212-2044

OWEB
Grant Cycle Date
OCT 17 2011
Received By
OWEB
OCT 17 2011

APPLICANT INFORMATION

Type the information for Sections I and II.

Name of project: Coho life history in tide gated lowland coastal streams

OWEB funds requested: $148,962.00 **Total cost of project**†: $308,114.00

† *This dollar amount refers only to the total cost of the technical assistance activity, and does not include the subsequent planned restoration work.*

Project location:

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

Watershed Name(s)	County or Counties
Coos	Coos

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
T24S, R13W, S. 24,25; T25S, S13	-124.169134, 43.437433	1710030404

Applicant	Project Manager
Organization: Coos Watershed Association	**Name:** Jon Souder
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Fiscal Agent
Organization: Coos Watershed Association
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Fax: 541.888.6111
Email: apeters@cooswatershed.org
Contact Person: Aimee Peters

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: [signature] Date: 10/14/2011

Print Name: Jon A. Souder Title: Executive Director

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.
This project is a continuation of a long-term monitoring study initiated in 2004 to examine coho salmon survival, life histories and habitat use in tide gated coastal lowland streamsthat are critical for the sustainability of Oregon Coastal coho. Specifically, this project will demonstrate use of innovative PIT tag techniques for coho life cycle monitoring, to evaluate over-winter habitat use and for project effectiveness monitoring in Larson, Palouse Willanch Creeks subbasins. Oregon Department of Fish and Wildlife, Oregon State University, UCAN-AmeriCorps, the Bonneville Environmental Foundation, and local landowners will partner with Coos Watershed Association management to provide property access, equipment usage, and technical guidance to implement the proposed objectives. OWEB funds will be used to support personnel and provide necessary materials.

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)? 208-8004, 207-238, and 210-2017

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)?

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	$148,962.00	$	☐	☐	$148,962.00
Landowner(s) or other partners:	$	$	☐	☐	$
UCAN AmeriCorps	$	$39,752.00	☒	☐	$39,752.00
OSU Fisheries & Wildlife (Giannico)	$	$58,000.00	☒	☐	$58,000.00
Bonneville Environmental Foundation	$29,000.00	$	☒	☐	$29,000.00
Coos Watershed Association	$32,400.00	$	☒	☐	$32,400.00
	$	$	☐	☐	$
	$	$	☐	☐	$
Total Estimated Funds (add all amounts in the far-right Column):					*$308,114.00

*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: Will need to annually apply for AmeriCorps members.

* 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 aud 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/ESA-Salmon-Listings/Salmon-Populations/Maps/Index.cfm.

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.**

The objectives of the proposed project are to 1) obtain reliable coho salmon freshwater and marine survival data to calibrate limiting factors models that identify habitat bottlenecks, 2) monitor movement patterns, survival and growth in lowland stream systems where restoration projects have improved habitat connectivity. Objective 1 will expand ODFW Coho Life Cycle Monitoring sites from seven to nine and enhance their usefulness to identify trends in coho abundance and survival by adding critical data from productive lowland coastal streams. Objective 2 will provide information on habitat use by juvenile salmonids within lowland coastal streams and their upper estuarine zones. This will not only allow for a better description of the various freshwater- and estuarine-rearing life histories, but will help in assessing the effectiveness of past restoration projects and identify future potential restoration needs.

8. **Is the project identified as an essential or needed project in an assessment or recovery plan?**
☒ **Yes** ☐ **No**
If yes, provide name of document (Author, date, title, source, source address. Endnote citation format).
ODFW. 2007. Oregon Coast Coho Conservation Plan For the State of Oregon. Oregon Department of Fish and Wildlife, Salem, OR. http://www.oregon.gov/OPSW/cohoproject/coho_proj.shtml

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).

10.4 Total stream miles to be monitored or assessed

313 Total acres to be monitored or assessed

10. Is this project a part of a comprehensive monitoring strategy/program?

☒ **Yes** ☐ **No**

If yes, provide name of document (Author, date, title, source, source address. Endnote citation format).

Coos Watershed Association. 2008. Model Watershed Proposal To The Bonneville Environmental Foundatoin. Approved by the Board of Directors April 9, 2008. Charleston, OR. 27 pp. http://www.cooswatershed.org/Publications/CoosWA%20MWP.pdf

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

☒ **Yes** ☐ **No**

If yes, identify the number of organizations and list their names:

3 # cooperators

Cooperating Organization Names
ODFW, Charleston District Office (Coos estuary summer seining & trap assistance)
ODFW, Corvallis Research Lab - Life Cycle Monitoring Projec (LCMP)t
ODFW, Corvallis Research Lab - Oregon Adult Salmonid Inventory & Sampling (OASIS)

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

☒ Baseline	☐ Implementation	☒ Status and Trend
☒ Effectiveness	☐ Other:	

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: _____

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): Salinity		

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):	

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 *Coho Life History in Tide Gated Lowland Coastal Streams* program conducted by the Coos Watershed Association (CoosWA) with cooperation from Oregon State University (OSU) and the Oregon Department of Fish and Wildlife (ODFW) has made substantial contributions to our understanding about this fish species—specifically its habitat requirements and life histories—and how they respond to conditions found throughout the Oregon coast where lowland streams are often straightened, diked and tide gated, with agriculture, roadways and rural residential land uses common. Since 2003, through a variety of monitoring grants and restoration projects, CoosWA has explored why these streams continue to be productive in the face of considerable pressures, and how to improve their performance through targeted restoration projects.

The overarching goal in our program is not just de-listing coho salmon under the federal Endangered Species Act (ESA), but rather to provide habitat conditions such that coho populations become self-sustaining and are resilient in the face of changing land uses and climate. Our effort to gain a better understanding of coho salmon populations and monitor their responses to restoration actions in lowland coastal streams implements a number of the desired outcomes and criteria in OWEB's *Monitoring Strategy – The Oregon Plan For Salmon and Watersheds* (2003) and ODFW's *Oregon Coast Coho Conservation Plan* (2007). This monitoring approach is explicitly linked with our restoration programs in our *Coos Model Watershed Program – 2008 to 2017*, which guides our organization with support from the Bonneville Environmental Foundation. Our approach seeks to improve our understanding of the natural systems that support coho salmon, identify where and what types of watershed restoration actions will provide the best benefits, evaluate whether those actions have had the intended effects, and continually build knowledge to refine our program.

Our approach to implementing our Coho Life History project is unique and particularly successful, based on a long history of productive cooperation between CoosWA and Oregon Sea Grant Extension faculty, particularly with Dr. Guillermo Giannico in the Department of Fisheries and Wildlife at OSU. Although initially we hired technicians to operate our life cycle monitoring sites, we switched to graduate students in more recent times. The technicians were often ex-ODFW seasonal employees, so they were able to coordinate field work well with their former colleagues. However, as a result of partnering with Dr. Giannico on an OWEB Research Grant (208-8004) to assess coho salmon passage through tide gates we gained first had experience about the benefits of having a graduate student working on a project. This made us decide to use our OWEB monitoring grant (207-238) to hire a new employee, Adam Weybright, who was very keen on using various components of his work on the Coho Life Histoty project towards a graduate thesis. Subsequently, we continued that practice by hiring Katherine Nordholm (ex-ODFW Life Cycle Monitoring Program) to work on our current monitoring grant (210-2017). Among the benefits of this approach are: the high level of involvement from OSU researchers and the staff of government agencies (i.e., USFS, NOAA, USEPA, ODFW) that form the graduate students' committees, the access to research facilities (i.e., the Oregon Hatchery Research Center, Hatfield Marine Science Center, OSU campus, and even the Northwest Fisheries Science Center in Seattle), and last, but not least important, the commitment of the students and their major professors to produce high quality, publishable results through their theses and related peer-reviewed journal articles.

<u>Issue 1</u> Need for better coho salmon freshwater and marine survival data, especially for lowland streams, to calibrate limiting factors models.

OWEB's *Monitoring Strategy* (2003) has as its first "Desired Outcome" a better understanding of salmon populations on a regional, watershed and sub-basin basis (Strategy 2) while recognizing that there are local effects and landscape influences (Strategy 3). The Oregon Coast Coho Conservation Plan (ODFW, 2007) in Criterion 1 (Adult Abundance) identifies the need to better estimate coho survival through all life stages (both freshwater and marine), with the seven existing ODFW life cycle monitoring sites on the Oregon Coast playing a critical role in these estimates. However, a study conducted by the CLAMS project at the USFS Pacific Northwest Research Station, showed that the ODFW sites are not representative of the range of watersheds on the Oregon coast because they are generally located in headwater stream areas (Jeff Rodgers, ODFW Life Cycle Program Manager, Personal Communication). Expanding the network of life cycle sites to include coastal lowland streams is identified by ODFW as a much needed action (see letters from Jeff Rodgers and Erik Suring, ODFW). Coastal lowland streams and estuaries provide critical nursery habitat for juvenile coho (Bustard and Narver 1975, Tschaplinski and Hartman 1983, Nickelson et al. 1992, Miller and Sadro 2003) and can considerably increase juvenile coho salmon production (Bradford et al. 2000, IMST 2002). Better knowledge about both freshwater and marine survival rates in a wider variety of watersheds is needed to calibrate the limiting factors models that are used to identify, prioritize, and determine the effectiveness of restoration projects.

Ideally, it would be beneficial to have marine survival (MS) estimates on a population-by-population basis, or at a minimum, for each gene conservation group (GCG), recognizing that they may be differences among populations, and differences among a diversity of life history traits within and between populations based on juvenile rearing strategies. Improving freshwater and marine survival estimates from these diverse populations will contribute to overall restoration efforts, particularly as these traits contribute to the "portfolio" of salmon recruits (Green et al., 2010; Schindler et al., 2010; Moore et al., 2010).

The Coos Watershed Association (CoosWA) has been operating two salmon life cycle monitoring sites in the Coos Bay Lowlands of Larson and Palouse Creeks (Figure 1) since 2004 with OWEB funding. ODFW has historically attempted to establish Life Cycle Monitoring sites in the Palouse and Larson sub-basins; however, difficulties in maintaining adult traps and obtaining landowner access caused the state agency to discontinue work at these sites. The CoosWA, however, has been able to operate sites in each sub-basin, although the successful operation of the adult traps was always problematic. As a result of an extensive PIT tagging effort, carried out in collaboration with OSU's Department of Fisheries and Wildlife, in Palouse, Larson and, to a lesser extent, Willanch Creeks (see Table 1), we were able to demonstrate that PIT-tag antenna arrays result in more effective enumeration of returning coho salmon spawners, particularly in the case of jacks.

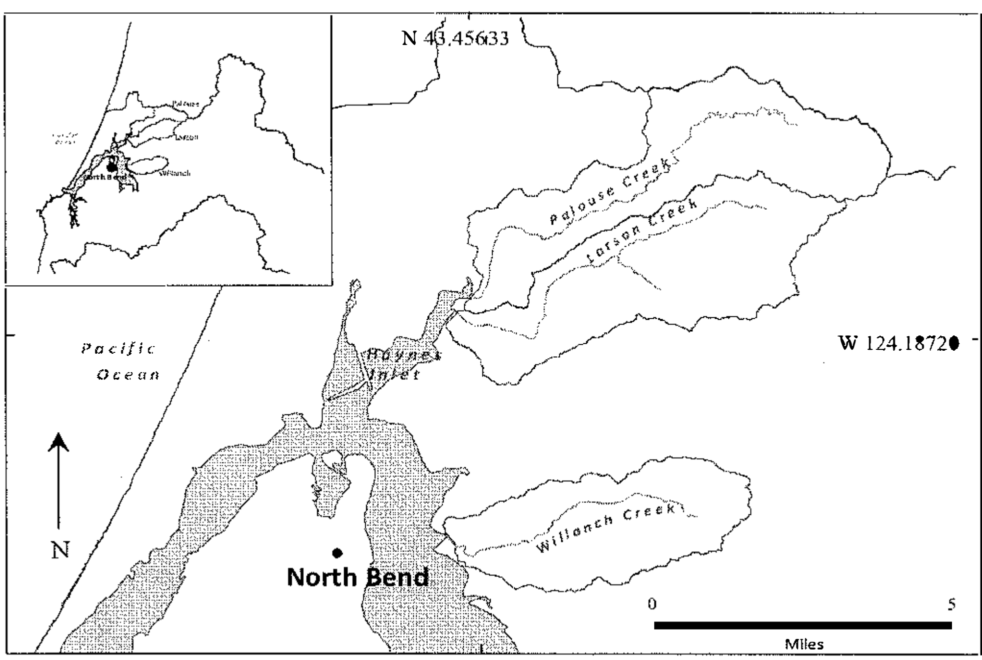

Figure 1. Location of Palouse, Larson and Willanch sub-basins in the Coos River Basin.

Juvenile coho salmon PIT tagging has been carried out since 2008 and under current funding will continue through spring 2012 (Table 1). PIT tagged individuals allow us, first, to assess fish passage at the Palouse and Larson tide gates and, second, to examine movement, habitat use and growth of juvenile coho salmon in the above-mentioned sub-basins. Coho salmon marked during this effort migrated to sea as smolts in the springs of 2008, 2009, 2010 and 20011 and returned, or potentially will return, to spawns (as jacks or adults) in the fall/winters of 2009 through 2014 (see Figure 2). Besides providing an additional means to estimating freshwater and marine survival in each sub-basin, returning PIT tagged spawners will provide information on how life history type, habitat use patterns and the resulting differences in growth rates during the freshwater phase may contribute to individual fitness. Because the PIT tag antennas we built and installed in Palouse and Larson Creeks are highly effective (62-95% efficiency) at detecting PIT tagged fish (see Bass 2010), continuing with their use will reduce the costs of operating life cycle monitoring sites while obtaining important individual movement information and, when recaptured, growth data.

Table 1. The number of coho salmon fry and smolts PIT tagged by brood year in the Palouse and Larson subbasins during 2006-2011, and estimated number of PIT tagged coho smolts, jacks, and adults with corresponding freshwater and marine survival rates.

