Focused Investment Partnerships

FIP Application 2021-2023

Application Deadline: 5:00 pm, January 13, 2022

OWEB's Mission

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

Instructions

1. **All partnerships interested in submitting an application to the Focused Investment Partnership (FIP) Program are required to participate in a pre-application consultation with OWEB staff.**
   - Consultations will occur September 1 – October 31, 2021.
   - Consultations can be scheduled any time by contacting Kristi Primley at OWEB: 971-345-7019; kristi.primley@oregon.gov.
   - Partnerships will be asked to provide a list of core partners and a map that illustrates the strategic action plan geography and the initiative geography under consideration.
   - We strongly recommend that you schedule your consultation as early as possible, as opposed to waiting until the end of the consultation period.

2. Complete the application based on the instructions below.
   - Use Letter (8½" x 11") page size and single-spacing.
   - Complete and attach the required forms and attachments (see Section 1 and attachments).
   - Read and sign the application certification (Section 1).
   - Additional application instructions regarding format are located on p8.

3. **Email completed application and attachments to: OWEB.FIPApp@oregon.gov by 5:00 pm, January 13, 2022.**
   - Attach PDF application as one document, using the current application posted online.
   - The email subject line should begin "FIP Application" followed by the Partnership name.
   - Applications must:
     - Have a maximum file size of 20 MB
     - Include one PDF document with text recognizable by the computer (OCR, not just an image). Use the "Save As" function in Microsoft Word and choose "PDF" from the "Save as type" drop-down menu. If your version of Word does not support PDF, use a conversion program (such as pdfonline.com).

4. You will be notified when OWEB receives your email application submission. *If you did not receive a confirmation email,* please contact Kristi Primley at OWEB: 971-345-7019; kristi.primley@oregon.gov. Applicants are responsible for confirming that OWEB received your application.

OWEB Staff Assistance

We encourage you to contact an OWEB FIP Partnerships Coordinator for assistance in developing your proposal.

Eric Hartstein: eric.hartstein@oregon.gov; 503-910-6201

Eric Williams: eric.willliams@oregon.gov; 971-345-7014

FIP Program

Your proposed FIP initiative (hereafter called "initiative") is the portion of your strategic action plan that is being proposed for FIP funding through OWEB. The scope of the initiative is determined by the partnership and constitutes that portion of the strategic action plan that the partnership believes it can accomplish in the proposed timeframe (maximum of 6 years) with the proposed funding (maximum of $12 million).

A FIP initiative is an OWEB investment that:

- Addresses a board-identified Focused Investment priority of significance to the state;
- Achieves clear and measurable *ecological outcomes;*
- Uses integrated, results-oriented *approaches* as identified through a *strategic action plan;*
- Is implemented by a high-performing *partnership* with a formal decision-making process.

This application will address the partnership's organizational structure and capacity, and the proposed FIP initiative, work plan and budget. Responses to this application will provide the OWEB Board an understanding of the partnership's potential as a FIP investment.

Partnerships that were previously awarded FIP funding are eligible to reapply to this grant offering. Information on reapplying, including additional application questions, can be found in Section 5 of this application.

IMPORTANT: Applying to the FIP Program requires an interview with the OWEB Board FIP Committee as part of the evaluation process. Interviews are planned to occur in June 2022 and will be conducted via virtual meeting arranged by OWEB.

Important Note about Budgets

- The OWEB Board will seek to balance Focused Investments funding each biennium. The board approved the 2021-23 biennium spending plan at the July meeting. OWEB has $10 million available for the 2021-23 FIP solicitation and may award up to 3-5 new FIP initiatives to begin during this biennium, with an average of approximately $2 million per initiative in each biennium.
- Maximum duration of funding for an initiative will be three biennia (six years) contingent upon available funding.
- Maximum funding for an initiative will be $4 million/biennium for a total of $12 million.
- The board may fund an initiative in whole or in part.

Application Timeline

August 2021
FIP solicitation opens for 2021-23 biennium.

September 1 – October 31, 2021
Required application consultation with OWEB staff.

January 13, 2022
Applications due to OWEB by 5:00 pm.

April – May, 2022
Technical review.

June 2022
Interviews with the OWEB Board FIP Committee.

July 2022
At the July meeting, the OWEB Board reviews technical evaluations and FIP Committee recommendations and awards FIP initiatives for the 2021-23 biennium. (There will be an opportunity for public comment at this time.)

August 2022
Partnership kick-off meeting for awarded FIPs.

Definitions

Conservation Actions
"Conservation Actions" refer to ecological conservation treatments that have specific aims, such as juniper treatment, culvert replacement, fish passage enhancement, or acquiring interest in land or water. Conservation actions contribute to producing conservation outputs, which in turn generate ecological outcomes.

Conservation Outputs
"Conservation Outputs" consist of the specific, measurable products or yields resulting from a conservation action or series of actions. Conservation outputs are typically achieved in the near term. For instance, outputs may include (but are not limited to) the total cfs restored to instream flow, the number of stream miles restored, the number of plants employed in re-vegetation, fish barriers removed, or fish screens installed. Collectively, conservation outputs contribute to positive changes in ecological process and function that lead to the achievement of ecological outcomes over the long term.

Core Partners
"Core Partners" are the partners identified in the proposal that will bring substantial capacity to a partnership and will lead the implementation effort.

Ecological Outcomes
"Ecological Outcomes" constitute the broader vision of ecological uplift that may be attained through the achievement of a conservation output or collection of outputs. Ecological outcomes are typically achieved over the long term. Outcomes may include (but are not limited to) water quality improvement, habitat connectivity, fish passage and reintroduction, and fish population increases.

High Performing Partnership

"High-Performing Partnership" means a collaborating group of organizations with an existing governance structure that includes a formal decision making process resulting in an effective performance history.

Initiative

"Initiative" means the program that the partnership will pursue with Focused Investment Partnership funding for up to six years.

Strategic Action Plan

"Strategic Action Plan" is the long term conservation strategy of a partnership. Plans will include all components identified by OWEB as a part of the application process.

Theory of Change

A theory of change is an articulation of the hypothesized relationships and underlying assumptions between strategy implementation, resulting intermediate ecological outcomes, and long-term ecological goals (OWEB *Strategic Action Plan Guidance*, p6).

Work Plan

"Work Plan" means the proposed actions of the partnership in each biennium of the Initiative. Focused Investment Partnership Implementation partnerships will submit to OWEB an updated work plan in advance of each new biennium.

Section 1: Applicant Information

1. What is the name of your partnership?

   The name of the partnership and proposed initiative (below) should be used on all related correspondence, agreements, etc. Try to keep names to 5 words or fewer.

   Oregon Central Coast Estuary Collaborative (OCCEC)

2. What is the name of your proposed initiative?

   Restoring Resilience to Two Estuaries

3. What is the name and contact information of the point of contact for the partnership? This individual is responsible for communication with OWEB on details related to this grant application.

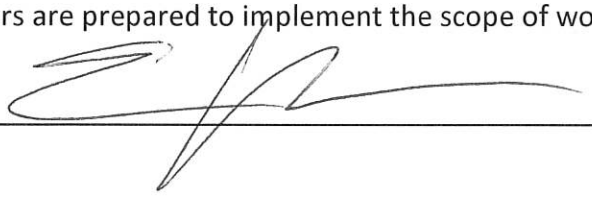
   Evan Hayduk, MidCoast Watersheds Council Coordinator

   evan@midcoastwc.org Office: (541) 265-9195 Cell (206) 714-5546

   MCWC PO Box 2273 Newport, OR 97365

Certification

Regardless of who wrote the application, it must be signed by the point of contact for the partnership, identified above. By signing, the point of contact certifies that all the information accurately reflects the partnership, and that the partners are prepared to implement the scope of work as presented in the application.

Applicant Signature: 

Print Name: **Evan Hayduk**

Organization: **MidCoast Watersheds Council**

Title: **Coordinator**

Date: **1/13/2022**

Attach the following **required** documents to this application:

1) A **letter of participation** on the applicant's letterhead that includes the authorized signature(s) from each **core partner** affirming their concurrence with the FIP initiative as proposed in this application and their commitment to its implementation through the proposed period of the initiative, pending availability of funds.
2) **Color maps** that illustrate the geographical boundary and major features of the proposed initiative.
3) The partnership's **strategic action plan**. Strategic action plans can be written in any format; however, the strategic action plan will need to address the components outlined in OWEB's *Strategic Action Plan Guidance*.
4) **Partnership governance documents** (see Section 3, question 1).
5) **Work Plan** (see Section 6).

*Please **DO NOT** provide letters of support.

Section 2: Initiative Summary

1. **Initiative Abstract**

   Upon completing your application, write a brief initiative abstract (200 words or fewer). The abstract should address the following points:

   - Identify all core partners,
   - Identify the partnership's ecological outcomes,
   - Briefly state what the partnership intends to do with FIP funding, and
   - State how the goals of the FIP funding align with the OWEB Board-identified Focused Investment priorities.

   Coastal Estuaries are a FIP priority because they are highly productive, diverse, and provide ecosystem services crucial to people and nature. Connecting forested uplands to the ocean, estuaries play a unique role, influencing landscape function across multiple habitats. Coastal resiliency to sea level rise depends upon conserving our estuaries through protection and restoration of key ecological processes and functions including hydrological connectivity, nutrient cycling and sediment transport.

   The Yaquina and Alsea estuaries have lost over 90% of their tidal swamps and significant amounts of other types of tidal wetlands. Correcting decades of degradation can be daunting, but a diverse team of Core Partners have committed to working on the priority projects identified. They come from these organizations: MidCoast Watersheds Council, Confederated Tribes of the Siletz Indians, The Wetlands Conservancy, McKenzie River Trust, Ducks Unlimited, Fred M. VanEck Forest Foundation, Pacific States Marine Fisheries Commission, ODFW, Lincoln SWCD, USFWS, BLM, and USFS.

   FIP funding will help achieve OCCEC's ecological outcomes in the Alsea and Yaquina estuaries: restoring the percentage of functional tidal wetlands through restoration (900 acres), protecting current tidal swamps and landward migration zones (100+ acres), and protecting with conservation ownerships or easements 400+ acres to allow for future restoration.

2. What are the proposed start and end dates for this initiative?

   Start: July 2022 End: June 2028

3. **Budget Overview**

   Complete this section ***after*** you have completed the Budget section. Be sure that the numbers here are consistent with the numbers you provide in the Budget section. For each biennium that the partnership is seeking Implementation FIP funding, provide estimated budget and leverage information in the table below.

Funding Period	**OWEB Funding Request**	**Estimated Leverage**
Biennium 1	$1,523,000	$1,073,000
Biennium 2	$3,921,700	$2,106,000
Biennium 3	$2,390,250	$1,791,000
TOTAL	$7,834,950	$4,970,000

4. Identify the OWEB Board-identified priority(ies) that your proposed initiative will address.

Note: Indicating that your proposal addresses multiple Focused Investment priorities **does not** make your proposal more competitive. The OWEB Board is interested in how well the proposal addresses the priority(ies), not the number of priorities that are addressed. If you check more than one box you should be prepared to discuss in the application how the initiative addresses each priority. Memos explaining each board-identified Focused Investment priority can be found on the Focused Investment Partnerships webpage.

Check all that apply:

- Aquatic Habitat for Native Fish Species
- ✓ Coastal Estuaries in Oregon
- Coho Habitat and Populations along the Oregon Coast
- Dry-type Forest Habitat
- Oak Woodland and Prairie Habitat
- Oregon Closed Lakes Basin Wetland Habitats
- Sagebrush/Sage-steppe Habitat

Application Instructions

There is no page limit for completing the following sections:

- Section 3 (The Partnership)
- Section 4 (The Initiative)
- Section 5 (Reapplying to the FIP Program)
- Section 6 (Initiative Work Plan)
- Section 7 (Budget)

Applicants will determine the appropriate level of detail and length of response for completing each question in these sections.

Responses should be clearly formatted, occur in the order presented in the application, and include the question number and text corresponding to each response.

Formatting: Letter (8½" x 11") page size, single-space, minimum 11 point type size, and standard 1" margins.

IMPORTANT: Applicants should not refer readers to content included in their attached strategic action plan, governance documents, or other attachments. Any content from these documents that is needed for response to an application question should be written into that response.

Applicants are invited to use tables, images, etc. in responding to questions. These items should be clearly labelled and organized.

Application responses that are not formatted in a clear, organized manner may be difficult to understand, and thus negatively impacted in the review process.

Section 3: The Partnership

1. Describe the performance history of the partnership, including why the partners are working together and how the partnership includes the right partners (core and other) to successfully implement the initiative**.** What are the names of the key leader(s) and what are their roles? What is your methodology to address transition in key leadership and changes in the composition of the core partnership? Attach partnership governance documents (e.g. memorandum of understanding, operations manual, and/or other guidance documents). These documents are required of the initiative application.

Estuaries are complex ecosystems. The convergence of salt and freshwater makes them highly productive for a large variety of fish, wildlife, and plants. They support a number of economically and ecologically important species, including rearing areas for marine and anadromous fish and feeding grounds for migratory waterfowl and shorebirds. Estuaries also protect communities and habitats from the devastating impacts from large storm events and can sequester significant amounts of carbon and thus help to mitigate climate change.

An individual estuary is defined by the area of water influenced by the rise and fall of daily tides, ranging from extremely high salinities near the river mouth to freshwater in the upper reaches. Within this large zone of complexity, estuaries can be divided into several key habitats including: subtidal; shallow subtidal (often where aquatic vegetation grows); tidal flats (sand, mud or combination); tidal channels; upland tidal flats (which includes low and high salt marsh); and the transition zone from aquatic to terrestrial uplands (where spruce swamps occur).

The Oregon Central Coast Estuary Collaborative (OCCEC) is a network of estuary conservation and restoration practitioners collaborating to improve the health and resilience of estuaries on Oregon's central coast. The group was founded in 2012 by eight nonprofit organizations and watershed councils that comprise the Core Group of the Partnership: the Siuslaw Watershed Council, MidCoast Watersheds Council, Salmon Drift Creek Watershed Council, Nestucca Neskowin Sand Lake Watersheds Council, Tillamook Estuaries Partnership, The Nature Conservancy, the Estuary Technical Group of the Institute for Applied Ecology, and The Wetlands Conservancy. Other Partners include: ODFW; USFWS National Fish Passage Program and Coastal Program; OPRD; Pacific States Marine Fisheries Commission; Confederated Tribes of the Siletz Indians (CTSI); NRCS; DLCD; Lincoln SWCD; Ducks Unlimited; McKenzie River Trust; Lower Nehalem Community Trust; Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians; Pacific Birds Joint Venture; US Forest Service; and USFWS Refuges. The current email distribution list includes over 70 people from almost 40 organizations or agencies and 15-25 individuals actively engage with us on a regular basis. We believe that most, if not all, entities working within our focus area on estuarine protection and restoration are included in OCCEC's partnership.

Our collaborative's multi-disciplinary breadth of expertise and extensive experience in estuarine science and restoration practice positions us to successfully address the complex challenges of estuarine work. We are scientists, practitioners, land managers and conservationists who are fully committed to improving and protecting the Alsea and Yaquina estuaries, as well as others on the central and north coast. Importantly, our work will serve to inform and advance future estuarine restoration actions as we learn from and share our experiences with others seeking to improve estuarine health in the Pacific Northwest. We are also committed to furthering the public understanding of the importance of estuaries.

Debbie Pickering, Oregon Coast Ecologist with The Nature Conservancy (TNC), has facilitated the OCCEC since its inception, and administered the FIP Capacity Building grant the collaborative was awarded in 2016. We recognize that effective leadership is an essential component of highly functioning partnerships. A change in leadership is addressed in our Charter (see "OCCEC Charter 2018" attached to end of application): "Future or substitute facilitators can be designated by a vote of the Core Group". It is a sign of a healthy and stable group to have a smooth transition to any changes in leadership. For this FIP initiative, we anticipate making a transition to more shared leadership. Debbie, at least initially, will continue to facilitate non-FIP OCCEC activities and Evan Hayduk (MCWC) will lead the FIP activities and administer the FIP grant.

2. Are there other organizations engaged in similar conservation actions in the proposed initiative geography that are not a partner to the initiative? If so, why is their work not a part of the proposed initiative?

The core partners on this FIP initiative represent 12 organizations working on conservation actions in the proposed FIP initiative geography, we feel this represents most groups working towards our shared goals.

The Oregon Tide Gate Partnership (OTGP) is not part of this FIP, but our work is complementary to that work, as we have different focuses. The OTGP is a coordinated effort of agencies, agriculture and conservation organizations, landowners and others working to achieve more resilient coastal communities by protecting working landscapes and enhancing some of the ecological functions of Oregon's estuaries.

OCCEC partners are involved in the OTGP and will continue to provide assistance and support for the repair and replacement of tide gates in Oregon Coast estuaries to promote working lands and better conditions in the Yaquina and Alsea estuaries. OCCEC partners support OTGP work priorities including the consolidated approach to funding, engineering and design resources, and providing regulatory clarity and coordination between permitting agencies and tide gate owners.

The tide gate work proposed in this FIP initiative focuses on lands slated for conservation and emphasizes restoration of full tidal prism inundation or, in the case of tide gate setbacks, will focus on achieving significant ecological uplift and the restoration of full fish passage for access to spawning and rearing habitat and complete restoration of ecological processes (see question 10 below).

3. Who are the key community groups necessary for successful initiative implementation and describe how the partnership has engaged with those groups.

Property owners, including private individuals, land trusts, conservancies and agencies are necessary for the successful implementation of this initiative's work.

<u>Projects in *both* the Yaquina and Alsea estuaries (See "OCCEC Maps and Project Descriptions" attached to end of application)</u>

The OCCEC includes the following landowners with planned tidal marsh, tidal swamp and Landward Migration Zone (LMZ) work on their lands occurring in the 1st year (end of 2021-2023 biennium) and 2nd biennium (2023-2025): The Wetlands Conservancy (TWC), Fred M. VanEck Forest Foundation, and

U. S. Forest Service (USFS). In the 3rd biennium, work on Weyerhaeuser Company property is expected. Additionally, Core Partners of this Initiative, the USFS and Bureau of Land Management (BLM), will assist with project design and provide trees and other support.

Projects in the Yaquina estuary

Core Partners CTSI and The Conservation Fund, a nonprofit organization, are working on an acquisition project in Boone Slough and dialogue with property owners and surrounding neighbors has begun. Funding to match FIP funds for this acquisition is being pursued by Core Partners USFWS, MCWC, TWC, ODFW, CTSI, PSMFC, and Ducks Unlimited along with the support of The Wildlife Heritage Fund, McKenzie River Trust, and Lincoln County.

Projects in the Alsea estuary

Core Partner TWC has worked with willing property owners in the Bayview Oxbow to design a restoration project on approximately half of the Oxbow. The 60% design was completed with technical support from the MCWC and funds from OWEB and the USFWS. However, the design may undergo revision and expansion to the full Oxbow given that the landowner has passed away. One change may be the replacement of the undersized culvert with a bridge. Conversations have begun with the heirs of that property owner.

New and on-going communication with property owners and partners will create and develop opportunities for additional work in the 2025-2027 biennium and beyond. For example, there are opportunities for additional restoration work to enhance resiliency and sustainability in Lint Slough with ODFW, restoration in Starr Creek with TWC, and in Drift Creek with USFS.

Additionally, we have been invited to work with the Port of Alsea to help improve water quality in Eckman Lake and on other properties. Conversations have already begun and will be expanded to other landowners as part of an OWEB funded outreach effort in the Alsea Basin.

Other Core Partners in this estuary include Lincoln SWCD, USFWS, and PSMFC.

4. Describe the partnership's decision-making process to identify, prioritize, and sequence the initiative's conservation actions.

The partnership's decision-making process is outlined in our charter (See "OCCEC Charter 2018" attached to end of application), which was developed in 2013-14 shortly after the formation of OCCEC. During those discussions, we learned that our federal agency partners would not be allowed to be voting members of the group. So, we agreed to define two participation levels in our Charter: a Core Group (not to be confused with the *Core Partners* defined for this OWEB FIP Initiative) and Other Partners, with the Core Group being empowered to vote. In practice, we typically come to agreement on topics of discussion by general consensus of the full group. On rare occasions when official votes are taken (e.g., approval to apply for collaborative grant proposals, changes to the charter, changes to the Core Group, change in facilitators), this is the process described in our charter:

Decision-Making

- Each Core Group organization will have one vote
- A quorum will consist of 50% of the Core Group organizations plus 1
- Those voting will disclose any potential conflicts of interest

- Email notice will be sent to all participants prior to votes
- The facilitator may set up an email vote if a decision needs to be made before the next meeting
- For any given vote, partners must be all participating in the meeting (in person or by phone) or all voting via email
- Decisions will be made by a simple majority vote of the quorum except in the case of email votes, which must be a unanimous vote of the quorum to pass
- The outcome of votes will be documented in the meeting notes and minority opinions can also be reflected in the notes at the request of those in opposition to a particular outcome

Our decisions regarding conservation actions are driven by our Strategic Action Plan (SAP) (See "OCCEC Strategic Action Plan 2021 Revision" attached to end of application). We created the SAP in 2015 using The Nature Conservancy's Conservation Business Planning approach, which is derived from the Open Standards for the Practice of Conservation [About Conservation Standards (CS)]. This plan was updated and revised in 2020-21. We used the goals identified in the SAP along with an analysis of current and historical tidal wetlands (Brophy et al. 2019 & Brophy 2019) and a prioritization of future Landward Migration Zones (Brophy & Ewald 2017) to determine the focus for this FIP Initiative (see Questions 8 & 10 for more details on the FIP Initiative).

For this FIP, we chose to concentrate our efforts in estuaries where there was both ecological need resulting from loss of functionality due to past hydrologic alteration (see Question 8 for details) and current opportunities. The MCWC, CTSI, and TWC proposed the Alsea and Yaquina estuaries be the focus area for the FIP. They identified potential project types within these estuaries and the group agreed these would help advance the OCCEC's SAP. These projects include tidal wetland restoration, tidal swamp restoration, and work within the landward migration zone for sea level rise resilience.

Project Prioritization and Selection for the FIP

The MidCoast Watersheds Council invited all OCCEC partners to attend a Technical Team meeting to review and discuss each of the prioritized projects submitted by partners in these estuaries. Twenty individuals representing a wide breadth of expertise participated in the review. The projects were then scored and ranked (as an individual exercise after the meeting) and the results compiled to see those that would be included in this FIP proposal.

Ranking was based on 11 criteria developed by the OCCEC and MCWC. These questions focused on project readiness, size/scope of project, potential ecological uplift, and cost/benefit ratio. Some individuals from the MCWC Technical Team were not able to score the full project list but provided input on priority projects. Using this process, 25 proposed projects were sorted into three tiers resulting in 12 top priority projects, 3 medium priority projects, and ten deferred projects. The high and medium priority projects are included in the FIP. The "OCCEC Maps and Project Descriptions" document (attached to end of application) contains maps of projects by habitat type, a description of the habitats, and a very short overview of each project.

5. How will the partnership allocate funding and workload amongst the partners? How do these processes support the partnership's goals in achieving the desired conservation outputs and ecological outcomes for the initiative?

For the first two biennia, the partners have largely already chosen to lead or participate on specific priority projects depending on their ownership, landowner contacts, skills, and interests. For example, tidal swamp restoration will be a partnership effort on lands owned by The Wetlands Conservancy

(TWC), the USFS, and the Fred M. VanEck Forest Foundation. The work will be conducted by the MCWC and the ODFW in conjunction with and supported by those landowners. Land acquisitions or conservation easements will be guided by the expertise of The McKenzie River Trust, The Wetlands Conservancy, the Confederated Tribes of the Siletz Indians (CTSI), Ducks Unlimited (DU), the USFWS and others such as the Conservation Fund and Lincoln County and each group has committed funds to this collaborative effort. Ducks Unlimited will also assist by providing experience and capacity of expertise in project delivery (design, engineering, permitting), coordination and project management.

As landowner outreach results in new opportunities and as new projects are designed, the multi-stakeholder technical team convened by the MCWC will serve as a forum to prioritize work based on conservation benefits and determine project leads, funding, and technical assistance requirements. The diversity of the Core Partners and their long-term partnerships with each other makes such decisions a collaborative, non-competitive one, with the ability to have frank discussions of each partner's availability, capacity, financial support, and what assistance from others would be needed. On at least a biannual basis, the MCWC technical team meeting will be focused on reviewing progress of the FIP grant and upcoming opportunities.

Additionally, through annual reports to the OCCEC partnership, the progress made by the FIP initiative Core Partners can be added to an assessment of the OCCEC partnership's overall goals and ecological outcomes.

The OCCEC Monitoring committee will provide guidance for development of restoration effectiveness monitoring plans. The Monitoring committee consists of representatives from ODFW, the Estuary Technical Group of the Institute for Applied Ecology, The Nature Conservancy, Tillamook Estuaries Partnership, Siuslaw Watershed Council, and MCWC.

6. Describe the partnership's approach to catalyzing additional funding over the duration of the FIP funding commitment. Describe potential sources and amounts of leverage funding. This response should align with the budget table information outlined in Section 7 of this application. Note: 25% is the minimum amount of match required by OWEB for the initiative, but please report all leverage sources and amounts that will contribute to implementation.

As part of our OWEB FIP Capacity-building grant awarded to OCCEC in 2016, we contracted with a consulting firm to develop a list of diverse funding sources and a financial plan to help advance implementation of our SAP. The consultants provided an extensive list of potential sources from which we identified nine foundations and several government funding sources that appear especially promising for our work. We plan to submit applications to at least seven of those private foundations (including: Burning Foundation- $10k, Healy Foundation- $45k, Collins Foundation- $20k, Harder Foundation- $15k, Network for Landscape Conservation- $20k, Meyer Memorial Trust- $25k, and Oregon Conservation Fund-$10k). We plan to also apply to the traditional sources core partners have received in the past (e.g., Oregon Wildlife Heritage Fund, Worthy Foundation, funds from TWC, NW Steelheaders, Ducks Unlimited, The Nature Conservancy, Save our Wild Salmon, and private donors).

The partnership will also apply for federal funds (USFS, USFWS, NAWCA, BLM, NRCS), tribal funds (CTSI), and Lincoln County funds (from Title III) and will leverage the skills and expertise of our partners for in-kind contributions. Though there is some uncertainty at this time, we do expect an influx of infrastructure related funding from Federal Recovery funds, via NOAA or through internal contributions from county, state or federal partners. We expect contributions (unsecured) from both the USFWS

Coastal Program ($30k/year for acquisition related due diligence, $180k over the six-year FIP), and the USFWS National Fish Passage Program ($100k/year in years 2-6 for tidal reconnection design and implementation projects that restore tidal flow and fish passage to altered wetland habitats, $500k total over the six-year FIP). NFWF Coastal Resilience grants are also expected on yearly funding cycles and we expect to start applying for funding from that program for years 2-6, for up to $750k over the six-year FIP timeframe. MCWC has also successfully implemented two projects through the Pacific Marine and Estuarine Fish Habitat Partnership (PMEP) and has secured $50k for work on the Poole Slough LWD in LMZ project in late summer 2022.

MCWC and DU, in coordination with the greater OCCEC group, will also be scoping a NAWCA grant in years 3-6, this would likely have a wider geography than this proposed FIP, but some funds would be available for work in the Alsea and Yaquina estuaries. DU brings expertise in applying for and implementing NAWCA grants from their recent work in the Willamette basin. While still early in the planning process, we have estimated $300-400k from NAWCA in years 4-6 of this FIP initiative.

Core partners will provide in-kind staff time, including state in-kind contributions for project management by the ODFW Habitat Biologist ($13k/year, $78k over six years) and CTSI ($20k in in-kind project management on CTSI project properties) in addition to the Pacific States Marine Fisheries Commission. Other federal, tribal, and special district in-kind work includes participation by USFS, USFWS, BLM and the Lincoln Soil and Water Conservation District. Private in-kind assistance includes contributions from TWC, Portland Audubon, The McKenzie River Trust, The Conservation Fund, and Oregon Wildlife Fund. The MCWC Tech Team, which assisted OCCEC in prioritizing projects for this application, will also be consulted during Technical Assistance Design applications, this is additional “in-kind” staff time from local, state and federal partners.

A major source of in-kind funding will come from donated Large Woody Debris (LWD) material from the BLM and USFS. This effort aims to restore historic loading of this type of material in tidal wetland areas, tidal channels, and adjacent riparian areas and floodplains. Wood placement is particularly important for restoring tidal swamp habitats. This wood forms an elevated platform for trees and shrubs to grow (keeping their roots out of the water) and over time, as these trees fall, they create, maintain and enhance this elevation into the future. Our work in this FIP accelerates tree and shrub re-establishment by using weathered wood where possible, drilling holes and depressions for soil placement and seeding swamp adapted seeds (from reference sites). See the “OCCEC Maps and Project Descriptions” document for images of trees and shrubs becoming established on downed wood. Additionally, large wood in tidal wetlands and channels helps trap and hold sediment that will help increase marsh elevations over time.

MCWC has worked with CTSI over the last three years to request LWD donations from USFS via the Farm Bill, in which USFS donates LWD material to CTSI, and then that material is disseminated to projects managed by MCWC. We expect this process to ramp up for this FIP application, with thousands of pieces of LWD expected to be available from USFS via CTSI. MCWC has also worked with BLM on a similar process for LWD material, and BLM and TWC have a current 5-year MOU to provide BLM LWD material directly to projects on TWC ownership. Note: LWD material includes any piece of large wood (long logs, short logs, logs with retained rootwads, rootwads only, slash material, etc). The value placed on this material, $100/piece, is an average value for these various types of LWD material that will have different use and function for projects. This undervalues long logs (i.e., large diameter 40’ “fish logs”), but slightly over-values material often treated as waste material (small diameter logs, rootwads, etc). MCWC also coordinates with local landowners and contractors via an OWEB funded Salvage Log program. While the OWEB funds would not qualify as a match for this FIP, the value of the logs obtained through this

program is split 50/50 between the separate OWEB grant and any project grant (these FIP activities). The need to restore historic LWD loading levels in these tidal wetland areas is substantial, and therefore the value of the LWD material needed is substantial as well. In this six-year FIP proposal, we expect over 13,000 total pieces of LWD, valued at $100/piece, and totaling $1.3 million of in-kind materials from USFS, BLM, and MCWC.

Finally, current efforts by core partners in the Boone/Nute slough complex for conservation acquisition are expected to continue beyond the current property for sale. This includes bridge funding from The Conservation Fund for the current acquisition, and the possibility of additional bridge funding for other properties in the Boone/Nute complex and throughout the FIP geography. We expect up to $300k from private philanthropy and from core partners foundations for the current acquisition, and $175k from an USFWS oil spill settlement (approved through ODFW and CTSI). While the bridge funding is not considered match for this FIP, it is a useful tool to quickly acquire properties on the market while grants or other funding is sought for reimbursement of bridge funding.

7. If the partnership's proposed initiative includes acquisition(s) explain how the partnership has the appropriate level of capacity to pursue acquisition work.

The partnership includes groups skilled in the acquisition of easements and fee title purchases including the USFWS, TWC, MRT, and CSTI. The Core Partners have engaged the additional skills, expertise and funding capacity of The Conservation Foundation, an organization that has completed large-scale acquisitions throughout the country.

MRT is committed to being a dependable land trust resource for community conservation efforts in the FIP geography. MRT has been working on the central coast of Oregon since 2000, primarily in the Siuslaw River watershed, and has recently expanded its coastal service area to span from Lincoln City to Reedsport. A new full-time Central Coast Conservation Program Manager, based in Newport, was hired in summer 2021. During acquisitions, MRT fundraising, transactions, and communication staff are brought in to support the project. MRT owns over 250 acres of estuarine lands in the Siuslaw watershed, and holds conservation easements on approximately 625 acres in coastal watersheds. In addition to acquiring conservation easements and fee title properties, MRT also works with partner organizations to facilitate their protection efforts.

TWC is a committed stakeholder and landowner in the central coast community, currently owning over 800 acres of tidal wetlands in the FIP geographic area. TWC has been working on the coast since 2006. Currently, TWC has a part time Coastal Land Manager who lives and works on the central coast. TWC takes a collaborative approach to acquisition by convening and supporting partner organizations in the area.

Section 4: The Initiative

The initiative is your opportunity to tell the story of the proposed initiative and explain why it is important to your partnership's region, strategic action plan, and the OWEB Board-identified Focused Investment priority(ies).

8. Describe the geography of the initiative and how this geography was determined relative to the strategic action plan geography.

Our focus for this FIP is the Yaquina and Alsea estuaries of the central coast. This area is a subset of the entire SAP geography, which covers estuaries in the area from Nehalem Bay south to the Siuslaw estuary. We are limiting this FIP to the Yaquina and the Alsea to concentrate our efforts where projects are ready or nearly ready for implementation and will meet our goals of restoring ecologically functional tidelands. These estuaries were chosen through a combination of ecological need resulting from loss of functionality due to past hydrologic alteration and current opportunities and readiness of key partners.

One of the goals in our SAP is to bring each estuary up to at least moderate viability by restoring hydrologic connectivity to at least 60% of historic tidal wetland area (according to OWEB Watershed Health Indicators for Oregon Coast Coho, Bauer et al. 2008). According to recent work by Laura Brophy, four estuaries in our focus area are currently below that threshold: Nehalem, Tillamook, Nestucca and Yaquina (See Table 1, below). Consultations with OCCEC partners in each of those estuaries revealed that the best opportunity to advance that goal currently is in the Yaquina. While the Alsea currently has "moderate" viability, it is just 89 acres short of reaching "adequate" viability for hydrologic connectivity, which is 80% of historic. And it offers significant opportunities for our forward-looking focus to advance another one of our SAP objectives: to protect and restore areas for future tidal wetlands in the Landward Migration Zones. Finally, all our estuaries are severely bereft of tidal swamps (over 90% lost) and areas have been identified in both the Yaquina and Alsea to begin work to restore tidal swamps and learn from our efforts so that successful techniques can be employed elsewhere.

Oregon's Conservation Strategy also names estuaries as one of 11 strategic habitats in the state and calls out the Yaquina and Alsea as "Conservation Opportunity Areas" and recommends a conservation action in both estuaries to "Remove remaining dikes and tide gated areas to recover lost salt marsh habitats." (Oregon Conservation Strategy 2016). We will do just that for prioritized areas within those estuaries.

The conservation strategy document notes that estuarine habitats have been impacted by diking, ditching and other hydrologic modifications and that both salt and freshwater marshes and tidal swamps have been diked, drained, and converted to pasture. They also note that shrub and forested tidal swamps, once common, have been even more heavily impacted, resulting in substantial habitat loss. Finally, they note that "efforts to conserve healthy estuarine areas and restore degraded habitats will benefit many species, including several commercially important fish and wildlife species. For example, coho salmon, Chinook salmon, and Dungeness crab are Strategy Species that use estuarine habitat for at least part of their life cycle".

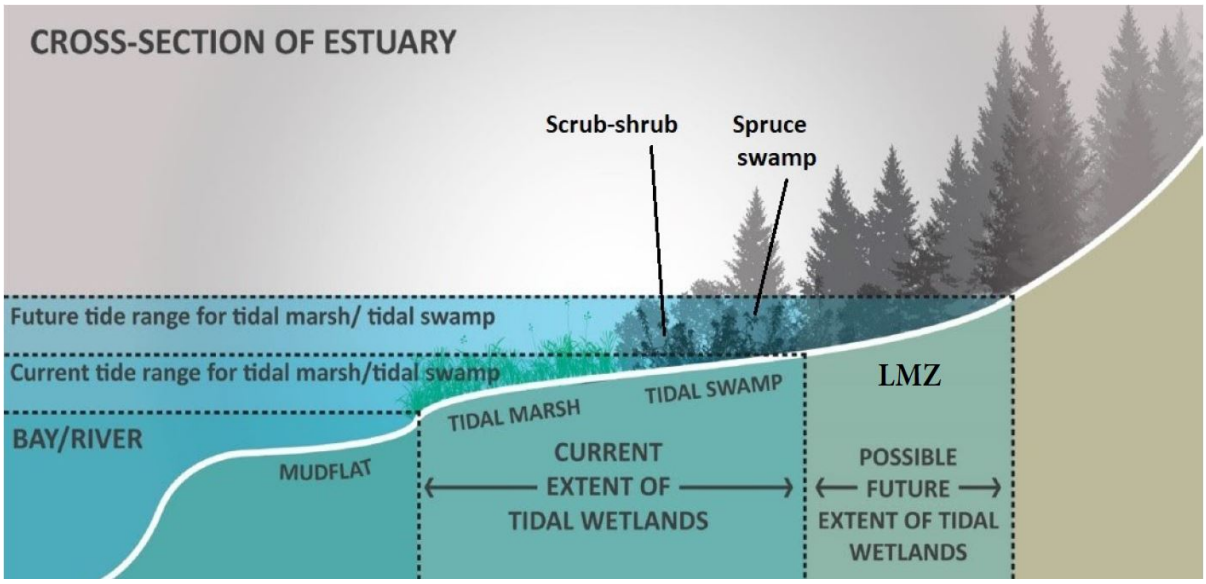
Table 1. From OCCEC SAP - Appendix II. Table A. Characteristics of the 11 largest estuaries in the OCCEC Focus Area.

* Includes open water, tide flats, and current and historical tidal wetlands. Source: Brophy et al. (2019).

** Unless otherwise noted, data in this table are from Brophy (2019), whose analysis of tidal wetland loss primarily used diked areas from OCMP's 2014 CMECS mapping. OCMP's diked areas may not include areas disconnected from tidal influence by features other than dikes, e.g., other restrictive culverts, fill material, roads, etc. Therefore, tidal wetland losses are generally higher than shown.

Estuary Name	Estuary Size (acres)*	Area of Historical Tidal Marsh and Tidal Swamp (acres)	Diked Former Tidal Wetland Area (acres)	% Loss of Historical Tidal Marsh and Swamp due to Diking	% loss of Historical Forested Tidal Swamp Due to Diking and Vegetation Conversion	Current Area of Tidal Marsh and Tidal Swamp (acres)	Minimum Desired Area of Tidal Marsh and Tidal Swamp (acres) (60% of historical)	Difference (Current – Desired Area) (acres)	Ideal Desired Area of Tidal Wetlands (acres) (80% of historical)	Difference (Current – Ideal Area) (acres)
Nehalem	5253	2481	1362	54.9	87.1	1404	1489	-85	1985	-581
Tillamook	14,028	4636	3319	71.6	92.3	2090	2782	-692	3709	-1,619
Netarts	2634	301	0	0	88.0	274	181		241	
Sand Lake	1177	568	67	11.7	90.5	615	341		454	
Nestucca Bay	2766	1621	1270	78.3	99.3	376	973	-597	1297	-921
Salmon River	882	657	7	1.2	80.4	618	394		526	
Siletz Bay	2711	1072	222	20.9	78.1	825	643		858	-33
Yaquina	6649	2575	1404	54.5	92.3	909	1545	-636	2060	-1,151
Beaver Creek	240	222	0	0	99.6	203	133		178	
Alsea Bay	3562	1100	252	22.9	90.8	791	660		880	-89
Siuslaw	6320	2693	1003	37.2	96.0	1967	1616		2154	-187
Totals	**46,222**	**17,926**	**7,635**	**42.6**	**92.3**	**10,072**	**10,757**	**2,010**	**14,342**	**4,581**

The estuary work we will do in this FIP covers a continuum of habitat types defined by elevation. The diagram below shows the two types of tidal vegetated wetlands (marshes and swamps) where our conservation and restoration work is planned in both current and future (with sea level rise) tidal wetlands. Tidal swamps occur in the fresh and brackish areas of the estuary and can be scrub-shrub wetlands (e.g., willow, crab apple) or forested (e.g., spruce swamp) with the forested wetlands occurring at higher elevations. (See "OCCEC Maps and Project Descriptions" attached to end of application for more detailed definitions)



9. Describe baseline conditions at the outset of the initiative, specific to the geography, habitat, and limiting factors within the scope of the initiative (not the entire strategic action plan). Reference recovery, conservation, tribal, and/or other key plan(s), as appropriate.

Baseline conditions: Tidal Marsh and Tidal Swamp

Emergent, scrub-shrub and forested (i.e., on the coast these are spruce swamps) tidal wetlands have been significantly reduced from their historical extent in Oregon (Brophy 2019; Appendix 5). The most profound losses in the Yaquina and Alsea were scrub-shrub and forested wetlands, with over 90% lost in each estuary (See Tables 2 and 3, below).

Table 2. Historical vs. current tidal wetland area and wetland loss by vegetation class for Alsea Bay.

Alsea Bay

Vegetation class	% of tidal wetland area (historical)	% of tidal wetland area (current)
Emergent ("tidal marsh", EM)	58.1%	88.5%
Scrub-shrub (SS)	7.0%	4.5%
Forested (FO)	35.0%	6.9%
All three classes (EM, SS, FO)	100.0%	100.0%

Historical vegetation class	% loss from diking	% loss from conversion to another vegetation class	Total % loss
Emergent ("tidal marsh", EM)	25.3%	12.8%	38.1%
Scrub-shrub (SS)	77.5%	18.8%	96.3%
Forested (FO)	8.0%	82.8%	90.8%
All three classes (EM, SS, FO)	22.9%		

Table 3. Historical vs. current tidal wetland area and wetland loss by vegetation class for Yaquina Bay.

Yaquina Bay

Vegetation class	% of tidal wetland area (historical)	% of tidal wetland area (current)
Emergent ("tidal marsh", EM)	60.5%	82.7%
Scrub-shrub (SS)	3.5%	7.3%
Forested (FO)	35.9%	10.0%
All three classes (EM, SS, FO)	100.0%	100.0%

Historical vegetation class	% loss from diking	% loss from conversion to another vegetation class	Total % loss
Emergent ("tidal marsh", EM)	67.4%	10.6%	78.0%
Scrub-shrub (SS)	34.4%	60.9%	95.3%
Forested (FO)	34.8%	57.5%	92.3%
All three classes (EM, SS, FO)	54.5%		

Baseline conditions: Landward Migration Zones (LMZ):

The Yaquina currently has about 2037 acres that are of appropriate elevation to support tidal marsh and swamps. By 2100, the acreage in the LMZ that is high enough to support tidal wetlands is expected to be reduced to 1101 acres with projected sea level rise. The Alsea currently has about 939 acres that can support tidal marshes and swamps. By 2100 the LMZ area would be reduced to 678 acres (Brophy and Ewald 2017; Appendix C). If degraded wetlands have their hydrology and sediment transport regimes restored, elevations of the tidal plain may increase, reducing these projected losses.

Baseline conditions: Estuarine habitat complexity; including large wood:

The contrast between current and past amounts of large wood in estuaries, the role of this wood, and the potential impacts of its loss was described by Gonor et. al 1988. They mention that mid-1800 government reports and early visitor journals documented great amounts of large wood in the estuaries. They note that the quantities and sizes of the drift trees significantly exceeded present amounts of woody debris. While no specific information was presented for the Alsea and Yaquina estuaries, between 6400 and 9800 snags were removed from similar estuaries in a 26-year period by the Army Corps of Engineers alone to "improve and maintain the navigability of the portions of the rivers deemed to be economically important". This does not include the additional amounts of wood historically cleared by gillnetters associations, ports, and landowners. The policies and practices of the past to clear streams of their wood and the loss of large wood from clear-cutting operations in riparian areas and on unstable slopes further starved the estuary of wood sources.

The loss of this wood has had significant impacts on tidal marsh elevation and topographical and habitat diversity. For example, Eilers (1975) by examining historical charts, aerial photographs, and conducting field work in the Nehalem estuary documented an extensive amount of wood in the upper margins of high salt marshes. That wood captured sediments and created islands covered with trees that were 6' higher than the surrounding area. These higher elevation areas persist to this day.

In addition to areas of elevation, Eilers also found depressions between 0.8-1.6' deep and 1.8-6.8' in diameter that were formed when logs in the upper high marsh drifted away. These depressions persisted over time and provided refuge for juvenile fish at low tide.

Large wood in estuaries is also key for the formation and maintenance of spruce and scrub-shrub swamps (e.g., alder and willow) that grow on top of these wood piles on "nurse logs", allowing the roots of these trees to avoid the high salinity soils of the marsh. In fact, the large wood is an ecosystem engineer in establishing these higher platforms on which other species depend.

Baseline Conditions: Large wood in estuaries and salmon use:

In the January 2003 book, The Ecology and Management of Wood in World Rivers, estuarine experts Charles Simensted, A. Wick, D. Bottom and partnership member Stan van de Wetering addressed the dynamics and ecological functions of wood in estuarine ecosystems. When tides and wind cause wood to pile up, this may help support the tidal and seasonal movements of juvenile salmon.

They note, however, that more research is necessary to understand the habitat functions of large wood in estuaries, including for the support of juvenile salmon. Estuarine large wood is not likely to play the same roles as wood in streams and may be scale-dependent and vary with the availability of refugia and predation pressure. However, they stress the importance of this wood and the need for management

and restoration plans to protect upstream wood sources and delivery processes to retain the supply of wood to the estuaries.

Baseline conditions: Coho salmon access to tidal wetland habitats:

Dikes and tide gates block or limit access to historical tidal wetlands for salmonids and other fish, and lamprey. In the Alsea, access to 102 acres of historical tidal wetlands has been altered, and in the Yaquina, access to 568 acres (Brophy 2019). Beyond access, diked areas also present water quality issues and unnatural salinity regimes that further limits and degrades fish habitat.

A recent study (2018/2019) by the MCWC in partnership with The Nature Conservancy found ten tide gate barriers in the Alsea and nine tide gate barriers in the Yaquina that curtail or eliminate salmon access to tidal wetland habitats.

Baseline conditions: Hydrologic processes, streamflow, and nutrient and sediment inputs:

When tidal flow is blocked or altered by dikes, ditches and tide gates, the hydrologic regime is changed. Reduced tidal inundation blocks sediment, wood and nutrient inputs. It also exposes marsh soils to the air more often, which oxidizes the carbon stored there. As a result, areas that have been diked or ditched are subsided due to the loss of these processes. Tidal floodplain subsidence renders these marshlands very vulnerable to sea level rise until sediment and wood transportation processes are restored. Reduced tidal inundation also leads to warmer temperatures that may be favorable to invasive species such as parrotweed.

10. Describe the conservation actions that the partnership will pursue with the initiative to address limiting factors or ecological problems identified in recovery, conservation, tribal, and/or other key plan(s). Explain how conservation outputs resulting from those conservation actions are expected to lead to and/or support the long-term ecological outcomes outlined in the partnership's strategic action plan.

Our scope for this FIP proposal includes a full suite of conservation actions[1] in the categories of: Outreach, Technical Assistance, Restoration, and Acquisition. Our focus for these endeavors is three-

[1] Tide gate work would only include removals and/or setbacks as defined here:

> **Tide gate:** an opening through which water may flow freely when the tide sets in one direction but which closes automatically to control water flow in the other direction. Typically used to prevent incoming tide water from entering agricultural or other developed areas to protect from damage associated with high water levels and high salinities, while also allowing drainage of rainwater or other runoff that has accumulated behind the tide gate to leave in an outbound direction.
>
> **Tide gate removal:** removal of a tide gate to allow the free exchange of incoming and outgoing tidal or flood flows into and out of an area of interest.
>
> **Tide gate setback:** removing a tide gate from its current position to a new position that is farther away from the primary source of flooding, thereby allowing an area previously blocked from natural flooding to be inundated with a free exchange of natural tide and flood flows. Usually associated with a levee setback, this action expands the area of tidal inundation while still protecting adjacent lands behind a setback dike.

fold: tidal marsh restoration, tidal swamp restoration, and work in areas resilient to sea level rise (see details below).

Project types included in this FIP are:

1. Restoring tidal marsh in areas within the existing tidal range. Activities to restore processes may include removal or breaching of dikes, removal of tide gates where feasible, filling drainage ditches, channel creation, removal of fill/regrading, creation of setback dikes/tide gates where necessary, creating topographic diversity with thin-layer placement of soils, placement of large wood, and planting of native marsh vegetation. Tide gate retrofits that do not result in expanding the area of tidal inundation are not included as actions under this FIP because they do not significantly advance our overarching ecological outcome of increasing the area of ecologically functional tidal wetlands. Recognizing that they do have benefits for things like fish passage where landowners are not interested in allowing full tidal inundation, excluding them from this FIP will allow those projects to move forward using other sources of funds. Two of the largest tidal marsh restoration opportunities remaining in the Yaquina and Alsea estuaries covering over 450 acres are targeted for action by this FIP.

2. Protecting and restoring spruce swamp and scrub-shrub tidal swamps. The FIP also focuses on protecting what little intact swamp habitat remains (and using them as reference sites) and restoring swamp habitat by large wood placement, mounds, and planting with appropriate plant materials in areas with higher elevations (including within the LMZ, see below). Work done under this FIP will initiate tidal swamp restoration activities on 295 acres in the Alsea and 181 acres in the Yaquina within the prioritized LMZ areas (see 3 below) and will include tidal swamp restoration work within all our restoration activities in tidal wetlands (see 1 above), by using or creating areas of higher elevation for planting.

3. Protection and restoration of current and potential future tidal wetland areas that are likely to withstand sea level rise into the future. Activities in this project type may include fee title acquisitions, easements, and restoration actions such as those listed in 1 & 2 above. This FIP proposes to work within the high & medium-high ranked Landward Migration Zones (LMZ) that were modeled and prioritized by the MidCoast Watersheds Council study (Brophy & Ewald 2017).

These LMZ areas are at higher elevations than current tidal marsh elevations and will be able to sustain tidal wetlands into the future as the prioritization used the 4.7 ft sea level rise (SLR) scenario, the high end of the models for 2100. The high and medium ranked areas were established based on 5 factors:

- Area of the LMZ at the 4.7 ft SLR scenario
- Area of the LMZ at higher SLR scenarios (8.2’ and 11.5’)
- Land management (public vs. private)
- Land use zoning
- Development status (number of structures)

These actions will address the following key limiting factors and threats as identified in the OWEB Coastal Estuaries Priority Memo:

- Alteration of natural hydrological processes and streamflow, including limited salt- and fresh-water exchange due to such issues as tide gates,
- Loss of habitat complexity and connectivity degraded tidal areas, and
- Nutrient cycling and sediment transport.

By focusing additional efforts on protecting and restoring areas in the LMZ to prepare them for eventual sea level rise in the future, this initiative will also address this limiting factor:

- Impacts of climate change (e.g., sea-level rise, increased acidification).

As further explained in question 15 below, Oregon's Global Warming Commission worked with OWEB, Oregon Department of Agriculture and Oregon Department of Forestry to develop a proposal and goal for using natural and working lands to sequester and store carbon. Their report (Oregon Global Warming Commission 2021) calls for tidal wetland protection, among other habitats, since these areas, and especially forested swamps, have great potential to sequester and store carbon.

These actions will also address a suite of limiting factors identified for the strategy habitat "Estuaries" under the Oregon Conservation Strategy. These are:

- Altered or Blocked Tidal Flow
- Degraded Water Quality
- Invasive Species
- Loss of Habitat Complexity
- Climate Change

Further, these actions will benefit estuarine fish and wildlife species and directly address Limiting Factors and priority actions for salmonids, including Chinook, chum, and coho salmon. While the importance of tidal wetland habitat for Chinook and chum salmon has been established, there has been considerable research in recent years that show large numbers of coho salmon in their first year exhibit considerable variation in their migratory movements and the habitats they use, including tidal wetland areas. Research in the Salmon River Estuary, just north of the focus geography for this FIP, shows that coho and Chinook that spend their time rearing in restored tidal wetland areas can represent a disproportionate number of returning adults. In fact, estuary life histories that were able to be expressed after restoration, contributed 20-35% of the adult Coho and 25-40% of adult Chinook produced in the Salmon river (Bottom et. al., 2014).

The final ESA Recovery Plan for Oregon Coast Coho Salmon (NMFS,December 2016) called out the high priority actions of reducing fish passage barriers by addressing tide gates and dike issues, including, in the Yaquina and Alsea estuaries.

Action ID	Habitat component	Strategy	Action	Area	Priority
MCS-33	Estuary	Increase access to sloughs, side channels, and floodplains	Reduce fish passage barriers to floodplains by managing tidegate presence and operations.	Salmon, Siletz, Yaquina, Alsea	High
				and Siuslaw estuaries	
MCS-34	Estuary	Increase access to sloughs, side channels, and floodplains	Reduce fish passage barriers to floodplains by reducing or setting dikes back.	Salmon, Siletz, Yaquina, Alsea and Siuslaw estuaries	High

11. Explain how the initiative's ecological outcomes address the board-identified priority(ies) that were selected in Section 2.

Given the massive loss of tidal wetlands, in particular forested tidal wetlands (Brophy 2019) this FIP aims to directly benefit the board-identified priority of Coastal Estuaries by protecting and/or restoring over 1000 acres of tidal wetlands and paving the way for over 400 acres of future conservation and restoration work in future years. Removing or reducing dikes and tide gates (the main factors that drive the key limiting factor of altered hydrologic processes and limited salt and freshwater exchange) will lead to the intermediate ecological outcomes of:

- Improved sediment regime
- Improved tidal and floodplain connectivity & hydrology
- Improved natural species composition
- Increased carbon storage
- Improved water quality

These are key ecological attributes (Aldous et al. 2008) that help define functional tidal wetlands and healthy estuaries, which support a multitude of important habitats and species. Fully removing barriers and restoring connectivity to tidelands results in not only the free exchange of salt and fresh waters but also allows flood waters to deposit sediments that will help these wetlands keep pace with sea level rise. It also allows large wood to be delivered naturally helping to create productive nursery habitat for a diversity of fish. These are the types of ecological functions that tide gate retrofits do not provide.

12. Describe the barriers and opportunities for the initiative (e.g. regulatory, partnership, landowner coordination, funding, strategic planning efforts, etc.). What are the social limiting factors within the initiative geography that the partnership will need to address?

Social Limiting Factors:

The geography of this FIP proposal is primarily rural, and many local communities' economies are now or have historically been dependent on resource extraction (fishing and logging). That history still informs a culture that often includes distrust of "environmentalists" engaging in restoration or conservation projects. While our partnership has completed many successful projects with willing landowners and has developed positive relationships with former skeptics, this barrier still frequently delays or scuttles potential projects.

A New economic benefit analysis from the 443 acre Tillamook Bay estuary restoration project, conducted by NOAA and OSU, which quantified the benefits on property values, reduced flooding, more fish, water quality and carbon benefits, may give us additional specifics that may be of interest to landowners and help us overcome this limiting factor.

Fundraising to support coastal conservation and environmental organizations is also a challenge. Lincoln County has a poverty rate above the State average (Lincoln County: 14.6%; State of Oregon: 11.4%). Conservation jobs on the coast tend to be part-time and dependent on grant funding, which leads to high turnover rates, limited capacity, and loss of project momentum and institutional knowledge, further contributing to community skepticism. The provision of FIP funding over the course of three biennia would contribute to a foundation for a more stable workforce that would be better able to carry out the priority projects identified in this proposal. It would also allow groups the stability to recruit and train younger and more diverse members for long term restoration benefit, reach out to the fishing industry, and otherwise diversify our funding base. Currently, it's difficult to take on these long-standing objectives as seeking funding takes precedence.

