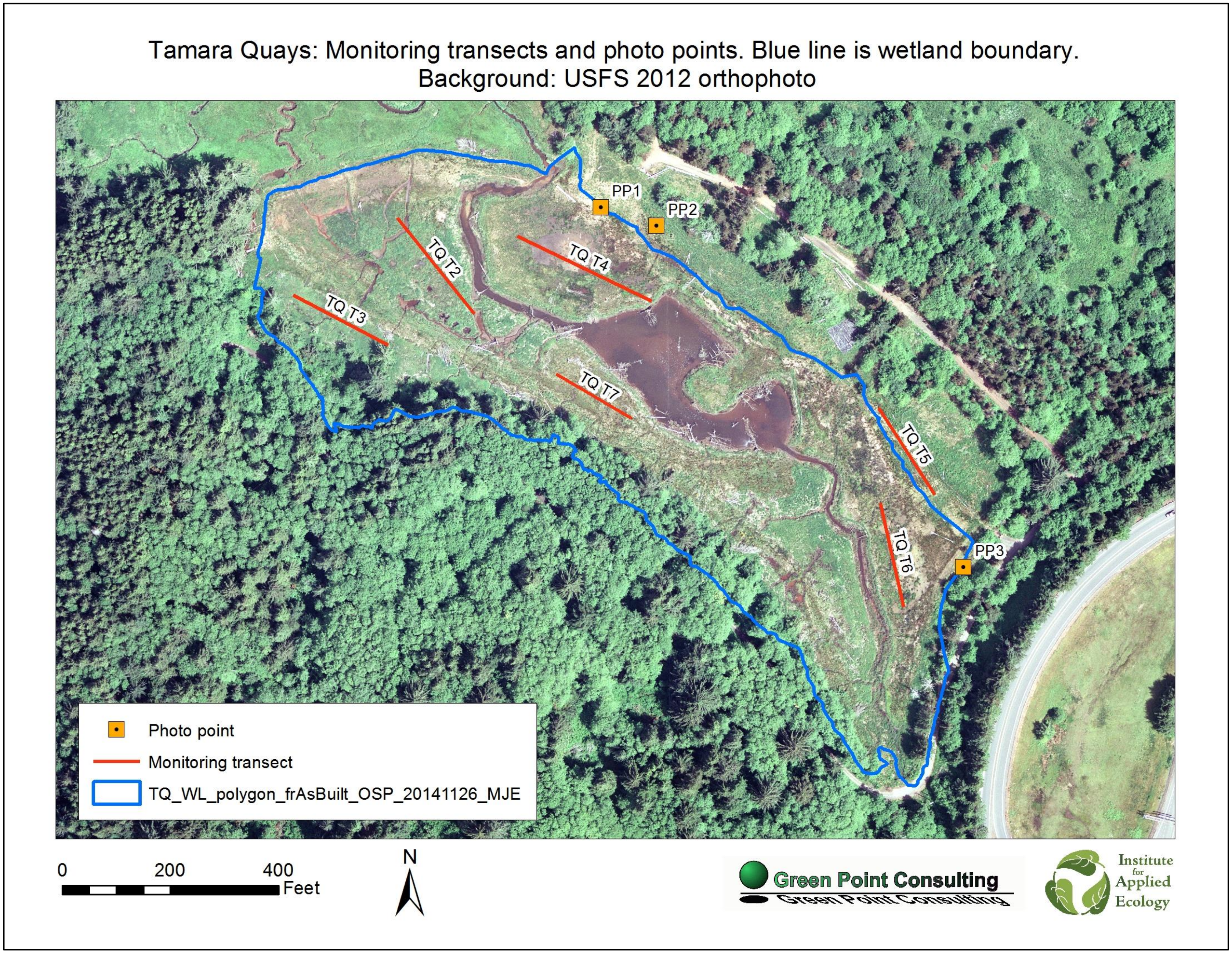
Map 2. 2014 Post-project wetland delineation study area and site features



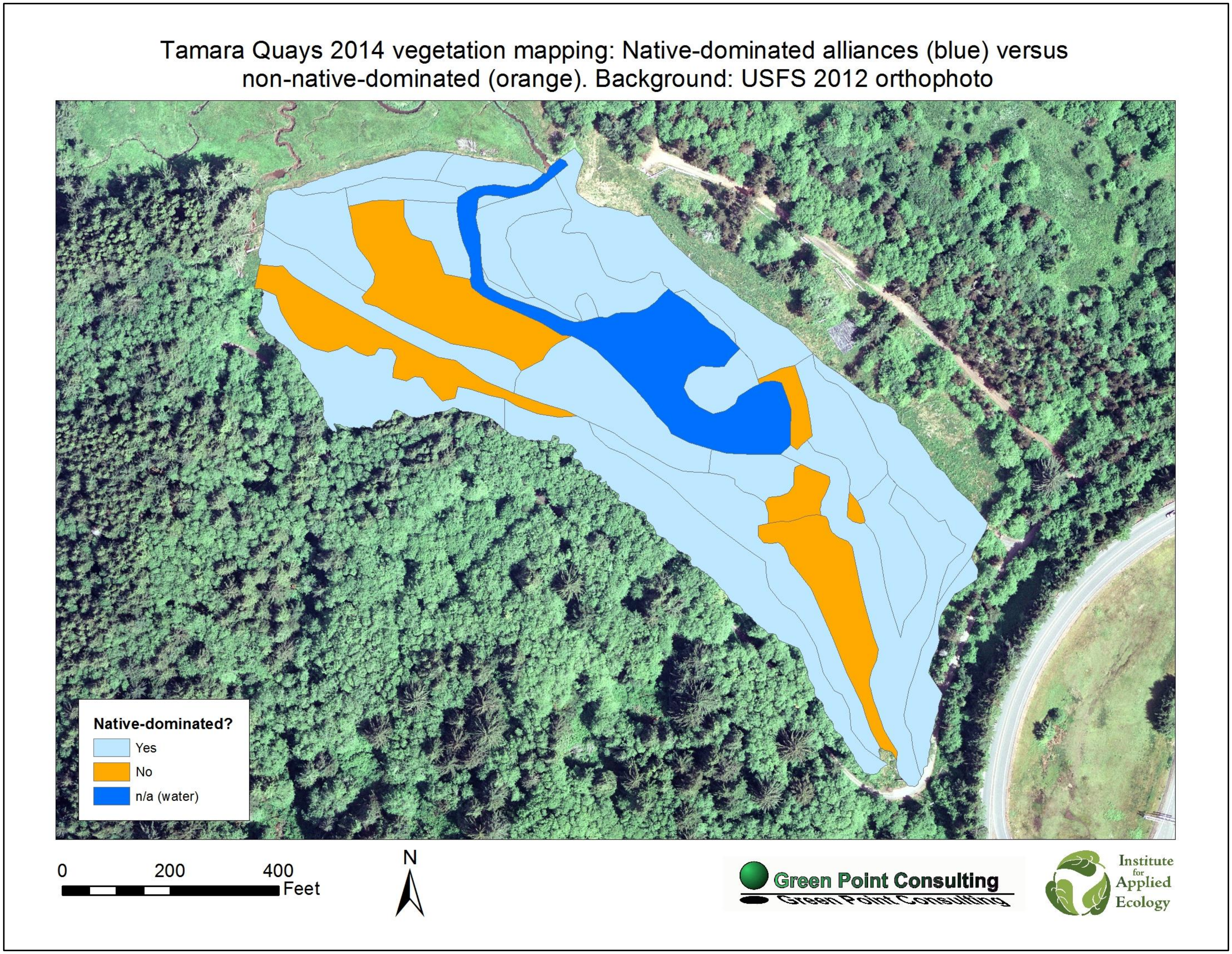
Map 3. 2014 post-project wetland delineation (wetland boundary) and wetland delineation sample points



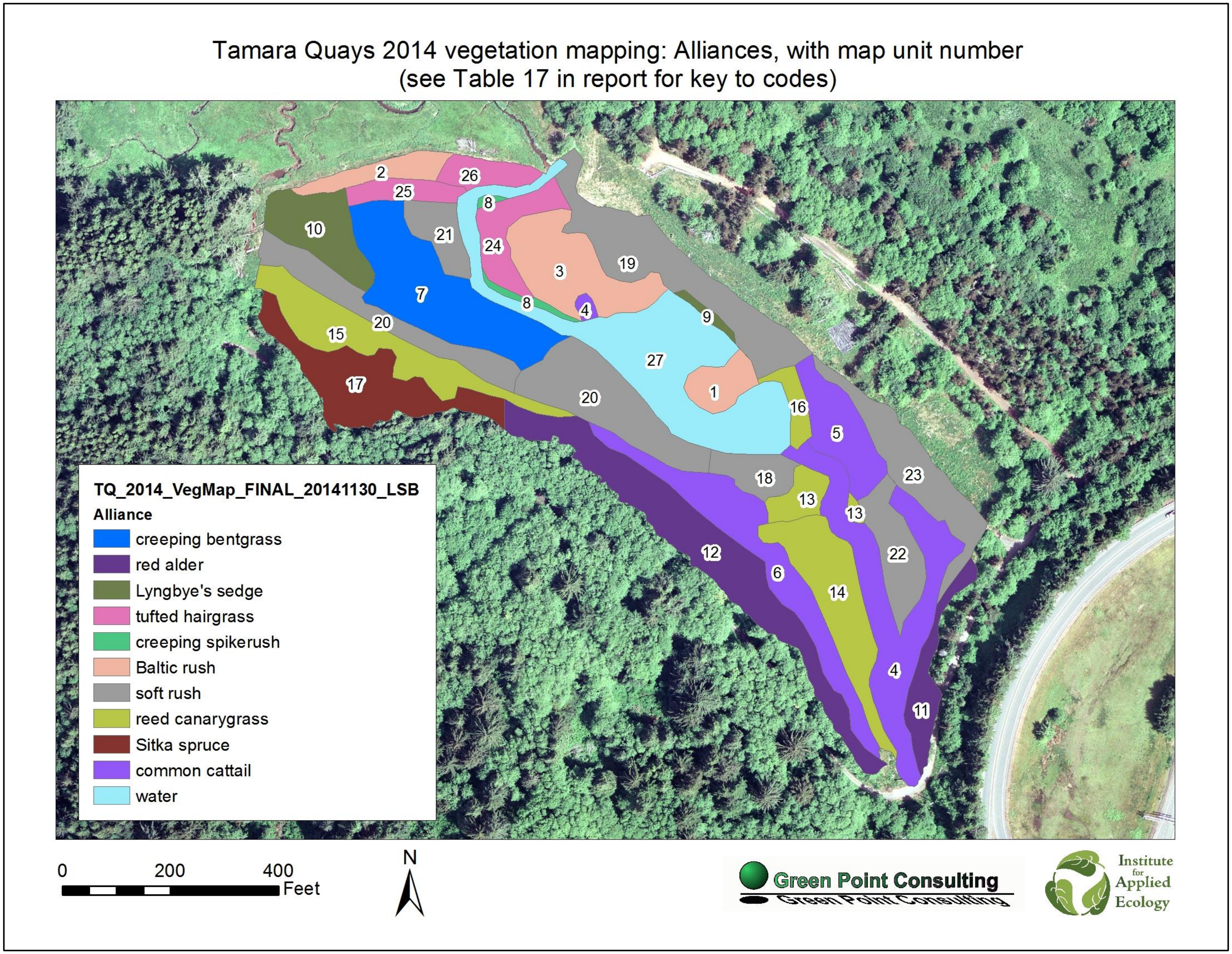
Map 4. Monitoring transects and photo points. Photo points are included in the wetland delineation report (Appendix 7).



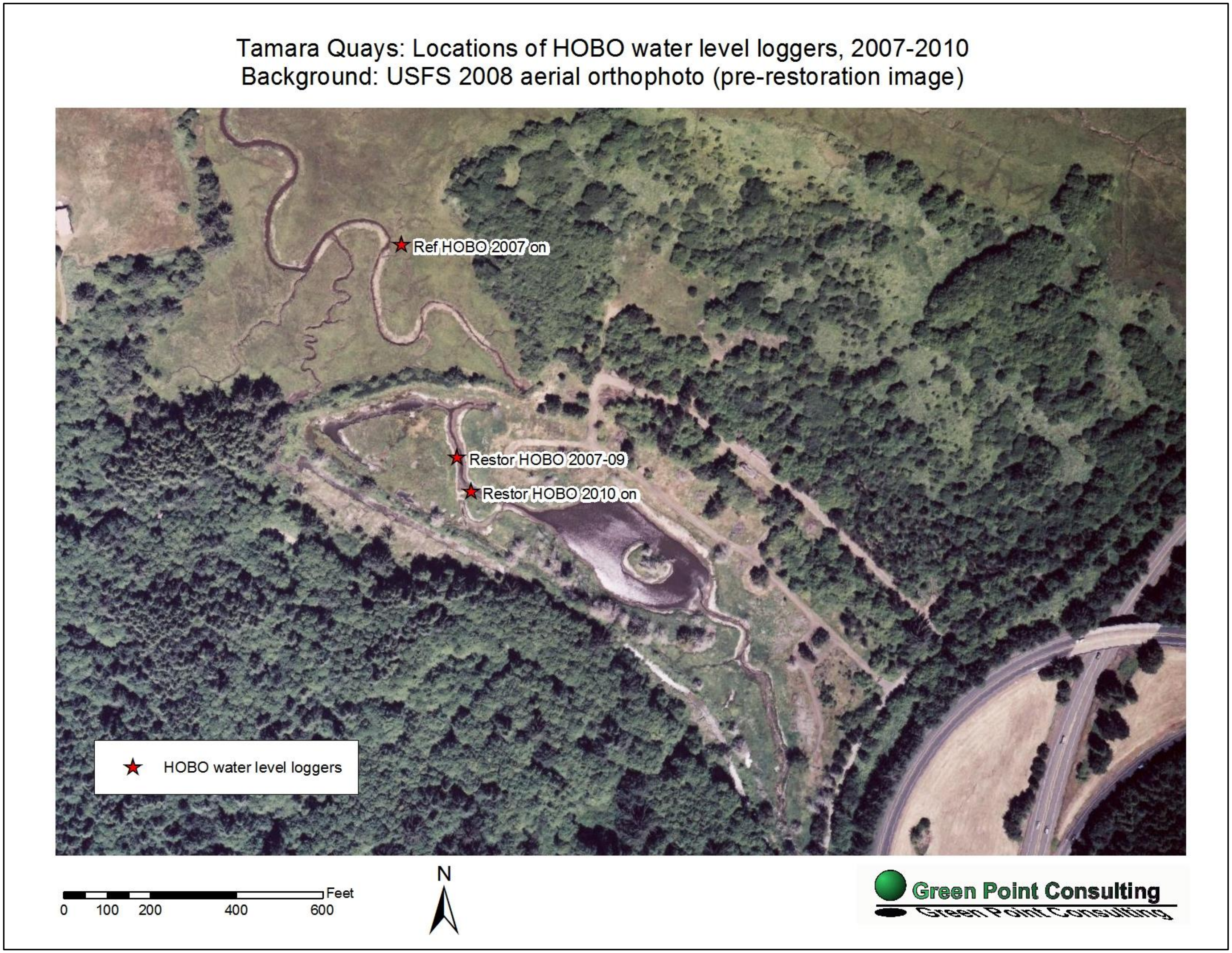
Map 5. 2014 vegetation map: Alliances colored by native dominance. Alliances dominated by native species are blue, non-native orange.



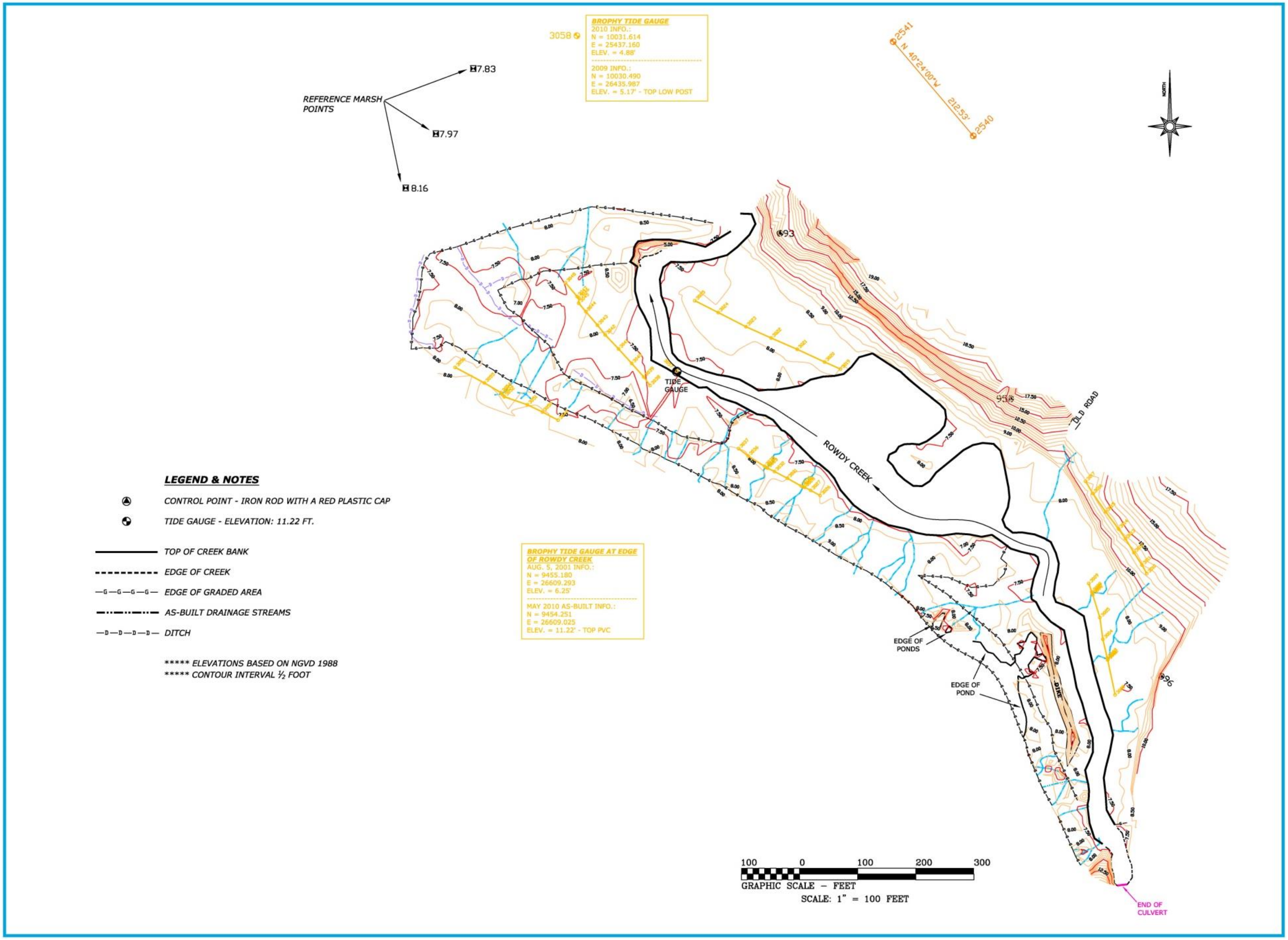
Map 6. 2014 vegetation alliances and associations, colored by alliance. Numbered map units represent associations; see Table 17 for key.