Basin	Brood Year[1]	Numbers Tagged Fry (Age-0)	Numbers Tagged Smolt (Age-0)	PIT tagged Population Size[2] Smolt (Age-1)	PIT tagged Population Size[2] Smolt (Age-2)	Jack	Adult	Freshwater Survival[3]	Marine Survival[4]
Palouse	2006	0	487	380	2	2	19	-	5.00%
	2007	1,191	742	960	7	9	69	51.15%	8.67%
	2008	2,846	542	729	1	5	-	16.59%	-
	2009	967	148	225	-	-	-	17.94%	-
	2010	219	-	-	-	-	-	-	-
Larson	2007	282	375	350	0	8	9	20.64%	5.99%
	2008	495	125	277	0	0	-	57.34%	-
	2009	75	330	21	-	-	-	27.95%	-
	2010	253	-	-	-	-	-	-	-

1. Brood year is defined as the first year that eggs are deposited during the fall/winter spawning period (e.g. coho of the 2006 brood year were derived from coho spawning during the 2006-07 spawn period. This brood returned to spawn as adults during the 2009-10 spawning season.).
2. Estimated number of PIT tagged coho smolt populations based on tide gate PIT antenna detections. Jack and adult coho estimates were based on detections at all antennas. Both estimates are adjusted for antenna efficiency.
3. Freshwater survivals represent the proportion of coho PIT tagged as age-0 fry or parr within a subbasin that were recorded at the subbasin tide gate PIT antenna array during the following spring, adjusted for antenna efficiency.
4. Marine survival is the proportion of coho smolts that returned to spawn as 2-year-old jacks or 3 year-old adults.

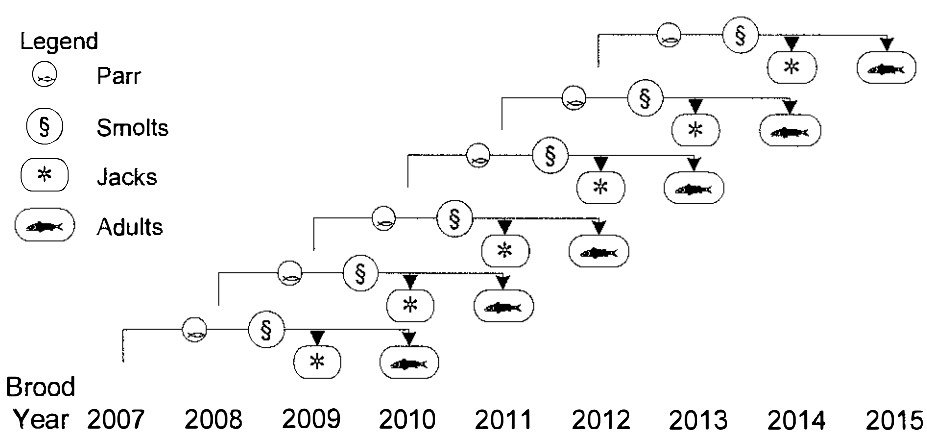

Figure 2. Relationship of brood year (spawning) to smolt outmigration and subsequent jack and adult returns.

Results from the life cycle monitoring efforts in Palouse and Larson sub-basins indicate that there is potentially a high degree of yearly variation in coho salmon survival rates, and that production in both streams can differ substantially from Winchester Creek, the coastal lowland ODFW Life Cycle Monitoring site located in Coos Bay (see Figure 3 on attached color sheets). These data emphasize the need for additional years of monitoring to identify the variation in survival rates within and among sites. Continued monitoring efforts at Palouse and Larson sub-basins will establish a longer term of survival rates that can be used to better assess limiting factors in lowland streams that will help guide restoration efforts.

OWEB's *Monitoring Strategy* (2003) Desired Outcome 1, Strategy 3 highlights the need to better understand how salmon, particularly coho, are responding to local effects and landscape influences. The *Oregon Coast Coho Conservation Plan* (ODFW, 2007) in Recovery Criterion 4 (Within Population Distribution) and Criterion 5 (Diversity) identifies the need to better understand the dispersion of coho adults, sub-yearlings and smolts among different tributary systems. Lowland sub-basins that drain directly into estuaries are believed to play a significant role in maintaining the genetic diversity in many coastal coho populations, furthermore the associated diversity of life histories are likely to provide a mechanism not only to expand coho production but also increase population resiliency (Greene et al. 2009; Schindler et al. 2010; Moore et al. 2010). The Oregon Coast Coho Conservation Plan (ODFW, 2007) in Recovery Criterion 5 (Diversity) and Criterion 6 (Habitat Conditions) also highlights the need for additional information on the spatial-temporal use of lowland streams by sub-yearlings, as well as smolts. Coho juvenile rearing strategies are directly related to three of the seven Research Priorities in the Coho Plan (Coho Plan, Appendix 4): (a) the relative importance of potential limiting factors throughout the entire freshwater and estuarine residence of coho; (b) the contribution that habitat protection, management, and restoration programs have toward achieving desired status goals; and (c) validation and refinement of the coho winter high intrinsic potential model.

Issue 1 - Opportunity 1: Continued tracking of PIT tagged juvenile coho salmon can provide key information on habitat utilization in lowland streams, with special emphasis on winter survival and performance of two different life history types.

Previous studies conducted as part of the OWEB Research Grant to Dr. Giannico (Grant 208-8004) and the OWEB Life Cycle Monitoring grants to the CoosWA (Grants 207-238 and 210-2071) have provided a strong foundation for the work presented in the current proposal. Thus, A. Bass' (2010) thesis work showed that Larson's side hinged tide gate offers a longer window of opportunity for fish passage than Palouse's top hinged gate. Although this may seem as a clear benefit to migrating fish, the improvement in habitat connectivity is only apparent. The new Larson side-hinged gate is very effective at excluding estuarine waters from the lowest reach of the creek, thus eliminating the salinity gradient that can lessen the osmotic stress that fish experience when transitioning from freshwater into salt water (Linley 2001). By contrast, the older and leaky structure surrounding the top hinged gate at Palouse allows for the development of estuarine conditions in the upstream tide gate reservoir. Coho salmon smolts respond to the "estuarine signal" at Palouse Creek by increasing their emigration time (i.e., slowing down), a behavior that is not observed among smolts migrating through the tide gate reservoir in Larson Creek (see Bass 2010).

Subsequently, through the intensive fish tracking work headed by A. Weybright (2011) (with support from OWEB Grant 207-238) we were able to corroborate the presence of two main coho salmon life histories in Palouse Creek: a) the sedentary, and b) the mobile type. Sedentary individuals only dispersed a short (few hundred m) to medium distance (2 km) from spawning grounds in early spring before setting up residence within a stream reach (sometimes even in the same habitat unit). Whereas, mobile fish not only showed a tendency to disperse further away (3-7 km) from the spawning grounds but also were found in different stream reaches over time. Thus, based on fish seasonal movement patterns the following four main strategies were identified (percentages reported here are based on 163 juvenile coho salmon that were repeatedly detected during their freshwater residence period): 1) sedentary in summer and winter (63%), 2) sedentary in summer and mobile in winter (21%), 3) mobile in summer and sedentary in winter (11%), and 4) mobile throughout the year (5%) (Weybright 2011).

Apparent winter survival of juvenile coho salmon was greater for fish that were sedentary during summer (24%; n = 127) than fish that were mobile (15%; n = 20). Similarly, coho salmon that were sedentary in winter experienced higher apparent winter survival than those that were mobile, though survival appeared to depend upon the reach in which individuals resided at the start of winter (Figure 4). For example, sedentary coho in Reach 5 (one of the two uppermost reaches with spawning habitats, see Figure 5 on attached color sheets) experienced high survival, whereas no sedentary coho survived in Reaches 2 or 3 (which are further down in the floodplain) (Figure 4). Among all coho known to be alive in late summer 2009, regardless of winter movement strategy, the highest apparent survival rates were recorded in Reaches 1, 5, and 6 (Figure 4). Among juvenile coho salmon residing in tributary habitat at the onset of winter, apparent winter survival ranged from 10%, higher in the system, to 50 % in tidally affected tributaries. The apparent winter survival rate of coho in off-channel ponds adjacent to the upper Reach 5 during the winter of 2009 was 40% (n = 10) (Weybright 2011).

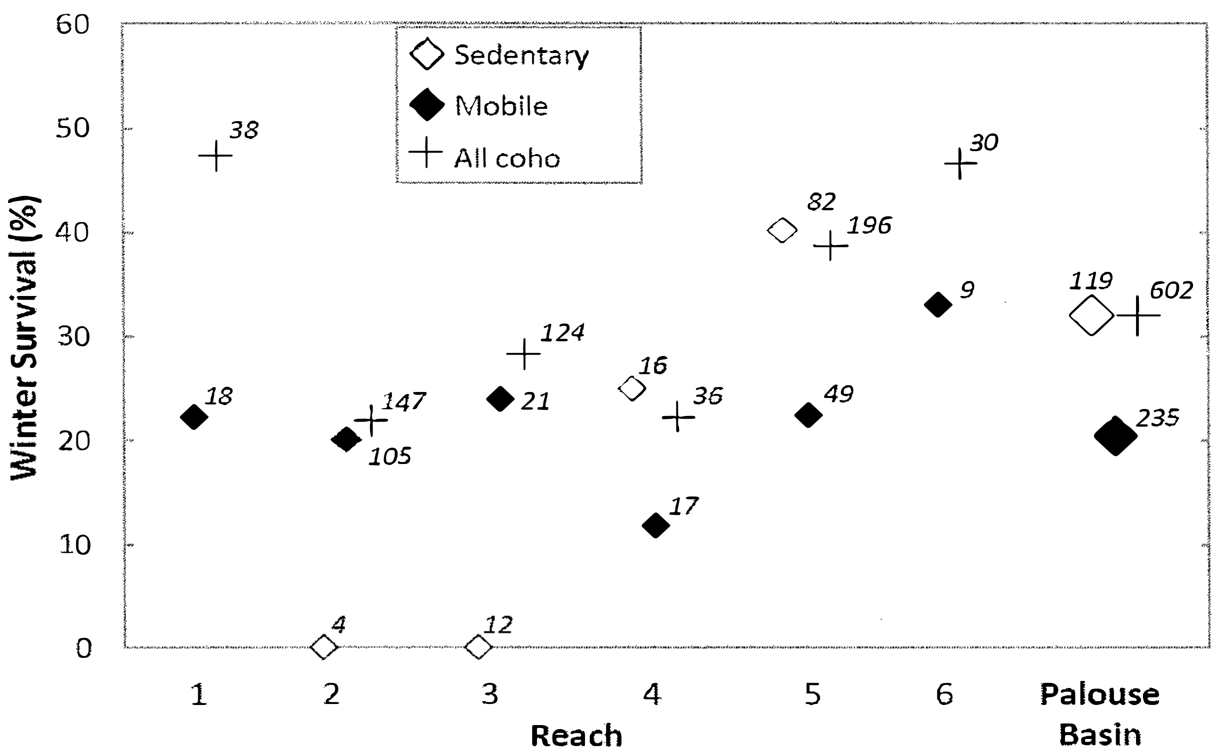

Figure 4. Apparent winter 2009 survival rates for juvenile coho salmon that exhibited either sedentary or mobile behavior during winter, and for all individuals combined (regardless of movement strategy), by stream reach of residence at the start of winter and for the entire Palouse sub-basin. The group labeled 'All coho' included both fish with a known winter movement strategy and fish whose strategy could not be classified because they were only detected the following spring as smolts by the tide gate antenna arrays. Reach 1 corresponds to reservoir pool above tide gates, Reaches 2 and 3 are within floodplain area, and Reach 5 and 6 have the steepest gradients and contain most of the available spawning gravels. Numbers next two symbols represent sample sizes (from Weybright 2011).

Shortly after gravel emergence in the springs of 2009 and 2010, Weybright (2011) captured coho salmon fry throughout Palouse Creek, including tidally affected areas (i.e., Haynes Inlet and Palouse Reaches 1 and 2). Such early dispersal into estuarine habitats was reported for other coastal coho populations in Oregon, British Columbia and Alaska (Chapman 1962; Crone and Bond 1976; Hartman et al. 1982; Murphy et al. 1997; Miller and Sadro 2003). The cause of the extreme downstream dispersal among these individuals has been attributed to competition (Chapman 1962), stream discharge (Tschaplinski 1987) and genotypic variation (Koski 2009), but remains poorly understood. Although the work that Weybright (2011) completed recently lacked direct evaluations of how those factors controlled spring fry dispersal, his data did not support the hypotheses that such early migration of fry into estuarine habitats was associated with competition or stream discharge. In the spring of 2010, fry dispersal to estuarine areas occurred prior to coho fry occupation of many suitable riverine habitats over a range of low and high stream discharge conditions, indicating that competition for resources and discharge were not primary causes of such early mass movement event.

One intriguing possibility is that these different early movement strategies are caused by genotypic variation, thus supporting the hypothesis that these are distinctive life histories that have evolved over time. In such scenario, identifying those specific life histories and developing restoration strategies that overcome the factors that may limit their productivity will increase the resilience of these coho populations to environmental changes and improve their chances for recovery. During fall 2011, Katherine Nordholm, CoosWA employee and OSU graduate student (with support from current grant 210-2017), will conduct a genetic analysis of micro-satellite DNA from juvenile coho salmon that displayed either sedentary or early estuarine rearing tendencies in Palouse and Larson Creeks to determine: (a) whether coho in the two streams differ in microsatellite markers; (b) whether coho salmon that move early into the estuary differ in microsatellite markers from fish that only migrate as smolts; and (c) whether those juveniles that move early to the lower watershed and estuary differ in the, so called, "clock genes" from fish that move down as smolts. This work will be supervised by Dr. Kathleen O'Malley (OSU's Hatfield Marine Science Center).

