

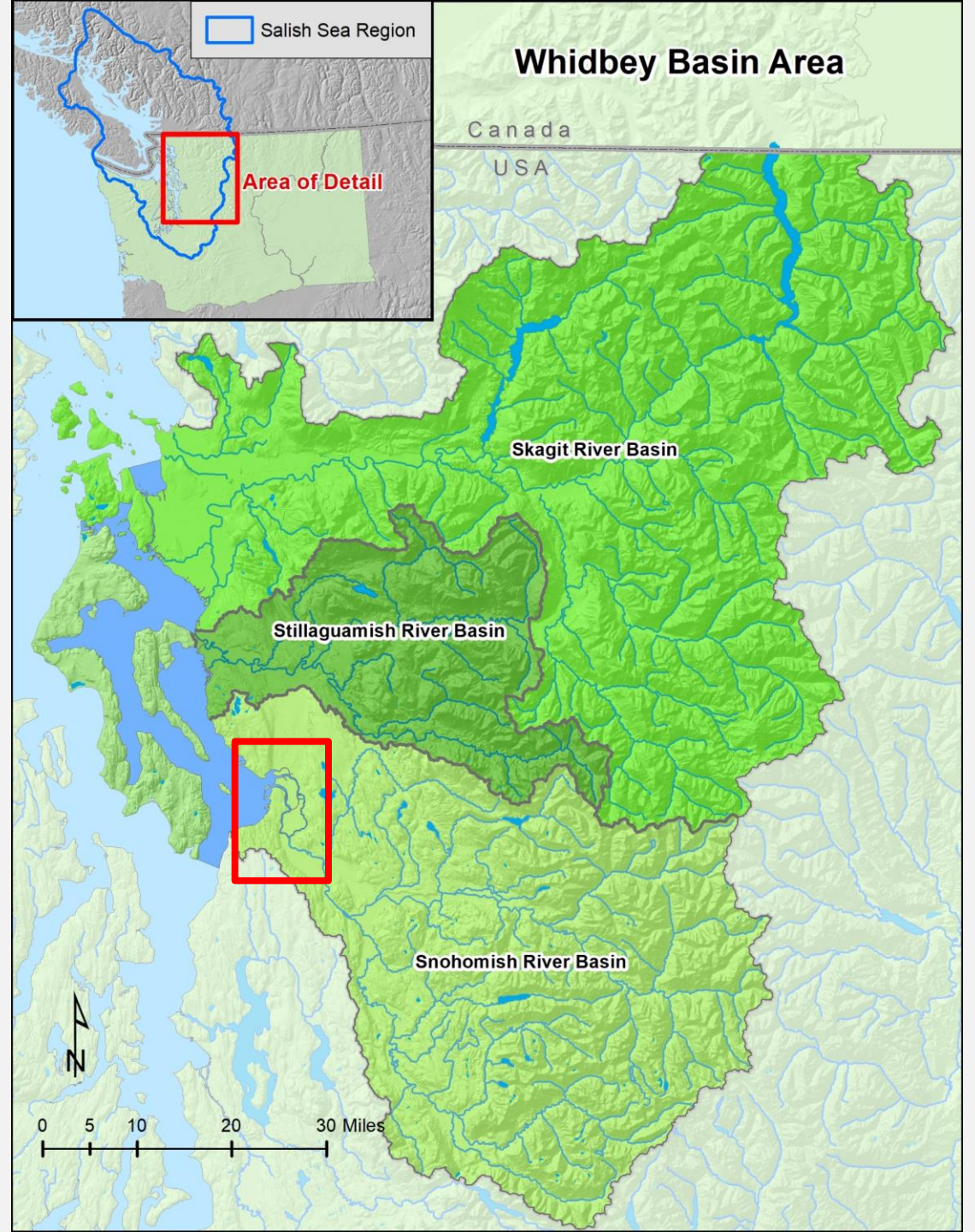
RESTORATION MONITORING IN THE SNOHOMISH RIVER DELTA



Promoting Effective Estuary Restoration Workshop – Monitoring Guidance, Data Tools, & Collaborative Platforms - May 6, 2025

Todd Zackey
Field Projects Manager
Tulalip Tribes Natural & Cultural Resources Department







