



<http://www.pacificfishhabitat.org>

Pacific Marine and Estuarine Fish Habitat Partnership 2016 Annual Report



Nehalem Bay. Photo credit: Laura Brophy.

Our mission is to work with partners to protect, enhance, and restore ecological processes and habitats within estuaries and nearshore marine environments to sustain healthy native fish communities and support sustainable human uses that depend on healthy fish populations.

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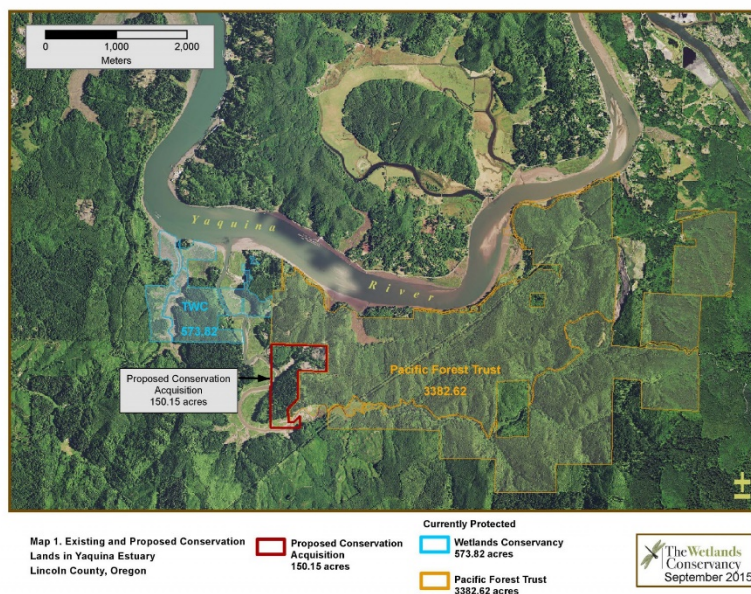
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On-the-Ground Restoration

In 2016, the Pacific Marine and Estuarine Fish Habitat Partnership (PMEP) provided \$140,474 in funding to help support three prioritized projects focused on estuarine protection and restoration—the Poole Slough Acquisition, Assessment, and Planning (\$40,000), Columbia Pacific-Passage Habitat Restoration at Megler Creek (\$39,864), and the Coos Bay Eelgrass Mapping Project (\$60,610).

Poole Slough Acquisition, Assessment and Planning (Oregon)

<http://www.pacificfishhabitat.org/2016---poole-slough-acquisition-assessment-and-planning>



Over 70% of salt marsh habitat in Yaquina Bay has been lost to historic filling, diking, and ditching activities. This project will result in permanent protection of decreasing coastal wetland marsh types that are zoned in a way that would allow environmentally disruptive activities that could threaten marsh integrity. The proposed conservation and long-term stewardship actions are key to implementing protection on one of the highest priority sites in the

Yaquina estuary as determined by the assessment completed by the MidCoast Watersheds Council and The Yaquina Estuary Conservation Plan. The project area is especially diverse in salmon species, in part because it is low-gradient floodplain close to the estuary.

The Yaquina Bay and River is an important production system for Coho, Chum, Chinook salmon and winter steelhead trout as well as resident and sea-run cutthroat trout. The Coho population is viable, the Chinook population is stable, and the Chum salmon, which spawn in Mill Creek, are one of the most southern populations of the species. Additionally, NOAA has designated the lower reaches and sloughs in the Yaquina system as critical habitat for the ESA-listed green sturgeon. Herring has been documented spawning in the estuary and Poole Slough. Tidal wetlands provide a variety of functions that are vital to salmonids, with a significant body of research on the role estuaries and estuarine wetlands play in the salmonid life-cycle.

This project will directly result in permanent conservation of 150 acres in the lower Yaquina estuary. The project parcel contains diverse estuarine, riparian and upslope habitats, including 17 acres of estuarine habitat, a 20 acre riparian zone immediately adjacent to the estuary, and 60–80 year old naturally regenerated forestland. Indirectly, this project builds on The Wetlands Conservancy's ownership and management of 500 acres of salt marsh and timber habitats in McCaffery and Poole Sloughs and conservation management of an additional 3,500 acres of adjacent upland habitat by Pacific Forest Trust and further conservation lands in the watershed managed by the Siuslaw National Forest and the City of Toledo and provide a continuous ridge top, riparian and estuarine habitat connection. Adding the proposed acquisition to the currently conserved areas, more than 80% of the McCaffery and Poole Sloughs will be in conservation ownership and management in perpetuity.