Regulatory Limiting Factors:

Estuary partners are well acquainted with applying for standard removal-fill joint permits and DEQ water quality permits. However, there continues to be a challenge that causes delays and an increased expense: getting floodplain development permits. A majority of areas within tidal range are within FEMA mapped flood zones A or AE. Zone A and AE represent areas subject to inundation by the 1-percent annual-chance flood event and are subject to mandatory floodplain management standards. This means that any proposed work is not allowed to cause any rise (no-rise) or limited to one-foot of rise from base flood elevations. The interpretation of FEMA guidance is determined by county level authorities, and conservation measures such as large wood placement are counted as "fill" and subject to Floodplain Development Permits on a project-by-project basis. The need for No-rise analysis has caused delays and is costly. OWEB was reviewing this issue but to date no resolution has occurred.

Restoration projects that seek to remove tide gates established under historic (1940s) federal flood damage reduction projects, such as that on Boone/Nute Slough will need to pursue removal through the federal 408 process with congressional support. FIP applicants anticipate a multiyear process in order to allow for permitting that is directed at levee and tide gate removal to meet the long-term goals of conservation and habitat restoration, while protecting other landowners not engaged with the project.

13. Describe the landowners that the partnership will engage to conduct conservation actions for the initiative (e.g. public land, industrial timber, agriculture, rural residential, etc.).

Explain how the initiative proposes to conduct landowner outreach and recruitment in support of its conservation actions.

Major outreach and recruitment for this initiative has already taken place in the formation of a highly functioning partnership (OCCEC) that includes public lands managers (ODFW, USFS and BLM), private conservation ownership groups (TWC, VanEck, MRT), and tribal and non-profit interests (CTSI, CTCLUSI, MCWC, LSWCD, TNC). This partnership has been functioning since 2012 and an indication of its effectiveness to date is the strong group of Core Partners who have come together to submit this FIP application. The OCCEC partnership has resulted in the identification of a significant amount of acreage where work can be completed within the first biennium, including areas of current tidal influence and LMZ areas. For example, willing landowners own and/or manage 295 of 447 acres (~66%) of High/Medium-High LMZ areas in the Alsea estuary and 181 of 831 acres (~22%) in the Yaquina estuary.

Landowner and stakeholder engagement efforts will build from recent and ongoing work led by the MCWC in the Alsea Basin tied to an OWEB-funded Stakeholder Engagement effort (221-1026). In that effort, MCWC will be organizing and facilitating community meetings in spring 2022 in partnership with the Port of Alsea and the Port Commissioners to engage all stakeholders relating to water quality concerns at Eckman Lake. Eckman Lake, a former tidal marsh that was tide gated decades ago and still functions as a freshwater reservoir, has experienced major summer algal blooms for the last 5-10 years. We expect the first steps of this outreach effort to be completed by summer 2022 and hope to continue those efforts through this FIP.

Engaging private landowners in both the Alsea and Yaquina estuaries to explore tide gate removal or beneficial upgrade projects also builds off of previous MCWC efforts to complete a tide gate inventory with funding from TNC in 2018/2019. In that effort, MCWC contacted most landowners who have tide gates on their property and are utilizing the Alsea Basin Stakeholder Engagement grant to deepen these connections and continue dialogue on tide gate removals and project scoping in these areas.

Conservation actions for this FIP include major efforts to restore historical levels of large woody debris (LWD) loading in tidal marshes and sloughs. We hope to engage timber companies to determine if logs can be donated to this effort in both the Yaquina and Alsea estuaries. MCWC and partners also expect to work closely with the USFS for log donation via CTSI to acquire large quantities of LWD from timber harvest areas. This has been a major source of LWD for MCWC and partner projects since 2018 via the Farm Bill, and we expect this to continue through the FIP period. Further, MCWC and BLM have worked closely to match up current timber sale areas and project sites to facilitate the use of BLM provided logs for ecological benefit. An MOU was developed between BLM and TWC in 2020 for BLM to provide logs for placement on TWC property for restoration projects. This MOU is valid through 2025 and we expect to help develop further MOUs between BLM and other landowners for similar work through this initiative.

Compared to other large estuaries (Tillamook to the north and Coos to the south), the Yaquina and Alsea have relatively limited agricultural interests. The largest agricultural property in the Yaquina estuary is the Boone/Nute Slough complex and in the Alsea, it is in the Barclay Meadows area. Partners are actively engaged in acquisition efforts with the owner of the largest property in the Boone/Nute complex and have received interest from adjacent landowners who may want to sell a portion of the tidal wetlands on their properties as well. This current effort would be bolstered with funding and support as scoped in this initiative.

While we currently have many tidal wetland projects with supportive landowners in the queue, we also plan to expand outreach efforts to private landowners in both the Yaquina and the Alsea estuaries as part of this FIP. We will recruit interest through letter writing and outreach at grange halls, libraries, schools, and other civic group meetings. The public will be invited to field tours and to meetings with speakers who are likely to spark interest and attendance. In-person meetings will be held on a regular basis in both estuaries near priority work areas. Through presentations at meetings and field tours of existing project sites and in reference areas, landowners will be able to observe the positive impacts of conservation actions in the tidal wetlands on stream/marsh complexity, native species communities, wildlife diversity, and the beauty of healthy marshes and riparian areas. Then, through one-on-one engagement with landowners on their own properties, landowners will have an opportunity to explain their interests and to be walked through the possibilities of where restoration techniques (e.g., native species planting, floodplain reconnection, beaver assisted restoration, tidal flow restoration) could be applied to their own landscape. Representatives of NRCS, MRT, and other conservation groups will be asked to present opportunities for long-term easement incentive programs to boost habitat quality and quantity on private properties.

14. Explain how the partnership will ensure the sustainability of ecological outcomes in the initiative geography beyond completion of the initiative.

The sustainability of ecological outcomes depends on addressing limiting factors and restoring ecological processes. That is ideally the goal of restoration projects. Acquiring fee-title or long-term easements over key lands allows for control of future uses on those lands and greater potential for full-scale restoration. However, even with lands where conservation goals are the focus, sometimes a phased approach is necessary before functional ecological processes can be achieved (e.g., when property boundaries cut across ecologically functional units). Where full restoration can occur from projects implemented during this FIP initiative, we anticipate the sites will be self-sustaining, with limited interventions as identified through monitoring, needed in the future. At the same time, we are continuing to learn from past restoration work so adjustments may be advisable in the future to enhance previously restored sites. For projects where a phased approach is needed, we offer some examples below of how the Initiative Core Partners continue to evaluate and improve ecological outcomes to build on previous successes in the Alsea and Yaquina estuaries.

As part of this initiative, we will conduct work on past restoration projects to improve hydrologic connectivity. For example, at the Lower Drift Creek site (below the Drift Creek Wilderness) the community-supported acquisition of about 1000 acres of tidal wetlands and associated uplands by the Western Rivers Conservancy and the Siuslaw National Forest was restored in 2009. Through this FIP, additional work will be done that will improve the site's resiliency to sea level rise and control invasive species. Much of Bayview Oxbow, Starr Creek, and Lint Slough sites in the Alsea are now under conservation status. Tidal and upland restoration work was done years ago at Starr Creek and Lint Slough. At Starr Creek, a successful culvert project and instream work restored fish passage allowing coho salmon to return to their spawning grounds on the Siuslaw National Forest for the first time in 25 years, and tidal wetland restoration in Lint Slough turned this former failed hatchery site into a high functioning area. But there is more to be done to enhance hydrologic connectivity at both sites, including further removal of former dike footprints and LWD placement. In the Bayview Oxbow, replacing a culvert with a bridge would restore full hydrologic connectivity, and deposition of sediment and wood would increase and maintain resiliency.

Note on Questions 15 and 16:
While OWEB will not be evaluating climate questions in project-level applications this year, questions 15 and 16 below, which focus on climate-related issues, will be evaluated in this initiative-level application in preparation for selection of 2021-23 FIP initiatives.

15. Describe how climate change will impact ecosystem function in the initiative geography, and how the initiative's conservation actions will improve ecosystem resiliency in the face of climate change. In particular, describe how species, habitat, and/or water quality variables relevant to the initiative geography are expected to be affected. For additional information, see OWEB's *Climate-Related Technical Resources for OWEB Applicants*.

Sea level rise is the main issue that climate change poses for Oregon's central coast estuaries. Relative sea level rise rates for Yaquina Bay (R. Burgette et al. 2009) due to tectonic uplift after the last subduction zone earthquake in 1700 is 1.22 mm/year. This uplift of the coastal plain (about 3.8 inches by 2100) will not be sufficient to help estuarine wetlands keep up with sea level rise as climate models summarized by the National Academy of Science show that up to 56 inches (4.7') of sea level rise may be expected in Oregon by 2100. Tidal wetlands (when hydrology is restored via the removal of dikes, ditches, and tide gates), can capture sediment to help raise elevations. Additionally, restored estuaries can build up ground elevations as marsh vegetation builds soil through each seasonal cycle of growth and decay. Planned restoration activities in this FIP will also use thin layers of sediment taken from dikes to form slightly higher areas on the floodplain and the planned addition of wood also adds elevation diversity and topography that helps trap additional sediment. Tidal wetlands can also survive sea level rise by sending shoots and seeds to higher elevation lands in the vicinity known as the landward migration zone (LMZ). The LMZ includes areas that currently support tidal swamps and upland habitats.

Oregon's Global Warming Commission (OGWC) formed by legislative action in 2007, tracks trends in greenhouse gas emissions, recommends ways to coordinate state and local efforts to reduce emissions, and works to prepare communities for the effects of climate change. Following the Governor's Executive Order 20-04, the OGWC worked with OWEB, the Oregon Department of Agriculture and the Oregon Department of Forestry to develop a proposal and goal for using natural and working lands to sequester and store carbon. Their 2021 report recommends tidal wetland protection, especially forested swamps, because of their great potential to sequester and store carbon (OGWC 2021). Their recommendation was to:

> "Increase protection and restoration of carbon-rich tidally influenced coastal ecosystems through investments in updating estuary management plans and conservation and restoration of tidal wetlands".

Kaufman et al. in a 2020 study documented that carbon stocks in forested tidal wetlands in the Pacific Northwest are comparable on a per acre basis to carbon stocks in the region's terrestrial old growth forests. However, as noted above, over 90% of the Yaquina and Alsea's forested tidal wetlands have been lost as well as 78% and 38% respectively of their tidal marshes (Tables 2 and 3 in Question 9 above). This reduces their availability to sequester carbon, along with the many other benefits provided by these important habitats.

For every thousand acres of restored forested tidal wetlands, roughly 212,500 MTCO2e (i.e., metric tons of carbon dioxide equivalent) could be sequestered by 2050 while providing significant benefits to fish and wildlife. This proposal aims to begin restoration of at least 475 acres in forested tidal wetlands in the LMZ areas as well as incorporate forested tidal wetland restoration areas within tidal wetland restoration sites.

Other predicted effects from climate change in Oregon include a warmer ocean, increased stream temperatures, drier summers and falls, and more intense storm events with precipitation dominated by rain versus snow in higher elevations (Dalton et al. 2021). Within the immediate outer coastal ecosystem, temperature and precipitation are not expected to significantly change from current annual measurements when compared to other parts of the state. Still, the modeled changes for the coast include longer periods of warm dry spells in the summer and more intensive storm and flood events during the rainy season. Restored tidal swamps and marshes may help buffer these extremes, absorbing flood waters and capturing sediment up higher in the watershed, perhaps helping the light-sensitive and valuable habitat forming eelgrass to persist (this species may help, on a local level, to buffer ocean acidification and hypoxia). Estuarine beaver populations that can thrive in restored and conserved estuaries may also aid in moderating the drier, warmer conditions by storing water during dry periods.

Finally, restoration of tidal wetlands may also help another keystone species withstand climate change impacts– the native Olympia oyster. This oyster is an Oregon Conservation Strategy Species, currently found only in the Yaquina estuary and two other estuaries in Oregon. These species are more resistant to ocean acidification due to their slower shell forming life histories (Waldbusser et. al 2016) and may be more resilient to sea level rise as well, as they create reefs higher in the subtidal zone (than the introduced Pacific oyster). Restoration of tidal wetlands, as noted above, can help trap sediment higher in the watershed to help avoid silting in the hard substrates and shell reefs these oysters need for their young to settle on.

16. Are there any constraints on the partnership's ability to incorporate climate considerations into initiative- or project-level restoration planning? If so, please describe.

No. Incorporation of activities that will serve to ameliorate the effects of climate change and increase resiliency of estuarine habitats is a central focus of the OCCEC and this FIP Initiative.

Note on Questions 17 through 21:
As described in OWEB's *Strategic Action Plan Guidance*, there is an expectation that partnerships applying for FIP funding have developed a theory of change and progress monitoring framework related to their strategic action plan. In doing so, the partnership identifies conservation outputs and ecological outcomes that will be monitored to measure progress and inform adaptive management. The progress monitoring framework will be used by OWEB staff to inform the review and refinement of monitoring activities proposed by the partnership for FIP funding. OWEB staff and FIP partners will also use the progress monitoring framework as the context for periodic reporting to the OWEB Board through the course of implementing the FIP initiative. Partnerships are encouraged to budget sufficiently to support monitoring actions that will measure the initiative's conservation

outputs and ecological outcomes over the three biennia of the initiative. No additional OWEB monitoring funding will be provided beyond the partnership's FIP initiative award.

Additionally, OWEB published the *Monitoring Restoration Initiatives* guidance document in July 2021. A monitoring plan is not required at the time of application, but partnerships are encouraged to request FIP funding to develop a monitoring plan during the first biennium of the proposed initiative.

17. Describe baseline monitoring *data* that either exists or that will be collected to enable tracking conservation outputs and ecological outcomes. Reference recovery, conservation, tribal, and/or other key plan(s)/report(s), as appropriate.

Ecologically functioning estuaries are a critical habitat prioritized in a diversity of plans, including Oregon's Coast Coho Plan, the Oregon Plan for Salmon and Watersheds, the Oregon Conservation Strategy, and the National Marine Fisheries Recovery plan for Oregon Coast Coho. The Watershed Health Indicators for Oregon Coast Coho (Bauer et al. 2008) defines a "moderate" viability ranking as 60% of functional hydrologic connectivity in historical tidal wetlands and an "adequate" viability as 80% hydrologic connectivity in historical tidal wetlands. Through this FIP, the OCCEC will make significant progress on this ecological outcome by lifting the Yaquina estuary to moderate status and the Alsea estuary to adequate status through restoration of historical tidal wetlands. The baseline acreages of historical tidal wetlands in both estuaries were quantified in Brophy (2019; Appendix 5). All potential project areas within these two estuaries have been coarsely assessed for restoration acreage potential in the Yaquina and Alsea River Basins Estuarine Wetland Site Prioritization Project (Brophy 1999), and their acreages are available in geospatial products from Brophy (2019). Completed projects shall report data on this conservation output: new acres with restored hydrologic connectivity and habitat broken down by tidal wetland habitat type - tidal marsh/emergent, scrub-shrub, and spruce swamp. The information will be used to calculate progress towards the metric of remaining diked estuarine area as a percentage of current and historical tidal marsh and swamp.

To ensure the desired ecological outcome of functional estuaries is met from restoration activities, the OCCEC has developed a draft monitoring framework for FIP-funded projects (see Question 19). During the restoration design phase, project managers will develop monitoring plans using OCCEC guidance, and will submit monitoring plans to OCCEC for approval. OCCEC will provide review and will recommend changes needed for approval. Monitoring will assess effectiveness of restoration on two conservation outputs: 1) dikes and other barriers to water flow removed or breached, and 2) native tidal wetland vegetation replanted as needed. Although each project will have different monitoring protocols in place, baseline data may consist of the following metrics:

- Restoration site development using repeated photography
- Salinity
- Water surface elevation
- Water temperature
- Channel and wetland elevation

An OCCEC-approved monitoring plan shall be in place prior to project implementation. Some baseline monitoring metrics in the OCCEC monitoring framework are recommended to be initiated at least one year prior to project implementation.

A second targeted ecological outcome is protection of landward migration zones to ensure resilience in the face of climate change. The potential locations have been mapped and prioritized in Brophy and Ewald (2017; Appendix C). Progress towards this ecological outcome will also be recorded as acres protected or restored. Restoration projects in the landward migration zones will also conduct effectiveness monitoring (see Question 19).

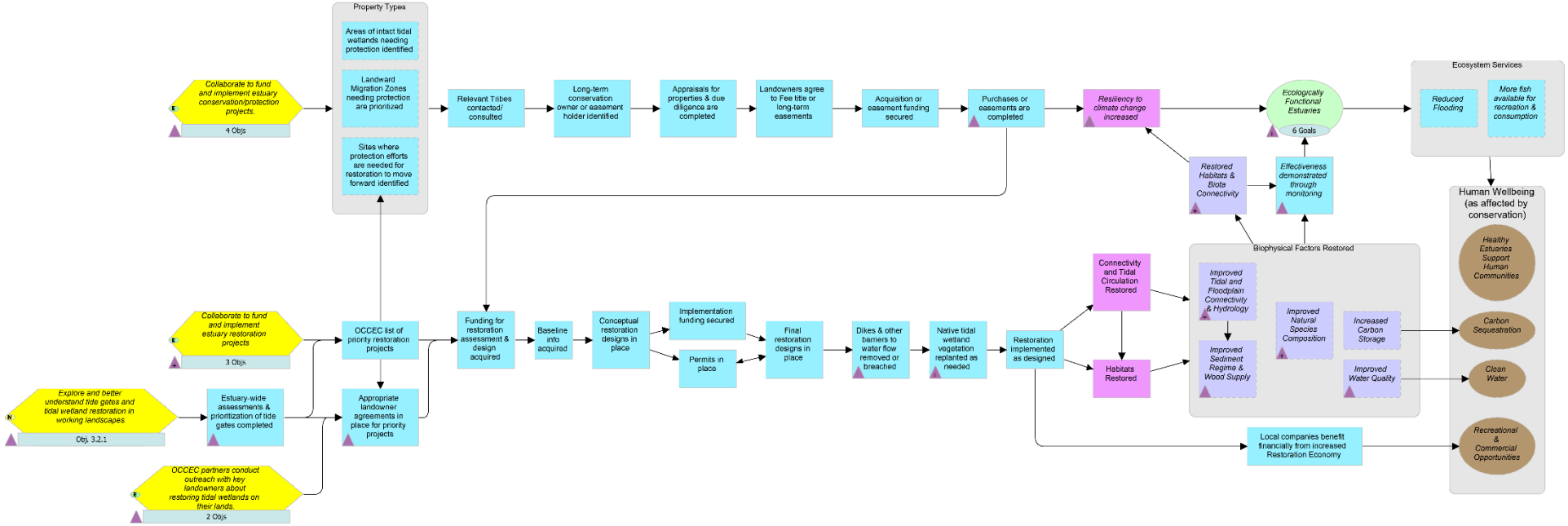
18. Explain the partnership's theory of change for how the initiative's conservation actions will address limiting factors. How do the proposed conservation actions lead to the desired conservation outputs and ecological outcomes?

As illustrated in our project-level restoration results chain (see Figure 1, below), our theory of change is that collaborating to fund and implement estuary restoration and protection projects, will result in effective restoration of impacted tidal wetlands. One of the first intermediate results is that we will identify high-quality project priorities (such as the projects identified for this FIP initiative). Then through targeted outreach, we will get appropriate landowner agreements in place for these projects and seek funding for assessment, design, and implementation. Properties that need to be protected for conservation purposes will also be identified, including remaining intact tidal wetlands (especially swamps), potential future tidal wetlands in priority landward migration zones, and current tidal wetlands where restoration can't happen unless it is brought into conservation ownership. For acquisition projects, relevant Tribes will be consulted, and appropriate long-term conservation entities identified. That will result in appraisals and other due diligence steps being completed and the current landowners agreeing to the purchase or easement terms. With those things in place, funding to complete the land deals can be secured and the purchases completed.

For properties needing restoration, funding for assessments and designs will be secured, baseline data gathered, and conceptual restoration designs completed. Restoration actions are designed to directly improve limiting factors and designs use baseline data to inform the process of achieving desired ecological outcomes. Hydraulic and hydrologic models will guide the development of our designs, with the goal of restoring functionality to ecological processes and facilitating permitting. Successful implementation of restoration designs will enable the restored areas to be self-maintaining in the long-term. Monitoring, as described below, will track both intermediate and long-term ecological outcomes and trajectories, and inform adaptive management responsive to changes in site conditions.

Ecological outcomes will be achieved by 1) removing or breaching dikes and other barriers to tidal inundation, sediment deposition, and fish passage; 2) filling ditches and re-meandering tidal channels; 3) adding topographical diversity through thin layer placement of soils; 4) adding large wood as nurse trees and sediment capturing structures; 5) controlling invasive weeds, and 6) planting native estuarine vegetation and native seed sowing. These actions are well-vetted and have proven to be successful at restoring estuarine function at many project areas in Oregon.

Figure 1. Project-Level Results Chain Diagram:



19. Describe how the partnership will monitor the initiative's progress to meet the ecological outcomes described in the theory of change using scientifically sound monitoring design and methods. Describe if the partnership has an existing monitoring plan or if one will be developed (see Monitoring Plan Guidance referenced above). Include a description of the ecological outcome indicators or metrics you plan to track over time.

The OCCEC has established a monitoring subcommittee that is drafting a restoration effectiveness monitoring framework to guide development of project monitoring plans. Monitoring is required for all projects, with monitoring complexity based on the questions to be addressed by the monitoring for that project. More complex and costly monitoring will be done as needed to evaluate progress towards specific project objectives. The draft monitoring framework document (see "Draft OCCEC Restoration Monitoring Framework 01072022" attached to end of application) is intended to guide all estuary collaborative partners in developing site-specific restoration effectiveness monitoring plans. The OCCEC monitoring subcommittee will review restoration monitoring plans to determine if they are designed to answer important monitoring questions for desired ecological outcomes in each habitat type. Monitoring of the following important ecosystem drivers will be recommended for projects when appropriate:

- Restoration site development using repeated photography: Repeat photography is a simple and low-cost method to document and assess change in landscape features over time. Ground-based photo points are good for visualizing appearance/change in specific locations but can't be used to document spatial extent of features or vegetation types. For documenting spatial extent, aerial photographs could be used. Photo locations should represent features of special interest (hydrologic restrictions, ditches, infrastructure, different plant communities, views of vegetation transitions, etc.)

- Salinity: The reintroduction of saline tidal water into previously tidally disconnected floodplains is a common restoration action for estuarine wetlands. Salinity and tidal inundation are ecosystem drivers that control a wide variety of tidal wetland processes like vegetation, fish habitat, and water quality. Salinity is straightforward to measure and provides critical information about changes to the physical, chemical, and biological conditions of the restoration site.

- Water surface elevation: Water level is affected by factors such as daily tidal variability, river flow variability and subsurface flow. The inundation regime resulting from these factors strongly affects tidal wetland features and functions, such as soils and sediment accretion, nutrient and gas fluxes, and diversity and abundance of plants and animals. Restoration actions are often designed to re-establish full tidal influence and connectivity, enabling transport of water, nutrients and sediment to interior estuarine tidal channels. Salmonids are dependent on estuarine habitat for refuge and food, and connectivity between tidal channels and main channels can provide daily access for forage and refuge. Restoration of tidal hydrology is generally measured using data loggers employing pressure sensors that provide data on inundation depth, duration, and frequency. These data can capture tidal fluctuation, high-flow events and seasonal variation. Simultaneous measurements at restoration and reference sites allow evaluation of restoration action effectiveness.

- Water temperature: Temperature strongly influences fish use of tidal wetlands. Water temperature is critical for fish habitat suitability, with temperature used as a predictor of juvenile salmonid abundance and condition. Dikes and tide gates can prevent cool, marine- influenced water from entering interior channels that serve as critical rearing, foraging and refuge habitat. Restoring connectivity of tidal channels creates tidal flushing and cooler summer temperatures. Continuous temperature measurements using data loggers can document the range of temperatures at restoration

and reference sites. These data can be used to assess temperature fluctuation associated with tides, high-flow events and seasonal variation.

- Planting survivorship: Plantings can accelerate the restoration of a desired native plant community, support other native species through structure and food production, outcompete invasive species, and prevent erosion, among other benefits. If planting is part of the restoration project, it is important to assess planting survival during the first three years of plant establishment. This helps project managers determine if further action is required to establish a native plant community.

- Invasive species: Invasive species can threaten the success of a restoration project by outcompeting desired native plants and disrupting food webs. They also can spread to surrounding areas and cause ecological and economic damage for other land managers. Invasive species can be introduced during restoration activities through the disturbance caused by construction activities or from plant materials. Invasive species can also enter a project site in subsequent years from flood events, wind, animal movements, or field gear. Monitoring invasive species is necessary to develop an approach to addressing potentially troublesome infestations before they require considerable time and money to control.

- Channel and wetland elevation: Wetland and channel elevations should be surveyed before restoration to assist in restoration design and after restoration is complete. Elevation changes resulting from grading, channel excavation, and other earthmoving activities are measured as part of implementation monitoring. Because elevation controls the inundation regime, it is also measured at effectiveness monitoring locations to assess restoration outcomes such as plant community development and suitability for fish use. If major elevation changes are observed post-restoration, elevation measurements may need to extend more than one year after restoration

The OCCEC Monitoring Subcommittee compiled resources on protocols and provided recommendations and information such as equipment needs, timing, frequency, staff time and budget for each of these metrics. This information can be found in the monitoring framework (attached at end of application). Baseline data collected at the project site and at suitable reference sites shall be collected for at least one year prior to restoration. Although the use of nearby reference sites that are monitored in the same way is highly recommended, data from ongoing reference site monitoring in other similar locations may be substituted if methods are comparable. Success will be measured by how closely the restoration site trends toward reference site conditions.

The OCCEC Monitoring Subcommittee can be a technical resource for project managers developing project specific monitoring plans, finding suitable reference sites, and analyzing data. The collaborative can also share other resources, tools, and equipment to support partners in restoration effectiveness monitoring as needed.

20. Describe how data will be managed, analyzed, and interpreted to ensure it can be used to describe the initiative's progress towards meeting ecological outcomes.

For each project, the monitoring team or project manager will submit a monitoring plan to OCCEC prior to project implementation. Additionally, annual progress reports will include summarized monitoring results. The raw data will be held by the program responsible for project development and implementation. Each specific metric included in the OCCEC monitoring guide has a minimum monitoring duration recommended to demonstrate desired restoration effects (see OCCEC monitoring

framework draft attached at end of application). The OCCEC monitoring framework includes instructions for analysis of each metric and guidance on interpreting results, but project-specific adjustments may be needed depending on site characteristics. The project's monitoring team or project manager will analyze data to determine whether restored site conditions are on a trajectory towards reference site conditions and answer the project's monitoring questions. Ultimately, reports for this FIP Initiative will be stored on MCWC website where they will be made available to the public.

Restored functional estuary habitat will be used to update the calculations for "Current Area of Tidal Marsh and Tidal Swamp" (Table 1 above) (see also "OCCEC Strategic Action Plan 2021 Revision" attached to end of application). Restoration activities will be also entered into the Oregon Watershed Restoration Inventory (OWRI).

21. Describe how the monitoring data will be applied to the partnership's adaptive management framework to inform future conservation and monitoring actions. For information on Adaptive Management, see OWEB's *Adaptively Managing Restoration Initiatives* guidance document.

Monitoring data will be used to track implementation of actions and progress towards our SAP objectives. It will also inform us as to how well restoration sites are progressing towards key ecological benchmark values and reference conditions as described in Question 20. Annual review meetings after the field season will include a review of any changes in action implementation, review of interim monitoring data, a discussion of lessons learned and whether any changes should be made going forward.

Approximately every five years, monitoring data will be evaluated and used to assess progress towards goals and objectives in the Strategic Action Plan and to update the plan. This will be a formal opportunity to reassess if our strategies are advancing our goals as we anticipated in our theory of change and results chains or if adjustments need to be made. This could occur earlier than five years if conditions change or if there is new scientific information that should be incorporated. As monitoring data show the achievement of goals and objectives, new goals and objectives will be developed to continue to build on these successes.

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Section 5: Reapplying to the FIP Program

Partnerships that have previously received OWEB FIP funding are eligible to reapply to the FIP grant offering. Partnership performance on the previous FIP initiative will be considered throughout the evaluation process. Partnerships that are reapplying will follow one of two paths, outlined below:

A. Partnerships who have received previous FIP awards are eligible to apply for new FIP awards for initiatives with **different geography and/or different conservation actions** from the previous FIP if they have obligated in project grant agreements all previous FIP funding prior to applying for a new initiative; or, if there is FIP funding remaining, partnerships must confirm a clear path forward for obligating those funds prior to the board's selection of FIP partnerships in July 2022. **There are no additional application questions for partnerships pursuing this path.**

B. Partnerships who have received previous FIP awards may apply for new FIP awards for the **same conservation actions in the same geography** if they have obligated in project grant agreements all previous FIP funding prior to applying for a new initiative; or, if there is FIP funding remaining, partnerships must confirm a clear path forward for obligating those funds prior to the board's selection of FIP partnerships in July 2022. **These partnerships will be required to address the following question in their FIP application:**

22. Document that the partnership made significant progress toward the intended outcomes of the previous 6-year FIP initiative. Be specific in the response, use examples as appropriate, and reference the partnership's FIP initiative results chain and progress monitoring framework. Justify why further investment in the initiative is warranted and why OWEB should continue investing in the same actions in the same geography.

This question will be evaluated as part of the overall initiative application evaluation process, including during technical review and the OWEB Board FIP Committee interview.

This question is **also required** of partnerships that are taking a **hybrid approach** by proposing an initiative that includes both continued conservation work in the same geography as well as conservation work in a new geography.

Section 6: Initiative Work Plan

The Work Plan outlines the conservation actions that the partnership will seek to implement in each biennium of the initiative. The Work Plan should include actions that will be supported by OWEB FIP funding, as well as actions under the initiative that may be supported in part or in full by other funding sources. FIPs will submit an updated work plan to OWEB in advance of each new biennium to be shared with the board.

There is no page limit for the Work Plan. The Work Plan should be structured as a timeline of the initiative, separated by biennia, in table format as appropriate. It should provide detail for the first biennium and general information for subsequent biennia (not to exceed three biennia total). The timeline should include interim milestones illustrating anticipated progress of the initiative.

The Work Plan should be attached to this application.

The Work Plan should outline the following items:

- The initiative's conservation actions and limiting factors being addressed by these actions (be as specific as possible regarding conservation actions and locations of those actions);
- The lead partner on implementation of each conservation action;
- The outputs for each conservation action;
- The metrics used to evaluate the outputs of each conservation action; and,
- A brief description and schedule of monitoring actions (including collection of baseline data, if needed) to assess the progress and effectiveness of the initiative toward meeting its proposed ecological outcomes.

Application Section 6: Initiative Work Plan

This work plan details the projects that will span the duration of the six-year initiative within the Yaquina and Alsea estuaries and prepare for work in subsequent years. It shows the timeline to accomplish 12 of the highest prioritized projects and 3 high priority projects (out of 25 ranked projects) that fall within one of three habitat settings: work within existing tidal wetland areas (FIP project type 1); work to conserve and restore tidal swamps (FIP project type 2); and work within areas that will support future tidal wetlands as sea level rises (the landward migration zone; LMZ) (FIP project type 3).

The locations of these 15 prioritized projects are shown on the accompanying maps by estuary and habitat type. Please note that some of the projects are shown on more than one map since the projects may cross ecological boundaries. For example, a project may involve removal of a tide gate within tidal marsh range as well as restoring spruce swamp habitat and working within the landward migration zone in the upper areas once hydrology is restored.

Projects implemented during the initiative will help address the key limiting factors identified by OWEB's Coastal Estuaries Priorities Memo, NOAA's Coho Recovery Plan, and ODFW's conservation strategy. These limiting factors are (no order of importance implied):

1. Alteration of natural hydrological processes and streamflow, including limited salt- and fresh-water exchange due to such issues as tide gates
2. Loss of habitat complexity and connectivity degraded tidal areas
3. Nutrient cycling and sediment transport
4. Degraded water quality
5. Impacts of climate change (e.g., sea-level rise, increased acidification).

Accomplishment of the project work will require, in addition to addressing ecological limiting factors, the continuation and furthering of partnerships and community outreach to identify additional projects within the FIP scope and build community support and understanding of the goals. Additionally, for each implementation project, monitoring will occur. These capacity, outreach and monitoring tasks are built into each project as well as having some separate focused line items in the workplan (and budget).

More specifically, this FIP will result in the following work being done:

- **Land conservation (to allow for protection and restoration):**
  Yaquina Estuary: 410 acres of land will receive formal protection by conservation acquisition or easement. This includes 360 acres of degraded tidal marsh in Boone Slough and 50 acres of intact tidal swamp in the upper Yaquina (Projects 1, 5).

  Additionally, during this FIP, landowner outreach work will continue in other parts of Boone/Nute Slough (313 acres) and elsewhere in the Yaquina to scope the potential for up to 350 acres of acquisition of intact marsh and swamp habitat (including lands in the priority LMZ).

  Alsea Estuary: 57 acres of degraded tidal marsh in Lower Drift Creek will be protected by conservation ownership (Project 9), with restoration occurring in years outside this FIP.

  Additionally, during this FIP, landowner outreach will also continue in Upper Lint Slough to see if up to 40 acres can be acquired (including lands in the priority LMZ).

- **Tidal marsh restoration:**
  Yaquina Estuary: 365 acres of tidal marsh habitat will be restored (the 360 acres on Boone Slough acquired above as well as 5 acres on Mill Creek/Slack

Creek) (Projects 1, 2).

Further restoration of tidal marsh hydrology will result from a technical assistance grant that first identifies and prioritizes culverts/tide gates restricting tidal marsh (and swamp) hydrology in the wetlands along Yaquina Bay Road (Project 4). This, followed up by landowner outreach and restoration planning and implementation, will lead to improved hydrological connectivity (both within and outside of the 6 years of the FIP), though the amount of affected acreage is yet unknown.

Alsea estuary: 250 acres of tidal marsh habitat will be restored (57 acres Bayview Oxbow, 12 acres Waldport school site, 56 acres in Drift Bend, 75 acres Eckman Lake, 50 acres Bain Slough) (Projects 12, 8, 13,14,15).

Restoring this acreage will allow these estuaries to meet the OCCEC partnership's identified ecological outcome of at least 60% functional tidal hydrological connectivity in the Yaquina ("moderate" viability for Oregon Coast Coho) and will bring the Alsea estuary's hydrological connectivity up to "adequate" viability (80% of historic habitat) for Oregon Coast Coho (Bauer et. al. 2008).

- **Tidal swamp restoration:**
  Yaquina Estuary: 111 acres will be restored (50 acres in the Yaquina Estuary and 61 acres of impacted tidal swamp in King Slough). This work will begin to restore 11.7% of the 952 acres of tidal swamp habitat in this estuary that has been lost (about 93.8% of this historical habitat type as calculated by Brophy et. al, 2019) (Project 5, 7).

- **Conservation and restoration of habitat in the Landward Migration Zone:**
  Yaquina Estuary: There is about 181 acres of land in the LMZ owned by FIP Core partners and other willing partners (TWC, Fred M. VanEck Forest Foundation [VanEck], CTSI, OPRD, Starker Forests and Lincoln County). About 30 of these acres will immediately (years 1-2) be treated with large wood (and with drilled seed bed areas) to provide an elevated structure on nurse logs above the existing invasive species, such as reed canary grass, and to allow beaver to colonize and establish ponds that capture sediment and increase rearing habitat for salmonids. Other work may include thin layer sediment placement, mound creation, and other strategies to increase topographical diversity when possible. This work, occurring in areas of higher elevation, will further increase resiliency to sea level rise and increase habitat complexity and function. In subsequent years of the FIP an additional 50 acres will be treated. Also, outreach in Upper McCaffery may allow for additional acres in the LMZ to be restored in years after this six-year FIP.

  Alsea Estuary: There is about 294 acres of land in the LMZ owned by FIP Core partners (USFS, TWC, ODFW). About 50 acres will immediately (years 1-2) be treated with large wood (and with drilled seed bed areas) to provide an elevated structure on nurse logs above the existing invasive species, such as reed canary grass, and to allow beaver to colonize and establish ponds that capture sediment and increase rearing habitat for salmonids. Other work may include thin layer sediment placement, mound creation, and other strategies to increase topographical diversity when possible. This work, occurring in areas of higher elevation, will further increase resiliency to sea level rise and increase habitat complexity and function. In subsequent years of the FIP an additional 50 acres will be treated. Also, outreach in Upper Lint Slough may result in additional acres in the LMZ to be restored in years after this six-year FIP.

Restoration actions, limiting factors addressed, lead partners, metrics, and outputs for each action are presented in the work plan table on the following pages. Limiting factors are referred to by the numbers above (1-5). Monitoring tasks, including pre-project monitoring, span all biennia and are summarized in a separate table on the last two pages. While some specific locations for landowner outreach are listed in the work plan, our stakeholder engagement and collaboration work are ongoing throughout the basins as well.

Action	FIP Project Type	Habitat category -Estuary	Project Name (# on map)	SAP Action #	Limiting Factor(s) Addressed	Lead Partner	NOTES	Outputs and Metrics							
								Acres protected by conservation ownership or easement	Acres with increased tidal connectivity and/or complexity	# or linear feet of barriers to tidal flow removed	Nurse logs placed & planted	Channels restored (length TBD from designs)	Acres planted or seeded with native tidal wetland vegetation	Restoration design completed	# of recruited landowners with signed agreements
2021-2023 Biennium															
Design-technical assistance for bridge; complete tidal wetlands design	1,2,3	Tidal Marsh -Alsea	Bayview Oxbow - TA for bridge design (#12)	1.1.1.2	1,2,3,4,5	MCWC, TWC	Site design at 60%; anticipates bridge installation but need bridge design							✓	
Tidal marsh acquisition	1	Tidal Marsh -Yaquina	Boone/Nute Slough Acquisition and Restoration (#1)	2.1.2.2	1,2,3,4 when restored	CTSI	Will close on 313 acres of property 11/2022	360 acres							5
Landowner outreach for sale or easement agreements	1	Tidal Marsh - Yaquina	Boone/Nute Slough Acquisition and Restoration (#1)	3.1.1.1	1,2,3,4 when restored	CTSI	Some initial interest from a few other landowners	Up to 313 additional acres							9
Restoration-tide gate removal, planting, and wood placement in LMZ	1,2, 3	Tidal Marsh, LMZ -Yaquina	Mill/Slack Creek tide gate removal (#2)	1.1.1.2	1,2,3,4,5	MCWC, LSWCD, DU			5 Acres	1	200	✓	5		
Restoration-LWD in LMZs, seeding, planting	1,2, 3	LMZ -Alsea	Starr Creek LWD in LMZ Areas (#11)	1.1.1.2	1,2,3,4,5	TWC, MCWC			10 Acres		1000				

Action	FIP Project Type	Habitat category -Estuary	Project Name (# on map)	SAP Action #	Limiting Factor(s) Addressed	Lead Partner	NOTES	Outputs and Metrics							
								Acres protected by conservation ownership or easement	Acres with increased tidal connectivity and/or complexity	# or linear feet of barriers to tidal flow removed	Nurse logs placed & planted	Channels restored (length TBD from designs)	Acres planted or seeded with native tidal wetland vegetation	Restoration design completed	# of recruited landowners with signed agreements
2021-2023 Biennium															
Restoration-LWD in LMZs, seeding, planting	2,3	LMZ -Yaquina	Poole Slough LWD placement in LMZ (#3)	1.1.1.2	2, 5	MCWC, DU			Up to30 Acres		600	✓			
TA/inventory/ hydrological modeling/ prioritize barriers.	1	Tidal Marsh, swamp -Yaquina	Yaquina Bay Rd Pocket Wetland culvert inventory, prioritization (#4)	5.1.1.1	1	LSWCD, DU	Coordination with County PW							✓	
Design for tidal restoration	1,2, 3	Tidal Marsh -Alsea	Drift Bend /Estuary (#13)	1.1.1.2	1,2,3,4,5	USFS								✓	
Stakeholder engagement- to consider restoration options	1,2,3	Tidal marsh -Alsea	Eckman Lake (#14)	3.1.1.1	1,2,3,4 when restored	MCWC	Stakeholder engagement								10
Hydro-model development, design, and permitting	1,2, 3	Tidal Marsh -Yaquina	CTSI Mill Property Design (#6)	1.1.1.2	1,2,3,4,5	CTSI, DU	Includes LWD placement to increase complexity on 1 mile of mainstem				200			✓	

Action	FIP Project Type	Habitat category -Estuary	Project Name (# on map)	SAP Action #	Limiting Factor(s) Addressed	Lead Partner	NOTES	Outputs and Metrics							
								Acres protected by conservation ownership or easement	Acres with increased tidal connectivity and/or complexity	# or linear feet of barriers to tidal flow removed	Nurse logs placed & planted	Channels restored (length TBD from designs)	Acres planted or seeded with native tidal wetland vegetation	Restoration design completed	# of recruited landowners with signed agreements
2023-2025 Biennium															
Stakeholder engagement – to consider restoration design	1	Tidal Marsh - Alsea	Lint Slough-Former Waldport School (#8)	3.1.1.1	1,2,3,4 when restored	MCWC	Stakeholder engagement, design							✓	5
Technical Assistance- tidal marsh restoration	1	Tidal Marsh -Yaquina	Boone/Nute Slough Acquisition and Restoration (#1)	1.1.1.2	1,2,3,4	CTSI	Hydrological modeling							✓	
Restoration- bridge and tidal marsh implementation	1,2,3	Tidal Marsh -Alsea	Bayview Oxbow – west side (#12)	1.1.1.2	1,2,3,4,5	TWC, MCWC	Barrier removed, tidal wetlands restored		52	1, Bridge installed	1000		✓		
Restoration- culvert upgrades	1	Tidal marsh, swamp -Yaquina	Yaquina Bay Rd Pocket Wetland culverts inventory & prioritization (#4)	5.1.1.1	1,2,3,4	MCWC, DU			10-20	3 culverts fixed			✓		
Acquisition	2,3	Tidal Swamp -Yaquina	Upper Yaquina mainstem tidal swamp (#5)	2.1.2.2	1,2,3,4,5	ODFW, MCWC	Willing seller	50							2-3

Action	FIP Project Type	Habitat category -Estuary	Project Name (# on map)	SAP Action #	Limiting Factor(s) Addressed	Lead Partner	NOTES	Outputs and Metrics							
								Acres protected by conservation ownership or easement	Acres with increased tidal connectivity and/or complexity	# or linear feet of barriers to tidal flow removed	Nurse logs placed & planted	Channels restored (length TBD from designs)	Acres planted or seeded with native tidal wetland vegetation	Restoration design completed	# of recruited landowners with signed agreements
2023-2025 Biennium															
Restoration	2,3	Tidal Swamp -Yaquina	Upper Yaquina mainstem tidal swamp (#5)	1.1.1.2	1,2,3,4,5	MCWC			50		1000	✓	20		
Restoration- tidal wetland restoration	1,2,3	Tidal Marsh Swamp, LMZ - Alsea	Drift Bend/ Estuary (#13)	1.1.1.2	1,2,3,4,5	USFS			56 Acres	5000 linear feet of dike removed		✓			
Design alternatives (continued in next biennium)	1,2,3	Tidal Marsh - Alsea	Eckman Lake (#14)	1.1.1.2	1,2,3,4	MCWC								✓	
Restoration- LWD in LMZ	2,3	LMZ - Alsea	Upper Lint Creek/ Slough (#10)	1.1.1.2	2,5	MCWC, ODFW			50 Acres		2000		25		
Technical Assistance	1,2	Tidal Swamp -Yaquina	King Slough- Culverts and spruce swamp (#7)	1.1.1.2 5.1.1.1	1,2,3,4	ODFW, MCWC								✓	2

Action	FIP Project Type	Habitat category -Estuary	Project Name (# on map)	SAP Action #	Limiting Factor(s) Addressed	Lead Partner	NOTES	Outputs and Metrics							
								Acres protected by conservation ownership or easement	Acres with increased tidal connectivity and/or complexity	# or linear feet of barriers to tidal flow removed	Nurse logs placed & planted	Channels restored (length TBD from designs)	Acres planted or seeded with native tidal wetland vegetation	Restoration design completed	# of recruited landowners with signed agreements
2023-2025 Biennium															
Restoration- culvert upgrades	1	Tidal marsh, swamp -Yaquina	Yaquina Bay Road Pocket Wetland culvert inventory and prioritization (#4)	5.1.1.1	1,2,3,4	MCWC, DU			10-20 acres	2		✓			
Stakeholder outreach/ Hydrological analysis/tide gate design	1,2,3	Tidal Marsh, Swamp - Alsea	Bain Slough tide gate removal (#15)	3.1.1.1 1.1.1.2	1,2,3,4	ODFW, MCWC								✓	20-30

Action	FIP Project Type	Habitat category -Estuary	Project Name (# on map)	SAP Action #	Limiting Factor(s) Addressed	Lead Partner	NOTES	Outputs and Metrics							
								Acres protected by conservation ownership or easement	Acres with increased tidal connectivity and/or complexity	# or linear feet of barriers to tidal flow removed	Nurse logs placed& planted	Channels restored (length TBD from designs)	Acres planted or seeded with native tidal wetland vegetation	Restoration design completed	# of recruited landowners with signed agreements
2025-2027 Biennium															
Technical Assistance, restoration design, permits	1	Tidal Marsh -Yaquina	Boone/Nute Slough Acquisition and Restoration (#1)	1.1.1.2	1,2,3,4	CTSI								✓	14
Tidal Restoration	1	Tidal Marsh -Yaquina	Boone/Nute Slough Acquisition and Restoration (#1)	1.1.1.2	1,2,3,4	CTSI			360 acres	1 tide gate removed	5000		300		
Restoration: culvert upgrades	1	Tidal marsh, swamp -Yaquina	Yaquina Bay Road Pocket Wetland culverts inventory and prioritization (#4)	5.1.1.1	1,2,3,4	LSWCD, MCWC, DU	Coordination with County PW		10-20 acres	2-4		✓			
Restoration: culvert replacement and LWD	1,2	Tidal Swamp -Yaquina	King Slough-Culverts and spruce swamp (#7)	1.1.1.2 5.1.1.1	1,2,3,4	ODFW, MCWC			20 Acres	2	2000	✓			
Technical Assistance- design for preferred alternative	1,2,3	Tidal marsh -Alsea	Eckman Lake (#14)	1.1.1.2	1,2,3,4	MCWC	Coordination with Port of Alsea, Private landowners							✓	25

Action	FIP Project Type	Habitat category -Estuary	Project Name (# on map)	SAP Action #	Limiting Factor(s) Addressed	Lead Partner	NOTES	Outputs and Metrics							
								Acres protected by conservation ownership or easement	Acres with increased tidal connectivity and/or complexity	# or linear feet of barriers to tidal flow removed	Nurse logs placed& planted	Channels restored (length TBD from designs)	Acres planted or seeded with native tidal wetland vegetation	Restoration design completed	# of recruited landowners with signed agreements
2025-2027 Biennium															
Acquisition	1,2	Tidal Marsh - Alsea	Lower Drift Confluence Acquisition (#9)	2.1.2.2	1,2,3,4 when restored	USFS, TWC	57 acres of 200 total acres is tidal marsh, upland areas could provide LWD recruitment to marsh	57							
Technical design completed	1,2,3	Tidal Marsh, Swamp	Bain Slough tide gate (#15)	1.1.1.2	1,2,3,4	ODFW, MCWC								✓	
Restoration	1,2,3	Tidal Marsh, Swamp	Bain Slough tide gate (#15)	1.1.1.2	1,2,3,4	ODFW, MCWC			50 Acres	tide gate removed		✓			

Monitoring Actions to track progress towards ecological outcomes from this FIP Initiative

Goal/Ecological Outcome	Restoration Action	Output Metrics	Objective	Monitoring Action	Frequency & Duration
By 2040, the percent of functional tidal wetlands across the OCCEC Focus Area will be increased from current 43% to desired > 60% by increasing hydrologic connections to tidal flows, restoring channels, and replanting native tidal wetland vegetation as needed By 2035, at least 5 priority transportation infrastructure impact project sites have increased hydrologic connection to tidal flows.	• Removal or breaching of dikes • Removal of tide gates • Filling drainage ditches • Removal of fill/regrading • Channel creation • Creating topographic diversity with thin-layer placement of soils • Placement of large wood • Planting of native marsh vegetation • Creation of setback dikes/tide gates where necessary	• # or linear feet of barriers to water flow removed or breached • Linear feet of channels restored • Diverse elevations create ecotone slopes to address sea level rise • Nurse logs placed & planted • Acres planted or seeded with native tidal wetland vegetation	• Implement restoration projects on about 900 acres in the Yaquina and Alsea estuaries by 2028. • By 2028, implement a priority on-the-ground co-benefit pilot project that upgrades transportation infrastructure and improves estuary health	• Establish photo points to track changes in landscape features and vegetation • Conduct baseline monitoring of key drivers (see below) at each restoration site and suitable reference sites • Record the implementation metrics listed in the "Output metrics" column • Monitor key ecosystem drivers to assess restoration success, including: o Salinity o Water surface elevation o Water temperature o Planting survivorship o Invasive species o Channel & wetland elevations	• 1 year before project starts then annually • 1 year before project starts • Once after project is implemented • Variable depending on site & monitoring questions for each project (TBD in monitoring plans)
By 2040, key estuary lands will be protected through fee title acquisitions or long-term easements to conserve current, and potential future, tidal wetland areas that are likely to withstand sea level rise into the future.	• Fee title acquisitions • Acquire long-term easements from willing landowners	Acres protected by conservation ownership or easement	• Protect 100-440 acres of remaining tidal swamp habitats and priority LMZ lands in the Yaquina and Alsea estuaries by 2028. • By 2028, bring 400-700 acres in the Yaquina and Alsea estuaries into conservation ownership to allow for future restoration. • 5% of tidal wetland LMZ lands protected in estuaries in the OCCEC focus area by 2035.	• Track number of wetland acres protected • Verify compliance with OWEB-approved management plan for each parcel • Track acres and % of Landward Migration Zone (LMZ) lands protected	• Annually • Cumulative totals in 2028 and LMZ % in 2035

By 2030 there will be increased landowner acceptance and understanding of the ecological benefits estuaries provide and the projects that restore them.	• Develop a landowner outreach plan for priority sites. • Implement the landowner outreach plans.	# of recruited landowners with signed agreements	By 2028, at least 5 priority landowners each in the Yaquina and Alsea Estuaries have signed landowner agreements to restore tidal wetlands on their lands.	Track number of participating landowners with signed agreements allowing estuary restoration projects to move forward	Annually

Section 7: Budget

Important Note about Budgets

- The OWEB Board will seek to balance Focused Investments funding each biennium. The board approved the 2021-23 biennium spending plan at the July meeting. OWEB has $10 million available for the 2021-23 FIP solicitation and may award up to 3-5 new FIP initiatives to begin during this biennium, with an average of approximately $2 million per initiative in each biennium.
- Maximum duration of funding for an initiative will be three biennia (six years) contingent upon available funding.
- Maximum funding for an initiative will be $4 million/biennium for a total of $12 million.
- The board may fund an initiative in whole or in part.

Budget Tables

Indicate *estimated* funding in the tables below, including grant administration requested for all categories, as applicable. **All budget estimates should be rounded to the nearest dollar.**

Biennium 1 Estimated Budget

OWEB Grant Types	Lead Partner(s)	OWEB Requested Investment	Estimated Leverage Funding (In-kind or cash)
Partnership Technical Assistance[†]	OCCEC, MCWC, CTSI, ODFW, PSMFC, USFWS	$30,000	$40,000
Stakeholder Engagement	ODFW, MCWC, LSWCD, DU	$55,000	$15,000
Technical Assistance	ODFW, CTSI, MCWC, LSWCD, DU	$337,500	$210,000
Restoration	ODFW, CTSI, MCWC, LSWCD, TWC	$255,500	$263,000
Land Acquisition	MRT, TWC, CTSI	$825,000	$535,000
Water Acquisition	N/A	$0	$0
Monitoring	OCCEC, MCWC, LSWCD, CTSI	$20,000	$10,000
TOTAL		$1,523,000	$1,073,000
Biennium 1 TOTAL Estimated Funding	$2,596,000		

Table 1

[†] The Partnership Technical Assistance grant type encompasses activities including, but not limited to: partnership coordination and communication; partnership development; facilitation; updates to governance and other partnership documents; partnership planning software; OWEB FIP reporting; and participation in workshops, conferences, training, etc. related to implementation of projects under the initiative. Activities related to stakeholder engagement should be included in the Stakeholder Engagement grant type. For

example, stakeholder engagement activities may include engaging with individual landowners and/or targeted audiences and developing a communications plan or other outreach-related publications.

Important note regarding the following two budget tables: The OWEB Board cannot make firm funding commitments beyond the current biennium. Prior to the start of each biennium, the partnership will have an opportunity to refine its biennial budget, although the total request cannot exceed the total biennial request in each table below.

Biennium 2 Estimated Budget

OWEB Grant Types	Lead Partner(s)	OWEB Requested Investment	Estimated Leverage Funding (In-kind or cash)
Partnership Technical Assistance	OCCEC, MCWC, CTSI, ODFW, PSMFC, USFWS	$30,000	$40,000
Stakeholder Engagement	ODFW, MCWC, LSWCD, DU	$55,000	$35,000
Technical Assistance	ODFW, CTSI, MCWC, LSWCD, DU	$353,700	$100,000
Restoration	ODFW, CTSI, MCWC, LSWCD, TWC	$1,947,000	$1,356,000
Land Acquisition	MRT, TWC, CTSI	$1,500,000	$560,000
Water Acquisition	N/A	$0	$0
Monitoring	OCCEC, MCWC, LSWCD, CTSI	$36,000	$15,000
TOTAL		$3,921,700	$2,106,000
Biennium 2 TOTAL Estimated Funding	$6,027,700		

Table 2

Biennium 3 Estimated Budget

OWEB Grant Types	Lead Partner(s)	OWEB Requested Investment	Estimated Leverage Funding (In-kind or cash)
Partnership Technical Assistance	OCCEC, MCWC, CTSI, ODFW, PSMFC, USFWS	$40,000	$30,000
Stakeholder Engagement	ODFW, MCWC, LSWCD, DU	$20,000	$10,000
Technical Assistance	ODFW, CTSI, MCWC, LSWCD	$166,250	$100,000
Restoration	ODFW, CTSI, MCWC, LSWCD, TWC	$1,974,000	$1,476,000
Land Acquisition	MRT, TWC, CTSI	$175,000	$160,000
Water Acquisition	N/A	$0	$0
Monitoring	OCCEC, MCWC, LSWCD, CTSI	$15,000	$15,000
TOTAL		$2,390,250	$1,791,000
Biennium 3 TOTAL Estimated Funding	$4,181,250		

Table 3

Budget Question

23. Explain the reasoning for the allocation of funds across grant types within each biennial budget. Describe how your budget allocation across grant types supports the proposed conservation actions and desired ecological outcomes of the initiative.

The budget for this FIP application details work that will span the duration of the six-year initiative, this includes 12 of the highest prioritized projects and three high priority projects, out of 25 total projects which were considered. Projects may require multiple FIP grant types, for example, stakeholder engagement efforts may lead to the need for an acquisition grant, after successful acquisition, a Technical Assistance grant may be required to complete a restoration project and then a Restoration grant will be needed for implementation. A monitoring grant may also be needed to monitor the project property after implementation.