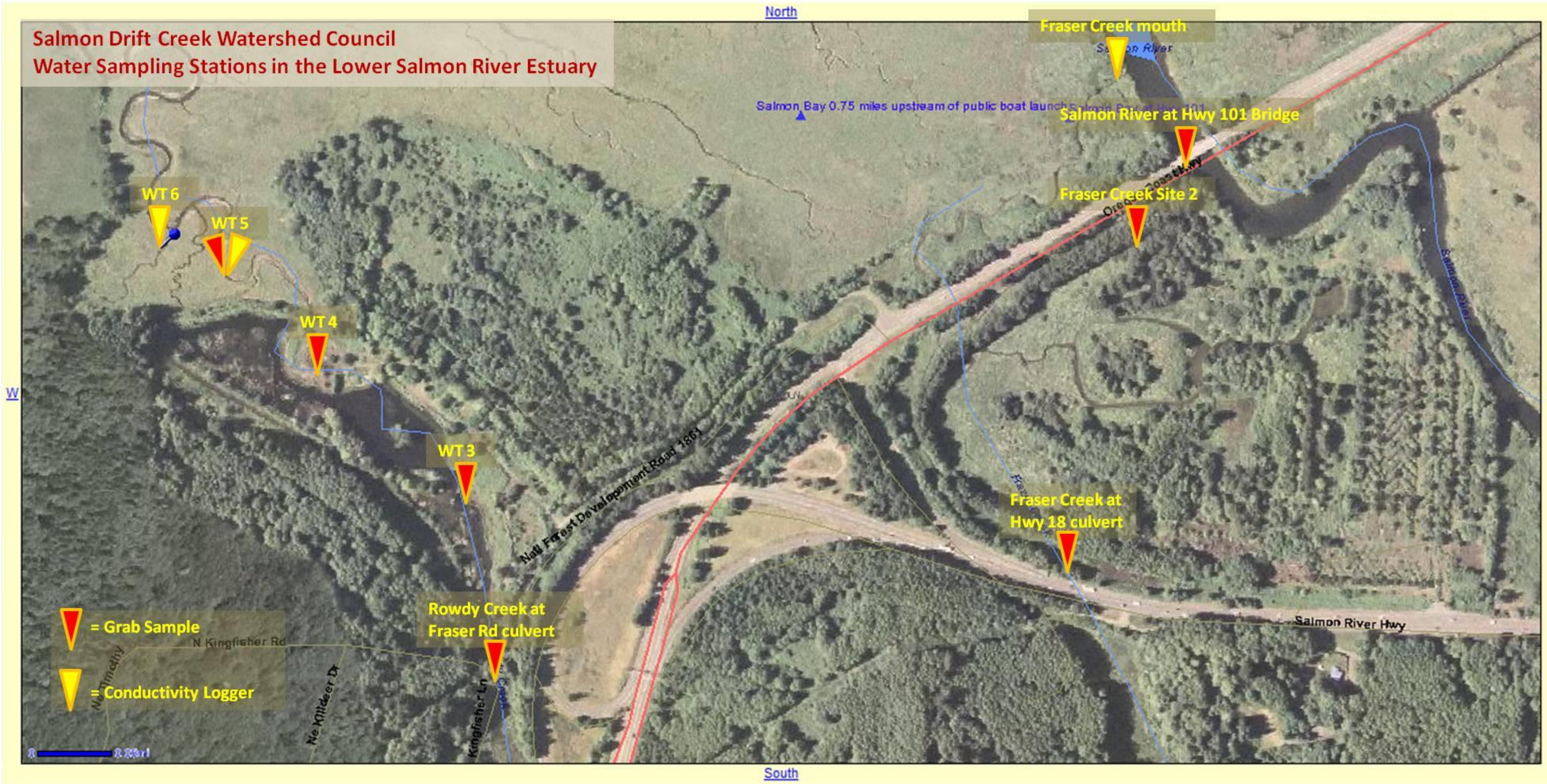
Map 7. Water level logger locations



Map 8. As-built survey of Tamara Quays restoration site (provided by USFS)



Map 9. Salmon Drift Creek Watershed Council's water sampling stations near Tamara Quays and Pixieland restoration sites, 2011-2012 (map provided by Salmon Drift Creek Watershed Council)



Appendix 5. Vegetation summary tables, DSL Routine Monitoring Protocol

TQ T5

Site: Tamara Quays TQ T5	**Sample Date(s):**	Wetland indicator status: 1=OBL 2=FACW 3=FAC 4=FACU 5=UPL																	
Shrub-Dominated Wetland Habitat Unit	6/30/2014			Percent Cover															
Species	Origin (N,NN,I)	Wet. Ind. Status (1-5)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Transect Average	% plot occurrence
Herbaceous plots																			
Native Herbaceous Species																			
Deschampsia cespitosa	N	2		5	0		0	0		0	0		0	0		0	0	0.5	10
Epilobium ciliatum	N	2		0	0		0	0		1	0		0	0		0	0	0.1	10
Carex lyngbyei	N	1		2	0		0	0		0	0		0	0		0	0	0.2	10
Juncus effusus	N	2		50	65		90	95		62	50		92	40		60	60	66.4	100
Invasive Herbaceous Species																			
Phalaris arundinacea L.	I	2		3	4		4	0		0	5		0	0		0	0	1.6	26.7
Holcus lanatus	I	3		5	3		1	0		4	5		0	3		5	0	2.6	46.7
Anthoxanthum odoratum	I	4		0	0		0	0		2	0		0	0		0	0	0.2	6.7
Non-Native Herbaceous Species																			
Agrostis stolonifera	NN	3		0	0		0	0		0	0		0	0		0	0	0.0	0
Lotus uliginosus	NN	3		35	25		5	5		14	30		8	30		35	20	20.7	66.7
Schedonorus arundinaceus	NN	3		0	0		0	0		0	0		0	0		0	0	0.0	0
Unknown Species																			
Poa sp.	Unknown			0	0		0	0		0	0		0	0		0	0	0.0	0
Shrub Species measured in herbaceous plots																			
Salix sitchensis	N	2		0	1		0	0		17	10		0	27		0	0	5.5	40
Salix hookeriana Barratt ex Hook.	N	2		0	2		0	0		0	0		0	0		0	20	2.2	20
Bare Substrate																			
Bare ground				0	0		0	0		0	0		0	0		0	0	0.0	0
Thatch/Detritus				0	0		0	0		0	0		0	0		0	0	0.0	0
Water				0	0		0	0		0	0		0	0		0	0	0.0	0
Summaries for herbaceous plots:																			
Total cover, native herbaceous species				57	65		90	95		63	50		92	40		60	60	67.2	
Total cover, non-native herbaceous species				35	25		5	5		14	30		8	30		35	20	20.7	
Tot cov inv herb spp INCL PHAARU (for std. 5.1)				8	7		5	0		6	10		0	3		5	0	4.4	
Tot cov inv herb spp EXCL PHAARU (for std. 5.1)				5	3		1	0		6	5		0	3		5	0	2.8	
Total cover, all herbaceous species				100	97		100	100		83	90		100	73		100	80	92.3	
Total cover, all species measured in herbaceous plots				100	100		100	100		100	100		100	100		100	100	100.0	

TQ T5 (cont'd)

Shrub plots																			
Native Shrub and Tree Species																		Transect Average	% Plot Occurrence
Salix hookeriana Barratt ex Hook.	N	2	3			7			1			13			5			5.8	100
Salix sitchensis Sanson ex Bong. var. sitchensis	N	2	4			3			7			1			35			10.0	100
Alnus rubra	N	3	0			0.5			0.5			0			2			0.6	60
Non-Native Shrub and Tree Species																			
species-latin name																			
Invasive Shrub and Tree Species																			
species-latin name																			
Bare Substrate																			
Bare Ground																			
Thatch/debris																			
			Woody Plant Count																
Native Shrub and Tree Count																		Avg stems	**Stems/A**
Salix hookeriana Barratt ex Hook.	N	2	3			5			1			9			5			4.6	890.6
Salix sitchensis Sanson ex Bong. var. sitchensis	N	2	2			2			4			1			13			4.4	851.8
Alnus rubra	N	3	0			1			1			0			5			1.4	271.0
																	TOTAL	10.4	2013.4

TQ T5 (cont'd)

Performance Standards	Threshold			1	2		3	4		5	6		7	8		9	10	Habitat Average	Standard Error
STD 7.1: Cover of Native Herbaceous Species	>=40% Yr1, 50% Yr3, 60% Yr5			57	65		90	95		63	50		92	40		60	60	67.20	5.94
Lower CI (80%)																		59.59	
Upper CI (80%)																		74.81	
(Total Vegetation Cover)				100	100		100	100		100	100		100	100		100	100	100.00	0.00
STD 7.2:a: Absolute Cover of Invasive Herbaceous Species not including Phalaris arundinacea	<=10%			5	3		1	0		6	5		0	3		5	0	2.80	0.76
Lower CI (80%)																		1.83	
Upper CI (80%)																		3.77	
STD 7.2b: Absolute Cover of Phalaris arundinacea	<=40% Yr1, 30% Yr3, 20% Yr5			3	4		4	0		0	5		0	0		0	0	1.60	0.67
Lower CI (80%)																		0.74	
Upper CI (80%)																		2.46	
STD 7.3: Cover of Native Shrubs	10% by Yr3, 30% Yr5		7			10.5			8.5			14			42			16.40	6.51
Lower CI (80%)																		8.06	
Upper CI (80%)																		24.74	
STD 7.4: Cover of Invasive Shrubs and Trees	<=10%		0			0			0			0			0			0.00	0.00
Lower CI (80%)																		0.00	
Upper CI (80%)																		0.00	
STD 7.5: Native Diversity (all layers)	3 by Year 5	Blue text in the native species lists qualify																	
STD 7.10: Moisture Index--All strata	<3.0			2.38	2.35		2.06	2.05		2.67	2.61		2.08	3.19		2.40	2.75	2.45	0.11
Weighted Prevalence Index				238	228		206	205		222	235		208	233		240	220	223.50	4.25
Sum of plant cover				100	97		100	100		83	90		100	73		100	80	92.30	3.22
Density of Woody Vegetation		Average per acre	968			1549			1162			1936			4453			2013.44	632.10
Plot Area (shrub/tree plot) in sq ft	225																		
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 Overstory Native Shrubs and Trees	>=50% (alternative)		7			10.5			8.5			14			42			16.4	6.51
Lower CI (80%)																		8.06	
Upper CI (80%)																		24.74	

TQ T1 – Reference Marsh

TQ-T1 Reference	Sample Date(s):	Wetland indicator status: 1=OBL 2=FACW 3=FAC 4=FACU 5=UPL																	
Herbaceous Wetland Habitat Unit	**6/30/2014**		**Percent Cover**																
Species	**Origin (N, NN, I)**	**We**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect Average**	**% plot occurrence**
Native Herbaceous Species																			
Deschampsia cespitosa	N	2	5	8	0	3	20	0	2	4	2	0	12	35	0	25	40	10.40	73.33
Festuca rubra	N	3	0	0	0	0	0	0	0	0	0	3	3	1	0	0	0	0.47	20.00
Carex lyngbyei	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	20	2	1.47	13.33
Symphyotrichum subpicatum	N	2	3	2	5	2	0	2	0	0	0	0	3	0	4	0	0	1.40	46.67
Glaux martima	N	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.07	6.67
Triglochin maritima	N	1	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0.20	13.33
Oenanthe sarmentosa	N	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	6.67
Potentilla anserina	N	1	80	55	60	85	10	80	55	54	60	58	40	45	50	10	35	51.80	100.00
Achillea millefolium	N	4	0	0	0	0	0	0	0	2	0	0	12	0	0	0	0	0.93	13.33
Hordeum brachyantherum	N	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.07	6.67
Juncus balticus	N	2	10	30	26	8	20	10	35	35	36	29	13	11	6	0.01	15	18.93	100.00
Invasive Herbaceous Species																			
Phalaris arundinacea L.	I	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Holcus lanatus	I	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Anthoxanthum odoratum	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Non-Native Herbaceous Species																			
Agrostis stolonifera	NN	3	2	0	4	2	20	8	8	4	0.01	10	15	8	40	10	8	9.27	93.33
Lotus uliginosus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Schedonorus arundinaceus	NN	3	0	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0.60	13.33
Bare Substrate																			
Bare ground			0	0	0	0	30	0	0	0	0	0	0	0	0	35	0	4.33	13.33
Thatch/Detritus			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Water			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total cover, native species			98	96	91	98	50	92	92	96	100	90	85	92	60	55.01	92	85.80	
Total cover, non-native species			2	4	9	2	20	8	8	4	0.01	10	15	8	40	10	8	9.87	
Tot cov inv spp INCL P. arundinacea			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
Tot cov inv spp EXCL P. arundinacea			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
Total cover, all species			100	100	100	100	70	100	100	100	100	100	100	100	100	65.01	100	95.67	
Performance Standards - not evaluated for this reference transect																			

TQ T2

TQ-T2 Restoration	**Sample Date(s):**	**Wetland indicator status: 1=OBL 2=FACW 3=FAC 4=FACU 5=UPL**																		
Herbaceous Wetland Habitat Unit	**6/30/2014**		**Percent Cover**																	
Species	**Origin (N, NN, I)**	**Wetland Status (1-5)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect Average**	**% plot occurrence**	
Native Herbaceous Species																				
Deschampsia cespitosa	N	2	0	15	0	15	0	0	0	40	0	0	0	0	0	0	0	4.7	20.0	
Potentilla anserina	N	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1	6.7	
Juncus effusus	N	2	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	2.3	6.7	
Juncus balticus	N	2	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0.3	6.7	
Unknown Species																				
Invasive Herbaceous Species																				
Phalaris arundinacea L.	I	2	10	5	80	35	80	8	90	5	50	0	0	0	0	0	2	24.3	66.7	
Holcus lanatus	I	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Anthoxanthum odoratum	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Non-Native Herbaceous Species																				
Agrostis stolonifera	NN	3	90	75	20	50	20	92	10	20	50	100	99	80	100	100	98	66.9	100.0	
Lotus uliginosus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Schedonorus arundinaceus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Bare Substrate																				
Bare ground			0	5	0	0	0	0	0	0	0	0	0	15	0	0	0	1.3	13.3	
Thatch/Detritus			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Water			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Total cover, native species			0	15	0	15	0	0	0	75	0	0	1	5	0	0	0	7.4		
Total cover, non-native species			90	75	20	50	20	92	10	20	50	100	99	80	100	100	98	66.9		
Tot cov inv spp INCL P. arundinacea			10	5	80	35	80	8	90	5	50	0	0	0	0	0	2	24.3		
Tot cov inv spp EXCL P. arundinacea			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
Total cover, all species			100	95	100	100	100	100	100	100	100	100	100	85	100	100	100	98.7		
Performance Standards	**Threshold**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect average**	**Standard Error**	**Standard Met?**
Standard 7.6	Invasive Cover =< 30%		10.0	5.0	80.0	35.0	80.0	8.0	90.0	5.0	50.0	0.0	0.0	0.0	0.0	0.0	2.0	24.3	8.7	Yes
Standard 7.7	At least 3 of species documented in reference marsh occur in project area																			
Standard 7.8	Native species progressing towards reference conditions (measured at 60%)		0.0	15.0	0.0	15.0	0.0	0.0	0.0	75.0	0.0	0.0	1.0	5.0	0.0	0.0	0.0	7.4	5.0	NO
Standard 7.9	Plant cover is progressing toward reference conditions (94.8%)		100.0	95.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.0	100.0	100.0	100.0	98.7	1.0	NO
Standard 7.10	Moisture Index < 3.0		2.9	2.8	2.2	2.5	2.2	2.9	2.1	2.2	2.5	3.0	3.0	2.9	3.0	3.0	3.0	2.7	0.1	Yes