Project partners include Oregon Department of State Lands, Oregon Department of Fish and Wildlife, NMFS, EPA Research Lab, Mid Coast Watersheds Council, Siletz Tribe, US Fish and Wildlife Service, Lincoln County, Adjacent landowners, Native Fish Society, Pacific State Marine Fisheries Commission, Audubon Society of Portland, and Siuslaw National Forest.

Columbia-Pacific Passage Habitat Restoration at Megler Creek (Washington)

<http://www.pacificfishhabitat.org/2016---columbia-pacific-passage-habitat-restoration-at-megler-creek>

The Megler Creek Restoration is one part of the Columbia-Pacific Passage Habitat Restoration Project, a multi-phase project sponsored by the Columbia River Estuary Study Taskforce (CREST) involving three separate tributaries to the Columbia River estuary. The three sites are located within nine miles of each other on the Columbia River shoreline in southwest Washington. The proposed sites of this large-scale restoration effort include Fort Columbia, which was restored in 2010 as part of Phase I of the project, Megler Creek, which is the site currently being proposed for funding, and Hungry Harbor, which will be completed during the third phase of the restoration strategy. Restoration is needed in this estuarine reach of the Columbia River because extensive historical alterations of the shoreline have eliminated the majority of off-channel foraging and rearing opportunities in this important migration corridor. Almost the entire lower river shoreline in Washington from Knappton Cove to the town of Chinook is riprapped. Most of the historical estuarine tributaries that once served as off-channel habitat for migrating and spawning salmon have been disconnected from the Columbia mainstem by inappropriately sized and placed culverts. Fish presence studies conducted by NOAA on the Columbia River mainstem indicate that the North Channel is the primary route taken by outgoing juvenile salmonids in the Columbia River system. Therefore, correcting the existing fish passage barrier and reconnecting off-channel rearing habitat necessary for migrating salmonids along this widely used route is vitally important for improving salmonid survival for ESA-listed fish in the estuary, as well as fish using Megler

Creek. Restoration actions proposed for the Megler Creek project will involve replacing an undersized culvert to correct the fish passage barrier and improve access to 2.2 miles of upstream spawning habitat, as well as improve off-channel rearing habitat by enhancing tidal connection to 1.3 acre\Sullivan Gulch Bottomland Restoration.

This project will address the fish passage barrier at Megler Creek by replacing the undersized existing culvert that is impassable to fish during the majority of tidal and flow cycles, with a larger culvert that will allow fish passage and improve tidal connection to 2.2 stream miles of upstream habitat. Installing a fully passable structure will address limiting factors, such as loss of habitat connectivity, blockages to off-channel/stream habitats, loss of side-channel or side-channel habitats, altered nutrient exchange processes, availability of preferred habitat (shallow water, peripheral habitats), and availability of macrodetritus-based food web. Restoration actions at Megler Creek will consist of replacing a dilapidated undersized (48-inch) perched corrugated metal culvert at the confluence of the creek and the Columbia River with a 25-foot wide by 10-foot tall full stream simulation concrete box culvert. Project actions will also involve realignment and enhancement of 300 linear feet of the Megler Creek channel to provide maximum habitat benefits for salmonids seeking off-channel refugia. Enhancement actions will include installation of large wood habitat structures, creation of small pilot channels off of the mainstem of Megler Creek to increase floodplain connectivity and available off-channel habitat, and installation of native wetland and riparian vegetation.

Project partners include the National Park Service, Washington



Temporary channel during construction.