Historic Estuary Extent = 15,642 acres

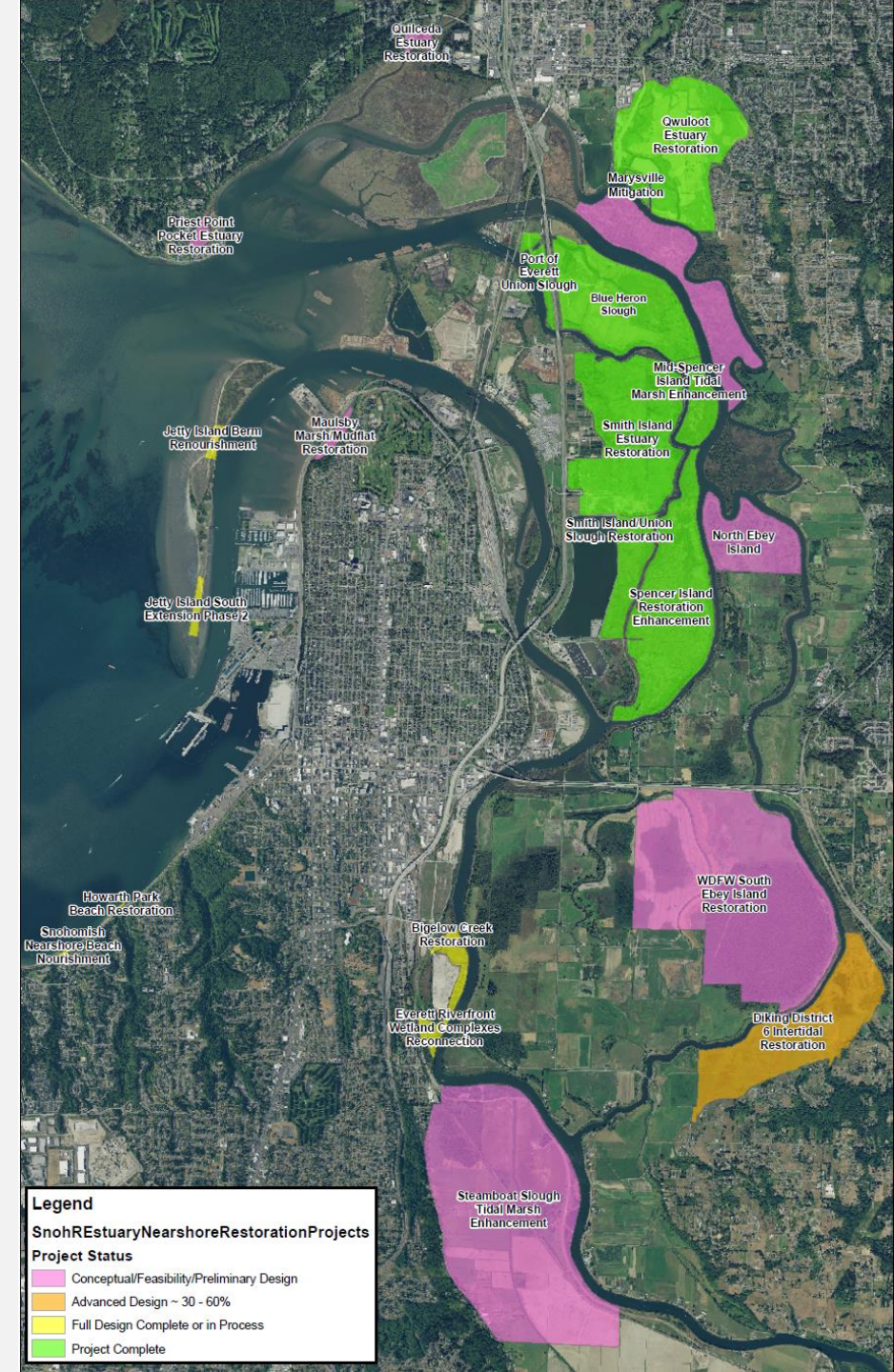
Remaining Estuary (pre-restoration) = 1,663 acres

Restoration work completed = 1,475 acres

Restoration projects in advance design = 376 acres

Restoration projects in conceptual design/feasibility stage = 2,647 acres

(Brophy et al 2019)