TQ T3

TQ-T3 Restoration	Sample Date(s):	Wetland indicator status: 1=OBL 2=FACW 3=FAC 4=FACU 5=UPL																		
Herbaceous Wetland Habitat Unit	**6/30/2014**		**Percent Cover**																	
Species	**Origin (N, NN, I)**	**Wetland Status (1-5)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect Average**	**% plot occurrence**	
Native Herbaceous Species																				
Eleocharis palustris	N	1	0	0	0	0	9	0	0	40	0	0	0	0	0	0	0	3.3	13.3	
Potentilla anserina	N	1	0	0	0	2	15	10	0	0	25	30	35	8	45	10	40	14.7	66.7	
Achillea millefolium	N	4	0	0	0	0	0	0	0	0	0	0	8	0	0	20	5	2.2	20.0	
Galium trifidum	N	2	0	4	0	0	0	0	0	0	0	0	0	2	0	0	0	0.4	13.3	
Typha latifolia	N	1	0	0	0	0	1	0	5	55	15	25	40	0	20	60	0	14.7	53.3	
Unknown Species																				
Invasive Herbaceous Species																				
Phalaris arundinacea L.	I	2	100	96	100	98	75	90	95	5	60	45	17	90	35	10	55	64.7	100.0	
Holcus lanatus	I	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Anthoxanthum odoratum	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Non-Native Herbaceous Species																				
Agrostis stolonifera	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Lotus uliginosus	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Schedonorus arundinaceus	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Bare Substrate																				
Bare ground			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Thatch/Detritus																				
Water																				
Total cover, native species			0	4	0	2	25	10	5	95	40	55	83	10	65	90	45	35.3		
Total cover, non-native species			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
Tot cov inv spp INCL P. arundinacea			100	96	100	98	75	90	95	5	60	45	17	90	35	10	55	64.7		
Tot cov inv spp EXCL P. arundinacea			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
Total cover, all species			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100.0		
Performance Standards	**Threshold**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect average**	**Standard Error**	**Standard Met?**
Standard 7.6	Invasive Cover =< 30%		100.0	96.0	100.0	98.0	75.0	90.0	95.0	5.0	60.0	45.0	17.0	90.0	35.0	10.0	55.0	64.7	9.0	NO
Standard 7.7	At least 3 of species documented in reference marsh occur in project area																			
Standard 7.8	Native species progressing towards reference conditions (measured at 60%)		0.0	4.0	0.0	2.0	25.0	10.0	5.0	95.0	40.0	55.0	83.0	10.0	65.0	90.0	45.0	35.3	9.0	YES
Standard 7.9	Plant cover is progressing toward reference conditions (94.8%)		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	YES
Standard 7.10	Moisture Index < 3.0		2.0	2.0	2.0	2.0	1.8	1.9	2.0	1.1	1.6	1.5	1.4	1.9	1.4	1.7	1.7	1.7		YES

TQ T4

TQ-T4	Sample Date(s):	Wetland indicator status: 1=OBL 2=FACW 3=FAC 4=FACU 5=UPL																		
Herbaceous Wetland Habitat Unit	**6/30/2014**		**Percent Cover**																	
Species	**Origin (N, NN, I)**	**Wetland Status (1-5)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect Average**	**% plot occurrence**	
Native Herbaceous Species																				
Deschampsia cespitosa	N	2	0	50	0	0	8	5	0	0	0	0	0	5	0	3	4	5.0	40.0	
Eleocharis palustris	N	1	0	0	0	0	0	0	0	0	40	65	5	0	0	95	4	13.9	33.3	
Carex lynbyei	N	1	5	4	65	0	62	45	0	0	25	5	0	0	0	0	0	14.1	46.7	
Juncus effusus	N	2	0	0	0	85	0	0	0	25	0	0	5	30	0	0	2	9.8	33.3	
Galium trifidum	N	2	0	0	0	0	0	0	0	0	0	0	0	0	5	0	20	1.7	13.3	
Juncus balticus	N	2	80	35	0	0	0	15	0	0	0	20	35	60	90	0	30	24.3	53.3	
Unknown Species																				
Invasive Herbaceous Species																				
Phalaris arundinacea L.	I	2	0	0	0	0	0	0	0	0	0	0	5	5	0	0	40	3.3	20.0	
Holcus lanatus	I	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Anthoxanthum odoratum	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Non-Native Herbaceous Species																				
Agrostis stolonifera	NN	3	15	11	35	10	0	35	1	25	35	10	50	0	5	3	0	15.6	80.0	
Lotus uliginosus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Schedonorus arundinaceus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Bare Substrate																				
Bare ground			0	0	0	5	30	0	99	50	0	0	0	0	0	0	0	12.3	26.7	
Thatch/Detritus																				
Water																				
Total cover, native species			85	89	65	85	70	65	0	25	65	90	45	95	95	98	60	68.8		
Total cover, non-native species			15	11	35	10	0	35	1	25	35	10	50	0	5	3	0	15.6		
Tot cov inv spp INCL P. arundinacea			0	0	0	0	0	0	0	0	0	0	5	5	0	0	40	3.3		
Tot cov inv spp EXCL P. arundinacea			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0		
Total cover, all species			100	100	100	95	70	100	1	50	100	100	100	100	100	100	100	87.7		
Performance Standards	**Threshold**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect average**	**Standard Error**	**Standard Met?**
Standard 7.6	Invasive Cover =< 30%		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0	0.0	0.0	40.0	3.3	2.7	YES
Standard 7.7	At least 3 of species documented in reference marsh occur in project area																			
Standard 7.8	Native species progressing towards reference conditions (measured at 60%)		85.0	89.0	65.0	85.0	70.0	65.0	0.0	25.0	65.0	90.0	45.0	95.0	95.0	97.5	60.0	68.8	7.2	YES
Standard 7.9	Plant cover is progressing toward reference conditions (94.8%)		100.0	100.0	100.0	95.0	70.0	100.0	1.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.7	7.2	
Standard 7.10	Moisture Index < 3.0		2.1	2.1	1.7	2.1	1.1	1.9	3.0	2.5	1.7	1.4	2.5	2.0	2.1	1.1	2.0	1.9		YES

TQ T6

TQ-T6	Sample Date(s):	Wetland indicator status: 1=OBL 2=FACW 3=FAC 4=FACU 5=UPL																		
Herbaceous Wetland Habitat Unit	6/30/2014		Percent Cover																	
Species	Origin (N, NN, I)	Wetland Status (1-5)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Transect Average	% plot occurrence	
Native Herbaceous Species																				
Deschampsia cespitosa	N	2	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0.2	6.7	
Eleocharis palustris	N	1	0	0	50	55	0	2	80	15	29	0	30	10	80	47	0	26.5	66.7	
Carex lynbyei	N	1	0	0	0	2	0	0	0	2	0	0	0	35	5	0	0	2.9	26.7	
Potentilla anserina	N	1	0	0	0	8	5	0	0	0	4	0	5	0	0	3	10	2.3	40.0	
Juncus effusus	N	2	34	98	40	0	40	85	0	75	0	1	25	0	0	0	15	27.5	60.0	
Galium trifidum	N	2	0	0	0	0	0	3	0	3	4	0	0	0	0	0	0	0.7	20.0	
Juncus balticus	N	2	0	0	10	15	35	0	0	0	49	0	40	20	0	0	15	12.3	46.7	
Typha latifolia	N	1	1	0	0	0	0	0	0	0	0	99	0	0	0	0	0	6.7	13.3	
Unknown Species																				
Invasive Herbaceous Species																				
Phalaris arundinacea L.	I	2	20	0	0	0	15	0	15	0	0	0	0	0	0	2	0	3.5	26.7	
Holcus lanatus	I	3	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0.1	6.7	
Anthoxanthum odoratum	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Non-Native Herbaceous Species																				
Agrostis stolonifera	NN	3	0	2	0	20	5	7	5	5	12	0	0	35	15	48	20	11.6	73.3	
Lotus uliginosus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Schedonorus arundinaceus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Bare Substrate																				
Bare ground			45	0	0	0	0	0	0	0	0	0	0	0	0	0	40	5.7	13.3	
Thatch/Detritus			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Water			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Total cover, native species			35	98	100	80	80	93	80	95	86	100	100	65	85	50	40	79.1		
Total cover, non-native species			0	2	0	20	5	7	5	5	12	0	0	35	15	48	20	11.6		
Tot cov inv spp INCL P. arundinacea			20	0	0	0	15	0	15	0	2	0	0	0	0	2	0	3.6		
Tot cov inv spp EXCL P. arundinacea			0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0.1		
Total cover, all species			55	100	100	100	100	100	100	100	100	100	100	100	100	100	60	94.3		
Performance Standards	**Threshold**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect average**	**Standard Error**	**Standard Met?**
Standard 7.6	Invasive Cover =< 30%		20.0	0.0	0.0	0.0	15.0	0.0	15.0	0.0	2.0	0.0	0.0	0.0	0.0	2.0	0.0	3.6	1.8	YES
Standard 7.7	At least 3 of species documented in reference marsh occur in project area																			
Standard 7.8	Native species progressing towards reference conditions (measured at 60%)		35.0	98.0	100.0	80.0	80.0	93.0	80.0	95.0	86.0	100.0	100.0	65.0	85.0	50.0	40.0	79.1	5.7	YES
Standard 7.9	Plant cover is progressing toward reference conditions (94.8%)		55.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	60.0	94.3	3.9	YES
Standard 7.10	Moisture Index < 3.0		2.0	2.0	1.5	1.6	2.0	2.1	1.3	1.9	1.8	1.0	1.7	1.9	1.3	2.0	2.2	1.7		YES

TQ T7

TQ-T7	Sample Date(s):	Wetland indicator status: 1=OBL 2=FACW 3=FAC 4=FACU 5=UPL																		
Herbaceous Wetland Habitat Unit	**6/30/2014**		**Percent Cover**																	
Species	**Origin (N, NN, I)**	**Wetland Status (1-5)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect Average**	**% plot occurrence**	
Native Herbaceous Species																				
Eleocharis palustris	N	1	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	2.0	6.7	
Potentilla anserina	N	1	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0.3	6.7	
Juncus effusus	N	2	0	0	0	65	45	40	95	95	98	89	80	65	88	60	30	56.7	80.0	
Galium trifidum	N	2	5	0	0	5	0	15	0	0	0	8	15	10	8	5	0	4.7	53.3	
Juncus balticus	N	2	85	45	17	0	0	0	0	0	0	0	0	0	0	25	60	15.5	33.3	
Typha latifolia	N	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0.2	6.7	
Unknown Species																				
PoaSp	Unknown		0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	6.7	
Invasive Herbaceous Species																				
Phalaris arundinacea L.	I	2	5	5	3	0	25	45	5	3	2	0	5	25	4	10	10	9.8	86.7	
Holcus lanatus		3	5	30	10	0	0	0	0	2	0	0	0	0	0	0	0	3.1	26.7	
Anthoxanthum odoratum		4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Non-Native Herbaceous Species																				
Agrostis stolonifera		3	0	3	30	0	0	0	0	0	0	0	0	0	0	0	0	2.2	13.3	
Lotus uliginosus		3	0	10	30	0	30	0	0	0	0	0	0	0	0	0	0	4.7	20.0	
Schedonorus arundinaceus		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Bare Substrate																				
Bare ground			0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0.7	13.3	
Thatch/Detritus			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Water			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Total cover, native species			90	47	22	100	45	55	95	95	98	100	95	75	96	90	90	79.5		
Total cover, non-native species			0	13	60	0	30	0	0	0	0	0	0	0	0	0	0	6.9		
Tot cov inv spp INCL P. arundinacea			10	35	13	0	25	45	5	5	2	0	5	25	4	10	10	12.9		
Tot cov inv spp EXCL P. arundinacea			5	30	10	0	0	0	0	2	0	0	0	0	0	0	0	3.1		
Total cover, all species			100	95	95	100	100	100	100	100	100	100	100	100	100	100	100	99.3		
Performance Standards	**Threshold**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Transect average**	**Standard Error**	**Standard Met?**
Standard 7.6	Invasive Cover =< 30%		10.0	35.0	13.0	0.0	25.0	45.0	5.0	5.0	2.0	0.0	5.0	25.0	4.0	10.0	10.0	12.9	3.5	YES
Standard 7.7	At least 3 of species documented in reference marsh occur in project area																			
Standard 7.8	Native species progressing towards reference conditions (measured at 60%)		90.0	47.0	22.0	100.0	45.0	55.0	95.0	95.0	98.0	100.0	95.0	75.0	96.0	90.0	90.0	79.5	6.4	YES
Standard 7.9	Plant cover is progressing toward reference conditions (94.8%)		100.0	95.0	95.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.3	0.5	YES
Standard 7.10	Moisture Index < 3.0		2.1	2.4	2.7	1.7	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	0.1	YES

Appendix 6. Tidal datums for the Salmon River Estuary and nearby NOAA station (Depoe Bay)

Tidal Datums for the Salmon River Estuary

The data in the left two columns of the table below were provided in Coulton *et al* (1995). The data in the right column (elevations relative to the NAVD88 datum) were calculated by our team using the VERTCON conversion of 3.32 ft for this location (http://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.prl).

The tidal datums shown in this table are derived from monitoring performed at approximately River Mile 2.4 (Mitchell, 1981).			
Tidal Datum	Elevation* feet above MLLW (meters, MLLW)	Elevation* feet above NGVD (meters, NGVD)	Elevation (feet above NAVD88)***
MHHW	4.40 (1.34)	4.57 (1.39)	7.89
MHW	3.71 (1.13)	3.87 (1.18)	7.19
MTL	1.90 (0.58)	2.07 (0.63)	5.39
MLW	0.20 (0.06)	0.37 (0.11)	3.69
MLLW	0	0.17 (0.05)	3.49
(NGVD)	**-0.17 (-0.05)	**0.00	3.32
Notes provided in the table in Coulton et al (1995): * The accuracy of these datums is determined by a comparison of simultaneous observations over a 12-month period is +/- 0.066 foot (+/-0.02 meter) (Swanson, 1974). Error associated with reading the tide staff and the tide chart is at least +/- 0.098 foot (+/- 0.03 meter). ** Review of the original notes by Mitchell indicate an inconsistency in the estimate of the NGVD datum conversion. The correct conversion is given here. Ref: Mitchell, D.L., 1981, Salt Marsh Re-establishment Following Dike Breaching in the Salmon River Estuary, Oregon, PhD Thesis, Oregon State University, August 21, 1981			

*** Elevation relative to NAVD88 calculated by Laura Brophy using VERTCON utility

Tidal datums at Depoe Bay (closest NOAA tide stations)

NOAA's Depoe Bay tide station provides the closest NOAA-calculated tidal datums for this site. The NOAA "Tides and Currents" website displays the Depoe Bay datums relative to NAVD88 and MLLW (http://tidesandcurrents.noaa.gov/datums.html?id=9435827). We used NGS's VERTCON utility to convert the datums to NGVD29 for comparison to USFS plans that use this datum.

Depoe Bay tidal datums (http://tidesandcurrents.noaa.gov/datums.html?id=9435827, 8/20/09):

Depoe Bay	MLLW-m	MLLW-ft	NGVD29-m	NGVD29-ft	NAVD88-m	NAVD88-ft
HMT	3.725	12.222	2.520	8.268	3.532	11.588
MHHW	2.511	8.239	1.306	4.285	2.318	7.605
MHW	2.295	7.530	1.090	3.576	2.102	6.897
MTL	1.356	4.449	0.151	0.495	1.163	3.816
MSL	1.346	4.416	0.141	0.463	1.153	3.783
NGVD29	1.205	3.954	0.000	0.000	1.012	3.320
MLW	0.418	1.371	-0.787	-2.582	0.225	0.738
NAVD88	0.193	0.633	-1.012	-3.320	0.000	0.000
MLLW	0.000	0.000	-1.205	-3.954	-0.193	-0.633

References

Coulton, K., P. Goodwin, C. Perala, and M. Scott. 1996b. Evaluation of flood management benefits through floodplain restoration on the Willamette River, Oregon, U.S.A. Prepared in portland, OR for the River Network, Portland, OR. Philip Williams and Associates, Ltd.

Appendix 7. Post-project wetland delineation "light" for Tamara Quays Tidal Wetland Restoration Site

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Summary

This Appendix describes the post-project wetland delineation conducted at the Tamara Quays tidal wetland restoration site. The delineation mapped tidal wetlands only; the scope did not include mapping of nontidal wetlands, which may extend well beyond the tidal wetland restoration area. Additional information about the project site is found in the effectiveness monitoring report (Brophy and Brown 2014).

As described in Chapter 9 of The Oregon Department of State Lands' Removal-Fill Guide (OR DSL 2012), wetland delineations for compensatory mitigation sites use a "delineation light" method. As stated in the Removal-Fill Guide, "The mitigation monitoring "light" delineation is treated as an amendment to the formal delineation (following OAR 141-90) prepared for the pre-project CWM [compensatory wetland mitigation] site. The delineation light should not repeat any of the background information from the pre-project CWM delineation, except as outlined below."

Following standard practice, the wetland boundary was drawn where tidal wetland hydrology, hydric soils, and hydrophytic vegetation were all present. Soil conditions at the site were disturbed by grading, so we followed guidance from the Western Regional Supplement (U.S. Army Corps 2010) for "Problematic hydric soils" and defined the extent of hydric soils using long-term water level gauge data, as described in the 1987 Manual (Environmental Laboratory 1987). The gauge data (obtained from NOAA's South Beach tide station) are analyzed by NOAA to provide an elevation for biennial tidal inundation (the "50% exceedance elevation"), which defines the limit of tidal wetlands. A second, alternate wetland boundary was also delineated, defined by the extent of hydrophytic vegetation; this alternate boundary was about 1 ft higher (vertically) than the primary boundary. Soils and hydrology were not investigated for the alternate boundary, since it is outside the extent of tidal wetlands (as defined by NOAA analysis), and therefore outside the scope of this project. The alternate boundary may represent locally higher tidal influence, or adjacent areas of nontidal wetlands. The difference in area between the two wetland boundaries is 0.56 ac. Details are provided in **Wetland Determination Methods** below.

Our 2014 wetland delineation was supported by our team's extensive effectiveness monitoring at the site during 2007 and 2009 (baseline period), 2010, 2011, 2012 and 2014 (Brophy 2009, 2010, 2011, 2012; Brophy and Brown, 2014). Effectiveness monitoring includes measurements of tidal hydrology, vegetation, and soils, providing strong support for the wetland status of the area delineated.