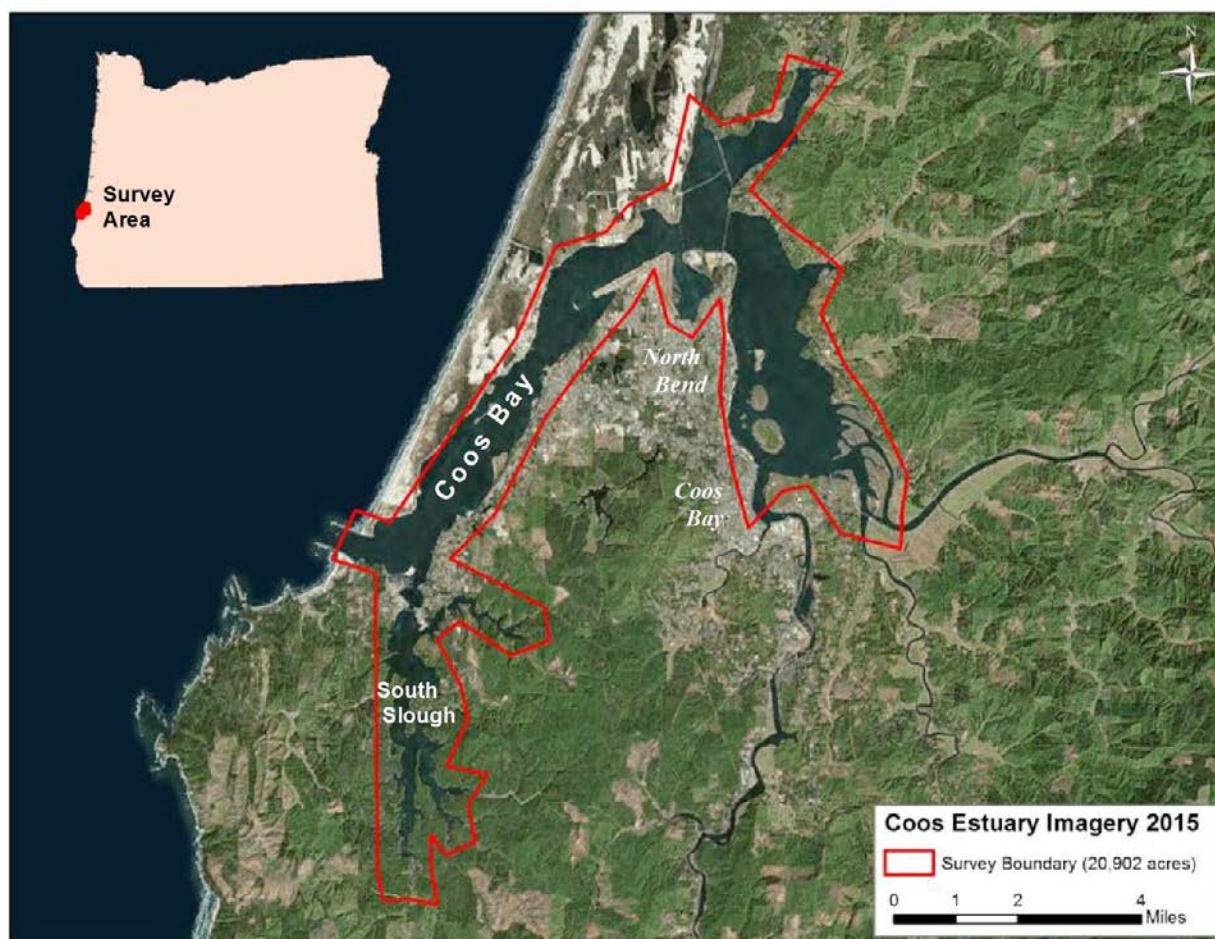
Department of Transportation, Lower Columbia Fish Recovery Board, Bonneville Power Administration.

Elgrass Mapping of the Coos Estuary (Oregon)

<http://www.pacificfishhabitat.org/2016---coos-bay-eelgrass-mapping-project>

The Coos estuary, located along the southern Oregon coast, encompasses 13,348 acres, making it the second largest estuary in the state. This large and complex estuary provides critical rearing habitat for dozens of marine and anadromous fishes and is home to many resident fish and invertebrate species that spend their entire life cycle in estuarine habitats. Commercial fisheries are critical to the economy of the region, and the Coos estuary has been an important system in recovery planning for endangered salmonids and estuarine restoration. The proposed project includes data collection via aerial photography surveys over 20,902 acres, which includes fringing shoreline areas to ensure complete coverage of intertidal eelgrass habitat.

