Department of Energy

Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

ENVIRONMENT, FISH AND WILDLIFE

June 25, 2010

In reply refer to:

Mr. Tony Grover, Fish and Wildlife Division Director
Northwest Power & Conservation Council
851 S.W. Sixth Avenue, Suite 1100
Portland, OR 97204-1348

Dear Mr. Grover:

With this letter, Bonneville Power Administration (BPA) is submitting a 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) project narrative for Independent Scientific Review Panel (ISRP) review. As you know, the 2008 FCRPS BiOp is a 10 year operations and configuration plan to mitigate for the adverse effects of the hydro-system on the 13 listed fish under the Endangered Species Act (ESA). The Reasonable and Prudent Alternative (RPA) 37 of the FCRPS BiOp calls for BPA and the other federal Action Agencies (AA) to implement specific mitigation actions to avoid jeopardy and adverse modification of the critical habitat of ESA listed Columbia River fish.

To this end, BPA will continue to fund ongoing Fish and Wildlife Program projects that support the RPA, and develop new projects designed to contribute to hydro, habitat, hatchery and predation management activities required under the 2008 FCRPS Biological Opinion. Additionally, many of the new FCRPS BiOp RPA projects will also assist BPA in meeting its mitigation obligations under the NW Power Act, and supplement the Northwest Power and Conservation Council's Fish and Wildlife Program. As sponsors develop narratives for these projects, we will submit them for ISRP review.

We are enclosing the detailed narrative for "Columbia Land Trust Estuarine Restoration," 2010-073-00, for immediate Council and ISRP review. The purpose of this new Columbia Land Trust (CLT) project is to develop, design and construct on-the-ground restoration habitat actions that provide high survival benefits to meet targets required under the 2008 BiOp. The restoration actions will benefit threatened and endangered salmonid species in lower river/estuary mainstem and tributary tidal habitats that promote diverse estuarine life histories.

The 2008 BiOp prioritizes habitat projects that are in tidally influenced areas of the tributaries. CLTs new habitat project, 2010-073-00, is focused from the mouth of the Columbia River to Bonneville Dam, including the tidally influence areas of the estuary tributaries.

The CLT project is intended to implement the following RPA required by the FCRPS BiOp:

a) RPA action 37: "Estuary Habitat Implementation 2010-2018 - Achieving Habitat Quality and Survival Improvement Targets. The AAs will provide funding to implement

> additional specific projects as needed to achieve the total estuary survival benefits identified in the FCRPS BA."

The initial contract is slated to start August 1, 2010 with a BPA FY10 funding commitment of $925,000. This will provide for continuation of estuary project development, design and implementation of estuary habitat actions.

In addition to ISRP project review, there will be two levels of scientific review for all estuary habitat restoration projects identified and implemented under the Columbia Land Trust Estuarine Restoration Project. CLT will utilize the Lower Columbia River Estuary Partnership's (Estuary Partnership) Science Work Group for the first level of scientific review for on-the-ground habitat projects. The second level of scientific review will be done by the RPA 37 Expert Regional Technical Group as required in the 2008 BiOp. Please see page fourteen of the project narrative for more detail.

If you have questions about the project narrative, please contact the project sponsor, Glen Lamb at glamb@columbialandtrust.org or Scott McEwen at smcewen@columbialandtrust.org. If you need any additional information from the BPA please contact Tracey Yerxa at tyerxa@bpa.gov or Marchelle Foster at mmfoster@bpa.gov, who is helping to coordinate the ISRP.

Thank you for your assistance, we look forward to working closely with you and your staff as we implement BiOp projects.

Sincerely,

/s/ William C. Maslen

William C. Maslen
Director, Fish and Wildlife

Enclosure: Columbia Land Trust Estuarine Restoration Project Narrative

The 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (2008 BiOp) is a ten-year operations and configuration plan to mitigate for the adverse effects of the hydrosystem on the 13 listed Columbia/Snake salmon and steelhead under the Endangered Species Act (ESA). The 2008 BiOp provides mitigation actions that are required of the FCRPS action agencies to avoid jeopardy and adverse modification of the critical habitat of ESA listed Columbia River fish. Ongoing projects supported and new projects developed are designed to contribute to hydro, habitat, hatchery and predation management activities required under the 2008 FCRPS Biological Opinion. Additionally, the projects assist the Bonneville Power Administration (BPA) in meeting its protection, mitigation, and enhancement objectives and responsibilities in support of the Columbia Basin Fish and Wildlife Program adopted pursuant of the Northwest Power Act.

Project Title: Columbia Land Trust Estuarine Restoration

Table 1. Proposal Metadata:

Project Number	2010-073-00
Title	**Columbia Land Trust Estuarine Restoration**
Proposer	Columbia Land Trust
Brief Description	Restoration of T/E Juvenile Salmon Off-Channel Rearing Habitat
Province(s)	Lower Columbia River and Estuary
Subbasin(s)	Columbia Estuary, Elochoman, Grays, Youngs, Lewis & Clark, Columbia Lower, Cowlitz, Sandy, Lewis, Kalama, Washougal, & Willamette
Contact Name	Glenn Lamb
Contact email	glamb@columbialandtrust.org
Projected Start Date	August 1, 2010

A. ABSTRACT

Columbia Land Trust seeks to accelerate the development, design and construction of on-the-ground habitat restoration actions in the Columbia River Estuary that benefit threatened and endangered salmonid species and help meet survival benefit targets/goals required under the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp). The Columbia Land Trust Estuarine Restoration Project is intended to implement the following RPA required by the FCRPS BiOp. This RPA States:

> RPA action 37: "Estuary Habitat Implementation 2010-2018 - Achieving Habitat Quality and Survival Improvement Targets. The AAs will provide funding to implement additional specific projects as needed to achieve the total estuary survival benefits identified in the FCRPS BA."

All restoration actions conceived of and implemented within this project are intended to benefit threatened and endangered salmonid species rearing and migrating in main stem and tidal habitats of

the Columbia River estuary. As a principle implementer of restoration in the Columbia Estuary, Columbia Land Trust has conserved over four thousand acres of Columbia Estuary floodplain over the last nine years. Columbia Land Trust accomplished this by permanently securing a land base from willing land owners through fair market processes. These lands now serve as platform from which on-the-ground restoration projects are able to be implemented. These restoration projects result in some of the highest survival benefits for threatened and endangered salmon in the estuary (Johnson et al. 2007).

Columbia Land Trust helps its public and private partners achieve their specific land protection and restoration goals by working closely with land owners, local, state and federal agencies providing risk capital through a revolving transaction fund, effective negotiation, legal skills and an ability to leverage significant sources of project funding. This approach enables Columbia Land Trust to act quickly and effectively to meet estuary habitat restoration goals and allows Columbia Land Trust to accomplish restoration where other practitioners cannot. Columbia Land Trust has identified and is developing numerous additional estuary habitat acquisition and restoration projects that this proposal seeks to support.

The project types developed within this program will be largely tidal reconnection actions that restore full or near full tidal influence to areas that have been historically disconnected from tidal and fluvial hydrologic processes by levees, roads, dredge material and railroad causeways. These restoration actions will restore such natural habitat forming processes as, tidal hydrology, sediment accretion, and the movement of macro-detritus that shape and maintain estuarine wetland habitats. Specific restoration objectives are to: 1) Restore connectivity between river and floodplain, as well as in-river habitats; 2) Increase shallow water peripheral and side channel habitats toward historic levels. In addition to the ISRP review of this proposal we anticipate that there will be two levels of scientific review for all estuary habitat restoration projects identified and implemented under this project. Columbia Land Trust will coordinate closely with, and utilize the Lower Columbia River Estuary Partnership's Science Work Group for the initial level of scientific review for on-the-ground habitat projects. The second level of scientific review will be done by the RPA 37 Expert Regional Technical Group as required in the 2008 BiOp; this review will be conducted in coordination with the Science Work Group.

The recovery of Columbia River salmonids requires that a sufficient amount and diversity of habitat opportunity is provided in the estuary to accommodate the full spectrum of stocks and life history types in the basin. To accomplish this, the primary objective of this project is to increase the diversity, extent, and spatial distribution of habitats capable of supporting multiple salmon ESUs and life history types.

B. PROBLEM STATEMENT: TECHNICAL AND/OR SCIENTIFIC BACKGROUND

Background

It is now widely understood that the Columbia River estuary is important to viability of anadromous fish populations for the entire Columbia Basin (Bottom et al, 2005). During their transition from the freshwater to marine environments juvenile salmonids, especially juvenile Chinook salmon, reside and feed for lengthy periods in the shallow, tidal-fluvial channels and wetlands that comprise the estuary (Fresh, et al 2005). Yet, over the past one hundred and fifty years there have been extensive alterations in the quantity, composition, and distribution of tidal wetland habitats in the Columbia estuary. The result of this fragmentation and habitat shrinkage is less exchange of materials and species among habitats, and a corresponding loss of productivity and survival rates.

These changes are largely the result of modifications intended to claim tidelands for agricultural and other development, improve river navigation, and generate electrical power. It is estimated that an area of over 80,000 acres of historic floodplain and wetlands are now positioned behind an extensive system of dikes and tide gates, and that urbanization and its associated filling and shoreline armoring account for an additional 20,000 acres of habitat loss (US ACOE, 2001). An extensive literature describes how dikes affect marsh surface subsidence, sediment accretion, soil density, and soil organic content. (Thom 1992; Bryant and Chabreck 1998; Anisfeld et al. 1999). In the lower Columbia River and estuary, historic wetland types, such as emergent and forested wetlands and their network of tidal channels and sloughs have been greatly diminished. It is estimated that approximately 77% of the total area of tidal marshes (wetlands dominated by herbaceous vegetation) and 62% of the tidal swamps (wetlands dominated by forest cover) has been lost in the area from the mouth of the river to Puget Island (Thomas, 1983). To the extent that survival and productivity of juvenile salmonids is related to shallow water wetland habitats, the loss of these habitats adversely affect juvenile salmonids in the Columbia estuary (LCFRB, 2004).

Our increased knowledge of the behavioral patterns of ocean type juvenile salmon is helping to improve restoration site selection and design. For example, efforts are now underway to track juvenile salmonids in and through the estuary (EST-P-02-01). This project is describing more accurately the timing, duration and location of juvenile salmonids rearing in the estuary. Research on the use of the tidal channels within marsh and forested wetland habitats within Cathlamet Bay (2003–010–00) and the Grays River (EST-P-04-04) has significantly improved our understanding of the diet and foraging patterns of juvenile Chinook. Russian Island in particular has received the greatest amount of research related to salmon residency and consumption in the estuary. Research questions are now being investigated about the importance of tidal circulation in regulating habitat opportunities (as defined by depth, temperature, and velocity metrics) and salmonid migration and residency through the dendritic channel network of these large marsh-island complexes.

Knowledge of the behavioral patterns of juvenile salmonids assists in maximizing restoration site selection and design. The landscape arrangement and connectivity of shallow water habitats and their associated channels in the lower river and estuary is important to juvenile salmon since individuals continually adjust their position as tidal fluctuations alter the distribution of wetted areas, depths, velocities, and chemical gradients. Salmon interact dynamically with this changing mosaic of habitats along the entire estuarine gradient (Bottom et al 2005). Their response is to the organization of

patches, corridors, and matrix of habitats through which they move and interact, as a part of the 'trophic relay' to the ocean (Kneib, 1997). Researchers in one promising project (2003-007-00) are using the principles of landscape ecology and hydrogeomorphology to develop a Columbia River Estuary Ecosystem Classification (CREEC). The goal of CREEC is to present a framework to understand habitat fragmentation in the lower Columbia River and model potential restoration scenarios (Simenstad, 2004). The progress made on these fronts is increasing our ability to be strategic in locating restoration projects at a landscape scale, but in many instances our ability remains experimental due to the relative lack of understanding on the spatial and temporal use of the estuary by juvenile salmon.

Concurrent with these broader research efforts is the applied research being conducted at a number of Columbia Land Trust and other tidal restoration efforts. NOAA and University of Washington are using experimental studies in Grays River in collaboration with Columbia Land Trust and CREST to evaluate the effects of multiple tidal wetland restoration projects on various life histories of juvenile salmon and to compare responses to observed habitat-use patterns in the mainstem estuary (2003–010–00). Also, applied research being completed this year at Columbia Land Trust projects by NOAA, CREST and PNNL (EST-P-04-04) will inform in an adaptive context restoration site selection and design (Johnson et al, 2007).

Findings from this research on some of Columbia Land Trust restoration and reference sites include:

- *Hydraulic Geometry and Channel Morphology Relationships* – There were strong, positive correlations between the three monitored indicators: catchment area, total channel length, and cross-sectional area at outlet. Measurement of these indicators in hydraulic geometry and channel morphology at restoration sites may now be compared with these established relationships to assess the restoration trajectory.

- *Elevation-Vegetation Relationships* – Data from several locations in the estuary reveal differences between habitat types (e.g., marsh versus swamp), as well as locations in the floodplain (e.g., island versus tributary floodplain area). Information about plant species tolerances in a given region of the estuary floodplain, coupled with pre-restoration data about elevations in restoration sites, provides managers with the ability to forecast the plant communities that may develop based on existing conditions or to elect to alter existing elevations to support desired plant communities.

- *Sediment Accretion Rates in Tidal Wetlands* – The sediment accretion rate was 2.4 cm/yr for Columbia Land Trust Johnson and Kandoll restoration sites combined over 2005 through 2007. Comparison of sediment accretion rates with the initial elevation of restoration sites and with the elevations of reference sites supporting target plant communities can help restoration managers predict the length of time it will take for ecological processes in a watershed to increase land elevations sufficiently to achieve project goals; if necessary, the process can be augmented through adaptive management with active restoration techniques.

- *Similarity Indices of Vegetation* – An example shows very little similarity between indices of vegetation at restoration and reference sites (13.1–53.2%) before and in the first year after restoration. Managers can assess the rate of change and whether change is occurring in the direction of the plant community target using similarity indices.

- *Juvenile Salmon Use of Tidal Reconnection Sites* – At Columbia Land Trust Kandoll and Devils Elbow sites, Chinook salmon were eating Chironomidae. Chum and coho diets included Chiromonidae, Heteroptera, and other insects. Species collected in insect traps and benthic cores at the sites included Chironomidae and Corophium, respectively. This key result supports management decisions to restore tidal wetlands and supports future restoration actions of this kind.

