WATERSHED MONITORING GRANT APPLICATION

Revised
October 2013

OWEB's Mission
To help protect and restore healthy watersheds and natural habitats that support thriving communities and strong economies.

OWEB applications were updated for the October 2013 cycle. All sections of applications must be completed using the October 2013 application forms. Applications submitted using previous forms will not be accepted.

GENERAL INSTRUCTIONS

1. Please read the "Instructions for Completing Monitoring Grant Applications" before beginning your application.
2. Please use **8½″ x 11″** papers. A double-sided application and materials are **optional** except for oversized maps and designs or multiple sets for reviewers. All materials included with the application should be single-spaced wherever possible, unstapled and unbound.
3. Avoid color, except maps, and detail that will not photocopy clearly (see below*).
4. Complete Sections I, II and III.
5. Complete the required forms and attachments: Section IV, Attachments A and B.
6. Read and sign the Monitoring Grant Application (Section I Certification).

***IMPORTANT:** Submit **one COLOR Project Location map** on 8½″ x 11″ paper. The required color map will be used to track project locations, and a color map provides the identifying features that are not legible in black and white. **If there are map(s), photo(s) or design(s) that you want the reviewers to see in color, supply 25 copies of each. If more than one map/photo/design is included, assemble and staple as a set; provide 25 sets for distribution to reviewers. This is the only exception to the use of staples.**

SUBMISSION OF GRANT APPLICATIONS

Grant applications may be submitted to OWEB by hard copy via mail or delivery to our Salem office.
No faxes or emails will be accepted.

Oregon Watershed Enhancement Board
775 Summer Street NE, Suite 360
Salem, OR 97301-1290
Phone: (503) 986-0178

Section I
APPLICANT INFORMATION
Type in the information for Sections I and II.

Name of project: Southern Flow Corridor Effectiveness Monitoring - Baseline

OWEB funds requested: $125,548.00 **Total cost of project:** $158,348.00

PROJECT LOCATION:

This project occurs in one region only. Region 1 ☒ Region 2 ☐ Region 3 ☐ Region 4 ☐ Region 5 ☐ Region 6 ☐

This project occurs in multiple regions. Check all that apply. Region 1☐ Region 2☐ Region 3☐ Region 4☐ Region 5☐ Region 6☐

This project occurs statewide / in all regions. ☐

This project occurs at (check one): ☐ **Site unknown at this time** ☐ **A single site** ☒ **Multiple sites**

Watershed Name(s)	County or Counties
Tillamook Bay-Frontal Pacific Ocean	Tillamook

Township, Range, Section(s) (e.g., T1N, R5E, S12)	Longitude, Latitude (e.g., -123.789, 45.613) (required for federal/state reporting)	Watershed code(s) – Please note the 10-digit hydrologic unit code, previously 5th Field HUC
T1S R10W S22, T1S R10W S23, T1S R10W S12	-123.878, 45.473	1710020308, 1710020303, 1710020304

Applicant	Project Manager
Name: Paul Levesque	**Name:** Laura Brophy
Organization: Tillamook County	**Organization:** Institute for Applied Ecology
Address: 201 Laurel Ave.	**Address:** P.O. Box 2855
Tillamook, OR 97141	Corvallis, OR 97330-2855
Phone: 503-842-1809	**Phone:** 541-752-7671
Fax: 503-842-1384	**Fax:** 541-753-3098
Email: plevesqu@co.tillamook.or.us	**Email:** brophyonline@gmail.com

Fiscal Agent
Organization: Tillamook County
Address:201 Laurel Ave.
Tillamook, OR 97141
Phone:503-842-2032 x3402
Fax:503-842-1829
Email: dpowers@co.tillamook.or.us
Contact Person: Diane Powers

CERTIFICATION:

I certify that this application is a true and accurate representation of the proposed work for watershed restoration and that I am authorized to sign as the Applicant or Co-Applicant. By the following signature, the Applicant certifies that they are aware of the requirements (*see Application Instructions*) of an OWEB grant and are prepared to implement the project if awarded.

Applicant Signature: Mark Labhart Date: 10-28-13

Print Name: Mark Labhart Title: Chair, Board of Commissioners

Co-Applicant Signature: ____________ Date: ____________

Print Name: ____________ Agency: ____________

Section II
PROJECT INFORMATION

1. **Abstract.** In the space provided, and in 150 words or fewer, state 1) the problem, 2) the proposed solution, 3) other partners involved, and 4) how OWEB funds will be used.
   The landmark Southern Flow Corridor (SFC) project will reduce flooding and restore tidal wetlands by removing dikes, tide gates and other flow barriers on 521 acres of lowlands in the Tillamook Estuary. The project's design, based on modeled flood reduction, is the product of Oregon Solutions, a community/governmental collaboration. The project will be implemented in 2015; effectiveness monitoring will determine whether flood reduction and wetland restoration goals were achieved. The SFC monitoring team, led by Laura Brophy of the Estuary Technical Group and Stan van de Wetering of the Siletz Tribes and guided by a multi-disciplinary Monitoring Advisory Committee, has developed a science-based effectiveness monitoring plan. This proposal requests OWEB funds for baseline monitoring of vegetation, soils, groundwater level, juvenile salmonid use (underwater videography), and macroinvertebrates. Other monitoring at the site, funded by NOAA, includes tidal hydrology, water quality, juvenile fish use via seining techniques, channel morphology, and sediment accretion.

2. **Was this application submitted previously?** ☐ **Yes** ☒ **No**
   If yes, what was the application number?

3. **Is this project a continuation of a previously OWEB-funded project(s)?** ☒ **Yes** ☐ **No**
   If yes, what was the application number(s)? 099-421/099-804

4. **Does this application propose a grant for a property in which OWEB previously invested funds for purchase of fee title or a conservation easement; or is OWEB currently considering an acquisition grant for this property?** ☒ **Yes** ☐ **No**
   If yes, what is the grant number(s)? 099-421/099-804 and pending land acquisition grant

5. **Project Partners.** Show all anticipated funding sources, and indicate the dollar value for cash or in-kind contributions. Be sure to provide a dollar value for each funding source. If the funding source is providing in-kind contributions, briefly describe the nature of the contribution in the Funding Source Column. Check the appropriate box to denote if the funding status is secured or pending. In the Amount/Value Column, provide a total dollar amount or value for each funding source.

Funding Source **Name the Partner and what their contribution is.**	**Cash**	**In-Kind**	**Secured (x)**	**Pending (x)**	**Amount/Value**
OWEB	$125,548.00	$	☐	☐	$125,548.00
Landowner(s) or other partners:	$	$	☐	☐	$
NOAA (funding for other monitoring activities)	$27,000.00	$	☒	☐	$27,000.00
ODFW (loan of boat and trailer)	$	$5,000.00	☒	☐	$5,000.00
Landowner: loan of ATV	$	$800.00	☒	☐	$800.00
	$	$	☐	☐	$
	$	$	☐	☐	$
	$	$	☐	☐	$
Total Estimated Funds (add all amounts in the far-right Column):					*$158,348.00

*The total should equal the total cost of the project on page 1 of the application.

6. **Have any conditions been placed on other funds that may affect project completion?**

   ☐ **Yes** ☒ **No**

   If yes, explain:

* The next six questions, 7 through 12, are required for federal reporting purposes. OWEB receives a portion of its funds from the federal government and is required to report how its grantees will use those funds. Please respond as applicable.

7. **Salmon/Steelhead Populations Targeted and Expected Benefits to Salmon/Steelhead**
The information provided will be used to by OWEB to better meet federal and state reporting requirements. Completion of this section is required but will not be used to evaluate this application for funding.

☐ This project is **NOT** specifically designed to benefit salmon or steelhead.

► If you check this box, STOP here and GO TO Question #8

7 a) Targeted Salmon/Steelhead Populations: Select one or more of the salmon ESUs (Evolutionary Significant Unit) or steelhead DPSs (Distinct Population Segment) that the project will address/benefit For species where the ESU/DPS name is not known or determined, use the species name with unidentified ESU (e.g., Chinook salmon – unidentified ESU). Additional information on the designation and location of the salmon/steelhead populations can be found at http://www.nwr.noaa.gov/maps_data/species_population_boundaries.html.

Chinook Salmon (*Oncorhynchus tshawytscha*)		**Coho Salmon** (*O. kisutch*)	
☐	Deschutes River summer/fall-run ESU	☐	Lower Columbia River ESU
☐	Lower Columbia River ESU	☒	Oregon Coast ESU
☐	Mid-Columbia River spring-run ESU	☐	Southern Oregon/Northern California ESU
☒	Oregon Coast ESU	☐	unidentified ESU
☐	Snake River Fall-run ESU	**Steelhead** (*O. mykiss*)	
☐	Snake River Spring/Summer-run ESU	☐	Klamath Mountains Province DPS
☐	Southern Oregon and Northern California Coastal ESU	☐	Lower Columbia River DPS
☐	Upper Klamath-Trinity Rivers ESU	☐	Middle Columbia River DPS
☐	Upper Willamette River ESU	☒	Oregon Coast DPS
☐	unidentified ESU	☐	Snake River Basin DPS
Chum Salmon (*O. keta*)		☐	Washington Coast DPS (SW Washington)
☐	Columbia River ESU	☐	Upper Willamette River DPS
☒	Pacific Coast ESU	☐	Steelhead/Trout unidentified DPS
☐	unidentified ESU		

7 b) Expected Benefits: Write a brief description of the goals and purpose of the project and how it is expected to benefit salmon/steelhead or salmon/steelhead habitat. This answer should be no longer than 2000 characters, which is approximately 330 words. **See Application Instructions for examples and ideas on how to calculate the number of words or characters in your answer.**

Listed as "threatened" under the federal Endangered Species Act (ESA), Oregon coastal coho populations have been severely impacted by the loss of off-channel and tidal wetland habitats. In few places is this impact more pronounced than in Oregon's Tillamook Bay, where almost 90% of the estuaries' tidal wetlands have been lost to agricultural and urban/residential development. The resulting lack of available tidal wetland habitats has been a primary contributor to the decline of Tillamook Bay coho, and today's runs (just over 2,000 fish in 2012) represent a fraction of estimated historic abundance (~200,000). Likewise, the lack of available tidal wetland habitats has been identified as a key impediment to species recovery both in Tillamook Bay and across the Evolutionary Significant Unit (ESU). These tidal habitat losses have impacted the Bay's four other anadromous species, as well, particularly Chinook which use tidal wetlands extensively for rearing.

Working with a diverse set of partners, Tillamook County proposes to permanently protect and restore 521 acres of tidal wetland habitats at the confluence of the Bay's two most productive salmon systems, the Wilson and Trask Rivers. Representing 10% of the watershed's historic tidal acreage and a far greater percentage of the "restorable" tidal lands, the project site contains an expansive mosaic of tidal wetlands, disconnected freshwater wetlands, and drained pasture lands. Once restored to a tidal regime, the resulting range of habitats (including mud flats, aquatic beds, emergent marsh, scrub-shrub wetlands, forested wetlands and sloughs) will provide substantial habitat benefits to not only threatened coho, but also chum and Chinook salmon, steelhead, and cutthroat trout.

By delivering full tidal inundation to 521 acres of restored marsh and wetland fringe habitats, this project directly addresses the loss and simplification of estuarine rearing habitat for the project's five Target salmonid species. Coupled with the re-connection of 14 miles of high quality off-channel areas on-site, this project represents a crown jewel of tidal wetlands conservation efforts in Oregon.

8. **Is the project identified as an essential or needed project in an assessment or recovery plan?**

☒ **Yes** ☐ **No**

If yes, provide name of the Plan, Watershed Assessment or Recovery Plan. If this project was not identified in a Plan, enter NONE below.

The SFC project is supported by many assessments and recovery plans. Tillamook County's proposal to NOAA Restoration Center (Tillamook County 2013) cites 13 plans which call for the actions being undertaken. Five of these are listed below. The others may be viewed in the NOAA proposal at http://www.co.tillamook.or.us/Documents/Misc/NOAA_App_02-15-2013.pdf.

1. U.S. Army Corps of Engineers, 2005. Tillamook Bay and Estuary, Oregon: General Investigation Feasibility Report. U.S. Army Corps of Engineers, Portland District, Portland, OR.
2. Philip Williams and Associates (PWA), 2002. Development of an Integrated River Management Strategy. PWA, Portland, OR.
3. Northwest Hydraulic Consultants, 2010. Project Exodus Final Report. 16300 Christensen Rd, Ste. 350, Seattle, WA.
4. Ewald, M.J., and L.S. Brophy, 2012. Tidal Wetland Prioritization for the Tillamook Bay Estuary. Institute for Applied Ecology, P.O. Box 2855, Corvallis, OR 97339-2855.
5. Tillamook Bay National Estuary Program, 1998. Tillamook Bay Comprehensive Conservation and Management Plan. Tillamook Bay National Estuary Project, PO Box 493, Garibaldi, OR 97118.

Name of document (Author, date, title, source, source address in Endnote citation format)

9. **Report the total stream miles and/or acres that will be monitored under this application.** If monitoring the same location or stream reach multiple times, do not sum the area or length metrics for each monitoring event. For example if the project monitors a 13-mile stream reach twice per year for 3 years, report the metric only as 13 stream miles. If there is more than one type of monitoring and the locations monitored will overlap, report the total miles and/or acres for all types (i.e., do not double count areas of overlap).

_____ Total stream miles to be monitored or assessed

455 Total acres to be monitored or assessed

10. **Is this project a part of a comprehensive monitoring strategy/program?** See explanation below*

☒ **Yes** ☐ **No**

If yes, provide the name of the comprehensive monitoring strategy/program. If this project is not part of a comprehensive monitoring strategy/program, enter NONE below.

Brophy, L.S., and S. van de Wetering. 2013. Southern Flow Corridor Effectiveness Monitoring Plan. Estuary Technical Group, Institute for Applied Ecology, P.O. Box 2855, Corvallis, OR 97339-2855. Name of document (Author, date, title, source, source address in Endnote citation format)

11. **Are other organizations cooperating with this monitoring project by concurrently conducting field work on other components of a Comprehensive Monitoring Strategy or Program?** See explanation below*

☒ **Yes** ☐ **No**

If yes, list the organization names and identify the number:

Cooperating Organization Names
Estuary Technical Group, Institute for Applied Ecology

Confederated Tribes of Siletz Indians
Tillamook Estuaries Partnership Northwest Hydraulic Consultants, Inc.

4 # of cooperators (number of cooperators shown in table above)

******The intent of questions 10 and 11 are to capture information on larger-scale or comprehensive monitoring efforts conducted by multiple entities (usually under an overarching or cooperative plan). The assumption is cooperating entities are working together to collect various aspects of integrated information (usually concurrently). For example, an OWEB funded project collected the salmon abundance/distribution data component of a salmon habitat restoration plan while other entities were collecting water quality, and/or habitat attribute data for the same comprehensive plan. Question 10 asks for the name of the plan(s) and question 11 asks for the name of the other entities involved in the cooperative collection of the data called for in that plan. If these questions are not relevant to this project enter 'None' for question 10 and for 11 answer 'None' for the cooperator names and answer 0 for the number of cooperators.*

12. Identify the type of monitoring proposed. (See Instructions for descriptions.) Check all that apply.

☒ Baseline	☐ Implementation	☐ Status and Trend
☐ Effectiveness of Restoration	☐ Effectiveness of Forest Management Strategies	☐ Other:

12.a) Are you monitoring a specific project(s)?

Please identify the OWEB Grant # 099-421/099-804 and pending land acquisition grant submitted by Tillamook County

OR if you are monitoring a non-OWEB project, identify main project funder and year project was completed ______

If monitoring is not related to a specific project(s) select ☐ None

13. Identify the parameters that will be measured. (See Instructions for descriptions.) Check all that apply.

☐ Adult fish presence/absence/abundance/distribution survey(s)	☐ Riparian vegetation
☒ Juvenile fish presence/absence/abundance/distribution survey(s)	☐ Spawning surveys
☐ Salmon/steelhead harvest monitoring	☐ Upland vegetation
☒ Instream habitat surveys	☐ Water quality
☒ Macroinvertebrates	☐ Water quantity
☐ Noxious weeds	☒ Other: Wetland vegetation, groundwater, soils
☐ Other Biological Monitoring (bird counts, amphibian surveys)	

13.a) If you checked Water Quality above, exactly which parameters will you be monitoring? Check all that apply.

☐ Bacteria	☐ pH	☐ Temperature
☐ Dissolved Oxygen	☐ Pesticides	☐ Toxics
☐ Nitrates	☐ Phosphorus	☐ Turbidity
☐ Heavy Metals (name):	☐ Nutrients (name):	
☐ Other (explain):		

13.b) If you checked Riparian or Upland Vegetation above, exactly which parameters will you be monitoring? Check all that apply.

☐ Canopy cover	☐ Invasive species presence/absence	☐ Plant survival
☐ Percent cover	☒ Other (explain): Wetland vegetation: percent cover	

14. What is the format in which the data will be stored? Check all that apply.

☒ Spreadsheet	☒ Database	☒ GIS layers	☐ Other (name): _____

Section III
SPECIFIC MONITORING PROJECT ACTIVITY

M1	What is the present situation? Describe the issue or opportunity the project seeks to address.

The Southern Flow Corridor (SFC) project is a very high-visibility flood reduction and tidal wetland restoration – the product of a long, intensive community involvement process (http://orsolutions.org/osproject/tillamook). Due to the strong community interest in the project and the large public investment (totaling approximately $10 million), a well-planned effectiveness monitoring program is essential. Only carefully targeted, science-based monitoring can provide the clear information needed to document project outcomes, provide accountability for the large public investment, and inform adaptive management if needed.

Effectiveness monitoring of the SFC project will have repercussions far beyond the project itself. In the agriculturally active Tillamook Valley, reconnection of tidal flows to former diked pastures can be controversial – even when it is implemented to achieve flood reduction. Accurate demonstration of flood reduction and ecosystem responses to the SFC project will open more opportunities in the future and strengthen the many partnerships that have formed to allow this project to proceed. Conversely, failure to adequately monitor ecosystem responses could greatly limit future opportunities and weaken those partnerships, locally and regionally. Well-designed monitoring and solid interpretation will lay vital groundwork for future public acceptance of combined ecosystem restoration/flood control solutions.