Seagrasses provide important and preferred habitat for many marine and estuarine species, including 13 of PMEP's 15 focal species, yet comprehensive information on the distribution of seagrass



habitat in the Coos estuary is lacking. The goal of this project is to create up-to-date geographic information system (GIS) data layers and associated maps that characterize the spatial extent of eelgrass (*Zostera marina*) throughout the entire Coos estuary. The only existing and publicly-available eelgrass data layers for the estuary were created from data collected in 2005, thus the data are inadequate for supporting important projects such as habitat classification and conservation, mitigation and restoration planning, or ecological monitoring. The South Slough Reserve is also working closely with the Department of Land Conservation and Development (project partner) to refine and validate Oregon's newly developed coast-wide estuary habitat classification system, referred to as the Coastal and Marine Ecological Classification Standard (CMECS). As applied to the Coos estuary, the CMECS system produced fairly coarse habitat classifications that do not provide the level of detail needed by Coos County for updating the Coos Bay Estuary Management Plan. Updated maps and data files on the spatial extent of eelgrass would complement existing assessments of eelgrass function and susceptibility to stressors.

Through a PMEP-funded project, South Slough Reserve is conducting a spatial and temporal assessment of fish and invertebrate assemblages utilizing eelgrass habitat in the estuary. Because habitat conditions in one area of the estuary (e.g., South Slough) are not necessarily representative of the whole system, mapping data will help identify important locations for future work and comparative assessments. The proposed mapping data is also needed to determine the status of eelgrass in the entire estuary. By using similar methods to the 2005 survey, scientists will assess changes in the spatial distribution and relative density of eelgrass beds over the past decade when the last comprehensive survey was conducted. In addition to using past methods, this project will also collect data on intertidal and subtidal eelgrass distribution and density at high tide along several transects in the project area. These surveys will be used to inform the aerial imagery to increase the accuracy and robustness of the resulting mapping files.

Science and Data

Background

The PMEP and its assessment partners continued implementation of [three Pacific Coast fish habitat assessments](http://www.pacificfishhabitat.org/overview-of-the-west-coast-fish-habitat-assessments) (<http://www.pacificfishhabitat.org/overview-of-the-west-coast-fish-habitat-assessments>) to inform future estuary resource protection and restoration efforts along the West Coast and enhance understanding of the role estuaries play in the health and production of commercially and recreationally important marine fishes:

- (1) [PMEP's Nursery Habitat Assessment](#), focusing on nursery functions for juvenile fish in West Coast estuaries (completed 2015).
- (2) The [National Fish Habitat Plan](#) (NFHP) [National Estuary Assessment](#), focusing on condition and key threats to habitats of recreationally and commercially important fish and shellfish stocks (ongoing collaboration with NOAA Fisheries in the Office of Science & Technology).
- (3) A [Nearshore Forage Fish Assessment](#), focusing on habitat-related changes over time in distribution and abundance of nine species of forage fish inhabiting estuary and nearshore habitats (ongoing collaboration with NOAA Fisheries and the Northwest Fisheries Science Center).

Progress Achieved to Date

Progress to date has been described in a [PMEP Assessment website](#), and is summarized here:

Pathways to Strategic Conservation in West Coast Estuaries

- Hosted [summit](#) in Seattle, WA January 14-15, 2014.
- Convened the PMEP Assessment Team, West Coast Spatial Data Team, and other groups and committees with assessment deliverables in 2014 and 2015.
- Coordinated deliverables and timelines across the three assessments in 2014 and 2015.
- Conducted a West Coast-wide tier 1 and tier 2 survey in 2015 to obtain information about existing datasets on juvenile fish use of estuaries and estuarine habitats. Collected and processed all datasets.
- Formed a Prioritization Committee in 2015 to compile and summarize methods for setting ecological priorities for restoration and habitat protection within estuaries, gathering information from peer-reviewed literature, gray literature, and web resources to propose alternative approaches for a prioritization strategy based on the above compilation and

summary work.