An approach of using uncertainties research that is describing estuarine dynamics and structure and its relationship to salmonids and effectiveness and validation monitoring conducted at restoration and reference sites in the estuary is critical to developing an adaptive process for effective implementation of restoration in the Columbia River estuary. This project, in conjunction and in coordination with other ongoing work described more completely in Section D. will ensure that restoration implementation provides the maximum benefit to salmonid species transiting the estuary.

Location

This work will occur within the Columbia River Estuary. The *estuary* is delineated in this proposal by that which encompasses the entire complex of gradients ranging from fluvial to nearshore ocean ecosystems and includes the tidally influenced portions of the Columbia River mainstem and its tributaries and floodplain from the River's mouth to Bonneville Dam and the Willamette Falls. This definition is based on tidal variation, rather than salinity. This definition follows the CREEC system (Simenstad *et al.* 2004) being developed by the Lower Columbia River Estuary Partnership (2003-007-00) for monitoring sampling design and restoration planning in this region.

Monitoring & Evaluation

Columbia Land Trust partners with every major entity involved in estuary research and monitoring, including CREST, National Oceanic and Atmospheric Agency (NOAA), Pacific Northwest National Labs (PNNL), University of Washington, USGS, etc.

The objectives of Columbia Land Trust's tidal restoration projects are to restore estuarine connectivity and function to floodplain and wetland habitats and thereby allowing juvenile salmon to regain benefit from these rearing and refuge areas. Columbia Land Trust will conduct monitoring and evaluation activities in accordance with standard protocols referenced in Monitoring Protocols for Salmon Habitat Restoration Projects in the Lower Columbia River and Estuary, (Roegner et al 2009). At a minimum, Columbia Land Trust strives to perform one year of pre-project monitoring and two years of post-project effectiveness monitoring with an emphasis the following metrics: for hydrology (water surface elevation); water quality (temperature, salinity, dissolved oxygen); elevation (bathymetry, topography); plant community (composition and cover); vegetation plantings (success); and fish (temporal presence, size/age structure, species). Genetic samples are also taken during fish sampling work to be integrated into other regional analysis efforts. Site specific metrics are selected based on individual project goals and expected outcomes. A more extensive discussion on project monitoring and regional coordination is found in Section G. Monitoring and Evaluation.

C. RATIONALE AND SIGNIFICANCE TO REGIONAL PROGRAMS

There are numerous management programs that identify restoration of the Columbia River estuary as vital to rebuilding productivity of salmon and steelhead runs in the Columbia River Basin. The following management plans all emphasize the following: (1) the importance of the estuary and lower river to fish and wildlife populations of the Columbia basin; (2) the potential impact of the Columbia River hydroelectric system and habitat changes on these environments; and (3) the need for basic ecological information to guide management decisions affecting the estuary. Implementation of this proposal will contribute to on-the-ground actions in support of these regional programs.

Columbia River Basin Fish and Wildlife Program (Northwest Power and Conservation Council, 2009)
The Northwest Power and Conservation Council adopted subbasin plans into the Columbia River Basin Fish & Wildlife Program in 2005. In February 2009 the Council completed a two-year process to amend its Columbia River Basin Fish & Wildlife Program. Specific implementation of habitat actions in the estuary, and monitoring and evaluation of these actions, will occur through the adopted Columbia River Estuary and Lower Columbia subbasin plans. The Columbia River Basin Fish and Wildlife Program summarize key estuary strategies which have been suggested to improve survival benefits. This proposal is designed to target two strategies identified in Section V.A, page 32, of the program.

- Habitat restoration work to reconnect ecosystem functions such as removal or lowering of dikes and levees that block access to habitat or installation of fish-friendly tide gates, protection or restoration of riparian areas and off-channel habitat, and removal of pile dikes
- Recognition and encouragement of continued partnerships in planning, monitoring, evaluating, and implementing activities in the estuary and lower Columbia River

Columbia Land Trust is one of the primary implementers of estuary strategies identified in the Council's Program and Columbia Land Trust Estuarine Restoration project is integral to accomplishing the goals of this plan.

Lower Columbia River and Estuary Subbasin Plan (Northwest Power and Conservation Council, 2004)
The Lower Columbia River subbasin planning effort describes a number of strategies related to restoration. The entirety of this proposal is focused on Strategy (2) Protect and restore habitat. Components of this strategy that this proposal addresses include:

1. Protect functioning habitats while also restoring impaired habitats to properly functioning conditions.
2. Use a combination of active and passive habitat restoration measures to provide near term and long-term benefits.
3. Maximize the efficiency of habitat restoration activities by concentrating on currently productive areas with significant scope for improvement, adjacent areas of marginal habitat where realistic levels of improvement can restore conditions suitable for fish, and areas where multiple species benefit.
4. Open access to productive habitat by removing or mitigating passage barriers.

NOAA Fisheries/Action Agencies' ESA Consultation on Federal Columbia River Power System Operations (National Marine Fisheries Service, 2008)
The 2008 NOAA FCRPS BiOp requires the Action Agencies to implement a strategy to protect and improve estuary habitat based on biological needs and prioritized actions (NMFS 2008). The Estuary Habitat Proposed Action as part of the FCRPS BiOP states that a "key step in conserving and rebuilding Endangered Species Act (ESA)-listed salmon and steelhead is determining the potential benefits that could occur from actions implemented to conserve and improve estuary habitats."

Columbia Land Trust Estuarine Restoration Project will contribute to the implementation of the following RPA required by the FCRPS BiOp. This RPA States: RPA action 37: "Estuary Habitat Implementation 2010-2018 - Achieving Habitat Quality and Survival Improvement Targets. The AAs will provide funding to implement additional specific projects as needed to achieve the total estuary survival benefits identified in the FCRPS BA."

Columbia River Estuary Recovery Plan Module (National Oceanic and Atmospheric Administration, 2008)
Columbia Land Trust estuary work through this BPA project will focus heavily on meeting recovery goals as stated in the NOAA Estuary Module, as well as the BPA Biological Opinion. The estuary recovery module is one element of a larger planning effort led by the National Marine Fisheries Service to develop recovery plans for Endangered Species Act-listed salmon and steelhead trout in the Columbia River basin. The goal of the estuary module is to prioritize management actions that, if implemented, would reduce the impacts of the limiting factors that salmon and steelhead encounter during migration and rearing in the estuary and plume ecosystems. The module identifies restoring off-channel habitat by breaching (or lowering dikes) a first tier priority.

Columbia Land Trust is one of the primary implementers of estuary strategies identified in the Module and Columbia Land Trust Estuarine Restoration project is integral to accomplishing the goals of this plan.

Comprehensive Conservation Management Plan (Lower Columbia River Estuary Partnership, 1999)
This project is consistent with Actions 5 of the Lower Columbia River Estuary Partnership's Management Plan (CCMP). That action call for the following: "Restore 3,000 acres of tidal wetlands along the lower 46 miles to return tidal wetlands to 50 percent of 1949 levels." This project will contribute directly to achieving this Action. Columbia Land Trust's accomplishments towards the Estuary Partnership's identified goal of 3,000 acres of restoration of tidal wetlands has been 904 acres of tidally reconnected wetlands and 1,020 acres of tidal reconnection projects pending final implementation which this proposal will support.

D. RELATIONSHIPS TO OTHER PROJECTS

Throughout the time period of this project, Columbia Land Trust will continue to participate in regional efforts to coordinate estuary restoration efforts. The Columbia Land Trust currently collaborates with the Pacific Coast Joint Venture, Lower Columbia River Estuary Partnership (LCREP), Lower Columbia Fish Recovery Board, Oregon Watershed Enhancement Board, the FCRPS Action Agencies and the State of Washington/Action Agency Memorandum of Agreement. The specific projects that the Columbia Land Trust is coordinate with include:

LCREP Columbia River and Estuary Habitat Restoration (2003–11–00)
For ten years the Columbia Land Trust has participated in LCREPs Science Work Group. LCREP's role is to convene and provide coordination among restoration implementers such as the Columbia Land Trust and CREST. LCREP uses a prioritized granting process in conjunction with a Science Workgroup to select projects for funding to project sponsors. Columbia Land Trust has received funding for some of its acquisition and restoration projects through LCREP annual funding cycle through the years. The Land Trust was an early user of the Restoration Prioritization Framework that was developed by the Pacific Northwest National Laboratory to evaluate where watershed processes are likely to support habitat restoration and protection.

WDFW Washington Estuary Memorandum of Agreement Plan (2009–016–00)
Columbia Land Trust is working closely with WDFW to identify and move projects towards implementation as part of the MOA. One of the proposed MOA projects on the Lower Elochoman River is a Columbia Land Trust property. Three other Columbia Land Trust projects have been identified in the preliminary stages of the project with a total of 974 acres to be restored if all projects are completed as proposed. Projects primarily consist of reconnection of historic habitats. Partners include LCFRB and Action Agencies.

Historic Habitat Opportunities and Food-Web Linkages of Juvenile Salmon in the Columbia River Estuary and Their Implications for Managing River Flows and Restoring Estuarine Habitat (2003–010–00)
NOAA and the University of Washington are using experimental studies in Grays River in collaboration with Columbia River Estuary Study Taskforce (CREST) and the Columbia Land Trust to assess effects of multiple tidal wetland restoration projects on various life histories of juvenile salmon and to compare responses to observed habitat-use patterns in the mainstem estuary. This research is being conducted, in part, at Columbia Land Trust projects. Columbia Land Trust is utilizing the digitized historic T-sheets developed as part of this project to define more accurately the historic floodplain and hydrogeomorphic complexes to guide restoration development and design.

Evaluating Cumulative Ecosystem Response to Restoration Projects in the Columbia River Estuary (EST-P-04-04)
The Army Corps of Engineers is funding a Cumulative Effects projects to assess the cumulative effects of restoration projects on ecosystem function. The Columbia Land Trust's Grays River tidal reconnection projects are where many of the cumulative effects protocols are being tested and where a good deal of the cumulative effects monitoring is occurring. This project has created a standardized means of evaluating the effectiveness of individual projects, and methods for assessing estuary-wide cumulative

effects. A priority has been to develop a protocol manual for minimum monitoring of physical and biological metrics, intended to standardize data collection critical for analyzing changes following restoration treatments. Columbia Land Trust utilizes these monitoring protocols as part of its effectiveness monitoring at select restoration sites.

USFWS Preserve and Restore Columbia River Estuary (2003–008–00)
Columbia Land Trust served as the transaction and negotiation agent for the acquisition of Crims Island. The goals of this project included acquiring or restoring 600 acres of tidal emergent marsh, swamp, slough, and riparian forest habitat in the Columbia Estuary to benefit salmon, Columbia white tailed deer, and other wildlife. Elements of the project included acquisition, fish and vegetation surveys, invasive weed removals, and restoration of tidal marsh. The project was accomplished with BPA, Corps, WDFW, and USFWS funding. This project demonstrates a large partnership working towards main stem tidal wetland protection and restoration of critical habitats.

Grays River Restoration Project (2003-013-00)
CREST partnered with Columbia Land Trust and other private landowners to complete a restoration project in the response reach of the Grays River under this project. One of three remaining natural Lower Columbia River Chum spawning locations is found at the Crazy Johnson Creek property (purchased by Columbia Land Trust in 2009) where CREST installed a series of engineered log jams on Columbia Land Trust property. The project was completed in 2009.

Lower Columbia River Ecosystem Monitoring (2003-007-00)
As part of this project the University of Washington and US Geological Survey is developing a Columbia River Estuary Ecosystem Classification (CREEC). The CREEC, when completed in 2011, will be able to describe the distribution, connectivity, abundance, size, and shape of estuarine habitat that affect the diversity and the spatial structure of a salmon population. The CREEC will allow the Columbia Land Trust and other restoration implementers to access a GIS driven hierarchical ecosystem classification that partitions the lower river into ecosystem types, then further into hydrogeomorphic reaches, complexes, then finally cover types. Understanding and describing the physical and biological characteristics of these varied habitats is critical to our understanding of where to site restoration projects and what the restoration trajectory may look like based on the natural processes available. In 2009, BPA funded a five-year project that is use statistical tools to analyze CREEC landscape classes (historical/present) to derive metrics for describing optimal juvenile salmonid habitats for each of the eight estuary reaches. The project is supported technically by an expert panel with products vetted through estuary restoration practitioners. Columbia Land Trust participated in the expert panel work session in October, 2009 and is helping shape the use of CREEC products as they emerge over the next three years.

