Coastal Response to OWEB's RFP for proposed Focused Investment Priorities

Oregon Coast Estuarine Habitats

1. Proposed Priority Description

a) What is the native fish or wildlife habitat to be conserved or other natural resource issue to be addressed? Estuarine habitats

b) What are the specific expected ecological outcome(s) to be achieved after this priority is addressed?

The overall outcome of addressing habitat and water quality in estuaries is improved long-term viability for the rich biodiversity of fish and wildlife population that utilize Oregon's estuaries.

Restoration of natural hydrologic processes and ecosystem functions, including improved or increased:

1) Quantity and quality of fish and wildlife habitats through restoration, acquisition/easement, voluntary set-asides, etc.
2) Rearing areas for juvenile salmonids and other fish species
3) Off-channel habitat (velocity refugia and shelter from predation)
4) Availability and/or connectivity among estuary habitats necessary for fish, avians, and wildlife
5) Water quality (lower temperature, increased D.O., pH, etc.) in estuaries
6) Connectivity with floodplain
7) Nutrient cycling and sediment transport
8) Survival and productivity for salmon and other important fish and wildlife species
9) Diversity of habitat types including:
    a. functional tidal marshes (emergent tidal wetlands)
    b. tidal swamps (forested and shrub tidal wetlands)
    c. riparian areas
    d. sloughs
10) Existing low and high marsh habitat
11) Hydrologic functions (such as osmotic exchange of nutrients via tidal inundation and draining to the bay)
12) Adaptability of the estuary to allow for migration of plant communities and change in vegetative species resulting from climate change, sea level rise, flooding, etc.

c) What is the defined geographic location within which this proposed priority can be successfully addressed?

This priority can be addressed both at an estuary-specific level and at a regional level (ie Oregon's outer coast estuaries or all Oregon Coast estuaries). Another perspective is that water quality monitoring may be better addressed regionally, while habitat restoration efforts may be better addressed locally (although it depends upon the habitat value that is being restored and maximizing efficiencies). Another approach would be regionally – North, Mid-Coast, and South. There are a variety of options that will result in appreciable benefits to the resource.

2. Significance to the State

a) Why is this proposed priority of ecological significance to the state, even though it may not be present everywhere in the state?

Estuaries, while a uniquely coastal habitat, provide habitat for a variety of fish and wildlife species, including resident and migratory birds, salmonids and other recreationally, commercially, and culturally important fish species, including the listed Oregon Coast Coho and Southern Oregon/Northern California (SONC) Coho, Dungeness crab, shellfish (including farm raised oysters), and a variety of other game and non-game fish and wildlife species. Most of our iconic species, salmon, crab, and oysters are dependent on these biologically rich lands. Salmon Strongholds have been identified in 10 watersheds in the State of Oregon and all are dependent upon healthy functioning estuarine habitats.

Estuaries are central to Oregon's policy framework including Statewide Planning Goals 16, 17 and 19. The purpose and intent of Goal 16 is: "To recognize and protect the unique environmental, economic, and social values of each estuary and associated wetlands; and to protect, maintain, where appropriate develop, and where appropriate restore the long-term environmental, economic, and social values, diversity and benefits of Oregon's estuaries."

Estuaries are critical to multiple migratory species that traverse throughout the state of Oreogn over the course of their life cycle including migratory birds that need a place to rest and refuel during their journeys. For example, the Klamath Bird Observatory has developed a list of "Important Aquatic Bird Sites". Of the 39 sites identified, 24 are located along the Oregon coast in and around estuaries from the Columbia at the northernmost point to New River at its southernmost point.

In addition to migratory species, many birds, mammals, fish, and other wildlife depend on estuarine habitats as places to live, feed, and reproduce.