- Gave [a presentation](#) on the PMEP Assessment status at the Restore America's Estuaries Conference November 5, 2014 in Washington, DC.
- Initiated a West Coast tidal mapping exercise to refine mapping of estuary extents on the West Coast using a variety of interpolation methods, including VDatum and 50% exceedance. In 2015, data was acquired, iterative steps have been completed, key experts were convened to review the results, and, in concert with NOAA, the data layers are being created and will be available in 2016.
- Completed the [inventory and classification of Oregon, Washington, and California estuaries](#) in 2014. West Coast estuaries were catalogued using boundaries from the National Wetlands Inventory and classified using the Coastal and Marine Ecological Classification Standard (CMECS).
- Completed the [“Nursery Functions of U.S. West Coast Estuaries: The State of Knowledge for Juveniles of Focal Invertebrate and Fish Species”](#) in 2015. We synthesized information on the life history, habitat requirements, nursery values, and threats to nursery function for 15 ecologically and economically important species, and compiled geospatial data on estuarine use of those species to help us understand the spatial extent and habitat use of focal fish species on the West Coast. The 15 focal species selected represented a range of fish and invertebrate guilds of cultural, economic, or social importance. The suite of species selected represented the geography of the West Coast. Results:
 - i. Juveniles of 11 species were documented in 113 of 303 estuaries.
 - ii. All four estuary classes (lagoonal, riverine, embayment and sound) are important systems for juveniles of some or all of 15 species.
 - iii. Four important estuarine subclasses are used by 11 species: Estuarine coastal subtidal, tidal channel/creek, slough and lagoon.
 - iv. Seagrass beds were used by 13 of 15 species.
 - v. Common threats to all 15 species include habitat loss, invasive species, hypoxia from eutrophication, pesticides for aquaculture, ocean warming, and sea level rise.
 - vi. Key knowledge gaps include a paucity of data from small estuaries and lack of a known nursery role for many species, especially species of low economic value.
- Completed the PMEP Nursery Assessment: [“Nursery Functions of West Coast Estuaries: Data Assessment for Juveniles of 15 Focal Fish and Crustacean Species.”](#) We compiled and synthesized available fish and shellfish data from California, Oregon, and Washington estuaries into a common format to understand measures of catch, effort, and presence and frequency of occurrence in estuaries with different stressor scores. Twenty estuaries were included in the modeling analysis. We used 1990–2014 data. We used estuaries scores calculated by the National Oceanic and Atmospheric Administration for their 2010 National Assessment. The scores are a composite of 43 indicators that represent four main categories (land use, river flow alteration, pollution sources, and eutrophication). We created maps displaying species location, average frequency of occurrence and average catch per unit

effort. Results and recommendations:

- Of the eight species that had suitable data for a modeling analysis, Chinook salmon, Coho salmon, Pacific herring, and English sole may be the most impacted by estuarine stressors and therefore may receive the largest benefit from restoration efforts in shallow water areas that were the focus of beach seine efforts in our analysis.
 - Target highly stressed estuaries with the goal of decreasing the score toward a more natural state.
 - Future analysis should seek to isolate the effects of individual versus cumulative estuarine stressors, and conduct concurrent fish sampling with measurement and updating of stressors to illustrate dynamic trends.
 - Standard habitat classification categories should be used so that labeling and documentation of sampled habitats are consistent (e.g., the Coastal and Marine Ecological Classification Standard—CMECS).
- **A Literature Review of Estuary Prioritization Schemes**—We compiled and summarized past methods and literature for setting ecological priorities for estuary restoration and habitat protection. Our expert-directed approach ensured that our framework was focused on initial priorities, ecological criteria, scale, intended uses, and advantages and shortcomings. We interviewed experts from UCSB, Pacific Northwest National Laboratory, NOAA, the University of Washington, and The Nature Conservancy. Identification of elements of a framework will help shape the estuary prioritization process and provide direction in refining criteria and weighing alternative approaches.
 - Presented the results of PMEP assessment work to date at a pair of dedicated sessions of the Coastal and Estuarine Research Federation in November of 2015 in Portland, Oregon.
 - Hosted a West Coast-wide workshop in December of 2015 to convene experts to advance assessment and prioritization scheme work.