In Biennium 1, this group estimates a major need for acquisition and stakeholder engagement efforts that lead to land conservation. However, we propose immediate restoration work on approximately 80 acres of identified LMZ areas owned or managed by core or willing partners. In biennium 1 there is also a need for Technical Assistance (design) grants to scope and assess alternatives and complete restoration designs for major efforts to restore tidal flow, remove fish passage barriers, and increase habitat quantity and complexity in the FIP geography.

In biennium 2, we expect a continued need for Technical Assistance grants to continue restoration design on additional projects. The need for Restoration grants to implement projects that were designed during biennium 1 increases, and we expect major Restoration work throughout the second biennium. We are also requesting a similar amount of Acquisition funding for biennium 2, building off the stakeholder engagement work in biennium 1. Monitoring will also increase in biennium 2 as restoration projects are completed, the results of which will be closely monitored to inform future restoration actions.

By biennium 3, we expect less Technical Assistance grants, while a need for Restoration grants will continue as core partners continue to implement previously designed restoration projects. We are requesting less for Land Acquisition grants in biennium 3, as we expect much of that work to be completed in the first two biennia, but some funding is requested for acquisition in biennium 3. Monitoring will continue through biennium 3.

Attachment A: Racial & Ethnic Impact Statement Form

This form is used for information purposes only and must be included with the grant application.
Chapter 600 of the 2013 Oregon Laws require applicants to include with each grant application a racial and ethnic impact statement. The statement provides information as to the disproportionate or unique impact the proposed policies or programs may have on minority persons[1] in the State of Oregon if the grant is awarded to a corporation or other legal entity other than natural persons.

1. The proposed grant project policies or programs could have a disproportionate or unique **positive** impact on the following minority persons:

Indicate all that apply:
- Women
- Persons with Disabilities
- African-Americans
- Hispanics
- Asians or Pacific Islanders
- ✓ **American Indians (See attached Letter)**
- Alaskan Natives

2. The proposed grant project policies or programs could have a disproportionate or unique **negative** impact on the following minority persons:

Indicate all that apply:
- Women
- Persons with Disabilities
- African-Americans
- Hispanics
- Asians or Pacific Islanders
- American Indians
- Alaskan Natives

3. The proposed grant project policies or programs **will have no** disproportionate or unique impact on minority persons.

If you checked numbers 1 or 2 above, on a separate sheet of paper, provide the rationale for the existence of policies or programs having a disproportionate or unique impact on minority persons in this state. Further provide evidence of consultation with representative(s) of the affected minority persons.

I HEREBY CERTIFY on this **10th** day of **January** , 2022 , the information contained on this form and any attachment is complete and accurate to the best of my knowledge.

Signature
Printed Name: **Evan Hayduk**
Title: **Council Coordinator**

[1] "Minority persons" are defined in SB 463 (2013 Regular Session) as women, persons with disabilities (as defined in ORS 174.107), African-Americans, Hispanics, Asians or Pacific Islanders, American Indians and Alaskan Natives.

Confederated Tribes of Siletz Indians
P.O. Box 549 Siletz, Oregon 97380
(541) 444-2532 • 1-800-922-1399 • FAX: (541) 444-2307

January 5th, 2022

Dear OWEB Staff and Board,

The conservation and restoration actions described in the Mid Coast Watersheds Council's Focused Investment Partnership application will benefit the 5,500 members of the Confederated Tribes of Siletz Indians by providing restorative actions to those habitats that support a myriad of culturally important species such as native anadromous fishes and shellfish, plants used for consumption, basketry and medicine; and trees used for traditional structures like plank houses and canoes. These are just a few examples of indirect benefits to the Tribe's membership. In addition, the proposed FIP provides broad opportunities to preserve the Tribe's culture through management of conserved lands such as those described in the land acquisition priorities section of the proposal.

Stan van de Wetering
Biological Programs Director

CORRESPONDENCE WITH CTCLUSI ABOUT OCCEC/MCWC FIP APPLICATION

---------- Forwarded message ---------
From: **Ashley Russell** <arussell@ctclusi.org>
Date: Thu, Dec 2, 2021 at 8:16 AM
Subject: RE: FIP for Yaquina and Alsea estuaries
To: Margaret Treadwell <margaret@mckenzieriver.org>

Hey Margaret,

Since our capacity is limited at this time and the OCCEC FIP isn't including any projects within the Tribe's Ancestral Territory (specifically the Siuslaw Estuary), we have been relying on the Siletz Tribe, our Northern Sister Tribe, to provide feedback relating to Tribal interests.

K'ele (Thank You),

Ashley Russell (Miluk Coos)
Water Protection Specialist & Cultural Stewardship Assistant
The Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians
1245 Fulton Ave
Coos Bay, OR 97420
(541) 888-7511 –office
(541) 808-4455 - cell

From: Margaret Treadwell <margaret@mckenzieriver.org>
Sent: Wednesday, December 1, 2021 3:53 PM
To: Ashley Russell <arussell@ctclusi.org>
Subject: FIP for Yaquina and Alsea estuaries

Hi Ashley,

I hope you're doing well. It's been a pleasure working with you on the Siuslaw FIP application process.

In a parallel effort, I'm involved with the Oregon Central Coast Estuary Collaborative (OCCEC), which is also working on a FIP application, revised from the last round and pared down to include just the Yaquina and Alsea estuaries in the FIP geography. Would the CTCLUSI want to be involved with this process, and/or provide feedback on what we are developing? OCCEC would greatly value the Tribes' participation to whatever extent is desired and practicable.

Thanks so much for your help.

All the best,
Margaret
Margaret Treadwell
Central Coast Conservation Program Manager
McKenzie River Trust
Cell: 541-228-8521

----- Forwarded Message -----

From: Ashley Russell <arussell@ctclusi.org>
To: Stan van de Wetering <stanvandewetering@yahoo.com>
Sent: Thursday, December 2, 2021, 08:08:12 AM PST
Subject: RE: do you have a minute you could talk to me about whether the Confederation's interests/concerns in a FIP covering the Alsea and Yaquina Basins ?

Hey Stan,

Since this OCCEC FIP application doesn't include any projects that will be implemented within the Siuslaw Estuary, I don't see us having any concerns. J

K'ele (Thank You),

Ashley Russell (Miluk Coos)

Water Protection Specialist & Cultural Stewardship Assistant

The Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians

1245 Fulton Ave

Coos Bay, OR 97420

(541) 888-7511 –office

(541) 808-4455 - cell

From: Stan van de Wetering <stanvandewetering@yahoo.com>
Sent: Wednesday, December 1, 2021 3:45 PM
To: Ashley Russell <arussell@ctclusi.org>
Subject: do you have a minute you could talk to me about whether the Confederation's interests/concerns in a FIP covering the Alsea and Yaquina Basins ?

Hi Ashley just wondering if you could comment via email or give me a quick bit of feedback via phone as far as what oweb would like to know in the FIP application.

Stan van de Wetering
Biological Programs Director
Natural Resources Department
Confederated Tribes of Siletz Indians
cell 541 351 0126

MidCoast Watersheds Council

Watersheds of the Salmon River, Siletz River, Yaquina River, Alsea River, Yachats River, and Ocean Tributaries

January 4, 2022

Oregon Watershed Enhancement Board
Focused Investment Partnerships
775 Summer Street NE, Suite 360
Salem, OR 97301

Re: Focused Investment Partnership

Dear OWEB FIP Program Representatives,

The Core Partners represented as signatories on this letter commit to participation in the Oregon Central Coast Estuary Collaborative's initiative "Restoring Resilience to Two Estuaries" for the duration of the proposed grant period, 2022-2028, as presented in the Partnership's Focused Investment Priority proposal to the Oregon Watershed Enhancement Board, pending availability of funds. Participation will be in accordance with the guidelines committed to in the Partnership's Governance Document.

Sincerely,

Evan Hayduk, Council Coordinator, MidCoast Watersheds Council

Katie Ryan, Executive Director, The Wetlands Conservancy

Mike Kennedy
Confederated Tribes of Siletz Indians

Fran Recht, Habitat Program Manager, Pacific States Marine Fisheries Commission

Derek Wilson, Habitat Conservation Biologist, Or. Dept. of Fish and Wildlife

914 SW Coast Hwy, Suite 314
Newport, OR 97365 (541)265-9195 www.midcoastwatersheds.org

MidCoast Watersheds Council

Watersheds of the Salmon River, Siletz River, Yaquina River, Alsea River, Yachats River, and Ocean Tributaries

Amy Horstman, Fish Passage Coordinator/Habitat Restoration, US Fish and Wildlife Service National Fish Passage Program

Madeleine Vander Heyden, Coastal Program Coordinator, US Fish & Wildlife Service Coastal Program

Madeleine VanderHeyden 12/17/21

Digitally signed by PAUL TIGAN
Date: 2021.12.16 11:51:58 -08'00'

Paul Tigan, Field Manager - Marys Peak Field Office, Bureau of Land Management

Jeff McCreary, Director Of Operations, Ducks Unlimited Inc.

Laurie Wayburn, Trustee, Fred M. VanEck Forest Foundation

Michele Holman, District Ranger, US Forest Service, Siuslaw National Forest, Central Coast Ranger District

Jen Hayduk, Conservation Programs Manager, Lincoln SWCD

Margaret Treadwell, Central Coast Conservation Program Manager, McKenzie River Trust

914 SW Coast Hwy, Suite 314
Newport, OR 97365 (541)265-9195 www.midcoastwatersheds.org

OCCEC FIP Application Prioritized Habitats, Maps and Projects

The OCCEC project team selected tidal wetland projects in the Yaquina and Alsea estuaries for this Focused Investement Project (FIP) initiative, further specifying the three types of habitat types in which these conservation and restoration actions would occur:

FIP Project Type 1: Tidal marsh restoration projects in areas within existing tidal range

For these projects, we build on the "Yaquina and Alsea River Basins Estuarine Wetland Site Prioritization Project" (MCWC and Brophy, 1999), which included descriptions and prioritization of projects in both the Alsea and Yaquina Estuaries. Maps for this FIP project type (pages 4 and 5 below) utilize the mapping from the 1999 assessment. We focus on removing barriers and ditches and re-establishing channels to restore hydrology and sediment regimes, placement of large wood, and planting and seeding.

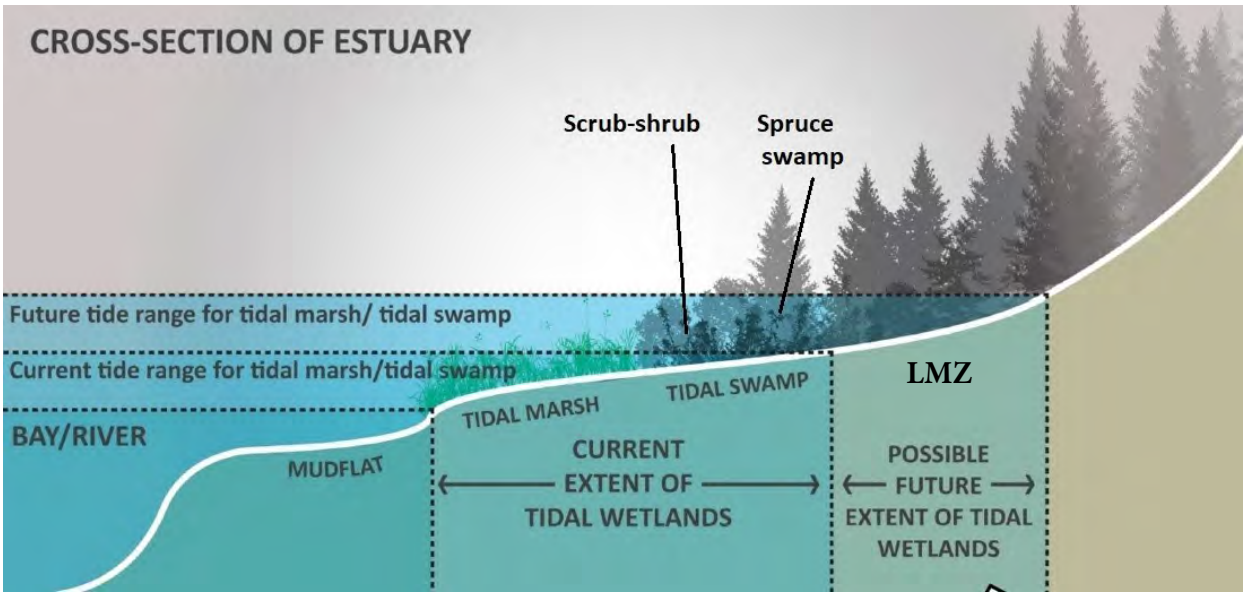
FIP Project Type 2. Protecting what little remains of spruce and shrub scrub forested wetlands and restoring this habitat type (only about 6% of original tidal swamp habitat remains in either estuary)

For this project type, we rely on the 2019 Brophy report titled "Comparing historical losses of forested, scrub-shrub, and emergent tidal wetlands on the Oregon Coast, USA: A paradigm shift for estuary restoration and conservation". Maps for both estuaries are below on page 6 and 7. Projects related to this project type would continue our Stakeholder Engagement efforts, result in acquisition or easements to protect the portions of intact habitat that remain, and restoration of former scrub-shrub and spruce forest tidal wetlands where possible. Work focuses on building resilience by placing large quantities of Large Woody Debris in these areas to act as nurse logs, along with planting and seeding native species associated with scrub-shrub and spruce swamp habitat (Sitka spruce, Pacific crabapple, black twinberry, etc). MCWC completed a pilot project on VanEck ownership in Poole Slough (Yaquina) in 2021 and have estimates of costs for this work on a larger scale.

FIP Project Type 3. Protection and restoration of current and potential future tidal wetlands within the high & medium-high ranked Landward Migration Zones (Brophy & Ewald 2017).

This project type is more forward looking, taking into account sea level rise estimates and how the location of tidal wetlands will subsequently change. The 2017 Landward Migration Zone report prioritized these areas based on five criteria, and the High and Medium-High LMZs have been mapped by the project team and overlaid with county tax parcel maps to show current ownership (pages 8, 9, and 10). Four FIP core partners are "willing landowners" for these efforts: The Wetlands Conservancy, Fred M. VanEck Forest Foundation (VanEck), the Confederated Tribes of the Siletz Indians, and the U.S. Forest Service. Others to be engaged (and are likely to be supportive) include Oregon Parks and Recreation Department, Starker Forest, and Lincoln County Property Management. The work focus is similar to the above, but conducted in these higher elevation areas.

Note re Habitat Continuum: Though we talk of the project types separately, these habitats form a continuum based on elevation (see diagram below). The projects we describe will often include elements from two or all three project types. For example, a tidegate removal project may occur in existing tidal marsh elevations, but the restored hydrology and restoration may allow spruce swamp restoration and work within the landward migration zone to assure resilience to climate change. That is why a project may appear on more than one map (pages 4-9) because we'll be working in more than one habitat type. However, to avoid confusion, the acreage numbers are <u>only</u> assigned to the primary habitat type in which the conservation or restoration work will occur.



We use the following definitions (Brophy 2019):

Tidal marsh: A tidal wetland with vegetation dominated by herbaceous plants such as grasses, sedges, rushes, and broadleaved herbaceous plants. In Oregon and the Pacific Northwest, tidal emergent wetlands can be saline, brackish, or fresh.

Tidal scrub-shrub wetland: A tidal wetland dominated by shrubs, with less than 10% cover of trees. This is one type of "tidal swamp;" the other type is tidal forested wetland. In Oregon and the Pacific Northwest, scrub-shrub tidal wetlands can be brackish or fresh.

Tidal forested wetland: A tidal wetland with more than 10% cover of trees. This is one type of "tidal swamp;" the other type is scrub-shrub tidal wetland. In Oregon and the Pacific Northwest, tidal forested wetlands may be brackish or fresh. Also called "tidal forest" or "tidal forest/woodland" or "spruce swamp".

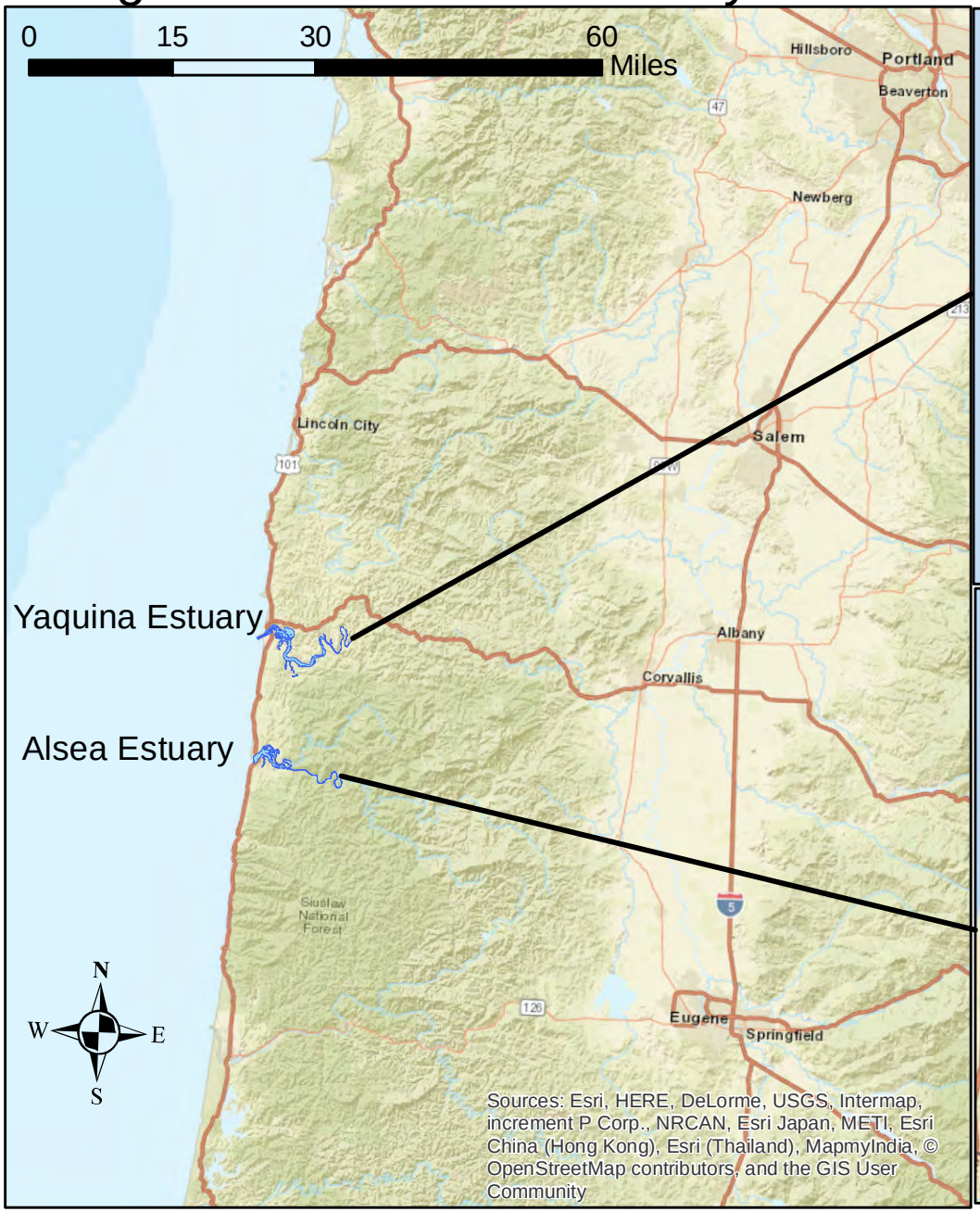
Project Prioritization and Selection for the FIP

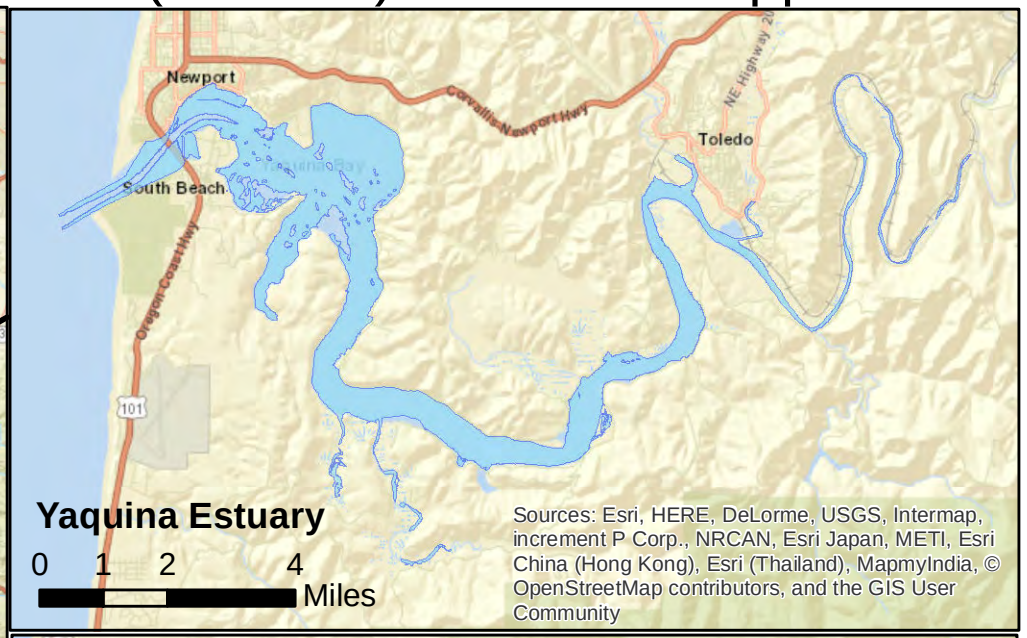
The MidCoast Watersheds Council invited all OCCEC partners to attend a Technical Team meeting to review and discuss each of the prioritized projects submitted by partners in these estuaries (project summaries below). Twenty individuals representing a wide breadth of expertise participated in the review. The projects were then scored and ranked (as an individual exercise after the meeting) and the results compiled to see those that would be included in this FIP proposal.

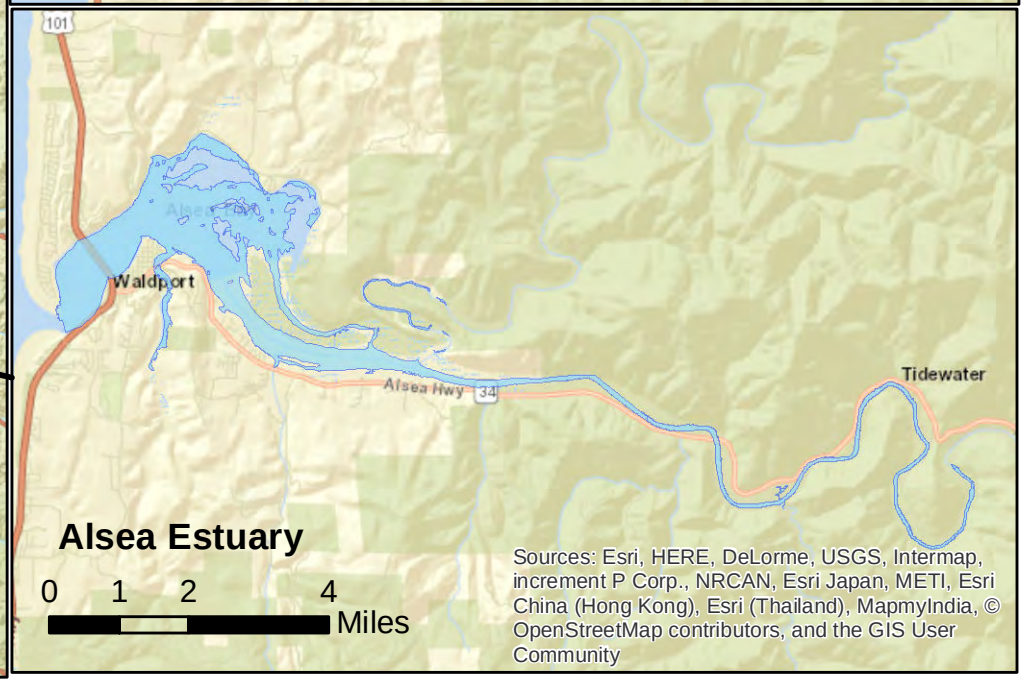
Ranking was based on 11 criteria developed by the OCCEC and MCWC. These questions focused on project readiness, size/scope of project, potential ecological uplift, and cost/benefit ratio. Some individuals from the MCWC Technical Team were not able to score the full project list, but provided input on priority projects. Using this process, 25 proposed projects were sorted into three priority tiers resulting in 12 top priority projects, 3 medium priority projects, and ten deferred projects.

In the following pages, each of these 15 projects is mapped and described below by FIP project type (i.e. marsh(1), swamp (2), or landward migration zone (3) as described above).

Restoring Resilience to Two Estuaries
Oregon Central Coast Estuary Collaborative (OCCEC) OWEB FIP Application

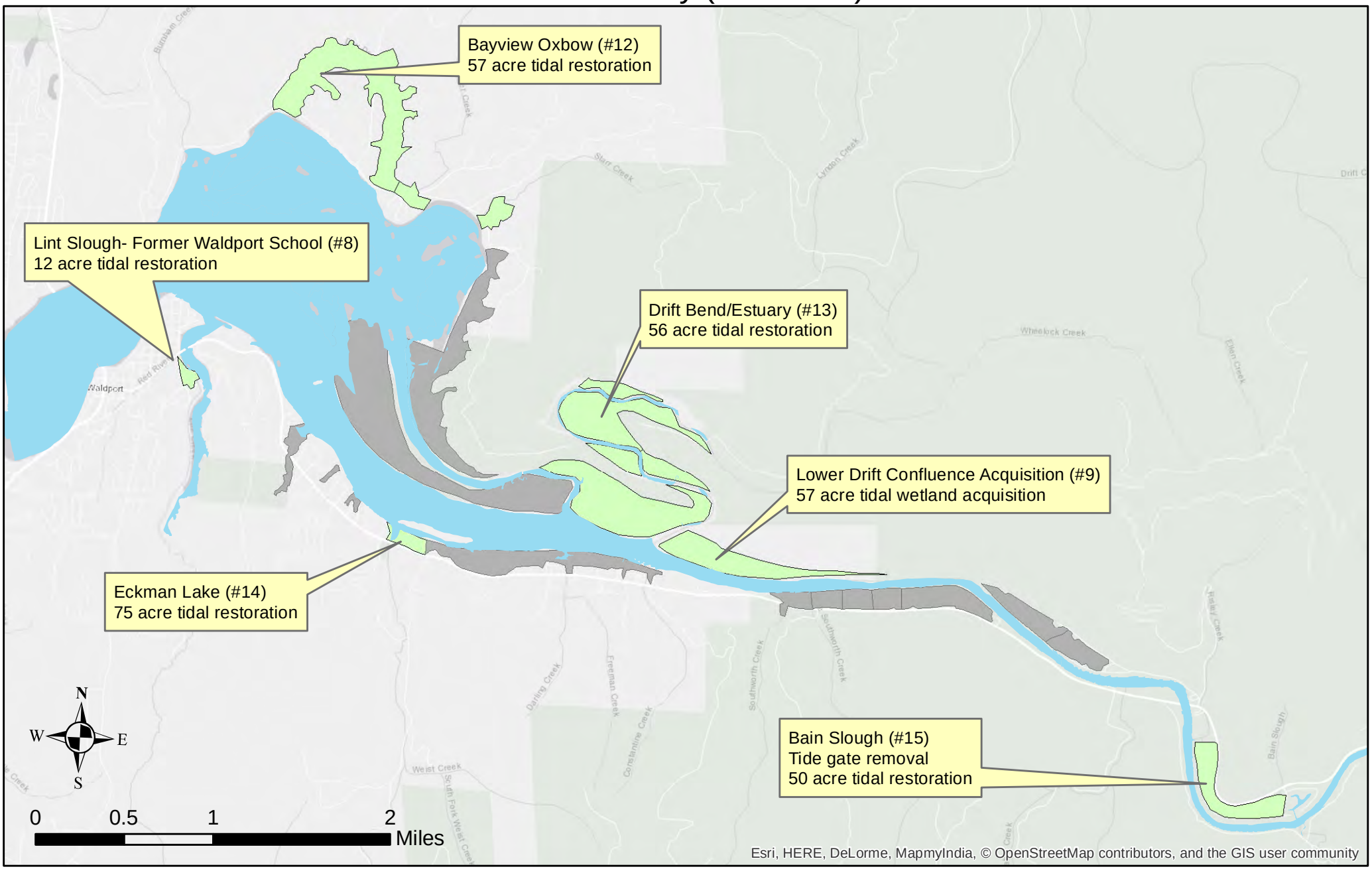






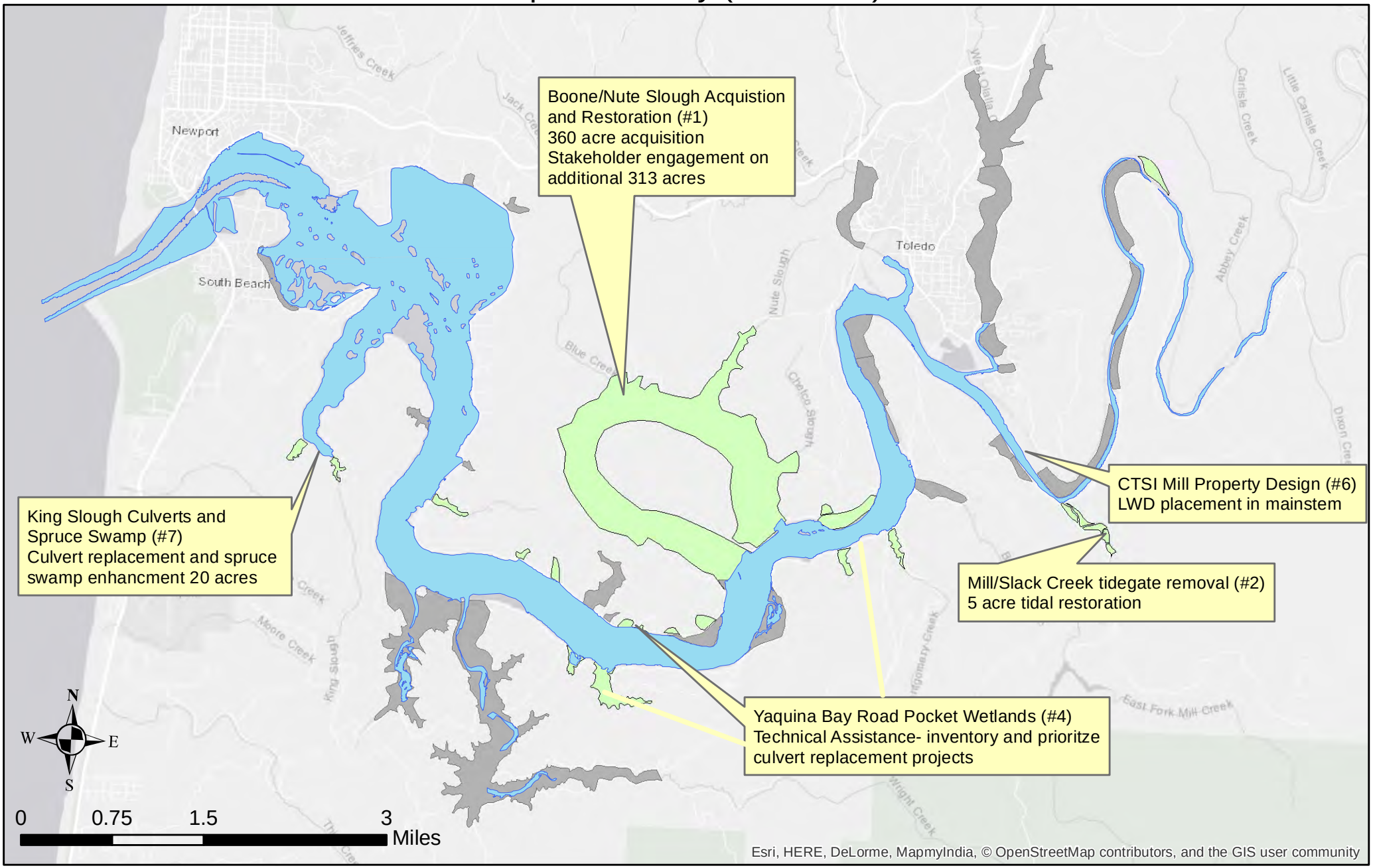
Projects shown on the following project locator maps show the main location of proposed activities by habitat type, but not every project is shown on each project locator map. Please refer to project descriptions for complete FIP project types (1, 2 or 3)

FIP Project Type 1- Tidal marsh conservation and restoration in areas of existing tidal range
Alsea Estuary (307 acres)



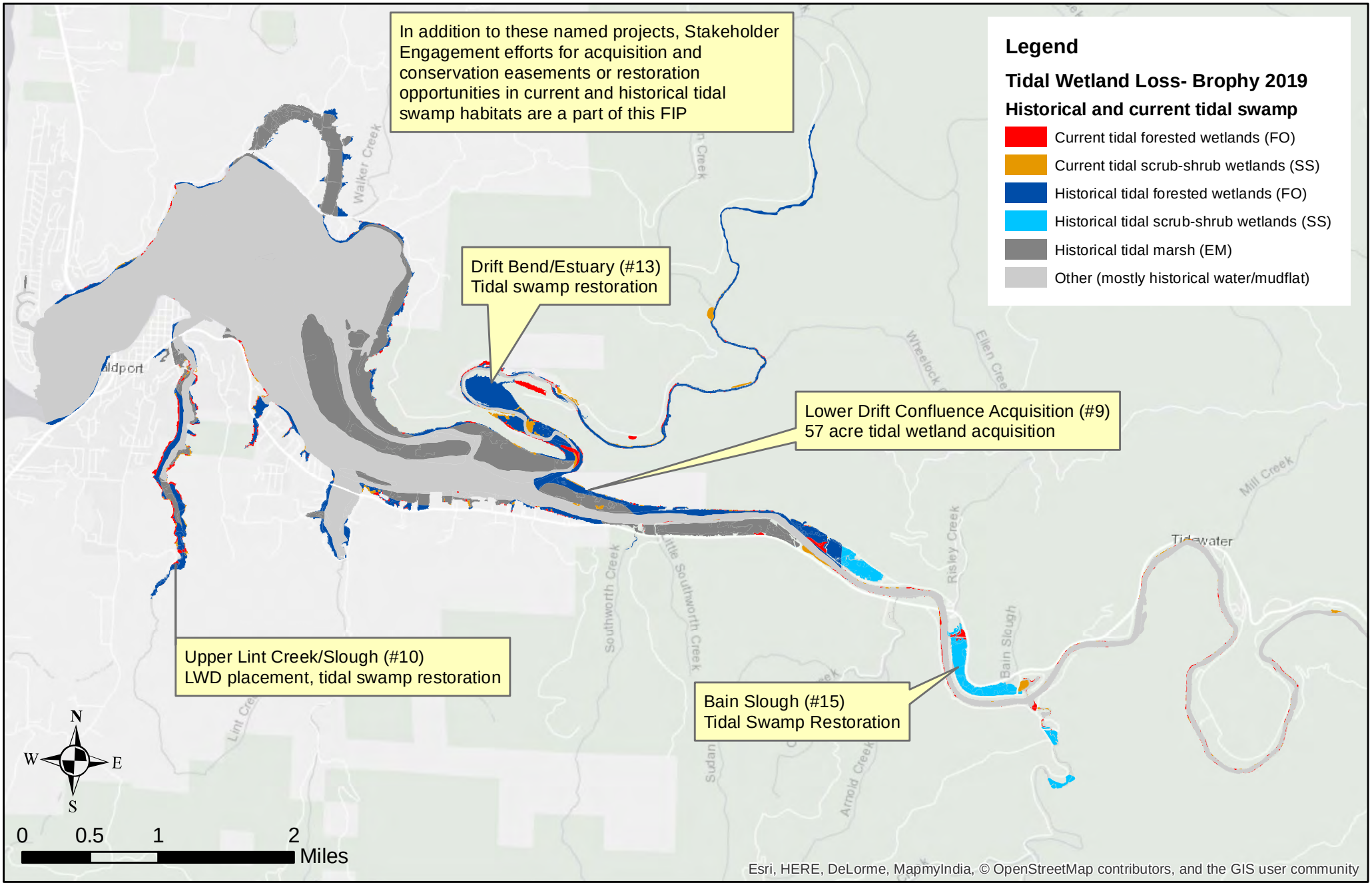
Areas in gray and green are tidal marshes or former tidal marshes that were mapped and prioritized in the "Yaquina and Alsea River Basins Estuarine Wetland Site Prioritization Project" (MCWC/Brophy 1999). Green shaded areas are prioritized projects in this FIP, gray shaded areas offer other potential areas for this project type within the FIP geography.

FIP Project Type 1- Tidal marsh conservation and restoration in areas of existing tidal range
Yaquina Estuary (385 acres)



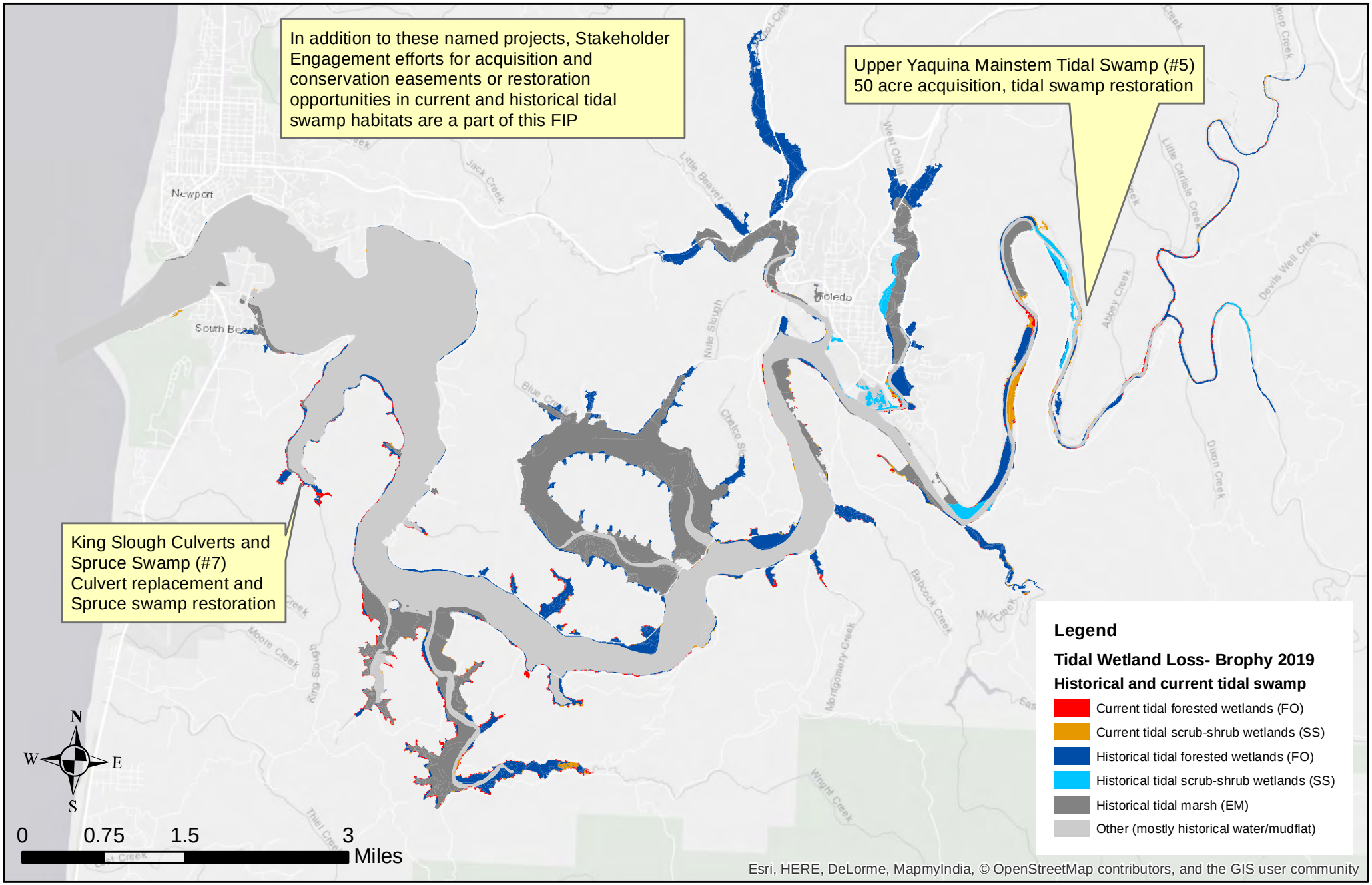
Areas in gray and green are tidal marshes or former tidal marshes that were mapped and prioritized in the "Yaquina and Alsea River Basins Estuarine Wetland Site Prioritization Project" (MCWC/Brophy 1999). Green shaded areas are prioritized projects in this FIP, gray shaded areas offer other potential areas for this project type within the FIP geography.

FIP Project Type 2: Conservation and restoration of Tidal swamp habitat (spruce swamp and scrub/shrub wetlands) Alsea Estuary



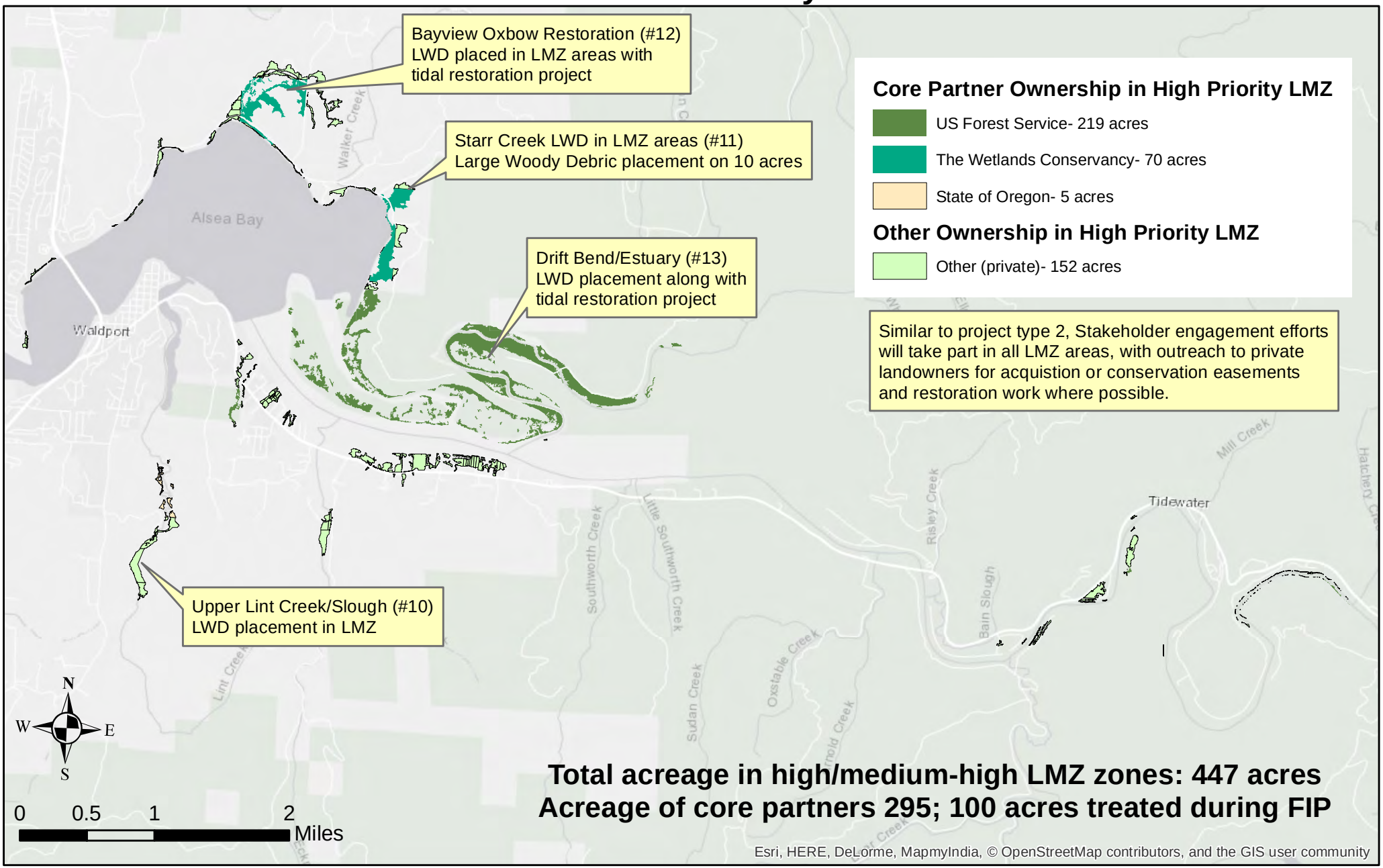
Historical and current tidal swamp habitat was mapped in "Comparing historical losses of forested, scrub-shrub, and emergent tidal wetlands on the Oregon Coast, USA: A paradigm shift for estuary restoration and conservation" (Brophy, 2019).

FIP Project Type 2: Conservation and restoration of Tidal swamp habitat (spruce swamp and scrub/shrub wetlands) Yaquina Estuary



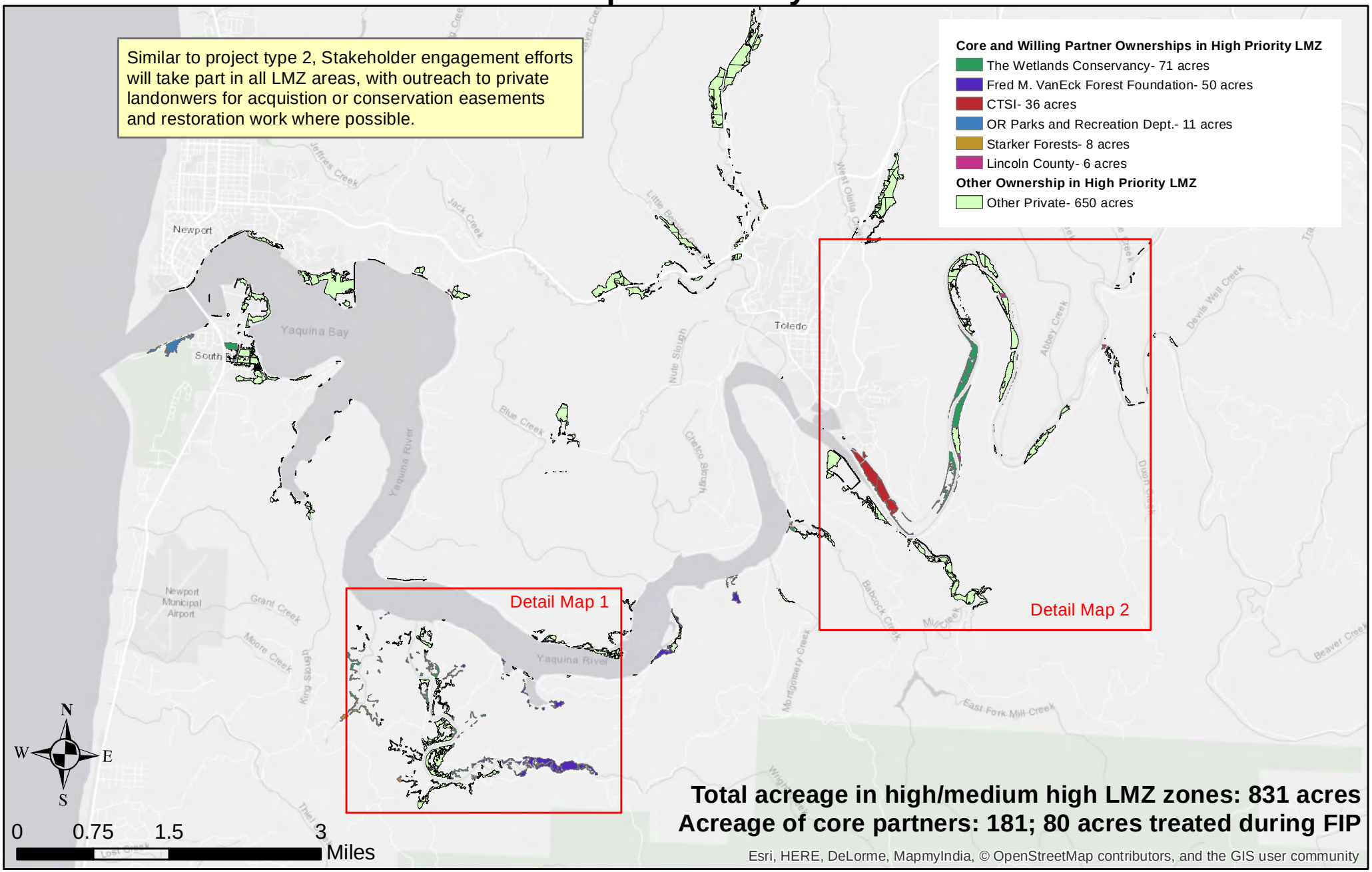
Historical and current tidal swamp habitat was mapped in "Comparing historical losses of forested, scrub-shrub, and emergent tidal wetlands on the Oregon Coast, USA: A paradigm shift for estuary restoration and conservation" (Brophy, 2019).

FIP Project Type 3: Protection and restoration of current and future tidal wetlands within the high and medium-high ranked Landward Migration Zone
Alsea Estuary



This project type is more forward looking, accounting for sea level rise estimates and how the location of tidal wetland will subsequently change. Core partners on this FIP own or manage 295 acres of a total 447 acres in high and medium-high prioritized LMZs. Work in these areas would focus on buildling resilience by placing large quantities of Large Wood Debris to act as nurse logs, invasive species removal, and seeding/planting of native species.

FIP Project Type 3: Protection and restoration of current and future tidal wetlands within the high and medium-high ranked Landward Migration Zone
Yaquina Estuary



This project type is more forward looking, accounting for sea level rise estimates and how the location of tidal wetland will subsequently change. Core and other willing partners own or manage 181 acres of a total 831 acres in high and medium-high prioritized LMZs. Work in these areas would focus on buildling resilience by placing large quantities of Large Wood Debris to act as nurse logs, invasive species removal, and seeding/planting of native species.

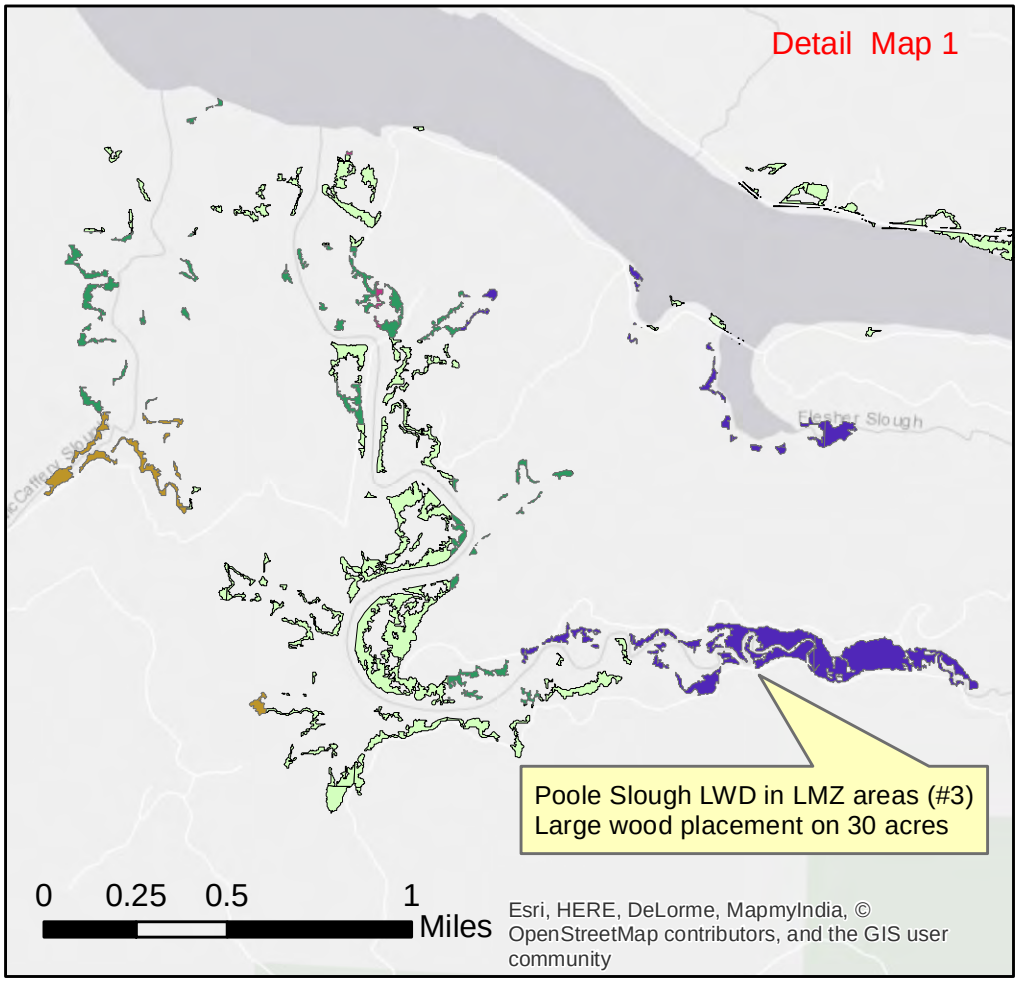
FIP Project Type 3: LMZ protection and restoration detail maps
Yaquina Estuary

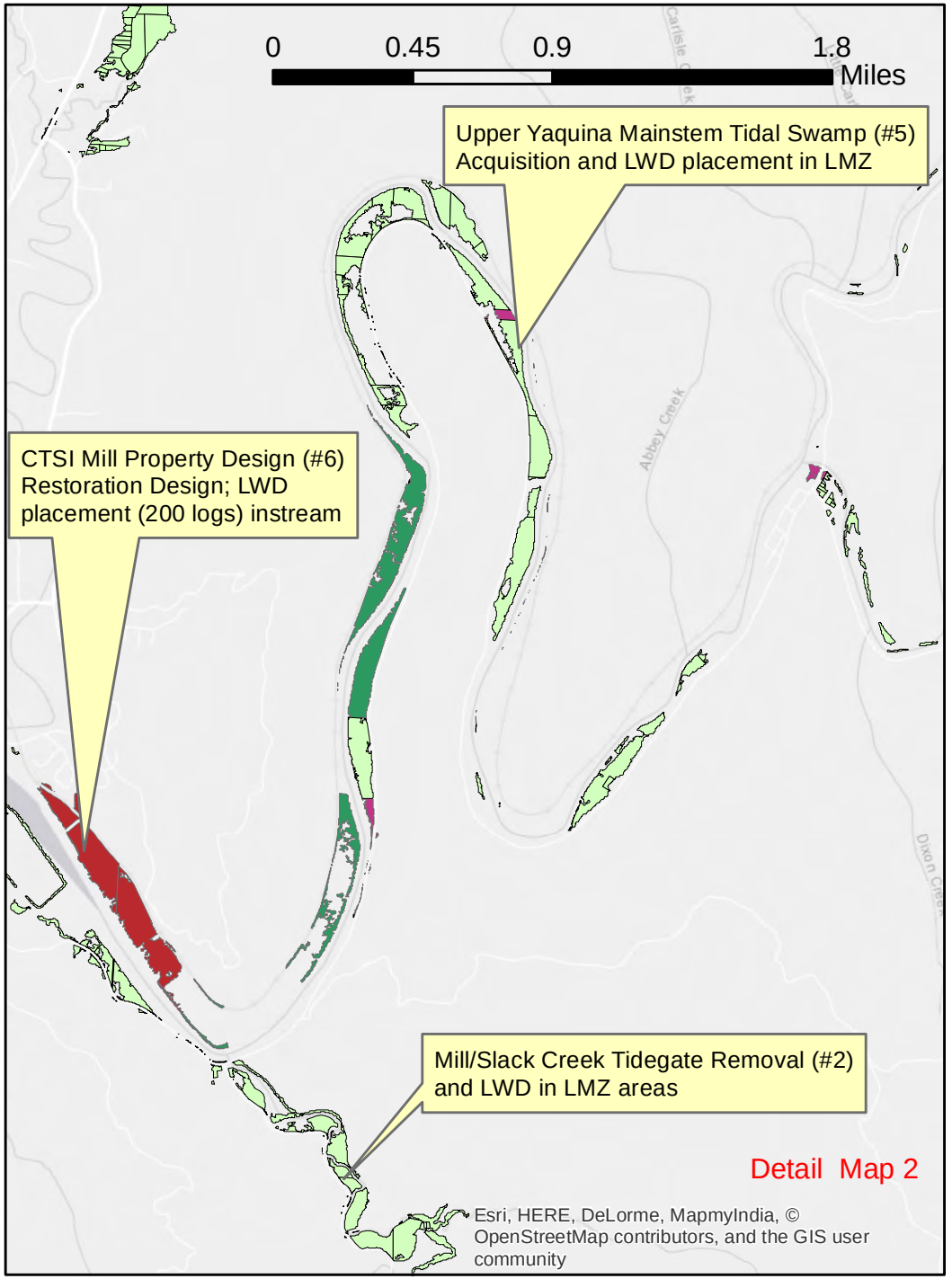
Core and Willing Partner Ownerships in High Priority LMZ

- The Wetlands Conservancy- 70 acres
- Fred M. VanEck Forest Foundation- 50 acres
- CTSI- 36 acres
- OR Parks and Recreation Dept.- 11 acres
- Starker Forests- 8 acres
- Lincoln County- 6 acres

Other Ownership in High Priority LMZ

- Other Private- 650 acres





1. **Project Name and Location:** Boone/Nute Slough Acquisition and Restoration (Project #1)

FIP Project Habitat Type: (1) Acquisition, Restoration
Estimated Cost: Acquisition $3.05m, TA $225k, Restoration $1.6m
Previously Prioritized: Yes, group 1 (highest priority ranking) and #1 priority within that ranking on 1999 estuary assessment. Prioritized due to large size (600+ acres total), relatively few landwoners, and high potential fish use

Project Summary: Boone-Nute Slough was also identified as a high priority restoration site in The Wetlands Conservancy 2011 Lower Yaquina Conservation and Restoration Plan as well as many plans associated with Coho Salmon recovery. While the landowner of the largest property (333 acres of the 600-acre total site) had initially showed some interest in restoration and worked with multiple conservation oriented groups, all those efforts fell through, and the landowner continued to manage the property for agricultural production. That landowner has since passed away and his family is selling 313 acres of the property.