- Estuaries provide ideal spots for migratory birds to rest and refuel during their journeys.
- Many species of fish and shellfish rely on the sheltered waters of estuaries as protected places to spawn, giving estuaries the nickname "nurseries of the sea." Hundreds of marine organisms, including most commercially valuable fish species, depend on estuaries at some point during their development.
- This "nursery" is dependent upon healthy functioning estuarine wetlands. These wetlands that fringe many estuaries also perform other valuable services. Water draining from the uplands carries sediments, nutrients, and other pollutants. As the water flows through fresh and salt marshes, much of the sediments and pollutants are filtered out. This filtration process creates cleaner and clearer water, which benefits both people and marine life. Wetland plants and soils also act as a natural buffer between the land and ocean, absorbing flood waters and dissipating storm surges. This protects upland organisms as well as valuable real estate from storm and flood damage. Salt marsh grasses and other estuarine plants also help prevent erosion and stabilize the shoreline. These estuary functions are essential as the coastal areas prepare for future issues such as rising sea levels and other climatic alterations.
- The geomorphology of the estuaries is diverse, including river-dominated drowned river mouths, tidal dominated drowned river-mouths, bar-built coastal lagoons, and numerous tidal creeks contributing overall to the biodiversity within the State.
- Climate change is expected to have significant physical impacts along the coast and estuarine shorelands of Oregon, ranging from increased erosion and inundation of low lying

areas, to wetland loss and increased estuarine salinity. The environmental changes associated with climate change include rising sea levels, increased occurrences of severe storms, rising air and water temperatures, and ocean acidification. Healthy resilient estuaries are critical to help mitigate these impacts including local mitigation of ocean acidification by seagrass beds and storm surge buffering by seagrass and natural water flow regimes. The combination of these processes and their climate controls are important to beach and property erosion, flood probabilities, and estuarine water quality, with the expectation that these impacts along the Oregon coast will significantly increase throughout the 21st century and those costs will be born across the state. (http://occri.net/wp-content/uploads/2011/04/chapter6ocar.pdf)

b) Are there any social and/or economic considerations that the Board should understand regarding this proposed priority?

1) As referenced by the Governor, "Estuaries are vital to Oregon's health and economy, they are home to 29% of Oregon's population as well as almost 68% of the State GDP. Annually, commercial and recreational fishing industries benefit Oregon's economy by $600 million."
2) The Dean Runyon Associates report for ODFW on "Fishing, Hunting, Wildlife Viewing and Shellfishing in Oregon" (2008 Expenditures) identify that along the entire Oregon Coast over $340,000,000 are expended on shellfishing, fishing (freshwater and saltwater), hunting, and wildlife viewing. Approximately 80% of that is expended on the North and Central coast. Almost 37% of all total travel-generated expenditures across the state are expended along the coast range.
3) A large percentage of oyster larvae used by commercial growers across the Pacific Coast comes from the Oregon coast
4) Estuaries provide habitat for more than 75% of America's commercial fish catch and for 80-90% of the recreational fish catch. Across the United States, there are 28 million jobs in the fishing, tourism, and recreational boating industries - all of which depend on healthy estuaries for their products and customers.
5) Millions of visits are made to Oregon's estuaries each year to boat, swim, bird watch and fish.
6) Estuarine wetlands function at a very high level for moderating economically damaging disturbances and changes such as climate change, flooding, and extreme weather. Economic damage from these disturbances can be reduced by protecting and restoring estuarine wetlands.
7) Preliminary studies show that Pacific Northwest estuarine wetlands can provide a very high level of carbon sequestration (http://earthcorps.org/pdfs./snohomish%20Estuary%20Blue%20Carbon%20Assessment%20FEB%202014%20Final.pdf). This function may provide a significant economic incentive for estuarine wetland restoration.

c) In addition to its significance to the state, identify how the proposed priority fits within regional & local ecological priorities.

Multiple frameworks identified in #3b below address the following priorities as they relate to estuaries along the coast:
- coastal coho/SONC coho (recovery plans, conservation strategies – all include an estuarine component)

- commercially viable species (commercial and recreational harvests of species that utilize and depend upon estuaries at certain points in their life cycles)
- whole watersheds (watershed plans, CCMPs, and other planning efforts include estuaries)
- estuarine wetlands (regional priorities include reduced flooding, improving water quality, creating community resilience, etc., and estuarine wetlands play a significant role in addressing those authorities)
- avian species/Important Aquatic Sites (Klamath Bird Observatory and Audubon's important bird areas)
- South Slough NERR and Tillamook and Lower Columbia NEP programs (federally recognized estuaries (Tillamook Bay and Lower Columbia are both designated as bays of national significance)
- Siuslaw Watershed Council's Seventh Field Aquatic Prioritization (estuaries are the highest priority)

3. Limiting Factors

a) What ecological limiting factors exist that relate to the proposed priority identified? Limiting factors are the physical, biological, or chemical conditions and associated ecological processes and interactions (e.g., population size, habitat connectivity, water quality, water quantity, etc.) experienced by the habitat that may influence viable population parameters (i.e. abundance, productivity, spatial structure, and diversity).