To set the context for this proposal, this section describes the tidal flow reconnection actions that will occur at the site. Current conditions at the site are shown in Figure 1. The SFC project will remove dikes, tide gates, and other flow barriers to reduce flooding in nearby lowlands and to restore tidal wetlands on 211 ha (521 acres) (Figure 2). Effectiveness monitoring will focus on the westernmost 184 ha (455 acres), as described in Geographic Focus below.

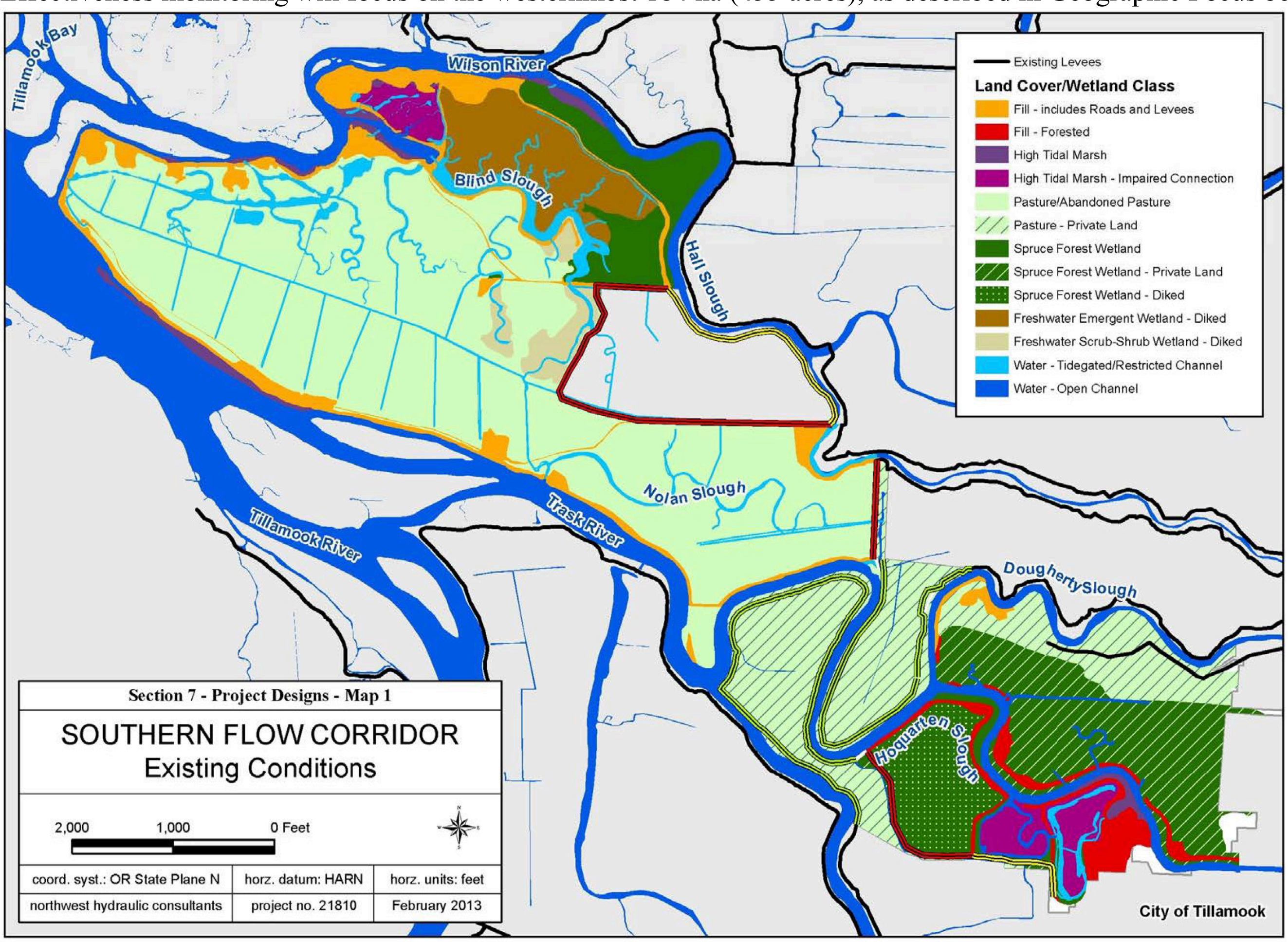


Figure 1. SFC project area: existing conditions

By November 2015, construction contractors for the SFC project will implement the following actions (Figure 2):

- Remove 11 km of existing levees and 3 km of road (orange areas in Figure 2)
- Remove and/or relocate seven tide gates and one floodgate (red dots in Figure 2)
- Reconnect nine major tidal channels totaling 23 km in length (light blue channels in Figure 2)
- Add large woody debris where logistically feasible to tidal channels
- Fill 5 km of drainage ditches to re-establish natural drainage regimes (purple lines in Figure 2)
- Lower over 3 km of existing levees (green/black parallel lines in Figure 2)
- Upgrade and construct over 3 km of dikes to protect adjacent landowners' property (red lines in Figure 2)
- Remove four buildings (black squares)

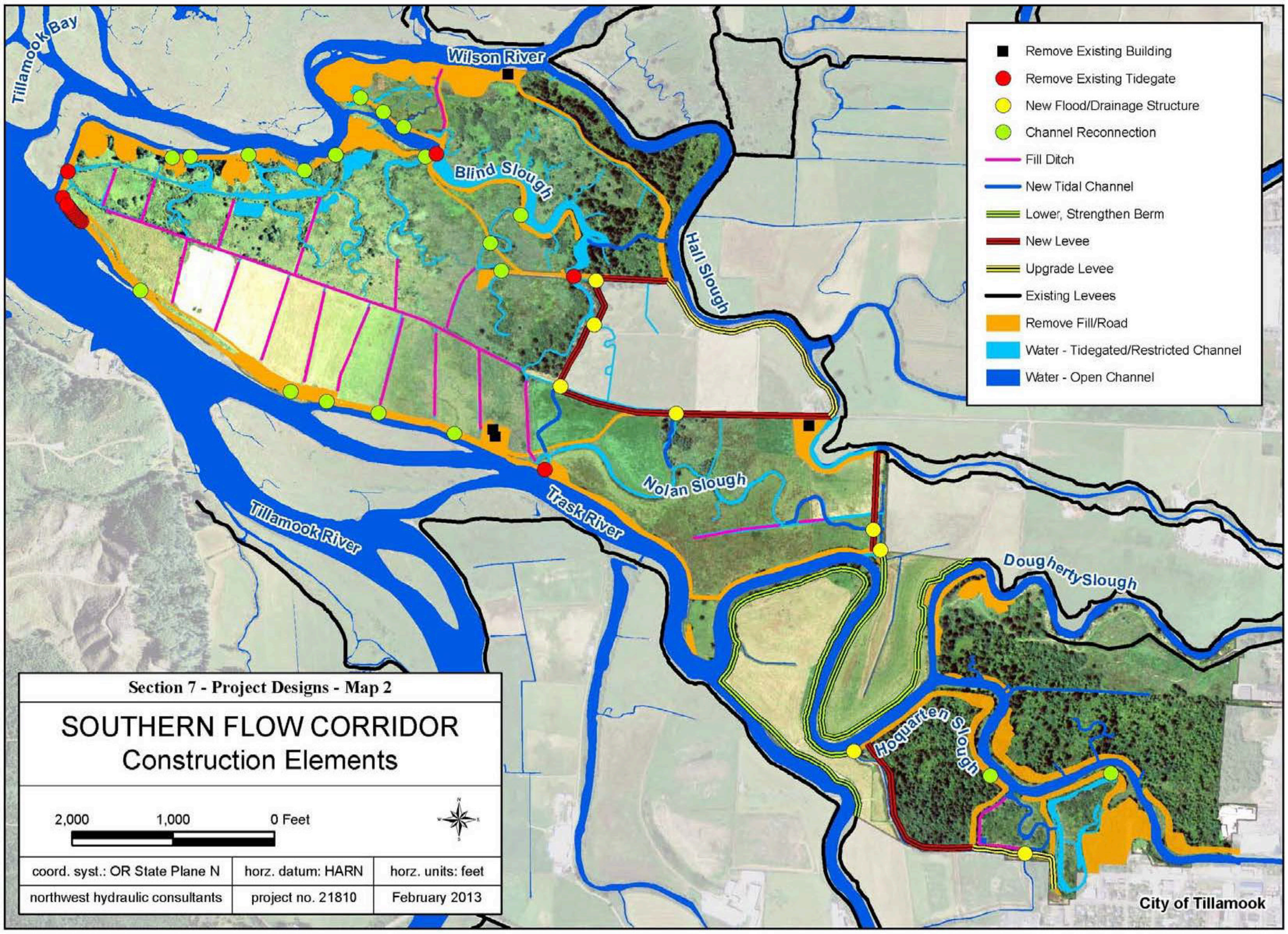


Figure 2. SFC project area: Construction elements

Expected future conditions are shown in Figure 3.

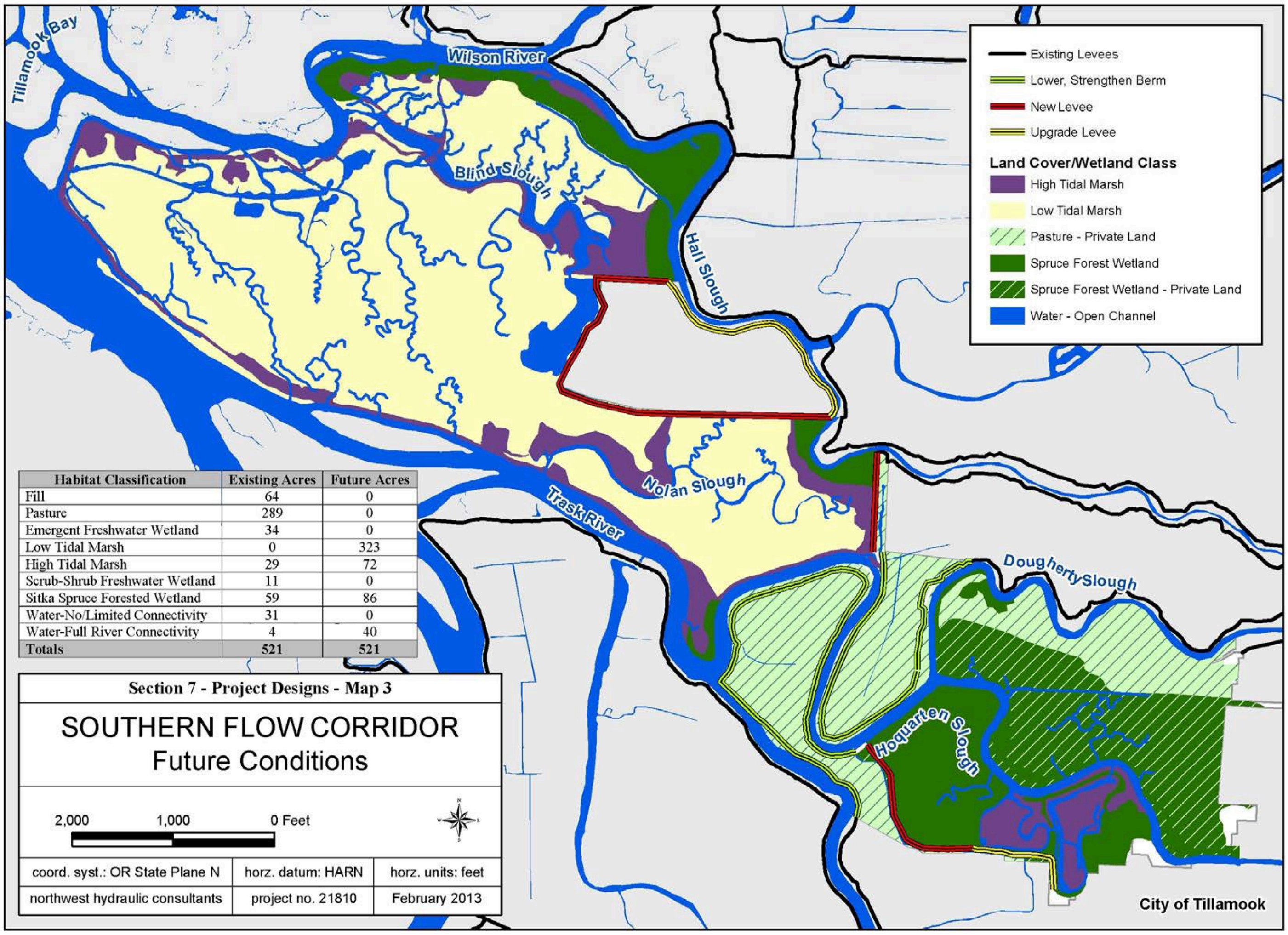


Figure 3. SFC project area: Future conditions anticipated as a result of the actions shown in Figure 2.

The SFC project is a landmark example of community and governmental cooperation towards shared goals of flood reduction and ecological restoration. Effectiveness monitoring is essential to document the achievement of those goals. The effectiveness monitoring plan for the SFC project (Brophy and van de Wetering 2013) is designed to allow evaluation of progress towards SFC project goals, including expected benefits related to flood attenuation and improved ecological function. Effectiveness monitoring will also help identify any areas where adaptive management may be needed, and will provide data to guide those management actions. The SFC project is a large public investment, and effectiveness monitoring will provide needed accountability for the investment, allowing the project team to clearly communicate project results to funders, the scientific community, and the public. Finally, because of the SFC project's large size, monitoring will provide valuable information to help guide other projects in the region – information that is urgently needed (Burdick and Roman 2012, NOAA Restoration Center 2013).

M2	What are you proposing to do? Supply sufficient detail to match the project's complexity and technical difficulty so that its technical viability can be evaluated.

We will conduct effectiveness monitoring at the SFC project to evaluate whether the project has met its stated goals. This proposal requests OWEB funding for approximately 43% of baseline monitoring costs (which total $291,482); the requested OWEB funding would cover baseline monitoring of vegetation, soils, groundwater level, juvenile salmonid use *via* underwater videography, and macroinvertebrates. NOAA Restoration Center is funding the remaining 57% (see attached NOAA award letter), including tidal hydrology, water quality, juvenile fish use via seining techniques, channel morphology, and sediment accretion. Post-implementation monitoring is planned for at least 6 years after restoration. The $2,458,000 in SFC project funding recommended by NOAA Restoration Center (see attached NOAA award letter) includes $374,591 in post-implementation monitoring funds. Our project team will seek additional post-implementation monitoring funds from multiple sources to provide full evaluation of project results.

All of the planned effectiveness monitoring activities associated with the SFC project are described in the draft SFC Effectiveness Monitoring Plan (EMP) (Brophy and van de Wetering 2013), downloadable from https://files.secureserver.net/0sp3l7L2bts1To. The full monitoring program is summarized in Appendix 2. In this section, we present detailed information about the specific monitoring parameters for which we are requesting OWEB funding: vegetation, soils, groundwater, fish habitat use (tidal migration monitoring), and macroinvertebrates.

For reference in this section, Figure 4 shows stratified sample zones, and Figure 5 shows the conceptual sample design for both NOAA-funded and OWEB-proposed monitoring parameters. The sample design will be finalized with the assistance of the Monitoring Advisory Committee during fall 2013. **Sample design is described in detail in Section M5.**

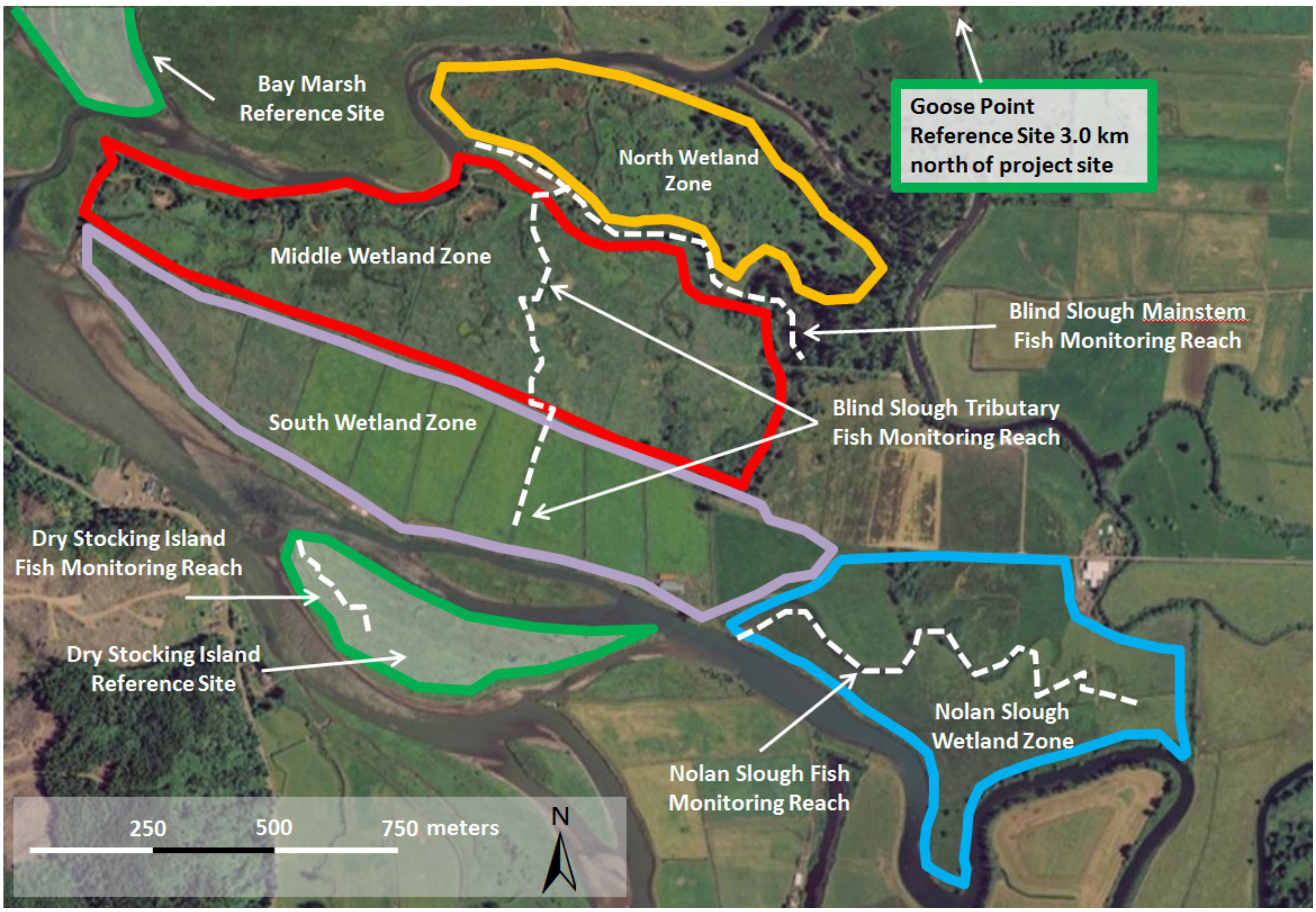


Figure 4. SFC project area: Wetland monitoring zones (sampling strata) and fish monitoring reaches