A second objective of Nordholm's work will be the identification of the juvenile life history of returning coho salmon spawners. This particular project component aims at increasing our understanding of which juvenile coho life history patterns are most successful. This work will be carried out during winter 2012 under the join supervision of Dr. Giannico and Dr. Jessica Miller (OSU's Hatfield Marine Science Center). The approach to address this objective requires the determination of juvenile coho salmon growth rates and their timing of salt water entrance relying on otoliths recovered from salmon carcasses from 2007 through the spawning run expected in 2011. From a total of 69 PIT tagged coho salmon detected in the 2010 spawning run by the Palouse antenna arrays the carcasses of only 14 were found and had their otoliths collected. Five of those fish were tagged as smolts and had unknown early life history. Nine were tagged as parr and eight of them were classified as early estuarine rearing type; therefore, an early salt signal is expected to be visible in their otoliths. The otoliths will be prepared as per the methodology described by Miller and Kent (2009) and elemental analysis will be carried out at a lab on the OSU campus. Different concentrations of elements in salt water (higher strontium, Sr, to calcium, Ca, ratios) and freshwater (higher barium, Ba, to calcium ratios) are associated with concentrations of those elements in the layers that are laid down in the otoliths as they grow over time (very much like tree rings). Hence, otoliths will be analyzed for changes in the Sr:Ca and Ba:Ca concentrations which are indicative of salt water residence. Otolith width at the time of first salt water signal will be used to estimate fish size (as fork length) at the time of estuary entrance. To back calculate this relationship, otoliths extracted from juvenile coho salmon (which died accidentally in smolt traps or during handling throughout the region) of known length will be used to develop a fish fork-length-to-otolith-size regression. This regression will allow us to estimate the fork length a spawner had when it entered the estuary based on the width the otolith had at the time the salt signal formed in it. A signal appearing on an otolith at a time when its width was significantly smaller than that the width typical of a one-year-old smolt would indicate an early estuary rearing pattern.

<u>Issue 1 – Opportunity 2</u>: Continue monitoring natural origin jack coho salmon returns, in addition to adult returns, to develop better marine survival estimates.

Desirable Outcome 1 in OWEB's *Monitoring Strategy* (2003) emphasizes the importance of obtaining high quality status and trends information on salmon population structure in the ESU to aid recovery planning (Strategy 1). Amendment 13 to the Pacific Marine Fishery Council's (PMFC) *Pacific Salmon Plan: Fishery Management Regime to Ensure Protection and Rebuilding of Oregon Coastal Natural Coho* (1999) uses smolt-to-jack survival from Columbia River hatchery coho salmon, which do not correlate well with the smolt-to-jack survival of natural origin coastal coho, to forecast coastal coho run size and manage their harvest. Adult weir traps at most ODFW life cycle monitoring sites cannot be used to count jacks for productivity estimates because their pickets are spaced wide enough to pass debris and cannot retain small fish. Because the only reliable estimate of smolt-to-jack survival of natural origin coastal coho salmon currently comes from weir enumeration at ODFW's Mill Creek life cycle site, in the Yaquina basin (J. Rodgers, ODFW, personal communication), there is an urgent need for additional sites that can provide data on natural origin coho jack returns, which is an important metric proposed for use in managing the harvest of natural origin coho salmon.

The CoosWA life cycle monitoring project tested the efficacy of antenna arrays to detect PIT-tagged coho salmon spawners during fall 2010 and early winter 2011 (Table 2). Our initial results were encouraging, even if somewhat limited due to freshet related equipment damage in Larson Creek. Cumulative antenna efficiencies were calculated using techniques described by Zydlewski et al. (2006). Considering the extremely low adult capture rates at the adult traps, and after discussion with ODFW staff regarding this matter, we decided to eliminate the adult traps for the monitoring of the 2011/2012 spawning run and rely only on the existing PIT-tag antenna arrays (including the system at Larson Creek, which is back in operation).

Table 2. Estimated efficiency for each row of antennas on Palouse Creek during the 2010 spawning run. N = number of fish known to pass antenna. Missed = number of fish that were known to pass the antenna but were not detected. Site 1 Row 1 is the antenna array located furthest downstream and Site 3 Row 2 is antenna array located furthest upstream. Combined = total efficiency of all antennas at each site. Basin = total efficiency of all antennas in the system.

Palouse Creek		**N**	**Efficiencies**	**Missed**
Site 1	**Row 1**	72	32.00%	49
	Row 2	68	68.00%	22
	Combined		78.24%	
Site 2	**Row 1**	66	85.00%	10
	Row 2	76	68.00%	24
	Combined		95.20%	
Site 3	**Row 1**	75	87.00%	9
	Row 2	12	75.00%	3
	Combined		96.75%	
Basin			99.97%	

Future work should consider three unresolved issues that may affect freshwater and marine survival estimates using PIT-tagged smolts and spawners: a) PIT tag effects on fish survival; b) PIT tag shedding; and c) the effect of straying on estimates of marine survival.

Issue 2: Need to evaluate effectiveness of stream habitat restoration projects on juvenile coho salmon winter access to floodplain habitats, fish survival and performance.

OWEB's *Monitoring Strategy* Desired Outcome 2 stresses the importance of evaluating the effectiveness of restoration projects both on an individual (Strategy 5) as well as cumulative basis (Strategy 6). Issue 2 specifically targets the need identified in the *Oregon Coast Coho Conservation Plan* (ODFW 2007) to provide coho parr with high-quality winter habitat. Unfortunately, many coho salmon bearing streams on the Oregon coast that are potentially very productive have culverts and/or tide gates limiting how juvenile coho salmon can use the existing habitats. Better understanding of the cumulative effects of fish passage restoration, as well as the fate of juveniles fish who do pass between freshwater and estuarine habitats are identified as research needs in the *Oregon Coast Coho Conservation Plan* (see Appendix 4: "Research the relative importance of potential limiting factors throughout the entire freshwater and estuarine residence of coho").

While the Coos River Basin itself does not seem to have a critical shortage of good quality coho salmon nursery habitats (Coho Plan, Appendix 2, Table 7), our surveys indicate that limited good quality winter habitats and their accessibility to juvenile fish may represent a bottleneck to the abundance of coho salmon in the small lowland streams of Coos Bay. Our watershed restoration programs are designed to target, both singularly and in aggregate, and overcome these habitat bottlenecks. Nonetheless, our ability to assess the effectiveness of these restoration projects is limited by the lack of high quality and systematically recorded data on the response of juvenile coho salmon to our actions. With better long-term data to make coho production model calibration possible, we will be able to focus our restoration activities, evaluate their effectiveness and thus learn from past mistakes.

Historic patterns of diking, channel simplification, culvert and tide gate placements occurred beginning in the 1880s and continuing through the 1970s in many lowland streams along the Oregon coast. Dikes were frequently created by the process of constructing roads (often using fill dredged from new, straightened stream channels). In many cases, culverts through these fills were perched, and tide gates installed to protect the areas inland from the road from inundation. Much of this infrastructure was last replaced in the 1960s and 1970s (boom years for coastal counties), and are now at or past their useful life. However, due to laws and regulations that have come into place since their original installation, the size and configuration of these structures must be altered when they are replaced or upgraded. This process has considerable potential benefits for coho salmon, but is not without controversy (see attached letter of support from the Coos County Commission). Having better data on juvenile coho rearing use in lowland stream systems will provide better justification and refinement of regulatory requirements.

Issue 2 - Opportunity. Integrate ongoing coho salmon life-cycle monitoring effort, equipment and the resulting data with effectiveness monitoring plan of floodplain restoration projects in coastal lowland streams.

The three stream systems that are the focus for this proposal (Larson, Palouse, and Willanch) have had watershed restoration projects that began in the mid-1980's with work by ODFW in Palouse Creek. The first restoration projects implemented by CoosWA took place in Willanch Creek in 1995; and with the latest OWEB-funded project to upgrade the tide gate and place large wood, restoration efforts will have been implemented in much of the Willanch sub-basin (CoosWA 2011). Seven culverts are being replaced along the County Road that forms a dike between Palouse Creek and the adjacent pastures in Reaches 1 and 2 during the summers of 2011 and 2012 (see Figure 6 on the attached color pages) with funding from the Coos County Road Department and OWEB grants 207-065 and 208-2006-5913. A wetland site in vicinity has been restored using funding from OWEB grant 99-113/99-461 and NRCS. Dozens of other OWEB-funded restoration sites are located in these three sub-basins. These projects include tide gate replacement, tidal reconnections, culvert and bridge installations, large wood placement, riparian and wetland restoration, and road sediment reductions and decommissioning. This combination of restoration intensity and diversity make the project area an ideal location to evaluate current habitat use as an indicator of past successes and future opportunities. Through previous assessment and monitoring projects we have a complete census of aquatic habitat in these areas, have significant investments in data collection infrastructure and excellent working relationships with landowners.

OWEB grant 207-238 allowed us to establish basic seasonal movement patterns in Palouse Creek (Weybright 2011). The continued operation of the antenna network used in that project—and additional PIT tagged juveniles during the summer 2011—funded by OWEB grant 210-2017 give us a unique opportunity to evaluate the specific effects of different restoration actions. Funding of this proposal will allow us to install PIT antenna arrays in, at least, two tributary culvert sites where the restoration objective was to increase fish passage so that flooded pastures could be used by over-wintering coho juveniles. Evidence from Weybright (2011) study shown in Figure 4 indicates that winter survival in the lower reaches of Palouse (1 through 3) was low (approximately 21% for mobile individuals to 0% for sedentary ones) in 2009. The proposed monitoring work will allow us to determine whether conditions have improved as a result of improved connectivity from recent and current watershed restoration actions.

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.

Our existing investments in assessments, monitoring, and research on coastal lowland streams provide us a unique potential to address the issues and opportunities identified in section M1. The work we propose will:

1. Continue to operate our two existing life cycle monitoring sites to generate data on coho salmon freshwater and marine survival in coastal lowland streams and estuaries, but transition to using PIT tagged individuals and PIT detection antenna arrays (rather than adult traps) to more effectively enumerate jack and adult spawners.

2. Leverage our investments in PIT tagged juvenile coho salmon to monitor relationships among seasonal juvenile coho movements and performance, habitat types and restoration projects.

We are able to propose all of this relevant and unique monitoring effort thanks to the infrastructure and organizational capacity that has been built over the past seven years as well as the extremely good working relationships the CoosWA has with riparian landowners in the project area, with OSU researchers, and with key government agency personnel.

1. Improved Freshwater and Marine Survival Data for Lowland Streams

The CoosWA proposes to continue operating its salmon life cycle monitoring sites on Larson and Palouse Creeks for an additional two years (see Figure 6). The life cycle sites will be operated consistent with ODFW protocols and/or with modifications approved by staff from the ODFW Research Lab (Erik Suring, ODFW Life Cycle Program Manager). Smolt and sub-yearling PIT tagging will occur during spring (March through May), while returning jack and adult spawners will be individually identified and counted using the existing PIT tag antenna systems located both at the tide gates and head of the reservoir pools in both Palouse and Larson Creeks.

1.a. Estimate freshwater survival and performance of different coho salmon early life history types. This is proposed in relation to Issue 1 – Opportunity 1. This component of the proposed work will rely on fish capture and PIT tagging followed by, one or more, recapture events and/or remote PIT tag detection at antenna systems. Fish recapture is critical to read PIT tags using hand-held units in habitats where stationary antennas systems will not be deployed, and also to record fish physical condition data, which are key to monitor individual fish performance (e.g., growth rate estimates, weight, fork length, condition factor estimates). We plan to sample and tag coho salmon parr in both the upper reaches and the floodplain area of our study creeks as a means of targeting individuals of two different life history types: upper-reach sedentary and early estuarine rearing fish. Rotary screw traps will also be used to capture sub-yearling coho salmon and smolts. These traps will be operated according to standard ODFW protocols and are used to capture and, subsequently, tag coho salmon smolts with the purpose of calculating abundance estimates. Screw trap efficiencies will be calibrated through the daily marking of a proportion of trapped fish, which will be released upstream of the traps for possible recapture. Variance and confidence intervals will be calculated for yearly smolt population estimates using a bootstrap procedure with 1,000 iterations per calculation (see Thedinga et al. 1994). Freshwater survival will be calculated for brood years 2012 and 2013 (see Table 2 and Figure 2) by dividing the smolt outmigrants by the estimated number of female spawners (including the rare jills, which are female equivalent to jacks, and adults) for that brood year multiplied by the average egg deposition per female.

As part of our freshwater survival estimation effort, we propose to continue monitoring movement of two distinctive early life history types of coho salmon to validate our earlier results. The completion of the genetic analysis that we expect (as part of work associated with grant 210-2017) will provide additional insight into whether the observed movement strategies have a genetic base and, therefore, represent distinct life histories, or they depend on environmental factors and are the result of the phenotypic plasticity that is characteristic of salmonids. In addition, the results of the otolith study will provide some indication of what proportion of spawners had an early-estuary rearing life history.

1.b. Estimate coho salmon marine survival, with emphasis on natural origin jack returns. This is proposed in relation to Issue 1 – Opportunity 2. Smolts-to-adult recruit ratios (SAR), provide important data not only about overall survival of coho salmon once they leave the freshwater environment, but also about the comparative fitness of various sub-sets of smolts within and across basins. For example, given the large number of PIT-tagged smolts in both Palouse and Larson Creeks we anticipate to be able to determine whether smolts from one of these sub-basins have comparatively higher ocean survival than smolts from the other, and also detect any survival dissimilarities among smolts with different early life history types (e.g., sedentary versus early estuarine rearing fry).

It is important to mention that the PIT tagging of juvenile coho salmon we conducted both in 2008 and 2009 (i.e., brood years 2007 and 2008, respectively) for the purpose of evaluating tide gate passage (Bass 2010) in Larson and Palouse Creeks, combined with the continued operation of stationary antenna systems at their respective tide gates allowed us to detect the first PIT tagged jacks returning during the fall/winter of 2009-10. Because of their relatively small body size, these premature spawners would have never been caught in the adult traps we had been operating in previous years. In preparation for the return of a relatively large number of PIT tagged spawners in the fall/winter of 2010-11 (including both adult fish from brood year 2007 and jacks from brood year 2008) we deployed a series of PIT antenna systems in both Palouse and Larson Creeks. This network of antenna systems had very high tag detection efficiency (see Table 2) and yielded very valuable data to estimate natural origin coho salmon marine survival. As a result, and in agreement with ODFW staff, we plan to eliminate the picket weir fences to trap spawners and rely solely on the PIT antenna systems as of next spawning season (i.e., fall/winter 2011-12).

As part of the work we propose, we will continue to operate PIT antenna systems at two sites (tide gates and upper end of tide gate reservoirs) in each stream where we have sufficient numbers of PIT tagged smolts (i.e., Palouse and Larson). As in the past, cumulative detection efficiencies for sequential antenna arrays at each system will be calculated using the approach described by Zydlewski et al. (2006) and Horton et al. (2007). In addition to adult spawner return data, our study systems will be the only ones along the coast of Oregon providing natural origin coho jack return data. This information is key to the development of better marine survival estimates for coastal coho salmon. PIT tag detections will also be supplemented with spawning surveys (using ODFW's protocol) to provide a second estimate of spawner abundance (Area-Under-Curve), and intensive surveys aimed at recovering carcasses. Carcasses will be tested with a hand-held tag detector for PIT tag presence and their otoliths will be removed for subsequent early life history type determination.