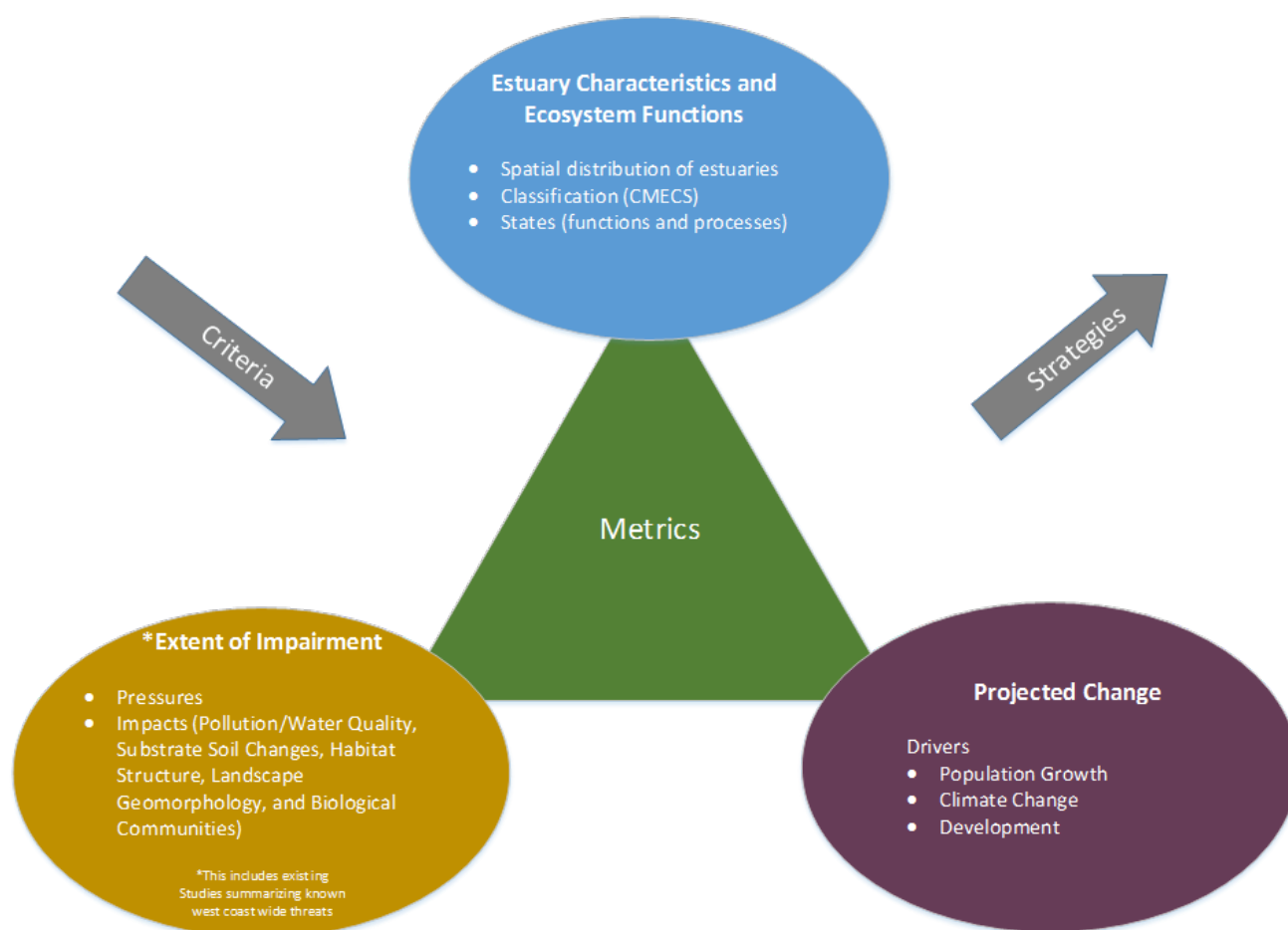
2016 Tasks:

- **Mapping the Extent of West Coast Tidal Wetlands Using Extreme Water Level Data and LIDAR**—We mapped the extent of West Coast tidal wetlands using extreme water level data and LiDAR (Light Detection and Ranging) (elevation-based mapping). We followed the 50% exceedance boundary methods published by the Oregon Department of Land and Conservation Development (Lanier et al. 2014), to map the current and historical extent of the estuary, and subdivided large systems, such as Puget Sound (originally characterized as “sound” in CMECS). LIDAR and VDatum analysis for the mapping were conducted by Hiroo Imaki (NOAA); expert panel webinars provided external review. These new West Coast tidal wetland maps will greatly improve and expand our understanding of West Coast estuaries, provide comprehensive coverage with improved accuracy and suitability for restoration planning, be positively reviewed by experts, match closely to historic wetland maps, and provide a solid base layer for West Coast-scale analysis of wetland losses, restoration, and conservation opportunities.

- **Mapping Estuary Habitats Using the Coastal and Marine Ecological Standard (CMECS)**—We mapped habitats within West Coast estuaries using the aquatic and biotic components of CMECS. Our process included coding each inventoried estuary with its aquatic setting units, and assigning biotic classes (aquatic bed, emergent, scrub-shrub, and forested) using the National Wetlands Inventory (NWI), and using C-CAP (outside NWI mapping).