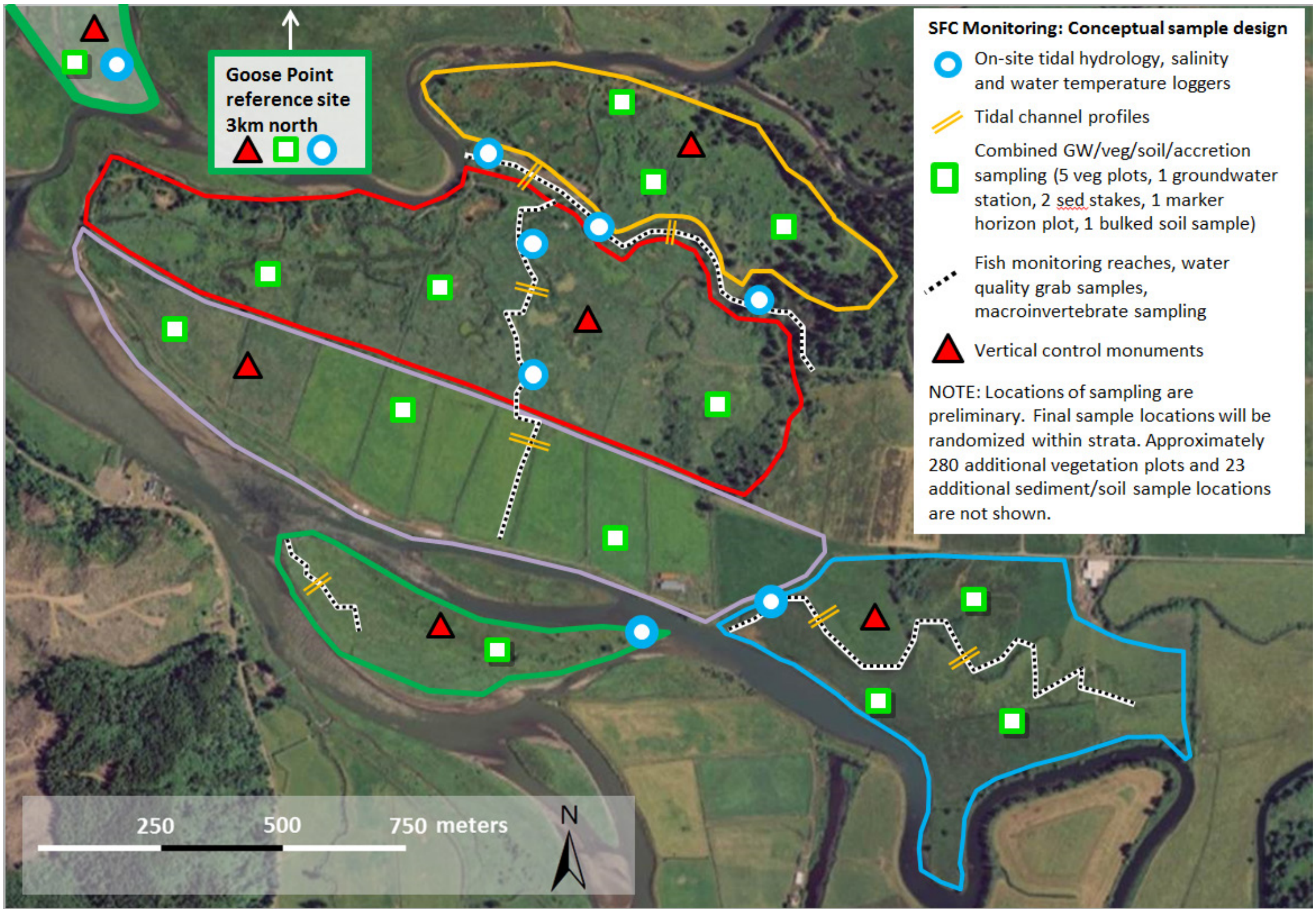


Figure 5. SFC project area: Conceptual sample design. Final sample locations will be randomized within strata (for physical drivers and vegetation), or based on field reconnaissance (for all other parameters). For clarity, approximately 250 additional vegetation plots and 23 additional sediment accretion/soil sample locations are not shown.

Vegetation

Vegetation monitoring is a top priority monitoring parameter for every tidal wetland reconnection project (Simenstad *et al*. 1991, Callaway *et al*. 2001, Roegner *et al*. 2008), because vegetation is a strong indicator of so many wetland functions (Adamus 2006) and because it's quite straightforward to sample, providing a large "information return" on the monitoring investment. Vegetation accurately reflects the ecological drivers and natural processes that structure tidal wetlands, such as tidal hydrology, soil characteristics, groundwater levels, and salinity. In addition, vegetation monitoring is needed to track the status and control of invasive plant species – such as the reed canarygrass that is dominant throughout the SFC site. Reed canarygrass is intolerant of strongly brackish water, but the SFC site occupies the transition zone from brackish to freshwater tidal (Lee and Brown 2009), so it will be important to track this species' status.

Vegetation will be monitored in 200-300 stratified random plots located within wetland sample zones at the SFC site, and in reference site wetlands. (For clarity, only fourteen of these plots – those co-located with groundwater sample locations -- are shown in Figure 5. A hypothetical sample layout is shown in Figure 6.) Results will be used to:

- Document changes in plant communities at the project site prior to and following project implementation, relative to reference sites;
- Document the degree to which native tidal wetland vegetation communities are re-established;
- Provide information on relationships between vegetation development and hydrologic, topographic and edaphic parameters including wetland surface elevation, tidal hydrology/inundation regime, water and soil salinity fluctuations, soil characteristics and groundwater level dynamics; and

- Document the presence and extent of invasive vegetation colonization, which will inform post-implementation adaptive management strategies, if needed.

Vegetation at the SFC project site and reference sites will be sampled using standard quadrats (1.0 m^2). Approximately 200-300 quadrats will be placed at random across the entire project, with numbers per stratum proportional to stratum area. Samples per stratum will range from 60 to 100 in the large South Wetland zone to less than 15 in low marsh at the reference sites. Computerized mapping (GIS) will be used to assign random locations for plots within strata. Vegetation measurements at each quadrat will include percent cover and species richness.

For sample points in forested areas, a rapid-assessment method may be substituted for the standard 1.0 m^2 cover quadrats. The method consists of brief (e.g., 15 min) timed-searches of woody, and herbaceous plants will be conducted by a single investigator within a predefined radius of the sample location (e.g., 20 m). Species lists will be used to determine differences in composition (e.g., ordination of species presence-absence lists), and species richness (species accumulation curves). Overall percent cover of canopy-forming trees, shrubs, and understory emergent vegetation will also be assessed in each rapid assessment area. This method will be refined based on time requirements in the field.

Physical conditions monitoring (described in detail below) will be co-located with vegetation plots as follows:

- Groundwater sample stations (shallow observation wells) will be located at a randomly selected subgroup of 14 quadrats (3 in each wetland sample zone on the SFC project site, and 1 to 2 in high marsh at each reference site).
- Soil sampling (funding requested in this proposal) and accretion/erosion sampling (feldspar marker horizon plots and sediment stakes, funded by NOAA) will be co-located with the 14 groundwater sample stations, and also at an additional 23 randomly selected vegetation plots.
- Of the remaining vegetation plots, 56 will be clustered around the combined vegetation/physical drivers sample sites (Figures 5 and 6) to provide greater ability to interpret linkages between groundwater regime and plant communities. These “clustered vegetation plots” will be placed at N-S-E-W bearings and at random distances from the groundwater well.
- The remainder of the vegetation plots (150 to 250 quadrats) will be not have associated physical conditions sampling.
- Elevation will be determined for every vegetation quadrat using RTK-GPS.

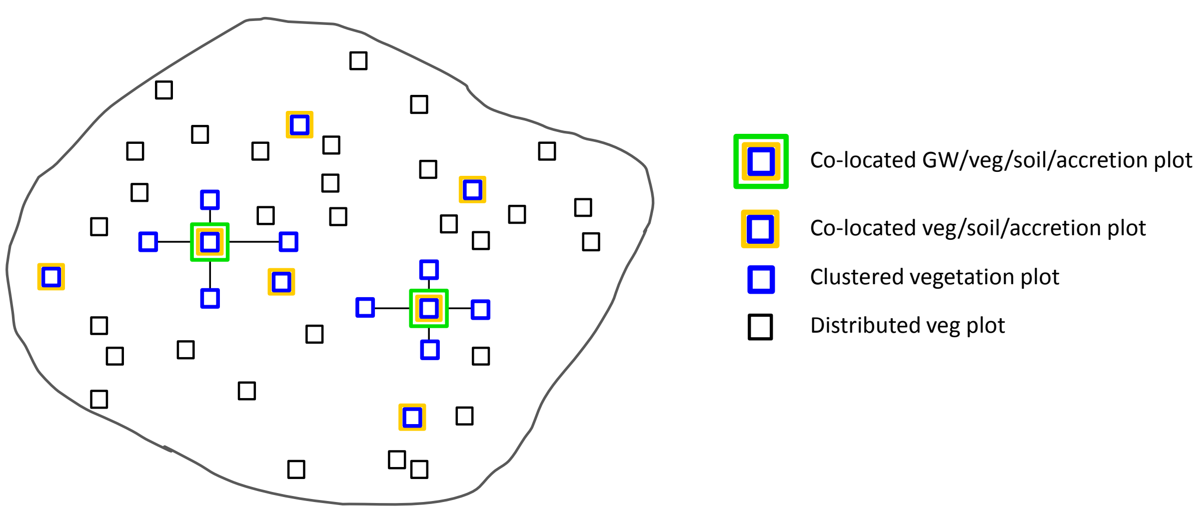


Figure 6. Diagram of a hypothetical sample layout for spatially linked vegetation and physical conditions monitoring. In this example, there are 2 combined GW/vegetation/soils/accretion sample locations, 8 clustered vegetation plots nearby, 5 co-located vegetation/soil/accretion sample locations, and 30 distributed vegetation plots.

Plant community mapping: In addition to the vegetation sampling described above, we will map plant communities within the wetland monitoring zones and reference sites (Figure 4). Mapping will use plot data along with aerial photographs (NAIP imagery) and field ground-truthing; plant community boundaries will be heads-up digitized with GIS software. Calculated metrics will consist of area of native-dominated and non-native-dominated communities, area of each vegetation alliance (major groupings of plant communities), and area of each mapped community.

Groundwater

Groundwater level (measured in shallow observation wells) will be monitored during spring through late fall at a randomly selected subset of approximately 14 vegetation quadrats (12 at the SFC project site, and 3 in high marsh reference sites) (Figure 5). Results will be used to:

- Document groundwater level dynamics prior to tidal reconnection;
- Determine the degree to which the natural hydroperiod is re-established within project wetlands;
- Help interpret the results of other monitored parameters, including plant community development, water quality, water temperature, and soil characteristics.

Groundwater level is a controlling factor in plant community development and many other tidal wetland functions. Groundwater dynamics are a defining characteristic distinguishing wetlands from uplands (Environmental Laboratory 1987). Groundwater is a likely controlling factor in water quality, nutrient processing, and salmon production in tidal wetlands, since water is cooled as it flows through the soil; salts may be dispersed or concentrated in the soil; and soil porewater acts as a medium for nutrient processing and other soil biota activity – such as production of benthic invertebrates that are prey for salmon. Wetlands with strong, regular fluctuation in water level are among the most productive and the most likely to export biota, nutrients and energy to other nearby ecosystems (Mitsch and Gosselink 1993). Groundwater fluctuation is also a likely controlling factor for carbon sequestration – a valued tidal wetland function – since organic matter breakdown is slow in saturated, anaerobic soils.

We will follow the standard national protocol for shallow groundwater level monitoring (Sprecher 2000), as modified by Brophy *et al.* (2011) for use in tidal wetlands. We will deploy automated water level loggers in each well and collect data at 15 min intervals for a full year prior to SFC project implementation. Water levels will be tied to NAVD88 through elevation surveys (see Vertical Control Monuments below). Groundwater depth relative to the soil surface will be calculated and compared to tidal water levels, and relationships between groundwater levels, associated tidal inundation period, and plant community composition will be described. Groundwater will not be monitored in low marsh at the reference sites, since our team's past experience has shown that it generally remains at the soil surface year-round (Brophy 2009, Brophy *et al.* 2011, Brophy and van de Wetering 2012).

Based on our monitoring at several sites in Oregon, groundwater in diked former tidal wetlands generally shows seasonal wetland characteristics, drying in summer but wetting in winter (Figure 7). Our studies of groundwater dynamics in least-disturbed reference sites show that levels depend on the habitat class; high marsh and Sitka spruce swamps show a very dynamic water table that dries somewhat in summer but is "reset" by spring tide cycles in early fall, while low marsh is saturated nearly to the surface year-round (Brophy *et al.* 2011). Contrasting baseline and post-implementation groundwater dynamics at the SFC site will provide valuable documentation of the project's effectiveness at re-establishing this key controlling factor.

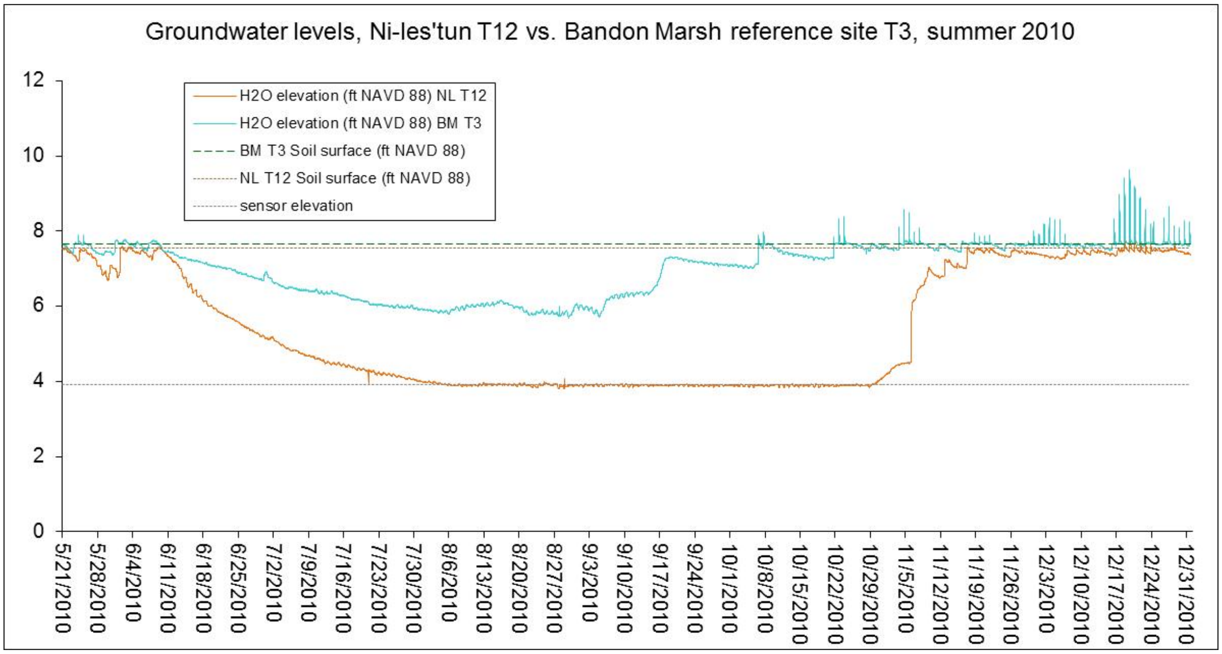


Figure 7. Examples of baseline groundwater levels in summer 2010 at one sample location on the diked Ni-les'tun pasture, Bandon Marsh National Wildlife Refuge (orange line) and the associated reference site (blue line). The two transects are at a similar elevation (7.5 to 7.7ft NAVD88). At the diked pasture, groundwater remained nearly 4ft below the soil surface for approximately 3 months. By contrast, reference site groundwater never dropped lower than about 1.5ft below the soil surface, and was at that level for less than 1 month. (Note that water levels lower than 4ft below the soil surface could not be measured, due to the limited observation well depth.)

Soils

Soil pH, soil salinity, and soil organic matter content will be monitored at approximately 37 sample sites co-located with a subset of randomized vegetation plots (Figures5 and 6). Results will be used to:

- Evaluate differences in soil characteristics before and after project implementation, relative to reference wetland conditions; and
- Help interpret the results of other monitored parameters, particularly plant community development.

Soil characteristics are controlling factors for plant community development and relate closely to valued wetland functions like nutrient cycling, carbon storage, and water temperature moderation (through surface/subsurface flow connections). The soil characteristics we are measuring are strongly influenced by tidal hydrology, groundwater level, and surface water salinity. In turn, soils literally form the basis for the tidal wetland functions we value such as native vegetation support, nutrient processing, and carbon sequestration. Wetland characteristics such as salmonid prey production, plant community development, and water quality are directly related to nutrient processing, soil salinity, and organic matter content, so monitoring of soils can be vital to understanding tidal wetland restoration results (Zedler 2001).