Not every fish that is PIT tagged as parr or smolt will retain its tag until the completion of its life cycle and there is evidence that tagging may increase mortality rates. One study estimated that PIT tag loss can be a cumulative 18% for adults returning 6 months to 4 years after initial tagging, and that survival may be as much as 25% less for tagged fish (Knudsen et al. 2009). However, other researchers reported less than 2% tag loss and 94% survival in a controlled experiment when surgical techniques rather than hypodermic needle injection was used to insert the tag (Gries and Letcher 2002). Both these tagging induced errors will influence the ultimate smolt-to-adult survival estimates, a key objective of our study. To evaluate PIT-tag loss we propose to use dual tagging procedures similar to those in (Knudsen et al. 2009). All smolts caught at the rotary screw traps at Larson and Palouse Creeks will be PIT tagged, and a sub-sample between 10 and 20% of them will be double tagged using coded wire tags (CWT) in their snout. PIT tagged returning spawners will be enumerated at the antenna systems as described earlier, and all carcasses will be tested with hand held PIT and CWT detectors. When detections are made for either-—or both—tags, heads will be retained for collection of otoliths and the CWT recovered for microscopic examination to determine the original PIT tag number (if absent) and recover its early life history.

This double tagging approach will not allow us to estimate tag induced mortality the way Knudsen et al. (2009) did because ours are not hatchery origin runs (with a known number of untagged smolts being released). However, we will use two alternative approaches to obtain an estimate of tag induced mortalities. One method will involve a sub-sample (40-60 individuals) of tagged juvenile coho salmon that will be kept in a floating flow-through pen in an off-channel or small tributary of the lower reaches of one of our study creeks. The pen will be covered to prevent avian predation, and will be made of nylon netting with a mesh size big enough to allow some invertebrate drift through. The diet of these fish will be supplemented with freeze dried shrimp (*Euphasia pacifica*) delivered by hand every several days to compensate for the likely reduction in prey availability caused by the enclosure. Feeding sessions will continue until satiation (i.e., lack of interest for the food) is observed in at least 2/3 of the captive fish. This manipulation will be conducted from early March until mid-April with fish that are expected to be at the pre-smolt stage. Fish will be released upon completion of the trial. This method will not only provide evidence of immediate mortality induced by tag and tagging procedure, but will also yield data on tag loss rates. Additionally, coho salmon mark-and-recapture data will be structured and analyzed using Cormack-Jolly-Seber models (Burnham et al. 1987, Brakensiek and Hankin 2007) to estimate coho salmon winter survival in both restored and un-restored habitats (see Effectiveness Monitoring section below), and to detect peaks in mortality rates may be attributable to tagging (i.e., those estimated for the first month after tagging).

The approaches we described will allow us to improve our freshwater and marine survival estimates, our smolt-to-jack ratios and, ultimately, our jack-to-adult ratios. Smolt-to-jack estimates will be corrected for antenna efficiencies and tag loss. If we are successful in adding CWT tagging for the 2010 brood year smolts in the spring of 2012—and to continue doing this in the first year of this study—we will be able to provide "corrected" smolt-to-jack estimates for the 2010 through 2012 brood years as part of this study, and corrected jack-to-adult ratios for brood years 2010 and 2011.

2. Improved juvenile coho salmon winter habitat access, survival and performance in lowland streams

Conduct effectiveness monitoring of lowland culvert replacements. Results from Weybright (2011), supported by previous grant (207-238), showed that juvenile coho salmon survival was highest in the upstream nursery areas (Reaches 5 and 6) and intermediate-to-low (particularly for sedentary type individuals) in the tidally-influenced reservoir reach and floodplain tributaries (see Figure 4, and Figure 5 on attached color sheet). Also in the upper reaches sedentary fish had a higher survival than mobile individuals, whereas in the lowermost reaches mobile fish were the only ones that survived (Figure 4). A possible hypothesis to explain these results is that juvenile coho salmon (and particularly the resident type) were able to escape high flows using the shelter provided by abundant instream structures, and a complex channel with alcoves and tributaries where they could avoid stranding as waters receded. Note that stream habitat alteration is relatively low and connectivity is high in these gravel rich and forested upper reaches. By contrast in the floodplain reaches (1 through 4), where mobile fish were the only ones that survived, juvenile coho salmon were less likely to escape high flows in the mainstem, and those who did could get stranded as waters receded due to constrained channels, lack of accessible off-channel habitats and poor connectivity among ditches, low-lying pastures and the mainstem (Weybright 2011). Therefore, we assume that improved connectivity resulting from recent watershed restoration investments in culvert replacements, tide gate removals or upgrades, and wetland development in lower Palouse Creek should result in higher juvenile survival in these areas compared to other, equivalent un-restored sites.

We propose to sample restored sites in the Palouse basins where culvert and tide gate upgrades have resulted in improved connectivity between off-channel winter habitats represented by agricultural ditches and flooded fields, wetland sites that either were restored or "self-restored," and to compare these to reference sites where these restoration actions have not yet been implemented (see Figure 6). Our focus will be on fish winter survival, habitat use and performance indicators (or fitness proxies such as condition factor and growth rate) from November through February and during the smolt migration window (March through May). We will configure our PIT antennas so that the multi-channel transceivers can detect not only fish passage in the mainstem, but by adding supplemental antennas, will be able to include a representative sample of other off-channel habitats. We will install two additional PIT antenna systems (including one at the Willanch tide gate) to track juvenile coho salmon movements into off-channel winter habitat (and returns into the mainstem) in relation to river discharge and flooding levels. The exact location of the other site will be determined based on need for representativeness as well as logistics. Through mark-and-recapture techniques, and the use of Cormack-Jolly-Seber analyses (Burnham et al. 1987, Brakensiek and Hankin 2007) we will calculate residence times and survival in both the newly-connected and reference habitats to assess the benefits resulting from the restoration projects.

Relying exclusively on "fish signals" to assess restoration effects is not recommended, particularly in the short term. Fish numbers, survival, movements and condition vary largely from year to year depending on climatic conditions, which in turn control ocean and stream conditions and productivity. Although it is our goal to determine how effective past and current restoration actions are in improving salmonid production, which requires the relatively long term (multi-year) life cycle monitoring plans that we are proposing, we think that many short-term indications of stream habitat changes can be best detected through the study of aquatic macroinvertebrate communities. Macroinvertebrates are particularly relevant when evaluating salmonid habitat conditions because these fish rely exclusively on insects, crustaceans and other invertebrates for food. If newly accessible habitats are going to offer good refuge or rearing conditions to salmonids, it would be desirable that they offered the same or a larger invertebrate prey biomass than what would be available in less well-connected and un-restored sites. Aquatic macroinvertebrates are also good indicator organisms; the types of invertebrates and their relative abundances can integrate information about water- and habitat-quality at any given site (Rosenberg and Resh 1993). Specifically, we might expect well-connected channels and wetlands to have a more diverse macroinvertebrate fauna than less connected habitats, and this diversity would include components of mainstem and intermittent wetland/channel fauna (Gallardo et al 2009, Tockner et al. 1998).

We propose assessing macroinvertebrate biomass and community composition in the un-restored pastures that are poorly connected to the mainstem of the river and in the recently connected off-channel habitats. In addition, we will sample a least-disturbed or reference site that has had little habitat modifications in recent history. At each site we will sample macroinvertebrates in standing-water, shallow wetlands and flowing channels. For sampling protocol see Section M4. Organisms will be identified and enumerated and then dried and weighed. Invertebrates will be identified to the finest level practical; for most aquatic insect this will be to the genus level. Invertebrate densities (number per square meter) and biomass per square meter will be calculated. Combining this information with habitat measurements collected at the time of invertebrate sampling, we will also be able to estimate the total number and biomass of invertebrates at each site. Sampling will occur once in March so that invertebrate biomass, abundance, and community composition can be assessed. Additional sampling trips may occur in January and May to assess invertebrate biomass only, if local volunteer personnel are available. These additional sampling events would give valuable information about seasonal variations in invertebrate biomass and community composition, which should serve as indicators of some more subtle differences between restored and un-restored sites that may not be clearly reflected in fish responses, at least, in the short term.

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.

The project objectives we outline below are fundamentally interrelated and based on a desire to better understand factors that affect the success of coho salmon in freshwater, particularly in the lowland creeks where the CoosWa has been conducting life cycle monitoring and restoration projects for the past several years. Obtaining this knowledge is critical to understanding how to design, implement, and evaluate effective watershed restoration programs. We identified the key issues and opportunities in response to question M1, discussed exactly what we are proposing to do in this project in response to question M2, and in response to M3 we will identify the specific project objectives and monitoring questions that relate to the issues and opportunities in M1 using the approach and tools described in M2.

Objective 1. Obtain Improved Freshwater and Marine Survival Data for Lowland Streams.

A major long-term goal of the CoosWA's watershed restoration program is to increase populations of coho salmon and other species of fish to the degree that they can again provide the resource they did historically. We do this by identifying suites of projects that are most likely to resolve population bottlenecks identified through limiting factors models. This approach is consistent with the ODFW Oregon Coast Coho Conservation Plan (ODFW 2007) where limiting factors models (i.e., Nickelson, 1998) provide the preferred method to evaluate salmon habitat quality (Coastal Coho Plan, Appendix 2, pg. 20). Having an accurate estimate of marine and freshwater survival in habitats representative of those in the Coos is needed for the results of the limiting factors models to be useful for the CoosWA's watershed restoration planning process.

This first objective leads to the following three monitoring questions:

1.1. What is the freshwater survival and performance of juvenile coho salmon of different early life history types?

1.2. What is the marine survival of smolt coho salmon, of different early life history types, to returning jack and adult spawners?

1.3. What are the rates of PIT tag induced mortality and tag shedding among the coho salmon marked in our study?

As mentioned earlier, the CoosWA has been operating two salmon life cycle monitoring sites in the Coos Bay Lowlands (i.e., Larson and Palouse Creeks) since 2004 according to ODFW protocols. This effort has generated data that can be used to expand the range of conditions represented by salmon life cycle monitoring sites on the Oregon coast. Suring et al. (2009) discussed how freshwater and marine survival both the Winchester Creek and the W. Fork Smith River life cycle sites were not correlated to the remainder of ODFW's sites. Our data for Larson and Palouse Creeks for the 2004 to 2007 brood years are also substantially different from that found in Winchester Creek (Figure 3). Furthermore, our most recent work in these systems has shown the presence of two very different coho salmon early movement strategies that generate two distinctive life history types (i.e., freshwater resident and early estuarine rearing types). Apparent winter survival estimates for fish of these two types in 2009 suggests that they differ significantly and that one type outperforms the other depending on the stream reach they occupy in early winter (Figure 4). It is in this context that Question 1.1 becomes important, both with regards to the state-wide evaluation of coho population status and trends and the local level responses to specific Coos Bay conditions and/or watershed restoration works.

Question 1.2. aims at evaluating the possible differences in marine survival between the two distinctive life history types described by Weybright (2011) in Palouse. It also emphasizes the importance of assessing smolt-to-jack survival particularly in the only system on the Oregon coast where such estimate will be based on natural origin fish and the use PIT tagging technology will give jacks and normal adult spawners equal probability of being detected. his proper accounting of returning jacks of natural origin, in combination with the manipulations we propose to answer Question 1.3 will contribute to the estimation of more accurate marine survival estimates. These corrected estimates are critical information for future fishery management decisions.

Objective 2. Improve juvenile coho salmon winter habitat access, survival and performance in lowland streams.

This objective aims at providing fine-scale spatial-temporal information on winter habitat use by juvenile coho salmon, particularly in response to past restoration actions (such as tributary and side-channel culvert replacements) aimed at enhancing floodplain connectivity in certain areas of our study systems.

This second objective leads to the following three monitoring questions:

2.1. Does lowland culvert replacement increase juvenile coho salmon access to and utilization of off-channel winter habitats compared to poorly connected and un-restored sites?

2.2. Do juvenile coho salmon winter survival and performance differ among restored, un-restored and reference floodplain sites in lowland streams?

2.3. Do aquatic macroinvertebrate indicator variables, such as functional types, species and relative abundance, show differences among restored, un-restored and reference cites?

Question 2.1. The current conditions of most lowland stream systems are constrained channels (often by dikes or road fills) that are only temporarily connected to flooded agricultural fields during winter. Current Intrinsic Potential models for salmonid production assume that floodplain connectivity and winter habitat access are not limited by land use, this assumption may lead to unrealistic expectations for habitat potential. Our floodplain connectivity restoration work (through the replacement of a series of culverts and other passage barriers) aims at providing juvenile fish with off-channel winter refuge where they can escape high flows, while being able to safely move back into the mainstem as waters recede. If we are effective in these restoration objectives, we should see winter juvenile rearing densities approach values estimated in the Intrinsic Potential models. This first question explores fish passage (in both directions), and habitat utilization in response to connectivity restoration projects. Utilization will be determined based on indicators such as fish rearing densities and predominant residence strategies (presence of mobile fish for shorts periods of time vs. continued occupation by a high proportion of resident fish).

Question 2.2. Aims at examining direct benefits of floodplain access restoration works on fish performance variables (such as winter survival, individual body size and growth rates). Finding adequate replicates to address this question in a statistically sound manner is likely to present a challenge. However, we anticipate that the number of replicates we propose to use (the target is three) in combination with the benefit of a multi-year monitoring approach should allow us to detect differences in selected fish performance variables among restored, un-restored and reference wetland sites in the floodplains of Palouse, Larson and Willanch Creeks.

Question 2.3. Considers the use of aquatic macroinvertebrates to detect habitat changes brought about by floodplain connectivity restoration projects as a back up option in case fish response signals are not statistically significant either in the short term or for some particular sites.

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

Our response to Questions M2 discussed how we proposed to conduct this monitoring study and in M3 we identified the specific monitoring questions we aim to answer. In this section we will summarize the types of sampling we intend to conduct and provide the protocols that will govern how data are collected and analyzed. Because of the nature of this project, many of the protocols we intend to use are found in the methods sections of peer-reviewed scientific articles rather than in manuals.

Objective 1. Obtain Improved Freshwater and Marine Survival Data for Lowland Streams.