Study area

The study area was the Tamara Quays tidal wetland restoration site in the lower Salmon River estuary. The restoration site was formerly an RV park and as a result has many small tax lots (Map W1). This delineation's scope was to identify and map tidal wetlands which were restored as a result of tidal reconnection actions taken at the site. The scope did not include mapping of nontidal wetlands. Therefore, we established the delineation study area boundary at the (14.8 ft) (4.5 m) contour (NAVD88), which is about 3 ft above Highest Measured Tide (HMT) for the nearest NOAA tide station (Depoe Bay, where HMT is 11.6 ft NAVD88). Based on information obtained from USFS, aerial photo interpretation, and a LiDAR elevation dataset obtained from USFS, we were certain that this boundary was sufficiently high to include the entire tidal wetland area. We established the location of the 4.5 m contour in 2009 using a contour map provided by USFS, built from a USFS LiDAR elevation dataset. For this delineation, we extended the study area boundary to include the former dike area, now lowered to tidal marsh elevation. The study area boundary and site features are shown in Map W2.

The entire northeast side of the site (east bank of Rowdy Creek) was graded during restoration (Map W3). A broad area (approximately the historic extent of tidal marsh on Rowdy Creek's east bank) was graded to an elevation of 8 ft NAVD88 to restore high marsh. The slope was then graded up to the northeast to blend into uplands.

On the west bank of Rowdy Creek, grading was limited to removal of the perimeter dike, filling of the bypass canal, and removal of the bypass canal levee. Brophy 2010 contains further details on site characteristics. The graded area on the west bank of Rowdy Creek is inside the lines marked "– G—G—G—G" in Map W3.

Wetland determination methods

This wetland determination followed the methods outlined in the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual (U.S. Army Corps of Engineers 2010) and the 1987 Corps delineation manual (Environmental Laboratory 1987).

Since soils at the site were disturbed by grading, we used hydrologic data to determine the extent of hydric soils. The general approach is described on page 115 of the 2010 Supplement:

> *Procedure 4(e): Using gauge data, water-table monitoring data, or repeated direct hydrologic observations (see item 5a in the procedure for Problematic Hydrophytic Vegetation in this chapter), determine whether the soil is ponded or flooded, or the water table is 12 in. (30 cm) or less from the surface, for 14 or more consecutive days during the growing season in most years (at least 5 years in 10, or 50 percent or higher probability) (U.S. Army Corps of Engineers 2005). If so, then the soil is hydric. Furthermore, any soil that meets the NTCHS hydric soil technical standard (NRCS Hydric*

Soils Technical Note 11, http://soils.usda.gov/use/hydric/ntchs/tech_notes/index.html) is hydric.

A more specific approach, tailored to tidal wetland gauge data, is provided in the 1987 Corps delineation manual (pp 43-44; Part IV, Section B, step 8(i)(1)). We used this approach to determine the maximum elevation of tidal wetland hydrology for Tamara Quays:

> *For the routine approach, determine the highest water level elevation reached during the growing season for each of the most recent 10 years of gage data. Rank these elevations in descending order and select the fifth highest elevation. Combine this elevation with the mean sea level elevation of the gaging station to produce a mean sea level elevation for the highest water level reached every other year. Compare the resulting elevations reached biennially with the project area elevations. If the water level elevation exceeds the area elevation, the area is inundated during the growing season on average at least biennially.*

The 1987 manual procedure defines the elevation that has a 50% probability of inundation each year; it is therefore conceptually the same as the 50% exceedance level (50% exceedance elevation) provided by NOAA at its Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/). At that website, NOAA states: "*On average, the 1% level (red) will be exceeded in only one year per century, the 10% level (orange) will be exceeded in ten years per century, and the 50% level (green) will be exceeded in fifty years per century.*"

The 50% exceedance elevation was selected by the State of Oregon as the boundary for updated mapping of tidal wetlands on Oregon's outer coast in 2014 (Lanier *et al*. 2014). The 50% exceedance elevation is also used as one of two alternate methods for defining the wetted area for tidal wetland restoration projects in the Columbia River estuary (ERTG 2013). Use of this elevation to define the upper boundary of tidal wetland hydrology was approved by Department of State Lands staff (Dana Hicks, personal communication, 8/7/14).

The nearest NOAA station for which NOAA provides Extreme Water Level data is South Beach (station 9435380). The 50% exceedance elevation at the South Beach station is 10.43 ft (3.18 m) NAVD88 (http://tidesandcurrents.noaa.gov/est/est_station.shtml?stnid=9435380).

Following the above approach, our field preparation and field procedures for mapping the wetland boundary at Tamara Quays were as follows:

1. USFS provided an as-built survey in CAD format. We used the "warp" geoprocessing function in ArcGIS 10.2 to georeference the CAD file in the GIS, matching features in the survey to landmarks on USFS aerial orthophotos and 2009 NAIP aerial imagery.
2. We located and extracted the 10.5 ft (3.2 m) NAVD88 contour from the USFS as-built survey, creating a tidal wetland hydrology boundary line in the GIS. We also printed this contour on maps for field use. (The 10.5 ft contour was the closest contour in the survey to the 10.43 ft [3.18 m] 50% exceedance elevation.) This contour represented the extent of tidal wetland hydrology and hydric soils (as described above).

3. In the field, we examined plant communities for the transition from hydrophytic to non-hydrophytic vegetation. We flagged the line that marked the extent of hydrophytic vegetation and measured horizontal and vertical positions at 64 points along that line using RTK-GPS, ensuring accuracy meets DSL standards. (Measured accuracy was 2 cm horizontal and 5 cm vertical.)
4. The results of step 3 showed that the hydrophytic vegetation boundary was almost always higher than the 50% exceedance elevation, by about 1 ft (0.30 m) vertically and 20-40 ft (6.1 - 12.2 m)horizontally. (Average elevation of this boundary was 11.4ft [3.47 m] NAVD88.)

We then created two wetland boundaries as follows:

1. **Primary wetland boundary:** This boundary was defined using the standard three jurisdictional criteria. It follows the 10.5 ft (3.2 m) NAVD88 contour from the USFS as-built survey, except where the hydrophytic vegetation boundary fell below that elevation, in which case the wetland boundary followed the vegetation boundary. Within this boundary, sample points met all three jurisdictional criteria (hydrology, soils, and vegetation) and are jurisdictional wetlands. This boundary is available as a shapefile (TQ_WL_polygon_OSP_20141201_LSB.shp).
2. **Alternate wetland boundary:** At the request of the Department of State Lands, we also drew an alternate wetland boundary at the hydrophytic vegetation boundary. As described above, this boundary was higher than the primary wetland boundary. Hydrology and soils were not evaluated for the area between the two boundaries, since this area lies above the 50% exceedance elevation and therefore does not meet the definition of a tidal wetland (and therefore is outside the scope of this delineation). There are three possible interpretations of the hydrophytic vegetation boundary: 1) local tidal hydrology may reach higher than predicted by the South Beach NOAA station; 2) this line may represent the additional extent of nontidal wetlands adjacent to the tidal wetlands; or 3) hydrophytic vegetation may be present in these areas without accompanying wetland hydrology or hydric soils. This boundary is available as a shapefile (TQ_hydrophytic_veg_polygon_OSP_20141130_LSB.shp).

Digital elevation models (DEMs) built from LIDAR data were not used for determination of wetland boundaries or other post-restoration site elevations, for two reasons:

1. The most recent available LIDAR data for Tamara Quays are from prior to restoration, so they do not reflect grading at the site; and
2. DEMs built from LIDAR data generally have insufficient accuracy for on-site delineation work, since elevations can vary by 1 to 2 ft (0.3 – 0.6 m) due to vegetation interference in Oregon tidal wetlands (Ewald 2013).

Wetland description and classification

The following wetland description and classification applies to the area defined by the primary wetland boundary. Total wetland area was 14.83 ac (6.00 ha). (The alternate wetland boundary was 0.56 ac larger, totaling 15.39 ac [38.03 ha].) The wetland boundary followed the site's topographic contours closely. All wetlands delineated were tidal; the majority of the site was occupied by emergent tidal marsh at an elevation slightly above Mean Higher High Water, which thus floods on higher high tides or during spring tide cycles. Forested tidal wetlands in the ungraded area on the west side of the site are at similar or slightly higher elevations. Water quality monitoring conducted by the Salmon Drift Creek Watershed Council indicated that salinities were brackish in the dry season, so these wetlands were classified in the Estuarine system of the Cowardin classification, specifically irregularly-flooded estuarine emergent wetlands (E2EMP) and irregularly-flooded estuarine forested wetlands (E2FOP). A few low areas along the banks of Rowdy Creek were regularly inundated (E2EMN). In the new, federally-mandated Coastal and Marine Ecosystem Classification System (CMECS), these wetlands were classified as *Estuarine Coastal* in the Aquatic Component and *Brackish Emergent Tidal Marsh* and *Brackish Tidal Forest/Woodland* in the Biotic Component.

As described above, we also delineated an alternate wetland boundary, defined by the extent of hydrophytic vegetation. This boundary was higher than the 50% exceedance elevation, by about 1 ft (0.30 m) vertically and 20-40 ft (6.1 – 12.2 m) horizontally. (Average elevation of this boundary was 11.4ft [3.47 m] NAVD88.) Possible interpretations of the wetland status and types present in the area within this boundary, but above the primary wetland boundary, are listed in "**Alternate wetland boundary**" above.

Sample locations

The wetland boundary was clear and abrupt at the site (see photos in Sub-Appendix 2), and vegetation patterns followed topographic contours closely. Given the clear topographic gradients at the site, only a few field sampling plots were needed. Sampling was conducted at seven plots at the site (Map W4; Photos 1-7, Sub-Appendix 2). Six of the seven plots were contained within two transects (TQ T1 and TQ T2). Transect 1 was placed at a location typical of the site's wetland-to-upland gradient, while Transect 2 examined an area of greater complexity.

In the vegetation descriptions below, we use the term "hydrophytic vegetation boundary" rather than "wetland boundary." This is because the tidal wetland boundary was defined by tidal wetland hydrology as described above, but hydrophytic vegetation extends somewhat farther upslope.

Across most of the east side of the site and at TQ T1, the transition from hydrophytic vegetation to non-hydrophytic vegetation was characterized by a shift from strongly dominant soft rush (*Juncus effusus*, as at TQ T1 P1) to herbaceous vegetation dominated by a mix of FAC and FACW species, typically reed canarygrass (*Phalaris arundinacea*) mixed with common velvetgrass (*Holcus lanatus*) and other FAC to FACU grasses (TQ 1 P2), plus subdominant Himalayan blackberry (*Rubus armeniacus*). In many areas, red alder (*Alnus rubra*) and Scots broom (*Cytisus scoparius*) were codominant just above the hydrophytic vegetation boundary.

At TQ T2, the transition from hydrophytic to non-hydrophytic vegetation was more complex: a narrow band of stunted FAC grasses (*Agrostis capillaris* and *Holcus lanatus*, see TQ T2 P2) and a patch of Douglas' spiraea (*Spiraea douglasii*, TQ T2 P3) intervened between the typical soft rush-dominated tidal wetlands (TQ T2 P1) and the adjacent uplands (TQ T2 P4). The band of stunted grasses is probably due to compaction during grading.

Wetland determination data sheets for the sample plots are attached in Sub-Appendix 3.

Wetland boundary and plot mapping method and accuracy

Plot mapping method

Sample plot positions and elevations were measured using RTK-GPS. The specific equipment and methods used are: Spectra Precision ProMark 220 GNSS Receiver equipped with an Ashtech ASH111661 GNSS Survey Antenna running the Spectra Precision FASTSurvey (version 4.1.11) data collector software. Measurements were differentially corrected in real time using the Oregon Realtime Correction Network (ORGN). According to FGDC Geospatial Positioning Accuracy Standards, the GPS data tested 0.016 meters horizontal accuracy and 0.051 meters vertical accuracy at 95% confidence level.

Wetland boundary mapping methods

The wetland boundary in Maps W4 and W5 was drawn using as-built survey data provided by USFS, as described above. Unfortunately, no metadata or accuracy information was provided by USFS for the as-built survey. However, data from our RTK-GPS elevation measurements at the site suggest the data from USFS were accurate. Metadata for this wetland boundary are provided in Sub-Appendix 4.

For the hydrophytic vegetation boundary (alternate wetland boundary shown in Maps W6 and W7), RTK-GPS data were collected using methods described in Sub-Appendix 4 and included with the shapefile. According to FGDC Geospatial Positioning Accuracy Standards, the GPS data tested 0.016 meters horizontal accuracy and 0.051 meters vertical accuracy at 95% confidence level.

Dates of field investigation

Wetland delineation was conducted on September 11 and September 23, 2014.

Precipitation on or prior to field investigation

Weather was sunny and dry during the field investigation.

Results and conclusions

The entire compensatory mitigation site meets jurisdictional wetland criteria. The Cowardin classification for the wetlands is predominantly irregularly-flooded estuarine emergent wetland

(E2EMP), with irregularly-flooded estuarine forested wetland along the site's west edge (E2FOP).

Disclaimer

This report documents the investigation, best professional judgment and conclusions of the investigator. It is correct and complete to the best of my knowledge. It should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and used at your own risk unless it has been reviewed and approved in writing by the Oregon Department of State Lands in accordance with OAR 141-090-0005 through 141-090-0055.

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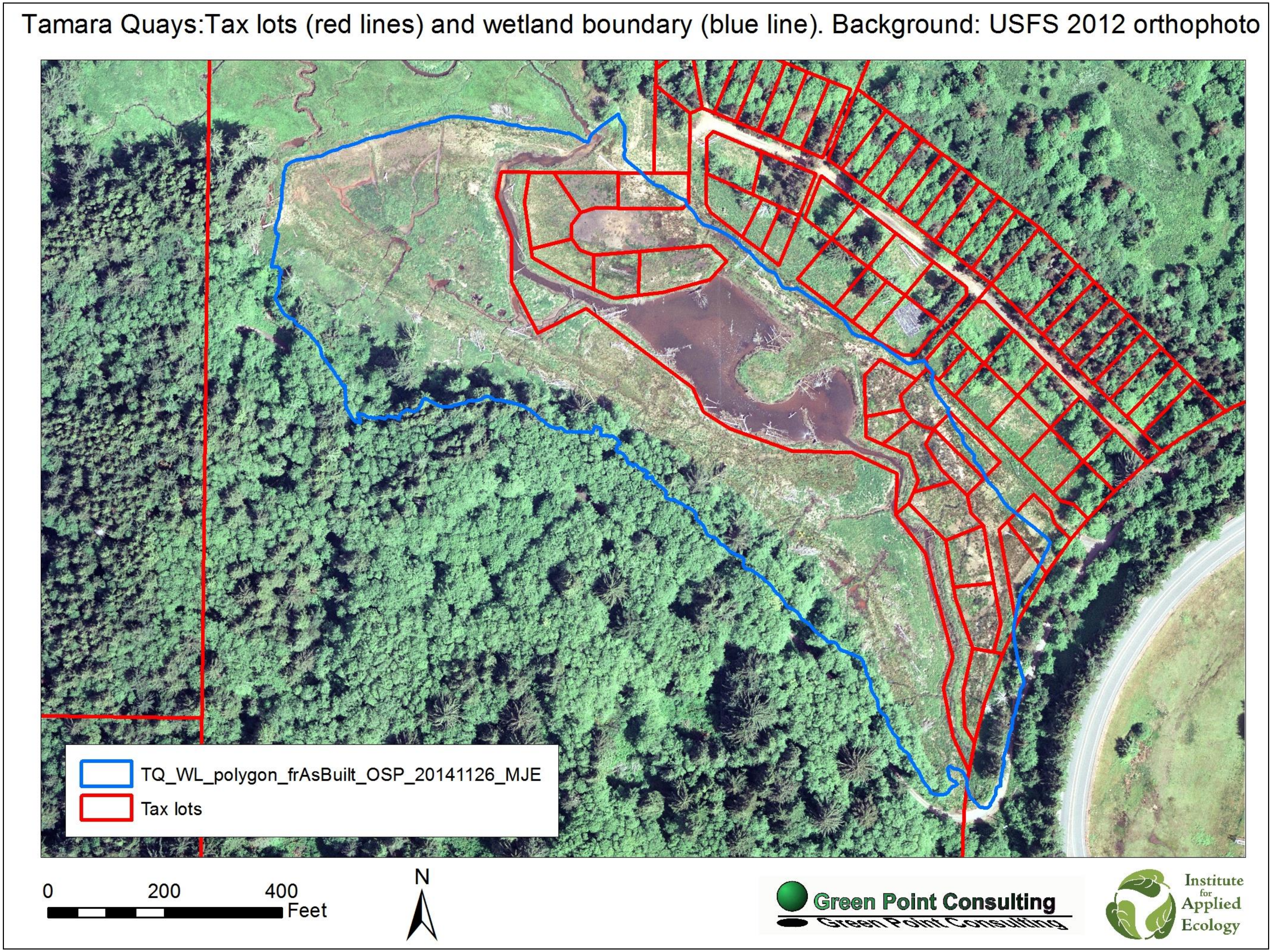
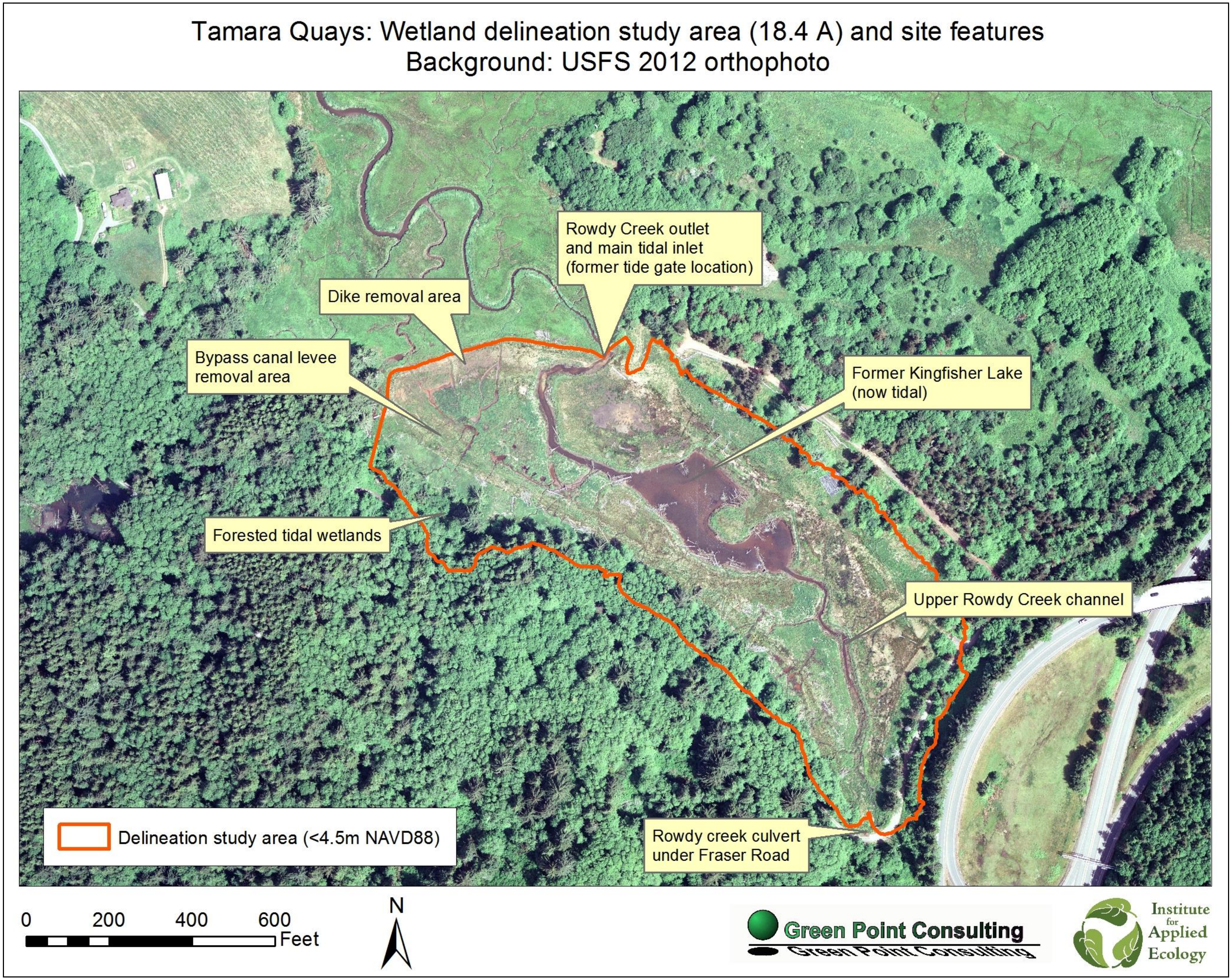
Sub-Appendix 1. Maps (see following pages)