Soil samples will be collected by pooling several subsamples in the vicinity of each co-located vegetation/soil/accretion plot (Figures 5 and 6). Samples will be analyzed by the Oregon State University Central Analytical Lab following standard national protocols (USDA NRCS 1996, Dane and Topp 2002, Sparks 1996). Measurements will include percent organic matter by loss on ignition, and pH and electrical conductivity of the soil solution (soil salinity). In addition, we will explore the potential of working with high school or community college students to collect more extensive data on soil salinity using field sampling methods (syringe and refractometer) (Callaway *et al*. 2001). Relationships between soil characteristics, plant community composition, and water quality in tidal channels will be examined to understand linkages between the physical site conditions and biological responses. and will help interpret plant community data.

Fish monitoring: Overview of sample design and methods

Fish sampling for effectiveness monitoring at the SFC project will use a stratified systematic design and Before-After/Control-Impact (BACI) structure, sampling both before and after project implementation within two typical watersheds at the SFC project site (Blind Slough and Nolan Slough), a reference site watershed (Dry Stocking Island), and the Wilson and Trask Rivers (Figure 4). A combination of two sampling methods (Figure 7) will be used to describe tidal wetland habitat utilization and species distribution, diversity and abundance. These methods are seine sampling and videography.

The combination of seine sampling (funded by NOAA) and video sampling (proposed OWEB funding) will demonstrate the project's effectiveness in restoring salmonid habitat opportunity and utilization by generating three key datasets:

1. the "supply" of aquatic species available to utilize wetland habitats within the SFC project site;
2. the relative proportion of these species that directly occupy these habitats before and after project implementation; and
3. the relative proportion of these species which use food resources transported out of the project site and into the river during the ebb tide, both before and after project implementation.

The first method, seine sampling (funded by NOAA) will generate information on fish distribution, diversity and abundance, and will be conducted during low tides when juvenile fish are most vulnerable to capture by nets due to increased sampling efficiencies. In addition this method allows for an evaluation of tidal refugia and its role in allowing for predator avoidance, improved water quality, and increased time of wetland channel use. It has been suggested that sampling during low tide is a less than optimal period to define use of wetland channel habitat by juvenile fish (SFC Monitoring Plan Review Committee meeting October 15, 2013, Tillamook, OR). It is common knowledge that most natural tidal wetland channels become mostly drained at a zero elevation tide (i.e. a low tide) due to their greater channel bottom elevation. Our experience suggests this variation is driven by the season, the associated wetland ground water levels and local river hydrology. In addition, our observations from past work (Nestucca, Siletz, Yaquina, Alsea, Coos and Coquille estuaries - unpublished) have shown the vast majority of disturbed and recovering wetland channels are positioned at a lower elevation than natural wetland channels, and/or have a longer drainage period. This lower elevation and/or longer drainage period results in ponding of water during the low tide period, which provides increased use opportunities for juvenile fish. Our work in other estuaries (Nestucca, Siletz, Yaquina, Alsea, Coos and Coquille) has resulted in the observation that those juvenile salmonids that utilize the wetlands during the earlier portion of the year (Jan-June) typically have shallow water habitats available to them during the low tide period, regardless of whether they are located within a natural wetland channel or a disturbed wetland channel; and in turn reside in those wetland habitats during low tide.

This proposal requests OWEB funding for the second method, videography. Videography generates data on patterns of fish movement into and out of the project wetlands in relation to daily tidal cycles. The combination of seine sampling and videography yields powerful information on the behavior of juvenile fish populations, as well as information on fish abundance, diversity, and species richness. These metrics will allow evaluation of the project's effectiveness in re-establishing salmonid rearing functions.

In order to understand fish use of the tidal wetland channels at SFC, we need to understand how, when and where they move into and out of the wetlands. Juvenile salmon may reside within tidal wetland channel habitats through multiple tidal cycles, or utilize channel habitat for less than a single tidal cycle (Cornwell *et al*. 2001, Bottom *et al*. 2005, van de Wetering 2005). These movements take place in relation to the tide cycle, so we use the term "tidal migration" to describe the habitat use patterns.

Tidal migration sampling will be accomplished using underwater videography (Figures 8 and 9); analysis of the data provides estimates of aquatic species migrating into and out of specific habitats (Figure 10). Videography will be conducted during the peak juvenile salmonid use season, as defined by prior work completed in several Oregon estuaries (van de Wetering *et al*. 2007). Because videography is not a method commonly used in Pacific Northwest streams and estuaries we provide a brief comparison of videography, fyke net trapping, hoop net trapping, and PIT tag advantages and disadvantages.

Fyke Net Trap Disadvantages - When using fyke net traps which are typically set at high slack tide, those fish that are captured in the trap will only be those fish that have utilized the habitat prior to the high tide. However, data from several of our Oregon sites show that a significant proportion of the fish that utilize tidal wetland channels enter during the ebb tide (see Figure 10 middle graphic). Standard fyke net trap methods therefore fail to account for fish use during half of the tidal cycle.

Fyke Net Trap Advantages - All fish captured can be counted, measured, weighed, and identified.

Hoop Net Trap Disadvantages – Hoop nets have variable efficiencies depending on the site sampled, the extent of tidal exchange and varying avoidance of the trap by different species. Hoop nets, by design, disrupt natural upstream and downstream migration, eliminating the ability to estimate migration patterns. Hoop nets are labor-intensive in larger channel systems and can be difficult to keep in place during higher velocity tidal periods.

Hoop Net Trap Advantages – Hoop nets can be deployed at multiple sites to capture fish migrating both upstream and downstream. Nets can target partial capture or full capture of available species. All fish captured can be counted, measured, weighed, and identified.

PIT Tag Technology Disadvantages – Fewer fish can be evaluated due to the time/labor required to mark fish. Smaller fish found early in the season are less likely to be of appropriate size to physically accept a tag, and more likely to exhibit abnormal behavior if oversized tags are used. Equipment is expensive and typically results in single site/transect evaluations. Maintenance of antennae within tidal habitats is labor intensive. Interpretation of data is also labor intensive.

PIT Tag Advantages – Individual fish can be tracked over long periods of time and their behaviors accurately described. When recaptures in nets or traps occur, growth rate data and other metrics can be obtained.

Videography Advantages – Fish behavior is not influenced by sampling method and not disrupted by partial tidal cycle sampling methods. All fish present (regardless of species) can be estimated, which results in a more complete understanding of full fish community behavior patterns. Equipment is relatively inexpensive, and multiple sites can be operated simultaneously. Data interpretation is straight forward and less labor intensive.

Videography Disadvantages – Sampling periods are typically limited to one day once a month across a few months, whereas PIT tag sampling typically is carried out for several weeks at a time. Results do not allow for interpretation of individual fish behaviors, but rather more broad population behavioral patterns.

Channel Morphology

Channel morphology measurements will be funded by NOAA. These data will be gathered at five transects in each of the fish study reaches. Emphasis will be placed on evaluating general scour and fill of the remnant channels as well as the effects of placed wood structures on recovery of the remnant channels. These data will be used to assist with the seine and videography analysis specific to available habitats with a focus toward low tide refugia.

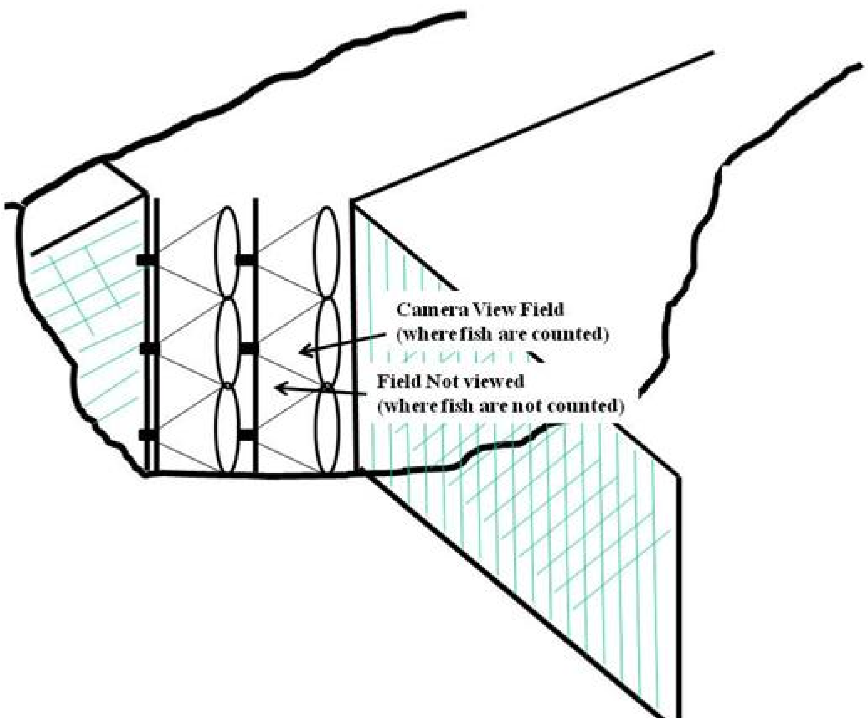
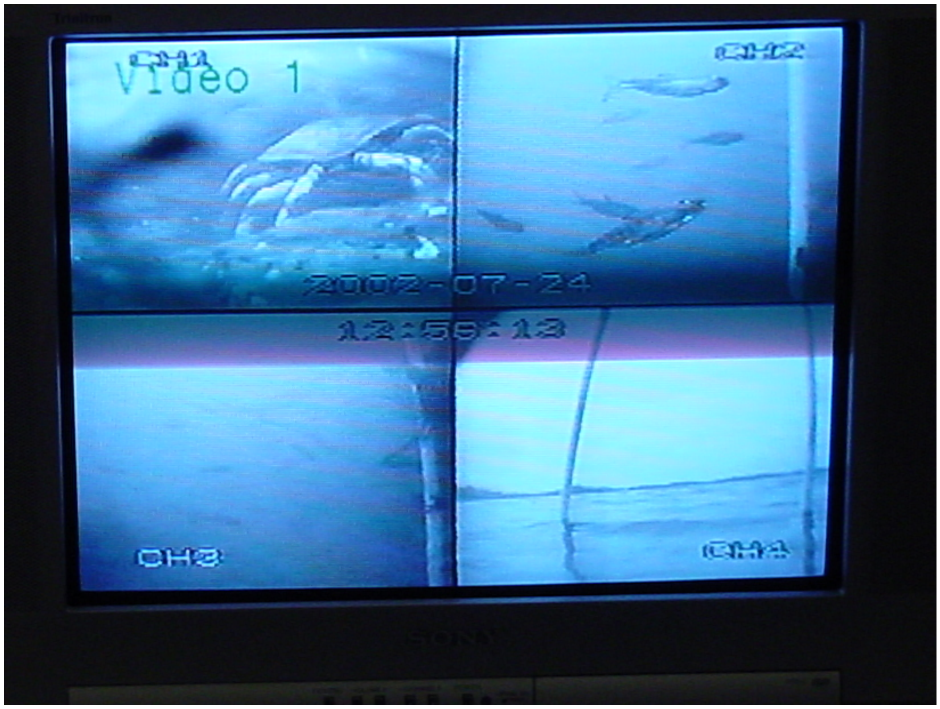


Figure 8. Top graphic shows example videography field setup. Bottom graphic depicts camera view fields used to count migrating fish as well as fyke nets used to direct fish into a narrow slot for camera viewing.



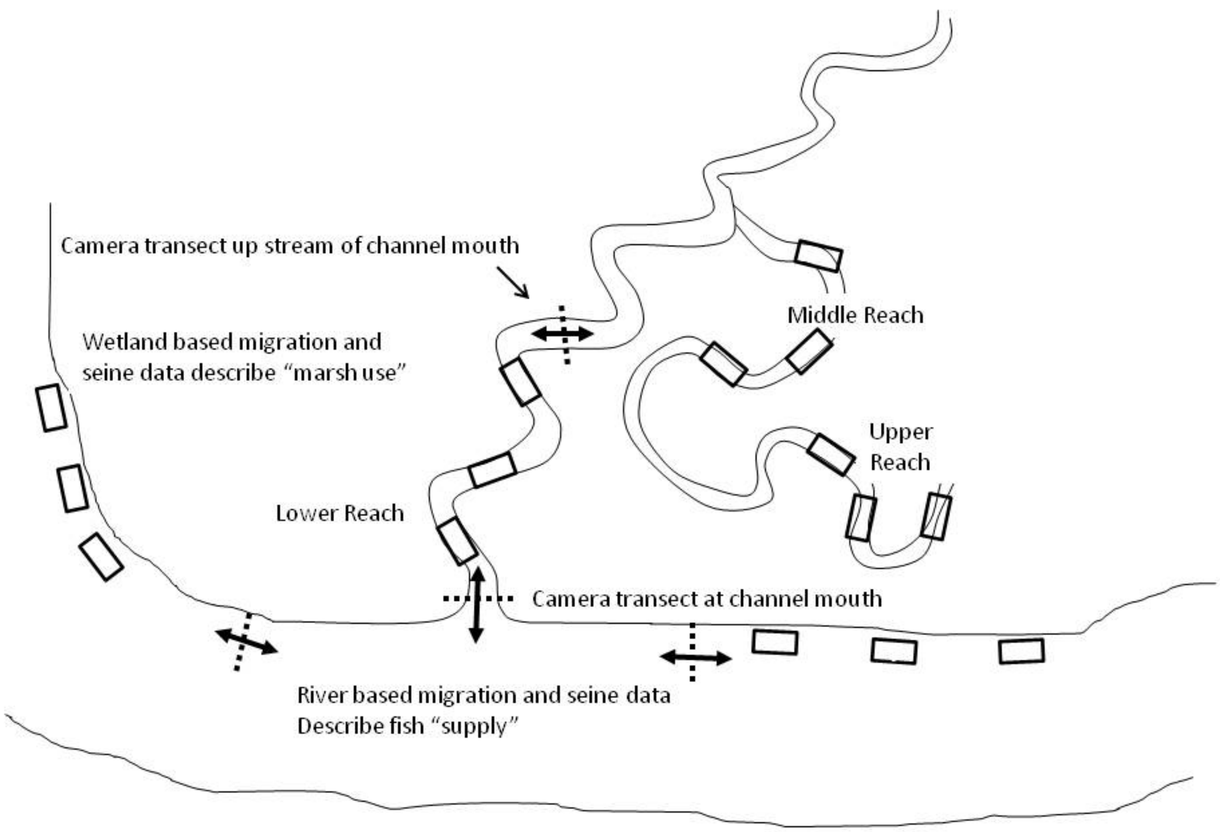
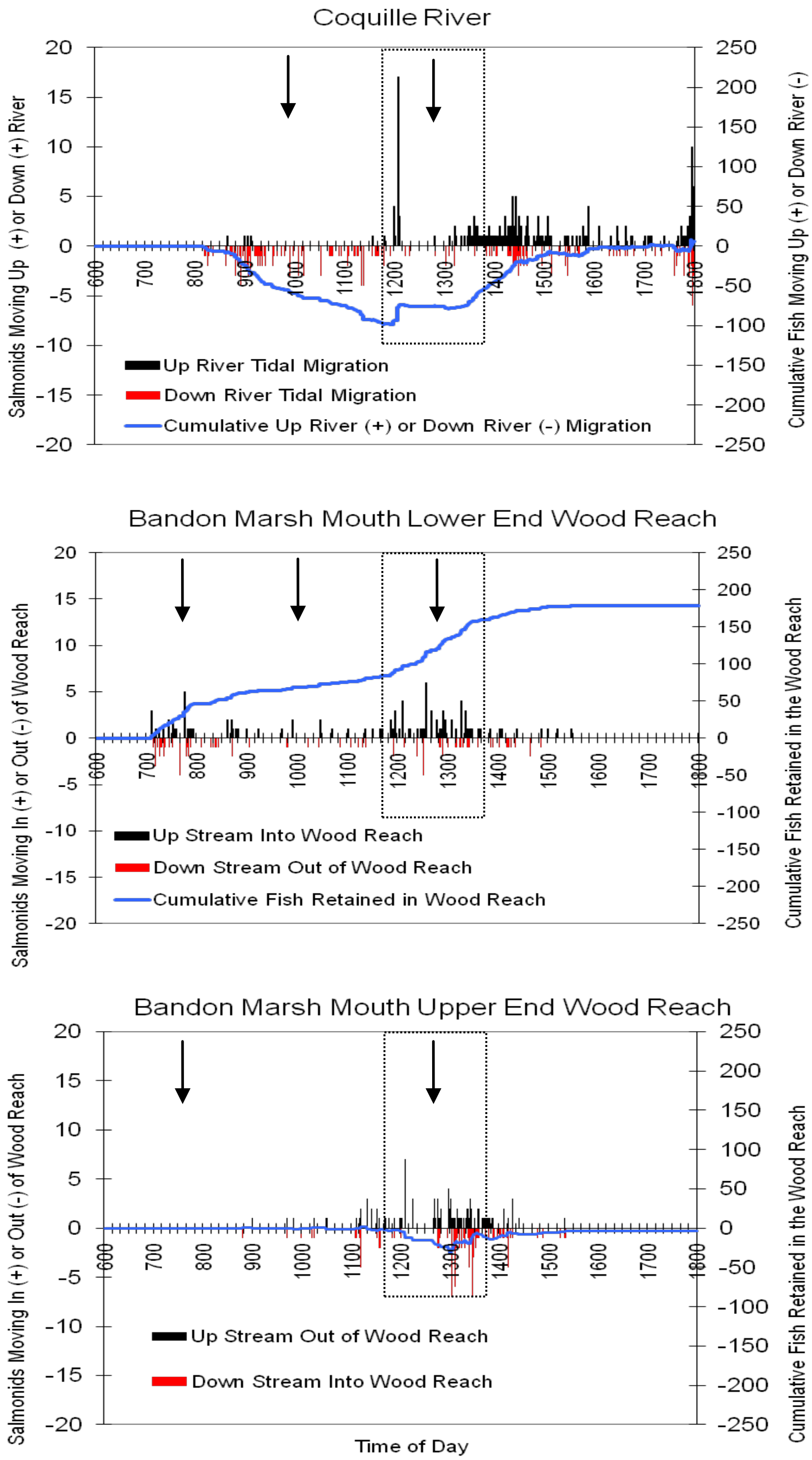


Figure 9. Top graphic is an example view of sampling data gathered using videography. The four views represent different cameras located at different water depths within the same sampling station. Bottom graphic represents typical sampling approach that combines river and wetland based sampling. Dotted lines with arrows represent video sampling of tidally migrating fish; boxes represent low tide seine sampling sites.