1) Loss of estuarine wetlands through dikes, tidegates, restrictive culverts, and other hydrologic alterations as well as associated fish passage barriers
2) Conversion from one estuarine wetland habitat type to another – e.g. past logging led to loss of forested tidal swamps and conversion to tidal marsh
3) Ditching reduces fish habitat complexity and suitability by greatly reducing total channel length, altering channel width:depth ratio and bank slope, raising water temperature and reducing overhanging vegetation that shelters juvenile fish from predation
4) Degraded Water quality- bacteria limits safe human recreation and shellfish production, dissolved oxygen (sloughs), temperature (sloughs), sedimentation, toxics pollution in shellfish, Harmful Algae Blooms (HABs), ocean acidification
5) Loss of native eelgrass beds
6) Loss of floodplain connectivity and other hydrologic alterations
7) Loss of overall habitat quality, quantity, and complexity
8) Loss of mudflats
9) Loss of large woody debris providing structure and habitat within estuaries (upstream influences)
10) Increasing development along the estuary and associated uplands can impact water quality, decreasing habitat for fish and wildlife, and flooding impacts
11) Introduction of invasive species flora and fauna as well as invertebrate species altering
12) Inability for habitats and vegetation communities (due to hydrologic alterations) to migrate in response to climate change, sea level rise, changes in salinity, gradients, and sedimentation, and floods, etc.

b) Reference any framework(s) that exist (Recovery Plans, Implementation plans, etc.).
Multi-species Conservation Strategy,
Oregon Plan for Salmon and Watersheds

Tillamook Bay Comprehensive Conservation and Management Plan
The "Raccoon Reports" available for 9 Oregon estuaries (Netarts, Sand Lake, Nestucca, Siletz, Umpqua, Coos, Coquille, Rogue, and Chetco)
Multiple watershed assessments
Yaquina Estuary Conservation Plan
2010 Natural Areas Plan
Nehalem Conservation Action Plan
Laura Brophy's estuary assessment and site prioritization reports for the Necanicum, Nehalem, Tillamook, Yaquina, Alsea, Siuslaw, and Umpqua estuaries (while the Brophy reports are neither recovery nor implementation plans, these reports identify and prioritize tidal wetland sites for conservation and restoration, and have served as valuable resources for conservation and restoration actions in several of Oregon's estuaries)
Multiple research efforts by the Western Ecology Division of US EPA Region 10.
Oregon Conservation Strategy and Nearshore Strategy
Migratory Bird Act
ESA
Fishery Management plans (through PFMC for regionally/federally managed species some of which are estuary residents/users)
Oregon Coastal Management Program Coastal and Estuarine Land Conservation Plan (DLCD)
The Nature Conservancy reports including "The Coastal Connection: assessing Oregon estuaries for conservation planning", Conservation Action Plans for Cape Blanco and Salmon River, and the 2011 report titled "A Conservation Assessment of West Coast Estuaries".

4. Threats and Benefits

a) What overall threats exist to the proposed priority identified? Threats are the human actions (e.g., fishing, development, road building, etc.) or natural (e.g., flood, drought, volcano, tsunami, etc.) events that cause or contribute-to limiting factors. Threats may be associated with one or more specific life cycle stages and may occur in the past, present, or future.

Ecological and economic value of estuaries may be degraded by forcing from upland (watershed) or by forcing from the ocean. Part of the challenge in maintaining estuary health is understanding the source of habitat degradation or impaired water quality. Oceanic forcing and upland forcing must be differentiated in order to successfully plan for restoration and long term success of restoration projects.