CREST Estuary Habitat Restoration (2010-004-00)
As the two principle estuary habitat restoration implementers, Columbia Land Trust and CREST have a long and productive history of collaboration in effectiveness monitoring, uncertainties research and restoration design and implementation. This collaboration is described (in part) projects 2003-013-00, EST-P-04-04, 2003–010–00. Similar to the physical and biological objectives of the CREST project the Columbia Land Trust's project will continue to develop, design and construct on-the-ground habitat restoration actions that benefit threatened and endangered salmonid species in the Lower Columbia and Estuary, specifically the 2008 BiOp RPA 37, *Achieving Habitat Quality and Survival Improvement*

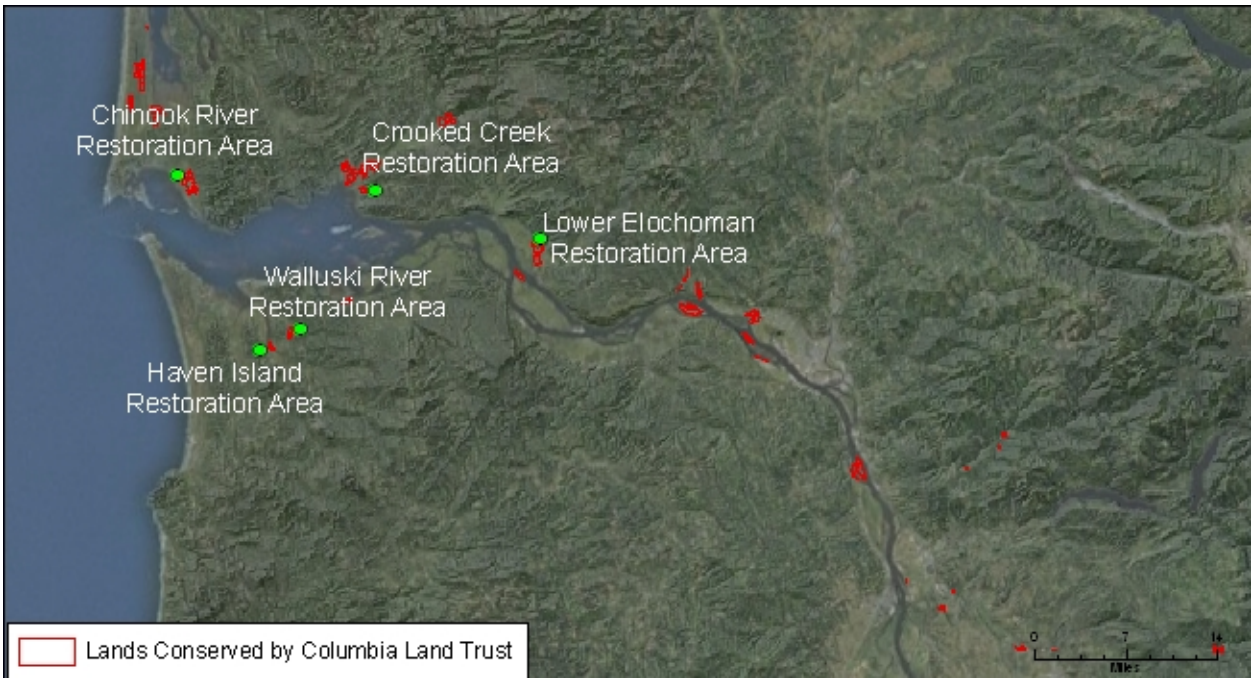
Targets. Moving forward, Columbia Land Trust will continue to adaptively coordinate and collaborate with CREST on estuary recovery actions.

D. PROJECT HISTORY

Columbia Land Trust does not have a current BPA project, but has an extensive history of collaboration with BPA in the estuary. Columbia Land Trust is a 501(c)(3) non-profit organization formed in 1990 to conserve "signature landscapes and vital habitat together with the communities of the Columbia River region." Columbia Land Trust works with private landowners and public entities to achieve common conservation goals. Columbia Land Trust has grown from an all volunteer effort to a professional organization with 19 full-time staff members. As part of its conservation program, Columbia Land Trust has established a science-based restoration program dedicated to ensuring the long-term maintenance and enhancement of the conservation values on all of its protected and restored properties.

Since 2000, Columbia Land Trust has protected and/or restored over 4,000 acres of estuarine habitat in the Columbia River estuary for the purpose of salmon recovery. Columbia Land Trust has accomplished this by permanently securing a land base from willing land owners. These lands now serve as platform from which on-the-ground restoration projects are able to be implemented. These restoration projects result in some of the highest survival benefits for threatened and endangered salmon in the estuary. Building this network of restoration areas is essential in our collective efforts to increase the survival benefits for threatened and endangered salmon in the Columbia River basin.

It is rare for private land owners to find an economic incentive to allow estuarine restoration on their lands due to the daily inundation that results from tidal reconnection projects, so securing a land base from willing owners through fair market processes is recognized as an essential component in estuarine restoration. This strategy has allowed Columbia Land Trust to accomplish restoration where other practitioners cannot. To date, Columbia Land Trust has established six restoration opportunity areas and is working to secure two more. This proposal covers some of the work in five of those restoration areas. It is anticipated that with funding for this project the pace and scope of additional estuarine restoration will significantly increase. Existing restoration opportunity areas that are part of this proposal are displayed on the following map.



Columbia Land Trust's estuarine restoration program involves developing and implementing restoration on its extensive conservation holdings. Assembling the properties required to make a restoration project viable can take a number of years. Columbia Land Trust is uniquely positioned for this role due to: 1) its long view on restoration and conservation - perpetual; 2) its long standing relationships with some of the largest landowners in the estuary; 3) a stewardship fund that it maintains to support, in part, the long term operations and management that this land base requires; and, 4) its reputation as an engaged land owner in its own right in estuary communities.

These factors require Columbia Land Trust to stay actively involved in projects, working with local communities and project partners to restore and steward these tidal habitats. Acquiring these lands comes with a perpetual responsibility to maintain and defend the conservation values of these properties. This approach of working incrementally with willing landowners is fundamental to success in the estuary since no entity is contemplating using eminent domain to secure land for salmon recovery. As a means to illustrate the types of restoration actions that are anticipated within this proposal one can review a subset of completed and pending restoration projects of Columbia Land Trust:

<u>Tidal Enhancement Projects</u> – COMPLETED
Secret River (invasive plant species control) – 25 acres
Crooked Creek (invasive plant species control) – 60 acres

<u>Tidal Reconnection Projects</u> - COMPLETED
Grays River Peterson (road removal, revegetation, invasive plant species control) – 116 acres
Deep River (dike breaching, invasive plant species control) – 155 acres
Kandoll Farm (dike breaching, invasive plant species control, revegetation) – 163 acres
Johnson Farm (dike breaching, invasive plant species control) – 88 acres
Walluski River (dike breaching, large wood placement, revegetation) – 55 acres

Crims Island (acquisition and transfer to USFWS for restoration) – 451 acres

Tidal Reconnection Projects – PENDING
Chinook River Mouth (road prism removal for tidal reconnection) – 20 acres
Mill Road, Grays River (dike breaching, invasive plant species control, revegetation) – 50 acres
Haven Island, Young's River (dike breaching, invasive plant species control, revegetation) – 79 acres
Germany Creek (revegetation, invasive plant species control, large wood placement) – 7 acres

Tidal Reconnection Projects – UNDER DEVELOPMENT
Wallacut River mouth– 50 acres
Crooked Creek – 40 acres
Chinook River Estuary – 871
Walluski River – 100 acres
Columbia River near Rainer – 550 acres
Lower Elochoman River – 300 acres

While the Action Agencies, policy makers, and others desire a strategic approach toward the placement of restoration projects in the estuary, the reality is that a large portion of lower Columbia's floodplain where restoration could occur lies in private ownership. These ownership patterns define where, how and when we can progress as it relates to restoration. Willing land owners emerge sporadically and opportunistically. It is therefore essential that an organization is able to readily respond as opportunities arise. Columbia Land Trust helps its public and private partners achieve their specific land protection and restoration goals by providing risk capital, negotiation and legal skills, and an ability to leverage a variety of sources of funding. This approach enables Columbia Land Trust to act quickly and effectively to meet estuary restoration goals. Columbia Land Trust intends to continue to work in a systematic manner over the coming years to build these restoration opportunity areas and secure additional properties within key restoration areas to fully realize the restoration potential. Looking forward, Columbia Land Trust outlines below the acquisition and restoration objectives and tasks that it seeks to achieve under this proposal.

F. PROPOSAL BIOLOGICAL/PHYSICAL OBJECTIVES, METHODS, WORK ELEMENTS AND METRICS

Physical Objective 1: Increase shallow water peripheral and side channel habitats toward historic levels.

Hypothesis Statement; If shallow water habitat is increased, then juvenile rearing capacity in the estuary and mainstem will increase.

Justification; Rearing juvenile fall Chinook and chum are closely associated with shallow water habitats in the estuary and lower mainstem.

Physical Objective 2: Restore connectivity between river and floodplain, as well as in-river habitats.

Hypothesis Statement; If connectivity with floodplain is restored, then juvenile salmonid productivity in the estuary and lower mainstem will increase.

Justification; Connectivity with the floodplain will restore macrodetrital inputs and alter the current food web. A macrodetritus-based food web will increase productivity and support greater life history diversity.

Methods

Task 1: Identify and prioritize mainstem and tidal tributary projects in a scientific and systematic manner which will directly benefit ocean - and stream- type salmonids

Columbia Land Trust has been an early user of two landscape level prioritization tools designed to assist siting restoration in the estuary: LCREP's Restoration Prioritization Framework and the Columbia River Estuary Ecosystem Classification (CREEC). These two prioritization tools assist Columbia Land Trust and other restoration practitioners in identifying and prioritizing restoration projects. The tools improve our understanding of how restoration projects are nested within the changing mosaic of habitats (and stressors) along the estuarine gradient through the matrix of patches and corridors that juvenile salmon move and interact within as a part of the 'trophic relay' system through the estuary.

The Restoration Prioritization Framework developed by PNNL in 2006 (and currently being updated to refine the model and increase its accuracy) uses a disturbance model to prioritize the optimal locations for restoration and protection projects (2003–11–00). Using available GIS layers, the Restoration Prioritization Framework provides an analysis of landscape-scale disturbances at a management area scale and the "site" scale to predict the degree to which physical processes are likely to support a specific project within a management unit of the estuary. The development and maintenance of habitats at a site is dependent on disturbances at the site scale and at the landscape scale within which the site resides. If there are high levels of disturbance (elevated water temperature, poor sediment of water quality, invasive plant species) in the landscape it will affect the quality of the processes that support the restoration trajectory at an individual site (Thom, 2000).

In 2009, BPA funded an effort to identify priority restoration projects using landscape ecological principles and CREEC as a platform for describing desired future habitat conditions by reach in the estuary. This five-year project uses statistical tools to analyze CREEC landscape classes (historical/present) to help derive metrics for describing optimal juvenile salmonid habitats for each of the eight estuary reaches. The project is supported technically by an expert panel with products vetted through estuary restoration practitioners. Columbia Land Trust participated in the expert panel work

session in October 2009 and will help shape the use of CREEC products as they emerge over the next three years.
The CREEC assimilates a variety of spatial datasets, including hydrologic, geomorphic (LiDAR), bathymetric, land cover, and other comprehensive data, in a geographical information system (GIS) to delineate the hierarchical classification structure. Many of the datasets that comprise the framework of the CREEC, digital T-sheets, floodplain LiDAR, and shallow water bathymetry are regularly accessed to understand the historic template of a site and the natural processes that exist at a site that can support habitat forming processes required to accomplish successful restoration.

At the site specific level, Columbia Land Trust uses a variety of tools to help prioritize potential restoration projects. This includes site visits, digital GIS layers such as diking extent, tidegate locations, culvert barriers, pile dikes, and dredge material disposal sites, LiDAR, and historic T-sheets. The due diligence Columbia Land Trust uses to review, scope and vet projects is found under Task 2.

In addition to the review by ISRP of this proposal there are two levels of external scientific review for all estuary habitat restoration projects identified and implemented under this proposal. The Lower Columbia River Estuary Partnership maintains a Science Work Group for the first level of scientific review of on-the-ground habitat projects funded through this proposal. The Estuary Partnership's Science Work Group reviews and ranks the restoration, identified by Columbia Land Trust by utilizing the Estuary Partnership's "Criteria for Identifying and Prioritizing Habitat Protection and Restoration Projects on the Lower Columbia River and Estuary." The Estuary Partnership's criteria have been reviewed by the Council and the ISRP. After the Science Work Group reviews and ranks the Columbia Land Trust projects the Estuary Partnership provides a written recommendation to BPA.

The next level of science review is conducted by the Expert Regional Technical Group (ERTG), authorized under the 2008 BiOp (RPA 37). The ERTG considers the Science Work Group's recommendation and use the approach originally applied in the 2008 BiOp, as well as subsequent information on the relationship between actions, habitat and salmon productivity models developed through the FCRPS RM&E. This will produce an estimate for the change in overall estuary habitat and resultant change in ESU survival for all estuary habitat restoration projects they review. The survival benefit assigned by ERTG will support and inform BPA's project selection decision. Columbia Land Trust currently has two projects moving through the ERTG review; the Lower Elochoman River project found within this proposal, and a 50 acre tidal reconnection project in the Grays River known as the Mill Road Project.

Work Elements for Task 1

1. **Work Element 119: Manage and Administer Projects** - Columbia Land Trust financial staff will administer financial and project management activities and technical work by the contractor to fulfill BPA's programmatic and contractual requirements such as financial reporting (accruals), and development of an SOW package (includes SOW, budget, property inventory).

2. **Work Element 114: Identify and Select Projects -** Columbia Land Trust will work with Estuary Partnership Science Work Group, BPA and ERTG as described in Task 1 to prioritize and select projects.

3. **Work Element 132: Produce (Annual) Progress Report** - Columbia Land Trust staff will develop and complete an annual report in compliance with BPA standards and timelines for each restoration project.

4. **Work Element 185: Produce PISCES Status Reports -** Columbia Land Trust staff will complete status reports for restoration projects in PISCES in a timely fashion.

Task 2. Engage with willing land owners to secure restoration land base in restoration areas
One of the most effective approaches to permanently securing restoration in the Columbia River estuary is through private land acquisition -- both fee simple acquisition and conservation easements. Columbia Land Trust helps its public and private partners achieve their specific land protection and restoration goals by working closely with land owners, local, state and federal agencies providing risk capital, negotiation skill, legal expertise and an ability to leverage additional project funding. This approach enables Columbia Land Trust to act quickly and effectively to meet estuary restoration goals. Columbia Land Trust structures, negotiates, and complete land transactions as an independent agent, buying land from willing landowners using fair market processes. Landowners often utilize this method of land protection because they are assured their family lands will be protected in perpetuity and they receive income from the sale of the land. The two principal approaches that are used in acquisition include:

1. **Fee Simple Acquisition:** Fee simple acquisition for restoration purposes involves Columbia Land Trust purchasing title to a property that merits conservation. After the title transfers the land is permanently maintained as habitat and open space by Columbia Land Trust or is transferred to an appropriate public entity (two transfer examples include 871 acres acquired by the Columbia Land Trust and transferred to the Washington Department of Fish and Wildlife in the Chinook estuary in the Columbia River's Baker Bay and the acquisition and subsequent transfer of 451 acres on Crims Island to the United States Fish and Wildlife Service).

2. **Conservation Easements:** A voluntary conservation easement is a legal agreement between a willing land owner and Columbia Land Trust, or a government agency, which permanently limits uses of land in order to protect important habitat values or allow for restoration. Landowners grant conservation easements to restrict developments and to protect resources, while retaining rights of private ownership. All of the conservation easements that Columbia Land Trust has developed have been perpetual in term.