Estimate Freshwater Survival and Performance of Juvenile Coho Salmon of Different Life History Types. Fish will be trapped in rotary screw traps (RST) in the spring and marked with PIT tags. Age-0+ juveniles will be tagged at a rate of 200-300/week, receiving 12.5 mm. full duplex PIT tags (Model TX1411SST, Biomark) when fish fork length > 80 mm during the late fall (October and November) as part of the effectiveness monitoring for over-winter survival. Smolts will be tagged at a rate of 500/creek/year with 12.5 mm PIT tags. Tagging will follow the standard handling and tag-implanting protocol described in CBFWA (1999) and used by Weybright (2011). The relatively large fish size will ensure that our tags will be below 2% of fish body weight in air; a percentage considered too low to affect behavior (Brown et al. 1999; Acolas et al. 2007). Despite targeting relatively large size individuals for tagging purposes, we still plan to evaluate the possible effects of PIT tag loss and possible PIT tag-induced mortality in the calculation of critical estimators related to coho salmon life history (see proposed experimental manipulation below).

To control for mortality between the RST and the tide gates as well as expand the results to population estimates, tagged juveniles will be re-released upstream of the RST to determine trap efficiency (Thedinga et al. 1994). Calculation of freshwater survival will be based on standard ODFW methods (i.e., standard estimates of egg-to-fry-to-parr survivals based on the number of recruits) found in Suring et al. (2009). These estimates will be compared with those generated using PIT antenna detections based on methods described by Burnham et al. (1987).

To operate the antenna systems we will use multiplexing transceivers (Model FS1001M, Destron Fearing). They record the date, time and code of each tag detection. Antennas are of the type described by Zydlewski et al. (2006). In saline conditions, the electromagnetic field of an in-stream PIT antenna attenuates rapidly, thus reducing the detection range of tags (see Bass 2010). Therefore, the antennas we use at each tide gate antenna system are made of 10 AWG 1100/40 PVC coated litz wire, which provides greater inductance than standard copper wire, to enhance tag detection range and efficiency. In high salinity conditions (32 ppt), litz wire antennas at the tide gates are capable of detecting 12.5 mm PIT tags oriented perpendicular to the antenna plane within 25 cm of the center of the rectangular antennas (Bass 2010). All other antennas in freshwater locations will be of standard copper wire construction and tag detection ranges are expected to be between 35 and 70 cm. The effective area covered by individual PIT antennas is anticipated to be 2.4 m^2 to 4.2 m^2, and each array will span tide gate or wetted channel widths. We will continue to use fine mesh (3 mm) plastic netting on channel margins to maximize areal coverage and guide fish passage through arrays.

At each site, multiple antenna arrays (i.e., channel-spanning antenna or row of antennas that intersect the stream channel at a single cross-section; *sensu* Zydlewski et al. (2006) are already in place or will be installed in close proximity to one another (within 4 m). The assemblage of transceiver and antenna arrays at each site is called an antenna system. Multiple antenna arrays are used at each site to improve tag detection efficiency and to provide the ability to determine direction of fish movement. Detection efficiency at each antenna system will be calculated as the percentage of fish detected at the antenna system from the total number known to have passed to the other side of the antenna system (that information will be obtained by other means such as physical recapture or detection at an adjacent antenna system) (see Zydlewski et al. 2006, and Horton et al. 2007).

Burnham, K.P., D.R. Anderson, G.C. White, C. Brownie, and K.H. Pollock. 1987. Design and Analysis Methods for Fish Survival Experiments Based on Release-Recapture. Monograph 5, American Fisheries Society, Bethesda, MD. 437 pp.

Columbia Basin Fish & Wildlife Authority (CBFWA). 1999. PIT Tag Marking Procedures Manual (Portland, OR: Columbia Basin Fish & Wildlife Authority). 22pp.

Horton, G.E., T.L. Dubreuil, and B.H. Letcher. 2007. A model for estimating passive integrated transponder (PIT) tag antenna efficiencies for interval-specific emigration rates. Trans. American Fisheries Soc. 136: 1165-1176.

Suring, E., K.A. Leader, C.M. Lorion, B.A. Miller, D.J. Wiley. 2009. Salmonid Life Cycle Monitoring in Western Oregon streams, 2006-2008. Monitoring Program Report Number OPSW-ODFW-2009-2, Oregon Department of Fish and Wildlife, Salem, Oregon

Thedinga, J.F., M.L. Murphy, S.W. Johnson, J.M. Lorenz, and K.V. Koski. 1994. Determination of salmonid smolt yield with rotary-screw traps in the Situk River, Alaska, to predict effects of glacial flooding. N.A. Journal of Fisheries Management 14:837-851.

Zydlewski, G.B., G. Horton, T. Dubreuil, B. Letcher, S. Casey, and J. Zdlewski. 2006. Remote monitoring of fish in small streams: A unified approach using PIT tags. Fisheries 31(10): 492-502.

Estimate Coho Salmon Marine Survival, with Emphasis on Natural Origin Jack Returns. Coho life cycle monitoring efforts will use ODFW protocols similar to those used at their other seven sites (Suring et al. 2009) with the exception that jack and adult spawners will be enumerated using PIT antenna arrays. Concurrent spawning surveys in Palouse and Larson sub-basins will be conducted according to methods described in Suring et al. (2009) and in the ODFW salmon spawning manual (Moore et al. 2008). Spawner abundance estimates from the spawning surveys will be estimated using AUC calculations described by Beidler and Nickelson (1980). Estimates of adult coho abundance using mark-recapture calculations from the PIT antenna arrays will be based on Suring et al. (2009) with antenna detections replacing adult capture for the "mark" and with carcass recovery as the "recapture." Estimates of antenna efficiencies will be based on techniques described by Zydlewski et al. (2006) and Horton et al. (2007).

Beidler, W. M., and T. E. Nickelson. 1980. An Evaluation of the Oregon Department of Fish and Wildlife Standard Spawning Fish Survey System for Coho Salmon. Oregon Department of Fish and Wildlife, Information Report Series, Fisheries Number 80-9, Portland.

Horton, G.E., T.L. Dubreuil, and B.H. Letcher. 2007. A model for estimating passive integrated transponder (PIT) tag antenna efficiencies for interval-specific emigration rates. Trans. American Fisheries Soc. 136: 1165-1176.

Moore, K., K. Jones, J. Dambacher, C. Stein, et al. 2008. Aquatic Inventories Project: Methods for Stream Habitat Surveys. Oregon Department of Fish and Wildlife, Conservation and Recovery Program, Corvallis, OR 97333.

Suring, E., K.A. Leader, C.M. Lorion, B.A. Miller, D.J. Wiley. 2009. Salmonid Life Cycle Monitoring in Western Oregon streams, 2006-2008. Monitoring Program Report Number OPSW-ODFW-2009-2, Oregon Department of Fish and Wildlife, Salem.

Zydlewski, G.B., G. Horton, T. Dubreuil, B. Letcher, S. Casey, and J. Zdlewski. 2006. Remote monitoring of fish in small streams: A unified approach using PIT tags. Fisheries 31(10): 492-502.

Estimate PIT Tag Induced Mortality and Tag Shedding. PIT and CWT tagging is an intrusive technology that has the potential to adversely affect the survival of parr and smolts. Evaluation of PIT tag shedding using CWT co-tagging will be conducted according to Knudsen et al. (2009). Standardized PIT tagging methodologies have been developed by the Columbia Basin Fish and Wildlife Authority (1999). Coded wire tag insertion will follow the manufacturer's protocols (Solomon 2005) and field techniques in Mangus et al. (2006). Fish will be held until they have recovered from the anesthesia, and a sub-sample of tagged fish will be held in a flow-through pen for up to 6 weeks to estimate immediate tag loss and tagging mortality (modified method from Mangus et al. 2006).

Columbia Basin Fish & Wildlife Authority (CBFWA). 1999. PIT Tag Marking Procedures Manual (Portland, OR: Columbia Basin Fish & Wildlife Authority). 22pp.

Knudesn, C.M., M.V. Johnston, S.L. Schroder, W.J. Bosch, D.E. Fast, and C.R. Strom. 2009. Effects of passive integrated transponder tags on smolt-to-adult recruit survival, growth, and behavior of hatchery spring Chinook salmon. N.A. Journal of Fisheries Management 29: 658-669.

Mangus, D.L., D. Brandenburger, K.F. Crabtree, K.A. Pahke, and S.A. McPherson. 2006. Juvenile Salmon Capture andCcoded Wire Tagging Manual. Alaska Department of Fish and Game, Special Publication No. 06-31. Anchorage, AK. 139 pp.

Solomon, D.J. (compiler). 2005. Coded Wire Tag Project Manual: Guidelines on the Use of Coded Wire Tags and Associated Equipment. (Shaw Island, WA: Northwest Marine Industries). 51 pp.

Objective 2. Improve Juvenile Coho Salmon Winter Habitat Access, Survival and Performance in Lowland Streams.

Conduct Effectiveness Monitoring of Lowland Culvert Replacements. Proposed monitoring efforts of juvenile coho habitat use in Palouse, Larson and Willanch sub-basins will employ published protocols in association with fish capture and density estimation, calibration of fish capture methods, and for baseline habitat data collection. Population estimates will be made through multiple-pass removal according to methods described by Rodgers et al. (1992) and Krebs (1999), with the modification that removal will be performed using three passes.

Mark-and-recapture techniques will be used to determine coho salmon parr over-winter survival and growth. Sampling gear will consist of beach seine nets, stick seine nets and electrofishers. Each sampling method will be calibrated using visual estimations of fish abundance during day and night snorkel surveys as described in Rodgers et al. (1992). Night snorkeling will be adjusted for decreased accuracy with increased habitat complexity using methods developed by Jeff Rodgers et al. (1992).

All captured coho salmon (parr and smolts) will be scanned with portable PIT and CWT tag detectors; additionally, they will have their length and weight recorded. Because many of the tagged fish will be recaptured one or more times each season at the various sampling sites and/or will be detected by stationary PIT antennas systems it will be possible to determine in each stream at least individual juvenile coho salmon movement patterns and habitat type preference, and for those fish that are recaptured body size will be recorded and growth rates estimated too.

The mark-and-recapture over-winter survival estimates will be based on Cormack-Jolly-Seber models and structured and coded according to Burnham et al. (1987). Analyses for detecting PIT tagging induced mortality and size-dependent survival will be based on Brakensiek's and Hankin's (2007) approach. Calculations will be performed using Program MARK, a commonly used software routine to analyze mark-and-recapture data (http://www.phidot.org/software/mark/index.html). Program MARK is well suited to interfacing among discrete parr and smolt recaptures during periodic surveys or at the rotary screw tap, detections at the PIT antenna arrays, and ultimately recovery of carcasses of spawned out adults (Cooch and

White, 2011). Data analyses and model construction will be done using an extension to the R-Statistics software called "RMark."

Macroinvertebrate sampling in shallow wetlands will be conducted using a stovepipe sampler and manual bilge pump (Meyer et al. 2011, Batzer et al 2001). Channels will be sampled using a Surber net sampler (Li et al. 2001). In the laboratory, composite samples will be sub-sampled to get a minimum of 500 organisms (Caton 1991, Larsen and Herlihy 1998).

Batzer D.P., A.S. Shurtleff, and R.B. Rader. 2001. Sampling invertebrates in wetlands. p. 339–354 in Rader, R.B., D.P.Batzer, S.A.Wissinger (eds), Bioassessment and Management of North American Freshwater Wetlands. John Wiley and Sons, New York, NY.

Burnham, K.P., D.R. Anderson, G.C. White, C. Brownie, and K.H. Pollock. 1987. Design and Analysis Methods for Fish Survival Experiments Based on Release-Recapture. Monograph 5, American Fisheries Society, Bethesda, MD. 437 pp.

Brakensiek, K.E., and D.G. Hankin. 2007. Estimating overwinter survival of juvenile coho salmon in a northern California stream: accounting for effects of passive integrated transponder tagging mortality and size-dependent survival. Trans. American Fisheries Soc. 136: 1423-1437.

Caton L.W. 1991. Improved subsampling methods for the EPA "Rapid Bioassessment" benthic protocols. North American Benthological SocietyBulletin 8:317-319.

Cooch, E. and G. White (eds.). 2011. Program MARK: A Gentle Introduction. 10th Edition. Available from: http://www.phidot.org/software/mark/docs/book/pdf/mark_book.zip.

Krebs, C.J. 1999. Ecological Methodology. (Menlo Park, CA: Benjamin/Cummings). 620 p.

Larsen, D.P., and A.T. Herlihy. 1998. The dilemma of sampling streams for macroinvertebrate richness. Journal of the North American Benthological Society 17:359-366.

Li., J., A. Herlihy, W. Gerth, P. Kaufmann, S. Gregory, S. Urquhart, and D.P. Larsen. 2001. Variability in stream macroinvertebrates at multiple spatial scales. Freshwater Biology 46:87-97.

Meyer C.K., S.D. Peterson, and M.R. Whiles. 2011. Quantitative assessment of yield, precision, and cost-effectiveness of three wetland invertebrate sampling techniques. Wetlands 31:101-112

Moore, K., K. Jones, J. Dambacher, C. Stein, et al. 2008. Aquatic Inventories Project: Methods for Stream Habitat Surveys. Oregon Department of Fish and Wildlife, Conservation and Recovery Program, Corvallis, OR 97333.

Rodgers, J.D., M.F. Solazzi, S.L. Johnson, and M.A. Buckman. 1992. Comparison of three techniques to estimate juvenile coho salmon populations in small streams. N.A. Journal of Fisheries Management 12:79-86.

White, G.C. and K. P. Burnham. 1999. "Program MARK: Survival estimation from populations of marked animals." Bird Study 46 (Supplement): 120-138.

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

Larson, Palouse, and Willanch Creeks are identified as long term monitoring study sites as part of the Coos Bay Lowlands Focus Area in our Model Watershed Program strategy. As direct tributaries to the Coos estuary, these streams have had a long history of assessment data collection, restoration projects, and exemplary landowner relationships. Larson and Palouse Creeks have been identified as Intensively Monitored, Paired Watersheds by CoosWA since our original tide gate effectiveness monitoring grant in 2004. The studies proposed in Willanch Creek will build upon project effectiveness monitoring that began in that basin in 1997, and has continued throughout the last 12 years.