Acquisition efforts have started and an agreement for purchase of those 313 acres no later than November 2022 will soon be entered into (estimated 1.3M); another property owner has expressed interest in providing her property for wetland acquisition as well. The team will initiate conversations with 3 additional landowners on the Boone side of Boone/Nute Slough (as the whole oxbow is called) subsequent to the acquisition of the largest property to facilitate subsequent restoration.

Current Status: A group of local partners are working with the Confederate Tribes of the Siletz Indians and The Conservation Fund to secure bridge funding for this current acquisition, funds are needed to guarantee reimbursement of this funding before the acquisition can proceed. This project include elements from all three FIP project types.

Associated projects: Outreach/Stakeholder Engagement, Technical Assistance (design), and Outreach/ Stakeholder Engagement for additional acquisitions/restoration work on 47 additional acres on Boone side and 313 acres on Nute side of oxbow

Aerial view of Boone/Nute Slough complex. Boone slough is the channel to the left, Nute Slough to the right

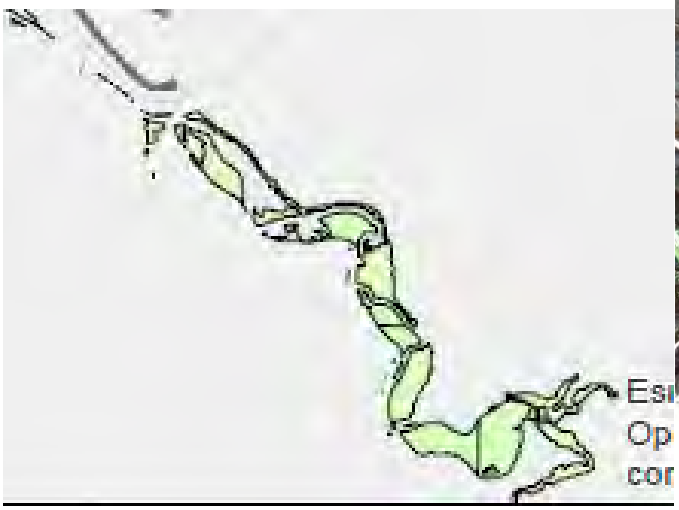
2. Project Name and Location: Mill/Slack Creek tidegate removal, planting (Project #2)

FIP Project Type: (1) (2) (3) Restoration
Estimated Cost: $129k
Previously Prioritized: Yes, group 1 in 1999 tidal assessment

Project Summary: Mill Creek sites were high priority in the 1999 assessment because the system supports healthy runs of wild salmon including chum, coho, steelhead and Chinook. The basin is also an ODFW Life Cycle monitoring site, with an impoundment upstream (City of Toledo source water).

Current Status: Lincoln SWCD had an agreement and funding to complete a tidegate pull and planting project at Y25 site. Unfortunately, the project fell through due to staffing issues and the funding was returned. The tidegate (picture below) is not functioning, and the landowner is not currently using the area behind the dilapidated structure. This project would remove the structure, breach the dike at the current tidegate location, and restore the tidal regime to 5 acres of this portion of the Mill Creek marsh area.

Associated projects: Other work in the Mill Creek drainage would require outreach to other landowners



Most of lower Mill Creek and Slack Creek is High/Medium-High for LMZ, owner is willing to pull and not replace tidegate (right)

3. **Project Name and Location:** Poole Slough LWD placement in LMZ areas (Project #3)

FIP Project Type: (2) (3) Restoration
Estimated Cost: $196k
Previously Prioritized: High/Medium-High LMZ zones, Group 1 in 1999 Tidal Assessment (system mostly seen as intact with only protection needed but now there is the opportunity to build resilience to SLR).

Project Summary: Large amounts of mostly weathered wood for nurse logs will be placed and suitable elevations planted with tidal swamp associated species and with locally collected seed in un-diked tidal wetlands, in areas prioritized in MCWC's 2017 Landward Migration Zone study. In the absence of other information, wood loading amounts will be similar to the NOAA benchmark for streams. As documented by Diefenderfer and Montgomerey, large wood accumulations in tidal swamps is what forces and explains channel morphology in Sitka spruce reference swamps, but these elements are now largely missing due to historic activities.

These swamp restoration efforts are informed by nearby reference site conditions. We will work within 20.5 acres in the Yaquina estuary conserved by the Wetlands Conservancy and Fred M. VanEck Forest Foundation(VanEck)(managed by Pacific Forest Trust) that are largely well-functioning (not diked) but lack this missing, swamp habitat element, and that are likely to persist even with sea level rise. That is, we will work in areas have been prioritized as being able to support vegetated tidal wetlands into the future.

Current Status: MCWC and partners completed a pilot project in this area in 2021, including removing fill from a former county road grade. 150 logs were placed on VanEck properties to act as nurse logs long term. MCWC has additional funding ($48,000) for more LWD placement in summer 2022, FIP funding would increase area where LWD could be placed in this area.

Associated projects: further acquisition by TWC in Poole Slough

LWD placed in LMZ areas in 2021 MCWC pilot project on Poole Slough

Wood can trap sediment and also serve as nurse logs that elevate trees above the tidal plain. Even tiny logs, like this 2-foot chunk above, can provide a spot for spruce and other species to grow above the marsh surface. Once these small trees establish, their root systems then become elevated platforms for further establishment of woody vegetation.

4. Project Name and Location: Yaquina Bay Road pocket wetland culvert inventory and prioritization (Project #4)

FIP Project Type: (1) Technical Assistance, Restoration
Estimated Costs: TA $148,500, Restoration $1.02M
Previously Prioritized: Each wetland individually prioritized in 1999 assessment

Project Summary: This project would assess the size and condition of former tidegates and culverts along the Yaquina North Bay and South Bay Road. A subset of these were surveyed with funding from The Nature Conservancy for a tidegate inventory in 2019, however, many of these were not former tide gates and were not included in those surveys. The road itself acts as a dike and a range of culvert sizes are present in each pocket wetland. Many of these were likely tidegates that are no longer functioning. After data is collected on each culvert site, the sites would be prioritized for culvert upgrade or replacement projects, which could result in a list of culvert fixes to be completed with the FIP timeframe. Existing information (and numbered marsh locations) from the 1999 Yaquina Bay tidal marsh assessment give us a starting point). E.g. Site Y10 appears to be in good condition, so the culvert that carries flow under North Bay Road may be adequately sized. Y10 is a publically owned site (Lincoln County). Y12 has a small culvert which appears to have once been tidegated but is now open. It appears undersized. Y13 has two culverts, a lower concrete culvert and a metal culvert placed about a foot higher, both about 2-foot diameter. Neither is tidegated, but tidal inflow appears to be restricted based on vegetation upstream from the culverts (Agrostis spp). Y18 is mostly mud flat, it looks as if the tidegate may have been removed in the late 1990's. Tidal inflow is evident, based on vegetation. Y19 has weedy upland vegetation mixed in with brackish marsh species. It is ditched. Y20 only has a small area of tidal marsh vegetation, and is highly altered, with roads on both sides of the site and outflow from an excavated pond running through the site. Y36, Y39 and Y41 are all near "known herring spawning areas".

Current Status: Private landowners would need to be engaged for each individual culvert replacement project (and for access during TA phase). Lincoln County Roads would need to be engaged for implementation of culvert upgrade projects.

Associated projects: subsequent restoration grants to replace culverts prioritized through TA

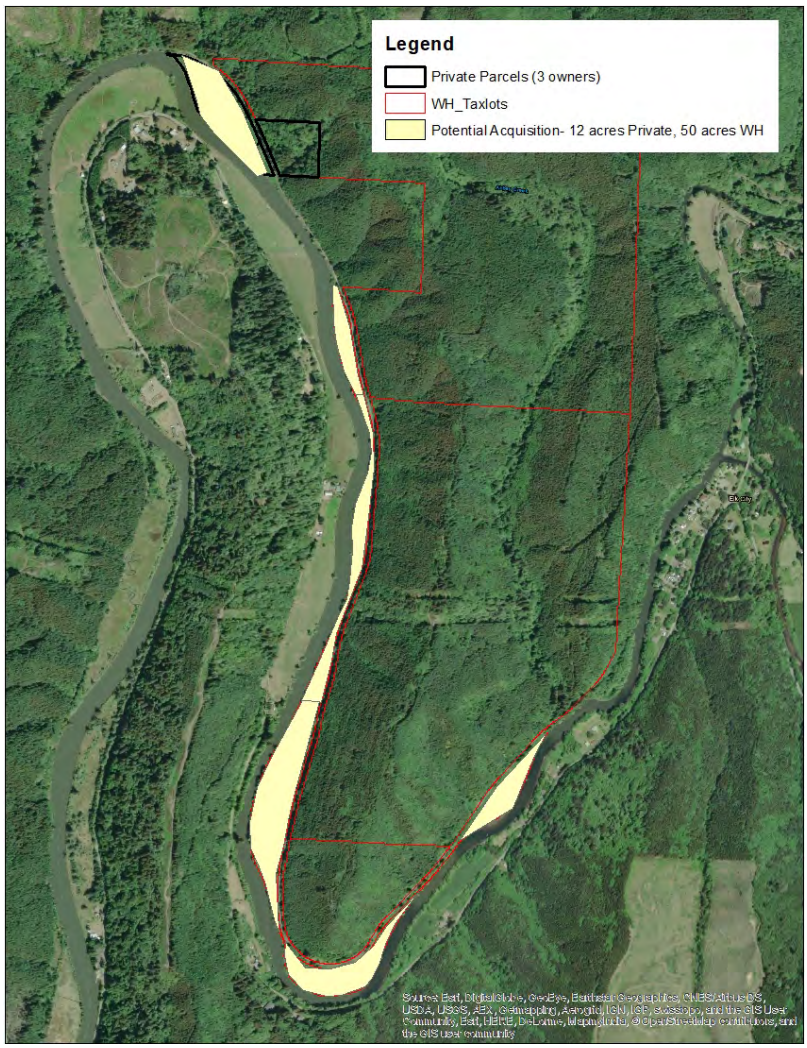
Over 10 culverts, some of which used to be tidegates, are present along North and South Yaquina Bay Roads.

5. Project Name and Location: Upper Yaquina Mainstem Tidal Swamp (Project #5)

FIP Project Type: (2) (3) Acquisition (50 acres), Restoration
Estimated Cost: Acquisition $250k, Restoration $337k
Previously Prioritized: LMZ High/Medium-high properties

Project Summary: Upstream from TWC ownership, these river adjacent marsh areas are not as heavily impacted (not diked, ditched, etc) than others in the same area. Most ownership is now Weyerhaeuser(and the properties have no structures, or access). Restoration work would include LWD placement for long term resilience (LMZ areas), invasive control (blackberry and reed canary grass (RCG), and riparian/marsh species planting (spruce, crabapple, black twinberry, associated species).

Current Status: MCWC and ODFW had traction to complete restoration work at this property when it was owned by Hancock. However, the properties were transferred to Weyerhaeuser in November 2020. Weyerhaeuser contacts recently said they may be interested in selling off the wetland areas as they are not planning tree production in those areas. Acquisition of these lands would be a great step to ensure long term protection, but restoration work could be done with or without acquisition.



Associated projects: future work would include landowner outreach to 12 acres of other private property on the NW corner of the map.

6. Project Name and Location: CTSI Mill Property Restoration (Project #6)

FIP Project Type: (1) (2) (3) Technical Assistance, Restoration
Estimated Cost: TA $150k; Restoration $510k
Previously Prioritized: Not included in 1999 Tidal Assessment, High/Medium-High on LMZ

80-acre former mill site area is High/Medium-High LMZ (red)

Project Summary: This tribally owned and managed 80-acre parcel is just upstream from Toledo on the Yaquina River, adjacent to the Y27 Yaquina Tidal Restoration project site funded in part by OWEB previously that is owned by TWC. The site contains a good quantity of fill material and some structures/ roads/impervious surfaces. However, a series of ditches, culverts and former tidegates do provide some tidal flow throughout the site.

Current Status: Siletz Tribal Business Corporation currently leases portions of the property for mixed use, including some light industrial, but mostly for storage. The fill at the site is mostly river cobble and gravel, and the elevations are currently too high for tidal inundation to cover the site. It is a high priority for LMZs, and could be planted with spruce and other associated species now to build resilience. More complex channel recreation, dike breaching, culvert removal, etc. are also potential restoration options.

7. Project Name and Location: King Slough culverts and Spruce Swamp (Project #7)

FIP Project Type: (1) (2) Technical Assistance, Restoration
Estimated Cost: TA $121k; Restoration $1.17M
Previously Prioritized: Yes, but low priority in group 4 of 1999 Tidal Assessment

Project Summary: King Slough is mostly mud flat, but has areas of fringing tidal marsh. This area has one of the largest areas of remaining Spruce swamp habitat left and a good chunk of former spruce swamp area that is restorable (up to 20 acres). The two major culvert replacements would restore the sedimentation processes upstream and allow more resiliency to sea level rise. Two possible restoration sites are the areas of tidal marsh at the south end of the slough, where the slough forks and each fork has a road crossing and a culvert. A creek flows into each arm of the slough; the eastern creek is larger (about 2 miles).

Current Status: This area is owned by a willing partner swho has been improving habitat in the area (Yakona Preserve and another private landowner).

Two sets of culverts on access roads in King Slough need to be replaced to allow for increased tidal exchange with sea level rise and restoration of sedimentation processes. The culverts on the right are from a low tide showing their poor condition, and above, the landowner walks across the flooded access road during a January 2022 King Tide. The same culverts from the photo on the right are located immediately behind the landowner above.

8. Project Name and Location: Lint Slough- Former Waldport High School site (Project #8)

FIP Project Type: (1) a. Stakeholder Engagement, Technical Assistance Design
Estimated Cost: Stakeholder Engagement 15k, TA: $123,200
Previously Prioritized: Lower site marsh in group 1 in 1999 assessment, did not consider this current upland site adjacent to that marsh.

Project Summary: This 11.47-acre property is located to the south of Highway 34. The former high school buildings, which were constructed in 1959, were removed and the property is now vacant. A stipulation of the grant is that the property be turned into open space. The City and the School District are working collaboratively to explore options for the future use of the property.

Based on a review of historic aerial photographs, it is known that much of the former school property used to be tidal wetlands connected to Lint Slough. As such, one of the options for the property is the restoration of those wetlands. To determine the feasibility of wetland restoration, the City hired Pacific Habitat Services (PHS) to complete an analysis of estuary/wetland restoration options in 2015. Three preliminary restoration options were analyzed in that report.

Current Status: City has not been recently engaged about current plans, so first step would be outreach and stakeholder engagement efforts, followed up with Technical Assistance for Restoration Design. Restoration work would be in future years beyond the current FIP

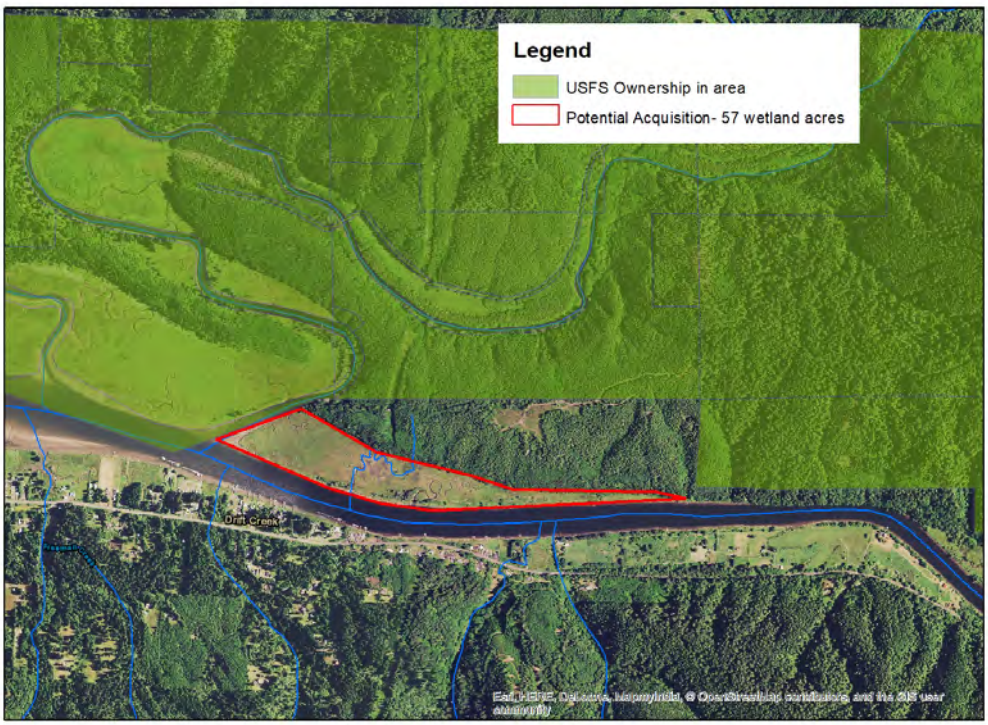
1939 aerial of Waldport High School site prior to construction shows tidal channel connections that can be restored

9. **Project Name and Location:** Lower Drift Estuary Confluence Acquisition (Project #9)

FIP Project Type: (1) (2) Acquisition 57 tidal wetland acres
Estimated Cost: Acquisition $275k
Previously Prioritized: Yes, prioritized for protection in 1999 Tidal Assessment

Project Summary: There are a number of undisturbed high marsh sites at the confluence. Together, they total 57 acres and were noted as the Alsea estuary's highest priority for protection (1999 Tidal Assessment) as they adjoin a large continguous block of protected USFS land. During the FIP, the tidal marsh sites will be acquired.

Current Status: Property just east of the confluence has been for sale for years but appears to be off the market. Properties to the east are owned by industrial timber but could be acquisition targets (tree production not possible in those areas). Most properties to the west and north are in USFS ownership.

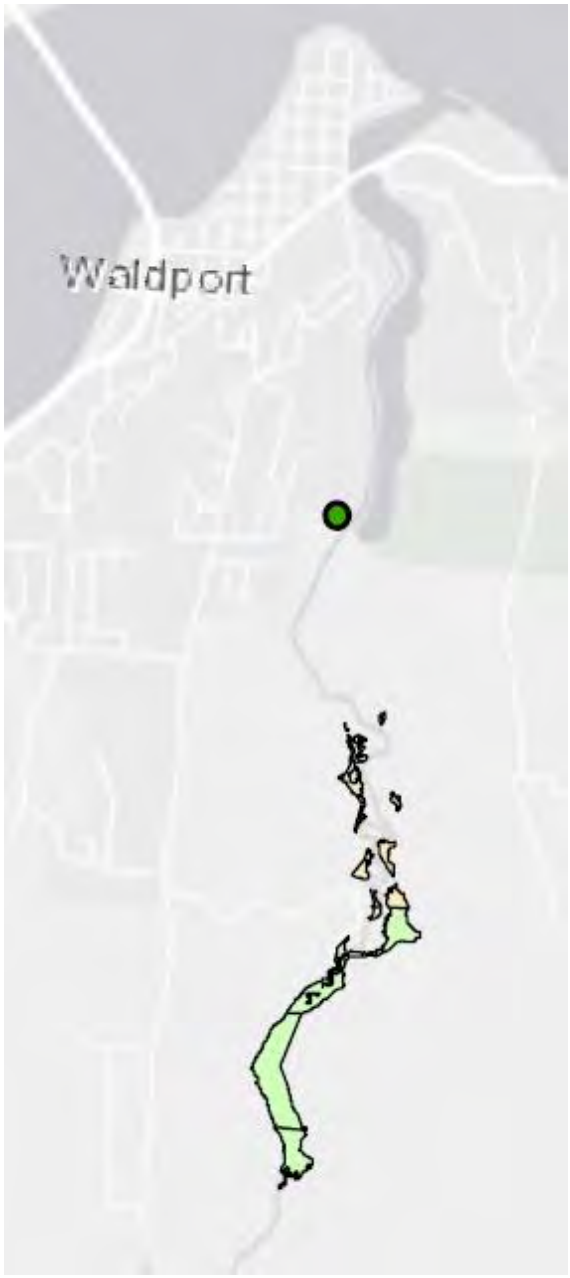


10. Project Name and Location: Upper Lint Creek/Slough (Project #10)

FIP Project Type: (2) (3) Acquisition and Restoration
Estimated Cost: Restoration $193k
Previously Prioritized: Yes, MCWC 2015-2030 Coho work plan- "Secure the areas identified in the LMZ study available for upslope migration of estuarine wetlands…including Lint Creek".
Priority action: Complete large wood project on Lint Creek

Project Summary: Two phases of restoration have restored portions of lower Lint Creek/Slough. The upper portions of the slough are High/Medium-High LMZs

Current Status: Portions of the upper watershed have changed hands from Hancock to Weyerhaeuser in the last year.



A majority of Upper Lint Slough is High/Medium-High LMZ, green dot in middle of image shows existing spruce swamp habitat that can serve as a reference site.

Below is an image of Lint Slough during a recent King Tide, taken near the green dot location.

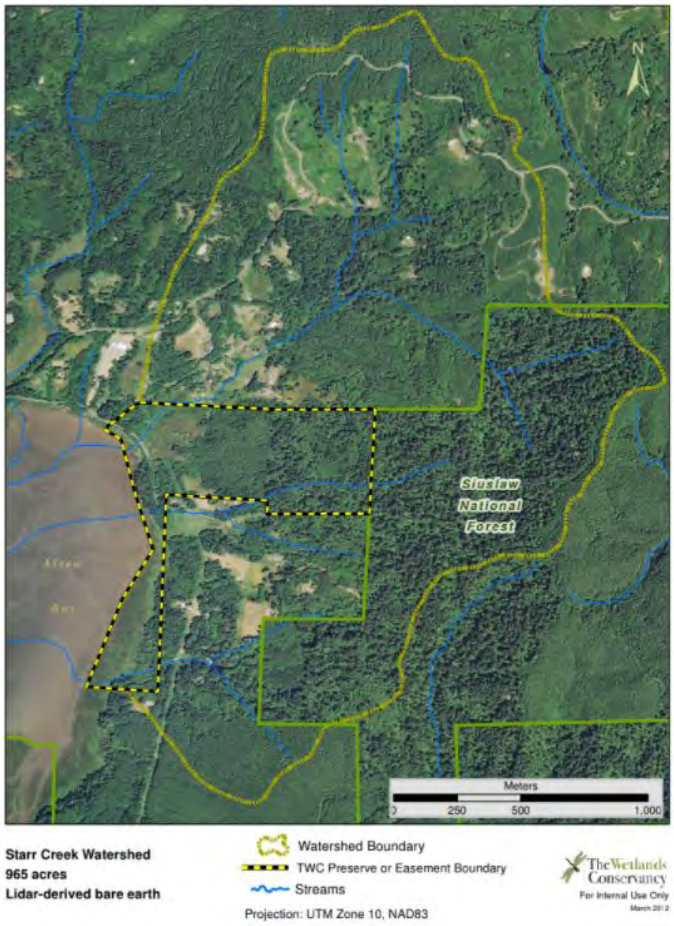
Spruce trees on platforms of other fallen spruce logs are elevated above the marsh surface and can survive occasional flooding like this. In this way, spruce trees are ecosystem engineers, their presence (alive as a tree or dead as a fallen log) modifies their environment for their benefit and that of other species within their functional domain.

11. Project Name and Location: Starr Creek LWD in LMZ areas (Project #11)

FIP Project Type: (1) (2) (3) Restoration
Estimated Cost: $203,500
Previously Prioritized: Group 4 in 1999 Tidal Assessment, High/Med High on LMZ

Project Summary: Large woody debris would be placed on TWC ownership in areas that have been prioritized in the LMZ study. Additionally seeding and planting on the LWD would occur. Currently, much of the site is reed canary grass, so these logs would act as nurse logs, elevated platforms to support growth of Sitka spruce, Pacific crabapple and other associated species. Logs placed instream would act as anchors for beavers to build dams on, and Beaver Dam Anchors could be installed to help beaver establish a persistent pond network.

Current Status: Willing Landowner and Core Partner (TWC); Site has tidal connection since culvert installation in 2014 (visible in image below).



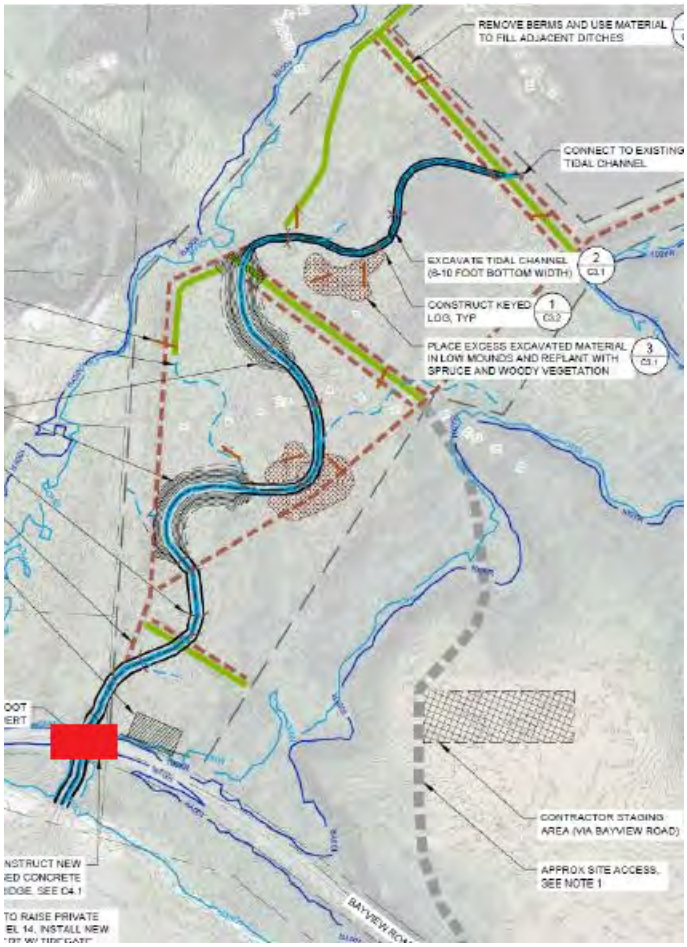
Tidal flow has been restored to this site with a culvert upgrade in 2014, but much of the site is covered in invasive reed canary grass.

12. Project Name and Location: Bayview Oxbow Restoration (West side and Bay Road Bridge) (Project #12)

FIP Project Type: (1) (2) (3) Technical Assistance (bridge design), Restoration
Estimated Cost: TA: $99k, Restoration $1.035M
Previously Prioritized: Group 1 (highest) in 1999 Tidal Assessment

Project Summary: Bayview oxbow is an extensive area of former tidal wetland. In the earliest photos available (1939) the site was already ditched, diked and actively used for agriculture. Tidegates are present on both the west and east side of the oxbows, where Bayview Road crosses the site. The west side tidegate is now a dilapidated culvert, with a reoccurring "trash rack" problem of logs depositing during winter storms. The eastside tidegate is still somewhat functional, but clearly has been patched and is likely to fail soon.

Current Status: TWC has 60% designs for new tidal channels, ditch filling, etc on about 52 acres. Currently, the severely undersized culvert (formerly a tide gate) restricts tidal flow to the west side of Bayview oxbow, a new full spanning bridge is needed to restore full tidal regime and processes at this important tidal restoration site. The new bridge would replace the undersize and dilapidated culvert that currently drains the Bayview Oxbow wetland. The new bridge is intended to provide full exchange of tidal flow, organic matter and woody debris/nurse logs, fish passage, and flux of nutrients and organic material. A summary of the bridge design includes:



Span / length: 50 feet (inside abutments)
Width: 28 feet outside-to-outside; 26 feet between guardrails
Road lanes: (2) 12-foot lanes (11' existing lane width)
Deck elevation: match existing, approx. elevation 14 feet NAVD88 at centerline
Loading: HL-93 (per Lincoln County standards)
Type: prestressed, precast reinforced concrete box girders
Foundation: steel pipe pile-supported conc. abutments (pile length TBD)
Channel width: 30' wide channel opening
Fish passage: tidal stream simulation for min. structure size ~ 1.5 x channel width

Associated projects: Stakeholder engagement and design for similar work on eastside of oxbow.

60% designs in hand for new tidal channels (left) Bridge location is marked by red polygon.

13. Project Name and Location: Drift Bend/Estuary (USFS ownership) (Project 13)

FIP Project Type: (1) (2) (3) Technical Assistance, Restoration
Estimated Cost: TA: $100k, Restoration: $920k
Previously Prioritized:

Project Summary: This site was a former tidal marsh that was diked, ditched, and severely degraded. However, on portions of the site, mostly on the north bank of Drift Creek, there is some remaining intact Spruce Swamp and Shrub-scrub habitat types that can serve as reference sites.

Current Status: The southern portion of this site was addressed by the USFS with the assistance of the Alsea Watershed Council and other partners in early 2000's, opening partial tidal inundation through dike breaching. The remainder of the site has a perimeter dike which can be removed and LWD placed. All of site is on USFS ownership.

Note: Portions of the upland area on this site are currently managed for open elk habitat, which will be considered in the project.

14.a. Project Name and Location: Eckman Lake (Project 14.a.,14.b.)

FIP Project Type: (1) (2) (3) Stakeholder Engagement, Technical Assistance **Estimated Cost:** Stakeholder Engagement $25,000, TA $179,500 **Previously Prioritized:**

Project Summary: Site has been a freshwater lake since Highway 34 construction, was previously tidegated.

Current Status: MCWC has funding and match from the Port of Alsea and an OWEB Stakeholder Engagement grant for intial public outreach about a solution to water quality issues at Eckman Lake. Members of the Board of Commisioners of the Port have expressed interest in restoration of the lake, including returning the site to a tidal wetland. Many of the landowners at the lake are nostalgic about the history of the site as a freshwater lake, but algal blooms and bad water quality are seemingly untenable. Outreach will be followed with restoration design options and subsequent restoration.

Eckman Lake during a King Tide in 2020 (looking north from fishing dock at Nelson Wayside Park). Tidal inflow at highest tides through concrete spillway.

14b. Project Name and Location: Eckman Lake east marsh (private property) (Project 14b)

See above-- these projects are combined in the work plan and budget

Project Summary: The Greenshields property (~16 acres total) is located on Alsea Bay roughly 2.5 miles east of the City of Waldport. The property itself includes intact tidal wetland (~8.4 acres) and two areas (shown in color outline below) in which tidal interaction could be increased. The first area is a small pond (~0.25 acres) that is connected to the Alsea Bay through a small, ~12" culvert. The culvert is located high enough that flow is limited to the pond to only higher tidal flows. The second area (~2.25 acres) is a former tidal marsh that has been diked and cut off from full tidal flow. However, at higher tides the dike is overtopped in at least two locations, and the area does receive some tidal influence. The composition of the vegetation in this second area shows that it does indeed receive intermittent influence from brackish water, with native salt marsh species present in the area.

To restore these areas hydrologic and engineering design are needed to evaluate the best way to increase tidal influence. Both areas have the potential to be important off channel tidal fish habitat. Complicating matters for this project is that the owners of the property live in a house on the property. Any work that is completed to increase tidal exchange would have to include limiting possible damage to infrastructure on the property.

Current Status: Owners have mentioned that their neighbors may also be interested in including their property in the restoration project; set back dikes would likely be needed for both properties.

15. Project Name and Location: Bain Slough (Project 15)

FIP Project Type: (1) (2) (3) Stakeholder Engagement and Technical Assistance
Estimated Cost: Stakeholder Engagement $10k**,** TA $121,250
Previously Prioritized: Yes, top priority in group 1 in 1999 assessment based on original wetland type (spruce swamp)

Project Summary: Bain Slough is tidegated and possibly diked (residential development here may be on a natural levee rather than a man-made dike). Based on tidal channel morphology, current vegetation, historic photos, and the site's location in the estuary, this site appears to have once been spruce tidal swamp. The banks of the Alsea were grazed meadow in the 1939 aerials; at that time, the remainder of the site was similar to current vegetation at a comprable reference site. The reduced salinity due to the tidegates has altered the plant community, increasing the presence of red alder, willow, spirea, slough sedge, reed canary grass, and other freshwater wetland species. More recently, large infestations of yellow flag iris are visible in the area from the nearby highway (Hwy34). However, some of the original vegetation is still present, particularly the scattered, large Sitka spruce that were present in the 1939 aerial. Restoration of tidal flow would allow for return of tidal marsh vegetation.

Current Status: Tidegates were inventoried by MCWC in 2019. More than 50 properties line the slough and acquisition would likely be difficult. Modeling tidegate removal's effect on hydrology will be a good first step to determine if tidal influence can be restored without negatively affecting adjacent properties, with restoration to occur in future years.

Two tidegates present on westside of Bain Slough, one still appears to be functioning (left), one has been damaged and is only a culvert at this point.

Oregon Central Coast Estuary Collaborative Strategic Action Plan

2015-2035

Version: 12/31/2021

Table of Contents

1 INTRODUCTION

The Oregon Central Coast Estuary Collaborative is a network of estuary conservation and restoration practitioners collaborating to improve the health and resilience of estuaries on Oregon's central coast. We exist to provide technical and other support for organizations conducting estuary conservation and restoration on the Central Oregon Coast. The group was initially founded by eight non-profits and watershed councils (the Core Group) but welcomes others who are willing to constructively engage in/support estuary conservation/restoration, either on specific projects and/or more broadly.

The purpose of this strategic action plan is to identify goals and activities we can all work towards and to coordinate our actions to increase the effectiveness, efficiency, and scale of conservation efforts for central coast estuaries. The plan focuses on work we can do as a Collaborative to achieve shared outcomes and to help all participants be more effective; it will complement work each partner is implementing within their own organizations. While deciding on the process we wanted to use to develop our plan, we made the decision to not just aggregate portions of plans that had been developed for specific estuaries but to consciously think about what we could do at a broader scale and as a group to help advance healthy estuaries. We are incorporating ideas from other plans as appropriate, but we didn't want to limit our scope by starting from that perspective.

We used The Nature Conservancy's Conservation Business Planning approach to develop a Strategic Action Plan (SAP) for the group. This approach is derived from the Open Standards for the Practice of Conservation [About Conservation Standards (CS)], but Business Planning puts the emphasis on solid strategy development and de-emphasizes viability and threat assessment. It is designed to address issues that are broader than more traditional place-based work; therefore, it is more applicable to the scale of planning we need for our collaboration.

At the start of our planning process, we brainstormed a list of the primary interests of conservation groups as well as our perception of other key stakeholders' interests (Appendix I). We consulted a set of simple conceptual models illustrating how ecological processes function in estuaries in general (Aldous et al. 2008) to guide our next step of identifying the major ecological, political, or socioeconomic factors that impact primary interests or present opportunities (i.e., conservation situation analysis).

We incorporated these interests into our situation analysis diagrams in a variety of ways. Many of the conservation interests help define our target of "Ecologically Functional Estuaries". While the primary focus of this group is conservation, we also wanted to make sure to capture important social interests, without straying too far into the social well-being realm. We decided "Healthy Estuaries Support Human Communities" captured that perspective. As we built out the diagram, we added "Clean Water", "Carbon Sequestration" and "Recreational & Commercial Opportunities" as additional social interests we wanted to consider. However, some of the social interests in the list can conflict with the conservation interests.

To represent this dichotomy, we started by constructing a situation analysis diagram from a conservation perspective then one from a social perspective. There was a lot of overlap between the diagrams, but this approach helped us identify some factors that did not emerge from the conservation focused diagram. For example, loss of agricultural land can occur from subsidence resulting from the effects of diking (e.g., compaction from livestock, oxidation of peat due to loss of continuous saturation) as well as development and restoration for conservation purposes. Also, many tide gates are failing, and state and federal fish passage rules oftentimes require expensive infrastructure and a potentially lengthy permitting process. This may present an opportunity to work with willing landowners to benefit both conservation and social interests. The two diagrams were then merged into one combined situation diagram that illustrates factors that impact conservation and social interests in central coast estuaries (See Figure 3 in Section 7 below). This process also helped us identify potential intervention points and strategies to help address those factors.

This current plan identifies prioritized strategies and associated objectives with measurable ecological outcomes that we will work to achieve over the next 20 years.

We then constructed diagrams called results chains for most of the priority strategies (See Section 8). Results chains help organizations evaluate strategies by making linkages from strategies to outcomes through a series of "if…then" causal statements. These chains focus on the measurable achievement of results, not activities, and allow determination of strategy effectiveness, even early on, by identifying intermediate results we need to see in order to reduce the threats that affect outcomes. Implicit assumptions are made explicit so they can be tested. Our situation analyses (conceptual models) show the situation today; results chains show desired future conditions and measure whether we're moving towards them. We did a preliminary risk assessment as part of constructing the results chains. We then defined specific activities we will implement to achieve these outcomes and identified lead entities and a timeline for each. These activities are updated periodically. We then identified measures of success.

OCCEC meetings will occur at least biannually and at least once every five years we will have on the agenda to review and update the action plan as needed. Topics will include:

- Review of ongoing activities;
- Review of completed projects (lessons learned);
- New project development;
- Review composition of the group (re. recruiting new participants); and
- Review of Action Plan.

Approximately every five years, monitoring data will be evaluated and used to assess progress towards goals and objectives in the Strategic Action Plan and to update the plan. This will be a formal opportunity to reassess if our strategies are advancing our goals as we anticipated in our theory of change and results chains or if adjustments need to be made. This could occur earlier than five years if conditions change or if there is new scientific information that should be incorporated. As monitoring data show the achievement of goals and objectives, new goals and objectives will be developed to continue to build on these successes.

Action plan review will ensure plan relevancy. Any changes will be documented in a plan addendum, along with rationale for the change. Included will be clarifications and recommendations for plan improvement as we adaptively respond to changes in the ecological, political, and socio-economic environment influencing estuarine restoration and protection. Our results chains will assist us with tracking progress and determining whether strategy changes are necessary. Regular review of the plan will ensure that it remains a "living document" and the addendum will serve as a record of the OCCEC's development as a dynamic and functioning team.

2 PARTNERSHIP ROLES

Implementation Partner	Experience	Anticipated Contributions
Confederated Tribes of Siletz Indians	As a coastal tribe, CTSI has a long tradition of sustainably managing natural resources and supporting estuarine habitats along the Oregon Coast. The current biological staff bring over two decades of experience in prioritization of restoration projects, on-site restoration, and land acquisition of estuarine lands for conservation. Additionally, CTSI has monitored several salt marsh channel systems along the Oregon coast for channel morphology and fish production, producing results that help to influence management practices and better utilization of restoration funding.	CTSI anticipates contributing in two ways. First, CTSI will continue to contribute directly to ongoing methods of completing strategic plans that identify and prioritize conservation, enhancement, and restoration of areas in the central Oregon coast estuaries. Secondly, CTSI plans to provide professional support via hydrodynamic modeling, mapping, and continual monitoring of central coast estuaries' habitat, fish, and shellfish.
Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians	CTCLUSI is a coastal tribe within the focus area that has an innate connection with the land and waters of the Siuslaw Watershed and Coastal Lakes since time immemorial. This connection has shaped their culture and roles as stewards. CTCLUSI has combined their Traditional Ecological Knowledge (TEK) with today's best science, allowing them to integrate traditional resource management into stewardship activities, restoration, and water quality monitoring in the Siuslaw Basin.	CTCLUSI anticipates providing staff to assist with project planning implementation/restoration activities, water quality and fish monitoring activities, outreach and education, and technical assistance for projects that are located within the Siuslaw Watershed and Coastal Lakes. CTCLUSI is also committed to providing plants for restoration that are of cultural significance as funding and resources allow.
Estuary Technical Group (ETG) of the Institute for Applied Ecology	ETG brings broad perspective and experience from decades of on-the-ground tidal wetland restoration and monitoring in Oregon and the Pacific Northwest and has provided strategic decision support for estuary restoration and conservation in all major estuaries of Oregon and across the Pacific Northwest and the West Coast. ETG's work includes analysis of climate change threats to tidal wetlands, and scientific outreach to bring the results of estuarine ecology research into practice for improved estuary management.	ETG provides technical information on estuaries that OCCEC can use for its activities. Examples include mapping of future tidal wetlands under sea level rise scenarios for the whole coast of Oregon; detailed assessment of tidal site alterations and conditions from whole-estuary studies in the Necanicum, Nehalem, Tillamook, Yaquina, Alsea, Siuslaw, Umpqua, Sixes and Elk; and a reference conditions dataset from least-disturbed tidal marsh, scrub-shrub tidal wetlands, and forested tidal wetlands in Oregon that provides a "blueprint" for restoration design.
MidCoast Watersheds Council	The MidCoast Watersheds Council is dedicated to improving the health of streams and watersheds of Oregon's Central Coast, so they produce clean water, rebuild healthy salmon populations, and support a healthy ecosystem and economy. The Council works in an area of nearly one million acres, including all streams draining from the crest of the Coast Range to the Pacific, from the Salmon River on the north to Cape Creek at Heceta Head on its south.	The MCWC will be a core partner in the OCCEC, with anticipated contributions from staff as well as from three members of the board. MCWC expects to continue our focus on whole watershed restoration, from the headwaters to the Pacific, and see collaboration in the five major estuaries (Salmon, Siletz, Yaquina, Alsea, Beaver Creek), as well as smaller direct ocean tributaries with tidal influence in

	Between its incorporation in 1994 and 2016, the MCWC has done assessment, prioritization, restoration, monitoring and outreach projects totaling over $10 million. MCWC has also generated over $19.2 million in local activity through employment and goods and services involved in the restoration work.	Lincoln and Lane Counties. In the past, MCWC has completed watershed assessments based on 6th fields throughout our coverage area and will contribute this data as needed. MCWC also has completed a prioritization of areas for restoration and conservation under an anticipated sea level rise scenario (4.7' expected by 2100). This prioritization includes our area as well as all Oregon estuaries south of the Columbia River through an Estuary Assessment, landward migration zone study funded by OWEB and USFWS. Maps and data for each estuary within the OCCEC is available for use.
Nestucca-Neskowin-Sand Lake Watersheds Council	The NNSL Watersheds Council has worked on estuary restoration since its first Nestucca Bay clean up in 2000. There are four estuaries in our working area: Neskowin, Little Nestucca, Nestucca, and Sand Lake estuaries.	NNSL has established a "Sand Lake Working Group". The working group consists of state and federal landowners and other natural resource stakeholders working within the basin. The goal is to work with a contractor and the working group to share current data and management plans and identify data gaps. Then the contractor will work with partners to acquire any needed data to produce a limiting factors analysis for coho within the estuary and stream system. The final goal of the process will be to use the LFA to identify potential restoration projects and partnerships to execute those projects. NNSL also works actively in the Nestucca and Neskowin estuaries doing clean-up initiatives and restoration projects.
Siuslaw Watershed Council	The SWC has prioritized conservation and restoration of estuary habitat on the Siuslaw River since the early 2000s and has accomplished estuary restoration projects as an organization and as a member of estuary restoration-focused partnerships. Estuary restoration was identified as an organizational priority in the SWC's 2004 Strategic Plan, in 2005 the SWC worked with Green Point Consulting to complete a prioritization study for conservation and restoration of estuary land, and strategic conservation and restoration of estuary land continues to be a focus for SWC efforts. The SWC also has extensive experience with developing partnerships and working within them to accomplish watershed restoration.	The SWC will continue its commitments as a core partner in the OCCEC and will utilize its extensive restoration and partnership experience and its Siuslaw estuary-specific knowledge in support of the OCCEC.
The Nature Conservancy	TNC identified estuarine conservation in Oregon as one of its top priorities in its 2012 Strategic Plan. In addition to broader-scope	TNC is currently providing facilitation services to the Collaborative. In addition to on-going facilitation of the

	strategies, TNC is working to restore estuarine habitats at two preserves in the Tillamook Bay area. TNC has been organizing small groups of conservation practitioners into partnerships known as Learning Networks since at least 1999 to accelerate conservation work. TNC also has a lot of experience with conservation planning.	group, TNC expects to continue our restoration work at our Kilchis Estuary Preserve, assist with estuary acquisitions, participate in the Tillamook County Wetland Restoration Task Force, participate in developing a coordinated estuary restoration monitoring framework, share our tide gate prioritization tool with partners, and participate on the Tide Gate Coalition.
The Wetlands Conservancy	TWC has developed conservation plans and strategies for the Yaquina and Alsea lower watersheds and estuaries. TWC owns and manages 500 acres in the Yaquina and 225 acres in the Alsea and has worked closely with State Parks on acquisition and management of the Brian Booth State Park in Beaver Creek. TWC is working with Confederated Tribe of Siletz Indians to do a Conservation Area Identification and Priority Plan for the Lower Siletz Watershed.	TWC will continue our annual King Tide flights and photography and provide those photographs to the collective. TWC is continuing to improve our restoration and conservation prioritization tool and hope others can use it. TWC created a conservation priority map from the Salmon River to Coos Bay. The areas are blobs not down to the parcel level. We have worked with many OCCEC partners on the map, we want to continue working with OCCEC to update the map and track conservation of those areas over time by the collaborative.
Tillamook Estuaries Partnership	TEP is a National Estuary Project started in 1999. It has a Comprehensive Conservation and Management Plan that outlines 63 actions to address water quality, habitat restoration, flooding, and stewardship to improve the health of the Tillamook Bay. Since 2002, TEP has expanded its study area to include all of the estuaries in Tillamook County and implements a robust water quality monitoring program in all of the bays and their watersheds and has been active in restoration, either as a lead or partner, throughout the study area.	The TEP will continue to be a core member of the OCCEC providing technical assistance, policy guidance, and implementing on-the-ground projects that positively impact estuarine health throughout the 5 estuaries in Tillamook County.
U.S. Fish & Wildlife Service Restoration Programs	The US Fish and Wildlife Service's Coastal Program has supported many estuarine-related endeavors on the central Oregon coast, including several OWEB funded projects such as the Landward Migration of Tidal Wetlands in Oregon Estuaries. USFWS has also completed estuarine restoration projects at Siletz Bay NWR, Nestucca Bay, and at the Miami and Salmon Rivers and has assisted Oregon State Parks and other landowners with their efforts to enhance salt marsh habitats.	The USFWS will continue to guide the OCCEC's development and implementation of its strategic plan. Technical assistance with individual projects will be provided as needed, including site assessments, fish and wildlife surveys and data synthesis, permitting, and environmental compliance. Project funding is available through several Service programs, as well as the ability to bring in scientific expertise in fish passage, geomorphology, engineering, and other disciplines.

3 SCOPE

Focus Area

The focus area for this partnership is estuaries on the Central Oregon Coast from the Siuslaw Estuary to Nehalem Bay (Figure 1). Our justification for agreeing on this area includes both ecological and social/logistical factors. The estuaries within this geography are predominately classified as drowned river mouth estuaries, while further south, there are more lagoon types. There is also a separate group of partners working on estuaries on the south coast. Under our FIP Capacity-building grant, we agreed to expand our northern boundary to include the Nehalem Bay estuary. This incorporates all the Tillamook Estuaries Partnership service area and is probably the extent to which we can expect participants to travel to meetings. Further north, there are few major estuaries outside of the Lower Columbia, which stands alone.

Organizational Goals

- Gain an understanding of conditions and threats to estuaries on the central Oregon coast.
- Develop priorities for conservation and restoration activities within our geographic scope.
- Improve knowledge, effectiveness, efficiency, and capacity for participating organizations to do estuary conservation and restoration.
- Engage in conservation and restoration efforts at a larger scale than members could do individually.
- Improve capacity to monitor the effectiveness of restoration and conservation actions.
- Analyze the effectiveness of the Collaborative and continually seek to improve.
- Share accomplishments, results, and knowledge gained as a result of our activities.

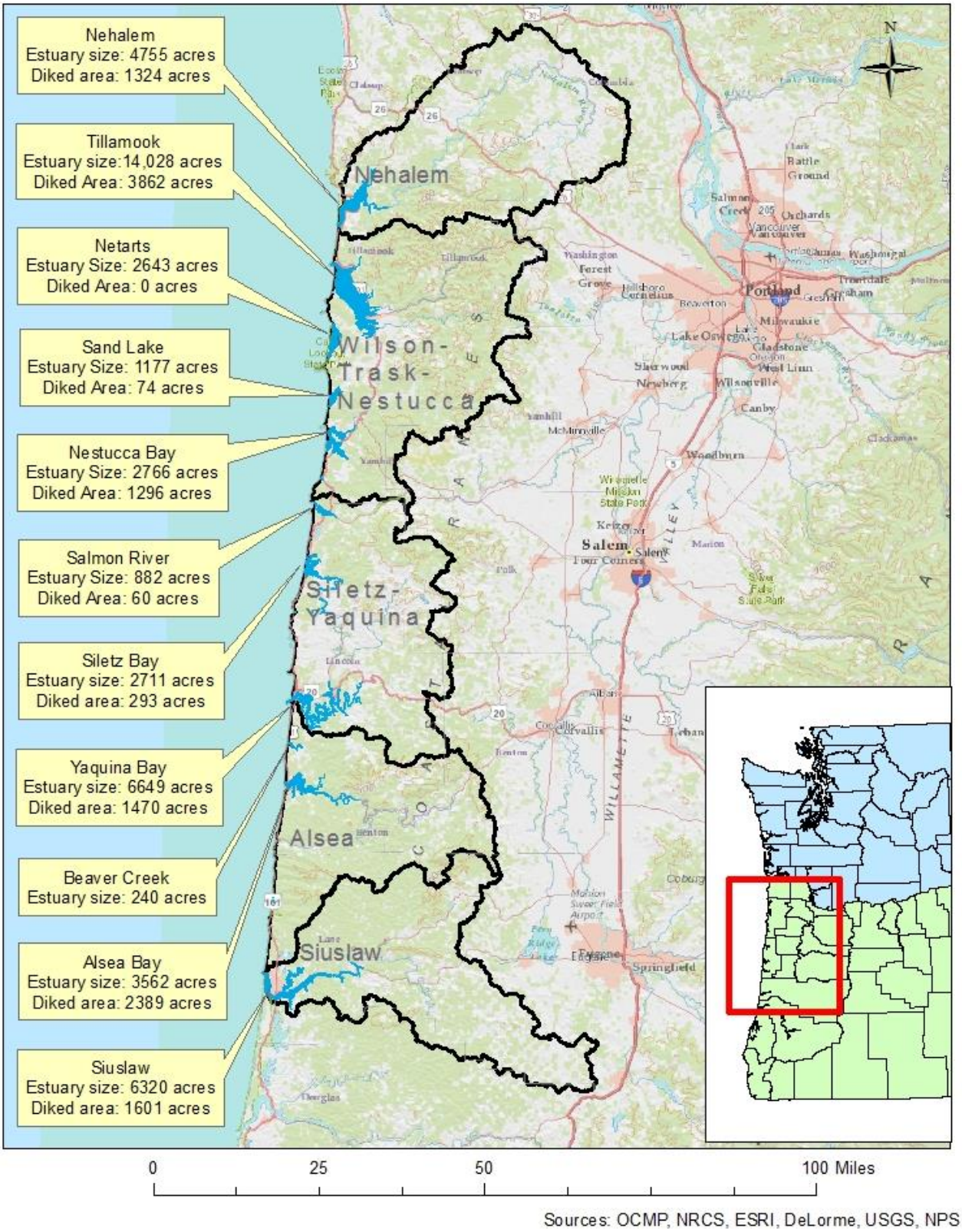
Temporal Scope

This plan was first developed in 2015/2016 and updated in 2020/2021. As we thought about our long-term goals, we decided it might take 20 years to achieve them so we set that as the timeframe for this plan with the understanding that we would periodically review and update it as conditions changed.

4 VISION

Our vision and long-term ecological goal is a network of healthy and resilient estuaries on Oregon's central coast that sustain a full complement of thriving native fish and wildlife populations, and support economically and socially vibrant communities.

Figure 1. Oregon Central Coast Estuary Collaborative focus area



5 ECOLOGICAL PRIORITIES AND GOALS

The land-sea interface found in estuaries is one of the most ecologically rich and complex habitats on earth. It supports an extraordinary array of fish, shellfish, birds & mammals including coho & other salmon, migratory birds, and juvenile marine fish and forage fish. Estuaries provide nursery habitat for many of Oregon's most valuable coastal commercial and recreational fisheries including crab, salmon, and steelhead, as well as supporting a host of other species such as lingcod, green sturgeon, brown rockfish, starry flounder, English sole, and herring (Hughes et al. 2014). Estuaries also provide important social services such as flood control, sediment detention, carbon sequestration and water quality improvement.