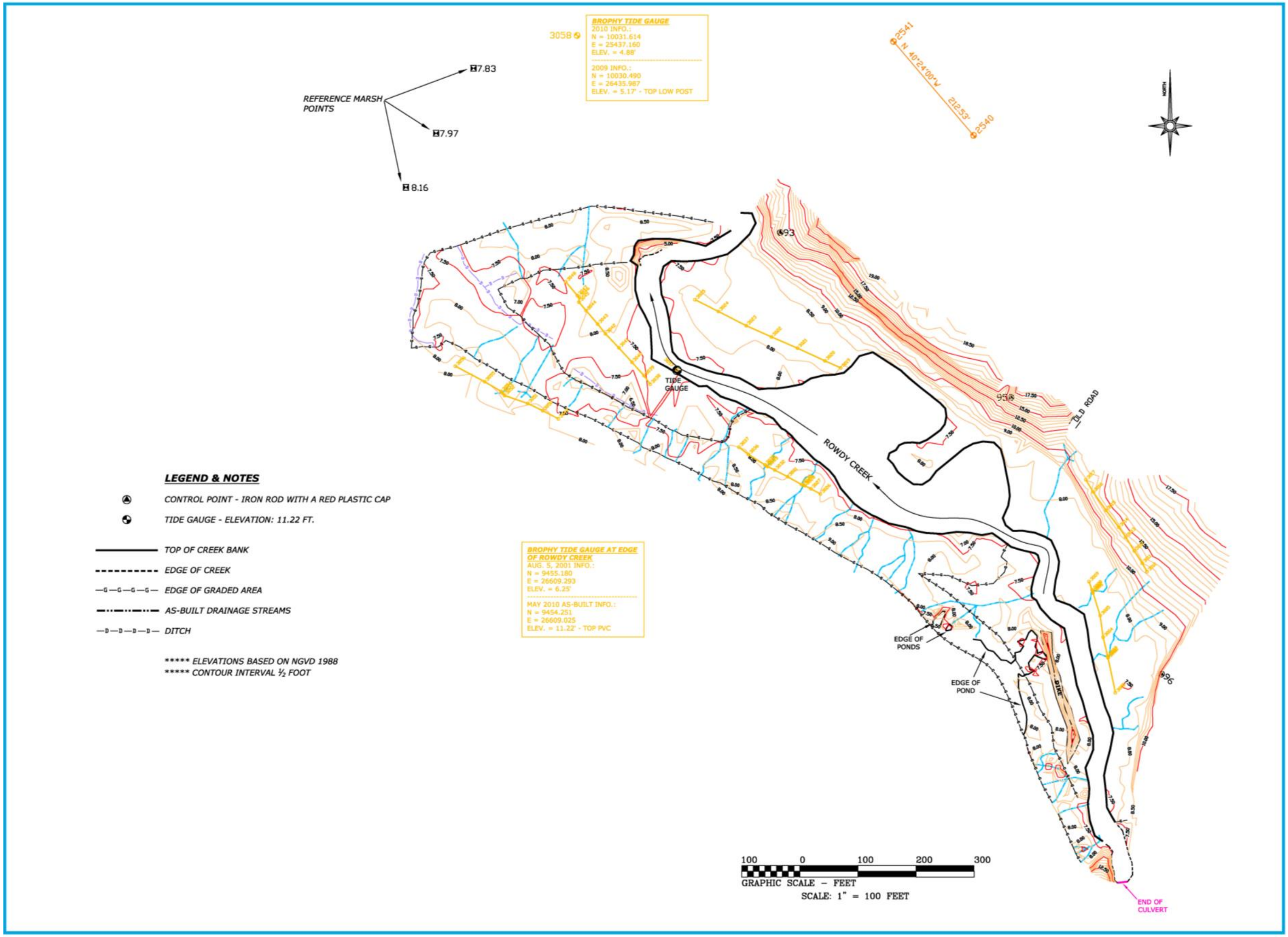
Map W1. Tax lots



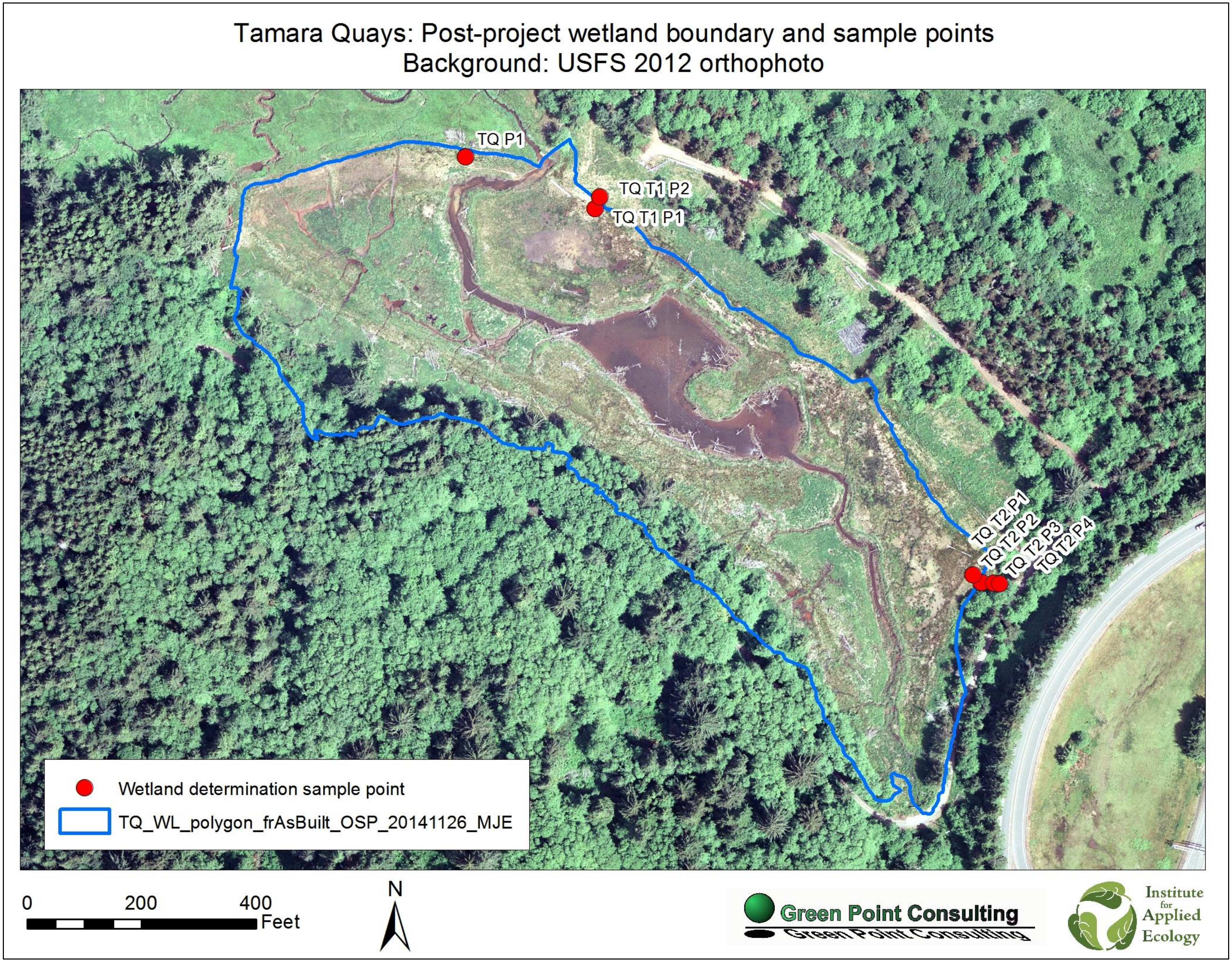
Map W2. Study area boundary and site features



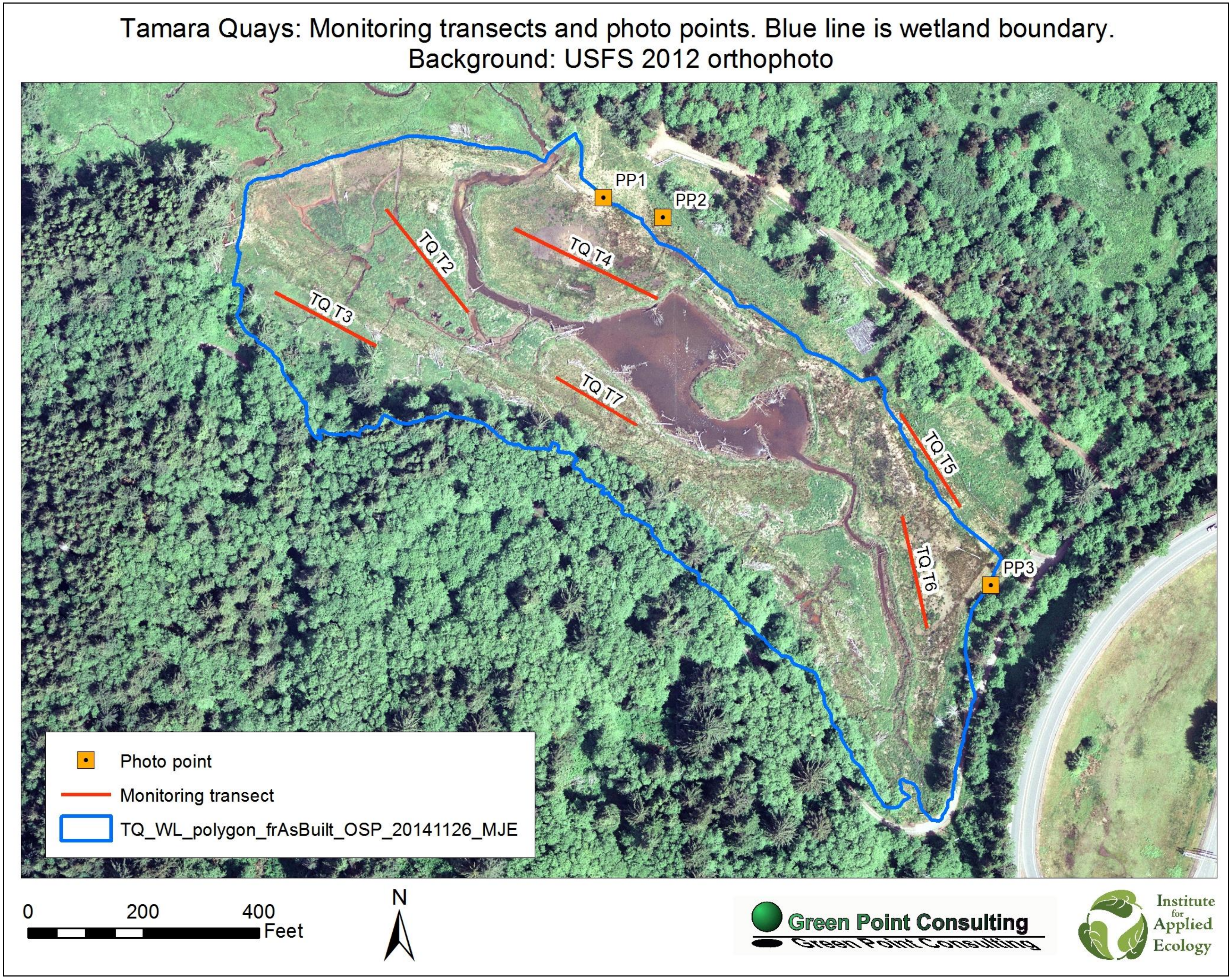
Map W3. As-built topography (provided by USFS)



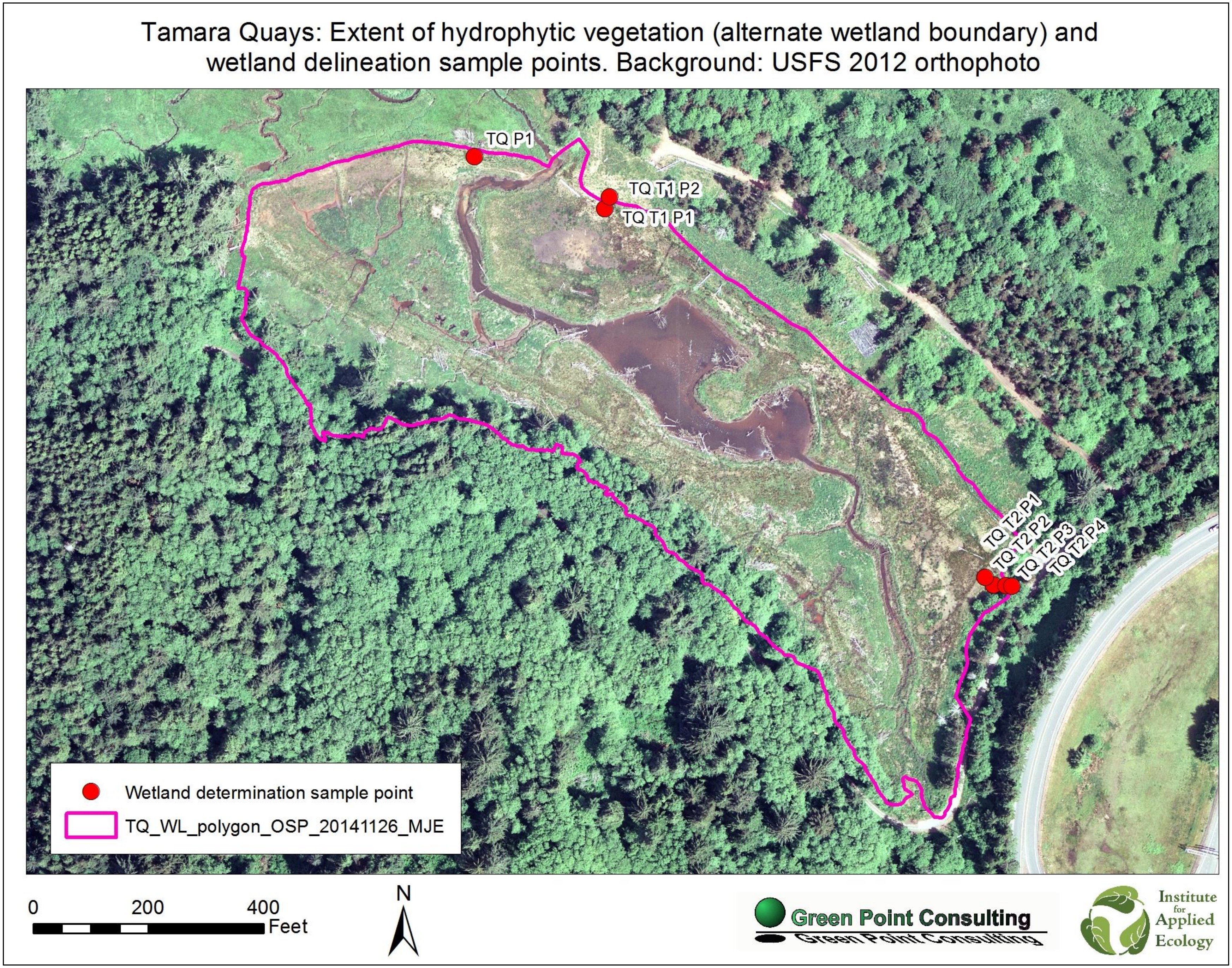
Map W4. Wetland boundary and wetland sample plots