Life Cycle Monitoring Sites. Larson and Palouse are two of seven fairly comparable streams tributary to the Coos estuary that are tide gated at their mouth. These two streams were chosen for life cycle monitoring sites based on their productivity for coho salmon, their almost identical size, and because we were interested in seeing the effect of tide gate improvements on Larson Creek. They were also chosen as representatives of coastal lowland tide gated streams with a mixture of rural residential, agricultural, and forestry land uses. This latter reason for choosing these streams was to diversify the coverage of the ODFW Life Cycle Monitoring network as was discussed in section M1.

Estimation of freshwater survival and performance of different coho salmon early life history types. The existence of the life cycle monitoring sites on Larson and Palouse Creeks, in combination with the fact that we have a rich physical, hydrological and biological dataset of these systems, justifies the continuation of monitoring work in these systems.

The rotary screw traps provide a ready source of coho salmon subyearlings and smolts for PIT tagging as well as allowing for an estimate of outmigrants. Only coho salmon smolts caught in these traps will be PIT tagged. Subyearlings or parr will be tagged in late fall and early winter, when they tend to be larger than 80 mm and are anticipated to be less stressed by the implant of 12.5 mm PIT tags. Furthermore, delaying coho salmon parr tagging until the onset of winter conditions will improve the quality of the winter survival estimates. Coho salmon parr samples of sedentary life history type will be randomly obtained from pools in the upper reaches 5 and 6 by means of pole seining or electroshocking. Early estuarine rearing fish will be caught in the lower reaches of the creeks. Because the channel in the lowermost 3 reaches consists of a long glide unit with no clear boundaries along the mainstem length, the channel will be divided longitudinally in 100 m segments for sampling site selection purposes. Sampling site selection will then be randomly done (*sensu* Weybright 2011). In those sites fish will be captured by means of beach and pole seining. Fish in off-channel habitats will be either electrofished or caught on minnow traps left soaking overnight. We anticipate having few problems with access to randomly selected sampling sites because as a result of the CoosWA's involvement with the local drainage districts and its good relations with the area's riparian landowners the field crew will have access to most of the properties along these lowland streams.

Fish performance during winter will be estimated by re-capturing PIT tagged individuals again in late winter and early spring (February-March) as described above and recording their body weights and fork lengths. To increase the probability of recapturing sedentary individuals in the upper reaches, we will sample not only the habitat units where they were initially caught but up to two adjacent habitat units in a downstream direction. By contrast, beach and pole seining will be used in the lower reaches to try to recapture the more mobile individuals that inhabit that part of the creeks.

Estimation of coho salmon marine survival, with emphasis on natural origin jack returns. All smolts caught in the rotary screw trap will receive a PIT tag, and a subsample of them (10-20%) will be double tagged (with PIT and coded wire tags) as part of the tag mortality and loss study we described in section M2. All PIT tagged individuals will potentially contribute to the estimation of this survival rate, however, to eliminate freshwater mortality only fish detected when they move as smolts into the estuary through the tide gate antenna systems of Larson and Palouse and Willanch Creeks will be considered. Although Willanch Creek is not part of the Life Cycle Monitoring sites, but PIT tagged smolts that will be leaving from it (as a result of having been tagged as late fall parr for the restoration effectiveness monitoring work we will carry out in all three creeks: Larson, Palouse and Willanch).

Returning PIT tagged jacks and adult spawners will be detected by the combination of two antenna systems (one at tide gates and one at upstream end of tide gate reservoir or Reach 1) that we will operate in Larson, Palouse and Willanch Creeks. Intensive stream surveys will be conducted twice-three times a week during the spawning season to find, count and test carcasses for PIT and coded wire tags using hand-held detectors. The heads of tagged carcasses will be retained for subsequent otolith removal and coded wire tag recovery.

Improvement of juvenile coho salmon winter habitat access, survival and performance in lowland streams. In order to evaluate the effectiveness of improved connectivity between mainstem channels and potential over-wintering rearing habitat, we developed three different classes dependent upon historic and current conditions. Historically, sites in all three classes were diked, ditched and drained for agricultural use (see Figure 6). However, current conditions differ among the three classes: a) "Reference Wetland" sites where the dikes have been breached and culverts and tide gates removed either intentionally or through neglect that are presently freshwater tidal wetlands (water levels are influence by operation of tide gates at the stream mouths); b) "Un-restored Baseline" sites that represent the baseline, original diked pastures where habitat connectivity is impeded by heavy top-hinged tide gates (often in poor condition) and/or poorly drained channels; and c) "Connectivity Treatment" sites where connectivity has been restored by upgrading culverts, removing tide gates, or utilizing improved tide gate designs.

The 23 candidate sites shown on Figure 6 were identified based on our knowledge of local conditions and landowners. All sites are located on properties where we have existing relationships with landowners who have allowed us access to sample in the past. The seven "Treatments" are culvert replacements on Haynes Lane adjacent to Palouse Creek (see Figure 6) and represent situations commonly found in lowland streams along the Oregon coast. Of these seven culverts, four were replaced during the summer, 2011 and the other three will be replaced during the summer, 2012. Each of these culverts provides drainage for pastures and hillslopes defined by channelized drainage channels (or channelized tributaries).

Using a series of strategically deployed PIT antenna systems, we plan to monitor the access of PIT tagged juvenile coho to off-channel winter habitat areas that represent the three classes of habitat conditions described above. The antenna systems will allow us to determine fish leaving the study area and the timing of the emigration. Detection of movement back into the mainstem in late winter/early spring will be used towards the estimation of juvenile coho winter survival in these different winter habitats. Recapture of PIT tagged individuals, by means of minnow trapping (with overnight soaking of the traps) to avoid chasing the fish out of their winter refuge, will be used both to record body size measurements (weight, fork length) and for mark-recapture estimation of abundance to be used in the calculation of fish rearing densities. Repeated captures of some individuals will provide the data needed to estimate their instantaneous growth rates, which can then be used as indirect indicators of habitat quality (see Weybright 2011). Ponded water behind dikes and in natural reference wetlands will be surveyed for evidence of fish stranding as flood level waters recede.

The distribution of sampling sites among Palouse, Larson and Willanch Creeks will ensure that a representative sample of coho from each habitat class are PIT tagged so that possible differential survival rates among those classes are more likely to be detected. Our intent is to aggregate the three basins to select study sites. This will allow us to have an adequate number of replicates for some of the habitat treatments in our sampling.

Macroinvertebrate sampling will be carried out in side-channels and ponded waters of the selected study sites representing the three habitat "treatments". We plan to collect ten randomly located samples per wetland or water ponded site, and these samples will be combined to get a representation of the amounts and types of wetland fauna. Six randomly placed samples will be collected per channel site and these samples will also be combined to get a representation of the fauna living on the channel bottom. Once in the laboratory, composite samples will be sub-sampled to get a minimum number of 500 macroinvertebrates per habitat "treatment" type.

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

Objective 1, coho life cycle monitoring in Palouse and Larson sub-basins, will supplement the existing ODFW Life Cycle Monitoring database. Data pertaining to coho abundance and survival in productive lowland coastal streams, in conjunction with other ODFW Life Cycle Monitoring sites, will help calibrate limiting factors models and identify trends in Oregon Coastal coho abundance and survival. Specific information on smolt-to-jack productivity will augment existing ODFW data from Mill Creek to further refine their models. Spawning surveys conducted in association with life cycle monitoring efforts in Palouse and Larson sub-basins will also complement ODFW standard spawning survey segments in each sub-basin.

We anticipate that the results from the effectiveness monitoring will fill a gap in knowledge about juvenile coho productivity in lowland coastal streams, particularly as it relates to habitat connectivity resulting from culvert upgrades and tide gates. This new information on the use of diked pastures and ditches as over-wintering habitat for coho parr will augment existing data from Weybright (2011) and Bass (2010) on coho in coastal lowland stream systems. This information will also augment studies done by Joe Ebersole et al. (2006) in the Smith River that characterized winter rearing habitat on coastal streams, but in areas that do not have similar land uses (forestry versus agricultural and rural residential).

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

Quality control and assurance for the coho life cycle monitoring component of the project will be performed internally by the CoosWA Project Manager and externally by Erik Suring, ODFW Life Cycle Monitoring program manager (see support letter). Quality control for fish handling is preformed annually by ODFW as part of our Take Permits for the project. Any unexpected levels of take are immediately reported and corrective measures worked out with the ODFW District Fish Biologist.

Quality control and assurance for the seasonal habitat use components of the proposed project will be conducted by CoosWA management and externally by Dr. Guillermo Giannico, OSU Department of Fisheries and Wildlife. Guillermo Giannico provides over 20 years of fisheries research experience and he is very familiar with the proposed study sub-basins as he has supervised several fisheries projects in Palouse, Larson, Willanch and Winchester sub-basins. He is also knowledgeable regarding juvenile coho use in a variety of stream contexts. Please see Dr. Giannico's letter of support which is attached to this proposal.

We have a third level of quality control that provides considerable ancillary benefits to the project. Graduate students conducting the study are simultaneously taking classes and have a committee that evaluates their individual study plan and their thesis. Committee members have included OSU faculty (such as Guillermo Giannico, Jessica Miller, Kathleen O'Malley, Marv Pyles, Don Stevens), researchers from the U.S.E.P.A. Corvallis Research Laboratory (Joe Ebersole), the Forest Service's Pacific Northwest Research Station (Gordy Reeves, Kelly Burnett), and NOAA's Northwest Fisheries Science Center (Phil Roni). Additional technical support and QC/QA is provided through the students' class instructors such as Lisa Madsen (statistics), Michael Banks and Kathleen O'Malley (genetics), and Jessica Miller (early life history of fishes).

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

Existing ODFW Life Cycle Monitoring sites are primarily located in inland stream sites and data from these sites may not accurately represent coho population trends in coastal lowland streams. These data will be used to calibrate existing limiting factors models which will enhance our ability to identify and prioritize stream restoration opportunities. ODFW is particularly excited about using the coho smolt-to-jack return estimates to meet their data requirements under Amendment 13 of the Pacific Salmon Plan.

The extent to which juvenile coho salmon utilize lowland coastal streams during freshwater residence is not fully understood, particularly streams in which movement is partially restricted by dikes and poorly maintained culvers and tide gates. Information collected as part of the project will provide basic information on winter habitat use in lowland streams (considered a key limiting factor) in un-restored as well as variously restored habitat classes. Proposed efforts to monitor juvenile coho salmon use of these habitats will help identify priority habitats that may provide differential benefits to the young fish in terms of size, growth, and survival. Identification of such habitats will assist with identification and prioritization of candidate restoration sites. This information is anticipated to inform regulatory considerations related to fish passage (see support letter from the Coos County Commissioners).

M9 What is the proposed schedule for the project?

	2012						2013												2014					
Sampling Effort	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Spawner abundance estimation w/ PIT antenna and spawning surveys.				X	X	X	X	X								X	X	X	X	X				
Smolt abundance estimation at screw trap								X	X	X	X									X	X	X	X	
Juvenile movement PIT detections in mainstem	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Over-winter habitat use sampling.			X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	
Macro-invertebrate sampling and analysis							X		X		X								X		X		X	
Data analysis & reporting				X	X						X	X								X	X	X	X	X

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

It is intended that the coho life cycle project be conducted for three complete generations using PIT technology, or at least nine years. Monitoring data is necessary for a minimum of three coho generations as yearly variation in fish abundance and survival can make interpretation of monitoring results difficult. The detailed information that will be collected from recaptured juvenile and adult PIT tagged fish will be valuable in assessing growth and survival rates of coho with distinct habitat use histories.

M11 How will the success of the project be determined?

Coho life cycle monitoring efforts in Palouse and Larson sub-basins will be considered successful if data from the sites are incorporated into ODFW Life Cycle Monitoring Project databases and if the data are used to update limiting factors models and to enhance prediction of coho recruitment for Oregon coastal basins. The proposed restoration effectiveness monitoring outlined in Objective 2 will be regarded as a success if we can detect differences in fish response and/or aquatic community response to increased floodplain connectivity. Negative results (i.e., lack of expected responses) are also going to be considered in our effectiveness restoration monitoring work. Once all possible sources of error—including small sample sizes or extreme spatial and/or temporal variability—are considered we should be able to conclude whether the restoration actions being studied may benefit juvenile coho salmon survival and performance or not. The project effectiveness monitoring, will be considered successful if the results are used in subsequent restoration program and project design, and if they are used by the regulatory agencies to establish their standards.

We are also committed to publication of the results of this work. We expect that one Masters thesis will result from work conducted as part of this grant, and that between one and three papers will be published in peer-reviewed scientific journals. Use of PIT antenna arrays in life cycle monitoring, and specifically the ability to enumerate coho jack returns, has broad application that would benefit from publication of our techniques and results. Additionally, there is limited information available of the range of benefits from improving connectivity in diked lowlands. Most monitoring efforts focus on restored wetlands; our program targets that much greater extent of lowlands along the Oregon coast that are not going to be restored to wetlands in the near future. We will consider this project a great success if our results identify ways to make these lands more productive for coho salmon through cooperative actions of watershed councils, local governments and landowners.

M12 Provide a detailed description of project location, including location(s) where monitoring will occur.

Monitoring will take places within the Coos sub-basin (HUC 1710030404), and specifically within Palouse, Larson and Willanch subbasins. Specific locations of sampling acitivities associated with each monitoring objective are identified in Figures 1 and 6 (attached) and Table 3 below.

Table 3. Mainstem and tributary reaches in Palouse, Larson and Willanch creeks.