2017 Tasks:

- **Mapping Tidal Wetland Loss on the West Coast**—We will conduct a rapid assessment of historic loss of tidal wetlands to inform restoration actions. We will compare two data sources: National Wetlands Inventory (NWI) and the elevation-based map of West Coast current and historical tidal wetlands to be completed in 2016. This task will support landscape-scale comparisons (not site-specific analysis) and will include:
 - Maps of tidal wetland areas lost
 - Tables summarizing losses by state, regional estuary, and estuary type
 - A report summarizing methods, comparisons to other studies, limitations of analysis, and appropriate use of the products
- **Identify Regional Stressors by PMEP region**—Using the DPSIR model (a framework that distinguishes driving forces, pressures, states, impacts and responses) as a way to organize our thinking and articulate threats to estuaries, we initially identified key drivers, pressures, and impacts affecting West Coast estuaries, and then identified key stressors by PMEP region. We will update the DPSIR definitions using Oesterwind et al. (2016). PMEP regions include the Salish Sea; Washington, Oregon, and Northern California Coast; Central California; and Southern California Bight. We will create storymaps for each of the regions, describing estuary types, historic estuary habitats, the current status of estuary habitats, threats, and stressors, restoration and protection strategies, and key data gaps in each PMEP region. As we develop the CMECS aquatic and biotic data layers, we are identifying the key stressors on specific habitat types, and identifying metrics that may exist to quantify and address those impacts.



- **PMEP Spatial Data System**—The PMEP Spatial Data System will launch in 2017, providing access to West Coast data layers, including historical tidal loss, aquatic and biotic CMECS estuary components, the current extent of estuaries, scope boundary, PMEP region delineations, and literature review/documents compiled to date for 444 West Coast estuaries. In addition, a complementary West Coast Estuaries Explorer (a product from our partnership with the North Pacific Landscape Conservation Cooperative [DataBasin]) will launch, provided public access to the data layers PMEP has created and compiled.

2018 Tasks:

- Integrate USGS Sea Level Rise projections as well as West Coast nearshore units to incorporate climate change considerations into priority estuary restoration and protection strategies.

Outreach and Education

The Coastal Fish Habitat Partnerships and Other FHPs

The PMEP Coordinator facilitates regular conference calls with the coastal fish habitat partnerships in the United States, and launched the development of [quarterly coastal FHP newsletters](#).

2016 10 Waters to Watch

PMEP was selected by NFHP to highlight the Qwuloolt Estuary in the national “[10 Waters to Watch](#)” campaign. PMEP has helped to promote awareness of the current and past restoration activities in this estuary through assistance with press releases and information.

The Qwuloolt (Qwuloolt means “marsh” in the Lushootseed language) Estuary is located within the Snohomish River floodplain about three miles upstream from its outlet to Puget Sound. Historically, the area was tidal marsh and forest scrub-shrub habitat, interlaced by tidal channels, mudflats and streams. The project area was cut off from the natural influence of the Snohomish River and Salish Sea tides by levees, and drained by ditches instead of stream channels. Prior to the breach, the area was characterized mostly by a monoculture of invasive reed canary grass instead of native estuarine vegetation, and warm water invasive fishes and amphibians. Through the cooperation of its many partners, this project has returned some of the historic and natural influences of the river and tides to the Qwuloolt area, and is the first of several large restoration projects that could collectively result in approximately 50% of historical tidal wetland area returned to tidal influence.

The estuary acts as a biotic refuge and natural buffer between marine and upland environments that is valued for its beauty and ecosystem functions. Today people benefit from the clean water and air the estuary supports, recreational opportunities, flood storage and protection, carbon sequestration, and its use for commercial, industrial, agricultural purposes. The Qwuloolt Estuary Restoration Project represents a significant rejuvenation of a critical natural and cultural resource for all peoples within northern Puget Sound.



Qwuloolt estuary. Photo credit: Tulalip Tribes website.

Finances

The PMEP received a total of \$215,474 in NFHP funding in 2016, of which \$75,000 was designated for the PMEP coordinator and operations support, and the remaining \$140,474 was used to support three restoration/assessment projects.

The \$140,474 PMEP provided for three projects in 2015 was matched with \$1,435,171 in funding from other sources and partners.