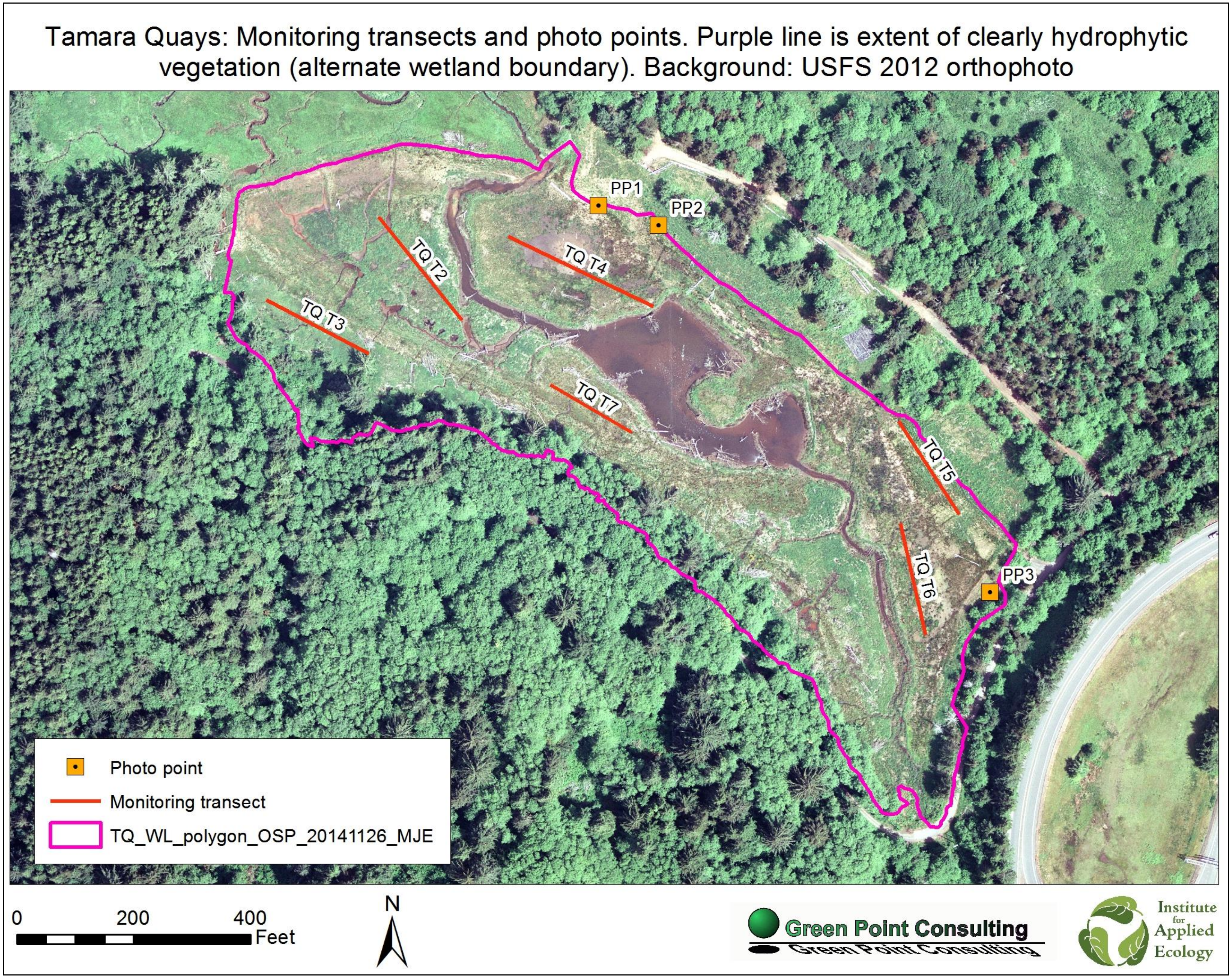
Map W5. Vegetation monitoring transects and photo points



Map W6. Extent of hydrophytic vegetation (alternate wetland boundary), and wetland determination sample points



Map W7. Extent of hydrophytic vegetation (alternate wetland boundary), with monitoring transects and photo points



Sub-Appendix 2. Photos

Photo 1. TQ P1, looking northwest towards Cascade Head, 9/11/14

Photo 2. TQ T1 P1, looking west, 9/11/14


Photo 3. TQ T1 P2, looking northwest, 9/11/14


Photo 4. TQ T2 P1, looking north, 9/23/14

Photo 5. TQ T2 P2, looking southwest, 9/23/14

Photo 6. TQ T2 P3, looking northwest, 9/23/14

Photo 7. TQ T2 P4, looking southwest, 9/23/14

Photo 8. Typical soft rush (foreground) and common cattail (background) communities in high tidal marsh at Tamara Quays, 7/1/14. Photo was taken near effectiveness monitoring transect TQ T5, looking northwest.

Photo 9. Creeping bentgrass – Baltic rush brackish tidal marsh association, ungraded area in northwest portion of Tamara Quays, 7/1/14. Photo was taken from the former dike location looking southeast towards effectiveness monitoring transect TQ T2.

Photo 10. Photo Point 1 (PP1 in Map W5), looking east-southeast towards PP2, 9/11/14

Photo 11. Photo Point 2 (PP2 in Map W5), looking SE along the hydrophytic vegetation boundary. The primary wetland boundary is downslope to the right, in dense *Juncus effusus*.

Photo 12. Photo Point 3 (PP3 in Map W5), looking east along transect TQ T2, 9/23/14. TQ T2 P1 is in the foreground. The primary wetland boundary is in the light band of grassy vegetation in the middle ground.

Sub-Appendix 3. Wetland determination datasheets (see following pages)

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Tamara Quays City/County: Lincoln Sampling Date: 9/11/14
Applicant/Owner: USFS State: OR Sampling Point: TQ P1
Investigator(s): Laura Brophy Section, Township, Range: T6S R11W Sec 25
Landform (hillslope, terrace, etc.): Tidal floodplain Local relief (concave, convex, none): slightly convex Slope (%): <1%
Subregion (LRR): LRR A Lat: 4985904.552 Long: 422806.507 Datum: NAD83, meters (UTM Zone 10N)
Soil Map Unit Name: Coquille silt loam, 0 to 1% slopes NWI classification: E2EMP
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil X, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: See Remarks in Soils and Hydrology sections

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 2m)			
1. Cytisus scoparius	1	N	NOL
2.			
3.			
4.			
5.			
= Total Cover	1		
Herb Stratum (Plot size: 2m)			
1. Juncus effusus	85	Y	FACW
2. Rubus armeniacus	18	N	FACU
3. Deschampsia cespitosa	5	N	FACW
4. Holcus lanatus	7	N	FAC
5. Potentilla anserina	1	N	OBL
6. Atriplex patula	0.5	N	FACW
7. Carex lyngbyei	0.5	N	OBL
8. Agrostis stolonifera	1	N	FAC
9.			
10.			
11.			
= Total Cover	118		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	1.5	x 1 =	1.5
FACW species	90.5	x 2 =	181
FAC species	8	x 3 =	24
FACU species	18	x 4 =	72
UPL species	1	x 5 =	5
Column Totals:	119 (A)		284 (B)

Prevalence Index = B/A = 2.39

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- x 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Plot is within the footprint of the former dike, lowered to marsh elevation during restoration. *Rubus armeniacus* cover is about 5% for the dike footprint as a whole.

SOIL

Sampling Point: TQ P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
_X_ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: Soils are disturbed by recent grading, so they were not sampled. Instead, the 2010 Supplement's Procedure 4e for Problematic Hydric Soils was used: The elevation of biennial tidal inundation (50% exceedance elevation) was determined from long-term water level monitoring at NOAA's South Beach tide station, and soils below that elevation were considered hydric. See Hydrology section (below) and the wetland delineation report for details.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
_X_ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
NOAA's Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/) analyzes long-term water level monitoring data to determine the elevation that has a 50% probability of inundation each year (the elevation of biennial inundation, or the "50% exceedance elevation"). At the nearest available NOAA station with these data, the 50% exceedance elevation is 10.44 ft NAVD88, so **all areas below 10.44 ft have wetland hydrology**.

Remarks: **Elevation of this plot is 8.5 ft NAVD88**, based on USFS as-built survey.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Tamara Quays City/County: Lincoln Sampling Date: 9/11/14
Applicant/Owner: USFS State: OR Sampling Point: TQ T1 P1
Investigator(s): Laura Brophy Section, Township, Range: T6S R11W Sec 25
Landform (hillslope, terrace, etc.): Tidal floodplain Local relief (concave, convex, none): concave Slope (%): 4%
Subregion (LRR): LRR A Lat: 4985877.100 Long: 422875.356 Datum: NAD83, meters (UTM Zone 10N)
Soil Map Unit Name: Bentilla silty clay loam, 3 to 12% slope NWI classification: E2EMP
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil X , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: See Remarks in Soils and Hydrology sections

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 2m)			
1. Juncus effusus	97	Y	FACW
2. Phalaris arundinacea	0.4	N	FACW
3. Epilobium ciliatum	0.1	N	FACW
4. Rumex occidentalis	0.5	N	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	98		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 2

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	98	x 2 =	196
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	98 (A)		196 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- x 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks:

SOIL

Sampling Point: TQ T1 P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
_X_ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks: Soils are disturbed by recent grading, so they were not sampled. Instead, the 2010 Supplement's Procedure 4e for Problematic Hydric Soils was used: The elevation of biennial tidal inundation (50% exceedance elevation) was determined from long-term water level monitoring at NOAA's South Beach tide station, and soils below that elevation were considered hydric. See Hydrology section (below) and the wetland delineation report for details.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
_X_ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes		No		Depth (inches):	
Water Table Present?	Yes		No		Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
NOAA's Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/) analyzes long-term water level monitoring data to determine the elevation that has a 50% probability of inundation each year (the elevation of biennial inundation, or the "50% exceedance elevation"). At the nearest available NOAA station with these data, the 50% exceedance elevation is 10.44 ft NAVD88, so **all areas below 10.44 ft have wetland hydrology**.

Remarks: **Elevation of this plot is 8.41 ft NAVD88**, based on RTK-GPS survey (accuracy 0.051 m = 2 in).

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Tamara Quays City/County: Lincoln Sampling Date: 9/11/14
Applicant/Owner: USFS State: OR Sampling Point: TQ T1 P2
Investigator(s): Laura Brophy Section, Township, Range: T6S R11W Sec 25
Landform (hillslope, terrace, etc.): Tidal floodplain Local relief (concave, convex, none): concave Slope (%): 4%
Subregion (LRR): LRR A Lat: 4985883.495 Long: 422877.658 Datum: NAD83, meters (UTM Zone 10N)
Soil Map Unit Name: Bentilla silty clay loam, 3 to 12% slopes NWI classification: n/a (not wetland)
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil X, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks: See Remarks in Soils and Hydrology sections

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 2m)			
1. Cytisus scoparius	0.5	N	NOL
2. Alnus rubra	0.5	N	FAC
3.			
4.			
5.			
= Total Cover	1		
Herb Stratum (Plot size: 2m)			
1. Phalaris arundinacea	50	Y	FACW
2. Holcus lanatus	31	Y	FAC
3. Agrostis capillaris	15	N	FACW
4. Hypocharis radicata	0.5	N	FACU
5. Cirsium vulgare	2	N	FACU
6. Cytisus scoparius seedlings	0.3	N	NOL
7. Lotus uliginosus	0.5	N	FAC
8. Convolvulus arvensis	0.1	N	NOL
9. Anthoxanthum odoratum	0.5	N	FACU
10. Deschampsia cespitosa	0.1	N	FACW
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	65	x 2 =	130
FAC species	32	x 3 =	96
FACU species	3	x 4 =	12
UPL species	.5	x 5 =	2.5
Column Totals:	101.5 (A)		241 (B)

Prevalence Index = B/A = 2.39

Hydrophytic Vegetation Indicators:

- [ ] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [x] 3 - Prevalence Index is ≤3.0[1]
- [ ] 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] 5 - Wetland Non-Vascular Plants[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks:

SOIL

Sampling Point: TQ T1 P2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Soils are disturbed by recent grading, so they were not sampled. Instead, the 2010 Supplement's Procedure 4e for Problematic Hydric Soils was used: The elevation of biennial tidal inundation (50% exceedance elevation) was determined from long-term water level monitoring at NOAA's South Beach tide station, and soils below that elevation were considered hydric. See Hydrology section (below) and the wetland delineation report for details. **This plot is above the 50% exceedance elevation, so soils are not considered hydric for purposes of delineating the tidal wetland.**

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes		No		Depth (inches):
Water Table Present?	Yes		No		Depth (inches):
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
NOAA's Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/) analyzes long-term water level monitoring data to determine the elevation that has a 50% probability of inundation each year (the elevation of biennial inundation, or the "50% exceedance elevation"). At the nearest available NOAA station with these data, the 50% exceedance elevation is 10.44 ft NAVD88, so **all areas below 10.44 ft have wetland hydrology**.

Remarks: **Elevation of this plot is 10.59 ft NAVD88**, based on RTK-GPS survey (accuracy 0.051 m = 2 in). Therefore, this plot does not meet the hydrology criterion for a tidal wetland, since it is above the 50% exceedance elevation.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Tamara Quays City/County: Lincoln Sampling Date: 9/23/14
Applicant/Owner: USFS State: OR Sampling Point: TQ T2 P1
Investigator(s): Laura Brophy Section, Township, Range: T6S R11W Sec 25
Landform (hillslope, terrace, etc.): Tidal floodplain Local relief (concave, convex, none): concave Slope (%): 4%
Subregion (LRR): LRR A Lat: 4985681.935 Long: 423076.288 Datum: NAD83, meters (UTM Zone 10N)
Soil Map Unit Name: Brenner silt loam, 0 to 2% slope NWI classification: E2EMP
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil X , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: See Remarks in Soils and Hydrology sections

VEGETATION – Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 2m)			
1. Alnus rubra sapling	5	N	FAC
2.			
3.			
4.			
5.			
= Total Cover	5		
Herb Stratum (Plot size: 2m)			
1. Juncus effusus	81	Y	FACW
2. Lotus uliginosus	15	N	FAC
3. Phalaris arundinacea	2	N	FACW
4. Holcus lanatus	1	N	FAC
5. Persicaria maculosa	1	N	FACW
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	84	x 2 =	168
FAC species	21	x 3 =	63
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	105 (A)		231 (B)

Prevalence Index = B/A = 2.20

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- x 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Small plot sizes due to topographic gradient

SOIL

Sampling Point: TQ T2 P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks: Soils are disturbed by recent grading, so they were not sampled. Instead, the 2010 Supplement's Procedure 4e for Problematic Hydric Soils was used: The elevation of biennial tidal inundation (50% exceedance elevation) was determined from long-term water level monitoring at NOAA's South Beach tide station, and soils below that elevation were considered hydric. See Hydrology section (below) and the wetland delineation report for details.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	No		Depth (inches):	
Water Table Present?	Yes	No		Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes	No		Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
NOAA's Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/) analyzes long-term water level monitoring data to determine the elevation that has a 50% probability of inundation each year (the elevation of biennial inundation, or the "50% exceedance elevation"). At the nearest available NOAA station with these data, the 50% exceedance elevation is 10.44 ft NAVD88, so **all areas below 10.44 ft have wetland hydrology**.

Remarks: **Elevation of this plot is 9.09 ft NAVD88**, based on RTK-GPS survey (accuracy 0.051 m = 2 in).

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Tamara Quays City/County: Lincoln Sampling Date: 9/23/14
Applicant/Owner: USFS State: OR Sampling Point: TQ T2 P2
Investigator(s): Laura Brophy Section, Township, Range: T6S R11W Sec 25
Landform (hillslope, terrace, etc.): Tidal floodplain Local relief (concave, convex, none): concave Slope (%): 4%
Subregion (LRR): LRR A Lat: 4985678.064 Long: 423080.809 Datum: NAD83, meters (UTM Zone 10N)
Soil Map Unit Name: Brenner silt loam, 0 to 2% slopes NWI classification: n/a (not wetland)
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil X, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks: See Remarks in Soils and Hydrology sections

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 2m)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 2m)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 2m)			
1. Agrostis capillaris	50	Y	FAC
2. Holcus lanatus	30	Y	FAC
3. Anthoxanthum odoratum	10	N	FACU
4. Juncus effusus	5	N	FACW
5. Hypochaeris radicata	1	N	FACU
6. Plantago lanceolata	1	N	FACU
7. Lotus uliginosus	1	N	FAC
8. Deschampsia cespitosa	2	N	FACW
9. Spiraea douglasii seedling	0.5	N	FACW
Salix hookeriana seedling	0.5	N	FACW
11.			
= Total Cover	101		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	8	x 2 =	16
FAC species	81	x 3 =	243
FACU species	12	x 4 =	48
UPL species		x 5 =	
Column Totals:	101	(A)	(B)

Prevalence Index = B/A = 3.04

Hydrophytic Vegetation Indicators:

- [ ] 1 - Rapid Test for Hydrophytic Vegetation
- [x] 2 - Dominance Test is >50%
- [ ] 3 - Prevalence Index is ≤3.0[1]
- [ ] 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] 5 - Wetland Non-Vascular Plants[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Small plot sizes due to topographic gradient.

SOIL

Sampling Point: TQ T2 P2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Soils are disturbed by recent grading, so they were not sampled. Instead, the 2010 Supplement's Procedure 4e for Problematic Hydric Soils was used: The elevation of biennial tidal inundation (50% exceedance elevation) was determined from long-term water level monitoring at NOAA's South Beach tide station, and soils below that elevation were considered hydric. See Hydrology section (below) and the wetland delineation report for details. **This plot is above the 50% exceedance elevation, so soils are not considered hydric for purposes of delineating the tidal wetland.**

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______
Water Table Present? Yes ___ No ___ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ______

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
NOAA's Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/) analyzes long-term water level monitoring data to determine the elevation that has a 50% probability of inundation each year (the elevation of biennial inundation, or the "50% exceedance elevation"). At the nearest available NOAA station with these data, the 50% exceedance elevation is 10.43 ft NAVD88, so **all areas below 10.43 ft have wetland hydrology**.