Top: Left arrow shows early migration down river followed by a shift to upriver migration (right arrow) during highlighted ebb tide period (box). This shows common up-current movement during feeding periods.

Top and Middle: As fish turn and migrate into the river's ebb tide to feed (top graph right arrow) more fish begin to leave the river and migrate into the ebbing tide at the mouth of the wetland channel at the lower end of the wood reach. In addition the unexpanded raw numbers suggest greater use of the wetland channel mouth habitat when compared to the mainstem river.

Middle: Early migration from the river into the wetland channel wood reach (left arrow) is followed by a "lull" (middle arrow) followed by a peak rate of entry (right arrow) and retention in the wooded reach during the highlighted ebb tide period(box). High retention equates to high rate of use of wood habitat as a source of low tide refugia.

Bottom: Limited migration upstream of the wood reach during both the early tide low activity period (left arrow) and the ebb tide peak activity period (right arrow and box) show concentrated use of the wood habitat and limited proportional entry into further upstream wetland habitats.

Figure 10. Raw tidal migration data patterns for the Coquille River (top), the mouth of a wetland channel where wood habitat was restored (middle) and the same channel upstream of the wood habitat (bottom).

Salmonid utilization of wood *vs.* non-wood habitats

Background

Utilization of large wood habitats will be measured to describe the success of re-establishing this more costly specific in-stream habitat type. Both seining (NOAA-funded) and videography will be used to sample wood and non-wood habitats. There will be wood-treated and non-wood treated reaches in both Blind and Nolan Sloughs.
Wood restoration will occur in a consistent pattern of wood and non-wood placement using repeated-length treatment and control sections within each designated reach. These will be evaluated as low tide refugia using seine sampling. Comparisons will be made between treated and non-treated habitats within each reach type (as defined by salinity, temperature and channel order) within each slough basin. Seine sampling will allow for the above analysis of fish use across woody and non-woody habitats during the low tide portion of the daily tidal cycle (e.g. Figure 11).

Evaluation of Wood Habitat Use by Fish Relative to Tidal Cycles

There will be an additional evaluation of wood habitat within the lowest reach of both Blind and Nolan Sloughs. Migration sampling will be used to measure movement into and out of channel mouth wood habitat reaches across the flood and ebb portions of the tidal cycle (Figures 9 and 10). The videography method will focus on our existing understanding of how fish utilize channel mouth reaches and how wood habitat can enhance that rate of use (Figure 11). Our channel morphology data will be used to describe how the wood has affected the available habitat in comparison to the reference wetland channel. Our before/after design will allow us to describe overall changes in migration patterns and use rates specific to the two restored channels, and by extension allow for an evaluation of the influence the wood structures have on tidal migration and low tide refugia. This second approach utilizes the same method above describing general marsh migration evaluation during a full tidal cycle. In order to evaluate the use of the target wood habitat reaches, there is simply a second migration sampling site placed at the upper end of the reach of interest (Figure 9).

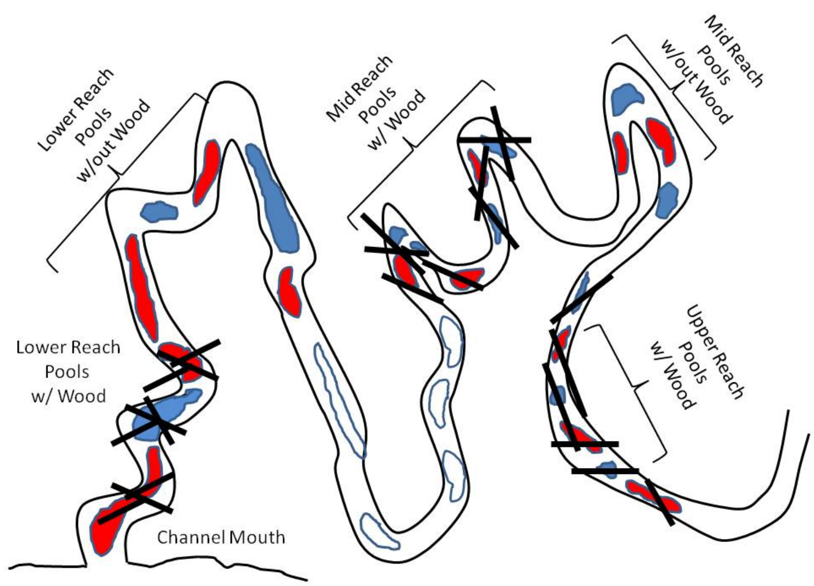


Figure 11. Diagram depicts NOAA-funded seine sampling study reaches and sampling site opportunities for wood and non-wood habitats constructed within a given treatment reach. Red, blue and open polygons represent available sampling units. Red polygons represent pools selected under proposed sampling scheme. Black lines represent wood habitat in channel.

Benthic macroinvertebrates

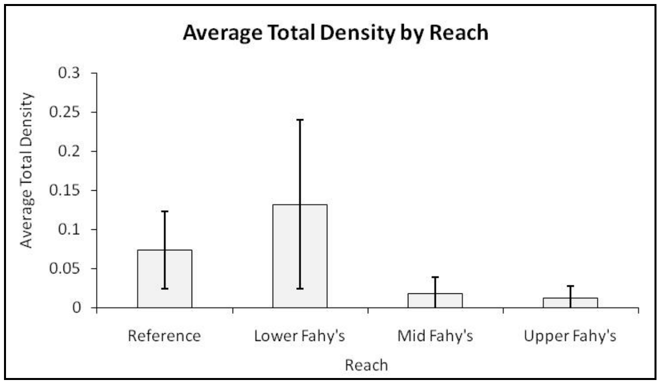
Benthic macroinvertebrate density and composition will be measured to describe the degree of success in re-establishing salmonid habitat opportunity and capacity, as well as the degree of success in re-establishing tidal channel habitat through improved hydraulic connection.

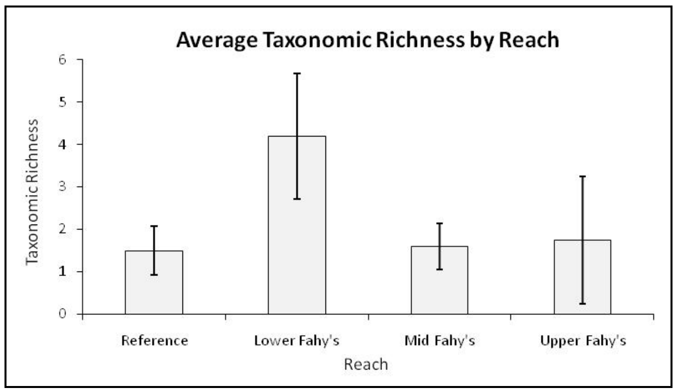
Background and Rationale

While plant communities in estuarine wetlands integrate environmental conditions such as soils, groundwater hydrology and elevation, invertebrate assemblages reflect an additional biological response to plant species composition and architecture and thus may reveal distinctions in ecosystem condition and function undetectable in the plant community alone. Using invertebrates as indicators represents a popular "litmus test" for determining ecosystem health and status. A variety of techniques have been widely applied to taxa in many different ecosystems (Carignan and Villard 2002). Wetland characteristics have been described using invertebrate indicators (Dufrene and Legendre 1997), and invertebrate communities are often compared among disturbed, restored and reference wetland sites (Craft *et al.* 2003; Zajac and Whitlatch 2001; Lerberg *et al*. 2000; Greenwood *et al*. 1991). Invertebrates are more closely controlled by bottom-up forces, so their integration of environmental variation and reaction to disturbance occurs on fine spatial scales (Carignan and Villard 2002). Macroinvertebrate response to salt marsh restoration is often used for ecological assessment protocols (Simenstad *et al*. 1991; Zedler 2001). Differences in site-specific taxa can reveal information about salt marsh condition and microhabitat differences (Cordell *et al*. 1998; Tanner *et al*. 2002). Invertebrate indicators and assemblage structure relate to physical characteristics such as plant composition, porewater depth and tidal flooding duration (Heatwole 2004), and can be used as reliable indicators of tidal marsh recovery status (Gray 2005).

The SFC project historically contained a gradient of habitats. Although tidal reconnection activities will occur across the full SFC project, we propose to use benthic macroinvertebrate sampling to characterize a subset of our fish monitoring reaches (Blind Slough mainstem, Blind Slough tributary, Nolan Slough, Wilson River, and Dry Stocking Island channel) to describe overall project rate of recovery. We have used a similar approach to examine habitat zones in diked former tidal wetlands and reference sites at Bandon Marsh National Wildlife Refuge (Brophy and van de Wetering 2012) (Figure 12).

Macroinvertebrates will be sampled from channel bottom cores gathered from fish monitoring reaches described in "Fish monitoring: Overview of sample design and methods" above and in Section M5 below. The reaches will be stratified based on anticipated post-implementation salinities, temperatures, and substrates. Sampling sites within strata will be randomly selected. At each site a grid will be placed over the channel bottom substrate. The grid will span the channel width, will be one channel width in length, and will be subdivided into 1 m^2 cells. Eight cells will be selected for core sampling from within each grid.





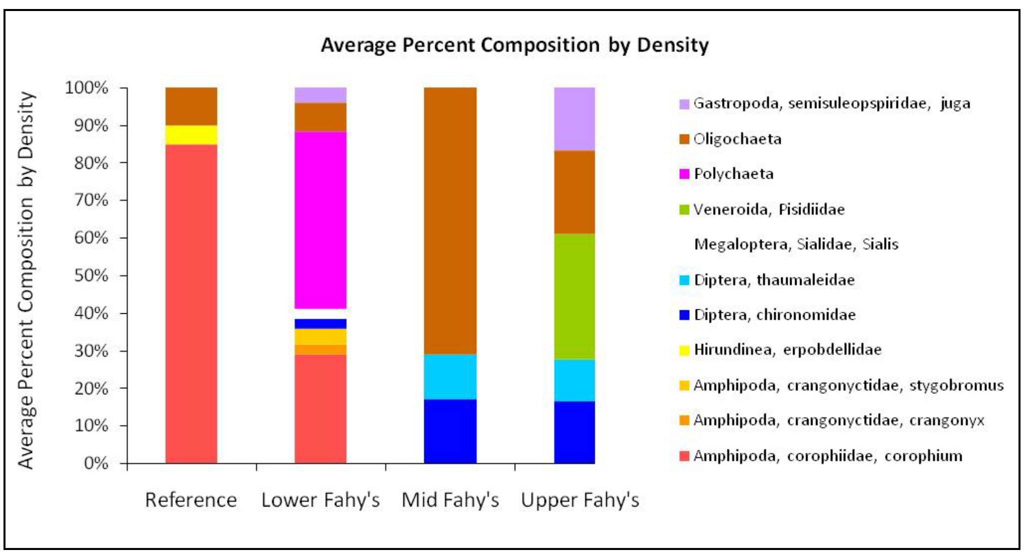


Figure 12. Example benthic macroinvertebrate data gathered during the pre-project phase at the USFWS Bandon Marsh tidal wetland restoration project. Note the differences in density, richness and composition when comparing the reference wetland to the wetland pasture prior to project implementation. These are a result of altered salinity, temperature and sediment patterns in the pasture.

M3	What are the project's monitoring objectives? Tie monitoring objectives to watershed restoration objectives. If effectiveness monitoring is proposed, provide a specific hypothesis or monitoring question.

In this section we provide the overall goals of the SFC project, the overall goals of effectiveness monitoring at the project, and the objectives associated with the specific monitoring parameters we are asking OWEB to fund: vegetation, soils, groundwater, fish use of habitats (tidal migration monitoring), and macroinvertebrates.

As stated in Tillamook County's proposal to the NOAA Restoration Center, the goals of the SFC project are to: 1) improve habitat for native fish and wildlife, 2) improve water quality and reduce sedimentation, 3) reduce flood hazards, and 4) enhance the overall ecological health of Tillamook Bay (Tillamook County 2013). The specific flood attenuation benefit the project is expected to provide is reduced flood elevation and duration along the City of Tillamook's highway 101 business corridor.

The SFC project proposal (Tillamook County 2013) highlighted four ecological benefits the project is expected to provide:

1. Increased habitat complexity and availability, including low and high tidal marsh, forested tidal wetland and tidal channels;
2. Increased target species use, including increases in both species distribution and density within the project area. Target species include Chinook salmon (fall and spring races), coho salmon, chum salmon, and coastal cutthroat trout;
3. Enhanced water quality – specifically, reductions in temperature and turbidity, and increases in dissolved oxygen – in reconnected and constructed tidal channels; and
4. Increased climate change resilience through re-establishment of natural sediment accumulation and accretion processes, maximizing the opportunity for the site's wetlands to keep pace with sea-level rise.

The overall goals of SFC effectiveness monitoring follow logically from the project goals and benefits described above. The effectiveness monitoring goals are:

1) To determine the degree to which the project meets its overall goals as listed above, including evaluation of the level of structural and functional ecosystem recovery taking place at the project site;
2) To help identify adaptive management needs (if any), and to provide data and interpretation to assist adaptive management if needed;
3) To provide the SFC project team with information that will be useful in communicating project results to funders, the scientific community, and the public;
4) To provide scientifically-sound data to help guide other similar projects and advance the understanding of estuarine wetland ecosystems; and to disseminate that information to other practitioners, resource managers, decision-makers, and scientists.

Monitoring objectives for vegetation monitoring: Quantify the post-implementation development of vegetation communities within the SFC project site (including non-native and invasive species) and assess their degree of similarity to vegetation within reference wetlands.

Parameters to be measured: Plant species richness; percent cover (including non-native and invasive species); distribution and extent of plant communities

Monitoring objectives for groundwater: Quantify post-implementation changes in groundwater hydrology and soil parameters that support wetland functions and organisms using tidal wetland habitat.

Parameters to be measured: Groundwater regime (shallow groundwater level), soil pH, soil salinity, soil % organic matter and carbon content.

Monitoring objectives for soils: Quantify post-implementation changes in soil parameters that support tidal wetland functions and organisms.

Parameters to be measured: Groundwater regime (shallow groundwater level), surveyed geodetic elevation of groundwater observation stations, surveyed geodetic elevation of surrounding wetland surface.

Monitoring objectives for tidal migration monitoring (fish use of project site and reference habitats in relation to tidal cycles): Describe population-level tidal wetland fish use patterns based on daily migration rates into and out of two typical SFC project site watersheds (Blind Slough and Nolan Slough) and one reference watershed (Dry Stocking Island).

Parameters to be measured: Fish movement (by species) into and out of wetland channels with and without large wood placements.

Monitoring objectives for macroinvertebrate monitoring: Describe the degree of success in restoring salmonid habitat opportunity and capacity, as defined by prey resource availability.

Parameters to be measured: Benthic macroinvertebrate density and taxonomic composition

M4	Describe in detail and provide the citation for the protocols that will be used.

Vegetation: We will follow protocols in Roegner *et al.* 2008, with one major adjustment: we will use stratified random sampling (completely randomized vegetation plots within each sample zones), rather than placing plots along systematically-placed transects. Within plots, we will conduct percent cover estimates as described in Roegner *et al*. 2008 – a standard method for tidal wetland monitoring (Simenstad *et al*. 1991, Callaway *et al*. 2001, Rice *et al*. 2005, Thayer *et al*. 2005) and vegetation monitoring in general (Elzinga *et al*. 1998).

Soils: Soil samples will be collected within stratified transects; 10 subsamples will be bulked to generate one sample per transect. Samples will be analyzed by the Oregon State University Central Analytical Lab following standard national protocols (USDA-NRCS 1996, Dane and Topp 2002, Sparks 1996). Analyses will include percent organic matter by loss on ignition, and pH and electrical conductivity of soil solution.

Groundwater: We will follow the standard national protocol for shallow groundwater level monitoring (U.S. Army Corps of Engineers 2005), as modified by Brophy *et al.* (2009) for use in tidal wetlands. We have used this technique at many other tidal wetlands in Oregon (Brophy 2009, Brophy et al. 2009, Brophy and van de Wetering 2012). Groundwater depth relative to the soil surface will be calculated and compared to tidal water levels, and relationships between groundwater levels and plant community composition will be determined using the clustered vegetation plots (Figures 5 and 6).

Salmonid tidal migration patterns: There are no established regional or national protocols for monitoring tidal wetland fish migrations through complete tidal cycles. PIT tag technology has been used but is expensive, time consuming and is limited by the size of fish that can be sampled (age 0+ fish are difficult to work with). Roegner *et al*. 2008 recommend seining or trapping but these methods do not allow fish to freely migrate into and out of tidal channels. A commercial statistics firm, Western Ecosystems Technology, Inc., (http://www.west-inc.com/) in conjunction with the Tribe, has developed statistical models to describe tidal migration patterns from data collected with the proposed method (Appendix 5). The model is used to predict salmonid movement, and predicts the magnitude of fish movement at each camera sampling transect using Poisson linear regression. The results are composed of an estimated migration behavior line with associated confidence intervals, allowing determination of any significant differences between migration patterns before and after project implementation. These methods have been used for several site evaluations to estimate migration rates in marsh and river channels across six Oregon estuaries (van de Wetering *et al*. 2007; additional unpublished data).

In-stream Habitat: The protocols will reflect those found in Roegner *et al*. (2008) and will be adapted to the SFC project site conditions. Emphasis will be placed on channel width, depth, substrate, presence of scour and fill, and channel bank morphology as measured by cross sectional data. Wood structure or absence thereof will be recorded.

Salmonid utilization of wood *vs.* non-wood habitats: Video sampling methods used to measure migration into and out of the channels will be used to estimate wood habitat use across a full tidal cycle. The protocols are those described above.

Benthic macroinvertebrate density and composition: The methods used for sampling macroinvertebrates are those recommended by Simenstad *et al*. (1991) in the Estuarine Habitat Assessment Protocol (EPA 910/9-91-037).

M5	Describe in detail the sampling design used to choose your sampling locations.