Columbia Land Trust has a long track record of working with the Bonneville Power Administration's land acquisition staff to complete land acquisitions in the estuary. Land acquisition steps for restoration include:

1. Map the property with existing LiDAR http://pugetsoundlidar.ess.washington.edu/lidardata/metadata/pslc2005Columbia/columbia05_ascii.html and conduct field surveys for consistency with estuarine restoration goals and quantify habitat opportunity (access) as it relates to juvenile salmonids. This includes:
    a. Elevation
    b. Subsidence
    c. Tidal channel configuration
    d. Size of parcel
    e. Context of property in relation to other estuarine restoration projects and reference conditions
    f. Context of the property in relation to existing habitat forming processes
        i. Sediment accretion
        ii. Tidal flux
        iii. Fluvial hydrology

2. Map the property with georeferenced and classified T-sheets (U.S. Coast and Geodetic topographic survey: 1861-1901) in GIS to conduct historic comparative analyses
3. Identify restoration actions including the mapping of the following:
    a. Tidegates
    b. Culverts
    c. Levees
    d. Road and railway infrastructure
    e. Drainage ditching
    f. Dredge material
    g. Invasive plant species
4. Identify proximal reference sites
5. Conduct environmental studies (phase 1) of the property and historical uses of the property
6. Examine title reports and property condition to determine the project's feasibility
7. Develop baseline assessment
8. Develop management/restoration plan
9. Present the acquisition and management/restoration plan to:
    a. Columbia Land Trust's external project review committee (Lands Committee)
    b. LCREP's Science Work Group
    c. Action Agencies' RPA 37 Expert Regional Technical Group
    d. Other technical review committees (i.e. Lower Columbia Fish Recovery Board)
    e. Columbia Land Trust's Board of Directors for final approval
10. Identify stewardship concerns (encroachments, potential for off-site flooding, cost of construction and maintenance of cross-dikes or setback levees)
11. Contract for an appraisal to determine fair market value using the *Uniform Standards for Federal Land Acquisitions* (Yellow Book appraisal)
12. Negotiate acquisition terms and price with landowner
13. Sign purchase and sale agreements
14. Coordinate development of documentation and fund transfers, opening escrow
15. Signing and notarizing documents, placing in escrow and closing the transaction
16. Contract for boundary survey

Work Elements for Task 2

1. **Work Element 119: Manage and Administer Projects -** Columbia Land Trust financial staff will administer financial and project management activities and technical work by the contractor to fulfill BPA's programmatic and contractual requirements such as financial reporting (accruals), and development of an SOW package (includes SOW, budget, property inventory).

2. **Work Element 165: Produce Environmental Compliance Documentation -** Columbia Land Trust project management staff will complete, submit, and obtain environmental compliance documents with all necessary federal, state, and local agencies, and in compliance with federal laws for each restoration project.

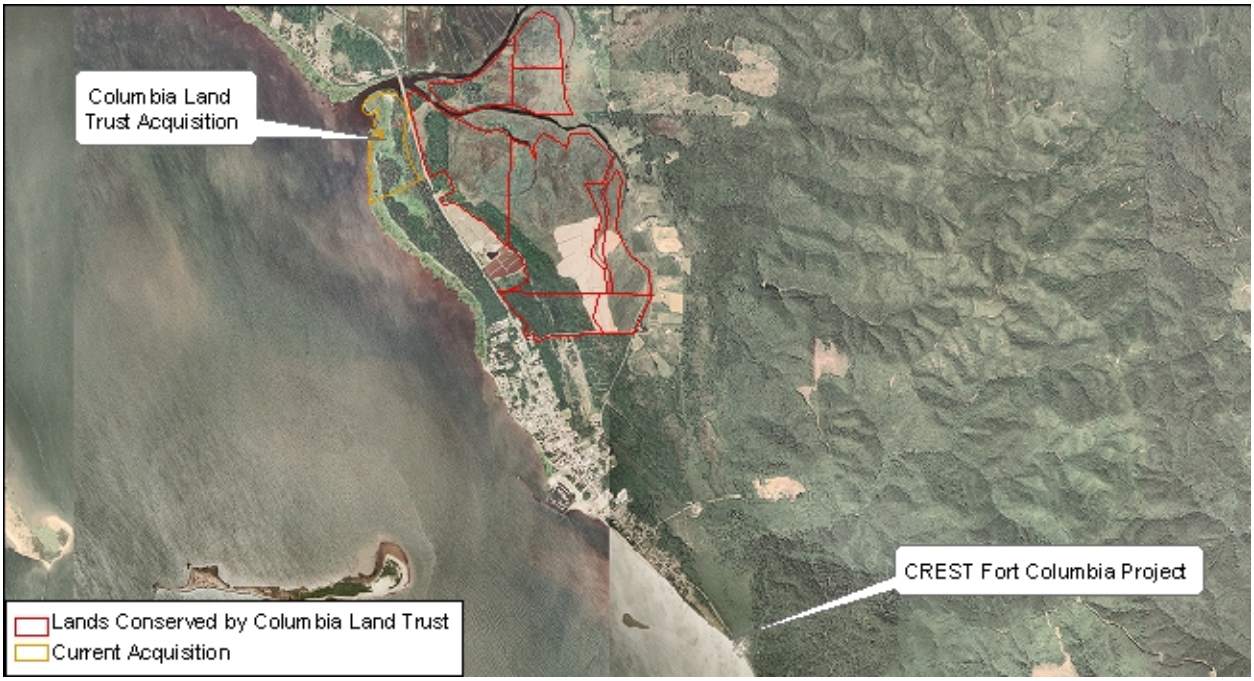
3. **Work Element 132: Produce (Annual) Progress Report -** Columbia Land Trust staff will develop and complete an annual report in compliance with BPA standards and timelines for each restoration project.

4. **Work Element 185: Produce PISCES Status Reports -** Columbia Land Trust staff will complete status reports for restoration projects in PISCES in a timely fashion.

5. **Work Element 172: Conduct Pre-Acquisition Activities -** This work element includes the majority of the steps that are required before fee title or a conservation easement can be acquired for a tract of land. The steps are: perform appraisal, perform title searches, perform land boundary surveys, provide legal descriptions, perform hazardous waste assessment, and identify minimum habitat units. For easements, this work element would also include the definition of the easement terms and conditions.

Subtask a. Develop property acquisition projects with willing land owners to secure restoration land base in Chinook River restoration area

In 2003, Columbia Land Trust secured 871 acres in the Chinook River Restoration Area from a willing land owner and transferred the title to Washington State Department of Fish and Wildlife (WDFW). This action was in anticipation of a large estuary reconnection project that has yet to be completed. Since then, and as part of this project, Columbia Land Trust has continued to approach land owners in the area to identify additional lands that could be added to the restoration area to help achieve the restoration. It is the ultimate goal of Columbia Land Trust and other project partners to fully reconnect this estuary to Columbia River processes.



As part of this project Columbia Land Trust is currently working with a land owner to secure an additional 75 acres of potential restoration land. This property is at the confluence of Columbia River estuary (~RM 5) and the Chinook River. The site is within the Baker Bay embayment of the estuary, a high priority habitat area for salmonids due to its habitat function and location within the salinity gradient.

The property contains 0.65 mile of Columbia River frontage, .25 miles of Chinook River frontage and 0.5 mile of side channels. It is composed of 20 acres of forested estuarine wetlands, 50 acres of emergent estuarine wetlands, and 5 acres of mature Sitka spruce-forested uplands. The property is adjacent to the 850-acre WDFW Chinook Wildlife Area, providing valuable habitat connectivity. Conservation of this site will enable future restoration of the site and improve habitat connectivity and accessibility to offsite habitats for all 13 ESA-listed ESUs. ***(See Task 3, Subtask a. for restoration approach)***

Metrics

Anticipated Estuary Module Management Actions (Reach A) include:

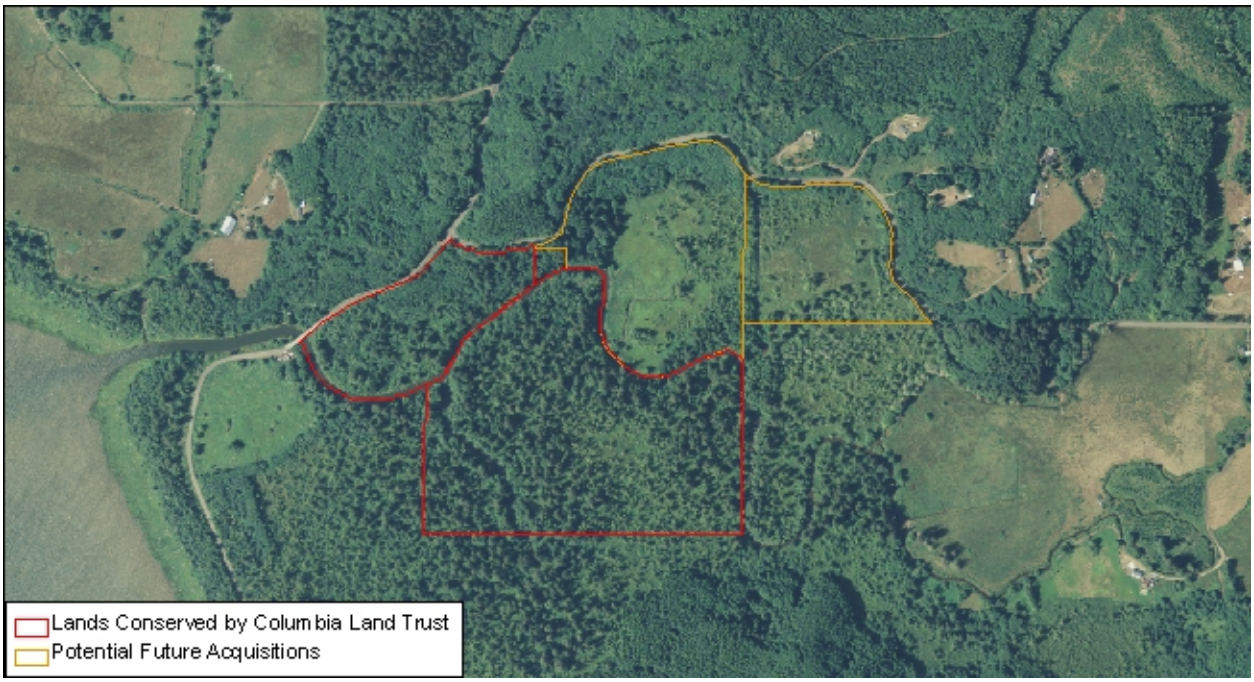
- CRE 1.3: protection with future restoration of 75 acres of tidally influenced floodplain and riparian habitat.

Subtask b. Develop property acquisition projects with willing land owners to secure restoration land base in Crooked Creek restoration area

In 2004, Columbia Land Trust secured its first property (60 acres in red) in the Crooked Creek watershed in Grays Bay with funding from Bonneville Power Administration. Columbia Land Trust is in active negotiations with two adjacent neighbors to secure their partially diked property to build the restoration footprint.

The historic spruce swamp (Thomas, 1983) has been diked and ditched and at one time was converted to pasture. The existing habitat conditions are poor. The historic tidal channel has been disconnected and altered by sediment accretion and backwater vegetation growth. A parcel immediately north of Columbia Land Trust property is a 40 acre parcel that Columbia Land Trust currently has under appraisal. Additionally, the land owner of the property furthest to the east has approached Columbia Land Trust with an interest in selling an additional 20 acre property. Removal of the dike infrastructure will facilitate tidal restoration.

(See Task 3, Subtask c. for restoration approach)



Metrics

Anticipated Estuary Module Management Actions (Reach B) include:

- CRE 1.3: 60 acres of habitat protection with future restoration, including 0.70 mile of riparian and channel shoreline.

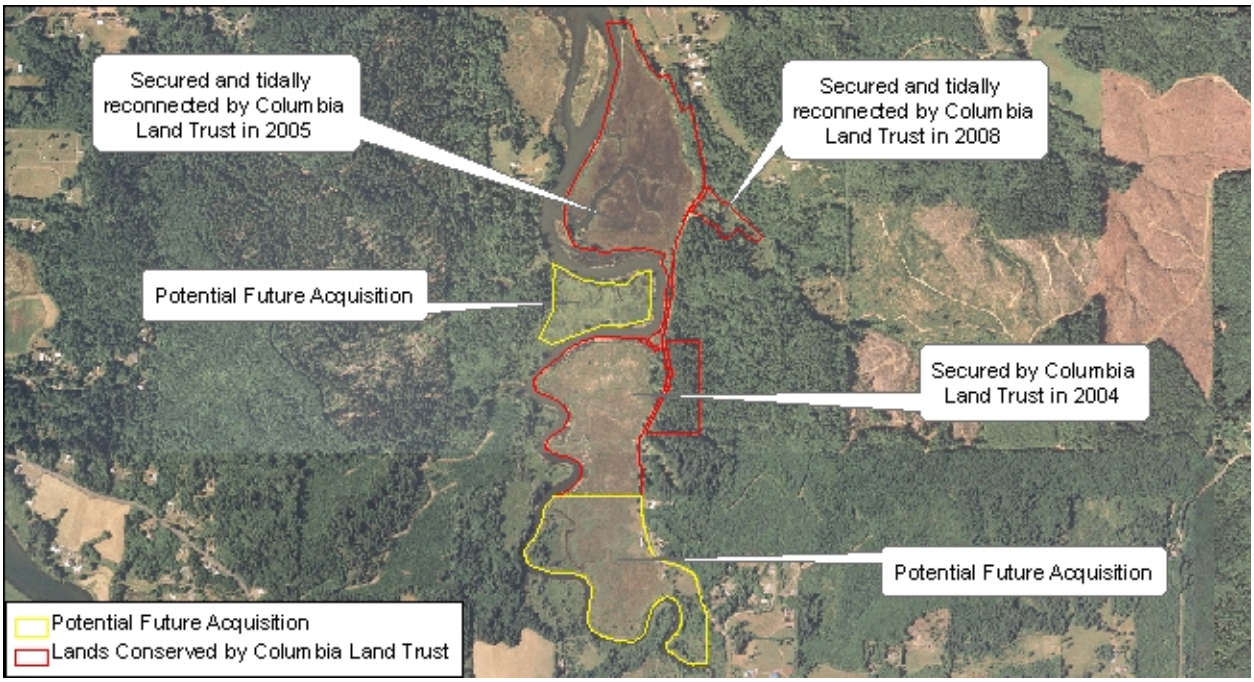
Subtask c. Develop property acquisition projects with willing land owners to secure restoration land base in Walluski River restoration area

Columbia Land Trust currently owns 90 acres of tidal floodplain on the Walluski River. In 2004, Columbia Land Trust acquired a 40 acre property in anticipation that the adjacent floodplain property would become available. In 2005, Columbia Land Trust secured a 55 acre property which was breached in 2005.