The Open Standards planning approach we are using recommends the selection of ecological communities or systems as "coarse-filter" conservation targets (Parrish et al. 2003). These ecological systems/habitats are chosen to represent and encompass the full suite of biodiversity in the project area for place-based conservation. Individual species can also be selected to supplement the system targets if conservation of the system itself would not be sufficient to conserve especially significant species with special needs beyond a healthy functioning system. Since our group's focus is on the estuarine systems on the central coast, we felt that our conservation target should be "Ecologically Functional Estuaries". While we recognize that impacts to the upper watersheds draining into the estuaries do affect estuarine health, we felt the historic loss of tidal wetlands in the estuaries due to diking and other alterations was the biggest threat to that system so that is where we are focusing our efforts. These complex systems warrant the multi-disciplinary approach of our collaborative to support, learn from, and build on each other's work.

In addition to this conservation target, we wanted to highlight that conservation of estuaries can also result in outcomes that enhance human well-being and benefit the local economy such as: reduced flooding, increased recreational opportunities, healthier fish & wildlife resources, clean water, and benefits to the local economy from implementing restoration projects. So, we identified the following Human Well-being targets as well: healthy estuaries that support human communities, clean water, recreational & commercial opportunities, and carbon sequestration.

The need to increase the scale of estuary conservation is supported by a diversity of plans. Oregon's Coast Coho Plan calls for restoration of 5000 acres of tidal wetlands statewide. Estuaries are identified as a Strategy Habitat in the Oregon Conservation Strategy. Strategy habitats are those with a high degree of historic loss and that are important to recover and conserve to support a broad suite of species. The National Marine Fisheries recovery plan for Oregon Coast Coho (NMFS 2016) calls out the need for estuary restoration. Protecting and restoring healthy ocean and coastal habitats (including estuaries) is one of the seven priority areas identified in the West Coast Governor's Agreement. The OWEB Watershed Health Indicators for Oregon Coast Coho ESU identifies benchmarks needed for viable estuaries. The amount of hydro-modification is a key one; "Extent of wetlands altered by restricted flow: Limiting: > 40% of historic wetland area modified, Moderate: 20-40% of historic wetland area modified, Adequate: <20% of historic wetland area modified" (Bauer et al. 2008; pg. 53). Goal #1 below is based on these benchmarks and would bring all estuaries in our focus area up to at least the "Moderate" level. Estuaries are mentioned as a priority in many other conservation plans on the Oregon Coast by a variety of other entities as well.

> GOAL 1: By 2040, the percent of functional tidal wetlands across the OCCEC Focus Area will be increased from current 43% to desired > 60% by increasing hydrologic connections to tidal flows, restoring channels, and replanting native tidal wetland vegetation as needed.
> GOAL 2: By 2040, key estuary lands will be protected through fee title acquisitions or long-term easements to conserve current, and potential future, tidal wetland areas that are likely to withstand sea level rise into the future.
> GOAL 3: By 2030 there will be increased landowner acceptance and understanding of the ecological benefits estuaries provide and the projects that restore them.

GOAL 4: Through science, collaboration, and engagement with community members and decision makers, there will be improved opportunities to advance estuary conservation, restoration, and resiliency on the Central Oregon Coast.
GOAL 5: By 2035, at least 5 priority transportation or other infrastructure impact project sites have increased hydrologic connection to tidal flows.
GOAL 6: By 2035, each Central Coast estuary has an invasive species Early Detection Rapid Response program in place to catch new invasions early.

6 PROFILE OF THE FOCUS AREA

The estuaries in our focus area extend from Nehalem Bay at the north end to the Siuslaw Estuary on the south. The major estuaries include: Nehalem, Tillamook Bay, Netarts, Sand Lake, Nestucca, Salmon River, Siletz Bay, Yaquina Bay, Beaver Creek, Alsea Bay, and Siuslaw, as well as smaller ones associated with smaller rivers, e.g. Neskowin Creek, Devils Lake, Yachats River, Tenmile Creek, and Sutton Creek. Multiple tables in Appendix II provide summary information about these estuaries. The estuaries of our central coastal zone vary greatly in size from Tillamook, with an area of around 14,000 acres, draining an area of almost 360,000 acres (560 square miles) to very small estuaries, with estuary drainage areas of 11,000-17,000 acres (17-27 square miles). Short profiles of the major estuaries in our focus area can be found in Appendix III.

There are thirty-six estuaries inventoried in our study area in the 2014 "Inventory and Classification of West Coast Estuaries" (Heady et. al. 2014). According to the CMECS classification system (the Coastal and Marine Ecological Classification System, the national standard for classifying estuaries) most of the estuaries in our focus area (27), including all the large estuaries, are classified as riverine estuaries. Six of the estuaries are considered "Lagoonal Estuary" (Lake Lytle, Smith Lake, Chamberlain, Sears, Sand Lakes and Fogarty Creek) and one (Netarts) is considered an "Embayment/Bays" (see Appendix II, Table C for definitions of estuary types). Appendix II, Table A contains data on total historical area of tidal marshes and swamps, and the proportion of those tidal wetlands that have been lost; the data are from Brophy (2019) whose analysis was primarily based on the Oregon Coastal Management Program's mapping of diked areas (Lanier et al. 2014, available on DLCD's Coastal Atlas).

The Department of Land Conservation and Development has classified 21 of the large estuaries on the coast into three categories (based largely on the conditions and uses of the estuaries when the classification was being done, in the early 1970's). These categories are Natural, Conservation, and Development (Shallow Draft, dredged to less than 22' depth and Deep Draft, dredged to deeper than 22'). In our focus area, we have two estuaries classified as Natural (Sand Lake and Salmon River), four classified as Conservation (Netarts, Nestucca, Siletz and Alsea), three classified as Shallow Draft (Nehalem, Tillamook, Siuslaw) and one classified as Deep Draft (Yaquina). Even within Development estuaries, there are management units designated for natural and conservation uses.

The Oregon Central Coast Estuary Collaborative includes active representatives from Federal agencies such as the US Fish and Wildlife Service and USDA Forest Service. These entities own and manage 15% of the estuarine lands in our focus area overall but as much as 82% in some estuaries such as the Salmon River (Table 1 & Figure 2). We have representation from state agencies such as Or. Dept. of Fish and Wildlife; also, local non-profit and watershed council partners are working directly with Or. Parks and Recreation Dept. staff in estuaries where they own property. We also have active participation from the Confederated Tribes of the Siletz Indians and the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians. Several land trusts own estuarine property in the focus area including: Lower Nehalem Community Trust, North Coast Land Conservancy, The Nature Conservancy, The Wetlands Conservancy, and McKenzie River Trust. Nearly all of these land trusts are actively engaged in the Collaborative.

Many of the estuaries are owned primarily by individual, private non-industrial landowners. Engagement of such a large number of diverse landowners across a wide geography is challenging, so our approach is to work through various local groups such as the watershed councils and the Tillamook Estuaries Partnership in their local estuaries. We also hope to work with other entities with connections to these landowners such as the local Soil & Water Conservation Districts and Natural Resources Conservation Service more in the future (many of them are included in our e-mail distribution list but only some have been more active in the partnership to date). In addition, one of our Outcomes identified in the action plan is to foster increased social acceptance and understanding of the ecological benefits estuaries provide through various methods of engagement with this key audience.

Table 1. General land ownership in the focus area by estuary.

	All Major Estuaries	Nehalem	Tillamook	Netarts	Sand Lake	Nestucca Bay	Salmon River	Siletz Bay	Yaquina Bay	Beaver Creek	Alsea Bay	Siuslaw
Federal	15.0%	0.0%	0.1%	0.0%	0.4%	22.8%	82.0%	24.6%	0.0%	0.0%	21.7%	11.5%
State	4.9%	4.0%	0.0%	70.5%	10.7%	5.6%	0.7%	0.0%	1.3%	36.2%	2.2%	3.8%
City and county	1.1%	0.0%	0.9%	0.0%	3.4%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	4.5%
Tribal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
Private industrial	2.0%	4.4%	0.4%	2.0%	0.0%	1.2%	0.0%	3.0%	19.3%	3.3%	2.9%	0.1%
Private non-industrial	77.0%	91.6%	98.7%	27.5%	85.5%	70.3%	17.4%	72.3%	79.2%	60.5%	73.1%	79.9%

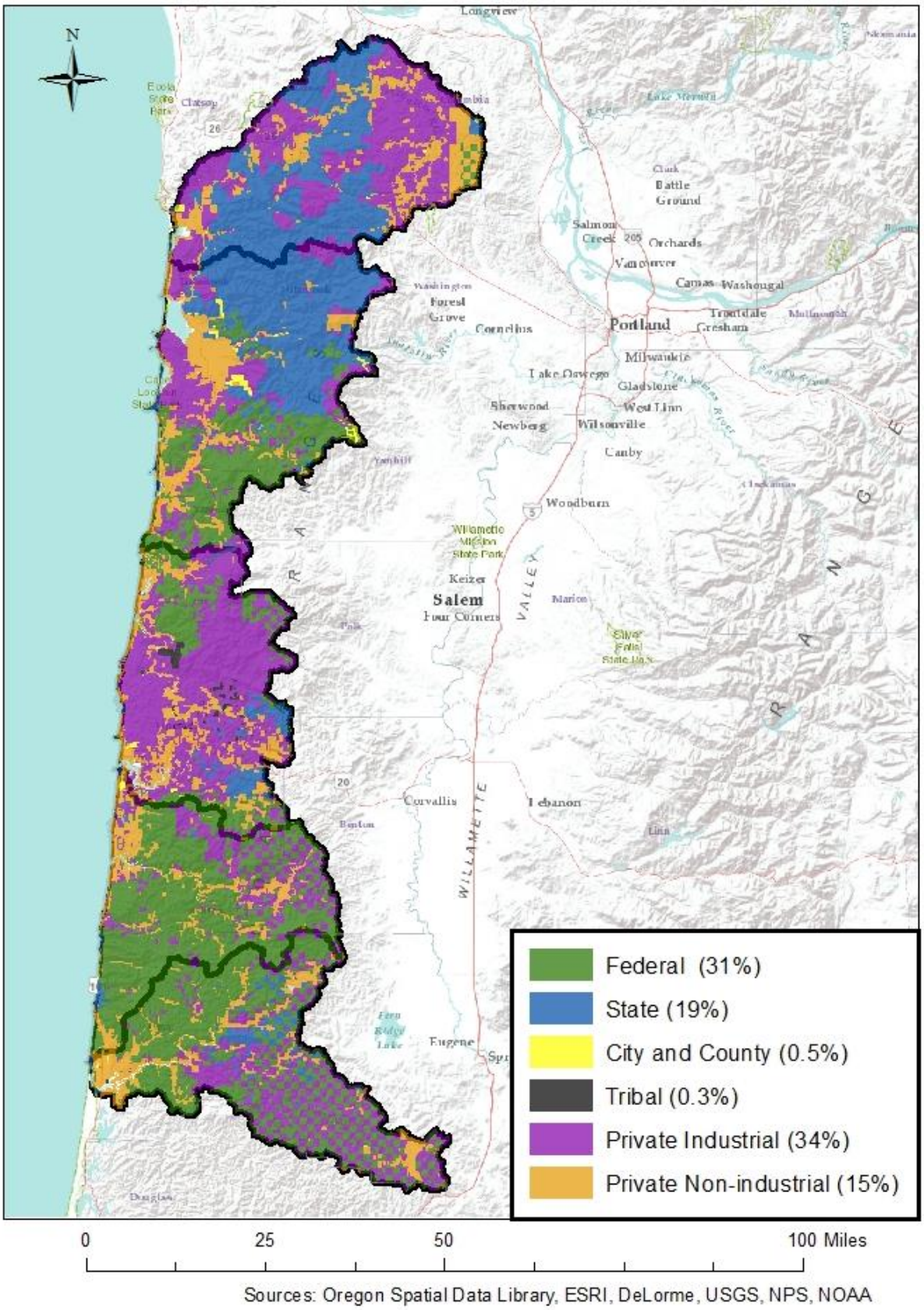
Commercial fishing is an important economic factor in the communities within the focus area. The commercial fleet in the focus area operates primarily out of Garibaldi (Tillamook Bay), Pacific City (direct ocean launch), Depoe Bay, Newport (Yaquina Bay), and Florence (Siuslaw estuary). These fleets concentrate primarily on the offshore groundfish (e.g., whiting, flatfish, sablefish, rockfish), Dungeness crab, shrimp, salmon, and tuna fisheries. There are some small commercial bait fisheries (e.g., sand and mud shrimp, clams), within several of the focus area's estuaries (Tillamook, Siletz, Yaquina, Alsea, and Siuslaw). Yaquina Bay once supported a commercial herring fishery but hasn't in recent years. Recreational fishing (e.g., salmon, herring, perch, rockfish, flounder, sturgeon, crab, clams, shrimp [sand and mud]) occurs throughout our central Oregon Coast estuaries and recreational charter boat fisheries are most active in Garibaldi (in Tillamook Bay), Depoe Bay, Yaquina Bay, and Florence (on the Siuslaw).

Two estuaries in our focus area contain commercial oyster operations for the non-native Pacific oyster (Netarts and Yaquina), and native oyster restoration is also ongoing in those estuaries. These bays were documented to have historic populations of native oysters (which were overfished in the 1800s for markets in San Francisco and New York). Native oyster restoration has been promoted by The Nature Conservancy, the Confederated Tribes of Siletz Indians, and Oregon State University.

There has been much federal, state, tribal, county, and non-governmental interest and investment in our area's major estuaries. Two of our area's estuaries contain USFWS refuges (the Nestucca and Siletz), the Tillamook Estuaries Partnership evolved from a Tillamook Bay National Estuary Program funded by the Environmental Protection Agency (EPA). The Oregon Watershed Enhancement Board, the USFWS's Coastal Program and National Coastal Wetlands Program, the US Forest Service (USFS), the Pacific Coast Joint Venture, Ducks Unlimited, and Western Rivers Conservancy and other funders have helped watershed councils, land trusts, and The Confederated Tribes of Siletz Indians to acquire or restore tidal wetlands for conservation and restoration throughout our area. Additionally, the USFS, the EPA, The Confederated Tribes of Siletz Indians, Oregon Department of Fish and Wildlife, Oregon Department of State Lands, and Oregon State University have also all played roles in studying estuaries and their restoration.

There has been considerable progress made in initiating estuarine restoration projects within our focus area. Table D in Appendix II summarizes tidal wetland restoration efforts by estuary (as of 2017). The projects listed in this table are those that endeavor to restore more natural hydrological and biological processes and functions (e.g., removing or breaching dikes, initiating channels in historic locations, filling drainage ditches etc.).

Figure 2. General Land Ownership in the Watersheds of the Focus Area



7 CONSERVATION NEEDS AND OPPORTUNITIES

Although geographically estuaries cover only a small area, the essential ecological functions they deliver make them critically important. Estuaries provide key habitat for a broad range of fish and wildlife, including many economically important marine species and species of concern, such as black brant and sturgeon. They provide habitat for salmon transitioning to salt water as well as a food-rich environment that supports rapid growth of juvenile salmon prior to ocean entry. In their study of coho salmon use of restored and natural estuarine wetlands in the Salmon River, Jones et al. (2014) found that estuarine-associated life-history strategies accounted for 20–35% of the adults returning to spawn. Estuaries also support other important social and ecosystem services such as flood control, water quality, carbon sequestration, and coastal food web support.

People use estuaries in a variety of ways including agriculture, recreation, and transportation. However, 150 years of increasing human use have taken a toll on our estuaries, resulting in substantial loss of estuary habitats. Tidal wetland losses average around 60% for tidal marsh and 95% for forested and shrub tidal swamps (Brophy 2019), leaving only a small fraction of the high-quality tidal wetlands that once provided the valued services listed above. However, our group realizes that the human uses that have reduced the area of tidal wetlands also have high cultural and economic value. Therefore, we seek to integrate our approach with human uses, by working to enhance ecological functions on working lands, improving road infrastructure, and restoring ecosystem services estuaries provide such as flood control for example.

Altered Key Ecological Attributes (from Aldous et al. 2008) form the basis for understanding what the direct threats are to estuaries. Such critical ecological attributes, if missing or altered, would lead to loss of estuarine function over time. These key altered biophysical factors are: reduced habitats, tidal & floodplain disconnection and altered circulation, altered sediment regime, degraded sediment quality, degraded water quality, and climate change impacts (e.g., change in timing & distribution of rainfall, increased storm surges & intensity, acidification and sea level rise).

The primary human activities leading to these altered conditions (i.e., direct threats) include incompatible agricultural activities (such as dredging, ditching, tiling, tide gates, and dikes); introduction of invasive species; competing land uses; roads, railroads & inadequate culverts; septic systems; stormwater runoff; industrial development in estuaries; and incompatible forestry practices. Additional threats to the social targets include loss of productive agricultural land, natural hazards, loss of access to estuary lands for recreation, and overfishing.

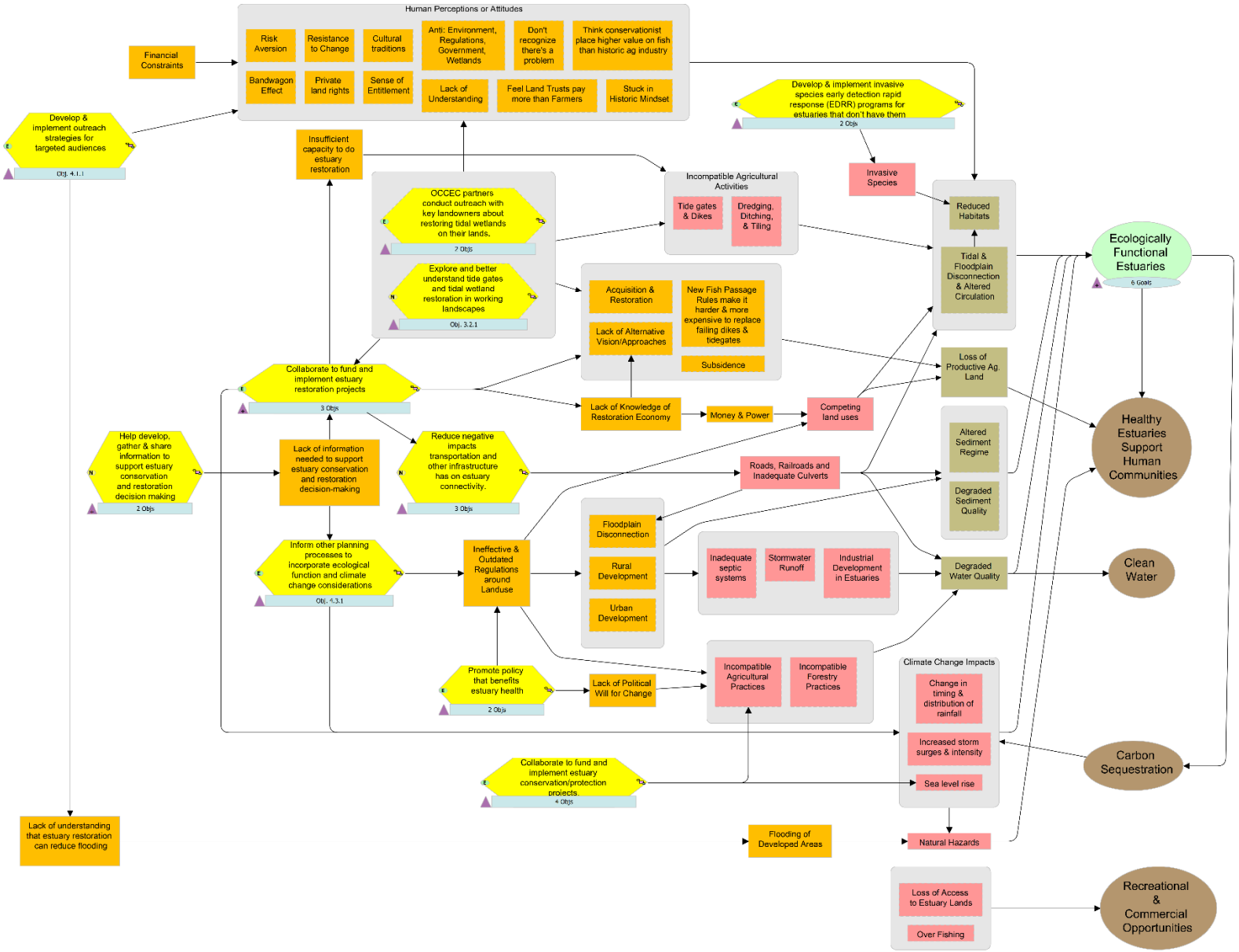
The team identified many factors believed to contribute to these threats (Figure 3). In particular, differing human perceptions or attitudes, financial constraints, ineffective &/or outdated regulations around land use in estuaries, lack of understanding about the restoration economy and flood-control benefits of estuary restoration, and lack of political will for change were cited as important factors. Given the current status of our estuaries, and impacts from potential climate change, we are challenged to find new approaches and to scale up our estuary work.

The following symbols are used in the diagrams throughout this plan:

Legend Table
Conservation Target
Human Wellbeing Target
Direct Threat
Contributing Factor
Intermediate Result
Threat Reduction Result
Strategy
Draft Strategy

Legend Table
Goal
Objective
Indicator
Biophysical Factor
Group Box
Task
Activity
Measurement

Figure 3. Central Coast Estuaries Situation Diagram



8 THEORY OF CHANGE: GOALS, STRATEGIES, OBJECTIVES AND ACTIONS

Strategy logic represents the cornerstone of a project's theory of change, explaining in narrative and diagrammatic form how selected strategies are expected to achieve essential intermediate results and ultimately, Outcomes. This involves being very explicit about how we'll take advantage of big opportunities, influence the decisions and behavior of important actors, and create the conditions that will incentivize or enable conservation over the long term. Results Chains (e.g., logic models) are an effective tool for describing a theory of change. A situation analysis diagram (See Figure 3) serves as the basis for creating a results chain diagram. The situation analysis diagram describes the situation today, whereas the results chain shows the desired future condition. Each of our priority strategies are represented in at least one results chain, however closely linked strategies are sometimes combined on the same results chain diagram.

1. **OUTCOME/GOAL: By 2040, the percent of functional tidal wetlands across the OCCEC Focus Area will be increased from current 43% to desired > 60% by increasing hydrologic connections to tidal flows, restoring channels, and replanting native tidal wetland vegetation as needed.** (see Appendix II for background data)
    - 1.1. **Strategy: Collaborate to fund and implement estuary restoration projects.**
        - **1.1.1. Objective:** Implement restoration projects on about 900 acres in the Yaquina and Alsea estuaries by 2028. (MCWC, CTSI, MRT, TWC, USFWS, DU, PSMFC, ODFW, Lincoln SWCD, Fred M. VanEck Forest Foundation, BLM, USFS)
            - **1.1.1.1.** Action: Submit a competitive Focused Investment Partnership (FIP) application to OWEB
            - **1.1.1.2.** Action: Implement the FIP Initiative focused on the Yaquina and Alsea estuaries from 2022 to 2028
        - **1.1.2. Objective:** At least five prioritized estuary wetland habitat restoration projects, covering ~400 acres, implemented in OCCEC estuaries outside the FIP area by 2028. (TEP, TNC, NNSL, CTSI, USFWS, SWC, MRT, OPRD, DU)
            - **1.1.2.1.** Action: Update list of potential priority projects
                - 1.1.2.1.1. Pull together relevant projects from participating group's priorities outside of the Yaquina and Alsea estuaries for OCCEC prioritization
            - **1.1.2.2.** Action: Help lay the groundwork for implementation of priority projects (ODFW, USFWS)
            - **1.1.2.3.** Action: Identify and hire expertise for shared needs across projects (e.g., design, hydro-geo-morphologist etc.) (TEP, TNC, USFWS)
            - **1.1.2.4.** Action: Develop MOUs as needed for joint OCCEC proposals that provide transparency (TEP)
            - **1.1.2.5.** Action: Use consistent measures and messages for greater impact (All as appropriate)
            - **1.1.2.6.** Action: Seek out economies of scale in implementation steps (e.g., joint grant proposals, share resources, consultants, technologies, LIDAR processing, drone flights, helicopter & other equipment mobilization, native plant nurseries) (All as appropriate)
            - **1.1.2.7.** Action: Coordinate & share information (TNC, TEP, ODFW, ETG, PSMFC)
                - 1.1.2.7.1. Coordinate and share common guidance on restoration best practices (TEP, ODFW, ETG)
                - 1.1.2.7.2. Host periodic information exchange forums for OCCEC partners (TNC)
        - **1.1.3. Objective:** Implement additional priority tidal wetland habitat restoration projects to bring the cumulative total of acres restored between 2021 and 2040 to at least 2010 acres.
            - **1.1.3.1.** Action: Obtain Institute for Natural Resources (OSU) tide gates and diked areas data layers and evaluate for other potential project ideas (TEP, TNC, ODFW, NNSL, ETG)
            - **1.1.3.2.** Action: Identify, prioritize and implement next round of estuary conservation and restoration projects (TWC, TEP, NNSL, MCWC)

2. **OUTCOME/GOAL: By 2040, key estuary lands will be protected through fee title acquisitions or long-term easements to conserve current, and potential future, tidal wetland areas that are likely to withstand sea level rise into the future.**
    - 2.1. **Strategy: Collaborate to fund and implement estuary conservation/protection projects.**
        - **2.1.1. Objective:** Protect 100-440 acres of remaining tidal swamp habitats and priority Landward Migration Zone (LMZ) lands in the Yaquina and Alsea estuaries by 2028. (CTSI, MRT, TWC, USFWS)
        - **2.1.2. Objective:** By 2028, bring 400-700 acres in the Yaquina and Alsea estuaries into conservation ownership to allow for future restoration. (CTSI, MRT, TWC, USFWS)

2.1.2.1. Action: Submit a competitive Focused Investment Partnership application to OWEB

2.1.2.2. Action: Implement the FIP Initiative focused on the Yaquina and Alsea estuaries from 2022 to 2028

2.1.3. Objective: Protect at least 100 acres of remaining tidal swamp habitats in the OCCEC estuaries outside the FIP area by 2035.

2.1.4. Objective: By 2028, bring at least 250 acres in OCCEC estuaries outside the FIP area into conservation ownership to allow for future restoration.

2.1.5. Objective: 5% (~750 acres based on 4.7' SLR Scenario) of tidal wetland Landward Migration Zone (LMZ) lands protected in estuaries in the OCCEC focus area by 2035 (guided by priorities established in Brophy & Ewald 2017)

2.1.5.1. Action: Implement relevant protection strategies for priority projects

3. OUTCOME/GOAL: By 2030 there will be increased landowner acceptance and understanding of the ecological benefits estuaries provide and the projects that restore them.

3.1. Strategy: OCCEC partners conduct outreach with key landowners about restoring tidal wetlands on their lands.

3.1.1. Objective: By 2028, at least 5 priority landowners each in the Yaquina and Alsea Estuaries have signed landowner agreements to restore tidal wetlands on their lands.

3.1.2. Objective: By Dec. 31, 2028, at least 1 priority property landowner in each OCCEC area estuary recruited following coordinated outreach, have signed landowner agreements to restore tidal wetlands on their lands.

3.1.2.1. Develop and implement landowner outreach plans (All as appropriate)

3.1.2.2. OCCEC partners will keep each other informed of outreach to landowners who could cross estuary boundaries or where working areas overlap with other partners (All)

3.2. Strategy: Explore and better understand tide gates and tidal wetland restoration in working landscapes

3.2.1. Objective: By 2025, gather information from on-going efforts and new assessments needed to identify 5 priority working lands projects ready for implementation.

3.2.1.1. Action: Work with NRCS & other agencies (SWCD) to identify opportunities and potential project types (TEP)

3.2.1.2. Action: Investigate/assess conservation value of "fish-friendly tide gates" (All)

3.2.1.3. Action: Test Working lands pilots in LMZ areas (TEP, NNSL)

3.2.1.4. Action: Collaborate with statewide tide gate engineering work group to develop engineering analysis of tide gate function under SLR scenarios tool kit (see TNC New Hampshire tool) (TEP)

3.2.1.5. Action: Complete Estuary-wide assessments of tide gates and restrictive culverts in estuaries including location, ownership, condition, and responsibility including maintenance requirements and prioritize for project selection. (see TNC Oregon tide gate prioritization tool) (TNC, TEP, NNSL, ETG, MCWC, Lower Nehalem WC) (in progress)

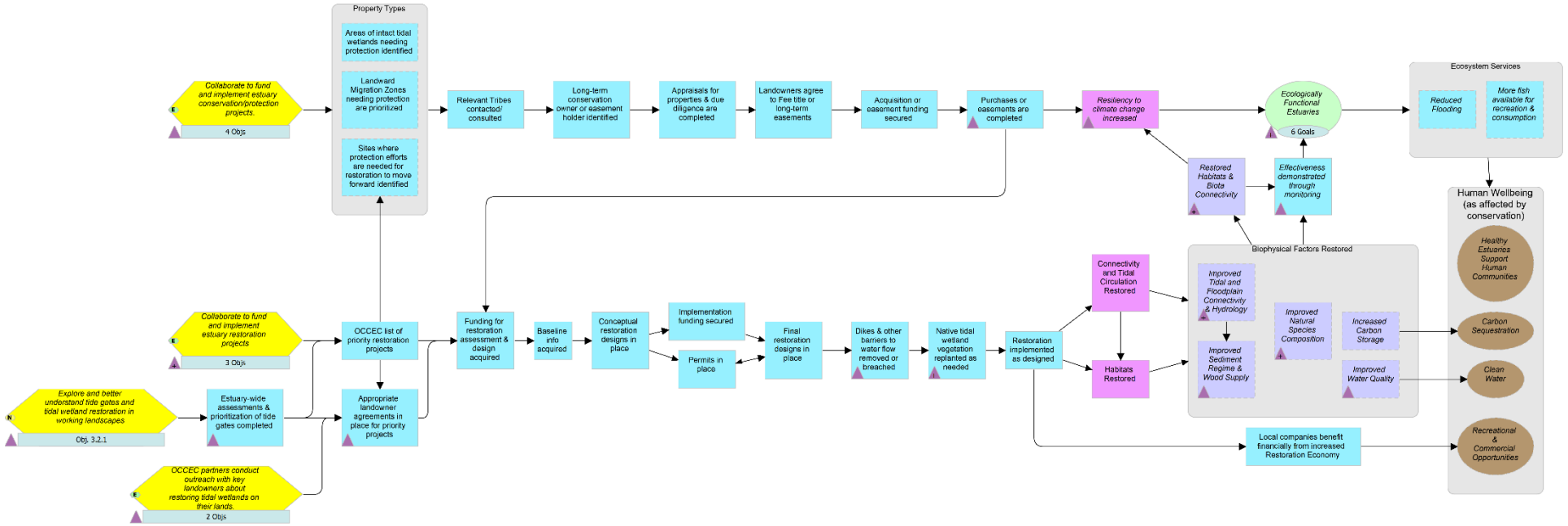
3.2.1.6. Action: Stay informed of, and participate as appropriate, in state Tide Gate Coalition and its work groups (TNC, NNSL, DU)

Theory of Change for Project-Level Actions

Through participation in the Or. Central Coast Estuary Collaborative, practitioners will collaborate to identify and prioritize potential estuary restoration projects (including utilizing information from new tide gate inventories) and acquire necessary landowner agreements. Properties that need to be protected for conservation purposes will also be identified, including remaining intact tidal wetlands (especially swamps), potential future tidal wetlands in priority landward migration zones, and current tidal wetlands where restoration can't happen unless it is brought into conservation ownership. For acquisition projects, relevant Tribes will be consulted, and appropriate long-term conservation entities identified. That will result in appraisals and other due diligence steps being completed and the current landowners agreeing to the purchase or easement terms. With those things in place, funding to complete the land deals can be secured and the purchases completed. For properties needing restoration, funding for assessments and designs will be secured, baseline data gathered, and conceptual restoration designs completed. The initial designs will allow applications to be submitted for implementation funding and lead to

acquisition of necessary permits. With some anticipated back-and-forth with permitting agencies, final restoration designs will be completed. This will lead to removal or breaching of impediments to water flow, wetland vegetation being replanted as needed, and the restoration plans being implemented as designed. This will reduce the threats of altered hydrologic connectivity and habitat destruction and increase resiliency to climate change impacts by restoring the key ecological attributes that define a healthy functioning estuary. Restoration effectiveness will be demonstrated through monitoring and will help advance human well-being interests in some instances by reducing flooding and helping fuel the local economy through support to the restoration economy.

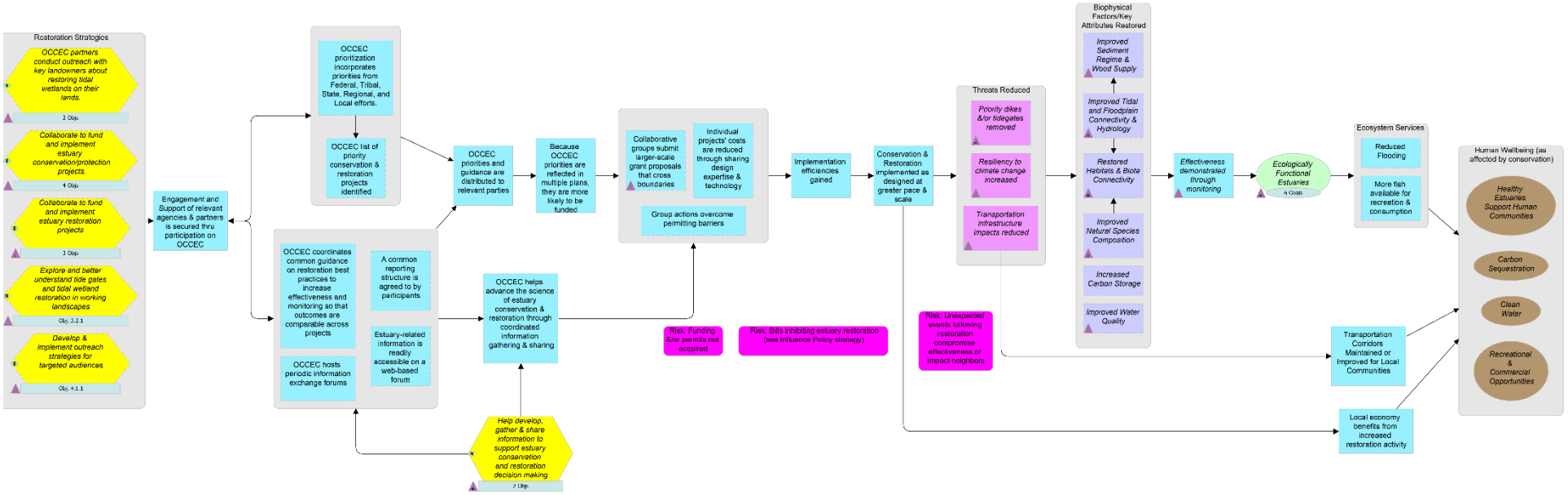
Project-Level Results Chain Diagram:



Theory of Change for OCCEC Partnership-Level Actions

Better engagement and support of agencies and partners thru participation in the Or. Central Coast Estuary Collaborative will result in: shared priorities, identification of restoration projects that can be integrated into working landscapes, common guidance on restoration best practices, a common monitoring and reporting structure, and an accessible web-based forum for information exchange. This will help advance the science of estuary conservation and restoration and lead to projects that are more likely to be funded. As a result, implementation of larger-scale projects will be facilitated, and implementation efficiencies will be realized thus increasing the pace and scale of estuary restoration on the central coast.

Partnership-Level Results Chain Diagram:



4. **OUTCOME/GOAL: Through science, collaboration, and engagement with community members and decision makers, there will be improved opportunities to advance estuary conservation, restoration, and resiliency on the Central Oregon Coast.**
   - **4.1. Strategy: Develop and implement outreach strategies for targeted audiences** (TEP)
     - **4.1.1. Objective:** Provide <u>coordinated</u> engagement opportunities across the OCCEC focus area to a variety of audiences including at least one annual speaker presentation on an estuary topic in each estuary.
       - **4.1.1.1.** Action: Determine outreach needs for priority strategies 1st (TWC, SWC, CTSI, TNC)
       - **4.1.1.2.** Action: Work with contractor to develop social media toolkit for estuary messages, making the outreach materials as relevant to local communities as possible (TNC, TWC, SWC, CTSI) (see also Obj. 4.2.2)
         - 4.1.1.2.1. Highlight how functioning estuaries benefit human communities
         - 4.1.1.2.2. Highlight economic benefits of estuary restoration activities (e.g., contractors, local retail, etc.), fishing, hunting, recreation, more rearing habitat for fish, & focus on positives (TWC)
         - 4.1.1.2.3. Eelgrass and kelp ocean acidification mitigation benefit & blue carbon (OAH bill funding?)
         - 4.1.1.2.4. Research/share beaver benefits & alternatives to take (TWC)
       - **4.1.1.3.** Action: Keep library of relevant articles, papers, and other resources up to date on Basecamp (All)
       - **4.1.1.4.** Action: Implement outreach to key audiences for priority strategies (All)
       - **4.1.1.5.** Action: Implement Southern Flow Corridor outreach plan with coordinated messaging (TEP)
       - **4.1.1.6.** Action: Engage with OSU & NOAA as well as partner groups for speaker presentations
         - 4.1.1.6.1. Coordinate with Hatfield Marine Science Center agencies/programs to present on their relevant research projects (ODFW)
       - **4.1.1.7.** Action: OCCEC may want to capitalize (e.g., advertise, participate) on the estuary presentation Lincoln County will be doing next year on the Yaquina Estuary Plan update. (DLCD)
   - **4.2. Strategy: Help develop, gather & share information to support estuary conservation and restoration decision making**

4.2.1. Objective: Initiate one new project a year that improves decision-makers' understanding of estuary function and restoration and/or fills a key data gap. (TEP, NNSL)

4.2.1.1. Action: List information needs and develop outreach materials to address bills that inhibit restoration

4.2.1.2. Action: Help develop consistently used metrics for tracking restoration effectiveness in tidal wetlands (TNC, NNSL, MCWC, ODFW, SWC, TEP, ETG)

4.2.1.3. Action: Develop Salinity models for our estuaries that incorporate climate change factors (ETG)

4.2.1.3.1. Encourage work by EPA & USGS to gather the required data inputs and then run hydrodynamic models using current vs. predicted future levels for our estuaries

4.2.1.4. Action: Pull together information on carbon sequestration rates in Oregon tidal wetlands and eelgrass beds and the potential for carbon mitigation funding for OCCEC projects.

4.2.1.5. Action: Conduct a Coho Strategic Action Plan project for Tillamook Bay in partnership with Wild Salmon Center and partners (TEP)

4.2.1.6. Action: Conduct a Coho Strategic Action Plan project for Siletz Bay in partnership with Wild Salmon Center and partners (MCWC, CTSI)

4.2.1.7. Action: Conduct Limiting Factors Analysis or other data gathering for restoration prioritization in Sand Lake Estuary (NNSL, USFS)

4.2.1.7.1. Use LFA and Restoration Prioritization to guide restoration actions in basin (NNSL, USFS, TEP, OPRD- In Process)

4.2.1.8. Action: Conduct management-oriented studies to inform restoration, maintenance, and protection activities in the Siletz & Nestucca estuaries (USFWS Refuges, TWC, CTSI, ETG, MCWC).

4.2.1.8.1. Examples include: water resources assessment, development of a national Vegetation Classification Standard vegetation data layer for GIS, baseline assessment and monitoring of water chemistry to determine acidification rates, estuary assessment (characterization of conditions at current and former tidal wetland sites; prioritization of conservation and restoration opportunities)

4.2.1.9. Action: Conduct hydrologic study to determine effects of tsunami evacuation trail (old roadbed) on water flow in Nestucca Wildlife Refuge (USFWS Refuges).

4.2.1.10. Action: Comprehensive Water Quality Tests to help determine the causes of acidification in estuaries (e.g., chemicals, algae toxins, warm water conditions, PH imbalance, etc.).

4.2.1.11. Develop a list of potential opportunities for mitigation sites in our estuaries.

4.2.2. Objective: Work with PMEP and others to develop outreach information to create and maintain a system that fosters a favorable economic and political climate in support of estuary conservation, restoration, and resiliency. (TEP, ODFW, NNSL)

4.2.2.1. Implement actions to achieve Outreach: media releases, survey's, direct contact, public meetings, coastal caucus, emails, brochures, attend and support partners with information booths, YouTube page for Sea Levels Rising, Video's (e.g., compare Estuary area un-restored, then restored), economic advantages of restoration and other actions determined by goals.

4.2.2.2. Action: Work with contractor to develop social media toolkit for estuary messages, making the outreach materials as relevant to local communities as possible (TNC, TWC, SWC, CTSI)

4.2.2.3. Action: Find grant funding sources for Outreach to achieve OCCEC goals. (see potential funders spreadsheet)

4.3. Strategy: Inform other planning processes to incorporate ecological function and climate change considerations

4.3.1. Objective: Updated local estuary plans incorporate current data and climate change adaptation planning by 2035.

4.3.1.1. Action: Participate in Yaquina Estuary Plan update as appropriate (MCWC, Audubon)

4.3.1.1.1. Utilize ODFW shellfish and eelgrass data to help inform decision-making (ODFW)

4.3.1.1.1.1. OAH/Ocean chemistry bill HB3114 Ocean Science Trust project funding

4.3.1.2. Action: Get involved/provide info in new DLCD estuary planning & Climate Change resilience efforts (TEP, ETG)

4.3.1.3. Action: See if there are opportunities to put more detail into State Climate Change plan (PSMFC)

4.3.1.4. Action: Participate in local visioning efforts as appropriate (TEP, NNSL)

4.3.1.5. Action: Track and provide input on other types of plans that could influence estuaries (e.g., ag. water management plans, integrated water resource plans, fill & removal permits) (NNSL)

4.3.1.6. Action: OCCEC folks involved in estuary projects connect with Blue Carbon working group and see how we can interact (ETG, TWC)

4.3.1.6.1. Opportunities for data collection

4.3.1.6.2. OCCEC connect with BCWG to investigate blue carbon financing for restoration projects.

4.3.1.7. Action: Complete assessment of Sea Level Rise impacts to human infrastructure (coast-wide with focus on estuaries) (DLCD - Done)

4.3.1.7.1. OCCEC participants review results to design projects/protection as human infrastructure is to be updated/relocated/developed to avoid impacts

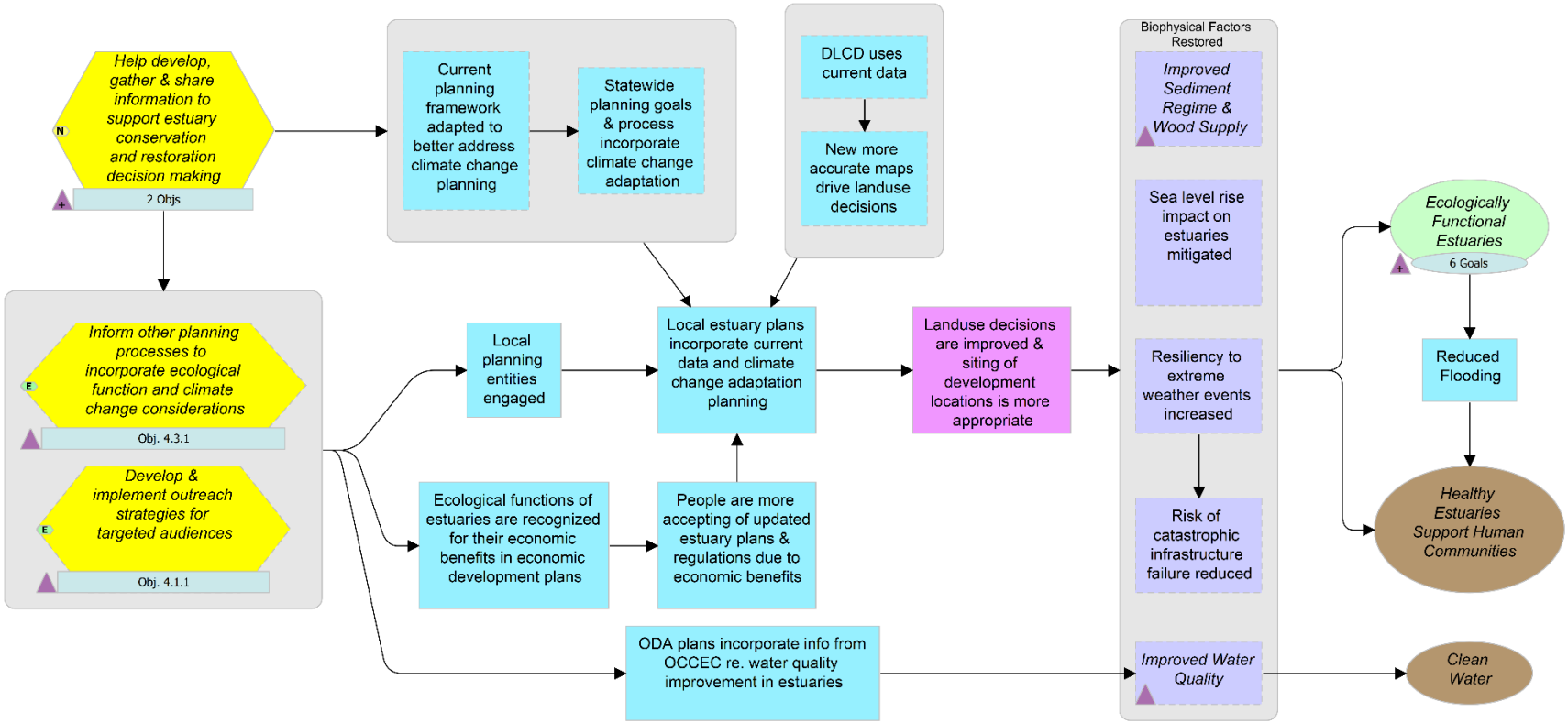
4.3.1.8. Action: Coordinate with communities & planners/commissions (local govt.) to incorporate climate change & natural resource issues into their comprehensive plans.

4.3.1.9. Action: Apply for funding to have estuary expertise available to DLCD as needed

Theory of Change

By engaging with local planning entities and highlighting the economic benefits of estuaries' ecological functions, we expect people to be more accepting of updated estuaries plans and regulations. That, in combination with more accurate estuary maps and planning goals/process that incorporate climate change adaptation, will result in local estuary plans that incorporate current data and climate change adaptation planning. As a result, land use decisions will be improved and developments will be sited in more appropriate locations. This will lead to more ecologically functional estuaries through more functional sediment regimes, less impact from sea level rise, increased resiliency to extreme weather events, reduced risk of catastrophic infrastructure failure, improved water and sediment quality, and reduced flooding in coastal communities.

Results Chain Diagram:



4.4. Strategy: Promote policy that benefits estuary health

4.4.1. Objective: Initiate or participate in one policy project a year that helps engage community decision makers on policies that affect estuary restoration or protection.

4.4.1.1. Action: Track and inform OCCEC about estuary related legislative proposals (TNC)

4.4.1.2. Action: Help design engagement messages related to estuary legislation and distribute to key decision makers

4.4.1.3. Review Global Warming Commission proposal to OR. Legislature on natural and working lands and consider how to align recommendations with OCCEC work (TNC, ETG)

4.4.1.4. Action: Find ways for Private Property Owners to be financially motivated to participate (e.g., tax breaks, direct payments, cash incentives for critical estuary habitats) (TWC & NRCS)

4.4.1.5. Action: Track & engage as appropriate discussions of new Eelgrass protection policy (TWC)

4.4.2. Objective: Help secure a future for tidal wetland protection and restoration activities in Tillamook County.

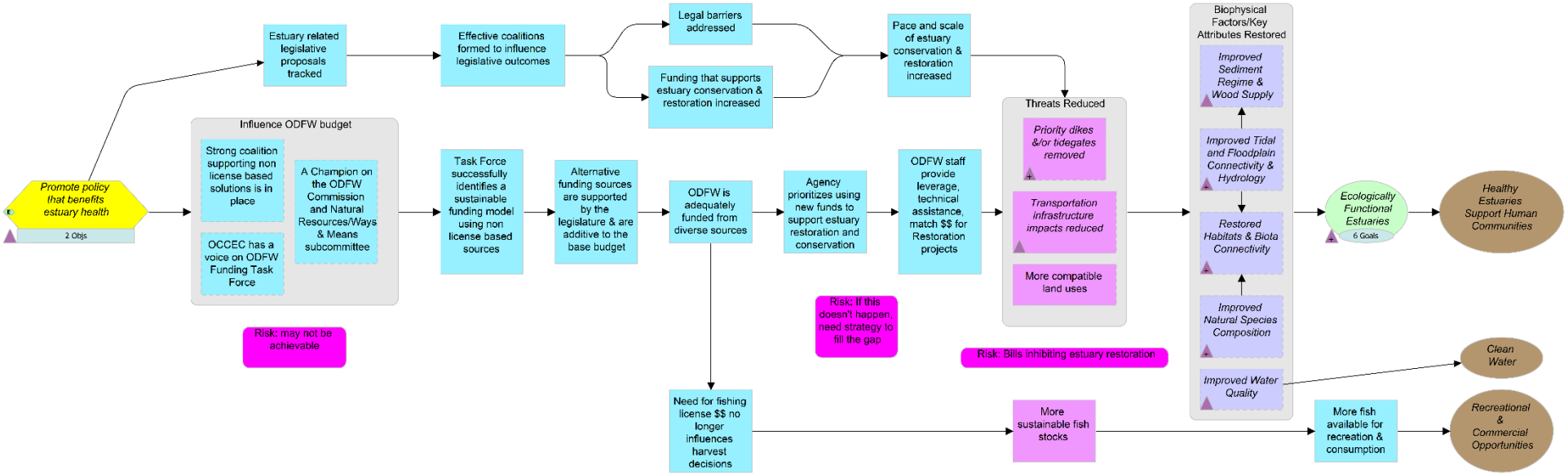
4.4.2.1. Participate in AAR and identifying ways to improve the process for future estuary restoration (TNC, TEP)

4.4.2.2. Support pilot project permit process & participate in public hearings etc. (TNC, PSMFC, TWC, TEP)

Theory of Change

Actions by the Oregon legislature have the potential to help or hinder estuary restoration and protection efforts. By tracking those and building coalitions to address them as appropriate, we can facilitate estuary conservation. Many OCCEC participants have been impacted by the loss of key ODFW staff due to limited budgets. We believe that finding alternative funding sources, that do not rely on hunting and fishing license fees, is a key to more sustainable ODFW funding. This will result in more stable staff resources who can provide technical assistance and match for estuary restoration projects. Less reliance on fishing license fees may also lead to more sustainable fish stocks.

Results Chain Diagram:

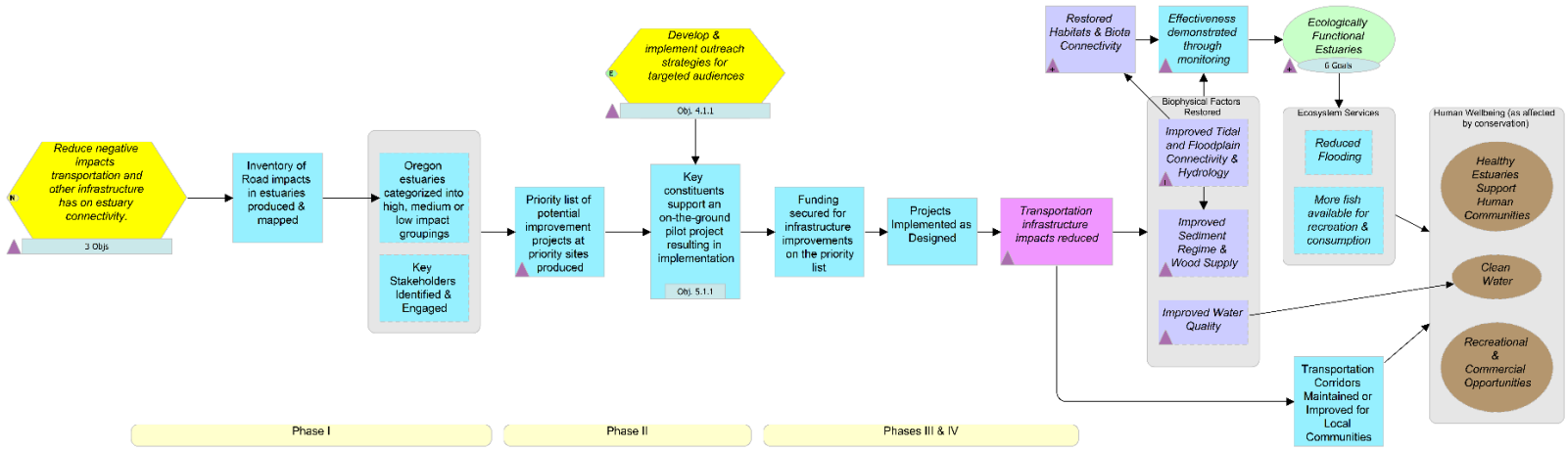


5. **OUTCOME/GOAL: By 2035, at least 5 priority transportation or other infrastructure impact project sites have increased hydrologic connection to tidal flows.**
   - **5.1. Strategy: Reduce negative impacts transportation and other infrastructure has on estuary connectivity.**
     - **5.1.1. Objective**: By 2028, implement at least one priority on-the-ground co-benefit pilot project that upgrades transportation infrastructure and improves estuary health
       - **5.1.1.1.** Action: Submit a competitive Focused Investment Partnership (FIP) application to OWEB
       - **5.1.1.2.** Action: Implement at least one transportation improvement project under the FIP Initiative in the Yaquina from 2022 to 2028
       - **5.1.1.3.** Action: Work with the Port of Alsea to lay the groundwork for designing a preferred alternative for a tidal wetland improvement project by 2028
     - **5.1.2. Objective:** By 2035, Implement at least 4 priority transportation projects utilizing lessons learned from the pilot.
       - **5.1.2.1.** Action: Develop priority list of potential improvement projects at priority sites.
       - **5.1.2.2.** Action: Identify sources & secure funding for infrastructure improvements on the priority site list beyond the pilot project.
       - **5.1.2.3.** Action: Conduct alternative routes study – identify alt. road access around estuaries and prioritize maintenance of these routes (USFS)
       - **5.1.2.4.** Action: Implement priority transportation improvement projects. (TEP, NNSL)
     - **5.1.3. Objective:** Institutionalize use of the assessment by at least 1 transportation entity (if feasible).
       - **5.1.3.1.** Action: Explore feasibility of a programmatic approach, including agency prioritization (STIPs) and funding sources
       - **5.1.3.2.** Action: Funding and possible policy proposals for the Transportation Bill, etc., highlighting the “triple bottom line”

Theory of Change

In Phase I of our strategy to Address Transportation Impacts to Estuaries, we believe that conducting an inventory to identify the estuaries that are most highly impacted by roads and engaging with ODOT during that process will help identify sites where projects might have the most ecological benefit. Overlaying the ecological priorities with ODOT infrastructure upgrade priorities and local community interests in Phase II, will result in a priority list of potential improvement project areas that have broad support. This phase will also require implementation of outreach strategies targeted to key audiences for this project. By combining ecological benefit, needed infrastructure upgrades, and local community interests, we expect to be able to draw on diverse funding sources to pay for these generally high-cost projects in Phases III & IV. Implementation of the projects will improve connectivity to tidal wetlands and fish passage. This will also benefit local communities through ecosystem services provided by more ecologically functional estuaries and by improved or more secure transportation corridors.