Direct human threats:

- Development (urban, impervious surfaces, removal of vegetation, agricultural development, etc.)
- Tidal disconnection (dikes, tidegates, restrictive culverts, and other structure that block tidal flows)
- Floodplain disconnection
- Filling or conversion of tidal wetlands
- Dredging of shipping channels
- Shipping/boating as vectors for invasive species introduction
- Fishing pressures

Indirect human threats or natural threats:

- Water quality degradation(sedimentation, temperature, dissolved oxygen, toxic pollutants, ocean acidification, etc)
- Conflicting uses in the estuaries
- Tsunamis and floods (natural but degree of impact my be increased by other indirect human actions)
- Post seismic land surface subsidence (following a major earthquake)
- Upland and watershed processes
- Climate Change (observed and anticipated effects include sea level rise, ocean acidification, storm intensity, etc.)

b) What will happen if the threats aren't addressed?

Reduced community resilience
Loss of habitat (marshes, swamps, eelgrass, etc)
Loss or degradation of commercially viable species (fish and wildlife)
Loss of fish and wildlife productivity
Increased flooding impacts
Saltwater intrusion into groundwater
Inability to adapt to climate change
Impacts to migratory birds
Reduced recreational use
Potentially more flooding and erosion impacts (to not only homes but key infrastructure such as Highway 101 (a major transportation network))

c) Describe the economic, social, iconic and cultural benefits of addressing the outcome and impacts of not addressing it.

Impacts:

Loss or degradation of recreational and commercial fisheries (finfish and shellfish)
Loss of culturally significant areas (erosion, climate change, etc.)

> Oregon's estuaries have been central to Oregonian culture(s) for centuries and have been focused around the natural resources the estuaries provide

Loss of essential fish habitat
Impacted salmonid runs
Economic impacts to rural coastal communities (tourism, resource-related services, etc)
Increased regulatory presence
Increased conflicts between stakeholders
Economic impacts to the overall state economy (tourism, impacts to funding for State agencies, etc)

Benefits:

Healthy salmon runs
Improved fisheries opportunities (recreational and commercial)
Improved community resilience to address natural hazards like sea level rise, storm surges, and flooding
Improved water quality resulting in fewer shellfish harvest closure days
Improved water quality resulting enhanced recreational opportunities
Healthy resident and migratory bird populations
Improved wildlife viewing opportunities

Enhanced restoration economy
Enhanced recreation economy (passive and active)
Improved sense of stewardship through active restoration using outreach and education

d) Briefly summarize how much has been done already, how much is remaining.

At least 70% of Oregon estuarine wetlands have been lost overall and losses of tidal swamps (forested and shrub wetlands) have been much higher, over 90% for those estuaries where figures are available (see weblinks below). Restoration has helped make up for these losses, but is still low compared to total losses. For example, in the Siuslaw River estuary, 67% of tidal wetlands were lost prior to 2005, and only 24% of those had been restored by 2005 (http://ir.library.oregonstate.edu/xmlui/handle/1957/19035). In the Tillamook Bay estuary, 76% of tidal wetlands were lost by 2012, and less than 1% had been restored by 2012 (http://docs.google.com/viewer?url=http%3A%2F%2Fwww.tbnep.org%2Freports-publications%2Ftidal-wetland-prioritization-for-the-tillamook-bay-estuary-2012.pdf) -- although an additional 10% will be restored in 2015 (http://tillamookoregonsolutions.com/the-project-3/).

Actions that have occurred/are occurring:
Land acquisitions of tidal and non-tidal wetlands
Removal of dikes, tidegates, and restrictive culverts
Restoration of tidal wetlands (swamps/marshes)
Tidegate upgrades
Revegetation of riparian areas along tidal sloughs and rivers
Upper watershed restoration efforts resulting in improved water quality, reduced sedimentation, large wood recruitment, increased riparian shade and other benefits
Infrastructure improvements (Tillamook cross connections)
Implementation of best management practices on ag land
Forest practices (road decommissions, culvert replacements, etc.)
Reintroduction of the native oyster (Netarts and Coos Bay, in particular)

e) What is your best estimate of cost to address the priority, and as a result, how economically feasible do you believe it is to address this priority over time?