The historic spruce swamp in this reach of the Walluski River has been diked, drained and converted to pasture. The condition of the habitat is poor due to flooding of the site over the past several years caused by dike and tidegate failure. The historic tidal channels have been disconnected and altered by sediment accretion and filling.

Columbia Land Trust is working with adjacent landowners to determine their willingness to sell. This land acquisition would lead to a 90 acre dike breach project.

(See Task 3, Subtask d. for restoration approach)



Metrics

Anticipated Estuary Module Management Actions (Reach A) include:

- CRE 1.3: 50 acres of habitat protection, including 0.65 mile of riparian shoreline. An additional 10 acres of potential intact habitat protection in the future would add to the Walluski conservation area;
- CRE 9.3: Over one mile and approximately 2.3 acres of off-channel habitat protection once restored;

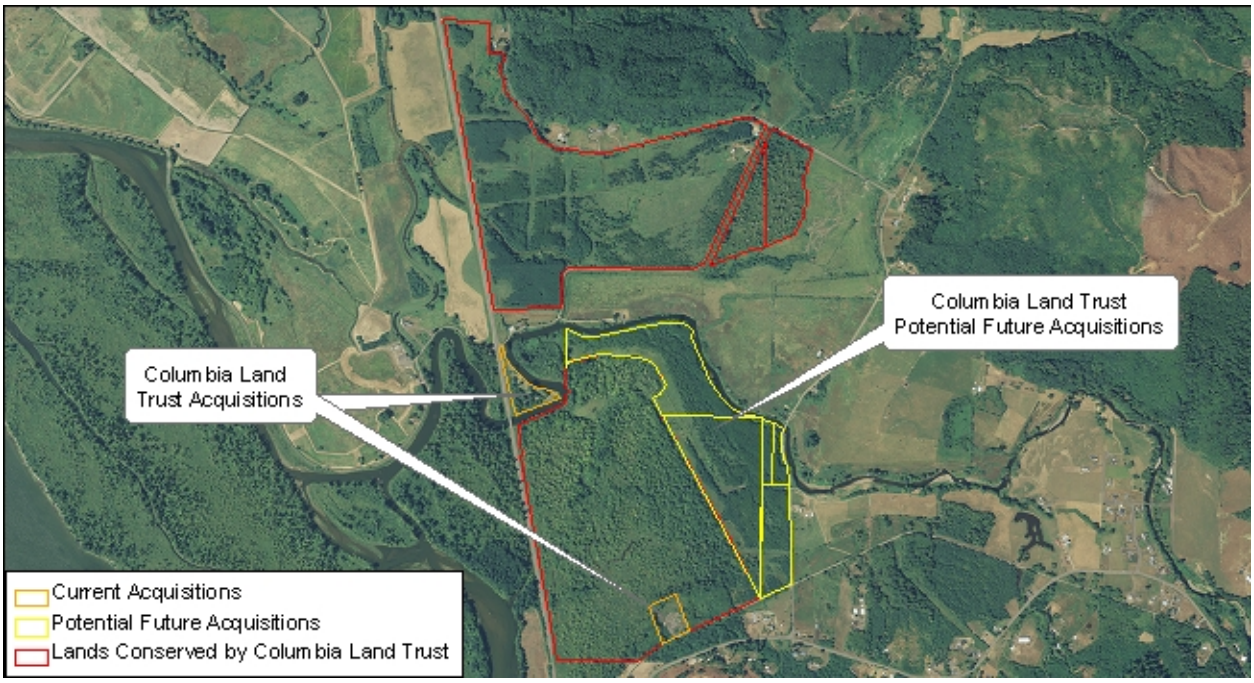
- CRE 10.1 and 10.2: 6,500 feet of dike leveling restoring connectivity to 80 acres of tidal wetlands and over 5,000 feet of tidal channel; and
- CRE 15.3: Weed control and planting on 10 acres.

Subtask d. Develop property acquisition projects with willing land owners to secure restoration land base in the Lower Elochoman Restoration Area

Columbia Land Trust has permanently secured 200 acres in the Lower Elochoman River Restoration Area at River Mile 38 of the Columbia River. The property is on Highway 4 near the mouth of Elochoman River. The wetlands provide habitat for a variety of species, including migrating ocean-type juvenile salmon, particularly in this portion of the river where much of the historical floodplain and off-channel areas have been altered by diking and filling.

Restoration activities will likely involve removing ditching and road fill, replacing or removing several culverts and a tide gate, planting conifers to help re-establish spruce swamp, and invasive plant species control. If future acquisitions are successful dike leveling options will be considered. The restoration of this site will fall, in part, under project 2009–016–00 of the Washington MOA, with the Army Corps of Engineers initiating a feasibility analysis in the coming year.

Columbia Land Trust currently has two adjacent properties under appraisal to consolidate land holdings in this restoration and is engaging with another landowner to secure an additional 105 acres of wetland property for restoration. One of the barriers related to acquiring the priority adjacent property is a 10 year timber lease between an industrial forestry company and the private landowner. Using acquisition funding to secure this timber lease may expedite acquisition of the property. Finally, Columbia Land Trust has secured funding through the North American Wetland Conservation Act to secure some of these adjacent properties.



Metrics

Anticipated Estuary Module Management Actions (Reach B) include:

- CRE 1.3: Acquire an additional 105 acres of tidally influenced floodplain.

Task 3. Develop construction designs and implement tidal reconnection projects which follow best available science and provide most benefit to species, while being cost-effective and constructible. With funds provided through this proposal Columbia Land Trust will complete project engineering designs and initiate implementation. Project restoration will focus on restoring the natural habitat forming and sustaining processes that best achieve habitat goals. Projects will be moved through a design process to minimize design costs while maximizing product delivery. Final level of design will be determined by standard professional practice and staff expertise. Columbia Land Trust staff regularly engages in technical discourse through regular engagement with agencies and professionals. Review is typically conducted at 30/60/90/100% design levels. Columbia Land Trust works early in the process with regulatory agencies, engineers, and members of the public to review the design from multiple angles. We collaborate with other existing advisory groups, such as the Lower Columbia River Estuary Partnership's Science Work Group and the RPA 37 Expert Regional Technical Group.

Permitting documentation will be prepared during the design phases and submitted as soon as feasible to the necessary permitting agencies and reviewing bodies. Permitting is typically submitted at 30% design. Permitting is streamlined and efficient and all permitting documents will be secured prior to starting work. An element of design is collaborating with regional partners and utilizing existing metrics to develop individualized monitoring plans to evaluate effectiveness monitoring and project success to improve future restoration planning. Outreach and coordination with local leadership and affected neighbors is a critical part of successful restoration work in the estuary. Columbia Land Trust has a long history of involving critical stakeholders as part of its restoration efforts. These work elements are part of the project development process, and will be adapted as required to the needs of specific projects.

Work Elements for Task 3

1. **Work Element 100: Construction Management -** Columbia Land Trust project management staff will manage construction activities, including contract management, equipment purchasing, and construction oversight for salmon restoration projects.

2. **Work Element 175: Produce Designs and/or Specification -** Columbia Land Trust project management staff will publish an RFP, select an engineering consultant, contract with a consultant, and oversee design and coordination of design plans for restoration projects.

3. **Work Element 30: Realign, Connect and/or Create Channel -** Implementation projects may reconnect, realign, or create channels to increase available rearing or foraging habitat for salmon.

4. **Work Element 47: Plant Vegetation -** Implementation projects will include floodplain or riparian vegetation plantings that benefit the overall ecosystem of the site and improve floodplain, riparian, or instream function.

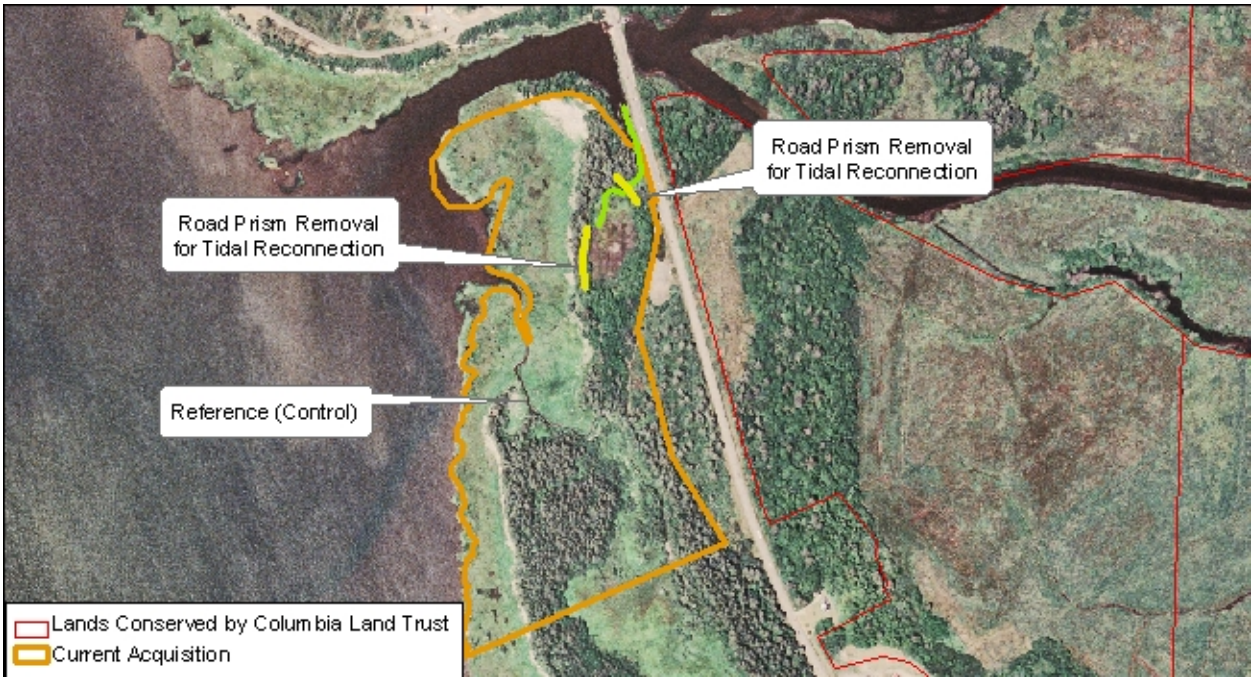
5. **Work Element 180: Enhance Floodplain/Remove, Modify, Breach Dike -** Implementation projects may include floodplain enhancements such as overflow channel development, excavation to reduce stranding, improved floodplain connectivity, and other elements which increase overall structural, and thus ecosystem, function.

6. **Work Element 181: Create, Restore, and/or Enhance Wetlands -** Implementation projects will include activities which restore or enhance historic wetlands adjacent to or near the mainstem Lower Columbia and Estuary such that they may be utilized by rearing juveniles.

7. **Work Element 165: Produce Environmental Compliance Documentation -** Columbia Land Trust project management staff will complete, submit, and obtain environmental compliance documents with all necessary federal, state, and local agencies, and in compliance with federal laws for each restoration project.

Subtask a. Develop construction designs for tidal reconnection project in the Chinook River Restoration Area which follow best available science and provide most benefit to species, while being cost-effective and constructible.

Salmonids and other fish have no direct access to portions of this site. Connectivity of the interior wetlands to the mainstem of the Columbia River is limited, and as such there is little functional benefit of this habitat area to salmonids. The permanent conservation of the property at the mouth of the Chinook River will enable the restoration activities that will include: tidal channel reconnection through road and culvert removal, invasive plant species control, and native planting. With funds provided through this proposal Columbia Land Trust will complete project engineering design and implementation.



Metrics

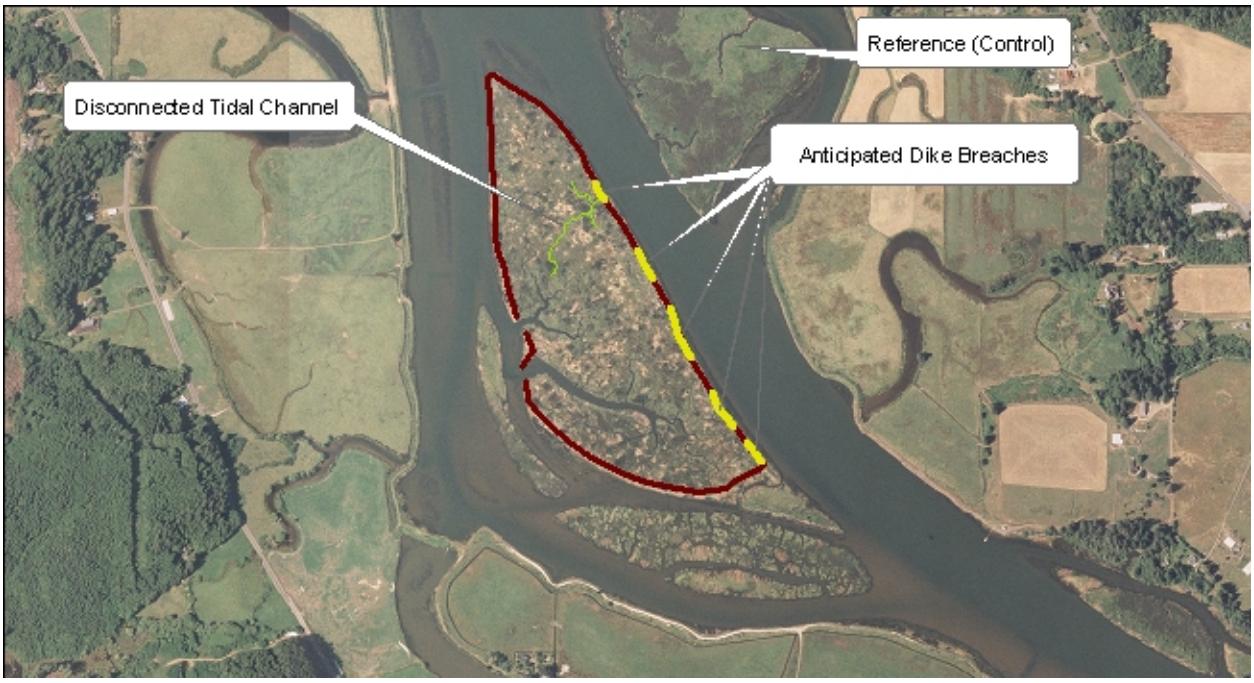
Anticipated Estuary Module Management Actions (Reach A) include:

- CRE 1.4: 75 acres of habitat restoration, including over two miles of riparian and channel shoreline;
- CRE 9.3: 0.5 mile and 1.5 acres of off-channel habitat protection;
- CRE 10.1 and 10.2: 550 feet of road prism and associated tidegate removal restoring connectivity to 3 acres of tidal wetlands and 500 feet of tidal channel; and
- CRE 15.3: Weed control and planting on 5 acres.