BACI design

Effectiveness monitoring will use a before-after/control-impact (BACI) sample design (e.g., Stewart-Oaten *et al.* 1986). Least-disturbed tidal wetland reference sites will be sampled to help evaluate the status of the project site and interpret trends in recovery trajectories of tidal wetland structure and function. Reference sites will represent both the habitat classes anticipated as shorter-term (5-15 yr) outcomes (e.g., low tidal marsh) and longer-term (50-100 yr) outcomes (e.g., high tidal marsh). Effectiveness monitoring will begin with pre-construction baseline data collection, followed by post-construction monitoring during the 2nd, 4th, and 6th years after project implementation is complete (Appendix 3). Additional data collection and analyses are recommended every five years thereafter.

Geographic Focus

Geographically, monitoring will focus on the 184 ha (455 acres) of pastures and lowlands being reconnected to tidal influence, including Nolan Slough and areas to the west (Figure 4). These areas are the central focus of the NOAA grant, and the vast majority of dike and tide gate removal work will occur here. Simultaneous monitoring will occur at two nearby reference sites (Figure 4).

As described in the abstract, the overall SFC project restores a total of 211 ha (521 acres). The additional 27 ha (66 acres) are located along Hoquarten Slough. Restoration on these 27 ha here will consist of a variety of actions (fill removal, channel reconnection, ditch filling) applied to four subsites 3-14 ha in size. The cost efficiency of monitoring these relatively small and disparate areas would be low, so we have focused our monitoring effort on the main contiguous project area as described above (Nolan Slough and areas west; Figure 4).

SFC Project Site and Stratified Random design

Sampling within the large SFC project area will be limited to wetlands, and will be stratified into separate sample zones to reflect differences in conditions across the site. Sampling for non-aquatic parameters (vegetation, groundwater, soils, accretion) will be randomized within these zones. Stratified random sampling is recommended in estuarine and other habitat monitoring because it allows greater ability to detect change over time by compartmentalizing the variability inherent in variable natural systems (Elzinga *et al*. 1998, Simenstad *et al*. 1991). A common approach is stratification by elevation zone, but based on initial reconnaissance and review of background data, elevations at the site appear to be quite homogeneous (that is, the site is quite flat). However, land use history differs markedly across the site. Below, we list the planned sampling strata (wetland sample zones); these are areas of relatively homogeneous land use history (Figure 4). Tides are currently blocked from all of these areas by dikes and tide gates.

SFC Project Site Wetland Sample Zones

- North Wetland Zone: Less-intensively-altered, freshwater wetland area to the north of Blind Slough. This area appears not to have been farmed (Tillamook County 2013), although it was probably grazed.

- Middle Wetland Zone: Abandoned pastureland to the north of Goodspeed Road and south of Blind Slough. This zone has been actively managed as pasture in the past, but it has many intact remnant channels, in contrast to the South Wetland zone.

- South Wetland Zone: Active pasture south of the centerline ditch, adjacent to the Trask River. This zone is heavily ditched and intensively managed.

- Nolan Slough Wetland Zone: Active pasture surrounding Nolan Slough. Ditching in this zone is intermediate between the South Wetland Zone and the Middle Wetland Zone.

SFC Fish Monitoring Reaches

- Blind Slough Mainstem: Blind Slough and its tributaries are the primary channel system for the North and Middle Wetland Zones. Prior to construction of the centerline ditch, the Blind Slough system It probably carried the majority of daily tidal flows into the South Wetland Zone as well, prior to construction of the centerline ditch and west end tide gates. Reconnection of Blind Slough to tidal exchange will drive recovery of wetland functions across much of the SFC site.

- Blind Slough Tributary: This tributary connects to Blind Slough just downstream of the Blind Slough Mainstem tide gates; it is also currently tide gated. It is representative of the mid-sized tidal channels that predominate in the Middle Wetland Zone. The upper reach of this tributary is ditched, and is representative of the ditched channels found in the South Wetland zone.

- Nolan Slough: This channel system drains the eastern third of the main SFC project area. Historically, the middle and upper reaches of the Nolan Slough channel system were surrounded by Sitka spruce tidal swamp (Hawes *et al.* 2006).

Least-disturbed Reference Sites

Prior to diking, in the mid to late 1800s, the SFC site was predominantly high tidal marsh; the easternmost portions of the site were tidal swamp (shrub/forested tidal wetland) dominated by Sitka spruce (Hawes *et al.* 2006). However, due to subsidence, low marsh is likely to form on the majority of the site during the initial years after project implementation. Least-disturbed reference sites that contain both low tidal marsh and high tidal marsh are therefore particularly appropriate for interpretation and analysis of SFC monitoring data. The low marsh reference data will provide a useful yardstick for evaluating the SFC site's initial recovery trajectory. Over the longer term, as accretion progresses, the site may return to its pre-disturbance wetland type (high marsh). High marsh reference data will allow evaluation of the site's progress towards this original wetland class.

Reference sites in geomorphic settings similar to the SFC site are most likely to provide useful information on effects of past site alterations, and interpretation of future biological and physical changes after project implementation. The SFC site's geomorphic setting within the Tillamook Bay estuary is characterized by a strong river flooding regime (high fluvial influence), high riverine sediment loads (Philip Williams and Associates, 2002), and a strong salinity gradient (Lee and Brown 2009). The site's position on the tidal marsh/tidal swamp ecotone is also of strong interest for re-establishment of native vegetation and for selection of reference sites.

Reference Site Wetland Sample Zones

- Dry Stocking Island: This site includes both low and high tidal marsh; each will constitute a separate sample zone. The island is located at the confluence of the Trask and Tillamook Rivers. Based on historic vegetation mapping (Hawes *et al*. 2006), it has expanded considerably since the mid- to late 1800s. Similar marsh expansion (progradation) has occurred throughout the Tillamook Bay estuary, due to the high sediment loads carried by the estuary's five major rivers (Philip Williams and Associates 2002, Ewald and Brophy 2012). A dike was constructed near or on the island in the late 1800s in an attempt to improve navigation in Hoquarten Slough (Coulton *et al*. 1996). The dike's exact location is not known, but it probably influenced sediment deposition in the area. Despite the historic actions to improve navigation, channels on the island itself appear to be undisturbed and were ranked in good condition by Ewald and Brophy (2012). Tidal inundation regime, salinity regime, and other controlling factors are likely to be very similar at this site and the adjacent SFC wetlands.

- Bay Marsh: This site lies west of the SFC project site, in a large marsh area that has accreted within the last century (Dicken 1961). It provides a low marsh reference for the SFC project, which will assist in interpreting the near-term restoration trajectory at the site.

- Goose Point: This site, 3 km north of the SFC site, was identified as a least-disturbed tidal marsh in the Tillamook Tidal Wetland Prioritization (Ewald and Brophy 2012). The site contains mature high marsh, providing useful reference for pre-disturbance conditions at SFC as well as the site's longer-term trajectory.

Reference Site Fish Monitoring Reaches

- Dry Stocking Island: This site's channels will provide useful reference for fish use, habitat conditions, and macroinvertebrate communities. Selection of monitoring reaches will occur during field reconnaissance in mid-October 2013.

- Wilson and Trask Rivers: Fish monitoring will also be conducted in the Wilson River and Trask Rivers. These rivers provide the "supply" of species for a tidal wetland; data from the river systems will be used to interpret fish monitoring results in the recovering wetlands.

Linked Monitoring of Biological and Physical Parameters

The SFC project's ecological goals include increased complexity and availability of tidal wetland habitats. To best evaluate this goal, our sample design ensures that monitoring of biological and physical characteristics will be tightly linked, both spatially and temporally. Vegetation will be intensively sampled in 200 to 300 plots, since it provides a strong indicator of wetland condition (Adamus 2006). Within a randomly selected subset of vegetation sample sites, we will measure physical drivers that are strongly associated with wetland functions and prioritized in regional and national monitoring guidance (Roegner *et al*. 2008, Thayer *et al*. 2005, Simenstad *et al*. 1991, Rice *et al.* 2005, Zedler 2001), including groundwater levels, soil organic matter content, and soil porewater salinity. Sediment accretion, which is strongly associated with climate change resilience (Cahoon *et al*. 2006), will be measured in the same locations as soil characteristics (Figure 4). This "co-location" of vegetation and physical conditions monitoring will allow analysis of the relationships illustrated in the ecosystem conceptual model (Appendix 4). In addition to allowing evaluation of project effectiveness, the tight links between biological and physical conditions in this monitoring plan will create a dataset that will be valuable in assessing the effects of climate change in the Tillamook Bay Estuary and along the Oregon coast.

Aquatic sampling design

NOAA-funded seine sampling will utilize a stratified systematic design focused on anticipated post-implementation salinity and water temperatures, channel order and wetland type, allowing for determination of linkages between fish use and other monitoring parameters. Tidal migration sampling will focus on the two larger key basins within the SFC project (Blind Slough and Nolan Slough). Other smaller basins exist within the project, but they offer less opportunity to evaluate the expected post-implementation habitat shifts. In addition, Blind and Nolan Sloughs offer the greatest opportunity to evaluate local stakeholder questions specific to agriculture and fish use, therefore maximizing information return for the monitoring investment. Tidal migration sampling will occur in May and June during peak juvenile salmonid use – with a focus toward smolting coho and Chinook (as opposed to steelhead, cutthroat trout, or chum salmon). The reference marsh, Blind Slough and Nolan Slough are positioned along an expected gradient of salinity and temperature in the mainstem Trask and Wilson Rivers (Figure 4). Fish migration sample sites for each of the three wetlands will occur within the first full channel width of a given tidal wetland channel mouth. The full channel will be sampled for migration as shown in Figure 7. Sample sites for the river reaches will be selected based on distance (two river channel widths) from the tidal wetland channel mouth. River video sampling will evaluate fish passage along the river bank extending 10 m toward the thalweg. Past sampling has shown there is a narrow band (<10m) of bank habitat, based on depth and velocity, that is utilized by migrating juvenile salmonids (van de Wetering Siletz River 2002, Coquille River 2013, unpublished). River sampling sites will occur upstream and downstream of each tidal wetland channel mouth evaluated.

Due to funding limitations, the prey resources/benthic macroinvertebrate sampling will be focused at the three tidal wetland channel mouth fish sampling sites to allow for combined analyses when considering fish migrations, low tide refugia, and wood habitat use. Additional samples will be collected from a Wilson River site as well as an internal

Blind Slough site. Sampling will be based on a random cell selection from within a grid and will occur within one channel width of the migration sampling sites.

M6	Describe how the information to be gathered augments existing available data.

Vegetation: Data will augment our team's studies at other tidal wetland restoration and reference sites (Brophy and van de Wetering 2012, Brophy *et al*. 2011, Brophy 2010, 2009a, 2009b, 2009c, 2007b, 2005a, 2005b, 2004; Brophy and Christy 2009, 2008). To date, no other site in Oregon offers an opportunity to track plant community changes at such a large site located on a rapid salinity gradient (Lee and Brown 2009) – the historic transition zone between tidal marsh and tidal swamp (shrub and forested tidal wetland) (Hawes *et al.* 2008). Vegetation data from the SFC project will be particularly useful to other practitioners because the site is currently dominated by reed canarygrass, yet prospects for reed canarygrass control are good, because much of the site is likely to have brackish soil salinities after project implementation. The salinity transition zone offers an excellent "test ground" to relate reed canarygrass control and survival to salinities, information that will be very useful to other practitioners in Oregon and across the Pacific Northwest.

Soils: Data on soils at SFC will augment our team's studies at other tidal wetland restoration and reference sites (Brophy and van de Wetering 2012, Brophy *et al*. 2011, Brophy 2009a, 2009b, 2009c), and will be compared to those projects' results. Again, the size and salinity gradient at the SFC site offer a valuable chance to improve our understanding of the role of soils in post-restoration vegetation trajectories and control of non-native invasive species. Soil salinities will be key to understanding reed canarygrass control at the SFC site, since recent evidence suggests that the salinity of the rooting environment, rather than surface water salinity, is most closely correlated to species distribution and spread (Janousek and Folger 2013).

Groundwater levels: Data will augment our team's studies at other tidal wetland restoration and reference sites (Brophy and van de Wetering 2012, Brophy *et al*. 2011, Brophy 2009a, 2009b;), and will be compared to those projects' results, as well as other Oregon outer coast sites such as the Miami River tidal wetland (Bailey 2011). The SFC site offers a unique opportunity to track re-establishment of groundwater hydrology regimes across a very large site located in a tidal, yet strongly fluvial setting (large river influence). No such data exist for Oregon.

Salmonid tidal migration patterns have been examined in a limited number of studies. These studies have mainly utilized PIT tag technology and mark-recapture data to describe general residence time (number of days), for small numbers of fish, within single estuarine zones such as smaller channel networks. Currently, there are no commonly accepted methods for examining tidal migration patterns into and out of whole tidal wetlands, for whole populations of juvenile salmonids. In part, tag technology is the limiting factor. Only recently have PIT tags that can be used on age zero salmonids become available. Tag receiver technology and variation in salt content of the shifting tide creates difficulty for those interested in studying juvenile salmonid migrations in salt marshes and other brackish tidal wetlands. In addition labor and equipment costs are high.

The method we propose has been used in prior restoration monitoring projects in the Siletz, Alsea, Yaquina, Nestucca, and Coquille estuaries (van de Wetering *et al*. 2002, 2007b; Brophy and van de Wetering 2013). In these projects we have been able to describe the juvenile salmonid population's *utilization* of the restoration *opportunity*. We have shown the fish population's truncated migration response to pre-treatment conditions around tide gates (abnormal velocities, tide heights and access). During post-implementation, we have shown population responses such as 1) fish entering the tidal wetland earlier in the tidal cycle and staying longer; 2) more fish utilizing the restored habitats; and 3) more feeding occurring at the mouths of the tidal wetland channels as ebb tide flushing rates increase. For a more extensive explanation, see van de Wetering *et al.* (2009).

Data on fish use of wood and non-woody habitats will augment our team's prior monitoring efforts by providing a new dataset of significant size. The partners for this project have restored wood to three other estuaries to date (van de Wetering *et al*. 2009, Brophy and van de Wetering 2013). All three projects received different wood placement types and different densities; all three projects occurred on significantly different landscapes. Development and assessment of large wood placements in tidal wetlands is still in its infancy. Large wood placement is typically expensive in estuarine restorations and often difficult to accomplish due to limited access by various types of equipment. The SFC project presents a unique opportunity in that there is a large volume of desirable wood available on site which can be placed by lower cost ground-based equipment - which creates an unusual cost efficient opportunity to restore and evaluate wood placements. The SFC project is also unique in that the restoration channels are blind channels not directly affected by freshwater stream flows associated with local upslope basins. This presents a new setting under which large wood restoration has not generally occurred or been monitored. The SFC project will significantly contribute to our understanding of the value of using wood placement in tidal wetland restorations that target juvenile salmonid habitat use.

Benthic macroinvertebrate density and composition will augment the very limited number of studies conducted in Oregon tidal wetlands to date (Gray 2005). Although macroinvertebrate density and composition has been used to determine extent of restoration in freshwater wetlands for several years, less information has been gathered for salt marsh wetlands (Ayesha Gray, Cramer Fish Sciences, Inc., Coos Bay, Oregon, personal communication, 2010). Researchers in the Pacific Northwest have been working to develop a database to assist practitioners in the use of macroinvertebrate community data analysis relative to reference and restoration sites. Our proposed work will increase this knowledge base and provide practitioners with an understanding of rate of recovery of salmonid habitat within a larger Oregon estuarine wetland network.

M7	Describe the quality control/quality assurance program for the project and who will be collecting your data.

All sampling will follow federally-approved and state-approved quality control procedures, where such procedures are available. Our protocols are identical to those used in projects with approved formal QAPPs (Quality Assurance Project Plans) (e.g., Brophy 2009), so the level of quality assurance is very high. There are no QAPPs developed for the field based fish sampling or habitat collection methods. QAPPs developed by EPA will used for macroinvertebrate identifications.

Data on vegetation, soils and groundwater will be collected by staff of the Estuary Technical Group at the Institute for Applied Ecology. Data on tidal migration and benthic macroinvertebrates will be collected by staff of the Confederated Tribes of Siletz Indians.

M8	Other than a final report to OWEB, how else will the monitoring data collected through this project be used?

Summary

Monitoring data from this project will provide guidance for other restoration projects throughout Oregon. Our team leads many of these restoration projects, so we have direct knowledge of the information needed. In fact, a recent practitioner survey showed that coastal restoration practitioners are very interested in obtaining monitoring results for the specific parameters we are monitoring (SSNERR 2009, 2007). **Many of these groups, such as watershed councils and other OWEB-funded groups, have limited technical and financial means. Our goal is to interpret and summarize our results in ways that will directly support their decisions.** We will maximize "real-time" dissemination of monitoring results through presentations to watershed groups, scientific meetings and conferences, and through daily informal contacts with our extensive network of restoration practitioners.

Kinds of information we will share, and how we anticipate it will be used

We will share all the data we collect; these data are listed in Methods above, and in the summary table in Appendix 2. Our outreach will focus on the relationships between the different kinds of data we are collecting. These relationships will provide "lessons learned" to inform decision-making for future restoration efforts. Examples of relationships include native *versus* non-native species dominance in areas with an altered groundwater regime (diked pasture), compared to areas with natural groundwater regimes (reference sites); soil characteristics in areas of reed canarygrass dominance; and groundwater fluctuation in areas with high versus low organic matter content. A few examples of potential applications are provided below.

Vegetation monitoring results will help practitioners successfully re-establish native vegetation in wetlands with low-brackish salinity regimes – common targets for restoration in Oregon. We will interpret our results to create simple, clear guidance for watershed councils and similar groups. For example, our results will help practitioners make decisions on the necessity for planting native tidal wetland species, the need for reed canarygrass control measures in brackish wetlands, and the soil and salinity conditions that support establishment of willows for wildlife habitat and reed canarygrass control. Because of its large size, the SFC project offers a valuable opportunity to generate answers to these practical questions faced by councils as they implement large wetland restoration projects.

Groundwater monitoring results will be used to help watershed councils and other practitioners understand the impact of diking on wetland functions, assisting their efforts to gain funding for tidal reconnection projects. We will also use our groundwater data to provide guidance on decisions like where to plant woody species, what species to plant, best methods for controlling invasives like reed canarygrass, and what to expect as vegetation develops at their tidal wetland projects. Groundwater results are very important for understanding plant community distribution, survival or non-survival of woody plantings, and post-implementation vegetation trajectory. We will form simple, action-ready stories that are understandable and usable by councils and their partners.