Remarks: **Elevation of this plot is 10.81 ft NAVD88,** based on our RTK-GPS survey (accuracy 0.051 m = 2 in). Therefore, this plot does not meet the hydrology criterion for a tidal wetland, since it is above the 50% exceedance elevation.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Tamara Quays City/County: Lincoln Sampling Date: 9/23/14

Applicant/Owner: USFS State: OR Sampling Point: TQ T2 P3

Investigator(s): Laura Brophy Section, Township, Range: T6S R11W Sec 25

Landform (hillslope, terrace, etc.): Tidal floodplain Local relief (concave, convex, none): concave Slope (%): 4%

Subregion (LRR): LRR A Lat: 4985677.493 Long: 423087.220 Datum: NAD83, meters (UTM Zone 10N)

Soil Map Unit Name: Brenner silt loam, 0 to 2% slopes NWI classification: n/a (not wetland)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___ , Soil X , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks: See Remarks in Soils and Hydrology sections

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 2m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 2m)			
1. Spiraea douglasii	85	Y	FACW
2.			
3.			
4.			
5.			
= Total Cover	85		
Herb Stratum (Plot size: 2m)			
1. Rubus ursinus	10	N	FACU
2. Holcus lanatus	2	N	FAC
3. Festuca rubra	1	N	FAC
4. Symphyotrichum subspicatum	1	N	FACW
5. Anthoxanthum odoratum	1	N	FACU
6.			
7.			
8.			
9.			
11.			
= Total Cover	15		
Woody Vine Stratum (Plot size:)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 85

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	86	x 2 =	172
FAC species	3	x 3 =	9
FACU species	11	x 4 =	44
UPL species		x 5 =	
Column Totals:	100 (A)		225 (B)

Prevalence Index = B/A = 2.25

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- x 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Small plot sizes due to topographic gradient.

SOIL

Sampling Point: TQ T2 P3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: ____
Depth (inches): ____

Hydric Soil Present? **Yes** ____ **No** X

Remarks: Soils are disturbed by recent grading, so they were not sampled. Instead, the 2010 Supplement's Procedure 4e for Problematic Hydric Soils was used: The elevation of biennial tidal inundation (50% exceedance elevation) was determined from long-term water level monitoring at NOAA's South Beach tide station, and soils below that elevation were considered hydric. See Hydrology section (below) and the wetland delineation report for details. **This plot is above the 50% exceedance elevation, so soils are not considered hydric for purposes of delineating the tidal wetland.**

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:
Surface Water Present? Yes ___ No ___ Depth (inches): ____
Water Table Present? Yes ___ No ___ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
NOAA's Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/) analyzes long-term water level monitoring data to determine the elevation that has a 50% probability of inundation each year (the elevation of biennial inundation, or the "50% exceedance elevation"). At the nearest available NOAA station with these data, the 50% exceedance elevation is 10.43 ft NAVD88, so **all areas below 10.43 ft have wetland hydrology**.

Remarks: **Elevation of this plot is estimated at 11.0 ft NAVD88 and is definitely above the 10.43 ft 50% exceedance elevation**, based on the USFS as-built survey and nearby RTK-GPS survey. Therefore, this plot does not meet the hydrology criterion for a tidal wetland, since it is above the 50% exceedance elevation.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Tamara Quays | City/County: Lincoln | Sampling Date: 9/23/14
Applicant/Owner: USFS | State: OR | Sampling Point: TQ T2 P4
Investigator(s): Laura Brophy | Section, Township, Range: T6S R11W Sec 25
Landform (hillslope, terrace, etc.): Tidal floodplain | Local relief (concave, convex, none): concave | Slope (%): 4%
Subregion (LRR): LRR A | Lat: 4985677.196 | Long: 423090.490 | Datum: NAD83, meters (UTM Zone 10N)
Soil Map Unit Name: Brenner silt loam, 0 to 2% slopes | NWI classification: n/a (not wetland)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil X, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks: See Remarks in Soils and Hydrology sections

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	45	Y	FAC
2.			
3.			
4.			
= Total Cover	45		

Sapling/Shrub Stratum (Plot size: 1m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

Herb Stratum (Plot size: 1m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus armeniacus	30	Y	FACU
2. Holcus lanatus	25	Y	FAC
3. Fragaria chiloensis	10	N	FACU
4. Symphyotrichum subspicatum	12	N	FACW
5. Plantago lanceolata	5	N	FACU
6. Agrostis capillaris	5	N	FAC
7. Lotus uliginosus	2	N	FAC
8. Digitalis purpurea	2	N	FACU
9. Anthoxanthum odoratum	10	N	FACU
10. Rubus ursinus	5	N	FACU
11.			
= Total Cover	106		

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	12	x 2 =	24
FAC species	77	x 3 =	231
FACU species	62	x 4 =	248
UPL species		x 5 =	
Column Totals:	151 (A)		503 (B)

Prevalence Index = B/A = 3.33

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Small herbaceous and shrub plot sizes due to topographic gradient.

SOIL

Sampling Point: TQ T2 P4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):
Type: ____________
Depth (inches): ____________

Hydric Soil Present? **Yes** ____ **No** X

Remarks: Soils are disturbed by recent grading, so they were not sampled. Instead, the 2010 Supplement's Procedure 4e for Problematic Hydric Soils was used: The elevation of biennial tidal inundation (50% exceedance elevation) was determined from long-term water level monitoring at NOAA's South Beach tide station, and soils below that elevation were considered hydric. See Hydrology section (below) and the wetland delineation report for details. **This plot is above the 50% exceedance elevation, so soils are not considered hydric for purposes of delineating the tidal wetland.**

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ________
Water Table Present? Yes ___ No ___ Depth (inches): ________
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ________

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
NOAA's Extreme Water Level website (http://tidesandcurrents.noaa.gov/est/) analyzes long-term water level monitoring data to determine the elevation that has a 50% probability of inundation each year (the elevation of biennial inundation, or the "50% exceedance elevation"). At the nearest available NOAA station with these data, the 50% exceedance elevation is 10.43 ft NAVD88, so **all areas below 10.43 ft have wetland hydrology**.

Remarks: **Elevation of this plot is estimated at 11.6 ft NAVD88 and is definitely above the 10.43 ft 50% exceedance elevation**, based on the USFS as-built survey and nearby RTK-GPS survey. Therefore, this plot does not meet the hydrology criterion for a tidal wetland, since it is above the 50% exceedance elevation.

Sub-Appendix 4. Shapefile metadata (see following pages)

TQ_WL_polygon_OSP_20141201_LSB

Shapefile

Thumbnail Not Available

Tags

Tamara Quays, Tidal wetland restoration, planningCadastre, Estuary, inlandWaters, Oregon, Salmon River Estuary, boundaries, Wetland boundary, environment, oceans

Summary

This layer represents the wetland boundary at the Tamara Quays Wetland Restoration in the Salmon River Estuary, Oregon. Areas within the boundary meet the three jurisdictional wetland criteria (hydrology, soils, vegetation).

Description

This layer represents the wetland boundary at the Tamara Quays Wetland Restoration in the Salmon River Estuary, Oregon. Areas within the boundary meet the three jurisdictional wetland criteria (hydrology, soils, vegetation).

Credits

Estuary Technical Group Institute for Applied Ecology Corvallis, Oregon

Use limitations

There are no access and use limitations for this item.

Extent

West	-123.981425	**East**	-123.976152
North	45.022577	**South**	45.019132

Scale Range

Maximum (zoomed in)	1:5,000
Minimum (zoomed out)	1:150,000,000

ArcGIS Metadata ►

Topics and Keywords ►

THEMES OR CATEGORIES OF THE RESOURCE inlandWaters, environment, planningCadastre, boundaries, oceans

* CONTENT TYPE Downloadable Data
EXPORT TO FGDC CSDGM XML FORMAT AS RESOURCE DESCRIPTION No

THEME KEYWORDS Tamara Quays, Tidal wetland restoration, Estuary, Oregon, Salmon River Estuary, Wetland boundary

THEME KEYWORDS oceans, planningCadastre, inlandWaters, boundaries, environment

THESAURUS ▶
TITLE ISO 19115 Topic Categories

Hide Thesaurus ▲

Hide Topics and Keywords ▲

Citation ▶

TITLE TQ_WL_polygon_OSP_20141201_LSB
PUBLICATION DATE 2014-11-26 00:00:00

PRESENTATION FORMATS digital map
FGDC GEOSPATIAL PRESENTATION FORMAT vector digital data

Hide Citation ▲

Citation Contacts ▶

RESPONSIBLE PARTY
ORGANIZATION'S NAME Michael Ewald, Estuary Technical Group, Institute for Applied Ecology, Geospatial Analyst
CONTACT'S ROLE originator

RESPONSIBLE PARTY
INDIVIDUAL'S NAME Laura Brophy
ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology
CONTACT'S POSITION Director
CONTACT'S ROLE principal investigator

CONTACT INFORMATION ▶
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CITY Corvallis
ADMINISTRATIVE AREA Oregon
POSTAL CODE 97339
E-MAIL ADDRESS brophyonline@gmail.com

Hide Contact information ▲

Hide Citation Contacts ▲

Resource Details ▶

DATASET LANGUAGES English (UNITED STATES)
DATASET CHARACTER SET utf8 - 8 bit UCS Transfer Format

STATUS completed
SPATIAL REPRESENTATION TYPE vector

PROCESSING ENVIRONMENT Version 6.2 (Build 9200) ; Esri ArcGIS 10.2.1.3497

CREDITS
Estuary Technical Group Institute for Applied Ecology Corvallis, Oregon

ARCGIS ITEM PROPERTIES
* NAME TQ_WL_polygon_OSP_20141201_LSB
* SIZE 0.086
* LOCATION file://\\DELL-14Z\Users\Laura Brophy\Documents\GIS_current\GPC_projects\TamaraQuays\wetland-delin\Actual_post-project\wl_delin_sep14\TQ_WL_polygon_OSP_20141201_LSB.shp
  * ACCESS PROTOCOL Local Area Network

Hide Resource Details ▲

Extents ►

EXTENT
GEOGRAPHIC EXTENT
BOUNDING RECTANGLE
WEST LONGITUDE -123.981425
EAST LONGITUDE -123.976044
SOUTH LATITUDE 45.019132
NORTH LATITUDE 45.02258

VERTICAL EXTENT
* MINIMUM VALUE 0.000000
* MAXIMUM VALUE 3.199800

EXTENT
DESCRIPTION
The wetland delineation and data collection were done on September 23, 2014

TEMPORAL EXTENT
DATE AND TIME 2014-09-23

VERTICAL EXTENT
* MINIMUM VALUE 0.000000
* MAXIMUM VALUE 3.199800

EXTENT
GEOGRAPHIC EXTENT
BOUNDING RECTANGLE
EXTENT TYPE Extent used for searching
* WEST LONGITUDE -123.981425
* EAST LONGITUDE -123.976152
* NORTH LATITUDE 45.022577
* SOUTH LATITUDE 45.019132
* EXTENT CONTAINS THE RESOURCE Yes

VERTICAL EXTENT
* MINIMUM VALUE 0.000000
* MAXIMUM VALUE 3.199800

Extent in the item's coordinate system
* West longitude 412501.299312
* East longitude 413814.944552
* South latitude 1210697.584716
* North latitude 1211898.888777
* Extent contains the resource Yes

Hide Extents ▲

Resource Points of Contact ►

Point of contact
Individual's name Laura Brophy
Organization's name Estuary Technical Group, Institute for Applied Ecology
Contact's position Director
Contact's role point of contact

Contact information ►
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Voice 541-752-7671

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E-mail address brophyonline@gmail.com

Hide Contact information ▲

Hide Resource Points of Contact ▲

Resource Maintenance ►

Resource maintenance
Update frequency not planned

Hide Resource Maintenance ▲

Spatial Reference ►

ArcGIS coordinate system
* Type Projected
* Geographic coordinate reference GCS_North_American_1983
* Projection NAD_1983_Oregon_Statewide_Lambert_Feet_Intl
* Coordinate reference details
Projected coordinate system
Well-known identifier 2992
X origin -118489100
Y origin -97381100
XY scale 37592196.316242374
Z origin -1072.1419234999989
Z scale 4194304001953.124
M origin -100000
M scale 10000

XY TOLERANCE 0.0032808398950131233
Z TOLERANCE 0.001
M TOLERANCE 0.001
HIGH PRECISION true
LATEST WELL-KNOWN IDENTIFIER 2992
WELL-KNOWN TEXT PROJCS["NAD_1983_Oregon_Statewide_Lambert_Feet_Intl",GEOGCS ["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID ["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT ["Degree",0.0174532925199433]],PROJECTION["Lambert_Conformal_Conic"],PARAMETER ["False_Easting",1312335.958005249],PARAMETER["False_Northing",0.0],PARAMETER ["Central_Meridian",-120.5],PARAMETER["Standard_Parallel_1",43.0],PARAMETER ["Standard_Parallel_2",45.5],PARAMETER["Latitude_Of_Origin",41.75],UNIT ["Foot",0.3048],AUTHORITY["EPSG",2992]]

REFERENCE SYSTEM IDENTIFIER
* VALUE 2992
* CODESPACE EPSG
* VERSION 8.1.1

Hide Spatial Reference ▲

Spatial Data Properties ►

VECTOR ►
* LEVEL OF TOPOLOGY FOR THIS DATASET geometry only

GEOMETRIC OBJECTS
FEATURE CLASS NAME TQ_WL_polygon_OSP_20141201_LSB
* OBJECT TYPE composite
* OBJECT COUNT 1

Hide Vector ▲

ARCGIS FEATURE CLASS PROPERTIES ►
FEATURE CLASS NAME TQ_WL_polygon_OSP_20141201_LSB
* FEATURE TYPE Simple
* GEOMETRY TYPE Polygon
* HAS TOPOLOGY FALSE
* FEATURE COUNT 1
* SPATIAL INDEX TRUE
* LINEAR REFERENCING TRUE

Hide ArcGIS Feature Class Properties ▲

Hide Spatial Data Properties ▲

Data Quality ►

SCOPE OF QUALITY INFORMATION ►
RESOURCE LEVEL dataset

Hide Scope of quality information ▲

Hide Data Quality ▲

Lineage ►

LINEAGE STATEMENT

Geoprocessing was conducted by Laura Brophy and Michael Ewald of the Estuary Technical Group (ETG) - Institute for Applied Ecology.

PROCESS STEP ►

WHEN THE PROCESS OCCURRED 2014-11-26 00:00:00

DESCRIPTION

A USFS as-built survey was provided to ETG in CAD format by Barb Ellis-Sugai, USFS hydrologist, and was georeferenced by ETG using the "warp" polynomial transformation tool in ArcGIS 10.2. To georeference the CAD layer, we matched landmark points in the CAD layer (particularly the Rowdy Creek channel and its banks) to the same landmarks in the 2008 USFS orthophoto. We verified that these landmarks also matched the same landmarks in the 2005 NAIP imagery (to ensure the USFS orthophoto was properly registered with NAIP).

PROCESS CONTACT

INDIVIDUAL'S NAME Laura Brophy

ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology

CONTACT'S POSITION Director

CONTACT'S ROLE processor

CONTACT INFORMATION ►

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ADMINISTRATIVE AREA Oregon

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E-MAIL ADDRESS brophyonline@gmail.com

Hide Contact information ▲

Hide Process step ▲

PROCESS STEP ►

WHEN THE PROCESS OCCURRED 2014-11-26 00:00:00

DESCRIPTION

The west boundary of the wetland polygon (along the steep hillslope base) remained the same as in the pre-restoration delineation. The west boundary is located at a sharp topographic break to upland forest (as described in the pre-restoration delineation report), and the boundary was not altered by the restoration. The north boundary of the wetland was extended to include the former dike area, which was lowered to marsh elevation during restoration. The north boundary was established at an elevation of 3.25 m NAVD88 (10.7 ft NAVD88) using the USFS quarter-meter contour dataset based on 2007 LIDAR data. This elevation represents the extent of tidal wetland hydrology, as described in the report (the 3.25 m contour is the closest available contour to the average biennial inundation level of 3.18 m NAVD88 at NOAA's South Beach tide station).

The east and south sides of the polygon were generally created from the 10.5 ft

(NAVD88) contour obtained from the USFS as-built survey. This boundary represents the extent of tidal wetland hydrology based on the 1987 Corps delineation manual, pp 43-44; Part IV, Section B, step 8(i)(1). The 10.5 ft (NAVD88) contour is the closest available contour to the elevation of biennial inundation (the 50% exceedance elevation), determined from NOAA's Extreme Water Levels analysis at the nearest NOAA tide station for which this analysis is published online (South Beach #9435380). The 50% exceedance elevation at the South Beach station is 10.44 ft (3.18 m) NAVD88 (http://tidesandcurrents.noaa.gov/est/est_station.shtml?stnid=9435380).

Where the boundary between hydrophytic and non-hydrophytic vegetation fell below the 10.5 ft (NAVD88) contour, the wetland boundary followed the hydrophytic vegetation boundary (since the area within the boundary must meet vegetation, soils, and hydrology criteria for jurisdictional wetland status).

For details, see the wetland delineation report (Appendix to the 2014 Effectiveness Monitoring Report).

PROCESS CONTACT
INDIVIDUAL'S NAME Michael Ewald
ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology
CONTACT'S POSITION Geospatial Analyst
CONTACT'S ROLE processor

CONTACT INFORMATION ►
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E-MAIL ADDRESS michael@appliedeco.org

Hide Contact information ▲

Hide Process step ▲

PROCESS STEP ►
WHEN THE PROCESS OCCURRED 2014-11-26 00:00:00
DESCRIPTION
The lines established above were joined to create a wetland polygon (shapefile name: TQ_WL_polygon_frAsBuilt_OSP_20141125_LSB.shp).