Subtask b. Develop construction designs for tidal reconnection project in the Haven Island Restoration Area which follow best available science and provide most benefit to species, while being cost-effective and constructible.

Haven Island is a partially diked island located in the lower Young's River. The 80 acre island was acquired by Columbia Land Trust for conservation and restoration in 2006. In the early 1900s, the island was altered to facilitate grazing of the land. A dike, ditches, culverts and tide gates were installed to limit tidal influx.

The island's dike failed on the western side of the island in two historic channel locations more than 10 years ago. However, 1.5 miles of dike remains and continues to impede natural tidal channel function and dynamic watershed processes. New breaches and dike leveling is planned to connect the island side channels system to the main channel of the Young's, allowing better usage by fish species.



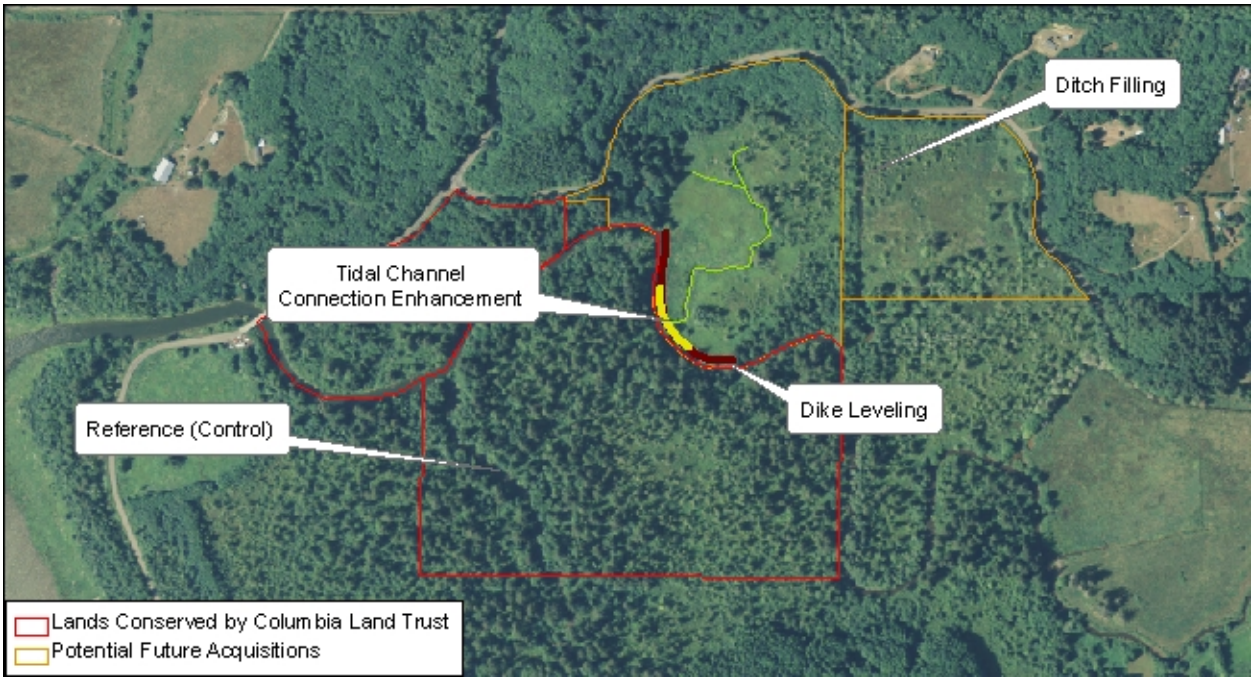
Metrics

Anticipated Estuary Module Management Actions (Reach A) include:

- CRE 1.4: Restore approximately 1.2 miles of shoreline vegetation;
- CRE 10.1 and 10.2: Level approximately 500 feet of dike along the island shoreline and remove one tidegate to enhance tidal marsh connectivity; and
- CRE 15.3: Control invasive plant species scattered over 70 acres of tidal marsh.

Subtask c. Develop construction designs for tidal reconnection project in the Crooked Creek Restoration Area which follow best available science and provide most benefit to species, while being cost-effective and constructible.

The Crooked Creek Conservation Area is strategically located on the eastern shore of Grays Bay. The conservation area, with future acquisitions, consists of intact spruce swamp and tidal channel habitat as well as tidal floodplain that have been disconnected and degraded by past land uses. Restoration actions on the 60 acre addition to the conservation area include dike leveling, ditch filling/tidal channel re-contouring, re-vegetation of disturbed areas and invasive plant species control.



Metrics

Anticipated Estuary Module Management Actions (Reach B) include:

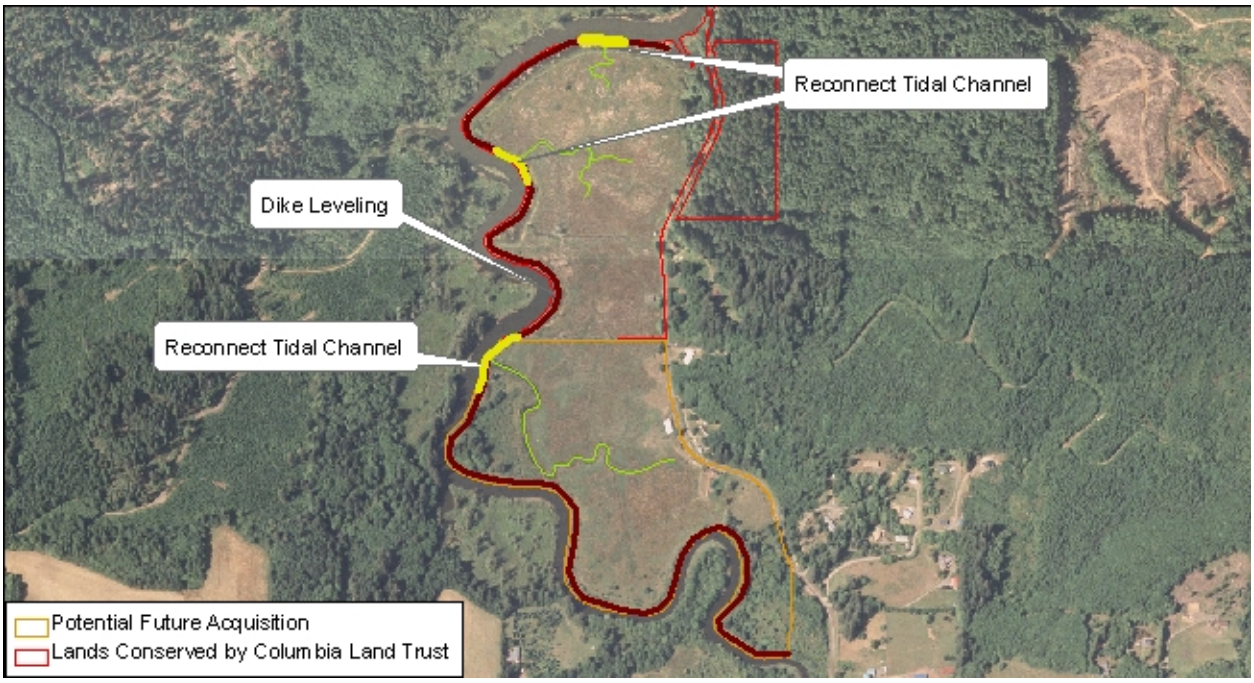
- CRE 1.4: 0.70 mile of riparian and channel shoreline.
- CRE 9.3: 0.5 mile and 1.5 acres of off-channel habitat protection;
- CRE 10.1 and 10.2: 700 feet of dike leveling restoring connectivity to 60 acres of tidal wetlands and 1,500 feet of tidal channel; and
- CRE 15.3: Invasive plant species control and planting on 40 acres.

Subtask d. Develop construction designs for tidal reconnection project in the Walluski River Restoration Area which follow best available science and provide most benefit to species, while being cost-effective and constructible.

The historic tidal spruce swamp in this project area has been drained and converted to pasture. Juvenile salmonids and other fish have no direct access to the site. Connectivity of the interior wetlands to tidal influence does not exist, and as such there is little functional benefit of this habitat area to the overall watershed or to salmonids. Shoreline vegetation on the dike is altered and no longer provides the same function capacity as the historic spruce swamp habitat.

The proposed project restores natural hydrologic connectivity to approximately 80 acres of disconnected tidal floodplain. The proposed restoration activity is to remove the existing levee and two tide gates along the Walluski River, plant native vegetation appropriate to the habitat, and re-contour interior drainage ditches to match historic channel configuration. The approach to restoration focuses on restoring natural processes using standard construction approaches, particularly for earthwork and flood control infrastructure. Work will be completed using heavy equipment (along the dike for removal and construction), smaller tracked equipment for contouring, and hand crews for planting.

The habitat elements of the project will be substantially self-sustaining once the hydrologic connection is completed. Continued maintenance work related to plant establishment and invasive plant species control will be on-going with a relatively low resource demand. Flood control infrastructure will require somewhat significant near-term maintenance to address settlement issues.



Metrics

Anticipated Estuary Module Management Actions (Reach A) include:

- CRE 1.4 Restore 0.65 mile of riparian shoreline along the Walluski River;

- CRE 10.1 and 10.2: 6,500 feet of dike leveling restoring connectivity to 80 acres of tidal wetlands and over 5,000 feet of tidal channel; and
- CRE 15.3: Invasive plant species control and planting on 10 acres.

G. MONITORING AND EVALUATION

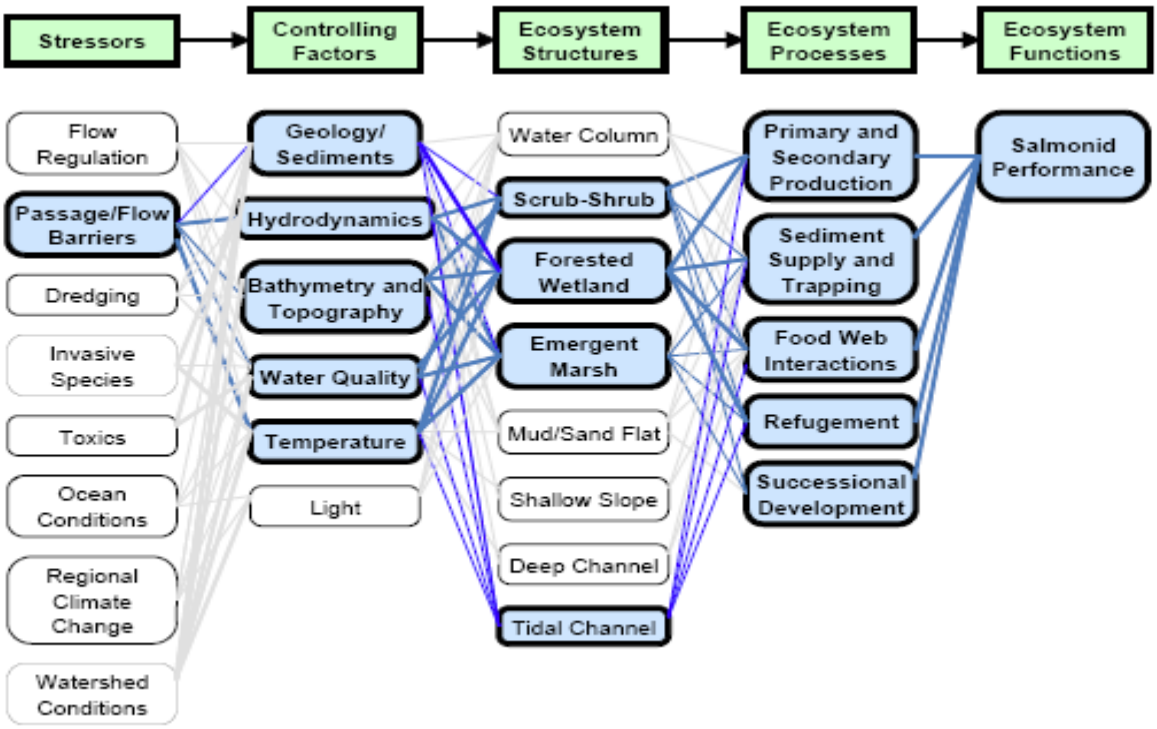
Columbia Land Trust intends to conduct effectiveness monitoring to evaluate restoration projects' adherence to the project's physical and biological objectives. These monitoring efforts and the work of others will contribute to regional efforts to establish a Columbia River estuary adaptive management framework. Implementation of monitoring efforts provides the means for informed land management by the Land Trust, as well as communication with neighbors and local communities regarding the results of this work.

Methods

The overarching goal of Columbia Land Trust's estuarine restoration projects is to restore tidal connectivity and function to floodplain and wetland habitats, and thereby to allow juvenile salmon to regain benefit from these rearing and refuge areas. Columbia Land Trust uses a combination of data logging instruments, on-site survey and sampling methods, and remote sensing techniques to accomplish its monitoring. The information derived from this monitoring is used to establish restoration goals and strategies, develop design parameters, predict restoration outcomes, and ultimately to evaluate project effectiveness.