Monitoring Objective	Subbasin	Stream	Monitoring Activity	River Mile(s)	Latitude (N), Longitude (W)
Objective 1 Life-Cycle Monitoring	Palouse	Palouse	PIT Antenna Array	0.0	43.465619, -124.189471
		Palouse	PIT Antenna Array	2.0	43.482877, -124.170827
		Palouse	Spawning Survey	5.3-7.5	43.503304, -124.122557*
		Bear	Spawning Survey	0.0-0.5	43.503304, -124.122557*
		Unnamed Tributary B	Spawning Survey	0.0-0.1	43.506418, -124.124004*
		Unnamed Tributary C	Spawning Survey	0.0-0.5	43.512895, -124.118715*
		Unnamed Tributary D	Spawning Survey	0.0-0.2	43.515115, -124.113420*
	Larson	Larson	PIT Antenna Array	0.0	43.461983, -124.193707
		Larson	PIT Antenna Array	1.2	43.457000, -124.173262
		Larson	Spawning Survey	4.4-5.9	43.483208, -124.131158*
		Sullivan	Spawning Survey	0.8-1.1	43.470437, -124.128085*
Objective 2 Habitat Use Effectiveness Monitoring	Palouse	Palouse	Fish Capture and Sampling	0.0-7.5	43.465619, -124.189471*
		Lowland Tributary A	Fish Capture and Sampling	0.0-0.3	43.482713, -124.168084*
		Lowland Tributary B	Fish Capture and Sampling	0.0-0.4	43.491146, -124.144518*
		Upland Trib (Bear Cr)	Fish Capture and Sampling	0.0-0.5	43.461983, -124.193707*
		Upland Tributary C	Fish Capture and Sampling	0.0-0.5	43.461983, -124.193707*
	Larson	Larson	Fish Capture and Sampling	0.0-5.9	43.461983, -124.193707*
	Willanch	Willanch	PIT Antenna Array	0.0	43.401526, -124.190846
		Willanch	Fish Capture and Sampling	0.0-3.8	43.401526, -124.190846*

* Latitudes and longitudes for monitoring activities that occur at multiple sites within a range of River Miles represent the downstream point of the range.

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Section IV
WATERSHED MONITORING BUDGET

	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
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.						
Fisheries Biologist (days)	50	195			9,750	9,750
		SUBTOTAL (1)	0	0	9,750	9,750
IN-HOUSE PERSONNEL. Includes *only* actual in-house staff costs for project implementation						
Fisheries Biologist (days)	400	195			78,000	78,000
AmeriCorps Member (years)	2	26,126	39,752	6,000	6,500	52,252
		SUBTOTAL (2)	39,752	6,000	84,500	130,252
CONTRACTED SERVICES. Labor, supplies, and materials to be provided by *non-staff* for project implementation.						
Guillermo Giannico (OSU)	40	300	12,000			12,000
Macro-invertabrate Analysis (day)	30	250			7,500	7,500
		SUBTOTAL (3)	12,000	0	7,500	19,500
TRAVEL. Mileage, per diem, lodging, etc. Must use current State of Oregon rate.						
Site Visit Mileage	21,500	0.51			10,965	10,965
Per diem Lab & Meetings	24	46			1,104	1,104
Lodging Lab & Meetings	12	77			924	924
		SUBTOTAL (4)	0	0	12,993	12,993
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.						
PIT antenna materials (lump)	1	8,000			8,000	8,000
Misc. hardware & hand tools (lump)	1	2,000			2,000	2,000
Fish sampling gear (nets, boots, etc.)	1	1,800			1,800	1,800
Scientific Take Permits (ODFW)	2	102			204	204
Macro-invertabrate supplies (lump)	1	750			750	750
PIT tags (ea.)	5000	2.50		6,000	6,500	12,500
		SUBTOTAL (5)	0	6,000	19,254	25,254
PRODUCTION. Design, video production, printing, direct mail, film developing, etc.						
Color Laser Cartridges (set)	1	448			448	448
		SUBTOTAL (6)	0	0	448	448
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.						
Smolt Traps (ea.)	2	13,000	26,000			26,000
Pressure Transducers (ea.)	6	900	5,400			5,400
PIT Antenna Transeivers (ea.)	7	8,500	42,500	17,000		59,500
Portable PIT Reader, Antenna (ea.)	2	500	1,000			1,000
Continuous Salinity Loggers (ea.)	5	700	3,500			3,500
Hess Stovepipe Sampler (ea.)	1	625			625	625
Surber Sampler (ea.)	1	350			350	350
		SUBTOTAL (7)	78,400	17,000	975	96,375
[Add all subtotals (1-7) from above] CATEGORY TOTALS (8)			130,152	29,000	135,420	294,572
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						
~~Aministration (~~10%)					13,542	13,542
FISCAL ADMINISTRATION TOTAL (9)			0	0	13,542	13,542
BUDGET TOTAL (10) **[Add Category Totals (8) and Fiscal Total (9)]**			130,152	29,000	**148,962**	308,114

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. 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, visit our website at www.oregon.gov/OWEB/GRANTS/grant_app_materials.shtml, or contact your local OWEB regional program representative (contact information available in the instructions to this application).

Project Name: Coho life history in tide gated lowland streams   Applicant: Coos Watershed Association

Match Funding Source	Type (√ one)	Status (√ one)*	Dollar Value	Match Funding Source Signature/Date*
UCAN-AmeriCorps	☐ cash ☒ in kind	☒ secured ☐ pending	$39,752.00	See attached e-mail
OSU Fisheries & Wildlife (Giannico)	☐ cash ☒ in kind	☒ secured ☐ pending	$58,000.00	See attached letter
Bonneville Environmental Foundation	☒ cash ☐ in kind	☒ secured ☐ pending	$29,000.00	See attached letter
Coos Watershed Association	☐ cash ☒ in kind	☒ secured ☐ pending	$32,400.00	See attached letter
	☐ 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.

October 14, 2011

Jon Souder
Executive Director
Coos Watershed Association
P.O. Box 5860
Charleston, OR 97420

Dear Jon,

This letter confirms that 2012 and 2013 Bonneville Environmental Foundation Model Watershed grant funds, in the amount of $30,000 may be committed as match for the Oregon Watershed Enhancement Board (OWEB) grant proposal titled "Coho Life History in Tide Gated Coastal Lowland Streams" to purchase supplies and cover staff time.

Please do not hesitate to contact me if you or OWEB representatives have any questions or require additional information.

Sincerely,

Robert F. Warren
Model Watershed Program Director

bonneville environmental foundation

240 southwest 1st ave.
portland, oregon 97204

503 248 1905
www.b-e-f.org

Subject:
RE: AmeriCorps Placement
From:
Sarah Davis <Sarah.Davis@ucancap.org>
Date:
10/14/2011 11:47 AM
To:
'Jon Souder' <jsouder@cooswatershed.org>
CC:
"ewright@cooswatershed.org" <ewright@cooswatershed.org>, Bessie Joyce <bjoyce@cooswatershed.org>, "Giannico, Guillermo - FW" <giannico@oregonstate.edu>

Hi Jon,

Looking over your concept below, it looks like a position that I think would be a good fit for our program design within education and job skills development. This coming year will be our first year in Coos County and applications from that area will be given preference by our reviewers.

All sites we partner with are required to pay a cash match to host a member. Our program has a graduated pay scale. The first year with our program, sites are asked to contribute a $6,000 match for the program. In years 2 and beyond, that match amount is $6,500.

Below I outline the cost per member we calculated for our members in the current service year.

$12,100.00	Living allowance
$1,740.00	Health coverage
$925.65	FICA for member
$350.00	Travel and training
$50.00	Service gear
$50.00	Member recognition
$100.00	Member background checks
$560.00	Worker's Compensation
$5,550.00	Segal AmeriCorps Education Award
$4,700.00	Indirect expenses
$26,125.65	Approximate total per term of service*

* Note: This amount may fluctuate per member and is based on an average. Other expenses that may be incurred include, but are not limited to, an interest accrual payment made by the Corporation for National and Community Service. This amount will vary depending on how much a member owes in student loans and what their interest rate is.

Let me know if you have any questions or need anything additional to demonstrate our program's support.

Thanks.

Sarah

Sarah Davis
United Communities AmeriCorps Program Director
United Community Action Network
280 Kenneth Ford Dr.
Roseburg, OR 97470
541-492-3518
541-672-1983 (fax)
541-817-5132 (cell)
https://sites.google.com/site/ucamericorps/

From: Jon Souder [mailto:jsouder@cooswatershed.org]
Sent: Tuesday, October 11, 2011 4:24 PM
To: Sarah Davis
Cc: ewright@cooswatershed.org; Bessie Joyce; Giannico, Guillermo - FW
Subject: AmeriCorps Placement

Sarah -

Our call this morning acted as a catalyst for me to have a broader conversation with Emily Wright (our VISTA member developing an intern program), Katherine Nordholm (our current granduate student/employee on the project), and Guillermo Giannaco, the faculty member who is our OSU partner on the project. Because of budgetary limitations, the project has been chronically short of staff, and we see some significant opportunities to involve interns and students to relieve some of the need for additional labor (while still recognizing that managing these folks will also take some effort).

Here's what I can foresee at this point:
1. A graduate student/CoosWA employee who would take the science lead on the project as part of her/his M.S. thesis work (and employment);
2. An AmeriCorps IP intern who would directly assist with the project as a technician, but who would primarily be responsible for making sure that there were adequate (and adequately trained and oriented) interns and students to help operate the equipment, do the surveys and work up the resulting data.
3. A coterie of community college interns/students, probably 6 - 10 at any one time (possibly constituting a class?) who would conceivably meet once a week for a discussion topic and then would have assigned days/times to work with the graduate student/AmeriCorps IP directly on the project.
4. Supplemental high school students, either in the "Friday's Program" or graduates of it who would participate in the program on Fridays (and who could "earn" the potential for summer employment with the project or on other CoosWA crews.

I think this approach would not only meet our needs for the project (as well as our outreach strategy), but would also fit well with your existing Job Skills and Education program slots. If the Environment option comes through it would be fine, but I still am excited about the potential to leverage our new intern program to support this project.

What are your thoughts?

Jon

--

Jon A. Souder, Ph.D.

Executive Director

Coos Watershed Association

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OSU
Oregon State
UNIVERSITY

Department of Fisheries and Wildlife
Oregon State University, 104 Nash Hall, Corvallis, Oregon 97331-3803
T 541-737-4531 | F 541-737-3590 | fw.oregonstate.edu

October 14, 2011

Oregon Watershed Enhancement Board
775 Summer Street NE, Suite 360
Salem, OR 97301-1290

Dear OWEB Grant Review Team:

This letter is in support of an OWEB Monitoring Grant application by the Coos Watershed Association (CoosWA) entitled "Coho Life History in Tide Gated Lowland Coastal Streams."

I have worked with the CoosWA over the past ten years developing stream restoration prioritization strategies and assessing the effects of tidegates on anadromous fish populations, particularly coho salmon. Our cooperative work has resulted in two Sea Grant publications that have raised the level of awareness and knowledge about tidegates (see http://seagrant.oregonstate.edu/sgpubs/onlinepubs/t05001.pdf and http://seagrant.oregonstate.edu/sgpubs/onlinepubs/g04002.pdf).

In addition, the support of the CoosWa has been pivotal in the successful field implementation of an OWEB research grant I received in 2008 to examine juvenile coho salmon passage through two different types of tide gates. Most recently, I have been involved with some of the work of this watershed council through the supervision of the theses work of two graduate students: one investigating juvenile coho salmon movement patterns, and the other exploring the use of otoliths to determine coho salmon early life histories. The study sub-basins have always been Larson and Palouse, with the use of other lowland sub-basins in the Coos Bay as either references or contrasting treatments.

As the life cycle monitoring work of the CoosWA is scheduled to end in 2012, this organization, with a clear long-term vision, is interested in taking advantage of both the considerable amount of fish tracking equipment it will have access to and the highly professional technical experience this council has developed locally in collaboration with OSU faculty.

The project the Coos Watershed Association proposes to OWEB is very well planned, and is expected to provide much needed information to improve our understanding of coho salmon life histories and their responses to floodplain connectivity restoration in coastal watersheds. Besides these important contributions, the proposed project is also anticipated to provide very high quality marine survival data (with the inclusion for, the first time, of natural origin jack coho salmon return data) that will be key in completing the coho salmon status picture ODFW is trying to put together for the Oregon coast.

I will provide technical support and cooperate to publish the results of the coho salmon life cycle and restoration effectiveness monitoring work proposed by the CoosWA. The contribution of 40 days of my time (i.e., technical assistance, travel) as in kind match for the two years of duration of this project can be valued at $12,000. The replacement value of the fish tracking equipment I will lend to the CoosWA for the proposed projects is $46,000 (five Destron Fearing multiplexing transceivers @ $8,500/each and 5 Star-Oddi salinity loggers @ $700/each)..

I believe this project represents a much needed and unique contribution to our understanding of coho salmon ecology and the effectiveness of specific types of restoration action actions on coho salmon abundance and watershed health. Please, do not hesitate to contact me if you needed any additional information.

Sincerely yours,

Guillermo Giannico

Guillermo Giannico, Ph.D.
Extension Fisheries Specialist and Associate Professor
Phone: (541)737-2479 E-mail: giannico@oregonstate.edu

Coos Watershed Association
P.O. Box 5860
Charleston, OR 97420
(541) 888-5922
(Fax) 888-6111
E-mail: jsouder@cooswatershed.org

MEMORANDUM

DATE: October 14, 2011

TO: OWEB Southwest Region Review Team

FROM: Jon Souder, Executive Director

SUBJECT: Match Commitment for Rotary Screw Traps

This proposal represents a continuation of a long term monitoring project whose relative economy is based on past investments by OWEB and others. As we bring on additional partners, such as the UCAN-AmeriCorps program and our desire to build an intern program, it becomes more difficult to logically differentiate among in-kind match, cash match, and past OWEB funding that has created the infrastructure that will be used in this project.

For example, the Coos Watershed Association (CoosWA) has operated two life cycle monitoring sites since 2004 that involve the use of two rotary screw traps. The estimated value of each of these screw traps is $13,000, or $26,000 for the two. One of the screw traps belongs to ODFW, but has been on long-term loan to CoosWA. The other screw traps was constructed of materials salvaged from a number of different agencies back in 2004. For all practical purposes it belongs to CoosWA.

In the past the Regional Review Team has been confident that rotary screw traps will be available for use in this project. My expectation, especially given state budgets, is that this will continue during the course of this project. Therefore we have included these traps as secured match in our application.

We are also indicating another $5,400 as "In-kind" match for 6 pressure transducers, and $1,000 for 2 handheld PIT tag readers. These items were purchased under a number of different grants, some including OWEB funding. They are listed here because of their importance to the project, not because we need additional match funding.

If there is a problem with this approach, please let me know and we will work together to resolve it. We have plenty of match for this grant so the 25% threshold is not a constraint.

Cordially,

Jon A. Souder
Executive Director

ATTACHMENT B

PUBLIC RECORD CERTIFICATION

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. _____
2. _____
3. _____
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: Exact effectiveness monitoring sampling sites remain to be determined.