Results Chain Diagram:

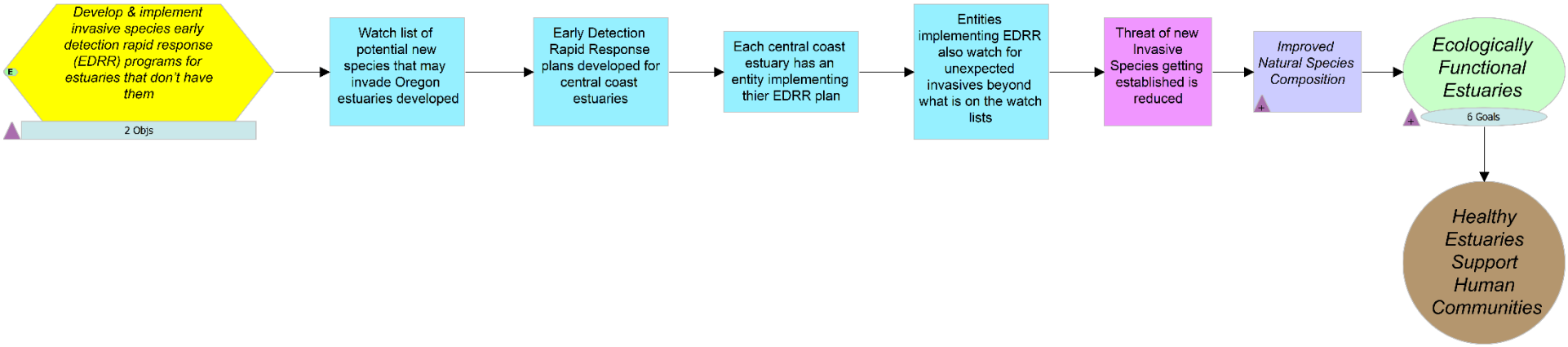


6. **OUTCOME/GOAL: By 2035, each Central Coast estuary has an invasive species Early Detection Rapid Response program in place to catch new invasions early.**
   - **6.1. Strategy: Develop and implement invasive species Early Detection Rapid Response (EDRR) programs for estuaries that don't have them**
     - **6.1.1. Objective:** Three different estuaries have developed EDRR plans by 2025.
       - **6.1.1.1.** Action: Identify which groups already have these and which species
       - **6.1.1.2.** Action: Identify any gaps and figure out if we can help fill them with resources &/or dedicated staff for the whole focus area
       - **6.1.1.3.** Action: Host a working group to develop a common EDRR protocol for OCCEC estuaries (TEP, TNC)
       - **6.1.1.4.** Action: Prepare & implement EDRR plans for Siuslaw estuary (TNC, SWC)
       - **6.1.1.5.** Action: Prepare & implement EDRR plans for Tillamook and Nehalem estuaries (TEP)
     - **6.1.2. Objective:** Remaining estuaries have developed and implemented EDRR plans by 2030. (Various)
       - **6.1.2.1.** Action: Prepare & implement EDRR plans for Siletz and Nestucca estuaries (USFWS Refuges, TEP)
       - **6.1.2.2.** Action: Prepare & implement EDRR plan for Yaquina, which is at high-risk due number of ships and boats (MCWC)

Theory of Change

By setting up Early Detection Rapid Response programs in each estuary on the central Oregon coast, potential new invaders will be found early before they are able to get well established leading to more effective control. Thus, the health of the estuaries will be protected from degradation.

Results Chain Diagram:



9 PROGRESS MONITORING FRAMEWORK

The OCCEC has established a monitoring subcommittee that is drafting a restoration effectiveness monitoring framework to guide development of project monitoring plans. This framework is expected to be finalized in 2022. At least a basic level of monitoring is recommended for all projects, with monitoring complexity based on the questions to be addressed by the monitoring for that project. More complex and costly monitoring will be done as needed to evaluate progress towards specific project objectives. The draft monitoring framework document is intended to guide all estuary collaborative partners in developing site-specific restoration effectiveness monitoring plans. The OCCEC monitoring subcommittee will review restoration monitoring plans to determine if they are designed to answer important monitoring questions for desired ecological outcomes in each habitat type. The OCCEC Monitoring Subcommittee can be a technical resource for project managers developing project specific monitoring plans, finding suitable reference sites, and analyzing data. The collaborative can also share other resources, tools, and equipment to support partners in restoration effectiveness monitoring as needed.

Baseline data collected at the project site and at suitable reference sites shall be collected for at least one year prior to restoration. Although the use of nearby reference sites that are monitored in the same way is highly recommended, data from ongoing reference site monitoring in other similar locations may be substituted if methods are comparable. Success will be measured by how closely the restoration site trends toward reference site conditions.

For each project, the local monitoring team or project manager will submit a monitoring plan to OCCEC prior to project implementation. Additionally, annual progress reports will include summarized monitoring results. The raw data will be held by the program responsible for project development and implementation. Each specific metric included in the OCCEC monitoring guide has a minimum monitoring duration recommended to demonstrate desired restoration effects. The OCCEC monitoring framework includes instructions for analysis of each metric and guidance on interpreting results, but project-specific adjustments may be needed depending on site characteristics. The project's monitoring team or project manager will analyze data to determine whether restored site conditions are on a trajectory towards reference site conditions and answer the project's monitoring questions. It is expected that the implementing programs will make monitoring reports available on their websites as appropriate.

Outputs

Implementation Results (outputs)	Objective	Metric
• OCCEC groups submit larger-scale grant proposals that cross boundaries • Dikes & other barriers to water flow removed or breached • Native tidal wetland vegetation replanted as needed • Channels restored • Large wood installed • Monitoring implemented	**Objective 1.1.1:** Implement restoration projects on about 900 acres in the Yaquina and Alsea estuaries by 2028. **Objective 1.1.2:** At least five prioritized estuary wetland habitat restoration projects, covering ~400 acres, implemented in OCCEC estuaries outside the FIP area by 2028. **Objective 1.1.3:** Implement additional priority tidal wetland habitat restoration projects to bring the cumulative total of acres restored between 2021 and 2040 to at least 2010 acres.	• FIP proposal submitted • # or linear feet of barriers to tidal flow removed or breached • Acres planted or seeded with native tidal wetland vegetation • Linear feet of channels restored • Number of nurse logs placed & planted • Key biophysical factors monitored (e.g., surface water elevation, salinity, planting survivorship, water temperature, channel & wetland elevation)
• Areas of intact tidal wetlands needing protection identified • Sites where protection efforts are needed for restoration to move forward identified	**Objective 2.1.1:** Protect 100-440 acres of remaining tidal swamp habitats and priority Landward Migration Zone (LMZ) lands in the Yaquina and Alsea estuaries by 2028.	• Acres protected by conservation ownership or easement • % of tidal wetland Landward Migration Zone (LMZ) lands permanently protected

• Feasible medium to high priority LMZ lands assessed and protected • Relevant Tribes contacted/consulted	**Objective 2.1.2:** By 2028, bring 400-700 acres in the Yaquina and Alsea estuaries into conservation ownership to allow for future restoration. **Objective 2.1.3:** Protect at least 100 acres of remaining tidal swamp habitats in the OCCEC estuaries outside the FIP area by 2035. **Objective 2.1.4:** By 2028, bring at least 250 acres in OCCEC estuaries outside the FIP area into conservation ownership to allow for future restoration **Objective 2.1.5:** 5% of tidal wetland Landward Migration Zone (LMZ) lands protected by 2035	
Appropriate landowner agreements in place for priority projects	**Objective 3.1.1:** By 2028, at least 5 priority landowners each in the Yaquina and Alsea Estuaries have signed landowner agreements to restore tidal wetlands on their lands. **Objective 3.1.2:** By Dec. 31, 2028, at least 1 priority property landowner in each OCCEC area estuary recruited following coordinated outreach, have signed landowner agreements to restore tidal wetlands on their lands.	# of recruited landowners with signed agreements
OCCEC list of priority working lands projects identified	**Objective 3.2.1:** By 2025, gather information from on-going efforts and new assessments needed to identify 5 priority working lands projects ready for implementation.	• # of estuaries with prioritized tide gate inventories • # of priority working lands projects ready for implementation
• Annual engagement opportunities identified, and schedule created, by OCCEC participants • Social media toolkit created	**Objective 4.1.1:** Provide coordinated engagement opportunities across the OCCEC focus area to a variety of audiences including at least one annual speaker presentation on an estuary topic in each estuary.	• # of engagement opportunities provided and # of people attending • # or organizations using estuary facts social media toolkit
• A common monitoring framework and reporting structure is agreed to by participants • Estuary related information is readily accessible on a web-based forum	**Objective 4.2.1:** Initiate one new project a year that improves decision makers' understanding of estuary function and restoration and/or fills a key data gap.	• # of decision maker engagement projects initiated • Data consistency and accessibility improved
OCCEC helps advance the science of estuary conservation & restoration through coordinated information gathering & sharing	**Objective 4.2.2:** Work with PMEP and others to develop outreach information to create and maintain a system that fosters a favorable economic and political climate in support of estuary conservation, restoration and resiliency.	# of informational products produced &/or data gaps filled
Land use decisions are improved & siting of development locations is more appropriate	**Objective 4.3.1:** Updated local estuary plans incorporate current data and climate change adaptation planning by 2035.	# estuary plans with current data and climate change adaptation
• Estuary related legislative proposals tracked • Effective coalitions formed to influence legislative outcomes	**Objective 4.4.1:** Initiate or participate in one policy project a year that helps engage community decision makers on policies that affect estuary restoration or protection.	# of policy projects with community decision makers.

	Objective 4.4.2: Help secure a future for tidal wetland protection and restoration activities in Tillamook County	
Road infrastructure improved at priority sites	**Goal 5.** By 2035, at least 5 priority transportation or other infrastructure impact project sites have increased hydrologic connection to tidal flows.	Project(s) implemented to increase tidal connection across road section in high impact estuary
	Objective 5.1.1: By 2028, implement at least one priority on-the-ground co-benefit pilot project that upgrades transportation infrastructure and improves estuary health	
	Objective 5.1.2: By 2035, Implement at least 4 priority transportation projects utilizing lessons learned from the pilot.	
Each central coast estuary has an entity implementing their EDRR plan	**Objective 6.1.1:** Three different estuaries have developed EDRR plans by 2025.	# of estuaries with implemented EDRR plans
	Objective 6.1.2: Remaining estuaries have implemented EDRR plans by 2030.	

Social Outcomes

Limiting Factor Reduction or Intermediate Ecological Outcome	**Outcome**	**Metric**
Human perceptions or attitudes that hinder estuary restoration/protection are reduced	**Goal 3:** By 2030 there will be increased landowner acceptance and understanding of the ecological benefits estuaries provide and the projects that restore them.	Change in perceptions about estuaries & restoration based on polling results
• Legal barriers addressed • Funding that supports estuary conservation & restoration increased • Pace and scale of estuary conservation & restoration increased	**Goal 4.** Through science, collaboration, and engagement with community members and decision makers, help facilitate opportunities to advance estuary conservation, restoration, and resiliency on the Central Oregon Coast.	• # of policies that inhibit or facilitate estuary conservation or restoration • Funding levels (over the previous 5-10 years)

Ecological Outcomes

Limiting Factor Reduction or Intermediate Ecological Outcome	**Outcome**	**Metric**
• Improved sediment regime • Improved Tidal and Floodplain Connectivity & Hydrology • Improved natural species composition • Increased carbon storage • Improved water quality • Priority dikes &/or tide gates removed • Transportation infrastructure impacts reduced	**Goal 1:** By 2040, the percent of functional tidal wetlands across the OCCEC Focus Area will be increased from current 43% to desired > 60% by increasing hydrologic connections to tidal flows, restoring channels, and replanting native tidal wetland vegetation as needed.	• Diked estuarine area as a percentage of current & historical tidal marsh and swamp • Acres with increased tidal connectivity and complexity

Resiliency to climate change increased	**Goal 2:** By 2040, key estuary lands will be protected through fee title acquisitions or long-term easements to conserve current, and potential future, tidal wetland areas that are likely to withstand sea level rise into the future.	• Acres protected by conservation ownership or easement • % of tidal wetland Landward Migration Zone (LMZ) lands permanently protected

10 ADAPTIVE MANAGEMENT

Monitoring data will be used to track implementation of actions and progress towards our SAP objectives. It will also inform us as to how well restoration sites are progressing towards key ecological benchmark values and reference conditions. Annual review meetings after the field season will include a review of any changes in action implementation, review of interim monitoring data, a discussion of lessons learned and whether any changes should be made going forward.

Approximately every five years, monitoring data will be evaluated and used to assess progress towards goals and objectives in the Strategic Action Plan and to update the plan. Included will be clarifications and recommendations for plan improvement as we adaptively respond to changes in the ecological, political, and socio-economic environment influencing estuarine restoration and protection. This will be a formal opportunity to reassess if our strategies are advancing our goals as we anticipated in our theory of change and results chains or if adjustments need to be made. This could occur earlier than five years if conditions change or if there is new scientific information that should be incorporated. As monitoring data show the achievement of goals and objectives, new goals and objectives will be developed to continue to build on these successes.

11 SUSTAINABILITY

In our scoring criteria for selecting projects, we prioritize projects that restore ecological function without the need for long-term management. If future stewardship is required, we prioritize projects that have a champion willing to invest energy into long-term management.

The sustainability of the OCCEC partnership is illustrated by its stability over the past 10 years and continued participation in the collaborative by a diversity of entities. Clearly it is still providing a useful forum and fulfilling a need for estuary conservation and restoration practitioners. We will continue to gauge interest and strive to improve our effectiveness by tracking levels of participation and through periodic surveys.

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13 PARTNERSHIP CERTIFICATION – Core Group

CERTIFICATION: I certify that this strategic action plan is a true and accurate representation of the proposed work and that I am authorized to sign as the Partner Representative or Co-Representative(s).

Partner Signature: 

Partner Print Name: Evan Hayduk

Title: Council Coordinator

Organization: MidCoast Watersheds Council

Date: 1/13/2022

Partner Signature: 

Partner Print Name: Katie Ryan

Title: Executive Director

Organization: The Wetlands Conservancy

Date: 1/12/2022

Partner Signature: 

Partner Print Name: Kristi Foster

Title: Executive Director

Organization: Tillamook Estuaries Partnership

Date: 1/12/2022

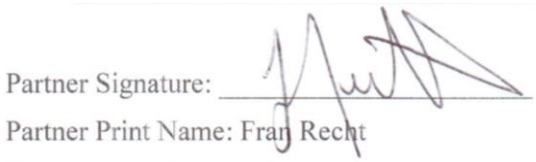
Partner Signature: 

Partner Print Name: Debbie L. Pickering

Title: Oregon Coast Ecologist

Organization: The Nature Conservancy

Date: 1/12/2022

Partner Signature: 

Partner Print Name: Fran Recht

Title: Board Member

Organization: Salmon Drift Cr. Watershed Council

Date: January 7, 2022

Partner Signature: 

Partner Print Name: Rosemary Pazdral

Title: Executive Director

Organization: Siuslaw Watershed Council

Date: 1/12/2022

Partner Signature: 

Partner Print Name: Laura S. Brophy

Title: Director

Organization: Estuary Technical Group, Institute for Applied Ecology

Date: 1/12/2022

Partner Signature: 

Partner Print Name: Dave Shively

Title: Executive Director

Organization: Nestucca, Neskowin, & Sand Lake Watersheds Council

Date: 1/13/2022

GLOSSARY

Activities: A set of specific result-oriented actions, typically done in a certain order, undertaken by project staff and/or partners as part of implementing a strategy in service of achieving specified outcomes or intermediate results.

Biophysical Factor: a generic term that encompasses the biological and physical effects resulting from a direct threat and influencing the health of a conservation target.

Direct Threat: The proximate human activities or processes that are causing or may cause stresses or impacts and thus the destruction, degradation, and/or impairment of conservation targets (for example, unsustainable fishing practices, unsustainable logging practices).

Goal: High-level summary of the main outcomes and key strategies relative to the scale of an important conservation need or challenge.

Indicator: Measurable entity related to a specific information need (for example, the status of a key aspect of conservation target or value, change in a pressure, or progress toward an objective or ultimate outcome). Indicators can be collected using quantitative or qualitative methods. They are the specific data you will collect to assess, directly or indirectly, progress toward project outcomes.

Indirect Threat: Contributing factors identified in an analysis of the project situation that are drivers of or increase the severity of direct threats. They are often an entry point for conservation actions (for example, incompatible logging policies or unsustainable demand for fish).

Intermediate Results: essential precursors to achieving outcomes. Intermediate results are often the near-term focus of strategies and activities and serve as important early “wins” and evidence that our overall theory of change is playing out as expected.

Measures: Refers to a wide variety of information a project or program manager collects, analyzes, and uses. They are a way of communicating information about changes in the condition of an item of interest and are often based on monitoring data. The term “measures” is sometimes used as a synonym for “indicators”.

Opportunities: Contributing factors identified in the situation analysis that carry the potential of having a positive effect on conservation targets or outcomes, either directly or indirectly. They are often an entry point for conservation actions (for example, demand for sustainably harvested timber).

Outcomes: Describe the major results we intend to achieve as a result of our strategies and within the scope and timeframe of a plan or project. Outcome statements include context, are measurable, and are the basis of most reporting measures.

Primary Interests: A statement of "what matters" to NGOs, influential actors, or important stakeholders. Some, but not all, primary interests will be converted into outcomes during planning.

Results Chain: Results chains are one type of logic model diagram that map out a theory of change in a series of causal statements that link intermediate outcomes in an “if…then” fashion. Results chains are similar to Situation Analysis diagrams; they start with selected strategies and change the boxes to result-oriented descriptions that capture the presumed consequences of taking actions. A results chain diagram shows the desired future condition of the project.

Risks: Risks are specific uncertain events that might have a negative effect on conservation outcomes and strategies, or that may pose a risk to conservation organizations. They often focus on enabling conditions. Our ability to deliver conservation outcomes is influenced by our capacity to assess the risks associated with our investments, and by our ability to manage these risks through time.

Scope: Statement that defines expectations and makes explicit a project's strategic, geographic, and temporal boundaries.

Situation Analysis: An assessment that weighs the key factors affecting primary interests in a place or problem, including the political, socioeconomic, institutional, and ecological factors creating impacts or threats, driving change, and providing opportunities for conservation intervention.

Stakeholders: Individuals, groups, or institutions who have a vested interest in the natural resources of the project area and/or who potentially will be affected by project activities and have something to gain or lose if conditions change or stay the same.

Strategy: A broad course of action with a common focus designed (alone or together with other strategies) to achieve specified outcomes and related intermediate results. Strategies focus on "means" – the "how" for achieving particular results. Strategies arise from the situation analysis and are backed by a robust theory of change.

Target: A value, asset, entity, or element of biodiversity or human welfare that a project team is ultimately trying to change, restore, or conserve. Biodiversity targets are ecological entities such as species, habitats, or ecological systems chosen to represent or encompass the broader suite of biodiversity within a project area or scope. Targets for thematic, environmental problem-oriented projects may describe particular environmental conditions (e.g., average global temperature for a project dealing with global warming). Human welfare targets are aspects or values of human well-being that a project chooses to focus on. (The Millennium Ecosystem Assessment defines human well-being as including: necessary material for a good life; health; good social relations; security; and freedom and choice.)

Task: Discrete, time-bound steps in a work plan required to implement activities, a monitoring plan, or other components of a CBP. Tasks are often assigned to a particular person to complete by a specific point in time.

Theory of Change: Explanation of how and why our strategies will achieve intended outcomes. Logic models in diagrams or narrative form are often used to describe the linkages among important drivers, trends, issues, and actors, and the logic of how we believe our strategies will lead to ultimate outcomes over time. The theory of change also identifies important intermediate results that must be achieved.

Vision: A vision is a succinct and compelling statement about an important and relevant conservation challenge, the urgent need and opportunity for change, and how we propose to make a profound

APPENDICES

Appendix I. Primary Interests

At the start of our planning process, we brainstormed a list of the Primary Interests of conservation groups as well as our perception of other key stakeholders' interests.

Primarily Conservation Interests

- Wildlife habitat
  - Beaver
  - Shellfish
  - Juvenile fish
  - Marine fish & invertebrates
  - Avian species
  - Keystone species
  - Marine mammals
  - ESA-listed species & other rare species
- Habitat connectivity
  - Between ocean and estuary
    - Sand spit management
    - Marine reserves/MPAs
  - Aquatic species passage
- Natural shoreline integrity
- Natural processes
  - Floodplain processes
- Cover
  - Large wood
- Channel complexity
- Vegetation community diversity
  - Eelgrass beds
  - Sitka spruce tidal swamps
  - Rare habitats
- Sediment supply/regimes
- Substrate diversity
- Life history diversity
- Genetic diversity
- Research
- Alteration from historic condition
- Invasive species

Primarily Social Interests

- Fisheries
  - Commercial
  - Recreational
  - Other non-commercial
- Recreation opportunities
- Passing-on lifestyle to children
- Navigability
- Economics of estuaries (see also below)
  - LNG (liquefied natural gas)
  - Industries
  - $$$
- Aesthetics
- Dredging and dredge material disposal
- Wastewater treatment
- Loss of Ag. Land
  - Grazing
- Mosquitos
- Salinity intrusion into:
  - Farmland
  - Water supplies
- Government planning processes

Equally Relevant to Both Types of Interests

- Water Quality
- Climate change resilience
  - Landward migration
- Upslope land use
- Freshwater inputs
  - Upslope water control structures
- Tsunami & earthquake hazards
  - Hazardous waste storage
- Education of youth
- Community engagement
- Economics of estuaries (continued)
  - Restoration economy
  - Ecosystem services
  - Carbon sequestration & markets

Infrastructure in Estuaries

- Residential development
- Diking & tide gates
- Road/highway infrastructure
- Jetties
- Pilings and docks
- Marinas and boat basins

Appendix II. Table A. Characteristics of the 11 largest estuaries in the OCCEC Focus Area.

* Includes open water, tide flats, and current and historical tidal wetlands. Source: Brophy et al. (2019).

** Unless otherwise noted, data in this table are from Brophy (2019), whose analysis of tidal wetland loss primarily used diked areas from OCMP's 2014 CMECS mapping. OCMP's diked areas may not include areas disconnected from tidal influence by features other than dikes, e.g., other restrictive culverts, fill material, roads, etc. Therefore, tidal wetland losses are generally higher than shown.

Estuary Name	Estuary Size (acres)*	Area of Historical Tidal Marsh and Tidal Swamp (acres)	Diked Former Tidal Wetland Area (acres)	% Loss of Historical Tidal Marsh and Swamp due to Diking	% loss of Historical Forested Tidal Swamp Due to Diking and Vegetation Conversion	Current Area of Tidal Marsh and Tidal Swamp (acres)	Minimum Desired Area of Tidal Marsh and Tidal Swamp (acres) (60% of historical)	Difference (Current – Desired Area) (acres)	Ideal Desired Area of Tidal Wetlands (acres) (80% of historical)	Difference (Current – Ideal Area) (acres)
Nehalem	5253	2481	1362	54.9	87.1	1404	1489	-85	1985	-581
Tillamook	14,028	4636	3319	71.6	92.3	2090	2782	-692	3709	-1,619
Netarts	2634	301	0	0	88.0	274	181		241	
Sand Lake	1177	568	67	11.7	90.5	615	341		454	
Nestucca Bay	2766	1621	1270	78.3	99.3	376	973	-597	1297	-921
Salmon River	882	657	7	1.2	80.4	618	394		526	
Siletz Bay	2711	1072	222	20.9	78.1	825	643		858	-33
Yaquina	6649	2575	1404	54.5	92.3	909	1545	-636	2060	-1,151
Beaver Creek	240	222	0	0	99.6	203	133		178	
Alsea Bay	3562	1100	252	22.9	90.8	791	660		880	-89
Siuslaw	6320	2693	1003	37.2	96.0	1967	1616		2154	-187
Totals	**46,222**	**17,926**	**7,635**	**42.6**	**92.3**	**10,072**	**10,757**	**2,010**	**14,342**	**4,581**

Appendix II. Table B. Characteristics of smaller estuaries on the Central Oregon Coast.

* includes open water, tide flats, and current and historical tidal wetlands. Sources: PMEP 2018, Brophy et al. (2019)

** includes areas which do not fully drain to the estuary. Source: PMEP 2018

Estuary Name	**CMECS Estuary Type** (Heady et al. 2014)	**EPA 2010 Classification**	**Estuary Size (acres)***	**Estuary Drainage Areas (acres)****
Lake Lytle	Lagoonal	Coastal Lagoon	83	
Rockaway Beach Creek	Riverine	Tidally Restricted Coastal Creeks		
Rockaway Clear Lake	Riverine	Tidally Restricted Coastal Creeks		
Smith Lake	Lagoonal	Coastal Lagoon	2.7	
Rover Creek	Riverine		0.24	
Chamberlain Lake	Lagoonal	Coastal Lagoon	6	
Sears Lake	Lagoonal	Coastal Lagoon	14	
Miles Creek	Riverine	Tidally Restricted Coastal Creeks		
Daley Lake	Riverine	Tidally Restricted Coastal Creeks	21	16,640
Neskowin Creek	Riverine	Tidally Restricted Coastal Creeks	11	16,640
Devils Lake	Riverine		1	10,880
Fogarty Creek (also called School House Creek)	Riverine		2	
Depoe Bay	Riverine	Marine Harbors/Coves	12	13,440
Little Creek	Riverine		12	16,640
Big Creek (N) (Lincoln County)	Riverine	Tidally Restricted Coastal Creeks	25	10,880
Yachats River	Riverine	Tidally Restricted Coastal Creeks	63	28,160
Tenmile Creek	Riverine	Tidally Restricted Coastal Creeks	4	14,720
Rock Creek	Riverine		Estuary mouth connection area	
Big Creek (S) (Lane County)	Riverine		4	25,600
China Creek	Riverine		0.8	
Cape Creek	Riverine		1	25,600
Berry Creek	Riverine	Tidally Restricted Coastal Creeks	1	14,720
Sutton Creek	Riverine	Tidally Restricted Coastal Creeks	30	14,720

Appendix II. Table C. CMECS definitions for Estuarine Types of the Central Oregon Coast (Lanier et al. 2014)

Riverine Estuaries	Estuaries that tend to be linear and seasonally turbid (especially in upper reaches), and which can be subjected to high current speeds. These estuaries are sedimentary and depositional, so they may be associated with a delta, bar, barrier island and other depositional features. These estuaries also tend to be highly flushed (with a wide and variable salinity range) and seasonally stratified. Riverine estuaries have moderate surface-to-volume ratios with a high watershed-to-water-area ratio—and they can have very high wetland-to-water-area ratios. These estuaries are often characterized by a V-shaped channel configuration and a salt wedge. High inputs of land drainage can promote increased primary productivity, which may be confined to the water column in the upper reach, due to low transparency in the water column. Surrounding wetlands may be extensive and healthy, given the sediment supply and nutrient input. This wetland perimeter may be important in taking up the excess nutrients that are introduced to the system. Physically, the system may tend to be stratified during periods of high riverine input, and the input of marine waters may be enhanced by countercurrent flow."	All estuaries in the central coast are considered riverine estuaries except the 7 listed below
Lagoonal Estuaries	CMECS describes these estuaries as usually having a very high surface-to-volume ratio, a low-to-moderate watershed-to-water-area ratio, and can have a high wetland-to-water ratio. The flushing times tend to be long relative to riverine estuaries and embayments because the restricted exchange with the marine-end member and the reduced river input lengthen residence times. As such, there tends to be more benthic-pelagic interaction, enhanced by generally shallow bathymetry. Additionally, exchange with surrounding landscapes (often riparian wetland and palustrine systems) tends to be enhanced and more highly coupled than in other types of estuaries. Occasionally, a lagoon may be produced by the temporary sealing of a river estuary by a barrier (e.g. Sand Lake Estuary). Such lagoons are usually seasonal and exist until the river breaches the barrier; these lagoons occur in regions of low or sporadic rainfall."	Lake Lytle Smith Lake Chamberlain Lake Sand Lake Sears Lake Fogarty Creek (School House Creek)
Embayment/Bay Estuary	"A water body with some level of enclosure by land at different spatial scales. These can be wide, curving indentations in the coast, arms of the sea, or bodies of water almost surrounded by land. These features can be small—with considerable freshwater and terrestrial influence— or large and generally oceanic in character." "This class of estuary tends to be shallow, highly enclosed, and have reduced exchange with the ocean. They often experience high evaporation, and they tend to be quiescent in terms of wind, current and wave energy."	Netarts

Appendix II. Table D. Implemented Estuarine Restoration Projects as of 2017

(does not include: projects that are only planting, weed control, clean-up, or large wood placements; and conservation acquisitions unless restoration also included)

Estuary Name	Project Name	Restoration Action	Year Completed	Tidal Wetland Acres Restored	Managing Entities
Nehalem	Alder Creek Farm	Dike removal & channel restoration?	2005	35?	Lower Nehalem Community Trust
Tillamook	OWEB grant 97-811	3 Tide gates replaced or modified	1998		Tillamook Bay National Estuary Project/TCPP
Tillamook	OWEB grant 99-016	8 Tide gates replaced or modified	2000		Tillamook Bay National Estuary Project/TCPP
Tillamook	Tillamook Tide gates (Blaser #1&2)/OWEB grant 99/336	2 Tide gates replaced or modified	2001		Tillamook County Performance Partnership
Tillamook	Tillamook Tide gates (Hathaway #1 & 2)	2 Tide gates replaced or modified	2001		
Tillamook	Tillamook Tide gates (Schriber #2)	1 Tide gate replaced or modified	2001		
Tillamook	Tillamook Tide gates (Fuhrman, Blind Slough) /OWEB grant 99/336	3 Tide gates replaced or modified	2001		Tillamook County Performance Partnership
Tillamook	Miami River Restoration Project	Ditches filled, tidal channels re-created, large wood installed	2011	44	Tillamook Estuaries Partnership
Tillamook	Miami Wetlands Restoration Plantings OWEB 213-1053-10602	Estuarine vegetation planted	2014	17	The Nature Conservancy
Tillamook	Kilchis Estuary Restoration	Dike removal, ditch filling, channel creation, slough reconnection; planting is ongoing	2015	66	The Nature Conservancy
Tillamook	Southern Flow Corridor	Dike and tide gate removal, ditch filling, channel restoration, road and fill removal, structure removal, large woody debris placement, plantings	2017	521	Tillamook Co, USFWS, OWEB
Netarts	Netarts Oyster Restoration Project OWEB 207-043	Existing estuary improved by reintroduction of native animal species	2008	3	The Nature Conservancy
Nestucca Bay	Millport Slough – Jackson & Gray Tracts	Estuarine connection restored by dike or berm modification / removal	2003	200	DU
Nestucca Bay	Little Nestucca Tidal Marsh Restoration	Estuarine connection restored by dike or berm modification / removal; Tide gate removed and not replaced	2007	82	USFWS/DU
Salmon River	Tidal Marsh Restorations (Mitchell, Y Marsh, etc.)	Dike removal	1976,1987, 1996	150 acres	U.S. Forest Service
Salmon River	Tamara Quays Dike Removal and Rowdy Cr. Fish Passage Culvert	Estuarine connection restored by dike or berm modification / removal; Existing estuary improved by channel modification; Tide gate removed and not	2010	13	Salmon Drift Creek Watershed Council & USFS

Estuary Name	Project Name	Restoration Action	Year Completed	Tidal Wetland Acres Restored	Managing Entities
	OWEB 208-1040/208-1061-7658	replaced; Culverts/ structures/ fords replaced with open bottom arch culverts; Estuarine vegetation planted			
Salmon River	Pixieland Phase I –Restoration OWEB 208-1061-8288	Main stream channel modified / created; Estuarine connection restored by dike or berm modification / removal	2011	40	Salmon Drift Creek Watershed Council & USFS
Salmon River	Pixieland Restoration Phase II	Estuarine connection restored by dike or berm modification / removal; Existing estuary improved by channel modification; Tide gate removed and not replaced	2014	10	Salmon Drift Creek Watershed Council & USFS
Salmon River	Lower Salmon River Lessons Learned Report and Crowley Creek Restoration OWEB 208-1061-9664	Estuarine connection restored by dike or berm modification / removal; Wetland vegetation planted; Wetland treated for non-native or noxious plant species; Culverts/structures/ fords replaced with culverts placed embedded or flat	2014	3	USFS & Salmon Drift Creek Watershed Council
Salmon River	Boat Basin Salmon River and Mink Creek Restoration OWEB 214-1003/208-1061-11234	Existing estuary improved by channel modification; Estuary treated for non-native or noxious plant species; Estuarine vegetation planted; Estuarine connection restored by dike or berm modification / removal	2014	2.5	Salmon Drift Creek Watershed Council
Salmon River	Fraser Tidal channel restoration	Installed new culvert under Hwy 101, reconfigured channel, and filled ditch	2017	40	Salmon Drift Creek & MidCoast Watersheds Councils/USFS/ODOT
Siletz Bay	Keys / Kernville Marsh	Restore Tidal estuary by removing portions of levees, removing culverts, and creating channels	2002	85	DU / USFWS
Siletz Bay	Siletz Tidal Salt Marsh Connectivity and Fish Passage OWEB 212-1013	Culverts replaced with culverts placed embedded or flat; Estuarine connection restored by estuarine culvert modification / removal; Large wood placed	2013	40	Lincoln SWCD
Siletz Bay	Alder Island	Two dike breaches with culverts placed in dike surrounding Alder Island for fish passage, 0.3 miles of tidal channel created, 4 acres of tidally influenced wetlands partially improved tidal flow	2016	4	USFWS – Siletz Bay NWR/DU
Yaquina	Yaquina Estuarine Wetland Restoration /OWEB 99-452	Dike breaching, channel formation	2001	70	MidCoast Watersheds Council, OWEB, Fish America Foundation, PSMFC, Green Diamond Resource Company, Georgia Pacific Fish America Foundation

Estuary Name	Project Name	Restoration Action	Year Completed	Tidal Wetland Acres Restored	Managing Entities
Yaquina	35th St. Fish Passage OWEB 210-1004	Estuarine connection restored by estuarine culvert modification / removal; Culverts/ structures/ fords replaced with culverts placed embedded or flat	2010	6	ODFW, OWEB
Yaquina	Poole Slough		2016	2.25	MCWC/OWEB/Lincoln Co., The Wetlands Conservancy
Yaquina	Oregon Oyster	1400 ft. Dike removal and estuarine channel encouragement	2016	8.2	The Wetlands Conservancy
Alsea Bay	Lower Drift Restoration Project	Acquisition of property by USFS, education outreach with charrette program, dike removal and breaching, removal of concrete drains	2005	82	USFS, MCWC, NOAA, Rocky Mountain Elk Foundation
Alsea Bay	3 phase restoration Lint Slough-Alsea Bay Restoration OWEB 98-105, 208-1054; monitoring 208-1062	Estuarine habitat created from non-estuarine/non-wetland area; Estuarine connection restored by dike or berm modification / removal; Existing estuary improved by channel modification	2000, 2009	80 acres tidal marsh; 50 acres mudflat	ODFW, USFWS, OWEB, City of Waldport, Port of Alsea, USFS, MidCoast Watersheds Council, DU
Alsea Bay	Lower Drift Creek OWEB 205-159	5.6 miles of planting and fencing to exclude livestock, stabilize streambanks, plant 7,000 trees and replace two barrier culverts on small tributaries to Drift Creek.	2009	50	USFS/MCWC/Alsea WC
Siuslaw	North Fork Siuslaw Estuary Tide Channel Restoration Project WY009 – Estergard	Dike breaching	2001	85	Siuslaw SWCD
Siuslaw	North Fork Restoration, ODOT mitigation	Dike breaching, ditch filling, tidal channel construction, planting	2007	7 acres	ODOT (mitigation for North Fork Bridge)
Siuslaw	Karnowsky Creek	Channel re-grade and re-meander (estuary and upstream)	2001	1 mile estuarine	USFS, Siuslaw SWCD, SI, SWC
Siuslaw	Wilbur Mitigation Bank (?)	Dike breaching and ditch filling	2010	162 acres	Private
Siuslaw	Siuslaw South Slough Tide gate and Culvert Project OWEB 03-02-002	Tide gate replaced or modified	2003		Siuslaw Watershed Council
Siuslaw	Phey Passage	1 Tide gate replaced or modified	2010		ODFW

Appendix III. Major Estuary Profiles

Nehalem Estuary

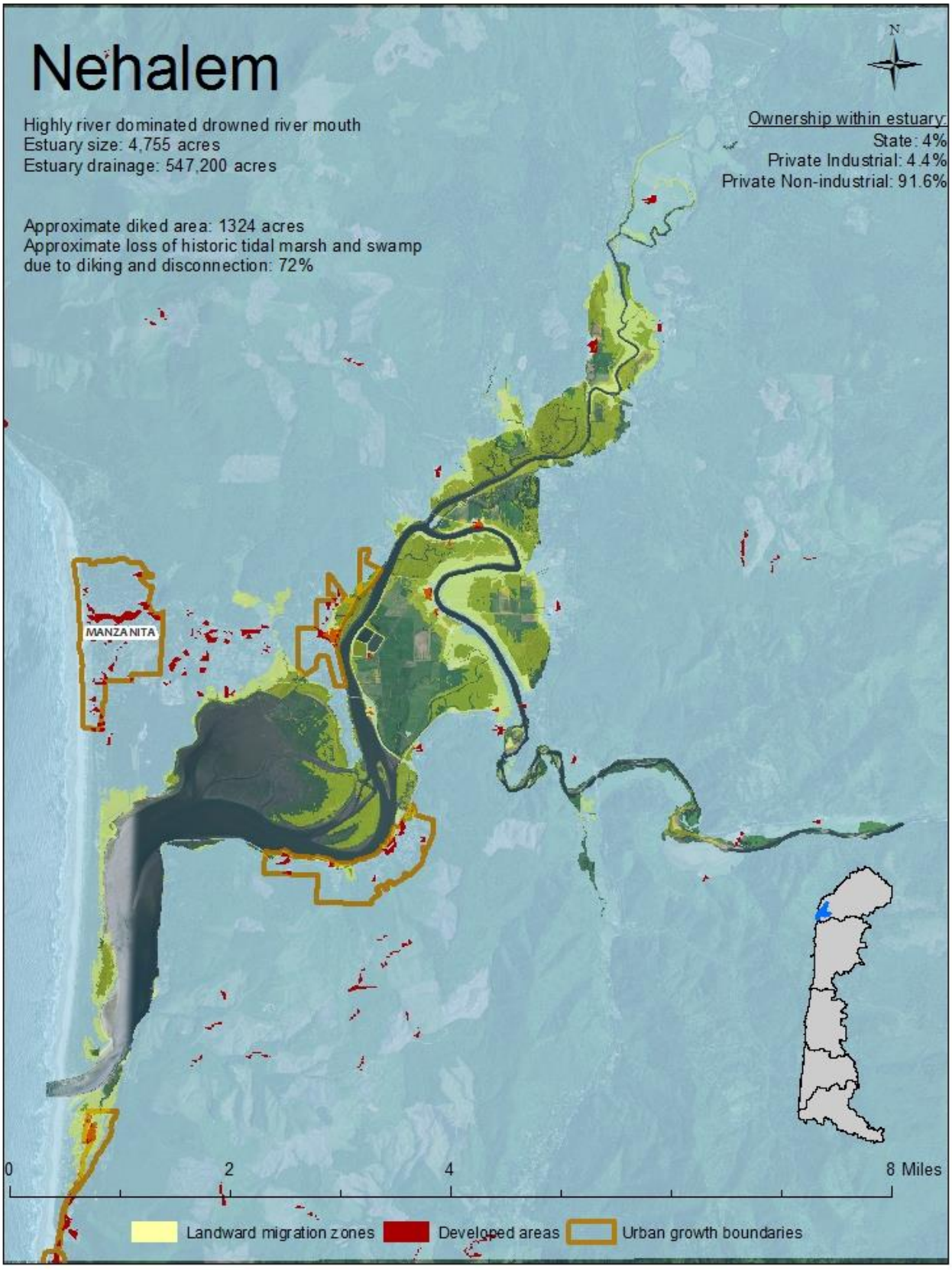
The Nehalem Estuary is a river-dominated mixing bowl at the confluence of the Pacific Ocean that collects waters of 105 river miles draining 855 square miles of watershed. Water passes through four counties on its way to the estuary. Once there, water mixing is highly stratified during winter high flow and moderately stratified during summer low flow (Adamus et al. 2005). The head of tide is approximately 13 miles from the mouth. Ownership is largely corporate timber, state forest, agriculture and smaller areas of urban development. The Nehalem Basin, which is the source of all fresh water arriving in the estuary, has been called the most aquatically diverse basin on the North Oregon coast (Nehlson 1997). Upon its arrival, it is often sediment laden, too warm, and has levels of fecal coliform bacteria that exceeds Oregon Dept. of Environmental Quality standards. Though it is estimated 72% of the associated wetlands and salt marshes have been lost due to diking, ditching, and levees (Brophy & So 2005), the heavy and rapid sedimentation largely due to logging has added some salt marsh along the west side of Dean's Point and West Island. Stewart Schultz (1990) posits in his book *The Northwest Coast: A Natural History* that estuaries of Nehalem's gradient (low) and design, (drowned river mouth) will in time lose their wide quiet waters to channelization as sedimentation continues to build marsh and narrows the flow of water to high velocity. However, sea level rise could be a mitigating factor.

The estuary itself is embraced by three small communities. Nehalem and Wheeler are physically adjacent, with the city of Nehalem considered the river town and Wheeler, further downstream, the bay front. The City of Manzanita is generally not physically connected to the estuary except for a few parcels in its Urban Growth Boundary, but it is the gateway to Nehalem Bay State Park, which forms the western boundary of the estuary. Dairy is the dominant industry in the upper reaches of the estuary, while tourism and second home sales and construction are the economic engines of the 3 "urban communities." This is especially true for the full and many part time residences in Manzanita and the unincorporated area to the north, Neahkahnie. The Bayside Gardens unincorporated area, which lies on the estuary's north edge between Manzanita and Nehalem, is sometimes referred to as "Contractor Village." Many service industry employees and some long-time local families reside in either Nehalem or its downstream neighbor Wheeler. Three marinas and a marine repair shop make up the only water related industries and are located along the bay front from Wheeler to the South jetty. It should be noted that the three communities have joined together to support a comprehensive cleanup of the Nehalem Estuary every two years for the past twenty.

The Estuary is home to an elk herd, deer, otter, black bear, coyote, beaver, mink, raccoon and the occasional cougar passing through. Seals make their year-round perch on the sandspit just upstream of the North Jetty and have on occasion been attacked by killer whales. Never less than 3 nesting pair of bald eagles and a multitude of shorebirds and other waterfowl count on this estuary for food and nesting habitat. The estuary supports a recreational Dungeness crab and clam fishery, and a salmonid population that includes, steelhead and cutthroat trout, coho, chum, and chinook salmon, all of which use the estuary for metabolic transition and some for extended "nursery" stays before entering the ocean. Sand shrimp, sculpin, perch, sole and other small non-salmonids make up about 95% of the total fish population. All species are supported by the diverse vegetation of the many types of tidal wetlands in the estuary, which range from low and high salt marsh to scrub-shrub and forested tidal wetlands. For example, the salt marsh plant community provides predator cover and the beginnings of the long and necessary food chain that relies upon detritus from the low and high salt marsh community. Protecting what is left and restoring what has been lost are the highest priorities of the Lower Nehalem Community Trust, which has already gained title to most of the north edge of the undeveloped portion of the bay.

Landward Migration Zones (LMZs) are the areas upslope of current tidal wetlands where wetlands may migrate in the future. These are based on sea level rise scenarios as the future tide range will predict the possible future extent of tidal wetlands. The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas along the North Fork and east of the junction of the mainstem Nehalem with the North Fork are expected to have the largest LMZs in the future.

Notes for All Maps in this Section:
Unshaded areas represent the estuary boundary according to DLCD's CMECS mapping (Lanier et al. 2014)
See Appendix II. Table A for Citations for estuary size, diked area and % loss
Data Sources include: ESRI; NAIP imagery; Or. Dept. of Land Conservation & Development; Estuary Technical Group, Institute for Applied Ecology; MidCoast Watersheds Council; & The Nature Conservancy



Tillamook

Tillamook Bay is located in central Tillamook County between the towns of Rockaway Beach and Netarts. The city of Tillamook (pop. 5,183) lies southeast of the estuary. Nestled between rugged mountains and the Pacific Ocean with over 597 square miles of rivers and creeks and a bay totaling 13 square miles, Tillamook Bay is Oregon's second- largest bay. The bay supports a thriving oyster industry and some of the best runs of salmon and steelhead on the West Coast. In addition, broad fertile floodplains play host to rich dairy lands which produce world-class cheese. A healthy and functioning Tillamook Bay is essential to not only honor our cultural landscape and crucial natural resources, but to the overall vitality of its surrounding communities.

The estuary drains the watersheds of five rivers: Miami, Kilchis, Wilson, Trask, and Tillamook. It is a river dominated estuary but the predominant source of sediments or nutrients is ocean derived (Adamus et al. 2005). Waters are highly stratified during summer low flow but vertically homogeneous during winter high flow. Head of tide is approximately 17 miles from the mouth. Wetland habitats in and around the estuary include: salt marshes, aquatic beds, freshwater emergent wetlands, forested wetlands, and mudflats. The Wetlands Conservancy has designated the Tillamook estuary as one of Oregon's Greatest Wetlands.

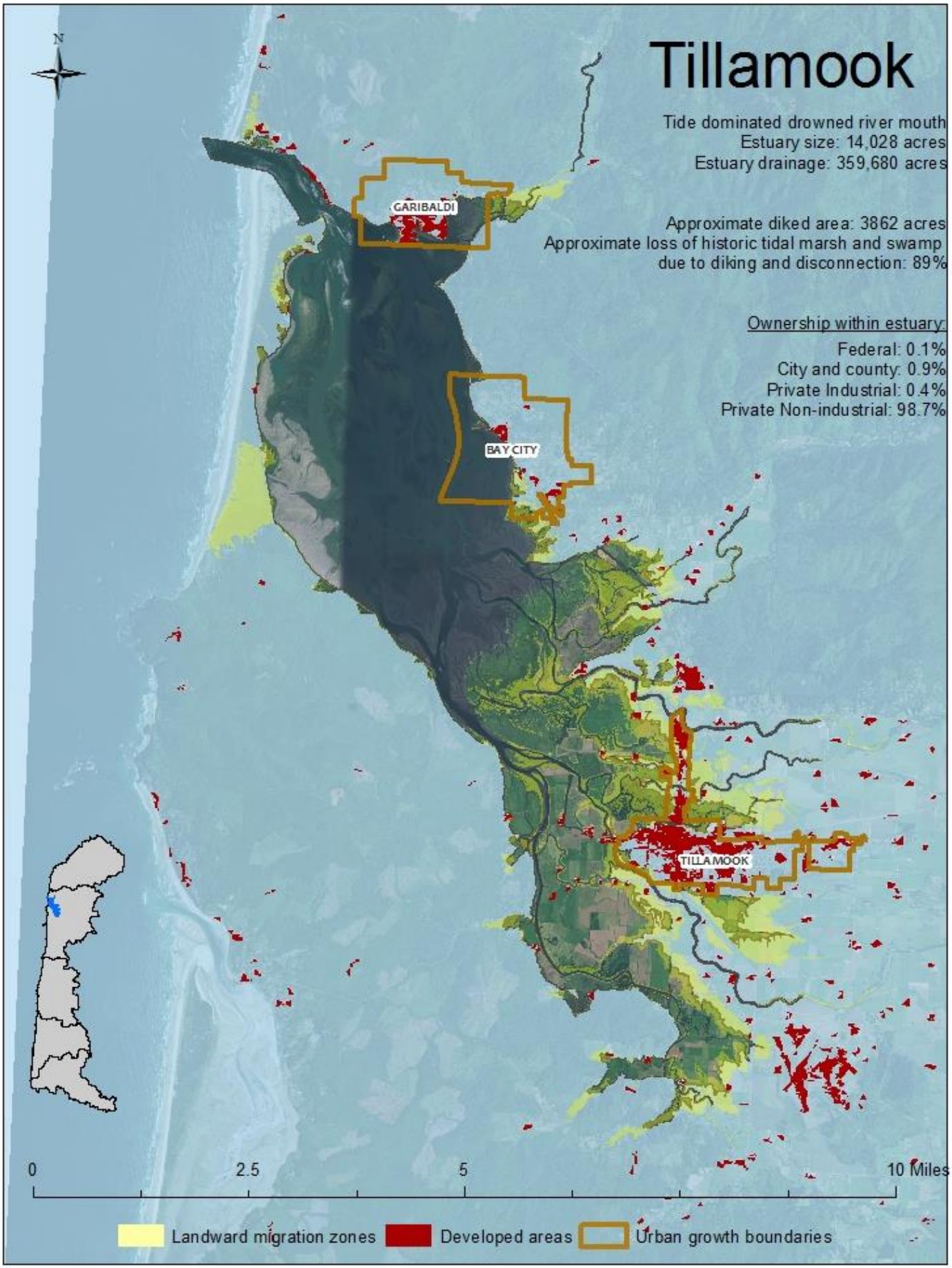
Much of the land in the watershed is privately or state-owned. The vast 364,000-acre Tillamook State Forest is east of the bay and is a major area for commercial logging and recreation. The uplands are primarily used for timber production, while the lowlands are primarily used for agriculture, dairy, and residential uses. The estuary is used for commercial and sport fisheries and other recreation activities.

Water temperature and toxics continue to be areas where improvements are needed. Bacteria, sediment, and dissolved oxygen are all improving throughout the watershed, which indicates a positive effect on water quality in the bay.

The rivers and bay provide important habitat for coho, Chinook and chum salmon, steelhead and cutthroat trout, and a variety of estuary-dependent species including forage fish, juvenile groundfish, marine invertebrates and waterbirds. Tillamook Bay supports close to 25 percent of Oregon's northern- and central-coast wintering waterfowl population and is designated as an Important Bird Area (Audubon 2018). It is consequently recognized by the Northern Pacific Coast Regional Shorebird Management Plan for shorebird migration (Drut & Buchanan 2000). The Tillamook Basin is a north coast stronghold for Pacific salmon species, including the federally threatened Oregon coho; the estuary environment is essential for salmon health, particularly for species that rear in lower river reaches (coho and chum) or spend months in the estuary (Chinook). The Kilchis River is known for having one of the last sustaining chum salmon runs in Oregon.

The disconnection of tidal wetlands from adjacent stream channels has been identified as one of the most critical limiting factors to the persistence of anadromous fish (Bottom et al. 2005; Brophy 2007), migratory waterfowl (Audubon 2018), and declining coastal wetland plant communities (Brophy 2007). It is estimated that 89% of historic tidal marsh and swamp habitats have been lost in Tillamook due to diking and disconnection (Ewald & Brophy 2012).

Landward Migration Zones (LMZs) are the areas upslope of current tidal wetlands where wetlands may migrate in the future. These are based on sea level rise scenarios as the future tide range will predict the possible future extent of tidal wetlands. The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas southeast of the bay, near the city of Tillamook, are predicted to have the largest LMZs in the future. Areas around Garibaldi and the Bayocean Peninsula Park may also undergo LMZ movement in the future.


Tillamook
Tide dominated drowned river mouth
Estuary size: 14,028 acres
Estuary drainage: 359,680 acres
Approximate diked area: 3862 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 89%
Ownership within estuary:
Federal: 0.1%
City and county: 0.9%
Private Industrial: 0.4%
Private Non-industrial: 98.7%
GARIBALDI
BAY CITY
TILLAMOOK
N
0
2.5
5
10 Miles
Landward migration zones
Developed areas
Urban growth boundaries

Netarts Bay

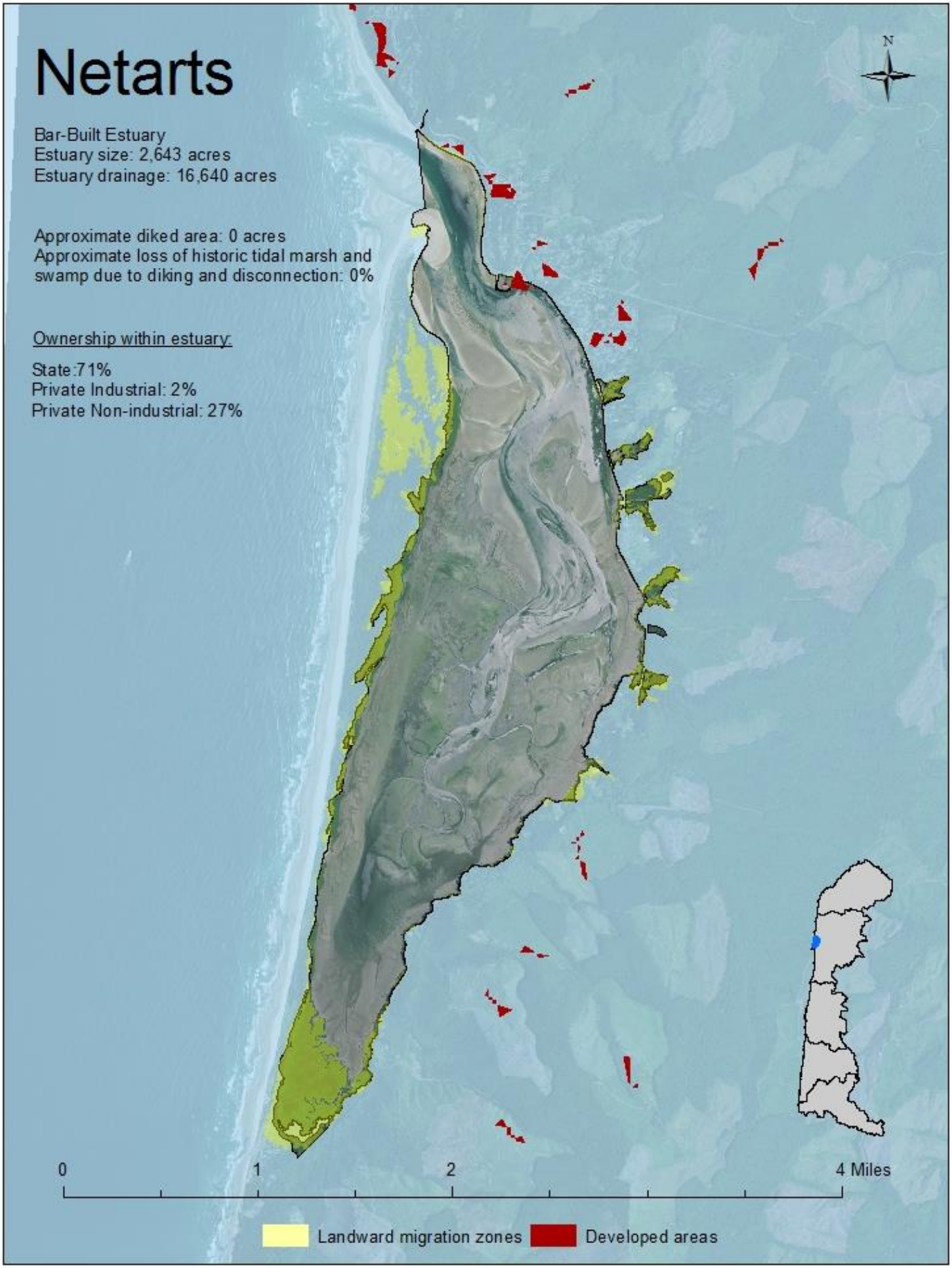
Netarts Bay is located in central Tillamook County between the communities of Netarts and Sand Lake. The Bay boasts a predominately pristine estuarine environment compared to its sister bays in Tillamook County with no diked areas (Lanier et al. 2014). This is due to the relatively light influence of development along its shores and throughout its watershed. Rather than being fed by larger rivers, Netarts Bay is fed by 16 smaller direct-to-bay creeks so it is an ocean dominated system. However, the predominant source of sediment or nutrients is land-derived, especially during fires of 1900 and logging of the 1950s and 60s (Adamus et al. 2005). Mixing of waters is vertically homogeneous during both winter high flow and summer low flow. The bay and estuary are approximately 2,643 acres, 812 of which are permanently submerged and 275 in tidal wetlands. Netarts is shallow compared to other Oregon estuaries. The watershed has dune and marsh communities in lowland areas. Wetland habitats in and around the estuary include: salt marshes, aquatic beds, freshwater emergent wetlands, forested wetlands, and mudflats. In spite of its size, Netarts Bay is a highly dynamic system that influences coastal erosion throughout its littoral cell.