At a minimum, Columbia Land Trust strives to perform one year of pre-project monitoring at both a reference site and the restoration location and two years of post-project monitoring with the following metrics: fish utilization, juvenile salmon stock identification (genetics), prey availability, vegetation changes, landform and hydrology changes, and water quality.

Based on the objectives of the aforementioned restoration actions, null-hypotheses were developed and based on the following conceptual model below. (Thom, et. al 1996, Roegner et al. 2009)



Restoration response monitoring will be concentrated on transects proximal to expected changes, for example, in a location where a tidegate was removed or a dike breached. Columbia Land Trust will use a before-after-control-impact (BACI) design for this effectiveness monitoring. The procedure for statistical analysis is the paired *t*-test (Sit and Taylor 1998). Protocols used in its effectiveness monitoring are from *"Monitoring Protocols for Salmon Habitat Restoration Projects in the Lower Columbia River and Estuary."* (Roegner et al. 2009)

Controlling Factor Hypotheses - Tidal Flow, Salinity, Temperature

Controlling H0 #1: Tidal channel volume will remain constant due to tidal channel reconnection enhancement

Rationale: While restoration treatments will vary for each of the sites described above, all of the activities share a common thread based on the reestablishment of tidal hydrology. Tidal hydrology is the primary means for the re-establishment of critical pathways for estuarine processes and functions. It allows fish to access the habitat area, causes the bi-directional movement of sediment, and supports vegetation structure and composition. The monitoring of these parameters is critical to understanding the drivers affecting *Structural* and *Functional* Hypothesis below.
Suggested Metric: Volume of water over time
Sampling Frequency: Hourly
Method: Protocol #1 – Hydrology

Controlling H0 #2: Salinity intrusion will remain the same after tidal channel enhancement
Rationale: Salinity is a primary driver for both physical and biological processes in the Estuary. Unique plant communities thrive under brackish conditions for a spectrum of salinity concentrations. It also

affects bio-chemical reactions in certain soil types and in the water column itself (i.e. flocculation, etc.). Many anadromous species also go through a biological transformation in their lifecycle when they enter the brackish Columbia River Estuary on their way to the ocean.
Suggested Metric: Parts/thousand
Sampling Frequency: Hourly
Method: Protocol 2. Water quality

Controlling H0 #3: ***Temperature will not decrease from tidal reconnection enhancement***
Rationale: Temperature is an important limiting factor for many species growth, survival, and reproductive capacity. Increases in stream temperature cause an increase in an organism's metabolic rate. For salmonids growth rates are positive at temperature ranges of 40-66 degrees Fahrenheit. Elevated stream temperature results in increased competition for a limited food supply, potentially displacing juveniles out of their preferred habitat. In addition as stream temperature increases, the amount of dissolved oxygen (DO) available to aquatic biota decreases.
Suggested Metric: Average Temperature; Number of samples >/=64 degrees F
Sampling Frequency: Hourly
Method: Protocol 2. Water quality

Structural Factor Hypotheses - Channel Morphology, Vegetation

Structural H0 #4: ***Channel shape, configuration, and marsh surface elevations will remain unchanged from tidal reconnection enhancement***
Rationale: *For Marsh Surface accretion.* Wetlands serve as natural sediment "sinks" due to their inherent topographic position as a deposition area. The vegetation structure interaction with hydrology can also reduce current velocity thereby intercepting suspended sediments. Measuring sediment influx is also an important variable for channel geometry and habitat forming processes. Reconnecting the historic tidal channel increases the level of natural floodplain interaction with the active channel thereby increasing opportunities for sediment in the restored area. Measuring the amount of sediment delivery into reconnected channels helps assess the rate and timing of sediment that is pulsing through a site as well as recovery from subsidence the site may have experienced due to floodplain disconnection. This is an important metric for understanding the long-term trajectory of the restoration work.
Suggested Metric: Transect Area changes, Marsh surface accretion increases/decreases
Sampling Frequency: Annually
Method: Protocol 3. Elevation (topography)

Rationale: *For Channel Evolution Patterns (Morphology*). Tidal channel structure change is a function of tidal velocities, flow patterns, and the source and size of sediment. An understanding of these processes assist in determining the shape, size, and elevation of channels. Surface elevation in turn determines the length and extent of inundation triggering plant community distribution and assemblages such as tidal marsh and swamp habitat types. Restoration actions such as dike removal can be likened to a small, localized disturbance event where energies are suddenly introduced causing an extremely dynamic movement and deposit of sediment. New channel patterns resulting from restoration actions may take years to reach an equilibrium based on sediment size, vegetation, and stream power.
Suggested Metric: Transect Area changes, Marsh surface accretion increases/decreases
Sampling Frequency: Annually
Method: Protocol 3. Elevation (bathymetry)

***Structural H0 #5:* Vegetation community composition will remain unchanged from tidal reconnection enhancement**

Rationale: Plant community composition in the restored areas may change as a result of increased velocities, salinity, introduced sediment, and a more dynamic hydrologic regime. This can change the timing and duration of soil saturation causing some plant species to die off triggering opportunities for other (i.e. hydrophytic) species adapted to brackish, wetted conditions to propagate. In addition, any salinity intrusion could cause fatalities of salt-intolerant species.
Suggested Metric: Dominance Diversity for each Community
Sampling Frequency: Annually
Method**:** Protocol 5. Plant species composition and cover

Functional Factor Hypotheses - Juvenile Salmonid Use

***Functional H0 #6:* No difference in salmonid use or benefits among wetland types**

Rationale: Tidal marsh and swamp habitat types are considered important to rearing of juvenile salmon and represent an integral component of the continuum of habitats that salmon occupy for significant periods of time. Changes in the environment and the loss or degradation of habitat have contributed to decreased runs of native fish. Estuaries contain food sources to support the rapid growth of salmon smolts, but adequate natural habitat must exist to support the detritus-based food web.
Suggested Metric: temporal presence, size/age structure, species
Sampling Frequency: Minimum sampling frequency should be one day per month from March through October.
Method: Protocol 7. Fish Community

Reference Sites

Reference site/conditions are characterized for all Columbia Land Trust restoration projects. A measure of restoration performance is for values of the post-restoration monitored attributes to converge with those of the reference site (Simenstad and Thom 1996). Reference sites in this proposal represent the state of a tidal wetland (marsh, scrub-shrub, and swamp) environment relatively undisturbed by human activity. Control sites are as similar as possible in all respects to the impact location, except for the presence/magnitude of the impact. The reference sites are spatially situated near the restoration site and subjected to similar large-scale climatic and environmental (mainly hydrologic) conditions, but independent of activities affecting the restoration site. It is understood by restoration practitioners in the estuary that choosing an appropriate reference site in some highly modified regions presents challenges. In the case of hydrological reconnection of floodplain areas to the mainstem Columbia, a typical reference site would be a tidal wetland, while a typical control site would be a diked pasture. Conditions at the tidal reconnection restoration sites are to be assessed with respect to the trajectory of their development against the target states represented by the reference site. When possible the reference location has been depicted on the restoration area map.

As part of project 2003–11–00 a network of reference sites in tidal marshes, swamps and other estuarine habitats with relatively undisturbed ecosystem structures and processes is being described.

These regional reference sites are being monitored to provide a range of target conditions for restoration activities. This effort is in the process of quantifying conditions necessary for wetland plant communities and tidal channel networks to develop. This information is important to designing and evaluating the effectiveness of restoration projects and is presently lacking for the Columbia estuary. This study is providing baseline characterization to address uncertainties regarding the elevation, soil, and inundation ranges required by native tidal wetland vegetation.

This network of reference sites is intended to provide restoration implementers a means for statistically analyzing and comparing projects along a temporal restoration trajectory. This study is using standard monitoring protocols (Roegner et al. 2008) to assess vegetation composition and percent cover, water surface elevation, elevation, channel morphology, substrate characteristics, and accretion rates. These monitoring protocols represent the same suite that is used in Columbia Land Trust's effectiveness monitoring. If a reference site characterized in project 2003-11-00 is proximal to a Columbia Land Trust restoration area it will be consulted.

As part of project EST-P-04-04, researchers are investigating naturally breached diked wetlands. Over the previous fifty years, some dikes have breached naturally due to flooding and storm damage. Most of these accidental breaches have since been repaired, but in a number of cases have remained open to tidal flux and provide researchers an opportunity to observe conditions over a longer arc of time. If the date of breaching can be approximated and the natural habitat forming processes described, the estimated time since "restoration" can be placed in context with other restoration projects for comparison along an ecological trajectory. The natural breach sites chosen with EST-P-04-04 for evaluation in 2008 are Karlson Island, Lewis and Clark River Bend, and Trestle Bay. Miller Sands, Goat Island, and Haven Island were monitored in 2009.

Regional Coordination

There is not currently a managed repository/database for the Columbia River Estuary reference site and effectiveness monitoring data. Effort are underway within projects 2003-007-00, 2003–11–00 and EST-P-04-04 to compile and analyze a compatible time-series database of physical and biological metrics collected from many individual restoration projects, habitat monitoring locations and reference sites. It is the intent of this database to enable the evaluation of the effectiveness of individual restoration projects, as well as the cumulative effects of many restoration projects, on improving salmon habitat in the CRE. When this framework is in place all effectiveness and reference monitoring the Columbia Land Trust or its contractors collect will be submitted in the appropriate format to the appropriate database managers.

Work Elements for Task 5

1. **Work Element 157: Collect/Generate/Validate Field and Lab Data** - Columbia Land Trust biological staff will collect pre- and post- project raw data on the restoration projects.

2. **Work Element 162: Analyze/Interpret Data -** Columbia Land Trust biological staff develop hypotheses prior to conducting work, test hypotheses during work, analyze data, and compile and publish data.

3. **Work Element 159: Transfer/Consolidate Regionally Standardized Data -** Columbia Land Trust biological staff will transfer data from field to office computers and upload to regional data distribution networks.

H. FACILITIES AND EQUIPMENT

The Columbia Land Trust has worked on estuary habitat protection and restoration for over ten years. Columbia Land Trust staff maintains three fully equipped offices: a main office in Vancouver, Washington and field offices in Astoria, Oregon and Hood River, Oregon. All offices are outfitted with state of the art technology including high speed internet, network computers and printers, office space for staff members, and the capacity to facilitate meetings. The Columbia Land Trust also maintains one truck and two boats used in monitoring and fieldwork. A wide variety of sampling gear is available to the Land Trust, including water quality monitoring equipment, depth loggers, field gear and other tools and supplies necessary to implement the work included in this proposal.

I. REFERENCES

Anisfeld, S. C., M. J. Tobin, and G. Benoit. 1999. Sedimentation rates in flow-restricted and restored salt marshes in Long Island Sound. Estuaries 22:231–244.

Bottom et al, 2005. Salmon at River's End: The Role of the Estuary in the Decline and Recovery of Columbia River. U.S. National Marine Fisheries Service, Seattle, WA.

Bryant, J. C. and R. H. Chabreck. 1998. Effects of impoundment on vertical accretion of coastal marsh. Estuaries 21:416–422.

CREST (Columbia River Estuary Study Taskforce). 2004. Effectiveness monitoring plan for Columbia Land Trust Grays Bay Conservation and Restoration Project. 40 pp.

Fresh, K. L., E. Casillas, L. L. Johnson, and D. L. Bottom. 2005. Role of the estuary in the recovery of Columbia River Basin salmon and steelhead: An evaluation of the effects of selected factors on salmonid population viability. NOAA Tech. Memo., NMFS-NWFSC-69.

Johnson et al, 2007. Evaluating Cumulative Ecosystem Response to Restoration Projects in the Columbia River Estuary. USACE Portland, OR.

Johnson, G.E., R.M. Thom, A.H. Whiting, G.B. Sutherland, J.A. Southard, B.D. Ebberts, and J.D. Wilcox. 2003. An ecosystem-based restoration plan with emphasis on salmonid habitats in the Columbia River Estuary. Prepared by Bonneville Power Administration, Columbia River Estuary Taskforce, Lower Columbia River Estuary Partnership, Pacific Northwest National Laboratory, and U.S. Army Corps of Engineers Portland District.

Kneib, R.T. (1997), "The role of tidal marshes in the ecology of estuarine nekton", *Oceanography and Marine Biology: Annual Review*, Vol. 35 pp.163-220.

LCFRB. Lower Columbia Fish Recovery Board. 2004. Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plans. 2004. Kelso, WA.

National Marine Fisheries Service. 2004. Biological Opinion, Federal Columbia River Power System. Portland, OR.

Northwest Power Planning Council. 2009. Draft Columbia River Basin Fish and Wildlife Program. Portland, OR.

Roegner et al. 2006. Monitoring Protocols for Salmon Habitat Restoration Projects in the Lower Columbia River Estuary. USACE Portland, OR.

Simenstad, C. A., J. Burke, I. Waite, T. Counihan, and J. Hatten. 2004. Lower Columbia River and Estuary Ecosystem Classification: Phase I. Rep. to Lower Columbia River Estuary Partnership. School Aquat. Fish. Sci., Univ. Wash., Seattle, WA, and US Geological Survey, Portland, OR.

Simenstad, C. A., and R. M. Thom. 1996. Functional equivalency trajectories of the restored Gog-Le-Hi-Te estuarine wetland. Ecol. Appl. 6:38–56.

Sit, B. and V. Taylor (editors). 1998. *Statistical Methods for Adaptive Management Studies.* Research Branch, British Columbia Ministry of Forests. Victoria, B.C. Land Management Handbook Number 42. 148 pages.

Thom, R. M. 1992. Accretion rates of low intertidal salt marshes in the Pacific Northwest. Wetlands 12:147–156.

Thom, R.M. 2000. Adaptive management of coastal ecosystem restoration projects. Ecological Engineering 15:365-372.

Thom, R. M. and K. F. Wellman. 1996. Planning aquatic ecosystem restoration monitoring programs. Institute for Water Resources, U. S. Army Corps of Engineers Alexandria Virginia and Waterways Experimental Station U. S. Army Corps of Engineers Vicksburg Mississippi, IWR Report 96-R-23.