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

[signature] Applicant Signature	10/14/2011 Date
Jon A. Souder Print Name	Executive Director Title
Co-Applicant Signature	Date
Print Name	Agency

Coos County

BOARD OF COMMISSIONERS

250 N. Baxter Street, Coquille, Oregon 97423
(541) 396-3121 Ext.225
FAX (541) 396-4861 / TDD (800) 735-2900
E-Mail: bbrooks@co.coos.or.us

Robert "Bob" Main Cam Parry Fred Messerle

Greg Sieglitz
Monitoring and Reporting Program Manager
Oregon Watershed Enhancement Board
775 Summer Street, NE Suite 360
Salem, OR 97301

RE: Support for Coos Watershed Association's OWEB Monitoring Proposal

Dear Mr. Sieglitz,

We (I) are writing this letter in support of the Coos Watershed Association's (CoosWA) monitoring grant proposal entitled "Coho Life History in Tide Gated Coastal Lowland Streams." Continued support for this program will provide information on juvenile coho usage of lowlands and the estuary surrounding the Coos Bay as well as similar areas along the Coquille River. These are important areas that support a wide range of economic activities as well as provide critical habitat for coho salmon. Better understanding how coho, particularly juveniles, use these areas will help us manage these areas under the Coos Bay and Coquille River Estuary Management Plans.

Coos County is currently a partner with CoosWA to replace seven culverts under Haynes Way on Palouse Creek (four were completed in the summer, 2011 and the other three will be installed next summer) to meet current ODFW and NMFS sizing requirements. While the County's financial constraints prohibit us from providing any direct cash contributions for the monitoring, the County has contributed over $150,000 for the culvert replacements in the project area. The Commissioners are extremely interested in applying the knowledge resulting from the project to help us better guide County policies and projects. We are particularly encouraged by the project objective that will evaluate juvenile coho passage through road culverts that provide access to winter rearing habitat in flooded pastures. Knowing how coho are using these culverts and pastures will help us to better understand the tradeoffs between infrastructure costs and fisheries benefits.

The Coos Watershed Association has strong existing relationships with land owners in the project area who have supported the monitoring over the past six years because they understand the importance of their streams to recover coho salmon so that they again provide a recreational and commercial fishery resource. The work that CoosWA is doing through their restoration programs is sensitive to the needs of these landowners to meet their own objectives while also benefiting salmon. Coos County strongly supports this cooperative approach, and understands that monitoring and evaluating the effectiveness of these restoration projects is crucial to maintaining continued public support for the Oregon Plan for Salmon and Watersheds.

We appreciate the opportunity that the OWEB grant program provides to assist us in this needed work.

Cordially,

Chair	Commissioner	Commissioner
Robert "Bob" Main	Cam Parry	Fred R. Messerle

Oregon
John A. Kitzhaber., Governor

Department of Fish and Wildlife
Corvallis Research Lab
28655 Hwy. 34
Corvallis, OR 97333
(541) 757-4263
FAX (541) 757-4102
Internet www.dfw.state.or.us
http://nrimp.dfw.state.or.us/crl/

October 11, 2011

To Whom It May Concern:

I am writing this letter to express my support of the Coos Watershed Council's watershed monitoring grant application to OWEB entitled "Coho Life History in Tide Gated Coastal Lowland Streams". As the application clearly articulates, the work proposed directly addresses high priority monitoring and research needs identified in the State of Oregon's Conservation Plan for the Oregon Coast Coho Evolutionarily Significant Unit. As one of the co-authors of the plan and as monitoring coordinator for ODFW, I know that monitoring the use of lowland and tidal areas by coho salmon is a key missing link to our understanding of the habitat needs of coho and actions critical to their recovery. Development of improved monitoring techniques also described in the application is also an important need, especially in a time of increasing information needs and decreasing budgets.

Because of this, I highly encourage OWEB to continue funding the Coos Watershed Councils proposal.

Sincerely,

Jeff Rodgers

Jeff Rodgers
Conservation and Recovery Monitoring Coordinator
ODFW

Oregon
John A. Kitzhaber., Governor

Department of Fish and Wildlife
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October 11, 2011

To Whom It May Concern:

I am writing this letter to express my support of the Coos Watershed Association's OWEB monitoring grant application "Coho Life History in Tide Gated Coastal Lowland Streams." As the project leader for ODFW's Life Cycle Monitoring Project I have reviewed the proposed protocols for consistency with ODFW methods. The survival and abundance data collected will be complementary to ODFW's monitoring efforts, providing additional information in an underrepresented area. The ability to determine smolt to jack survival rates using PIT tags is promising; currently we have reliable jack survival rate data at a single site. Having additional wild coho jack survival data will help coastal coho fisheries management. The research on using PIT tags to estimate smolt to adult survival rates could be applicable to other life cycle monitoring sites with low trap efficiency as a potentially more effective method to determine survival and additional work will help validate its utility.

I encourage OWEB to continue funding the Coos Watershed Association's proposal.

Sincerely,

Erik Suring
Life Cycle Monitoring Project Leader
ODFW

Oregon
John A. Kitzhaber, MD, Governor

Department of Fish and Wildlife
Charleston District Office
63538 Boat Basin Drive
PO box 5003
Charleston, OR 97420
(541) 888-5515
(541) 888-6860

Oregon Watershed Enhancement Board
775 Summer St., N.E., Suite 360
Salem, OR 97301

October 14, 2011

Dear OWEB Region 2 Review Team Members:

I am writing this letter in support of the Coos Watershed Association's (CoosWA) monitoring proposal entitled "Coho Life History in Tide Gated Lowland Coastal Streams." This proposal will continue a long-term program to better understand coho salmon life histories in coastal streams that are both very productive and under considerable environmental stress. The results to date of this program have informed ODFW's views on fish passage at tide gates and coho juvenile rearing strategies in lowland basins.

Of particular interest on our part is Objective 2 of the study that evaluates the benefits of increased connectivity between mainstem streams and adjacent diked areas. Most of the lowlands surrounding the Coos estuary (along with other areas of the coast), were diked, ditched, and drained for agricultural use. These traditional uses have become less economically viable, while rural residential land uses have gained in extent. At present, much of the infrastructure that supported these uses—dikes, culverts, and tide gates—is at or beyond its serviceable life. The CoosWA has been working with landowners, the Coos County Road Department, and ODFW to improve fish passage at these facilities. The effectiveness monitoring in this proposal will help to respond to landowner and local government concerns over the benefits of improved connectivity compared to the costs and associated flood risks.

The Charleston field office will provide assistance to this project as we are able. This includes technical assistance in the operation and maintenance of the rotary screw traps and PIT tag antenna sites, the services of a retired ODFW volunteer who conducts spawning surveys, and our Coos estuary summer fish seining crew who will target some of their efforts to the mouths of Larson, Palouse, and Willanch Sloughs to recover previously PIT-tagged coho juveniles.

Thank you for the opportunity to provide comments on this worthy proposal.

Sincerely,

Michael Gray
District Biologist/Charleston Field Office

cc. Greg Apke, ODFW Fish Passage Coordinator

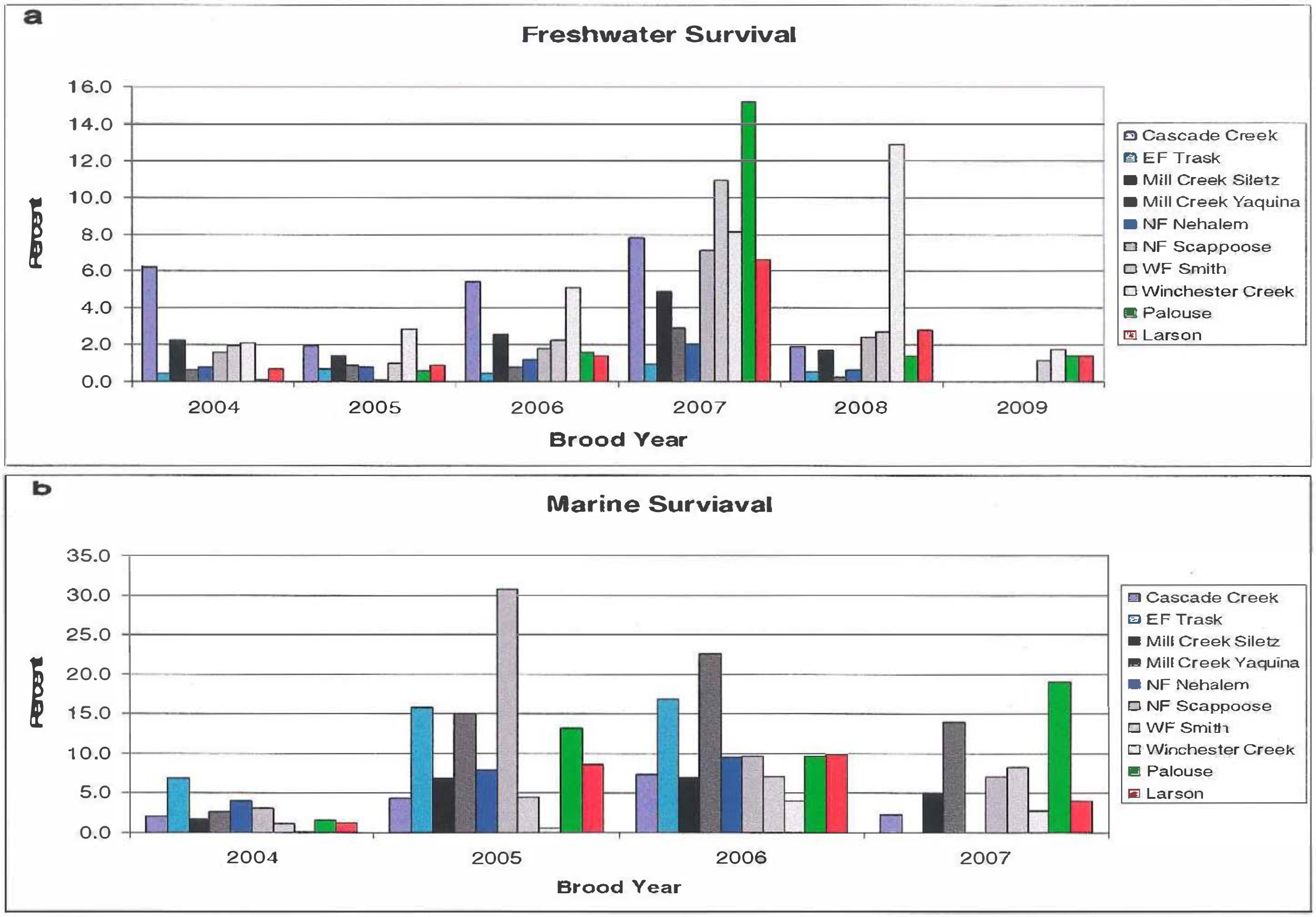

Figure 3: Annual estimates of freshwater (a) and marine (b) survival for coho salmon in seven ODFW Life Cycle Monitoring sites and Coos WA's sites in Palouse and Larson Creeks.

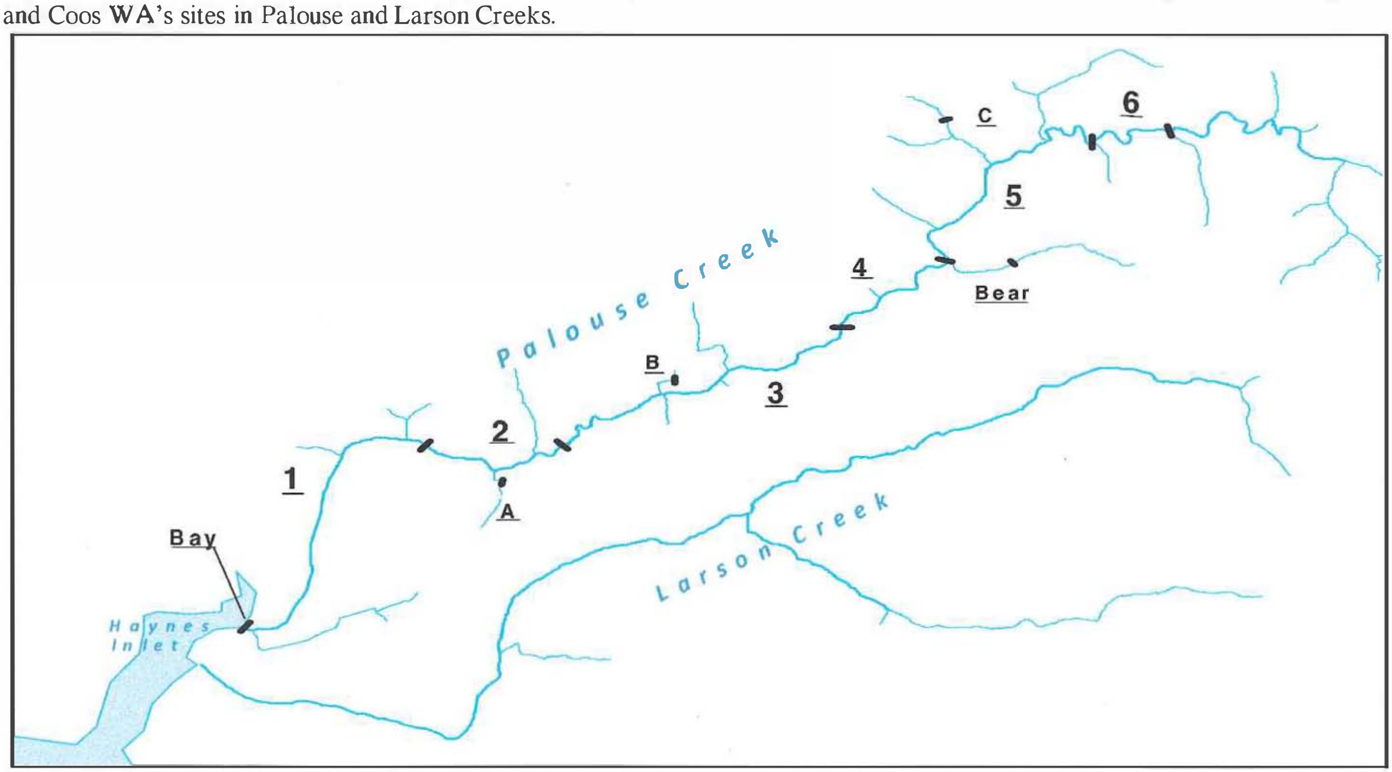

Figure 5: Larson and Palouse Creeks, showing the four tributaries and six main stem reaches on Palouse Creek. Classification of sampling reaches was based on stream morphology and habitat characteristics.