Soil monitoring results will be used along with vegetation data to help understand vegetation change and provide guidance on appropriate plantings for different salinity zones, appropriate control methods for invasive species, and climate change adaptation strategies. Practitioners across the Oregon coast are seeking information on appropriate locations and strategies for tidal swamp restoration, appropriate methods for reed canarygrass (RCG) control, and suitable management responses to future climate change and sea level rise scenarios. Through the outreach methods described below, we will provide our results to help with these decisions. For example, our past monitoring in the Siuslaw, Nehalem, and Columbia River estuaries (Brophy 2009; Brophy *et al*. 2011) showed that low soil salinities were associated with high woody cover, but also persistent cover of reed canarygrass and other non-native species. By contrast, at some least-disturbed sites (S63 on the Siuslaw, Y28 on the Yaquina – see Brophy 2009), soil salinities were in the brackish range, and cover of brackish-tolerant woody species was still high, but reed canarygrass cover was low. The SFC site and it associated reference sites will provide urgently-needed information linking soil salinity, groundwater, and dominance of native and non-native plants. Restoration practitioners at low-brackish restoration sites have expressed strong interest in using our results to inform their decisions on appropriate vegetation targets and management of invasive species.

Tidal migration and wood/non-wood habitat monitoring results will be used to provide a basic assessment of whether Oregon tidal wetlands provide more rearing value through sheer raw habitat volumes available to juvenile fish, or whether the food and energy produced in the tidal wetland itself has a greater downstream benefit to fish, regardless of whether they use the actual tidal wetland to rear. Fisheries policy leaders want to know how many fish a given tidal wetland restoration project is going to add to the overall basin population so that project costs can be supported. These are difficult estimates to make. Benefits from prior videography work in the Siletz, Nestucca and Coquille estuaries has resulted in step-wise adaptive management relative to restoration methods used and the best way to expend limited funds within a given restoration. Examples include our early work that suggested low tide refugia within a given marsh channel can significantly shift marsh use patterns – that is, fish can reside within a given marsh during the low tide period and in turn migrate out of the same marsh during the flood tide. This led to our early interest in placing wood in tidal wetlands to create scour holes and low tide refugia. In addition, videography has shown that large groups of juvenile fish will target wetland channel mouth habitats during the ebb tide, presumably to feed on food resources produced in the wetland and flushed out during ebb tide. This has led to an emphasis on restoration actions in the lower portions of tidal wetland channels – i.e. more wood placement in tidal wetland system channel mouths than further up system in smaller order reaches. Videography has also led to an improved understanding of specific life stages of various species that utilize tidal wetlands via daily migrations. For example, we do not observe large proportions of salmonid fry migrating to and from tidal wetlands within a given tidal cycle; instead, they remain within a wetland across several tidal cycles. Conversely when those same species reach larger sizes they complete greater levels of daily tidal migrations to and from smaller tidal wetlands and larger river habitats.

Another unique opportunity for data use under the present project includes that recapture of juvenile fish marked at the East Fork Trask River smolt trap. Fish are marked at this site daily and will provide a potential source of recaptures that can be analyzed for migration timing from the upper basin and evaluated for growth and survival. In addition, this trap and the data generated from it will provide an improved understanding of those fish available to utilize the restored marsh on any given study year.

Methods for information-sharing
The scientists who will coordinate and implement this monitoring program (Brophy and van de Wetering) are tightly connected to regional practitioner networks, and have demonstrated leadership in bringing science-based decision support tools to the coastal restoration community. Their past projects have had unusually high levels of collaboration and outreach involving local, state, and national groups, and achieving national recognition. Examples can be found in **References** below (e.g. Brophy *et al*. 2011, Brophy 2009, and Brophy 2004). These pre-existing collaborative relationships will "jump-start" the development of outreach activities and generate broad interest in results at the SFC project.

M9	What is the proposed schedule for the project?

This proposal requests OWEB funding for baseline monitoring of vegetation, soils, groundwater, tidal fish migration, and benthic macroinvertebrates in 2014. Details on timing for each parameter are contained in Section M2 above. See the monitoring timeline (Appendix 3) for the complete monitoring schedule. *For the clearest understanding of groundwater regime, groundwater monitoring should begin in March or April; starting groundwater monitoring later than April may reduce our ability to detect important site differences which are manifested mainly during the spring drying period.*

M10	How many years is this monitoring program going to be conducted?

OWEB funding is requested for the baseline year (one year only; 2014); see the project timeline (Appendix 3).

M11	How will the success of the project be determined?

[Note: OWEB staff has explained that Question M11 refers to the success of the monitoring project, not the success of the restoration project. We have followed that guidance below, but would be pleased to provide information on how we will use our monitoring results to determine the success of the restoration project.]

This monitoring project's success will be defined by four criteria:

1) Completion of data collection according to the timeline and methods described in this proposal;

2) Completion of interim and final reports meeting OWEB requirements; and

3) Successful outreach to the practitioner community *via* reports, presentations, and other formal and informal communications.

4) Successful use of monitoring data to facilitate adaptive management decisions by project managers.

M12	Provide a detailed description of project location, including location(s) where monitoring will occur. In addition, please provide geographic coordinates as described in the Section V Supplemental Information "Required Attachments" section of the application instructions, page 10.

Sampling locations are described in detail in Section M5 above and Figures 3 and 4. A project map is included (Figure 12), showing coordinates of the center of the project area.

Figure 12. Vicinity map, showing project coordinates (-123.878, 45.473).

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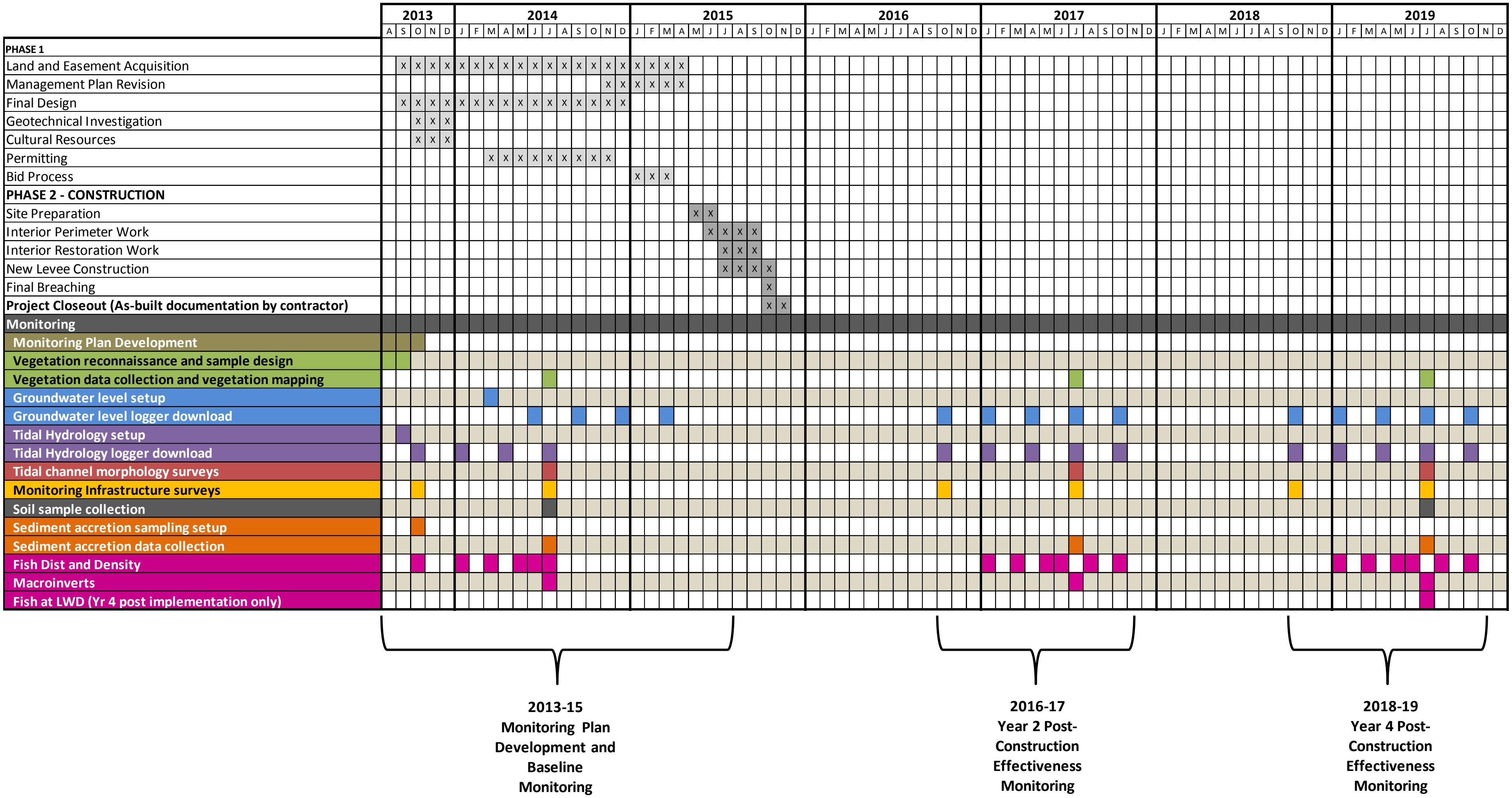
Appendix 2. SFC effectiveness monitoring summary

Parameter	Method/equipment	Frequency / timing	Sample locations*	Protocol citation(s)
On-site water level, temperature and salinity	Water level via Onset HOBO datalogger; temperature and salinity logger via Odyssey datalogger	Interval: 15min Duration: 1 year duration in baseline and yrs 2, 4 and 6 post-implementation	Blind Slough (inside and outside tide gates, and upper reach); lower and upper reaches of Blind Sl. Tributary; Nolan Slough mouth (inside tide gate); Wilson River at west end of SFC site; 2 reference sites	Roegner *et al*. 2008, Rice *et al.* 2005
Off-site water level, temperature and salinity	Water level, temperature and salinity logger (Solinst or equivalent)	Interval: 15min Duration: 5 yr starting after project implementation	Wilson, Trask and Tillamook Rivers, tidal marsh near SFC site, and mudflat west of SFC site	Vaughn Collins, personal communication 2013
Vegetation	% cover by species in randomly placed quadrats; plant community mapping by heads-up digitization on orthophoto base	1x/yr in baseline and yrs 2, 4 and 6 post-implementation	200-300 1 sq-m quadrats randomized within strata. Mapping: All wetland sample zones and reference sites (Figure 4)	Roegner *et al.* 2008
Groundwater level	Continuous water level logger (Onset HOBO) in shallow observation well (approx. 1m depth)	15min interval for 1 year in baseline and at least 1 month in summer of year 2; then re-evaluate for yrs 4 and 6 post-implementation	Co-located with a subset of approx. 14 random vegetation quadrats at project site site and high marsh reference sites	Sprecher 2000; Brophy 2009a, Brophy *et al.* 2011
Sediment accumulation/ vertical accretion	Sediment stakes and feldspar horizon markers	1X/year in baseline andyrs 2, 4 and 6 post-implementation	Co-located with a subset of approx. 37 random vegetation quadrats	Roegner *et al.* 2008; Cahoon and Turner 1989
Soil organic matter, pH and salinity	%OM by loss on ignition; conductivity and pH of soil solution via laboratory analysis.	1x/yr in baseline and yr 4 post-implementation	Co-located with a subset of approx. 37 random vegetation quadrats. 1 core bulked from 10 subsamples, from shallow root zone (upper 30cm)	Dane and Topp 2002; Sparks 1996
Tidal channel morphology	Survey rod and level, laser level, or RTK-GPS	1x/yr in baseline and yrs 2, 4 and 6 post-implementation	Selected portions of fish monitoring reaches	Roegner et al. 2008, Rice *et al.* 2005
Fish distribution and density	Low tide seine	1x/yr in baseline and yrs 2, 4 and 6 post-implementation	Fish monitoring reaches in Blind Slough, Blind Slough Tributary, Nolan Slough, and Dry Stocking Island; Wilson and Trask Rivers	Roegner et al. 2008; Van de Wetering *et al.* 2007
Juvenile fish tidal migration patterns	Video monitoring techniques	1x/yr in baseline and yrs 2, 4 and 6 post-implementation	Fish monitoring reaches in Blind Slough, Blind Slough Tributary, Nolan Slough, and Dry Stocking Island; Wilson and Trask Rivers	Roegner et al. 2008; Van de Wetering *et al.* 2007
Fish prey resources (benthic macroinvertebrates)	Sediment cores in dewatered ditch/tidal channel sediments	1x/yr in baseline and yrs 2, 4 and 6 post-implementation	Sampling sites adjacent to tidal channel cross-sections in fish monitoring reaches	Simenstad *et al.* 1991
Water quality	Grab samples: Hach Hydrolab datalogger (temperature, DO, salinity, pH, depth, turbidity)	During fish monitoring activities	In fish monitoring reaches	Roegner *et al.* 2008, OPSW 2001
Vertical control benchmarks	RTK-GPS or total station	Establishment in baseline year; re-survey in yrs 2, 4 and 6 post-implementation	To be determined; 4 locations on project site, 1 location at each reference site	Roegner et al. 2008, Smith 2010

* monitoring for all parameters will occur at the SFC project site and reference sites

Appendix 3. SFC project timeline, including timeline for all monitoring parameters. OWEB funding is requested for the baseline monitoring period only (2014). Year 6 monitoring is not shown, but will repeat the Year 4 timeline.



Appendix 4. Ecosystem conceptual model and relationship to monitoring parameters

The table below illustrates a simple ecosystem conceptual model for the SFC site. The table also shows the relationships between monitoring parameters and the conceptual model. A numeric code indicates which parameter(s) will be used to characterize each factor in the conceptual model (see key to codes at bottom of page).

Note that no relationship is implied by placement of particular model elements in the same row; for example, the alteration "tidal restriction" affects all controlling factors, not just tidal hydrology.

Alterations →	**Controlling → factors**	**Ecosystem → structures**	**Ecosystem → processes**	**Ecosystem functions**
Tidal restriction (dikes, tide gates) 1	Tidal hydrology 1	Emergent wetlands 2	Sediment accretion/erosion 4	Salmonid habitat 7
Ditching 6	Groundwater level 3	Shrub wetlands 2	Channel system development 6	Salmonid prey production 8
Grazing/veg manipulation 2	Water quality 1, 9	Forested wetlands 2	Plant community succession 2	Native vegetation support 2
Soil compaction 2 (elevation), 5	Water temperature 1, 9	Tidal channels 6		Organic matter production 5
Non-native and Invasive species 2		Soil characteristics 5		Sediment detention 4

Monitoring parameters:

1 = Tidal water levels, temperature and salinity (continuous dataloggers)
2 = Wetland vegetation (including elevation of each of 300 vegetation sample plots)
3 = Groundwater levels
4 = Sediment accretion/erosion
5 = Soil characteristics (% organic matter, pH, salinity)
6 = Tidal channel morphology
7 = Fish distribution, density, and tidal migration patterns
8 = Fish prey resources
9 = Water quality at fish monitoring sites (temperature, DO, salinity, pH, depth, turbidity)

Appendix 5. Behavioral Model Used to Generate Tidal Migration and Cumulative Retention Results

A behavior model is used to predict fish movement. The model predicts the magnitude of fish movement at an individual camera using Poisson linear regression. The model is used to adjust fish counts prior to the estimation of cumulative migration for a given site. Data from each site is fit to the behavior model. The data used in the model are composed of observations from each site. Each observation in the dataset represents the number of fish observed over a 30 min time period at one camera at one site. The response variables are the number of salmonids moving toward the habitat of interest plus the number of salmonids moving away from the habitat of interest. Each of these variables and their sum (movement) typically has a non-normal frequency distribution with many zeros.

A Poisson linear regression model is used to model the mean of fish movement. Since each observation is a count representing the sum of fish observed over a constant time interval (30 min) with a variable area sampled, the area sampled (ft^2) is used as an offset in the model.

The model for movement is specified as:

$$E(Y_i) = \mu_i = e^{x\beta}$$

where Y_i is the observed count of the i^{th} observation and assumed to be distributed Poisson (μ_i), μ is the mean of the Poisson distribution, X is the vector of covariate patterns, and β is the vector of model parameters (Dobson, 2002). The effect of the predictor variables on the count is then modeled through a log link function.

The predictor variables available for the model are: camera depth, velocity, total depth, and distance to bank.

Model selection

Many combinations of predictor variables are fit in the multivariate linear models. AIC ranking is used to select the final model for each site. See below example model for South Slough data (2007).

$\text{Log}(Count)_{\mathbf{upper}} = \beta_1 + \beta_2 Velocity_i = -3.54 - 0.32(Velocity_i)$
$\text{Log}(Count)_{\mathbf{middle}} = \beta_1 + \beta_2 Velocity_i + \beta_3 Dbank_{\mathrm{i}} = -1.48 + 0.54(Velocity_i) - 0.18(Dbank_{\mathrm{i}})$
$\text{Log}(Count)_{\mathbf{lower}} = \beta_1 + \beta_2 Velocity_i + \beta_3 Camdepth_{\mathrm{i}} = 4.55 + 1.72(Velocity_i) - 1.36(Camdepth_{\mathrm{i}})$.

The effect of the predictor variables on the count is evaluated using the Wald statistic. The magnitude and sign of the parameter estimate is used to interpret the coefficient, i.e. positive coefficients indicate increased predictor values and are associated with increased counts. Extra Poisson variation is estimated by the model deviance.

Use of Model Predictions

The Poisson model of fish movement predicts the magnitude of movement based on camera characteristics. Predictions from this model are used to compare fish movement throughout the tidal cycle. We calculate the predicted count by exponentiation of the linear predictor of this model. The predicted count at a camera is calculated for use as the weight in calculating weighted averages across the cameras in operation at a site for each time period.

The estimate of average retention for a site and time period is calculated as the weighted average across all cameras in the water during that time. Retention is calculated as the difference between fish moving into the habitat of interest and fish moving out of the habitat of interest. The weighted average gives equal weight to fish individuals so cameras with higher predicted movement are weighted more in the average. The weights sum to one for all cameras in the water at a site and time period. Cumulative passage is estimated for each time period as the sum of the average passage for the previous time periods.