Much of the land in the watershed is privately or state-owned. To the west of the bay is Cape Lookout State Park which is a popular area for fishing, camping, and sightseeing. The unincorporated community of Netarts (pop. 748) lies northeast of the estuary. The uplands are primarily used for timber production, while the lowlands are primarily used for residential uses. The estuary is used for commercial and sport fisheries and other recreation activities. In addition to the many recreational opportunities, Netarts is home to robust commercial oyster operations and an emerging premium sea salt industry. The Netarts Bay Shellfish Preserve is located on the south side of the bay, which includes areas both open and closed to commercial fishing and harvesting. Because of Netart's relatively unaltered natural state, it is often used as a reference site to compare the water and habitat quality of other estuaries.

The Netarts watershed is home to salmonids such as chum, coho, winter steelhead, cutthroat trout and chinook which require a range of habitat types: freshwater for spawning, estuaries for adaptation to salt water, and marine habitats for rearing. Coho salmon, winter steelhead, cutthroat trout, and chum are all currently listed species either federally or through the state which requires special consideration be given to habitat. Other common species include a variety of migratory and resident waterfowl and songbird species, elk, beaver, and black bear. The Audubon Society considers Netarts Bay an Important Bird Area; "Netarts Bay hosted an average of 43% of Oregon's wintering population of Black Brant during January counts 1996-2002. During two counts of shorebirds during 1988-1991, the peak count at Netarts Bay was 4,818 shorebirds in fall." (Audubon 2018).

Native oysters are important in estuary function as they improve water, provide habitat complexity for other species in their shell reefs, and serve as prey for other species. Little effort has been directed at restoring functionality to estuaries through the restoration of marine species populations that formerly played an important keystone species role in estuaries. However, Netarts Bay is a pilot site for a project focused on restoring the Pacific Northwest's native Olympia Oyster within its historical distribution.

Landward Migration Zones (LMZs) are the areas upslope of current tidal wetlands where wetlands may migrate in the future. These are based on sea level rise scenarios as the future tide range will predict the possible future extent of tidal wetlands. The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas southwest and west of the bay are predicted to have the largest LMZs in the future.


Netarts
Bar-Built Estuary
Estuary size: 2,643 acres
Estuary drainage: 16,640 acres
Approximate diked area: 0 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 0%
Ownership within estuary:
State:71%
Private Industrial: 2%
Private Non-industrial: 27%
N
0
1
2
4 Miles
Landward migration zones
Developed areas

Sand Lake Estuary

The Sand Lake Estuary, located in southern Tillamook County, empties into the Pacific Ocean between Cape Lookout and the community of Tierra del Mar. The estuary drains 16,000 acres and has freshwater inputs primarily from groundwater and four small creeks: Sand Creek, Jewel Creek, Gurtis Creek, and Reneke Creek. These creeks contribute very little towards the character of Sand Lake Estuary because of their limited freshwater inflow in comparison to tidal inputs. The predominance of marine inputs combined with the restrictive effect of the estuary's sand bar create a lagoonal estuary type. Head of tide is located approximately 4.5 miles from the mouth. Estimated mean annual freshwater inflow to the estuary is 109 cfs, and during an average winter flood tide freshwater inflow constitutes about 6% of the tidal inflow (Kreag 1979). Sand Lake Estuary is a bar built estuary with extensive marshes and a major island directly east of its mouth. Whalen Island was formed through dune and tidal marsh stabilization. Several other active dunes also exist in the Sand Lake drainage area. The mouth of the estuary is flanked by dynamic sand spits. USFS (1998) analysis of historic channel locations west of Whalen Island show that they have moved dramatically from wave forces and seasonal erosion in this high energy area.

Sand Lake Estuary is classified as a “natural” estuary by the Oregon Land Conservation and Development Commission (ODLCD Coastal Atlas 2018), indicating it is to be managed to preserve its natural resources and avoid constraining the dynamic ecosystem processes. The estuary is estimated to have lost only 11% of its historic tidal marsh and swamps due to diking and disconnection. Approximately 67 acres of the estuary is diked (Brophy 2019). There are three dike-type structures in the estuary (ODSL 1972): a county road that accesses Whalen Island, a flood control dike along the northern shore of the estuary, and Beltz Dike on the estuary’s southern shore.

There are no major population centers around the estuary. The village of Tierra del Mar sits on its southern edge along the Pacific Coast and several ranches and low-density residences lie along the shore lands. In the early 1900s cranberry bogs were cultivated in the Sand Lake estuary, bringing families to the area for harvest. The fertile valleys and extensive dunes of the Sand Lake basin offer pristine land for dairy farmers as well as other agriculture and recreation land users. Today the estuary has several popular recreational areas offering year-round campgrounds, day use facilities, and off highway vehicle riding (OHV) through many miles of sand dunes, including: Cape Lookout State Park to the north, USFS Sand Lake Recreation Area at the estuary mouth, Whalen Island County Park, and the Sitka Sedge State Natural Area.

Sand Lake Estuary has historically excellent starry flounder and Dungeness crab recreational fishing and abundant duck and geese use during migration and wintering periods. Anadromous fish species historically found in Sand Lake include steelhead trout, cutthroat trout, coho salmon, chum salmon, Chinook salmon and Pacific lamprey. There was a commercial fishery for chum salmon in the estuary and a private chum salmon hatchery on Sand Creek until the 1950s. Shrimp burrows, small cockle and Baltic macoma have been documented on the flats and unconsolidated bottom habitat types that dominate the estuary (Kreag 1979). Patches of eelgrass and algae provide important food and shelter for aquatic organisms. The southern spit provides important habitat for the Western Snowy Plover, a threatened bird that nested in the sand along this spit in 2016, the first time since 1984. A unique *Sphagnum* fen along the northern edge of the estuary was documented in 1953 containing the northernmost occurrence of *Darlingtonia californica* (Christy 2005). It is not uncommon to find elk, deer, black bears, beavers, and the occasional cougar in the Sand Lake estuary along with 43 different bird species. The Wetlands Conservancy has designated Sand Lake as one of Oregon’s Greatest Wetlands.

Currently the dike and bridge to Whalen Island is being replaced with an enlarged bridge, which will improve water circulation on the east side of the island and improve sediment and nutrient transport processes. The Salmon SuperHwy partnership is working to inventory all the potential fish passage barriers in the watershed and the Nestucca, Neskowin and Sand Lake Watersheds Council has led the restoration of several passage barriers on Jewel Creek. The Sand Lake Working Group is collaborating to gather more information about additional restoration priorities in the watershed.

The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas along the north, south, and west are predicted to have the largest LMZs in the future.

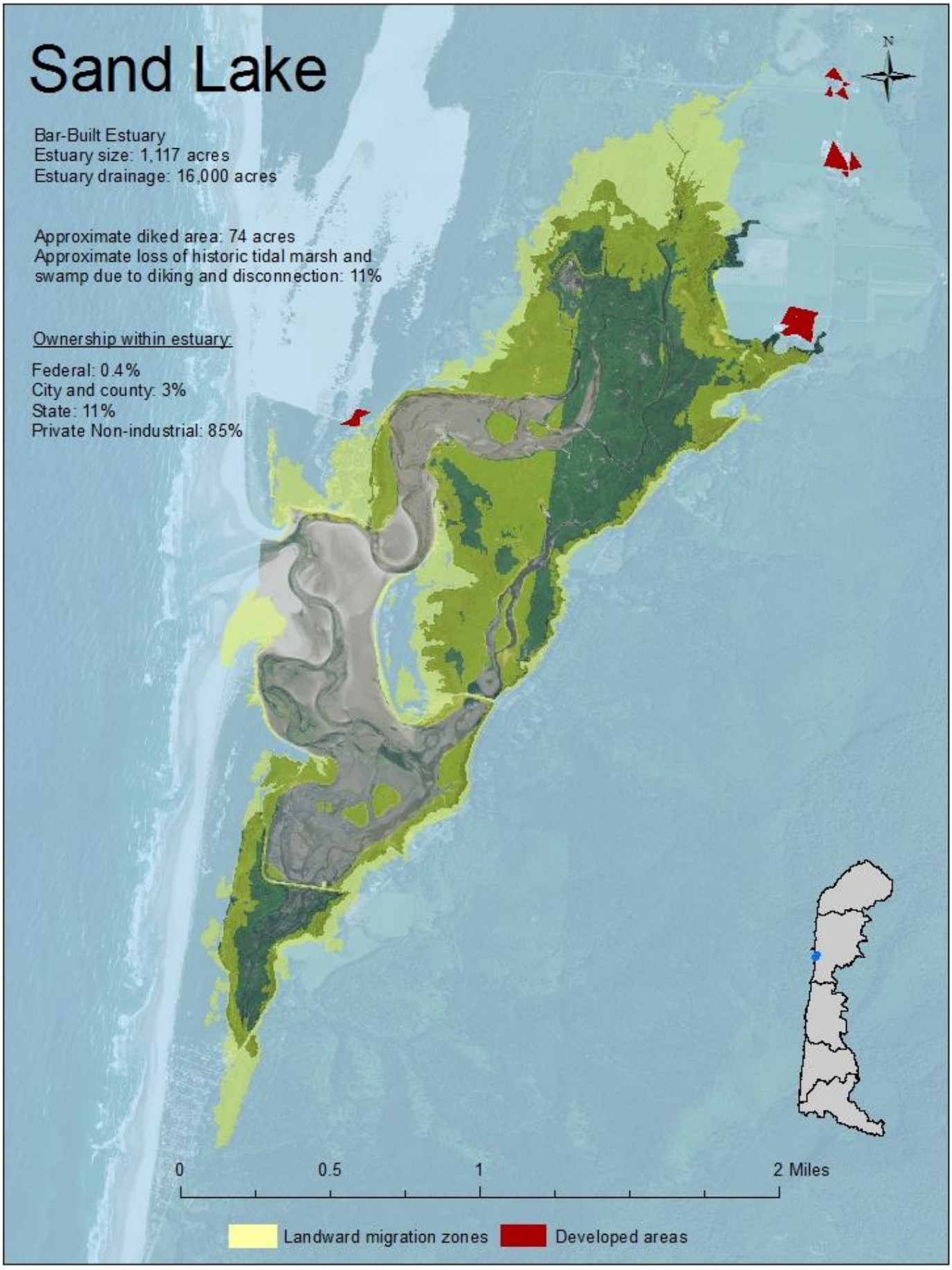
Sand Lake

Bar-Built Estuary
Estuary size: 1,117 acres
Estuary drainage: 16,000 acres

Approximate diked area: 74 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 11%

Ownership within estuary:

Federal: 0.4%
City and county: 3%
State: 11%
Private Non-industrial: 85%



Nestucca Bay Estuary

Of the 22 major estuaries in Oregon, Nestucca Bay is one of six without maintained jetties or channels. It is ocean dominated and the head of tide is about 8.6 miles from the mouth. The estuary is located at the confluence of the Pacific Ocean and two main tributaries: the Nestucca, and Little Nestucca Rivers in south Tillamook County between Pacific City and Oretown. The Nestucca River is the larger of the two and flows 53 miles east-northeast with a watershed that extends over 258 square miles. The smaller Little Nestucca flows approximately 18 miles southeast of the estuary mouth and has a basin of approximately 64 square miles. The Nestucca fork of the estuary extends from the farm fields north and east of Pacific City to the undeveloped, Nestucca Bay spit which constitutes the western boundary of the estuary. The estuary also extends east along the Little Nestucca River into a broad floodplain dominated almost exclusively by wetland pastures and tidal marsh.

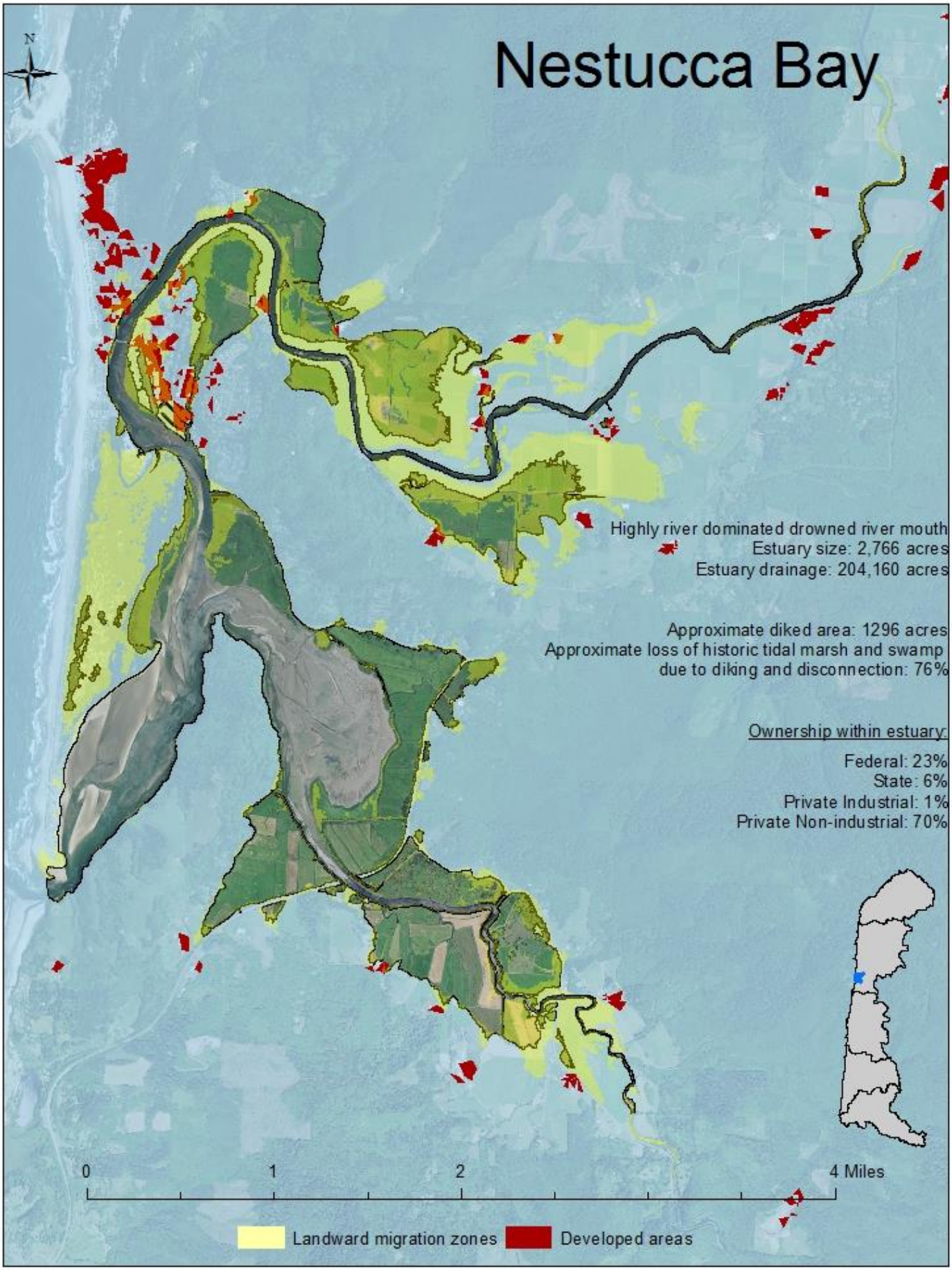
The Nestucca Bay Estuary is composed of a diverse network of public and private landowners due to its proximity to Pacific City. Residential and commercial landowners occupy several acres within the estuary that fall within the city limits of Pacific City. However, most of the critical estuarine habitat is located south of Pacific City where the two rivers converge and falls under the governance of the USFWS Oregon Coast National Wildlife Refuge Complex. The Nestucca Bay Wildlife Refuge (NBWR) protects and enhances habitat over 893 acres for Dusky Canada Geese. The NBWR engages in pasture management with local dairy farmers to offer prime habitat for geese during the winter. In 2007, an 83-acre tidal marsh restoration project resulted in a 30% increase in tidal marsh habitat in the estuary. In 2009, the refuge acquired 76-acres where the entire subpopulation of Semidi Islands Aleutian Cackling Goose resides during the winter. There is an additional 2,500+ acres still in private ownership that falls within the approved refuge boundary.

The Nestucca Bay estuary has the geomorphology of a drowned river mouth and contains habitat types that include intertidal salt marsh, tidal streams, mudflats, diked tidal flats, and estuarine forestland including several acres of Sitka spruce tidal swamps. Saltmarsh plants are found in areas with higher levels of salinity; these include plants such as pickleweed and saltgrass, which form important buffers as their densely matted roots stabilize shorelines and absorb pollutants. Over 40% of the National Wildlife Refuge is lowland pasture located behind either dikes &/or tide gates. Following European settlement, diking and draining estuarine and wetland habitat became the standard practice along the Nestucca and Little Nestucca Rivers to create usable land for cattle grazing resulting in a 76% loss of historic tidal wetlands.

The diverse habitats within Nestucca Bay support a great diversity of wildlife; most notably six subspecies of wintering Canada geese. The freshwater wetlands and estuarine habitats support thousands of migratory shorebirds and waterfowl earning it an Important Bird Area designation (Audubon 2018). Peregrine Falcon and Bald Eagles observations are numerous throughout the year. The recently de-listed California Brown Pelican also uses the open waters of the estuary as foraging habitat during summer and early fall.

The Nestucca Bay estuary and its two tributaries also provide essential habitat for Chinook, chum, and threatened coho salmon, and steelhead and coastal cutthroat trout. Historical data suggest that at one point the Coho salmon population was over 107,000 within the river. Mammals such as Oregon voles, marsh shrews, muskrats, mink, beaver, raccoons, and river otter can be found in the marshes and wetter pastures. Harbor seals forage over flooded tide flats and can be found resting at the mouth of the river. Roosevelt elk and deer graze the marsh and pasture lands. Long-toed and Pacific giant salamanders, Pacific chorus frogs, and rough-skinned newts are common throughout the area. Marine invertebrate such as crabs and clams are also abundant throughout the estuary. Wood-boring crustaceans and bivalve mollusks are abundant in the lower salt marshes and subtidal wetlands. These invertebrates play an important role breaking down large woody debris and are important links in the food chain.

The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas west of the bay and northeast along the Nestucca River are predicted to see some advancing tidal wetland (LMZ) in the future, while significant areas currently within tidal wetland elevation range along the Little Nestucca are predicted to convert to mudflat or open water.


Nestucca Bay
N
Highly river dominated drowned river mouth
Estuary size: 2,766 acres
Estuary drainage: 204,160 acres
Approximate diked area: 1296 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 76%
Ownership within estuary:
Federal: 23%
State: 6%
Private Industrial: 1%
Private Non-industrial: 70%
0
1
2
4 Miles
Landward migration zones
Developed areas

Salmon River

The Salmon River Estuary lies between Neskowin to the North and Lincoln City to the South. It is classified as a drowned river mouth estuary because it formed in the mouth of a flooded river valley, allowing a great deal of tidal flushing to occur. The total estuary area is 204 acres with head of tide located approximately 4.3 miles from the mouth. The mouth of the river is partially exposed to ocean waves, but the historically dynamic sand spit along the south end of its inlet has been stabilized over the past several decades by invasive European beachgrass and shorepine. Cascade Head, the prominent landform above the estuary, was formed by the uplift of underwater volcanic basalt flows.

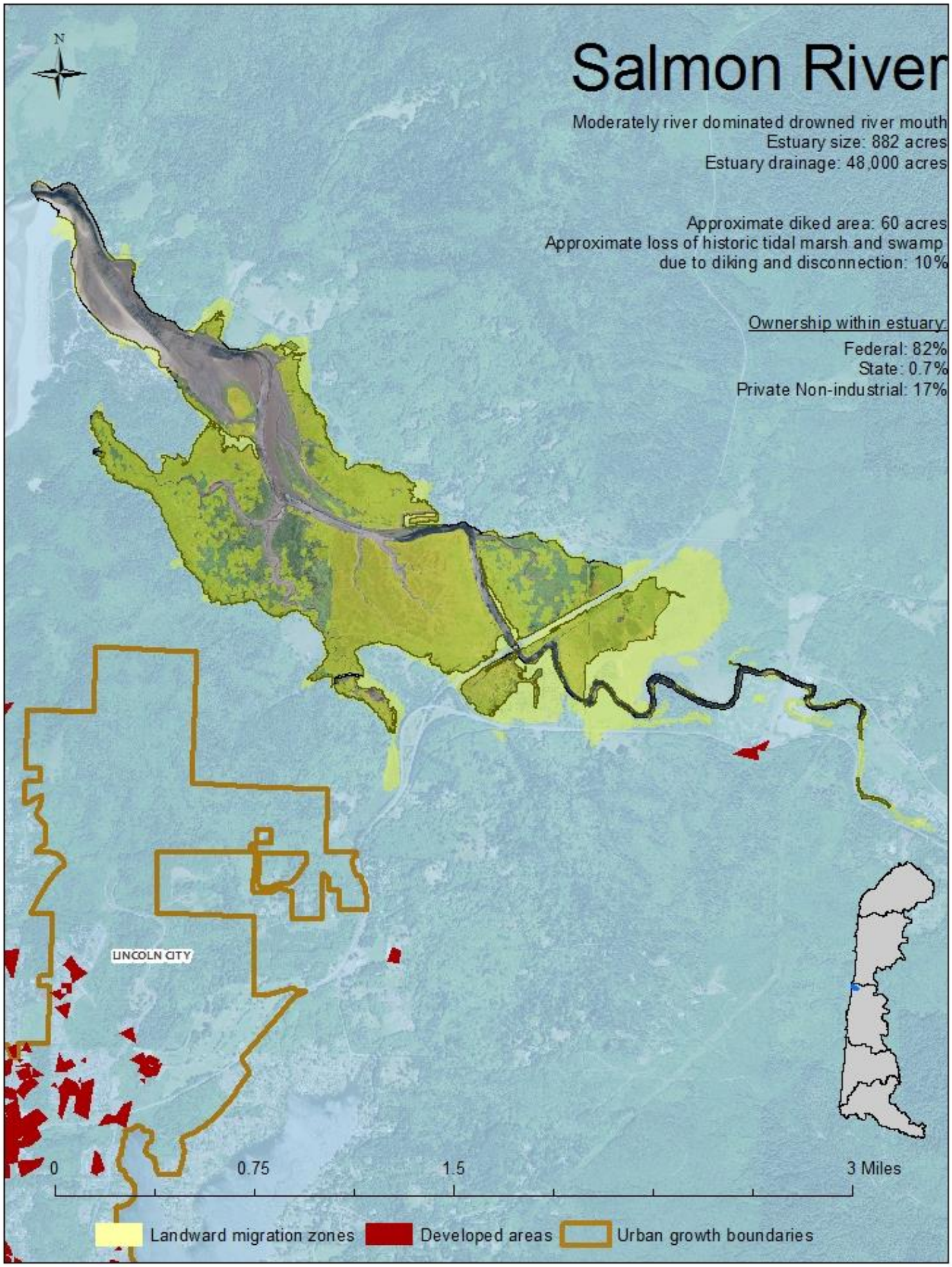
The Salmon River Estuary is currently used by 387 species: 230 birds, 56 mammals, 12 amphibians, 6 reptiles, and at least 74 fish. Three native species, the California Condor, the wolf, and the sea otter were eliminated from the area before 1915. Birds are the most numerous and conspicuous animals. The Salmon River Estuary is designated as an Important Bird Area for Brown Pelican, Bald Eagle, Peregrine Falcon, and for the presence of 1,000 or more shorebirds (mostly Western Sandpipers) at any given time (Audubon 2018). Examples of wildlife commonly seen here are mammals such as elk, deer, fox, beaver, raccoons, porcupine, rabbits, skunks, seals and sea lion, as well as red legged frogs, rough skinned newts, and garter snakes. The Salmon River has long been known for its abundance of fish. Chinook, coho, and chum salmon dominated the catches in the river and stories of catching fish by the dozens were not uncommon. Research done in 2000-2002 in the Salmon River estuary found Chinook salmon fry disperse into the estuary in the early spring and many move into restored tidal marsh habitat for an extended period of time. The results of this and later studies indicate that wetland restoration has increased estuarine rearing opportunities for juvenile Chinook and coho salmon and improved the resilience of salmon populations by providing suitable habitats for a variety of salmonid life history strategies (Jones et al. 2014).

The Salmon River (or Nechesne) Tribe occupied the estuary for at least 500 years prior to EuroAmerican settlement (Beckham 1984). They spoke a distinct dialect of Salish known as Neschesne. A trade route, known as the Salmon River Trail, from Sheridan to the Salmon River was well established and was mapped in 1850. This trail was used by inland tribes to reach the coastal rivers and waters via the Salmon River. European settlers began moving into the Salmon River area in the mid-1800s. Dairy production was the mainstay for many pioneer families once transportation became more reliable.

Due to its ecological significance, Cascade Head Preserve and surrounding national forest and other lands totaling 9,760 acres, have won recognition as the Cascade Head National Scenic Research Area (CHSRA). CHSRA was established when President Ford signed Public Law 93-535 on Dec. 22, 1974. This is the first scenic research area designated in the United States. In 1980 the entire CHSRA was designated a Biosphere Reserve as part of the United Nations Biosphere Reserve Man and Biosphere Program.

Between 1954 and 1974 most of the estuary was diked, ditched and tide gated to create pastures, and the construction of U.S. Highway 101 also disconnected the estuary. Estuary restoration work, primarily removing dikes and tide gates, began in 1978 and continues today. In the summer of 2006, a team of students developed a comprehensive restoration plan for the Salmon River estuary that identified six site-specific, high priority projects. Restoration work proceeded with the first of these identified projects in 2007 at the Tamara Quays trailer park development; the project returned the site back to tidal marsh and restored function to Rowdy Creek. Next, Pixieland, an abandoned amusement park, was restored to tidal marsh and forested tidal swamp, and a new channel for Fraser Creek was excavated. Crowley Creek was restored in 2012 restoring function to the lower tidal zone, and Boat Basin, a marina which was carved into the marsh floor was restored in 2014 reconnecting Mink Creek back to the Salmon River (Ellingson & Ellis-Sugai 2014). In 2015, Fraser Creek was reconnected under Highway 101 to the excavated channel at the Pixieland site and the Fraser Creek ditch was filled in 2017.

Landward Migration Zones (LMZs) are the areas upslope of current tidal wetlands where wetlands may migrate in the future. These are based on sea level rise scenarios as the future tide range will predict the possible future extent of tidal wetlands. The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas along the eastern edge of the current estuary are predicted to have the largest LMZs in the future.


N
Salmon River
Moderately river dominated drowned river mouth
Estuary size: 882 acres
Estuary drainage: 48,000 acres
Approximate diked area: 60 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 10%
Ownership within estuary:
Federal: 82%
State: 0.7%
Private Non-industrial: 17%
LINCOLN CITY
0
0.75
1.5
3 Miles
Landward migration zones
Developed areas
Urban growth boundaries

Siletz

The Siletz Bay estuary, which covers approximately 2,711 acres, including open water, tide flats, and current and historical tidal wetlands, has a watershed of about 373 square miles. Estuarine influence extends inland about 24 miles but fluctuates considerably due to the geomorphology of this watershed (Adamus et al. 2005). The estuary is river dominated and its waters are moderately stratified during both winter high flow and summer low flow. Based on a 2001 assessment, the estuary contains a total of 623 acres of tidal and formerly tidal marshes and swamps (Brophy 2001). A preliminary comparison of 1850s historic vegetation with recent vegetation mapping (Brophy 2011) indicated a 47% loss of tidal marsh and 84% loss of tidal swamp within the estuary.

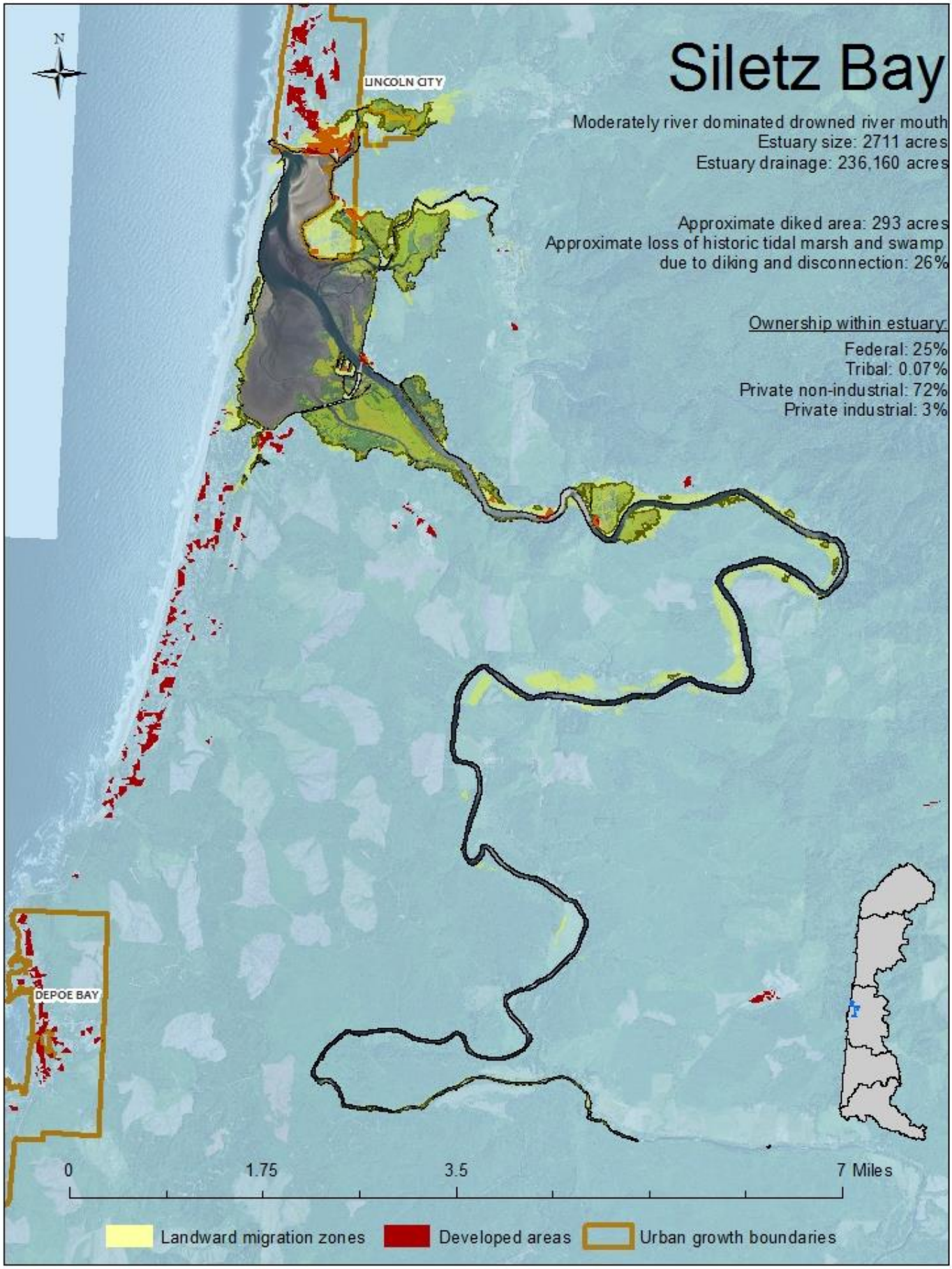
Most of the estuary is composed of either intertidal, muted tidal, or diked tidal marshes draining into the Siletz River, Millport Slough, Drift Creek, or directly into Siletz Bay. Remaining wetlands west of U.S. Highway 101 are largely intact, with natural tidal hydrology. However, old dikes located on the Siletz Keys parcel affect tidal exchange. East of Highway 101 and on the south bank of the Siletz River, the 10-acre Schoen Tract contains a perimeter dike that prevents tidal flows except during extreme high tides. The Millport Slough marshes contain both natural and restored tidal marsh areas. The marsh to the north of Millport Slough is a relatively undisturbed tidal marsh with intact tidal hydrology (i.e., with highly sinuous, dendritic, deep, and steep-sided tidal channels). Millport Slough South is a tidal wetland that was diked and managed as pasture for many decades until dike failures occurred in the 1980s and 1990s. Upstream of these marshes the mainstem Siletz formerly was flanked by narrow bands of tidal marsh and spruce-dominated tidal swamp. Most of these have been diked, and much of the acreage has been filled. (USFWS 2012)

Siletz Bay tidal wetlands also include the lower portions of Drift and Schooner Creeks, both east and west side of U.S. Highway 101. East of the highway on Drift Creek, these are primarily muted tidal wetlands dominated by Lyngby's sedge and slough sedge. Historically, these areas were comprised of tidal marsh and tidal swamp dominated by Sitka spruce. These areas were diked and drained and converted to pastureland for grazing of livestock. A severe flood event in the late 1990s resulted in the complete loss of the water control structure on private land located adjacent to the southeast corner in an area known as the Shaffer Tract. The loss of this water control structure, along with subsequent breaches in the dikes adjacent to Drift Slough and along Drift Creek, now allow significant but muted tidal flows on the property.

The Siletz Bay and river system supports large runs of anadromous fish including Chinook and threatened coho salmon (Oregon Coast ESU), coastal cutthroat trout, and steelhead. Large numbers of migratory birds use the marshes and tidal slough areas. Annual mid-winter waterfowl surveys are conducted in this area and in 2009 over 1,200 waterfowl were counted in the Siletz Bay area (USFWS unpublished data). Waterfowl species such as mallard, northern pintail, American wigeon, green-winged teal, bufflehead, red-breasted merganser, hooded merganser, and Canada geese feed and rest on the marshes. Siletz Bay is designated an Important Bird Area. Eelgrass, which grows in dense stands in shallow areas on mud, gravel, or sand, is rare along the Oregon coast. The largest concentrations of eelgrass occupy the southern end of Siletz Bay, with small patches occurring at the mouth of the bay, mouth of Schooner Creek, and the southern end of Snag Alley. Other listed species known to occur in the estuary include marbled murrelet, Pacific smelt, and green sturgeon.

Historically, native people settled small communities around Siletz Bay and subsisted by harvest of berries, tubers, plants, shellfish, fish, and animals. Native Americans burned portions of the forest to clear land of thick vegetation and create open areas. After 1850, permanent Euro-American settlements became established, with homesteading around the bay and upstream. After World War II, the shoreline of the bay became further altered through numerous dredge and fill operations such as the U.S. Highway 101 realignment and establishment of the Siletz Keys residential development. Commercial and residential encroachments onto coastal wetlands increased resulting in lost habitat, increased pollution and human activity, and lower water quality. The lumber and fishing industries were gradually replaced by tourism and recreation as the most important economic industry. Demand for construction of recreation and tourist associated facilities continues today (USFWS 1990).

The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas along Drift and Schooner Creeks and the mainstem Siletz are predicted to have the largest LMZs in the future.


N
LINCOLN CITY
DEPOE BAY
Siletz Bay
Moderately river dominated drowned river mouth
Estuary size: 2711 acres
Estuary drainage: 236,160 acres
Approximate diked area: 293 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 26%
Ownership within estuary:
Federal: 25%
Tribal: 0.07%
Private non-industrial: 72%
Private industrial: 3%
0
1.75
3.5
7 Miles
Landward migration zones
Developed areas
Urban growth boundaries

Yaquina Estuary

The Yaquina River is approximately 59 miles long and drains an area of 252 square miles in the Oregon Coast Range. It is one of the three Oregon estuaries classed for deep water development because of maintained jetties and a main channel dredged to deeper than 22 feet (Audubon 2018). The Yaquina watershed is made up of a drowned river channel and adjacent sloughs as well as smaller creeks and streams that are not tidally influenced. The two primary branches of the river are Big Elk Creek and Upper Yaquina River, which converge at Elk City. These branches provide approximately two-thirds of the freshwater runoff into the Yaquina River. The Yaquina River downstream of Elk City is tidally influenced and has substantial seasonal variation in salinity (Bauer et al. 2011 and Janousek 2013). The head of tide varies from 20-27 miles from the mouth depending on river flows; during the summer and early fall, the volume of salt-water intrusion substantially exceeds the volume of fresh water discharged into the estuary from the river (Adamus et al. 2005). In the summer months, when precipitation is low, saline water penetrates nearly to Elk City. In the winter, when precipitation is high, saline water is found much lower in the system, below the City of Toledo. Waters in the estuary are moderately stratified during both winter high flow and summer low flow (Adamus et al. 2005).

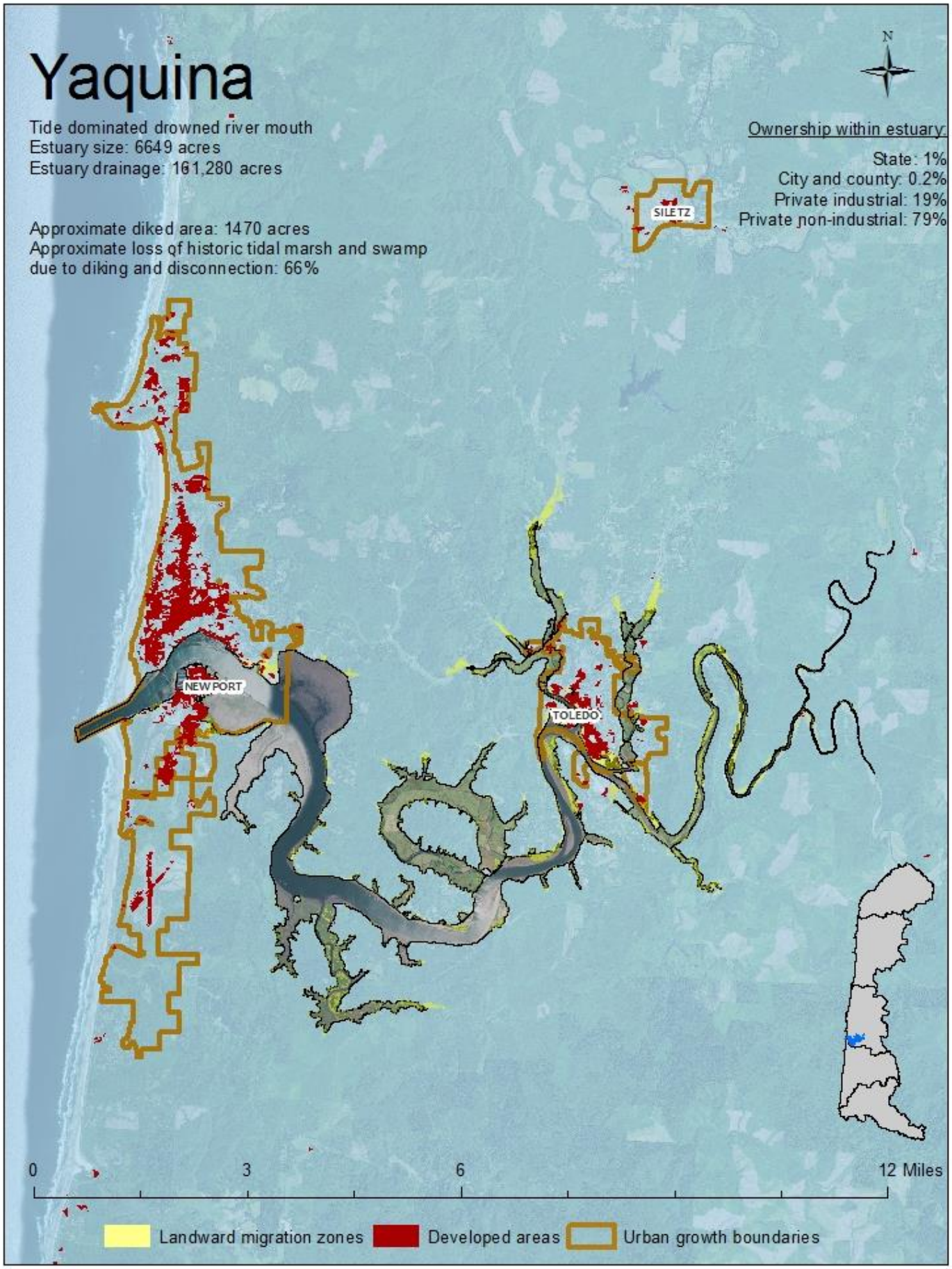
Vegetation in the Yaquina estuary is primarily brackish and marine intertidal high and low marsh. Forested and scrub-shrub tidal wetlands were once predominant in the brackish to freshwater tidal reaches of the middle and upper estuary, but only small remnants of these habitat classes remain; most were converted to agricultural uses (primarily diked pastures). Sitka spruce and other forest species such as red huckleberry (*Vaccinium parvifolium*) and other *Vaccinium* species are found on nurse logs throughout the intertidal zone.

Thirty species of conservation concern occur in the Yaquina Basin. Taxa include one amphibian, seven birds, one bryophyte, four fish, four fungi, four invertebrates, one mammal, one marine alga, and seven vascular plants. Five taxa are federally listed, and six are state listed. Of the 30 species of conservation concern, six (green sturgeon, chum salmon, coho salmon, steelhead, Gmelin's saltbush, and Point Reyes bird's beak) occur in the estuary and are the taxa most affected by the estuarine processes, indicators, and threats outlined in this plan. Bald eagle (*Haliaeetus leucocephalus*) is no longer a federally listed species but remains on state lists as a threatened species. Yaquina Bay regularly hosts thousands of waterfowl and shorebirds and is designated as an Important Bird Area (Audubon 2018).

Anadromous fish, particularly coastal coho salmon (*Oncorhynchus kisutch*), have been the focal species for riparian and wetland habitat restoration projects throughout the basin. Usage of the estuary and freshwater streams by anadromous salmonids varies by species and their life stages. Critical habitat for four of the five listed species (green sturgeon, Oregon Coast coho ESU, northern spotted owl, marbled murrelet) has been designated by US Fish and Wildlife.

Commercial forestry dominates much of the upland areas but is limited within the estuary. Land use zoning indicates that 87% of the basin is managed for forestry, but management differs by land ownership. In general, private forestland is managed on shorter rotations than on federal and state land and has less stringent regulations protecting riparian zones and older age classes. Agriculture occupies only 6% of the basin, while aquaculture in the form of oyster farming occurs in the Yaquina River mainstem between Oneatta Point and Oysterville.

Landward Migration Zones (LMZs) are the areas upslope of current tidal wetlands where wetlands may migrate in the future. These are based on sea level rise (SLR) scenarios as the future tide range will predict the possible future extent of tidal wetlands. The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). LMZs are very limited in this scenario; the largest areas are in tributary systems near Toledo (e.g., Depot Slough and Olalla Slough). Overall, the Yaquina is projected to lose 46% of its tidal wetland acres at 4.7' SLR, unless restoration efforts allow tidal flow and sediment accretion to occur.


Yaquina
Tide dominated drowned river mouth
Estuary size: 6649 acres
Estuary drainage: 161,280 acres
Approximate diked area: 1470 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 66%
Ownership within estuary:
State: 1%
City and county: 0.2%
Private industrial: 19%
Private non-industrial: 79%
N
SILETZ
NEWPORT
TOLEDO
0
3
6
12 Miles
Landward migration zones
Developed areas
Urban growth boundaries

Beaver Creek

The Beaver Creek estuary, located in Lincoln County, sits roughly equidistant between the cities of Newport and Waldport. Beaver Creek has a beach-impounded estuary, with 240 total acres of estuary and an approximately 21,760-acre drainage area. Oregon State Parks and Recreation Department and The Wetlands Conservancy jointly own over 1,200 acres of land in Lower Beaver Creek. Approximately 11,000 acres of the watershed are managed by the U.S. Forest Service for old-growth forest conditions. Overall, 40 percent of the watershed is currently managed for conservation.

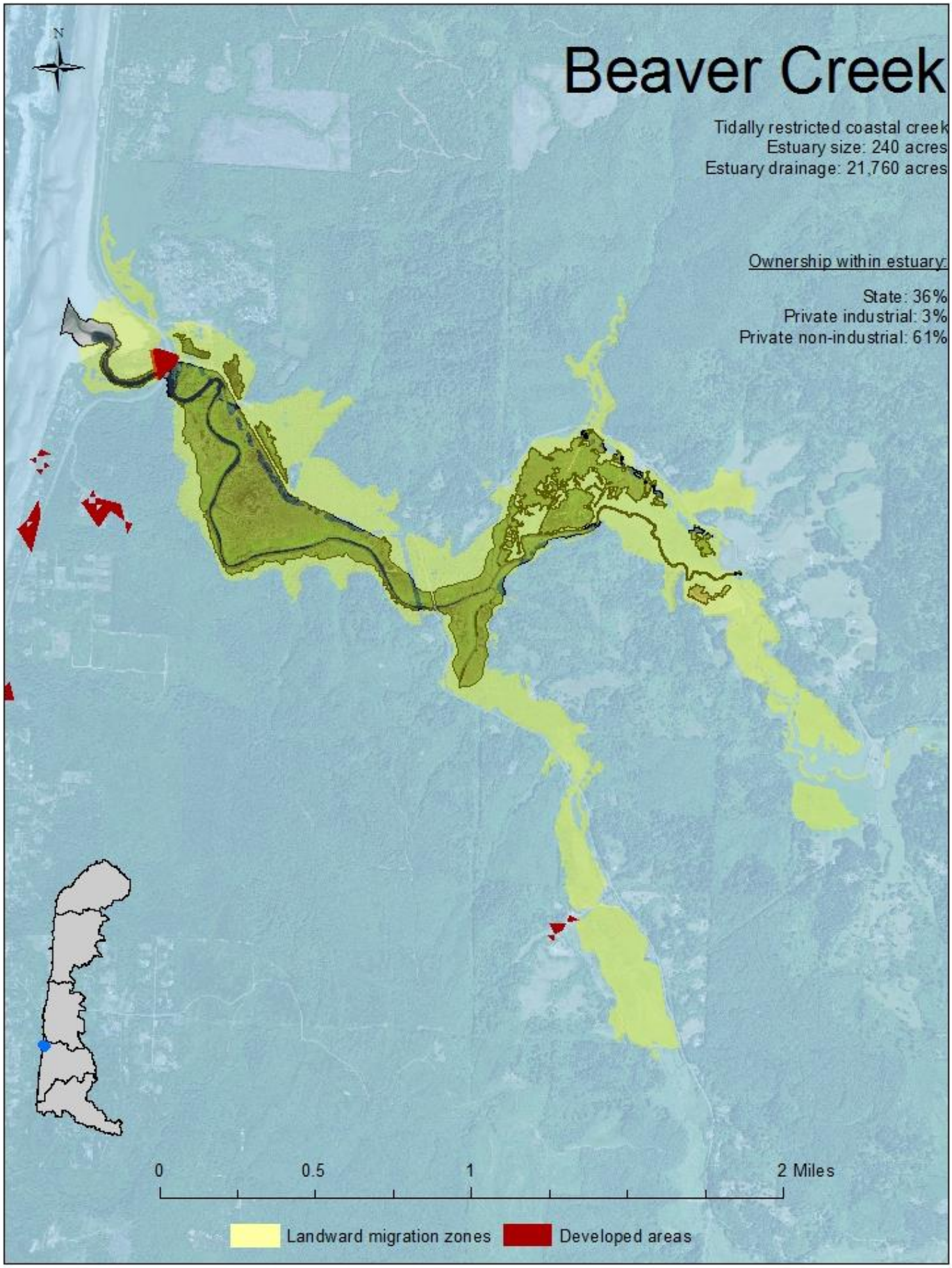
The mouth of Beaver Creek enters the Pacific Ocean over a beach berm, which typically has an elevation of about 8 feet above Mean Low Water. Thus, marine waters enter the estuary only on spring tides (tides associated with new and full moons) and on storm-driven high tides. As a result, the estuary has little tidal fluctuation, but water surface is maintained at or just above the elevation of the beach berm, extending inland almost 2 miles from the beach. The estuary is largely occupied with freshwater marshes, with deep stream channels cut through them. When ocean water does flow over the berm it tends to pool in the stream channel and becomes stratified. Limited data are available on salinity in the wetlands east of Highway 101; however, elevated salinity (into the mesohaline range) has been documented in the main channel upstream as far as the first bridge on South Beaver Creek Road, 2.2 river miles upstream from the beach.

Several tributary drainages flow into the Beaver Creek estuary. The north and south forks of Beaver Creek are the largest. The next largest tributary is Simpson Creek, which flows from the north and empties into Beaver Creek within the Brian Booth State Park a short distance upstream from its confluence with the south fork. Several other small unnamed stream drainages flow to the marsh from the park uplands. The hydrology of the lower estuary has been altered by past land use practices in various places by channelization, diking and road construction. Evidence of diking and channelization on lands now within the State Parks area is most apparent along Beaver Creek's main channel, and along Simpson Creek which flows through a straight ditch to its confluence with Beaver Creek.

Beaver Creek wetlands and watershed have been prioritized for protection in several federal, regional, state, and local conservation plans. The estuary and freshwater wetland complex supports a diversity of migratory and resident birds and waterfowl, and is a critical habitat component for anadromous salmonids populations in the basin. Beaver Creek has played a critical role in the science and politics of Oregon Coastal coho listing, management, and recovery decisions. It is the smallest basin classified as having an "independent" coho population, but this has been healthier than nearby larger populations. The adjacent uplands support a range of habitats from meadows to early seral stage Sitka spruce /western hemlock forest to older forest suitable for nesting by the ESA listed marbled murrelet. At-risk fish and wildlife species include coho salmon, winter run Oregon Coast ESU steelhead, bald eagle, marbled murrelet, northern spotted owl, and red-tree vole. Locally important species include American beaver and Oregon Coast ESU coastal cutthroat trout.

Most of the land near the Beaver Creek Estuary is forestland, much of it owned by or under easement to Oregon State Parks and/or The Wetlands Conservancy. The Siuslaw National Forest, which has been managed largely for natural resource values since adoption of the 1994 Northwest Forest Plan, begins about two miles to the east of the estuary and extends inland to the crest of the coast range. Much of the Beaver Creek bottomland and some of the toe slopes are used for farming, mainly for livestock pasture. Properties near or adjacent to the streams include a mix of residential, farmland, and private commercial timberlands. Seal Rock Water District is in the process of developing a water intake on Beaver Creek, just downstream of the confluence of north and south Beaver Creeks.

Landward Migration Zones (LMZs) are the areas upslope of current tidal wetlands where wetlands may migrate in the future. These are based on sea level rise scenarios as the future tide range will predict the possible future extent of tidal wetlands. The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Areas throughout the current estuary are predicted to see increases in tidal wetlands in the future.


Beaver Creek
Tidally restricted coastal creek
Estuary size: 240 acres
Estuary drainage: 21,760 acres
Ownership within estuary:
State: 36%
Private industrial: 3%
Private non-industrial: 61%
N
0
0.5
1
2 Miles
Landward migration zones
Developed areas

Alsea Bay

The Alsea Estuary is located along the central Oregon coast near the town of Waldport and drains the west slope of the Coast Range. The adjacent mountains are composed of uplifted marine sandstones and mudstones, which have been eroded to form relatively wide river valleys with low gradients. The Alsea River drains a watershed of about 470 square miles containing landscapes that range from heavily forested hillsides to open pastures along the lowlands and riverbank. Land use in the watershed is primarily timber production with some agriculture, development, and municipal uses. The Alsea Estuary is drowned river valley that connects to the Pacific Ocean through an inlet, which is always maintained open by tidal flows. Head of tide is at approximately 15 miles from the mouth and waters in the estuary are moderately stratified during both winter high flow and summer low flow (Adamus et al. 2005). McKenzie (1975) estimated that ocean-sourced sand forms most of the bed from the mouth to 1.5 miles inside the estuary. Upstream of 2.5 miles from the river mouth, river sediments dominate the bed. Between these two points, the bed is composed of a blend of riverine and ocean sediment.

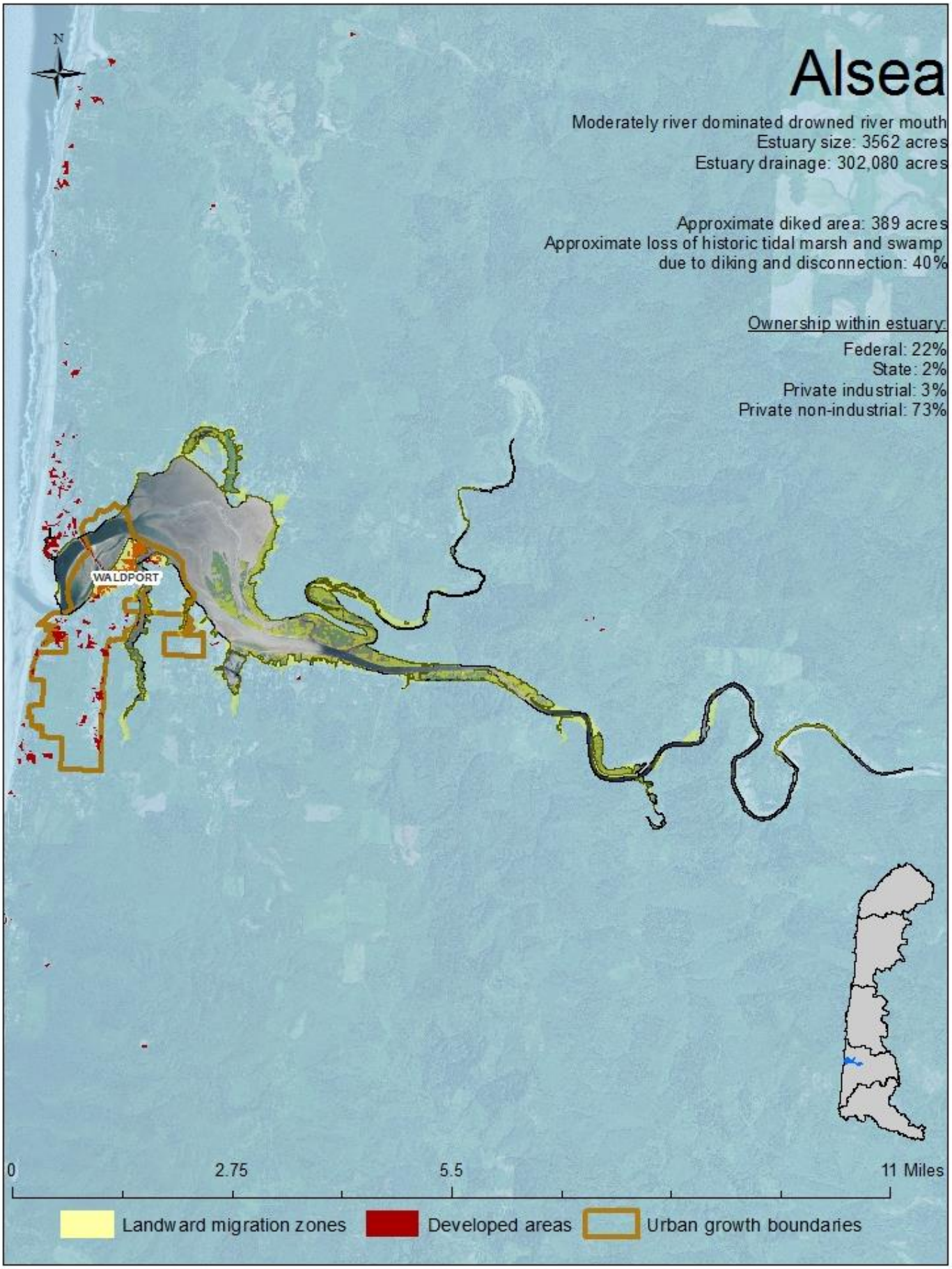
In the 1960s and 1970s, efforts were made to block flow to the northern channel in Alsea Bay in the hopes that re-directing additional flow into the southern channel would help maintain its depth for navigation. This channel management may have encouraged some net deposition in the north part of Alsea Bay, but McKenzie concluded that the shallowness of the bay is natural.