Hide Process step ▲

Hide Lineage ▲

Distribution ►

DISTRIBUTION FORMAT
* NAME Shapefile

TRANSFER OPTIONS
* TRANSFER SIZE 0.086

Hide Distribution ▲

Fields ►

DETAILS FOR OBJECT TQ_WL_polygon_OSP_20141201_LSB ►
* TYPE Feature Class
* ROW COUNT 1

FIELD FID ►
* ALIAS FID
* DATA TYPE OID
* WIDTH 4
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
  Internal feature number.

* DESCRIPTION SOURCE
  Esri

* DESCRIPTION OF VALUES
  Sequential unique whole numbers that are automatically generated.

Hide Field FID ▲

FIELD Shape ►
* ALIAS Shape
* DATA TYPE Geometry
* WIDTH 0
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
  Feature geometry.

* DESCRIPTION SOURCE
  Esri

* DESCRIPTION OF VALUES
  Coordinates defining the features.

Hide Field Shape ▲

FIELD acres ►
* ALIAS acres
* DATA TYPE Double
* WIDTH 19

* PRECISION 0
* SCALE 0

Hide Field acres ▲

FIELD perim_ft ►
* ALIAS perim_ft
* DATA TYPE Double
* WIDTH 19
* PRECISION 0
* SCALE 0

Hide Field perim_ft ▲

FIELD perim_m ►
* ALIAS perim_m
* DATA TYPE Double
* WIDTH 19
* PRECISION 0
* SCALE 0

Hide Field perim_m ▲

FIELD hectares ►
* ALIAS hectares
* DATA TYPE Double
* WIDTH 19
* PRECISION 0
* SCALE 0

Hide Field hectares ▲

Hide Details for object TQ_WL_polygon_OSP_20141201_LSB ▲

Hide Fields ▲

Metadata Details ►

METADATA LANGUAGE English (UNITED STATES)
METADATA CHARACTER SET utf8 - 8 bit UCS Transfer Format

SCOPE OF THE DATA DESCRIBED BY THE METADATA dataset
SCOPE NAME * dataset

LAST UPDATE 2014-11-26

ARCGIS METADATA PROPERTIES
METADATA FORMAT ArcGIS 1.0
METADATA STYLE FGDC CSDGM Metadata
STANDARD OR PROFILE USED TO EDIT METADATA FGDC

CREATED IN ARCGIS FOR THE ITEM 2014-11-25 17:54:58
LAST MODIFIED IN ARCGIS FOR THE ITEM 2014-12-01 10:39:23

AUTOMATIC UPDATES
HAVE BEEN PERFORMED Yes
LAST UPDATE 2014-12-01 10:30:51

Hide Metadata Details ▲

Metadata Contacts ►

METADATA CONTACT
INDIVIDUAL'S NAME Laura Brophy
ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology
CONTACT'S POSITION Director
CONTACT'S ROLE point of contact

CONTACT INFORMATION ►
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CITY Corvallis
ADMINISTRATIVE AREA Oregon
POSTAL CODE 97339
E-MAIL ADDRESS brophyonline@gmail.com

Hide Contact information ▲

Hide Metadata Contacts ▲

Metadata Maintenance ►

MAINTENANCE
UPDATE FREQUENCY not planned

Hide Metadata Maintenance ▲

FGDC Metadata (read-only) ▼

TQ_hydrophytic_veg_polygon_OSP_20141130_LSB

Shapefile

Thumbnail Not Available

Tags

Hydrophytic vegetation, Tidal wetland restoration, Tamara Quays, Salmon River Estuary, Estuary, Oregon

Summary

This layer represents the upper extent of hydrophytic vegetation at the Tamara Quays Wetland Restoration in the Salmon River Estuary, Oregon.

Description

This layer represents the upper extent of hydrophytic vegetation at the Tamara Quays Wetland Restoration in the Salmon River Estuary, Oregon. GPS data collection and subsequent geoprocessing were conducted by Laura Brophy and Michael Ewald of the Estuary Technical Group (ETG) - Institute for Applied Ecology. GPS data was collected using dual-frequency real-time kinematic (RTK) GPS/GNSS receivers and techniques, and meets the accuracy requirements of OAR 141-090-0035(11). The data was collected on September 23, 2014 at the Tamara Quays Wetland Restoration Project in the Salmon River Estuary, Oregon.

Credits

Estuary Technical Group
Institute for Applied Ecology
Corvallis, Oregon

Use limitations

There are no access and use limitations for this item.

Extent

West	-123.981425	**East**	-123.976044
North	45.022580	**South**	45.019132

Scale Range

Maximum (zoomed in)	1:5,000
Minimum (zoomed out)	1:150,000,000

ArcGIS Metadata ►

Topics and Keywords ►

THEMES OR CATEGORIES OF THE RESOURCE boundaries, environment, inlandWaters, oceans, planningCadastre

* CONTENT TYPE Downloadable Data
EXPORT TO FGDC CSDGM XML FORMAT AS RESOURCE DESCRIPTION No

Hide Topics and Keywords ▲

Citation ▶

TITLE TQ_hydrophytic_veg_polygon_OSP_20141130_LSB
CREATION DATE 2014-11-26 00:00:00
PUBLICATION DATE 2014-11-26 00:00:00
REVISION DATE 2014-11-26 00:00:00

PRESENTATION FORMATS * digital map

Hide Citation ▲

Citation Contacts ▶

RESPONSIBLE PARTY
INDIVIDUAL'S NAME Laura Brophy
ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology
CONTACT'S POSITION Director
CONTACT'S ROLE principal investigator

CONTACT INFORMATION ▶
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RESPONSIBLE PARTY
INDIVIDUAL'S NAME Michael Ewald
ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology
CONTACT'S POSITION Geospatial Analyst
CONTACT'S ROLE originator

CONTACT INFORMATION ▶
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VOICE 541-752-7671

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CITY Corvallis
ADMINISTRATIVE AREA Oregon
POSTAL CODE 97339

E-MAIL ADDRESS michael@appliedeco.org

Hide Contact information ▲

Hide Citation Contacts ▲

Resource Details ►

DATASET LANGUAGES * English (UNITED STATES)
DATASET CHARACTER SET utf8 - 8 bit UCS Transfer Format

STATUS completed
SPATIAL REPRESENTATION TYPE * vector

* PROCESSING ENVIRONMENT Microsoft Windows 7 Version 6.1 (Build 7601) Service Pack 1; Esri ArcGIS 10.2.0.3348

CREDITS
Estuary Technical Group
Institute for Applied Ecology
Corvallis, Oregon

ARCGIS ITEM PROPERTIES
* NAME TQ_hydrophytic_veg_polygon_OSP_20141130_LSB
* SIZE 0.081
* LOCATION file://\\DELL-14Z\Users\Laura Brophy\Documents\GIS_current\GPC_projects\TamaraQuays\wetland-delin\Actual_post-project\wl_delin_sep14\TQ_hydrophytic_veg_polygon_OSP_20141130_LSB.shp
* ACCESS PROTOCOL Local Area Network

Hide Resource Details ▲

Extents ►

EXTENT
DESCRIPTION
Data was collected on September 23, 2014.

GEOGRAPHIC EXTENT
BOUNDING RECTANGLE
EXTENT TYPE Extent used for searching
* WEST LONGITUDE -123.981425
* EAST LONGITUDE -123.976044
* NORTH LATITUDE 45.022580
* SOUTH LATITUDE 45.019132
* EXTENT CONTAINS THE RESOURCE Yes

TEMPORAL EXTENT
DATE AND TIME 2014-09-23 00:00:00

VERTICAL EXTENT
* MINIMUM VALUE 0.000000
* MAXIMUM VALUE 4.150600

EXTENT IN THE ITEM'S COORDINATE SYSTEM
* WEST LONGITUDE 412501.299312

* East longitude 413842.786664
* South latitude 1210697.584716
* North latitude 1211898.888777
* Extent contains the resource Yes

Hide Extents ▲

Resource Points of Contact ►

Point of contact
Individual's name Laura Brophy
Organization's name Estuary Technical Group, Institute for Applied Ecology
Contact's position Director
Contact's role principal investigator

Contact information ►
Phone
Voice 541-752-7671

Address
Type postal
Delivery point P.O. Box 2855
City Corvallis
Administrative area Oregon
Postal code 97339
E-mail address brophyonline@gmail.com

Hide Contact information ▲

Hide Resource Points of Contact ▲

Resource Maintenance ►

Resource maintenance
Update frequency not planned

Hide Resource Maintenance ▲

Spatial Reference ►

ArcGIS coordinate system
* Type Projected
* Geographic coordinate reference GCS_North_American_1983
* Projection NAD_1983_Oregon_Statewide_Lambert_Feet_Intl
* Coordinate reference details

Projected coordinate system
Well-known identifier 2992
X origin -118489100
Y origin -97381100
XY scale 37592196.316242374
Z origin -1071.6665235000032
Z scale 4194304001953.124
M origin -100000
M scale 10000
XY tolerance 0.0032808398950131233
Z tolerance 0.001

M TOLERANCE 0.001
HIGH PRECISION true
LATEST WELL-KNOWN IDENTIFIER 2992
WELL-KNOWN TEXT PROJCS["NAD_1983_Oregon_Statewide_Lambert_Feet_Intl",GEOGCS ["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID ["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT ["Degree",0.0174532925199433]],PROJECTION["Lambert_Conformal_Conic"],PARAMETER ["False_Easting",1312335.958005249],PARAMETER["False_Northing",0.0],PARAMETER ["Central_Meridian",-120.5],PARAMETER["Standard_Parallel_1",43.0],PARAMETER ["Standard_Parallel_2",45.5],PARAMETER["Latitude_Of_Origin",41.75],UNIT ["Foot",0.3048],AUTHORITY["EPSG",2992]]

REFERENCE SYSTEM IDENTIFIER
* VALUE 2992
* CODESPACE EPSG
* VERSION 8.1.1

Hide Spatial Reference ▲

Spatial Data Properties ►

VECTOR ►
* LEVEL OF TOPOLOGY FOR THIS DATASET geometry only

GEOMETRIC OBJECTS
FEATURE CLASS NAME TQ_hydrophytic_veg_polygon_OSP_20141130_LSB
* OBJECT TYPE composite
* OBJECT COUNT 1

Hide Vector ▲

GRID ►
TRANSFORMATION PARAMETERS ARE AVAILABLE No

Hide Grid ▲

ARCGIS FEATURE CLASS PROPERTIES ►
FEATURE CLASS NAME TQ_hydrophytic_veg_polygon_OSP_20141130_LSB
* FEATURE TYPE Simple
* GEOMETRY TYPE Polygon
* HAS TOPOLOGY FALSE
* FEATURE COUNT 1
* SPATIAL INDEX TRUE
* LINEAR REFERENCING TRUE

Hide ArcGIS Feature Class Properties ▲

Hide Spatial Data Properties ▲

Lineage ►

LINEAGE STATEMENT
GPS data collection and subsequent geoprocessing were conducted by Laura Brophy and Michael Ewald of the Estuary Technical Group (ETG) - Institute for Applied Ecology. GPS data was collected using dual-frequency real-time kinematic (RTK) GPS/GNSS receivers and

techniques, and meets the accuracy requirements of OAR 141-090-0035(11). The data was collected on September 23, 2014 at the Tamara Quays Wetland Restoration Project in the Salmon River Estuary, Oregon.

The GPS data was collected using a Spectra Precision ProMark 220 GNSS Receiver equipped with an Ashtech ASH111661 GNSS Survey Antenna running the Spectra Precision FASTSurvey (version 4.1.11) data collector software. Measurements were differentially corrected in real time using the Oregon Realtime Correction Network (ORGN) MAX real-time kinematic (RTK) corrector. See http://www.oregon.gov/ODOT/HWY/THEORGN for more information about the ORGN. The survey antenna was mounted on a survey rod fitted with an 11 cm diameter topographic shoe to prevent the rod point from penetrating the soil surface.

A measurement was taken approximately every eight meters along the line representing the upper extent of hydrophytic vegetation. At each measurement location, ten differentially corrected RTK GPS observations (at a rate of one measurements per second) were averaged to yield the final position for that point. Vegetation was cleared at the base of the survey rod prior to each measurement to ensure that the elevation of the point represented the soil surface. As mentioned above, a topographic shoe was fitted to the survey rod to prevent the tip from penetrating the soil surface.

The data was exported from the field controller to a tabular spreadsheet format, reprojected from NAD83 UTM Zone 10N (EPSG: 26910) to Oregon State Plane (EPSG: 2992) using ESRI ArcGIS (version 10.2.1) and analyzed to ensure data by comparing our measurement to the published position of a high-quality benchmark (PID: AJ1989) in the National Geodetic Survey (NGS) database and repeated measurements of control points within the project area.

According to FGDC Geospatial Positioning Accuracy Standards, the GPS data tested 0.016 meters horizontal accuracy and 0.051 meters vertical accuracy at 95% confidence level. These statistics were derived using a measurement of a high-quality benchmark (PID: AJ1989) published in the NGS database and three repeated measurements of three control points within the project area.

PROCESS STEP ▶

WHEN THE PROCESS OCCURRED 2014-11-26 00:00:00

DESCRIPTION

GPS points were collected along the line representing the upper extent of hydrophytic vegetation on the east and south sides of the wetland. The points were converted to a line feature using the "points to line" geoprocessing tool in ArcGIS 10.2. This line forms the east boundary of the hydrophytic vegetation polygon. The west boundary of the hydrophytic vegetation polygon (along the steep hillslope base) is the same as the pre-restoration wetland delineation. The west boundary is located at a sharp topographic break to upland forest (as described in the pre-restoration delineation report), and the boundary was not altered by the restoration. The north boundary of the hydrophytic vegetation polygon is the same as the delineated wetland boundary, and includes the former dike area, which was lowered to marsh elevation during restoration. The north boundary was established at an elevation of 3.25 m NAVD88 (10.7 ft NAVD88) using the USFS quarter-meter contour dataset based on 2007 LIDAR data. This elevation represents the extent of tidal wetland hydrology, as described in the report (the 3.25 m contour is the closest available contour to the average biennial inundation level of 3.18 m NAVD88 at NOAA's South Beach tide station).

PROCESS CONTACT

INDIVIDUAL'S NAME Laura Brophy

ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology
CONTACT'S POSITION Director
CONTACT'S ROLE principal investigator

CONTACT INFORMATION ►
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Hide Contact information ▲

Hide Process step ▲

PROCESS STEP ►
WHEN THE PROCESS OCCURRED 2014-11-26 00:00:00
DESCRIPTION
The lines established above were joined to create a polygon (shapefile name: TQ_hydrophytic_veg_polygon_OSP_20141130_LSB.shp).

PROCESS CONTACT
INDIVIDUAL'S NAME Michael Ewald
ORGANIZATION'S NAME Estuary Technical Group, Institute for Applied Ecology
CONTACT'S POSITION Geospatial Analyst
CONTACT'S ROLE originator

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Hide Process step ▲

Hide Lineage ▲

Distribution ►

DISTRIBUTION FORMAT
* NAME Shapefile

TRANSFER OPTIONS
* TRANSFER SIZE 0.081

Hide Distribution ▲

Fields ►

DETAILS FOR OBJECT TQ_hydrophytic_veg_polygon_OSP_20141130_LSB ►
* TYPE Feature Class
* ROW COUNT 1

FIELD FID ►
* ALIAS FID
* DATA TYPE OID
* WIDTH 4
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
  Internal feature number.

* DESCRIPTION SOURCE
  Esri

* DESCRIPTION OF VALUES
  Sequential unique whole numbers that are automatically generated.

Hide Field FID ▲

FIELD Shape ►
* ALIAS Shape
* DATA TYPE Geometry
* WIDTH 0
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
  Feature geometry.

* DESCRIPTION SOURCE
  Esri

* DESCRIPTION OF VALUES
  Coordinates defining the features.

Hide Field Shape ▲

FIELD acres ►
* ALIAS acres
* DATA TYPE Double
* WIDTH 19

* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

The area of the polygon, reported in acres

Hide Field acres ▲

FIELD hectares ►

* ALIAS hectares
* DATA TYPE Double
* WIDTH 19
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

The area of the polygon, reported in hectares

Hide Field hectares ▲

FIELD perim_ft ►

* ALIAS perim_ft
* DATA TYPE Double
* WIDTH 19
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

The perimeter of the polygon, reported in feet

Hide Field perim_ft ▲

FIELD perim_m ►

* ALIAS perim_m
* DATA TYPE Double
* WIDTH 19
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

The perimeter of the polygon, reported in m

Hide Field perim_m ▲

Hide Details for object TQ_hydrophytic_veg_polygon_OSP_20141130_LSB ▲

Hide Fields ▲

Metadata Details ►

* METADATA LANGUAGE English (UNITED STATES)
* METADATA CHARACTER SET utf8 - 8 bit UCS Transfer Format

SCOPE OF THE DATA DESCRIBED BY THE METADATA * dataset
SCOPE NAME * dataset

* LAST UPDATE 2014-11-30

ArcGIS metadata properties
Metadata format ArcGIS 1.0
Metadata style FGDC CSDGM Metadata
Standard or profile used to edit metadata FGDC

Created in ArcGIS for the item 2014-11-25 17:56:04
Last modified in ArcGIS for the item 2014-11-30 22:23:32

Automatic updates
Have been performed Yes
Last update 2014-11-30 22:16:05

Hide Metadata Details ▲

Metadata Contacts ►

Metadata contact
Individual's name Laura Brophy
Organization's name Estuary Technical Group, Institute for Applied Ecology
Contact's position Director
Contact's role principal investigator

Contact information ►
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E-mail address brophyonline@gmail.com

Hide Contact information ▲

Hide Metadata Contacts ▲

Metadata Maintenance ►

Maintenance
Update frequency not planned

Hide Metadata Maintenance ▲

FGDC Metadata (read-only) ▼