The variance of average passage is estimated using a bootstrap resampling approach. This method assumes the variance in the population is equivalent to the variance in the sample (Manly, 1997) and resamples data from the sample to get an estimate of the sample variance. We select 1000 samples with the same number of observations as in the original dataset. For every sample, we refit the behavior model, predict movement for every observation, calculate weights based on the predicted values, calculated the weighted averages of passage for each site and time, and calculate the cumulative passage estimates. The 2.5 and 97.5 percentiles of the 1000 cumulative passage estimates for each site and time period are taken as the 95% confidence interval for the observed cumulative passage.

Appendix 6. Cost details, Southern Flow Corridor Baseline Effectiveness Monitoring – Baseline

Section 1. Estuary Technical Group, Institute for Applied Ecology

Task	Staff	Unit rate	# Units	Cost
Vegetation monitoring				
Field sampling	Senior Scientist	121.00	22.7	$2,741
	Staff Scientist	35.00	182.7	$6,395
Data analysis and reporting	Senior Scientist	121.00	37.8	$4,568
	Staff Scientist	35.00	130.5	$4,568
			Task total	**$18,272**
Vegetation mapping				
Field mapping/ground truthing	Senior Scientist	121.00	12.7	$1,542
	Staff Scientist	35.00	18.9	$661
Data analysis and reporting	Senior Scientist	121.00	21.2	$2,570
	Staff Scientist	35.00	73.4	$2,570
			Task total	**$7,342**
Groundwater level dynamics				
Field sampling	Senior Scientist	121.00	19.7	$2,380
	Staff Scientist	35.00	272.0	$9,522
Data analysis and reporting	Senior Scientist	121.00	49.2	$5,951
	Staff Scientist	35.00	170.0	$5,951
			Task total	**$23,804**
Soil pH, salinity, and organic matter				
Field sampling	Senior Scientist	121.00	4.8	$581
	Staff Scientist	35.00	66.4	$2,323
Data analysis and reporting	Senior Scientist	121.00	12.0	$1,452
	Staff Scientist	35.00	41.5	$1,452
Expenses: Lab analysis	$23.50 per sample X 37 samples	23.50	37.0	$870
			Task total	**$6,678**

Appendix 5 (continued). Cost details, Southern Flow Corridor Baseline Effectiveness Monitoring – Baseline

Section 2. Confederated Tribes of Siletz Indians

Task	Staff	Unit rate	# Units	Total cost
Benthic Macroinvertebrate monitoring				
Scoping and site selection	Biologist	62.53	19.1	$1,193
	Technician	28.73	19.1	$548
Field sampling	Biologist	62.53	19.1	$1,193
Statistical analysis	Analyst	100.00	19.1	$1,907
Reporting	Biologist	62.53	28.6	$1,789
Expenses: Benthic core analysis (lab fees)	$350 per core X 40 cores	350	40	$14,000
			Task total	**$20,629**
Tidal migration monitoring				
Video monitoring (onsite)	Biologist	62.53	83.4	$5,217
	Technician	28.73	83.4	$2,397
	Aide	25.35	83.4	$2,115
Lab analysis of video data	Technician	28.73	547.1	$15,719
Statistical analysis	Analyst	100.00	38.1	$3,814
Reporting	Biologist	62.53	95.4	$5,963
			Task total	**$35,226**

Section IV

WATERSHED MONITORING BUDGET

IMPORTANT: Read the application instructions. Add additional lines, if necessary

Totals automatically round to the nearest dollar

	A	B	C	D	E	F
Itemize projected costs under each of the following categories:	**Unit Number**	**Unit Cost**	**In-Kind Match***	**Cash Match Funds***	**OWEB Funds**	**Total Costs**
	(e.g., # of hours)	(e.g., hourly rate)				(add columns C, D, E)
PROJECT MANAGEMENT. Includes *actual in-house staff or contractors* who coordinate project implementation. Line items should identify who will be responsible for project management and their affiliation.						
Rachel Hagerty, Tillamook Estuaries Partnership: reporting, project mgmt., liaison with Tillamook County	60	36.4			2,184	2,184
						0
SUBTOTAL (1)			0	0	2,184	2,184
IN-HOUSE PERSONNEL. Includes *only* actual in-house staff costs for project implementation						
						0
						0
SUBTOTAL (2)			0	0	0	0
CONTRACTED SERVICES. Labor, supplies, and materials to be provided by *non-staff* for project implementation.						
Estuary Technical Group (ETG):						
Vegetation monitoring		see cost			18,272	18,272
Vegetation mapping		details			7,342	7,342
Groundwater monitoring		(Appendix 6)			23,804	23,804
Soils monitoring					6,678	6,678
Sediment accretion				5,251		5,251
Confederated Tribes of Siletz Indians (CTSI):						
Tidal migration monitoring		see cost			20,629	20,629
Prey resources (macroinvertebrates)		details			35,226	35,226
Fish presence, abundance, diversity		(Appendix 6)		21,749		21,749
SUBTOTAL (3)			0	27,000	111,951	138,951
TRAVEL. Mileage, per diem, lodging, etc. Must use current State of Oregon rate.						
						0
						0
SUBTOTAL (4)			0	0	0	0
SUPPLIES/MATERIALS. Refers to items that typically are "used up" during the project. Costs to OWEB must be directly related to on-the-ground work.						
						0
						0
						0
SUBTOTAL (5)			0	0	0	0
PRODUCTION. Design, video production, printing, direct mail, film developing, etc.						
						0
						0
SUBTOTAL (6)			0	0	0	0
EQUIPMENT. List equipments costing **$250 or more per unit**. Useful life of equipment is for duration of project and will be used only for this project. Identify any portable equipment (items with useful life of generaly 2 years or more). Must be property of a governmental entity, tribe, watershed council, SWCD, institution of higher learning or school district.						
Boat and trailer (ODFW loan)			5,000			5,000
ATV loan from farm operator			800			800
SUBTOTAL (7)			5,800	0	0	5,800

	A	B	C	D	E	F
Itemize projected costs under each of the following categories:	**Unit Number**	**Unit Cost**	**In-Kind Match***	**Cash Match Funds***	**OWEB Funds**	**Total Costs**
	(e.g., # of hours)	(e.g., hourly rate)				(add columns C, D, E)
[Add all subtotals (1-7) from above] CATEGORY TOTALS (8)			5,800	27,000	114,135	146,935
FISCAL ADMINISTRATION. Not to exceed **10% of Category Totals (8) Funds.** Compute by multiplying by 0.10 or less. Costs associated with accounty; auditing (fiscal management); contract management (complying with the terms and conditions of the grant agreement); and fiscal reporting expenses <u>for the OWEB project</u>, including final report expenses (e.g., film developing) for the grant.						
Tillamook County fiscal administration (10% of OWEB fund total)					11,413	11,413
FISCAL ADMINISTRATION TOTAL (9)			0	0	11,413	11,413
BUDGET TOTAL **Totals automatically round to the nearest dollar**						
BUDGET TOTAL (10) **[Add Category Totals (8) and Fiscal Total (9)]**			5,800	27,000	125,548	158,348

* The totals for these two columns must mirror the match totals provided in Section II(5) of the application and on the attached Match Funding form (Attachment A).

ATTACHMENT A

MATCH FUNDING FORM

Document here the match funding shown on the budget page of your grant application

<u>OWEB accepts all non-OWEB funds as match</u>. An applicant may <u>not</u> use *another OWEB grant* to match an OWEB grant; this includes ODA Weed Board projects because they are funded through OWEB grants. However, an applicant who benefits from a pass-through OWEB agreement with another state agency, by receiving either staff expertise or a grant from that state agency, <u>may</u> use those benefits as match for an OWEB grant. (Example: A grantee <u>may</u> use as match the effort provided by ODFW restoration biologists because OWEB funding for those positions is the result of a pass-through agreement).

At the time of application, match funding for OWEB funds requested does not have to be *secured*, but you must show that <u>at least 25% of match funding has been *sought*</u>. On this form, you do not necessarily need to show authorized signatures ("secured match"), but the more match that is secured, the stronger the application. Identify the type of match (cash or in-kind), the status of the match (secured or pending), and either a dollar amount or a dollar value (based on local market rates) of the in-kind contribution.

If you have questions about whether your proposed match is eligible or not, see Allowable Match document in OGMS http://apps.wrd.state.or.us/apps/oweb/fiscal/nologin.aspx under Monitoring application or contact your local OWEB regional program representative (contact information available in the instructions to this application).

Project Name: Southern Flow Corridor Effectiveness Monitoring - Baseline Applicant: Tillamook County

Match Funding Source	Type (√ one)	Status (√ one)*	Dollar Value	Match Funding Source Signature/Date*
NOAA (see attached award letter)	☒ cash ☐ in kind	☒ secured ☐ pending	$25,000.00	See Attachment
ODFW (boat loan)	☐ cash ☒ in kind	☒ secured ☐ pending	$5,000.00	[signature]
Chad Allen (ATV loan)	☐ cash ☒ in kind	☒ secured ☐ pending	$800.00	[signature]
	☐ cash ☐ in kind	☐ secured ☐ pending		
	☐ cash ☐ in kind	☐ secured ☐ pending		
	☐ cash ☐ in kind	☐ secured ☐ pending		
	☐ cash ☐ in kind	☐ secured ☐ pending		
	☐ cash ☐ in kind	☐ secured ☐ pending		

* **<u>IMPORTANT</u>:** If you checked the "Secured" box in the Status Column for any match funding source, you must provide <u>either</u> the signature of an authorized representative of the match source in the final Column, <u>or</u> attach a letter of support from the match funding source that specifically mentions the dollar amount you show in the Dollar Value Column.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

June 26, 2013

Ms. Debbie Clark
Tillamook County
201 Laurel Ave
Tillamook, OR 97141-2311

Re: Southern Flow Corridor - Landowner Preferred Alternative (SFC)

Dear Ms. Clark:

Thank you for submitting an application for funding consideration to the NOAA 2013 Coastal and Marine Habitat Restoration Project Grants Federal Funding Opportunity (FFO). I am pleased to inform you that the project referenced above has been sent to NOAA's Grants Management Division (GMD) with the NOAA Restoration Center's (RC) recommendation for funding in 2013. The award has been recommended at $242,000 with up to $2,458,000 available in future years, as discussed with you during proposal negotiations.

The RC received nearly 150 proposals requesting more than $190 million over three years. All eligible applications were evaluated according to the procedures and criteria outlined in the Federal Funding Opportunity announcement. The RC anticipates awarding approximately $10.4 million to 19 high priority multi-year habitat restoration projects in 2013, including the one referenced above. After NOAA GMD notifies you that you have received an award using email and our Grants Online award management system, your RC Technical Monitor and I will be in touch to "orient" you to NOAA grants and monitor your progress towards your self-identified milestones.

Next year, I will reach out to you to discuss your anticipated funding needs. Funding decisions for 2014 will be made based on the availability and intent of funds provided by Congress; each grantee's performance, including progress towards milestones; each project's demonstrated need for funds; an award's continued relevance to program objectives as stated in the FFO; and any Special Award Conditions appended to your award. It is highly uncertain whether all remaining funding needs for the 2013 awards can be accommodated in 2014 and 2015.

Thank you for your efforts to restore habitat important to coastal and marine species; I look forward to working with you. Please remember this letter does NOT confirm receipt of an award. Only the email notification from the NOAA GMD does that. Please contact me (melanie.gange@noaa.gov, 301-427-8664), or your technical monitor if you have any questions.

Sincerely,

Melanie L. Gange

Melanie L. Gange
Federal Program Officer,
NOAA Restoration Center

ATTACHMENT B

PUBLIC RECORD CERTIFICATION

OWEB

Oregon Administrative Rule 695-005-0030(4) states that "All applications that involve physical changes or monitoring on private land must include certification from the applicant that the applicant has informed all landowners involved of the existence of the application and has also advised all landowners that all monitoring information obtained on their property is public record. If contact with all landowners was not possible at the time of application, explain why."

INSTRUCTIONS: **All applicants must complete Part One. In Part One, if you check the first box, skip Part Two and sign and date in the signature box below. If you check the second box, you must complete Part Two and sign and date in the signature box below.**

PART ONE

☐ Public land only (STOP: go to signature box and complete)

☒ Private land only, or a mix of public and private land (complete Part Two and sign and date in the signature box)

PART TWO

☒ I certify that I have informed all participating private landowners involved in the project of the existence of the application, and I have advised all of them that all monitoring information obtained on their property is public record.
The following is a complete list of all participating private landowners.

1. Ron Jones
2. Greg Hublou
3. Tillamook County Pioneer Museum
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

☐ I certify that contact with all participating private landowners was not possible at the time of application for the following reasons:

Furthermore, I understand that should this project be awarded, I will be required by the terms of the OWEB grant agreement to secure cooperative landowner agreements with all participating private landowners prior to expending Board funds on a property.

APPLICANT/CO-APPLICANT SIGNATURE

Mark Labhart Applicant Signature	10-28-13 Date
Mark Labhart Print Name	Chair, Board of Commissioners Title
Co-Applicant Signature	Date
Print Name	Agency

Congress of the United States
Washington, DC 20510

February 15, 2013

Dr. Jane Lubchenco
Administrator, National Oceanic and Atmospheric Administration
1401 Constitution Avenue, NW
Room 5128
Washington, DC 20230

Dear Dr. Lubchenco,

We are writing in support of Tillamook County's Wilson-Trask Wetland Restoration project grant application for Coastal and Marine Habitat Restoration with NOAA's Marine Habitat Restoration Center.

This wetland restoration project has multiple benefits. First, the work proposed will result in substantial reductions in flood elevations within the adjoining commercial, residential and agricultural areas. Secondly, with over 500 acres proposed for restoration, this project results in one of the largest wetland restoration projects in the northwest, benefiting all species of salmonid, as well as other fish and wildlife that utilize the estuary.

In 2007, former Governor Ted Kulongoski designated flooding in central Tillamook County as an Oregon Solutions project. Under the community governance model, Oregon Solutions brings together federal, state and local government agencies with community leaders to seek solutions. With over 30 partners, including city, county, and state officials, local farmers, and representatives from each of our offices, this multi-year planning project has identified challenges concerning flooding and collaborative solutions.

The Wilson-Trask Wetland Restoration project is a community driven project with a history of collaborative work that will help assure its success. We support this project and ask for your full and fair review of it.

Sincerely,

Ron Wyden United States Senator	Jeff Merkley United States Senator	Kurt Schrader Member of Congress

JOHN A. KITZHABER, MD
Governor

February 5, 2013

Re: Wilson/Trask Wetland Restoration
AKA Southern Flow Corridor

To Whom It May Concern:

As we look toward the future of habitat restoration, projects which are community-driven and the result of collaborative efforts will be the most successful. In the Tillamook Bay Basin, a federally designated "bay of national significance," we have such a project.

In 2007, former Governor Ted Kulongoski designated flooding in central Tillamook County as an Oregon Solutions project. Under the community governance model, Oregon Solutions brings together federal, state and local government agencies with community leaders to seek solutions. With over 30 partners, this multi-year planning project has resulted in a project known as the Wilson/Trask Wetland Restoration.

In evaluating projects, Oregon Solutions realized that this project not only had the best flood reduction benefits but that it also provided amazing environmental benefits. With over 500 acres proposed for restoration, this project results in one of the largest wetland restoration projects in the northwest, benefiting all species of salmonid as well as multiple other fish and wildlife that utilize the estuary. All of this while also resulting in substantial reductions in flood elevations within the adjoining commercial, residential and agricultural areas. When evaluating projects through the economic, social and environmental filters, this project is a win-win on all counts.

As a representative of the people of Oregon, a state known for its strong environmental ethos and collaborative approach to solving challenges, I am proud to support this project and strongly encourage NOAA's funding of this grant application.

Sincerely,

John A. Kitzhaber, M.D.
Governor

JAK:gw/lrh

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Tillamook County Oregon Solutions Project

OREGON SOLUTIONS

Co-Conveners:
Oregon State Senator Betsy Johnson
Tillamook County Commissioner Mark Labhart

Congressional Representation:
- Senator Wyden's Office
- Congressman Schrader's Office
- Senator Merkley's Office

Oregon State Representative Deborah Boone
Tillamook County
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
NOAA's National Marine Fisheries
Oregon Watershed Enhancement Board
Oregon Farm Bureau
Oregon Department of Fish and Wildlife
Oregon Economic & Community Development Department
Oregon Department of Forestry
Oregon Department of Transportation
Department of Environmental Quality
Economic Revitalization Team
Trust for Public Lands
Department of State Lands
Department Of Land Conservation and Development
Tillamook County Emergency Management
City of Tillamook Mayor
Tillamook City Manager
Tillamook Bay Habitat and Estuary Improvement District
Tillamook Bay Community College
Tillamook County General Hospital
Tillamook Economic Development Council
Tillamook County Soil & Water Conservation District
Tillamook Estuaries Partnership
Port of Tillamook Bay
Tillamook County Creamery Association
Hwy 101 Business Owner Representative
Farming Community Representative
Local Fishing Guide Representative

January 25, 2013

Re: Wilson-Trask Wetland Restoration
AKA Southern Flow Corridor

To Whom It May Concern:

With passage of Oregon's Sustainability Act in 2001, the Governor's Office launched the Oregon Solutions program. Flooding in central Tillamook County was designated by Governor Ted Kulongoski as an Oregon Solutions project in April, 2007.

Under the community governance model, Oregon Solutions brings together federal, state and local government agencies with community leaders to seek solutions. The Declaration of Cooperation signed by all the Tillamook project participants identified in the left margin of this letter, seeks to reduce flooding and its adverse impacts while incorporating environmental, social and economic values.

Until this collaboratively-developed project came along, the notion that restoring natural flood plain functions would reduce flooding, was viewed with local skepticism. However, this project not only results in one of the largest habitat and wetland restorations in the northwest, but it also creates substantial reductions in flood elevations within the adjoining commercial, residential and agricultural areas.

On behalf of the Tillamook County Oregon Solutions participants, we strongly endorse our capstone project and urge your financial support.

Sincerely,

Betsy Johnson
Oregon State Senator

Mark Labhart
Mark Labhart, Chair
Tillamook County Commissioner

Rick Klumph
Rick Klumph
Oregon Department of Fish and Wildlife
Chair, Oregon Solutions Design Team