The estuary is predominantly open water overlaying subtidal or unvegetated intertidal areas. Nearly 700 acres of wetlands edge the estuary. Approximately 150 acres of historic wetlands have been filled. The marsh habitat along the lower reaches of this creek enhances its value to fish and wildlife. The Western Rivers Conservancy and the U.S. Forest Service and partners breached 1600 feet of dike and restored hydrology to 82 acres of former marsh habitat in 2005. The Wetlands Conservancy's Bayview Oxbow Preserve is down river from this restoration area; additional land acquisition and proposed tidal reconnection will allow the extension of the conservation benefits and further ecological connectivity. The Drift Creek complex is considered one of The Wetlands Conservancy's Oregon's Greatest Wetlands.

The Alsea Estuary had been a prolific salmonid fishery, yielding more than 100,000 pounds of fish in the 1930s to commercial fisherman, which was processed by canneries at the estuary's mouth. This yield placed it at the top of the list for coho spawning among Oregon estuaries (Brophy 1999). Because of declining yields, fishing has since been limited only to sport fishing and yields are now orders of magnitude smaller. The Alsea watershed is now being managed for wild coho salmon following closure of the Fall Creek hatchery. The wild coho population has rebounded since hatchery closure and improved ocean conditions. The primary limiting factor for coho in the Alsea is low gradient winter habitat. Protection of these marsh habitats will help sustain the coho produced in the Alsea system.

The uplands in the estuary are primarily forested areas in federal or private industrial forest ownership. The watershed was subject to large-scale, infrequent fire in the 1850s. Historically, the lower Alsea landscape pattern consisted of large patches of single seral stages over most of the area. Today, landscape patterns are fragmented across the Alsea watershed. Major tree species include Douglas-fir and western hemlock, with Sitka spruce along the coast and noble fir at higher elevations. The upland habitats in the Alsea watershed support a range of habitats from meadows to early seral stage Sitka spruce/western hemlock forest to older forests suitable for nesting by the ESA-listed marbled murrelet.

Landward Migration Zones (LMZs) are the areas upslope of current tidal wetlands where wetlands may migrate in the future. These are based on sea level rise (SLR) scenarios as the future tide range will predict the possible future extent of tidal wetlands. The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). LMZs are very limited under this scenario; the largest areas are along Drift Creek and in the floodplains of other tributary systems such as Lint Slough. Overall, the Alsea is projected to lose 28% of its tidal wetland acres at 4.7' SLR, though tidal restoration at Bayview Oxbow could help the area accrete sediment that might allow it to keep up with rising sea levels.


N
Alsea
Moderately river dominated drowned river mouth
Estuary size: 3562 acres
Estuary drainage: 302,080 acres
Approximate diked area: 389 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 40%
Ownership within estuary:
Federal: 22%
State: 2%
Private industrial: 3%
Private non-industrial: 73%
WALDPORT
0
2.75
5.5
11 Miles
Landward migration zones
Developed areas
Urban growth boundaries

Siuslaw Estuary

The Siuslaw is a drowned river mouth estuary with marine, bay, slough, and riverine components. The mouth of the river is flanked by sand dunes and migrated regularly until being constrained by jetties in the late 1800s. The estuary, extending upstream from the bay at the confluence of the Siuslaw River mainstem and the North Fork of the Siuslaw, occupies progressively narrowing valleys through head of tide (about 23 miles from the mouth but reduced to 6 miles during winter high flows; Adamus et al. 2005). Water is delivered to the estuary from the 504,000 acres of the Siuslaw watershed via a network of streams that cut through the Coast Range, traveling over a substrate primarily composed of relatively soft sandstone, generating large amounts of sediment, deposition of which has resulted in the development of broad floodplains in the estuary. The estuary is river dominated with waters that are highly stratified during winter high flow, but vertically homogeneous during low summer flow (Adamus et al. 2005). The river has been dredged to maintain an 18-foot depth to RM 0.2, then 16-foot depth to RM 5. There has been no dredging above that since 1976 but dredging the channel to 12 ft. depth through RM 15 is authorized.

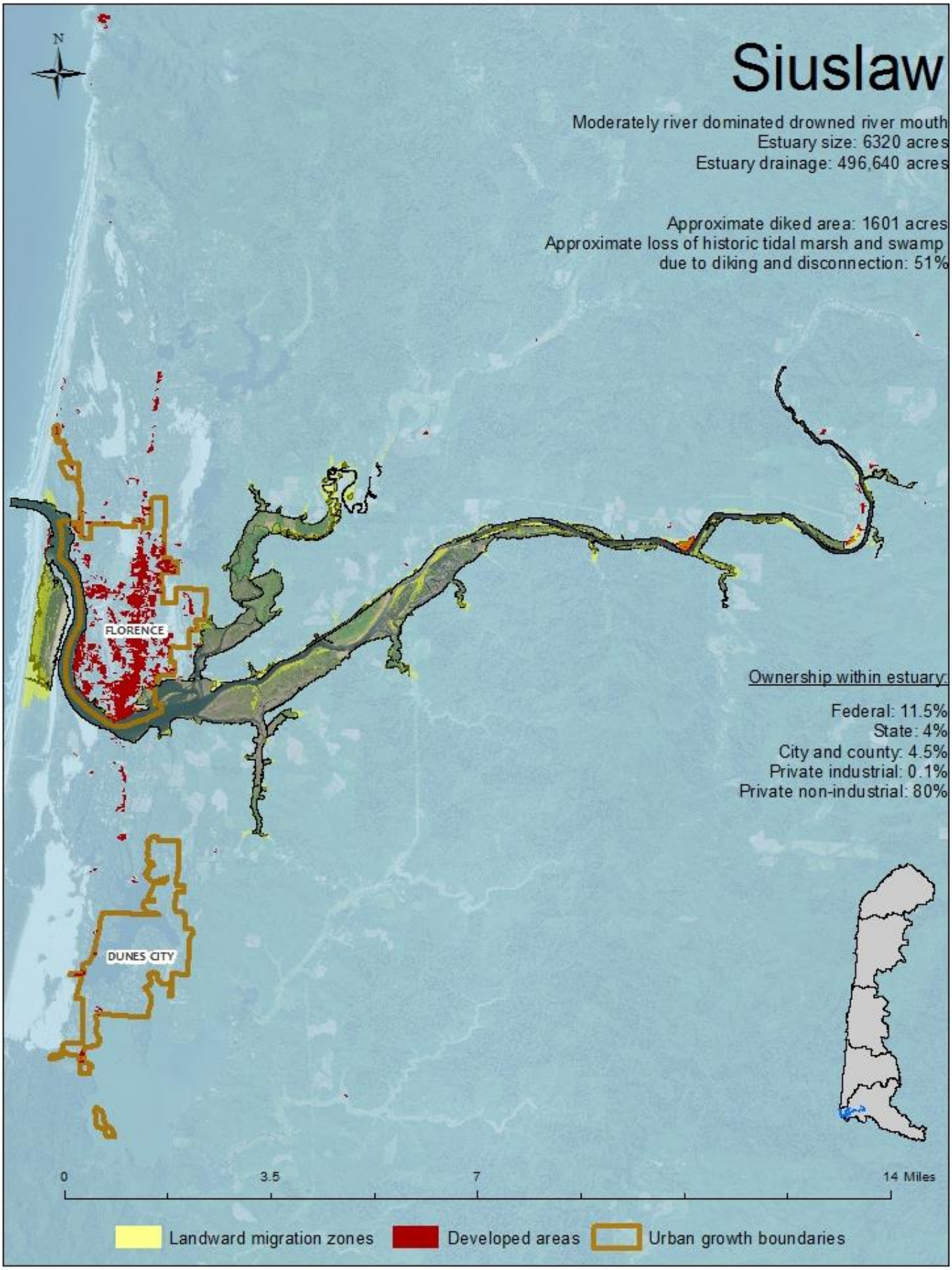
Tidally influenced wetlands within the estuary include aquatic beds, emergent marsh, scrub-shrub swamp and forested wetlands. The surrounding uplands are steep, heavily forested hillslopes. The Shayuushtl'axan, or Siuslaw People, now confederated with their southerly neighbors, the Coos and Lower Umpqua Tribes and known collectively as the Confederated Tribes of the Coos, Lower Umpqua, & Siuslaw Indians (CTCLUSI), inhabited and continue to reside to this day on the shores and upland slopes of this once rich and productive estuarine ecosystem. Also known as the 'Salmon People', a term that resonated with many tribal communities on the Pacific Northwest Coast, the CTCLUSI take great care and give much respect to all species, especially the salmon which holds great prestige within the Tribe. Pacific Lamprey are also another important subsistence food. Unfortunately, due to their diminishingly low returns year after year, the local Tribes are unable to harvest these once plentiful and prestigious resources.

Beginning in the late 1800s, resource extraction, focused on timber and fish harvest, and small-scale agriculture dominated the economic activity in the Siuslaw. The river was the primary means of transport for goods and people until a rail line was completed through the Siuslaw Valley in 1915, followed by a road in the 1930s. Isolated settlers required space for subsistence and commercial agriculture, and the flat floodplain and tidally influenced land in the estuary were both conveniently located adjacent to the river, and flat. These areas were however, subject to tidal and riverine flooding, so settlers constructed levees to isolate their property from the river. Land protected by levees served successfully as small-scale agricultural land from the early 1900s; however, without the annual addition of organics and sediments associated with tidal wetland habitats, and as soils are drained allowing oxidation of the organic-rich sediments below the surface, soils compact at a fast rate. This has resulted in the significant settling of the leveed land, increasing the portion of time that it is wet, making it less agriculturally productive over time. This change in the landscape, coupled with local and regional economic forces limiting profits from agriculture, fishing, and logging, has led landowners to reconsider the way that they use property in the estuary, and to consider conservation and restoration as viable financial and cultural choices. As a result, over the last 30 years, several estuarine properties in the Siuslaw estuary have been conserved or restored, and opportunities for conservation and restoration continue to be identified (Brophy 2005). The North Fork area is considered one of TWC's Oregon's Greatest Wetlands.

The Siuslaw estuary supports a diverse biotic community, including fish such as Chinook, coho, steelhead, sea-run cutthroat trout, lamprey, marine species, and migratory and resident bird populations (it is designated as an Important Bird Area). Prior to settlement, the Siuslaw River had significant populations of salmonid species. A combination of aggressive harvest and large-scale habitat alterations such as the isolation of tidal marshes via levee-building and upstream habitat-limiting actions have severely impacted population numbers.

Economic health in the Siuslaw watershed declined as a result of the decline in fishing and timber harvest, a move toward urbanization and export of raw natural resources, and the national recession beginning in 2008. Industrial jobs declined and contracted toward population centers. The largest population center in the watershed is Florence, located near the mouth of the Siuslaw River. Unlike several other population centers along the Oregon Coast, the bulk of urban Florence is not centered on the estuary and urbanization has not been a primary force in the loss of estuary acreage. There are numerous small towns upstream, almost all of which are in valley bottoms near streams. Many of those towns were historically associated with mills that are now closed. The economy in Florence is diversifying, however the small towns throughout much of the rest of the watershed remain economically depressed. Most respondents to area surveys report they highly value the natural beauty and health of the watershed, however there is significant resistance to change associated with conserving and restoring property that has recently been utilized for agricultural or timber harvest purposes, particularly among those whose families have resided in the watershed for generations.

The following map shows the extent of LMZs given a 4.7 ft. rise in sea level by year 2100 (Brophy and Ewald 2017). Significant areas currently within the tidal wetland elevation range are predicted to convert to mudflat or open water under this scenario, but some LMZs are located along the floodplain of the North Fork Siuslaw River and on the sand spit south of the river mouth.


N
Siuslaw
Moderately river dominated drowned river mouth
Estuary size: 6320 acres
Estuary drainage: 496,640 acres
Approximate diked area: 1601 acres
Approximate loss of historic tidal marsh and swamp due to diking and disconnection: 51%
FLORENCE
DUNES CITY
Ownership within estuary:
Federal: 11.5%
State: 4%
City and county: 4.5%
Private industrial: 0.1%
Private non-industrial: 80%
0
3.5
7
14 Miles
Landward migration zones
Developed areas
Urban growth boundaries

Appendix IV. Addendum to Action Plan

Changes Made to Plan in 2020/21 Update:

- Outcomes/Goals were revised to reflect more recent data on current conditions, use clearer language, and re-ordered by priority.
- Moved the results chains from former Appendix II to Section 8.
- Updated Appendix II, Table A, and associated descriptions elsewhere in the plan, with new data from Brophy 2019.
- Added a new Human Wellbeing Target of "Carbon Sequestration" to the Situation Diagram in Figure 3 to reflect the potential for functioning estuaries to provide this important ecosystem service to help mitigate climate change impacts.
- Updated actions in Section 8 to indicate current status, new actions and participating entities.
- Added new references.
- Made some corrections to appendix II. Table B.
- Dropped some sections that are no longer needed

Actions removed from Section 8 that have been completed:

- Establish a web-based information exchange forum (Done)
- Action: Complete mapping of estuarine LMZs (ETG & MidCoast WC – Done)
- Action: Include this factor (LMZ) in project ranking criteria (Done)
- Action: Outreach to Tierra Del Mar community about Sand Lake restoration with coordinated messaging (OPRD, NNSL) (Done)
- Submit OWEB TA grant proposal in 2016 (NNSL – Done)
- Form Sand Lake Working Group (NNSL – Done)
- Conduct Limiting Factors Analysis and Restoration Prioritization (NNSL- Done)
- Update Tillamook Estuaries Partnership's Comprehensive Conservation Management Plan covering Tillamook County estuaries. (TEP - Done)
- Utilize Roads component in Transportation assessment in Obj. 2.1.1 (TNC – Done)
- Action: Gather coarse-scale GIS metrics (such as miles of road in estuaries) (TNC – Done)
- Action: Categorize estuaries into high, medium or low impact groupings (TNC – Done)
- Action: With ODOT, overlay sites needing transportation upgrades with the list of sites ranked high for estuary impacts (TNC & ODOT – Done)
- Action: Identify vulnerable communities and existing info related to highway infrastructure from an economic and safety perspective (TNC – Done)
- Action: Investigate potential conceptual design solutions that meet transportation needs while allowing increased tidal flow through the road prism. (TNC & U. of Portland - Done)
- Produce a marketing version of the roads & estuaries assessment and other materials to share results with key parties by June 2018. (TNC - Done)
- Action: Conduct Vulnerability Assessment and develop Climate Change adaptation strategies for the estuaries and watersheds in Tillamook County (TEP) (Done)

Oregon Central Coast Estuary Collaborative Charter

Our Mission

We are a network of estuary conservation and restoration practitioners collaborating to improve the health and resilience of estuaries on Oregon's central coast.

Our Vision

Our vision is a network of healthy and resilient estuaries on Oregon's central coast that sustain a full complement of thriving native fish and wildlife populations, and support economically and socially vibrant communities.

Our Goals

- Gain an understanding of conditions and threats to estuaries on the central Oregon coast.
- Develop priorities for conservation and restoration activities within our geographic scope.
- Improve knowledge, effectiveness, efficiency, and capacity for participating organizations to do estuary conservation and restoration.
- Engage in conservation and restoration efforts at a larger scale than members could do individually.
- Improve capacity to monitor the effectiveness of restoration and conservation actions.
- Analyze the effectiveness of the Collaborative and continually seek to improve.
- Share accomplishments, results, and knowledge gained as a result of our activities.

Roles and Responsibilities

Participation will be at two levels: a Core Group and Other Partners

Core Group is:

- practitioners of estuary conservation/restoration;
- representative of the central coast geographic area (Siuslaw Estuary to Nehalem Bay);
- non-profit organizations, not individuals;
- actively involved in the organizational work of the collaborative;
- empowered to vote;
- initially composed of the non-profits who crafted this charter: Siuslaw Watershed Council, MidCoast Watersheds Council, Salmon Drift Creek Watershed Council, Nestucca Neskowin Watershed Council, Tillamook Estuaries Partnership, The Nature Conservancy, Institute for Applied Ecology, and The Wetlands Conservancy. The Core Group may be expanded in the future to include others by a vote of the Core Group;
- initially facilitated by The Nature Conservancy;
- future or substitute facilitators can be designated by a vote of the Core Group

Other Partners are:

- those who are willing to constructively engage in/support estuary conservation/restoration, either on specific projects and/or more broadly;
- agency representatives, funders, academics, and others who can help advance the mission of the Collaborative;
- able to fill a technical advisory role including: scientific input, funding advice, consultation and permitting guidance, resource management, land-use planning, outreach/communication

Time Commitment & Participation

Expectations for Core Group

- Attend at least 60% of meetings/field trips a year (expected to be 3-4/yr.)
- Organizations will sign the charter
- Provide input on the majority of documents circulated between meetings
- Contribute bulleted list of relevant activities &/or documents to the group annually

- Commit to sharing expertise
- Assist with meeting logistics and administrative needs (on a rotating basis)
- Participate in network projects e.g.:
    - Be open to activities beyond their boundaries
    - Shared grant writing
    - Joint permit applications
    - Research
    - Hosting site visits
- In general, the individual costs of participating in the collaborative will be covered by each participant's organization
- However, as funding is available:
    - Organizations wishing to request reimbursement must submit a written request to the facilitator;
    - Travel costs for Core Group representatives to attend collaborative activities may be reimbursed (within agreed upon limits) with appropriate documentation;
    - Annual stipends to help cover Core Group representatives' labor costs to participate may be available on a pro-rated basis to be divided evenly among requesting groups.

Expectations for Other Partners:

- Commit to sharing expertise
- Be open to activities beyond their boundaries
- Share information of potential interest to the collaborative
- Cover their own costs for participating

Coordination, Communication, and Decision-making

Decision-Making

- Each Core Group organization will have one vote
- A quorum will consist of 50% of the Core Groups plus 1
- Those voting will disclose any potential conflicts of interest
- E-mail notice will be sent to all participants prior to votes
- The facilitator may set up an e-mail vote if a decision needs to be made before the next meeting
- For any given vote, participants must be either all participating in the meeting (in person or by phone) or all voting via e-mail
- Decisions will be made by a simple majority vote of the quorum except in the case of e-mail votes, which must be a unanimous vote of the quorum to pass
- The outcome of votes will be documented in the meeting notes and minority opinions can also be reflected in the notes at the request of those in opposition to a particular outcome

Coordination & Communication

- No individual participant shall represent the whole group without delegation from the group to do so
- Meetings, other than field trips or special events, will be centrally located within our region (e.g. Newport)

Our expectations for how the group works together

- Have clearly defined roles and expectations for participants.
- Work together for success. Celebrate and communicate successes.
- Communicate effectively and respectfully with one another.
- Assist one another with solving problems and brainstorming solutions.
- Continuously learn and adapt.
- Fulfill our stated commitments to projects and to one another. We recognize the value of accountability.
- Use people's time wisely.
- Share our knowledge with others.
- Come to meetings prepared and engaged.

OCCEC baseline and post-project monitoring guidelines for Focused Investment Partnership

January 2022 Draft

This document is intended to be a project monitoring framework and reference for estuarine restoration practitioners and funding bodies. A goal of this monitoring framework is to develop a shared monitoring language that is cohesive between practitioners and readily understandable by funding bodies to aid in justifying monitoring methods in grant applications. This framework also contains example questions, equipment needs and costs, timelines, and links to external resources for aid in fitting monitoring into a grant and for project managers implementing monitoring.

For the OCCEC FIP, this document is intended to help project managers develop draft monitoring plans. To do so, a few broad potential monitoring questions and their suggested monitoring metrics for each FIP project type are included. These example questions do not cover the entire scope of possible monitoring questions and project managers are encouraged to be much more specific to their project. A table of monitoring metrics which includes FIP project relevance and minimum monitoring duration is included to help project managers decide what monitoring to include and to serve as a common language for monitoring plans. Following the table are descriptions of each monitoring metric with a basic background, materials, external resources, and other factors as appropriate that will guide monitoring design and implementation. Monitoring levels are categorized as either Basic or Advanced. Basic metrics are appropriate for most projects and generally have lower costs and equipment needs. Advanced metrics are more involved and require a greater time, expertise, and budgetary commitment. After draft monitoring plans are submitted, the OCCEC Monitoring Subcommittee will give feedback and assist as needed in finalizing the plans.

The scientific basis of this monitoring framework is before-after control-impact (BACI) design (Stewart-Oaten et al. 1986). In broad terms, BACI design demonstrates the impact of restoration by comparing baseline and post-implementation data at the project site to baseline and post-implementation data at a nearby least-disturbed reference site. This controls for physical, hydrological, or biological changes caused by weather, seasonality, or one-off events such as storms. Baseline monitoring should be conducted for at least one year on all chosen metrics prior to restoration. All restoration projects funded under this FIP should collect baseline data on the project site and at suitable reference sites if applicable. Although co-measured local reference sites are highly recommended, data from ongoing reference site monitoring may be substituted at the discretion of the OCCEC Monitoring Subcommittee.

Recommendation Framework:

FIP Project Types	Potential Monitoring Questions	Suggested Monitoring Metrics	
1. Tidal marsh restoration projects in areas within existing tidal range	Is the site fully connected to tidal influence?	Basic: Advanced:	Water Surface Elevation Salinity spot checks Continuous salinity Water Quality
	Does accretion or aggradation of the ground surface keep pace with anticipated sea-level rise?	Basic: Advanced:	Wetland elevation Sediment accretion
	Has there been a reduction or expansion of invasive species (i.e., reed canary grass) after tidal connection?	Basic: Advanced:	Photo monitoring Invasive species Vegetation cover
	How has fish use of the project area changed?	Advanced:	Fish surveys
	Have reintroduced tidal channels been maintained by natural processes?	Basic: Advanced:	Channel elevation Photo monitoring Channel morphology Aerial monitoring
2. Protecting what little remains of spruce swamp and scrub shrub tidal wetlands and restoring them where feasible	How much appropriate native tidal swamp vegetation is establishing on the site?	Basic: Advanced:	Planting survivorship Invasive species Vegetation cover
	How has potential juvenile salmonid habitat changed after spruce swamp restoration?	Basic: Advanced:	Water temperature Water Surface Elevation Salinity spot checks Water quality Macroinvertebrates Fish surveys Channel morphology Beavers
3. Protection and restoration of current and potential future tidal wetlands within the high and medium-high ranked landward migration zones	What is the carbon sequestration potential of this restored site?	Advanced:	Soil samples Soil cores
	Is the vegetation compatible with anticipated habitat types expected with sea level rise?	Basic: Advanced:	Invasive species Plantings Vegetation

	Are there impediments to future tidal connection on this site?	Basic: Advanced:	Elevation Channel morphology

Monitoring Level	Metric	Project Type 1 Tidal Marsh Restorations	Project Type 2 Tidal swamp Protection and Restoration	Project Type 3 Landward Migration Zone Protection and Restoration	Minimum duration post-restoration
Basic	Photo Monitoring	x	x	x	10 years
	Salinity (spot checks)	x	x		One year
	Water surface elevation	x	x		One year
	Water temperature	x	x		One year
	Plantings	x	x	x	Three years
	Invasive species	x	x	x	Three years
	Channel & wetland elevation	x	x		One year
Advanced	Vegetation	x	x	x	
	Sediment accretion-feldspar	x			
	Water quality (continuous salinity, DO, pH)	x	x	x	
	Soil Biogeochemistry (ORP, conductivity, pH, %organic matter)	x	x		
	Aerial Monitoring	x	x	x	
	Fish use	x	x	x	
	Channel morphology	x	x		
	Macroinvertebrates	x	x	x	
	Shallow ground-water level	x	x		
	Beavers	x	x	x	

Basic Metrics Monitoring

PHOTO MONITORING

Repeat photography is a simple and low-cost method to document and assess change in landscape features over time. Ground-based photo points are good for visualizing appearance/change in specific locations but can't be used to document spatial extent of features or vegetation types. For documenting spatial extent, aerial photographs are needed. Aerial photos that are available to the public at no cost (NAIP, Google Earth, or similar sources) are vital for initial project planning. They are best used in a GIS where locations can be related to locations of site features and design elements. Examining aerial photos for hydrological barrier locations, vegetation patterns, or channel locations can help with ground-based photo location selection.

Custom aerial photography (either drone or custom flown orthophotos) is more costly and requires a higher level of analysis, so it is recommended as a Level C metric for advanced monitoring. It can be used for many purposes such as tracking change in spatial extent of vegetation types; monitoring channel network development; measuring locations and change in abundance of large woody debris; etc.

Photo point locations should represent features of special interest (hydrologic restrictions, ditches, infrastructure, different plant communities, views of vegetation transitions, etc.). In order to retake photos covering the same view over time, photo points locations should be recorded using a GPS and the azimuth recorded. Physical markers can be placed at the location where the photographer stands or within the photo frame, where it can also provide scale reference. A challenge in estuarine wetlands is often finding a suitable vantage point. High ground with a good view of the site may be bare during restoration but become vegetated with tall shrubs or trees a few years after restoration; dikes are good vantage points prior to restoration but are often removed during restoration -- and both situations make it impossible to keep the same vantage point.

Timing: Ground-based repeat photography should be conducted at least once a year for 10 years. Photos should be taken during the same season. In the first three years, it would be beneficial to take photos during multiple seasons to capture different aspects of restoration progress, such as vegetation growth or channel morphology. Later, frequency can be reduced to once per year.

Publicly available aerial imagery may not be available every year. An image may not be available immediately after construction or during the same season as pre-construction images.

Equipment:
- Camera (preferably waterproof)
- GPS
- Compass
- Reference stakes for consistency and scale in photos (optional)

Desired results: To have a clear visual story of changes to landscape over time during pre and post project implementation stages. Compare seasonal differences or annual variability.

References to methods and protocols:

Ciannela, G., Dutterer, A., Fetcho, K., and Greer, S. 2021. OWEB Photo Point Monitoring Guidance. Available online: https://www.oregon.gov/oweb/Documents/Photo%20Point%20Monitoring%20Guide.pdf

Roegner, G.C., H.L. Diefenderfer, A.B. Borde, R.M. Thom, E.M. Dawley, A.H. Whiting, S.A. Zimmerman, and G.E. Johnson. 2009. Protocols for monitoring habitat restoration projects in the lower Columbia River and estuary. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-97, **pp. 30-31** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

SALINITY (SPOT CHECKS)

The re-introduction of saline tidal water into previously tidally disconnected areas is a hallmark of estuarine wetlands restoration. Salinity and tidal inundation are "ecosystem drivers" that control a wide variety of tidal wetland processes like vegetation, fish habitat, and water quality. Salinity is straightforward to measure and provides critical information about changes to the physical, chemical, and biological conditions of the restoration site.

Coastal marshes are highly dynamic environments, and the same location can be wet, dry, fresh, or saline depending on the interactive effects of season, rainfall events, and tide. For this reason, continuous salinity monitoring (e.g., Monitoring Level C) is preferred, and salinity spot checks must be carefully planned and interpreted. To detect the maximum extent of salinity intrusion, salinity spot checks should be performed at high tide and not directly subsequent to large rainfall events. Location within the water column is also an important consideration, as surface waters may have a freshwater lens due to the high density of saline water. Samples should therefore come from the mid-water column.

The number of sample locations will depend on the structure of the tidal reconnection project. In small, homogenous project areas, a small number of sites may sufficiently characterize the restoration area. In a larger project with multiple zones (e.g., low marsh and high marsh) it is necessary to sample more extensively. Salinity samples should also be taken concurrently at a reference site. At a minimum, one sample should be taken on the marine side of the barrier, and three samples should be taken within the restoration area. Since salinity measurements are fast and additional samples incur no extra costs, more samples are highly recommended. For larger restoration projects, ensure that representative samples are acquired in each vegetation zone and along any major channels to bracket tidal influence. Where possible, combine salinity spot checks with other monitoring activities like water temperature, channel elevation, fish use, or water quality.

Equipment:

- Handheld TDS Meter ($75-600): will generally also measure temperature. Ensure range up to 50 ppt.

- Refractometer ($50-$100): high-quality aquarium refractometers are also an option

Timing:

- Frequency: Once per season. Ideally, measurements would be taken monthly.
- Duration: One year of post-restoration salinity spot-checks should be sufficient to determine if restoration has met tidal connectivity goals. Sampling may need to continue if unusual conditions (e.g., hypersaline channels) are present.

References to methods and protocols:

There is little information on spot salinity checks. Information on continuous salinity is found in the following resources:

Roegner, G. & Diefenderfer, Heida & Borde, Amy & Thom, Ronald & Dawley, E.M. & Whiting, A.H. & Zimmerman, Shon & Johnson, G.E. (2009). Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary. NOAA Tech Memo. 10.2172/927720. **pp. 21-22** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. **pp.60-67**. Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf

Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University of Oregon. **pp. 68, 75-78** Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q

WATER SURFACE ELEVATION

Factors such as daily tidal variability, variability in river flow and sub-surface flows can impact wetland hydrology. Hydrology of tidal wetlands can affect soils and sediment accretion; nutrient and gas fluxes; and diversity and abundance of plants and animals. Restoration actions can lead to changes in surface and groundwater hydrology. For surface water/channel hydrology, pressure sensors are often used to measure water surface elevation.

Salmonids are dependent on estuarine habitat for refuge and food, and connectivity between tidal channels and main channels can provide daily access for forage and refuge. Restoration of full tidal influence and connectivity enables transport of water, nutrients, and sediment to interior estuarine tidal channels. Measuring continuous water surface elevation can provide maximum water surface elevation in restoration and reference sites. The suggested interval of

15, 30 or 60 minutes can capture tidal fluctuation, high-flow events, and seasonal water elevation variation.

Timing:
- Frequency: Pressure sensors record values every 15, 30 or 60 minutes. Wet season (Dec-March) & dry season (June-September)
- Duration: One year minimum

Equipment:
- Pressure Data Loggers - $300-$2000 each (Manufacturers of data instruments include Odyssey, Hobo, Solinist, YSI, PME) Often water depth and temperature can be recorded with the same instrument.
- PVC stilling wells

Analysis: For wet and dry seasons, daily maximum water level at each station (pre and post periods). Maximum water level can be averaged across wet and dry seasons.

When comparing pre project to post project, use ANOVA. If data is not normally distributed, use Kruskal-Wallis)

Water levels are tied to a geodetic reference frame. Raw water level data needs to be corrected to elevation above sea level.

Desired results: Success includes full tidal signature throughout the restored area that matches reference conditions.

References to methods and protocols:

Kidd, S. Schwartz, M., and Brennan, G. 2018. Best Practices - A Quick Guide to Water Surface Elevation and Temperature Data Collection. Lower Columbia Estuary Partnership. Available Online: https://www.estuarypartnership.org/sites/default/files/2020-03/Best%20Practices%20A%20Quick%20Guide%20to%20Water%20Surface%20Elevation%20and%20Temperature%20Data%20Collection_Draft_10_16_2018.pdf

Roegner, G. & Diefenderfer, Heida & Borde, Amy & Thom, Ronald & Dawley, E.M. & Whiting, A.H. & Zimmerman, Shon & Johnson, G.E. (2009). Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary. NOAA Tech Memo. 10.2172/927720. **pp.16-20.** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. **pp.45-60**. Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf

Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University

of Oregon. **Pp.67-68, 73-74.** Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q

WATER TEMPERATURE

Temperature is a physical driver that can determine plant and fish community structure in tidal wetlands. Water temperature is critical for fish habitat suitability, and temperature is considered a predictor of juvenile salmonid abundance and condition. Dikes and failing tide gates can block cool, marine influenced water from entering interior channels that serve as critical rearing, foraging and refuge habitat. Restoring connectivity of tidal channels can better regulate water temperature in interior channels, creating better tidal flushing and cooler summer-time temperatures. Measuring temperature continuously can provide maximum temperatures in restoration and reference sites. The suggested interval of 15, 30 or 60 minutes can capture temperature fluctuation associated with tides, high-flow events, and seasonal water temperature variation.

Timing:
- Frequency: Hobo sensors record values every 15, 30 or 60 minutes. Wet season (Dec-March) & dry season (June-September)
- Duration: One year minimum. Longer duration is recommended. It is very easy to continue to collect data from continuous monitoring equipment once it is set up and batteries can last over 10 years. Tidal swamp restoration projects may not show the effects of channel shading on temperature for 5-10 years.

Equipment:
- Continuous Data Loggers - $100-$2000 each (Manufacturers of data instruments include Odyssey, Hobo, Solinist, YSI, PME) Often water depth and temperature can be recorded with the same instrument.
- PVC stilling wells -$50 each

Analysis: For wet and dry seasons, daily maximum water temperature at each station (pre and post periods). Max temperature can be averaged across each season.

Desired results: Success includes meeting cold water benchmarks for salmonids that match reference conditions.

References to methods and protocols:

Kidd, S. Schwartz, M., and Brennan, G. 2018. Best Practices - A Quick Guide to Water Surface Elevation and Temperature Data Collection. Lower Columbia Estuary Partnership. Available Online: https://www.estuarypartnership.org/sites/default/files/2020-03/Best%20Practices%20A%20Quick%20Guide%20to%20Water%20Surface%20Elevation%20and%20Temperature%20Data%20Collection_Draft_10_16_2018.pdf

Roegner, G. & Diefenderfer, Heida & Borde, Amy & Thom, Ronald & Dawley, E.M. & Whiting, A.H. & Zimmerman, Shon & Johnson, G.E. (2009). Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary. NOAA Tech Memo. 10.2172/927720. **pp.21-23.** Available online:

https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. **pp.67-74**. Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf

Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University of Oregon. **pp.67-68, 75-78.** Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q

PLANTING SURVIVORSHIP

Plantings can accelerate the restoration of a desired native plant community, support other native species through structure and food production, compete with invasive species, and prevent erosion, among other benefits. If planting is part of the restoration project, it is important to assess planting survival during the first three years of plant establishment. This can help managers determine if further action is required to establish a native plant community.

Sampling should be randomized and stratified into zones reflecting different elevation bands, pre-planting habitat conditions, soil types, or other variables of interest. It is important to know the total number of plants planted within a given zone, as well as to mark a portion of the plantings at the time of planting in order to calculate survivorship. Sampling should be evenly distributed across planting zones and aim to capture a statistically significant sample size. Temporary or permanent plots can provide different information to project managers depending on project goals. Permanent plots can be helpful for long term assessment of sites of interest where predation is anticipated or soils are expected to change. Sampling different temporary plots each year can provide a broader picture of site conditions.

Qualitative observations of vigor and survival of particular species should be noted and reported for each habitat zone.

A more comprehensive analysis of vegetation across the site may be desirable for multiple reasons, this is addressed in the *Advanced* section of the Monitoring recommendations.

Timing:
- Frequency: Once a year during the growing season
- Duration: first 3 years after planting

Equipment and effort:
- One staff field day per year
- Fiberglass measuring tapes (depending on methods used) - $50-100

Analysis: Average percent survival of plantings for each habitat stratum and report with 80% confidence intervals.

Desired results: The monitoring of plantings should help the manager assess whether action is required to establish appropriate native vegetation at desired densities within the project site. A 70% survival rate is typically considered successful. However, it depends on your original planting density and project goals. If high mortality occurs in some areas within the first two or three years, replanting (possibly with different species or more protections in place) should likely occur. However, if areas of high mortality are colonized by native vegetation, no action may be necessary.

References to methods and protocols:

For one example of a Survivorship monitoring method:

COOE Pty Ltd. 2013. Vegetation Survivorship Monitoring. Littlehampton, SA. Prepared for Department of Environment, Water and Natural Resources. **p. 5.** Available online: https://data.environment.sa.gov.au/Water/Data-Systems/CLLMM/Shared%20Documents/CLLMM_50_Vegetation%20Program%20Survival%20Monitoring%202013.pdf

For sampling design considerations:

Elzinga, C., Salzer, D., and Willoughby, J. 1998. *Measuring & monitoring plant populations*. Denver, Colo.: U.S. Dept. of the Interior, Bureau of Land Management. **pp.97-154.** Available online: http://msuinvasiveplants.org/documents/archives_cism/BLM_Measuring_and_monitoring.pdf

INVASIVE SPECIES

Invasive species can threaten the success of a restoration project by outcompeting desired native plants, altering physical processes on the landscape, stopping vegetative succession, impairing ecological functionality, and disrupting food webs. They also can spread to surrounding areas and cause ecological and economic damage for other land managers. Invasive species may be present on site before beginning restoration work or can be introduced during restoration activities through the disturbance caused by construction activities or from plant materials. Invasive species can also enter sites in subsequent years from flood events, wind, animal movements, vehicle traffic, or field gear. Monitoring invasive species is necessary to develop an approach to addressing potentially troublesome infestations before they require considerable time and money to control.

Prior to restoration, conduct a site assessment to determine if control is necessary to avoid spreading invasive species throughout the site. Invasive species should be looked for frequently in subsequent years. Since morphological differences between certain native and invasive species are subtle, correct identification is important before implementing controls.

When choosing how to address invasive species populations, there are different approaches to prioritizing treatments. An Early Detection, Rapid Response (EDRR) approach toward invasive

species is often the most effective way to deal with new invasions as it can enable managers to treat potentially troublesome infestations before they require considerable time and money to control. When dealing with large populations of pre-existing non-native, invasive species, eradication may not be realistic. As a long-term goal, establishing native vegetation may change site conditions to reduce the vigor of invasive species and promote natural recruitment of native species. Effective approaches to invasive species control in these cases include localized containment of an infestation and control around planting zones or immediately adjacent to individual plantings.

Timing:

- Frequency: Survey the site at least once annually. All other monitoring efforts are opportunities to look for invasive species.
- Duration: Three years minimum monitoring is recommended. Monitoring should continue past restoration efforts by the long-term land manager.

Equipment and effort: GPS, 1-4 staff field days per year

Analysis: Synthesize data collection into an invasive plant management plan. Decision support tools are available for complex sites. Collect location information on infestations with a GPS to aid future relocation. It is also helpful to record the date, estimated size of the patch, percent cover, and phenology.

Desired results: Invasive species on a project site should be monitored to the extent necessary to establish a well-informed invasive species control plan. Continuous monitoring for invasive species distributions and abundance will inform site stewardship and adaptive management.

References to methods and protocols:

Invasive plant management prioritization tools:

The invasive plant management decision analysis tool (https://www.ipmdat.org/) can help managers develop site management plans based on project goals and financial resources

Early Detection Rapid Response guidebook for invasive plants:

Welch, B.A., Geissler P.H. and Lathan, Penelope, 2014, 2014. Early Detection of invasive plants – Principles and practices: U.S. Geological Survey Scientific Investigations Report 2012-5162, 193 p. http://dx.doi.org/10.3133/sir20125162

Reporting occurrences of invasive species:

- iMapInvasives (https://www.imapinvasives.org/) provides tools for mapping and sharing invasive species occurrences and treatments.
- Oregon Invasive Species Online Hotline (https://oregoninvasiveshotline.org/) collects reports of invasive species

Local priority lists for invasive plants developed by regional Cooperative Weed Management Areas:

- Mid Coast CWMA Management Plan: http://www.cascadepacific.org/shop/wpimages/2016-mid-coast-mangement-plan.pdf
- North Coast CWMA Management Plan: http://www.cascadepacific.org/shop/wpimages/2016-north-coast-cwma-management-plan.pdf

- Oregon Conservation Strategy. 2016. Oregon Department of Fish and Wildlife, Salem, Oregon. (Link to invasive species web page: https://oregonconservationstrategy.org/key-conservation-issue/invasive-species/)

CHANNEL AND WETLAND ELEVATION

Wetland and channel elevation are important to monitor because they impact tidal inundation, which in turn informs the trajectory of site restoration through plant community development and other factors. From Janousek et al., 2021:

"Because surface elevation in tidal wetlands is closely linked to many aspects of ecosystem structure and function such as hydrology, vegetation, and soil conditions, elevation...is an important consideration in assessing how a site may recover after restoration of tidal influence. For successful restoration of a former tidal wetland to vegetated tidal marsh or forested tidal swamp, the site's elevation must be in the range that supports establishment and growth of vascular plants, or it must be able to gain new elevation by vertical accretion. Emergent tidal marshes in the PNW typically occur in the upper half of the intertidal zone, from just above local mean tide level (MTL), up to the elevation of annual high tides, which is above local mean higher high water (MHHW). Tidal swamps, which include forested and scrub-shrub wetlands, also occur in the high intertidal zone in the PNW, generally in estuarine areas that are lower in salinity. At elevations below MTL, emergent vegetation is likely to be absent in PNW estuaries, but mudflats or eelgrass (*Zostera marina*) beds may be found."

Elevation monitoring is part of the construction as-built survey, but does not always include all areas of interest so additional post-restoration surveys may be desired. Wetland elevation measurements should cover all restoration project zones, and ideally would be combined with analyses of vegetation. Pre- and post-restoration elevations for each zone should be compared to determine if any major changes have occurred.

Equipment: Preferred survey equipment is real-time kinematic global positioning system (RTK-GPS), validated to a known stable benchmark in the area. LIDAR or drone-collected elevation data can also be used for a broad scale survey

Timing: Wetland and channel elevations should be surveyed before restoration (to assist in restoration design) and once after restoration is complete. If major elevation changes are observed during annual photo monitoring, elevation measurements may need to extend more than one year after restoration.

References:

Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. **pp.45-50**. Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf

Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries

Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University of Oregon. **Pp.23-44.** Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q

Roegner, G. & Diefenderfer, Heida & Borde, Amy & Thom, Ronald & Dawley, E.M. & Whiting, A.H. & Zimmerman, Shon & Johnson, G.E. (2009). Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary. NOAA Tech Memo. 10.2172/927720. **pp. 23-29.** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

Advanced Metrics Monitoring

VEGETATION SPECIES

Vegetation is critical for wetland structure and process. Plants play a large role in estuary food webs and carbon fluxes, can impact soil deposition, and provide physical structure for wetland organism habitat. A diversity of types of tidal wetlands exists in the PNW across various salinities and hydrological regimes. Plant groups in these wetlands commonly include graminoids, forbs, shrubs, and trees.

The estuarine physical environment can heavily impact distribution, abundance, and productivity of plant species. Spatial variation in inundation and salinity can impact plant communities. In altered regimes influenced by diking, soils are often less saline and periods of inundation are also altered. Often, invasive species that prefer drier and less saline soils such as reed canarygrass may take over. Restoring a natural hydrological regime, salinity and development of wetland soils can lead to a shift that emulates a pre-disturbed system. Full restoration of ecosystem function and services precludes restoring plant cover, abundance, and species composition. Measuring plant cover, composition, species richness and assemblage composition can capture transitions in plant community. This can be carried out using transect or quadrat sampling in addition to aerial photography.

Timing: Sampling should occur once before restoration treatment, and the year following restoration. Following restoration, sampling at a 1–3-year interval for 5-10 years may capture transition in vegetation communities. Sampling in mid- summer captures the period of greatest biomass and cover.

Equipment: Depending on methods, materials can include PVC or Rebar (to mark permanent plots); 100-meter tapes; Mallet/hammer; Bags for plant ID; Calipers; Increment borer; Clinometer; Meter stick; GPS

Analysis: One factor ANOVA in total plant cover, total native species cover, total non-native species cover, and plot level species richness between reference and restoration sites, before and after restoration

Desired Results: Post restoration transects/plots have statistically significant similarity in plant cover, composition, species richness and assemblage composition to reference plot/transects

References to methods and protocols:

Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. **pp.19-45**. Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf

Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University of Oregon. **pp. 92-117**. Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q

Roegner, G. & Diefenderfer, Heida & Borde, Amy & Thom, Ronald & Dawley, E.M. & Whiting, A.H. & Zimmerman, Shon & Johnson, G.E. (2009). Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary. NOAA Tech Memo. 10.2172/927720. **pp. 32-40.** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

For sampling design considerations:

Elzinga, C., Salzer, D., and Willoughby, J. 1998. *Measuring & monitoring plant populations*. Denver, Colo.: U.S. Dept. of the Interior, Bureau of Land Management. **pp.97-154.** Available online: http://msuinvasiveplants.org/documents/archives_cism/BLM_Measuring_and_monitoring.pdf

SEDIMENT ACCRETION

The feldspar marker horizon technique is useful for monitoring sediment accretion over short time frames (years to a decade or two). Feldspar (a white powdered mineral) is placed on the soil surface within permanently marked plots; during monitoring, cores are removed, and the thickness of the soil accumulated above the marker horizon is measured. The plots should be protected from disturbance (machine operations, trampling by livestock or people, etc.), since that would disrupt the feldspar layer.

Equipment and plot establishment: Plots should be placed at random within project strata (stratified random sampling). Short sections of PVC pipe are used to mark four corners of each 1-sq-m study plot. White feldspar mineral (powder) is placed in a layer about 0.5 to 1.5 cm thick in the central 0.25 m^2 area inside the larger 1.0 m^2 plot; about 2.7 kg is required per plot. Existing vegetation should be left undisturbed, unless it prevents establishment of a coherent feldspar layer. (In some cases, it may be necessary to remove dead plant matter and/or fibrous root mats; however, this will affect deposition rates, so it should be avoided in general.) Additional, tall markers should be placed more widely around the plot to help prevent trampling or disturbance. Laser level or RTK-GPS should be used to measure the ground surface elevation at the edge of each plot.

Data collection: During monitoring, a knife is used to remove 1-3 soil wedges from the central 0.25 m^2 area. The location of each wedge is recorded so that future sampling can avoid sampling the same location. On each soil wedge, the distance from the top of the soil (top of wedge) to the top of the feldspar layer is measured on all sides that show a distinct feldspar layer (up to four sides per wedge).

Analysis: Measurements are averaged for each soil wedge, then averaged from all wedges sampled from each plot. To determine the average annual accretion rate, divide the total deposition by the time elapsed since plot establishment. ANOVA and pairwise tests of differences among means can be used to compare accretion rates between strata and sites. Linear regression can be used to test the influence of other factors on accretion rates, such as wetland surface elevation or distance from tidal channels.

Timing: To document baseline accretion rates (necessary for determining the effect of restoration), at least one sample event must occur before restoration. Therefore, plots should be established at least 1 year and preferably 2 years prior to restoration. After restoration, sampling every 2-3 years provides good information on accretion rates. Too long an interval between samples (e.g., 5 years) can result in difficulty locating plots.

Budget: Feldspar mineral (e.g., "G200" or "Minspar 200" is available from ceramic supply houses and may cost from $10 to $50 per 50 kg. Allow about 30 minutes per plot for plot establishment and the same for plot sampling, for a team of 2 (plus travel time to the plot location).

References to methods and protocols

Cahoon D.R., & R.E. Turner. 1989. Accretion and canal impacts in a rapidly subsiding wetland II. Feldspar marker horizon technique. Estuaries 12:260-268.

Whelan, K.R.T., & M.C. Prats. 2016. Measuring Accretion with a Feldspar Marker Horizon—version 1.00. South Florida / Caribbean Network Standard Operating Procedure NPS/SFCN/SOP—SET06. National Park Service, Miami, Florida. https://irma.nps.gov/datastore/downloadfile/554420

WATER QUALITY

Much like temperature, water quality parameters such as salinity, DO and pH can influence species abundance and distribution. Species have specific tolerances for water quality parameter ranges and gradients of parameters. Salinity can influence vegetation assemblages and distribution and DO and pH can be determining factors in distribution of organisms. Measuring variation between pre and post restoration water quality conditions can directly determine habitat opportunity for species. This variation can explain changes in distribution and abundance of flora and fauna in post restoration areas of hydrologic reconnection. Tidal flushing associated with hydrologic reconnection can help maintain DO within a tolerable range for estuarine species. Vegetation structure may also change due to increased salinity intrusion from tidal reconnection.

Timing: Record readings every hour both pre restoration and post restoration at both reference and restoration sites

Equipment:
- Data loggers
- Software
- Anchoring equipment (stakes, cables, hammer)
- GPS
- Camera

Analysis: Data can be compared between sites using time series plots, and daily maximum values can be used when comparing benchmark tolerance values for specific species.

Desired Results: Values do not exceed benchmark values and values match reference conditions.

References to methods and protocols:

Roegner, G. & Diefenderfer, Heida & Borde, Amy & Thom, Ronald & Dawley, E.M. & Whiting, A.H. & Zimmerman, Shon & Johnson, G.E. (2009). Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary. NOAA Tech Memo. 10.2172/927720. **pp. 32-40.** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

Note: Final version should include better reference to detailed protocols

SOIL BIOGEOCHEMISTRY

Soil is a critical component of any ecosystem. In wetlands the biogeochemistry of the soil drives many wetland functions such as nutrient retention, seed germination, and plant growth. Wetland Restoration (reintroduction of flooding or shift in flooding regime) dramatically alters soil conditions, creating the template for which new wetland plant communities will grow and develop overtime.

Some soil quality features can be measured in the field with hand-held probes. These include conductivity (a proxy for soil salinity), pH, and oxygen reduction potential. These metrics impact plant community development and can be paired with field vegetation sampling.

Soil organic matter content is an important measurement for hydric soils and blue carbon sequestration that cannot be measured in the field. Soil samples can be collected using a soil augur to analyze percent organic matter in a lab.

Timing and location: Both pre and post restoration. Plots should be chosen to such that they are spatially linked with other metrics, such as plant community or soil accretion. (Note: Brown et al 2014 paired their soil monitoring sites with soil accretion sites.) Monitoring sites should also be chosen between restoration site and high/low marsh reference sites as well as within the restoration site.

Equipment:

For soil samples: soil augur, access to lab with ovens to measure “loss on ignition” for carbon content

Handheld devices for field data collection: Conductivity, pH and ORP meters. (Equipment manufacturers include Extech)

Analysis: Data collected should be used to:
a) evaluate differences in soil characteristics before and after project implementation, relative to reference wetland conditions and to different zones within the project site. To compare the project site with references sites, a t-test can be used. To compare among zones within a site, an ANOVA test can be used.
b) Help interpret the results of other monitored parameters, particularly elevation and plant community development. Linear regressions can be used to determine these relationships.

Desired results: Similarity to reference conditions

References to methods and protocols:

Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. **pp.82-87.** Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf

Kidd, S., and S.R. Nanohar. 2019. Re-visiting Monitoring Protocols For Wetland Restoration. Presentation to LCEP Science Work Group Meeting, December 18, 2019. https://www.estuarypartnership.org/sites/default/files/resource_files/Monitoring%20For%20Wetland%20Restoration_12_17_2019.pdf

Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University of Oregon. **pp. 30, 38-43.** Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q

AERIAL MONITORING

Custom aerial photography (drone or custom flown orthophotos) can be used for many purposes such as tracking change in spatial extent of vegetation types; monitoring channel network development; measuring locations and change in abundance of large woody debris; etc. The increasing frequency of freely accessed high-resolution satellite imagery makes this method of assessment simple and cost effective.

References to methods and protocols:

Roegner, G.C., H.L. Diefenderfer, A.B. Borde, R.M. Thom, E.M. Dawley, A.H. Whiting, S.A. Zimmerman, and G.E. Johnson. 2009. Protocols for monitoring habitat restoration projects in the lower Columbia River and estuary. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-97, **pp. 29-32.** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

FISH COMMUNITY

Estuaries are critical nursery habitats for juvenile salmonids and many marine fish species. Tidal wetland restoration efforts can improve fish habitat through increased channel area, improved passage, increased channel complexity, and improved water quality. Monitoring approaches should be designed by a fish biologist and incorporate local information for fish use in the

watershed. Species of interest, tidal fluctuations, channel network, and season are important elements to consider in designing a fish monitoring strategy.

References to methods:

Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. **pp.126-131.** Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf

Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University of Oregon. **pp. 120-139.** Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q

Roegner, G.C., H.L. Diefenderfer, A.B. Borde, R.M. Thom, E.M. Dawley, A.H. Whiting, S.A. Zimmerman, and G.E. Johnson. 2009. Protocols for monitoring habitat restoration projects in the lower Columbia River and estuary. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-97, **pp. 48-55.** Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary

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Brown, L.A., M.J. Ewald, L.S. Brophy, and S. van de Wetering. 2016. Southern Flow Corridor baseline effectiveness monitoring: 2014. Corvallis, Oregon: Estuary Technical Group, Institute for Applied Ecology. Prepared for Tillamook County, Oregon. Available online: https://appliedeco.org/wp-content/uploads/SFC_2014_baseline_EM_20160605_rev1_bookmks.pdf [Accessed 1/6/2022]

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Janousek C, Bailey S, van de Wetering S, Brophy L, Bridgham S, Schultz M, and Tice-Lewis M. 2021. Early post-restoration recovery of tidal wetland structure and function at the Southern Flow Corridor project, Tillamook Bay, Oregon. Oregon State University, Tillamook Estuaries Partnership, Confederated Tribes of Siletz Indians, Institute for Applied Ecology, and University of Oregon. Available online: https://ir.library.oregonstate.edu/concern/technical_reports/tx31qr89q [Accessed 1/6/2022]

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Kidd, S. and Nanohar, S.R. 2019. Re-visiting Monitoring Protocols For Wetland Restoration. Presentation to LCEP Science Work Group Meeting, December 18, 2019. Accessed online: https://www.estuarypartnership.org/sites/default/files/resource_files/Monitoring%20For%20Wetland%20Restoration_12_17_2019.pdf [Accessed 1/6/2022]

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Roegner, G.C., H.L. Diefenderfer, A.B. Borde, R.M. Thom, E.M. Dawley, A.H. Whiting, S.A. Zimmerman, and G.E. Johnson. 2009. Protocols for monitoring habitat restoration projects in the lower Columbia River and estuary. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-97, 63 p. Available online: https://www.researchgate.net/publication/237472316_Protocols_for_Monitoring_Habitat_Restoration_Projects_in_the_Lower_Columbia_River_and_Estuary [Accessed 1/6/2022]

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