Although the total cost of restoring all degraded estuarine habitats would be high and not economically feasible, restoration of prioritized, strategically selected habitats can provide a high return on the economic investment. Such restoration should be targeted at areas with the highest potential ecological function over the long term, and should aim to restore a diverse landscape array of habitat types, needed to support a diversity of native fish and wildlife species. Restoration of a diverse landscape array of habitat types has been specifically recommended to enhance salmonid population resilience, because this diversity supports a broad range of salmonid life history strategies.
(http://www.estuarypartnership.org/sites/default/files/resource_files/Current%20Review%20Criteria.pdf).

This is an issue of scalability. Estuarine resilience requires partnerships, like many of those already in place, across the entire Oregon Coast as well as a major coordinated funding investment. A coastal estuaries initiative will provide a coordinated strategic approach to

achieving the desired outcomes described in this RFP. With all of that, as noted above, restoration of prioritized, strategically selected habitats and water quality parameters (including upland influences) is economically feasible and should be attractive to other funders beyond OWEB.

5. Opportunities

a) Ecological:

1. What are the measures of ecological success? What's the likelihood of ecological success in the short (6-year), medium and long-term (define the term lengths)?

   Potential Metrics:

   Various estuary habitats preserved through acquisition/easement

   - 100 acres of high functioning tidal wetlands acquired by 2020 (short term)
   - % increase in protected acreage of native-dominated tidal wetland plant communities by 2025 (mid term)

   Improvements in estuarine habitat quantity and condition achieved through restoration

   - 200 acres of habitat made accessible through tidegate/dike removal (short term)
   - % increase of habitat with full tidal connectivity restored by 2025 (mid term)
   - % increase in cover of native tidal wetland plant species on restoration sites by 2030 (long term)
   - Area of riparian vegetation restored
   - 100 acres of riparian area planted (short term)
   - 50% average shade increase by 2025 (mid term)
   - % water temperature or dissolved oxygen improvement by 2030 (long term)
   - Established water quality baselines for Oregon estuaries (for ocean acidification, eutrophication and other parameters) (short and medium term)

2. What types of voluntary conservation actions could be undertaken to address the proposed priority?

   The list includes but is not limited to: Acquisitions, conservation easements, enhanced riparian setbacks, habitat restoration (riparian/wetland revegetation) on working or residential lands, enhancing tidegates, removing defunct infrastructure, water quality monitoring, education for k-12 as well as stewardship opportunities for adults.

3. Should the proposed priority be divided into geographic areas that are appropriate for partners to address?

   There are a number of ways to address this priority from a geographic perspective. This habitat type lends itself to both a single estuary (and watershed) being a focus as well as multiple estuaries being grouped together to address a specific limiting factor e.g. Oregon Coast's outer coast estuaries, all Oregon estuaries, or North, Mid-Coast, and South. There are multiple ways to divide this priority in a meaningful way and partnerships already in place to begin implementing restoration as part of a focused investment.

b) Social:

1. Do partnerships exist to address the proposed priority? If so, briefly describe. If not, note why this proposed priority is important enough that partnerships may form to address it.

There are partnerships around localized watersheds as well as regionally. Examples of these partnerships include the Central Coast Estuary Collaborative, South Slough NERR, Lower Columbia Estuary Partnership, Tillamook Estuaries Partnership, Partnership for Coastal Watersheds, Siuslaw Basin Partnership, Waite Ranch Tidal Wetland Restoration Project Team, Tillamook-Nestucca Fish Passage Collaborative, Wild Rivers Coast Estuaries, etc.

2. What social opportunities exist to address the proposed priority? Is there momentum built?

There is increasing energy and momentum around estuarine health as it affects tourism, recreational use, multiple industries (forestry, agriculture, fishing), and an expanding restoration economy. There are many partnerships already in place. Local jurisdictions are recognizing the value of estuaries in providing community resilience against natural hazards and are often partners in restoration projects. Healthy estuaries provide for improved recreational and commercial fisheries (finfish and shellfish), improved waterfowl and wildlife hunting opportunities, estuary watertrails, improved community resilience (reducing flood impacts, buffering against sea level rise, etc.), passive recreational opportunities such as bird watching, and overall improved sense of place. There is a growing emphasis at the federal level to restore estuarine health resulting in a number of initiatives and dollars to put towards the effort.