Thomas, Duncan W. 1983. Changes in the Columbia River estuary habitat types over the past century. Columbia River Data Development Program. Columbia River Estuary Study Taskforce, Astoria, Oregon. 51 p + append.

USACE (2001). Columbia River channel improvement project: 2001 biological assessment. Portland, OR, U. S. Army Corps of Engineers.

J. KEY PERSONNEL

IAN SINKS

Stewardship Manager, Columbia Land Trust, August 2000 – Present

- Oversees stewardship program responsible for protecting the conservation values on over 7,000 acres of land. Responsibilities include program and budget development, staff hiring and management, coordination with project partners and contractors, conservation project development, site stewardship and monitoring plan development, implementation of stewardship activities and community outreach.
- Hired as the first professional stewardship staff for the Land Trust. Developed program approach and tools for the program, and has worked with staff and board to build the capacity of the program to become one of the most successful in the Pacific Northwest.
- Coordinated restoration work for conservation properties including wetland restoration on over 600 acres of diked tideland, riparian restoration on several miles of river, and oak woodland restoration on the Land Trust's 2,500-acre Klickitat River preserve. Restoration work included the development of comprehensive project effectiveness monitoring plan as part of an adaptive management approach to land stewardship.
- Facilitated GIS-based conservation planning process for the land trust service region covering over 200 miles of the Columbia River. This process builds upon previous efforts to define conservation priorities for the land trust.
- Prepared and was awarded over $10 million in grant funding from public and private grant sources for habitat protection and restoration projects.
- Presented at Regional and National Land Trust Alliance annual rally events on issues related to conservation planning and stewardship.
- Participates on the LCREP Science Work Group and has presented on estuary restoration work in a variety of venues.

The JD White Company, Inc. - Natural Resource Manager/Senior Ecologist April 1996 – August 2000

- Natural Resource team manager and principle member of company management staff for a 25-person land use planning, public involvement and environmental consulting firm. Directly responsible for staff hiring, workload management, budget development, business development and strategic planning.
- Responsible for preparation and review of technical studies and documentation for environmental projects including biological assessments, habitat surveys, SEPA and NEPA analysis, resource planning assessments, resource protection plans, wetland evaluations and habitat mitigation projects.
- Project manager for biological assessment studies to evaluate potential project effects on listed species for Endangered Species Act compliance. Studies included the evaluation of over 35 species of fish, wildlife and plants. Responsible for scientific literature research, designing and implementing appropriate survey and assessment protocols, preparation of technical documents, coordination with resource agencies and clients, and defending findings before public and agency members.
- Lead biologist and project manager for numerous wetland habitat studies and mitigation projects including wetland creation/enhancement projects. Project work included mitigation

planning, grading and planting designs, analysis of site hydrology, preparation of permit applications, constructions specifications, habitat construction and post-construction monitoring.
- Strong understanding of environmental regulations including ESA, Section 404, NEPA and SEPA, state and local land use regulations, and state water rights.
- Responsible for representing firm and clients, and providing expert testimony, for project interviews, public and judicial hearings, and before regulatory agencies.

U.S. Peace Corps - Parks and Wildlife Officer/Volunteer July 1993 – October 1995

- Established Extension Unit for the northern region of the country under the Department of National Parks and Wildlife (DNPW).
- Developed sustainable resource utilization programs for two protected areas (Vwaza Marsh Wildlife Reserve and Nyika National Park) covering over 4,000 square kilometers.
- Completed public needs assessment and resource abundance surveys. Public surveys evaluated resource requirements, crop protection issues, traditional leadership roles and management practices of the DNPW.
- Responsible for facilitating DNPW interactions with local communities located around protected areas. Worked to resolve antagonistic relations resulting from historical management practices and events. Through this facilitation effort, the DNPW was able to form new relationships and partnerships with local communities and traditional leaders.
- Implemented Participatory Rural Appraisal techniques to establish better understanding of protected areas management issues with local communities.
- Served as a principal resource person on a multidisciplinary team for an $8 million donor funded project to increase resource management capability of the department. Participated in issues analysis and strategic planning for the northern region DNPW units as part of the project.
- Prepared grant applications for funding of small-scale resource projects. Projects included a community operated maize mill and a small game raising operation.
- Facilitated negotiations with local leaders and DNPW staff to realign park boundary and game management fences.
- Developed and implemented technical program for pre-service training of parks and wildlife volunteers.

Otak, Inc. – Biologist March 1992 – May 1993

- Served as primary biologist conducting wetland delineation, resource surveys, habitat assessments and wetland mitigation plans. Prepared technical documentation for project permit applications and land use reviews.
- Coordinated multidisciplinary teams to prepare project plans including civil and structural engineers, landscape architects, land use planners, hydrologists and geotechnical engineers.

OMNI Environmental Service - Environmental Specialist II/Biologist September 1990 – March 1991

- Assisted in a variety of technical studies including wetland assessments, air quality evaluations and hazardous materials assessments.
- Served as field crew leader for completing studies and data collection. Responsible for a crew of four technicians.

- Responsible for establishing test protocols, field methodologies, budget development and monitoring, literature research and preparation of technical reports.

EDUCATION

- Lewis and Clark College 1990
  B.S. Biology
- Certificate in Watershed Management (graduate level), 1998. Portland State University, Portland, OR
- Continuing education in ecology, conservation biology, protected areas stewardship, wetland and riparian restoration, environmental regulations.
- U.S. Peace Corps Pre-Service and In-Service training in cross-cultural, language and technical skills (protected areas management, resource conservation, wildlife ecology)

DAN FRIESZ

Stewardship Lead, Columbia Land Trust, February 2010 - Present
Oversees the development, design and implementation of estuary and other restoration projects.

Washington Department of Natural Resources - Fish and Wildlife Biologist 3 June 2007 – January 2010

- Provided timely consultation, analysis, and review of timber harvests and other forest related activities by ensuring that all proposed and implemented activities were consistent with the Region's Habitat Conservation Plan (HCP), Policy for Sustainable Forests, Forestry Handbook, and Forest Practice Rules.

- Created variance/exception recommendations and other supporting documents regarding proposed state land activities that disseminated that all best management practices were consistent with the appropriate policies and procedures recognized by the agency.

- Participated, trained, and mentored field staff to identify, protect, and enhance unique forested habitat types and features such as forested and non-forested wetlands, riparian areas, balds, old growth, species diversity, high wildlife use areas, cliffs, caves, and talus fields. In addition, assisted field staff in creating snags, down woody debris, and in-stream woody debris on a site-by-site basis.

- Actively participated in all pre-sale activities, desired prescriptions, and other forested related activities within the Nesting, Roosting, Foraging, and Dispersal Habitats of the northern spotted owl.

- Assisted engineers and foresters with stream assessments that evaluated for the presence/absence of anadromous or local fish populations, determined appropriate stream typing, analyzed the current status of fish blockages (RMAP), and electrofished particular streams if compliant with federal and state permits.

- Established working relationships with other state, federal, and local agencies, private user groups, and DNR employees in an attempt to fulfill the commitments of the agency by

establishing a trustworthy relationship dedicated towards achieving ethical and biological sound stewardship of the state trust lands.

- Assisted with screening, identifying, and protecting cultural resources on all state land proposals in cooperation with local tribes and the Department of Archaeology and Historic Preservation

Ducks Unlimited, Inc. – Regional Biologist December 2005 – June 2007

- Responsible for delivering DU wetland conservation projects throughout SW and western Washington.
- Project coordination, management, and budgeting for over 50 active projects, public and private fundraising, and grant writing.
- Applied for state, local, and federal permits, completed and reviewed SEPA checklists and Biological Assessments, and coordinated with the United States Fish and Wildlife Service regarding the National Historic Preservation Act.
- Developed habitat management plans, agreements, and recommendations for various habitat restoration projects.
- Maintained, developed, and created working relationships with private landowners and other government entities.

Washington Department of Natural Resources-Forester 1 May 2004-November 2005

- Performed pre-sales, reconnaissance, and layout activities of lump sum and thinning timber sales that benefitted state trust beneficiaries. Requested and consulted with resource specialists and managed forested habitats through the guidance of the State Environmental Policy Act, Forest Practice Applications, and Habitat Conservation Plan.
- Performed contract compliance administration inspections on active timbers sales and road building and abandonment activities. Provided silvicultural plans and prescriptions to maximize reforestation.
- Assisted with biological plans and provided recommendations in the placement of leave tree areas, riparian management zones, and other sensitive habitats. Assisted in the design and enhancement of Nesting, Roosting, Foraging, and Dispersal Habitat management areas for the northern spotted owl.
- Attended and conducted public meetings, completed and reviewed State Environmental Policy Checklists and Forest Practice Applications, created maps, reports, and recommendations through the use ArcGis-ArcMap, PowerPoint, Excel, and Microsoft Word.
- Efficient in the operation of GPS equipment (Garmin, Tremble-TSE 1, and Tremble Recon) and downloading data into ArcGis to create data layers, reports, and maps.

United States Fish and Wildlife Service-Ridgefield National Wildlife Refuge

(1996-2000-Biological Technician, 2000-May 2004-Assistant Wildlife Biologist)

- Responsible for co-designing, surveying, engineering, implementing, and supervising up to seven staff employees and five contracting representatives for over $300,000 of construction contracts dealing with on-the-ground activities of wetland restoration projects that involve levee restoration, dike removals, swale development, wetland basin disking, and water control structure installation that has benefited over 1700 acres of critical habitat.
- Developed Partners for Fish and Wildlife private landowner management plans and agreements, requirement contractor construction contracts, and cooperative farming agreements. Completed federal, state, and local permits, developed annual and long- range pasture and wetland management guidelines and plans, and formulated various wildlife monitoring and management plans.
- Provided written and verbal recommendations for wetland, pasture, and invasive species management activities, monitored wetland and pasture conditions, assisted private landowners in land base management activities and permitting process, attended and coordinated public meetings, and coordinated with other federal, state, and local agencies regarding biological and managerial activities.
- Created purchase orders, acquisition requests, and work orders in coordination with accounting and budgetary staff employees. Developed and maintained property inventory databases and completed federal, state, and local grant applications.
- Conducted aerial and ground surveys for wintering waterfowl and nesting sandhill cranes, performed point-count bird surveys, monitored various amphibian populations and state endangered species, mist-netted and banded various bird species, collected data on neck and tarsus banded geese, swans, and sandhill cranes, operated hunter check station, and operated telemetry and remote water temperate devices.
- Performed pasture, crop, and wetland vegetation surveys, operated farm machinery and implements to plant, spray, and disk pastures and wetlands.
- Efficient in data entry and analysis through Excel, Statview, Rbase, GPS, and ArcView and efficient with other computer programs such as WordPerfect, Microsoft Word, and PowerPoint.

EDUCATION

Washington State University, Pullman, WA, August 1990 to May 1995. Bachelor of Science degrees in Natural Resource Management and Natural Resource Biology; minor in Range Management (Cum Laude).

NADIA GARDNER

Coast & Estuary Conservation Lead, Columbia Land Trust, October 2007 - Present

- Serve as the principal staff for conservation projects (acquisition & stewardship) in the *Coast & Estuary* area.
- Assess potential projects for conservation and restoration value and develop priority projects.
- Co-manage salmon restoration projects, including dike breaches, large wood placement, and plantings.
- Develop, write and manage grants for acquisition and restoration projects.

Lower Nehalem Community Trust - Trust Manager April 2006 - 2007

- Acted a lead staff person, managing a budget of $100,000, staff and contractors, and over 100 volunteers.
- Staffed Board, Land Protection, Fundraising, and Land Stewardship Committees.
- Wrote management plans and developed implementation and funding strategies for conservation properties.
- Developed land acquisition protocol, met with landowners, and coordinated acquisitions.
- Helped to develop organizational and project budgets. Performed accounting and produced budget reports.
- Identified, wrote and managed grants (including OWEB, NAWCA, WRP). Produced funder reports.
- Produced monthly email bulletins, biannual newsletters, and an annual report. Gave community presentations.
- Coordinated volunteer work parties, community/fundraising events, educational workshops, and field trips.

Master of Environmental Science and Management June 2006
Donald Bren School of Environmental Science & Management, University of California, Santa Barbara
Specialization: Political Economy of the Environment
Honors: 2005 Association of Environmental Professionals Fellowship, 2004 Donald Bren Fellowship
Group Thesis Project: *Marine Protected Areas Along California's Central Coast: A Multi-Criteria Analysis of Network Design*.

Bachelor of Arts in Women's Studies, Wesleyan University, Middletown, CT - June 1997
Specialization: Gender, Science & Technology
Study Abroad: International Honors Program: Global Ecology, Bard College (9/95 – 5/96)
Studied environmental impacts of development patterns and more sustainable alternatives in England, India, The Philippines, New Zealand and Mexico.

DAN ROIX
Conservation Lead, Columbia Land Trust, February 2008 - Present

- Serve as the principal staff for acquisition projects in the *Mid-River (River Mile 60 - 120)* area.
- Assess potential projects for conservation and restoration value and develop priority projects.
- Develop, write and manage grants for acquisition and restoration projects
- Assist stewardship staff with monitoring, issue resolution, and restoration projects
- Manage Columbia Land Trust's *Urban Initiative*

Sierra Foothills Conservancy - Associate Director June 2006 – March 2008

- Responsible for conservation projects in Mariposa County including property
- identification, landowner negotiations, funding acquisition, baseline documentation and
- completion of transactions
- Assist Executive Director on conservation projects in Madera and Fresno counties
- Coordinate planning and budgeting processes for organization
- Coordinate monitoring visits for over 5,000 acres of protected lands

- Work with board and staff on fundraising and membership development projects

Great Valley Center - Program Associate October 2002 – June 2005

- Worked closely with consultants, government agencies and project managers on a variety
- of projects
- Coordinated grant and project activities for New Valley Connexions, including policy
- research, report writing and publishing of 10 reports and development and outreach for over 60 public meetings and workshops
- Assist other staff, especially Renewable Energy Program, on grant research, writing, and
- Administration
- Manage program website, email lists, and database

EDUCATION

Columbia University May 2000
School of Engineering and Applied Science
B.S. Computer Engineering