3. Describe educational benefits, if any.

A comprehensive plan addressing the restoration of estuaries has the potential to include educational benefits. Schools at both the k-12 and higher education level utilize estuaries in providing place based learning. The north and central coast are part of the STEM Hub. The Environmental Literacy Plan is being implemented and there are partnerships along the coast helping to bring that to students through outdoor learning and in the classroom. There is the Oregon Coast Education Program funded by NOAA's Bay Watershed Education Training program (disseminating the value of estuaries and restoration-based projects to teachers and communities); youth education programs up and down the coast that integrate estuaries and tidal wetland restoration projects into the curriculum and include partners like watershed councils, school districts, community colleges, conservation organizations, etc.

4. Summarize the social, community, political, regulatory or other factors that will help lead to the success of this proposed priority.

Estuaries play a critical role in the overall health of coastal communities. They play a role in economic development (ports, shipping, commercial and recreational fisheries, tourism, agriculture), community identity (bays of national significance, cultural heritage), environmental education, and water quality. With a growing emphasis on estuaries and many of the species that utilize the estuaries, government agencies are working with local entities to move restoration on the ground. There are challenges with regulations; however, that is not unique to estuaries. Socially, there is a greater understanding of the importance of estuaries as they relate to communities economically or environmentally. Our watersheds play such a role in the fabric of coastal life that it is impossible to separate it out.

5. What can be leveraged to address the proposed priority (funding, acreage impacts, other resources)?

Land Conservancies, private foundations,
Shellfish growers associations
An emphasis on coastal coho, USFWS coastal wetlands grant, DEQ 319, EPA 320, NFWF (Governors Fund), USFWS restoration dollars, WWRI, ODFW R&E, PMEP, PFMC, WRP, CREP

c) Economic Benefits

1. Describe the economic benefits of addressing the ecological proposed priority, including ecosystem services.

Benefits include but are not limited to:
a) increased restoration economy (and resulting increase in jobs)
b) improved opportunities for fishing and hunting (increase in licenses and associated businesses)
c) reduced costs associated with natural hazards (better resiliency)
d) improved water quality
e) carbon sequestration
f) increased tourism economy (water trails, hiking, bird watching, etc)

6. FOR ALL SUBMISSIONS: Assess the proposed priority by locating the proposed priority in one of the quadrants below. Describe why the proposed priority falls in this quadrant. There is no wrong answer to this question and there may be multiple answers.

This priority is located within the "Complex (but doable) and moderately understood" quadrant. It is complex in that social and political drivers can be a significant influence and that estuaries are some of the most diverse ecosystems on the planet. Yet, social and political influences can have very positive influences on this priority. It is moderately understood in that a lot of research has happened and continues to happen in estuaries; however, the complexity of the ecosystem is such that to suggest it is well-understood would be an over-simplification.

7. Is there other information the Board should know regarding this priority?

8. In lieu of attaching letters of support for this proposal, please submit a list of other supporting individuals and organizations.

Oregon Department of Fish and Wildlife
US Forest Service
Oregon Department of Forestry
Necanicum Watershed Council
Upper Nehalem Watershed Council
Nestucca-Neskowin Watersheds Council
North Coast Land Conservancy
South Slough NERR
Wild River Alliance
Mid-Coast Watersheds Council
Lower Nehalem Community Trust
Oregon Department of Environmental Quality
US Fish and Wildlife Service
Oregon Department of Land Conservation and Development
Lower Nehalem Watershed Council
Tillamook Bay Watershed Council
Tillamook Estuaries Partnership
TNC
Tillamook County SWCD
Salmon Drift Creek Watersheds Council
Wetlands Conservancy
Lower Columbia Estuary Partnership

NOAA
EPA
McKenzie River Trust
Wild Salmon Center
Siuslaw Watershed Council
North Coast Watershed Association
Oregon Department of Parks and Recreation
CREST
Pacific Coast Joint Venture
Trout Unlimited
Estuary Technical Group, Institute for Applied Ecology