Snohomish River Estuary Monitoring Plan

Monitoring Plan for the Qwuloolt Restoration Project

DRAFT

Revised 3/26/11

Casimir Rice, Phil Roni, Jason Hall, Josh Chamberlin, Gregory Hood,
Glenn Guntenspergen, Lyndal Johnson, Hiroo Imaki, Maria Calvi,
Anna Portinga, Caren Crandell, and Lucinda Tear



Snohomish River Estuary Monitoring Plan

REVISED June 10, 2019



Aerial image of Quilceda Marsh in the lower Snohomish River estuary. Available: <https://fortress.wa.gov/ecy/shorephotoviewer/>
Image Credit: Copyright © 1994-2018, Washington State Department of Ecology. All rights reserved. Web Communications
Manager, Washington State Department of Ecology, PO Box 47600, Olympia, WA 98504-7600, 360-407-6590.

Jason Hall ¹, Joshua Chamberlin ², Todd Zackey ³, Holly Zox ⁴,
Michelle Totman ³, and Casimir Rice ⁵.

¹ Cramer Fish Sciences, Watershed Sciences Lab (Email: Jason.Hall@fishsciences.net) ²
National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center,
Watershed Program (Joshua.Chamberlin@noaa.gov); ³ Tulalip Tribes Natural and Cultural
Resources Department (Email: tzackey@tulaliptribes-nsn.gov); and ⁴ One Horse Enterprises
(Email: cj_haz@hotmail.com); ⁵ Posthumous recognition of contributions while working at
National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center,
Watershed Program.

Restoration Goals:

“Restore historical tidal circulation processes and functions to the Qwuloolt Estuary, and move the biological integrity and function of the site towards comparable natural habitats of the region.”

(1) Topography:

Allow maximum tidal inundation.
Maintain and develop elevation, soil conditions, and hydrologic connectivity favorable to native biota historically present.

(2) Hydrology:

Maximum tidal inundation.
Temperature, salinity, and dissolved oxygen favorable to native biota historically present.

(3) Biota:

Character of the biota onsite returns over time to a condition similar to that historically present.

(4) Society:

No major adverse effects to property and infrastructure.
Positive contribution to natural and cultural heritage of the community in terms of conservation, education, and recreation.
Positive contribution to restoration science and practice

Focus Areas	Monitoring Element	Monitoring Component	Project Scale	System Scale	
Topography	Sediment & Elevation	Marker horizons (MHs)	Core	Supp.	
		RSETs with MHs	Core	Supp.	
		UAV and LiDAR	Core	Supp.	
		RTK/veg grid transects	Core	Supp.	
		Sediment pins	Supp.	Supp.	
		Soils	Supp.	Supp.	
	Bathymetry	Multi/single-beam sonar	Supp.	Supp.	
Hydrology	Temp & Salinity	Continuous water sensors	Core	Core	
		Point measurements	Core	Core	
		Water column profiles	Supp.	Supp.	
		Inundation	Continuous water sensors	Core	Core
		Water quality	DO, pH, nutrients, contaminants	Supp.	Supp.
		Flow	River discharge	Core	Core
			Point measurements	Supp.	Supp.
		Channel cross-sections	Supp.	Supp.	
Biota	Fish	Beach seining	Core	Core	
		Smolt trapping	Core	Core	
		Fyke trapping	Core	Supp.	
		Otolith microstructure	Supp.	Supp.	
		Tissue contaminants	Supp.	Supp.	
		Genetic mark-recapture DNA	Supp.	Supp.	
		Vegetation	RTK/veg grid transects	Core	Supp.
		Intensive quadrats	Core	Supp.	
		UAV and Aerial Imagery	Supp.	Supp.	
	Birds	Marsh bird point counts	Supp.	Supp.	
		Invertebrates	Benthic coring	Supp.	Supp.
			Nueston sampling	Supp.	Supp.
			Fallout trapping	Supp.	Supp.
			Salmon diets	Supp.	Supp.
		Beaver	Dam, slide, and den surveys	Supp.	Supp.
		Qualitative	Visual record	Photo points and observations	Core
Timelapse photography and video	Core			Supp.	
UAV and Aerial Imagery	Core			Supp.	

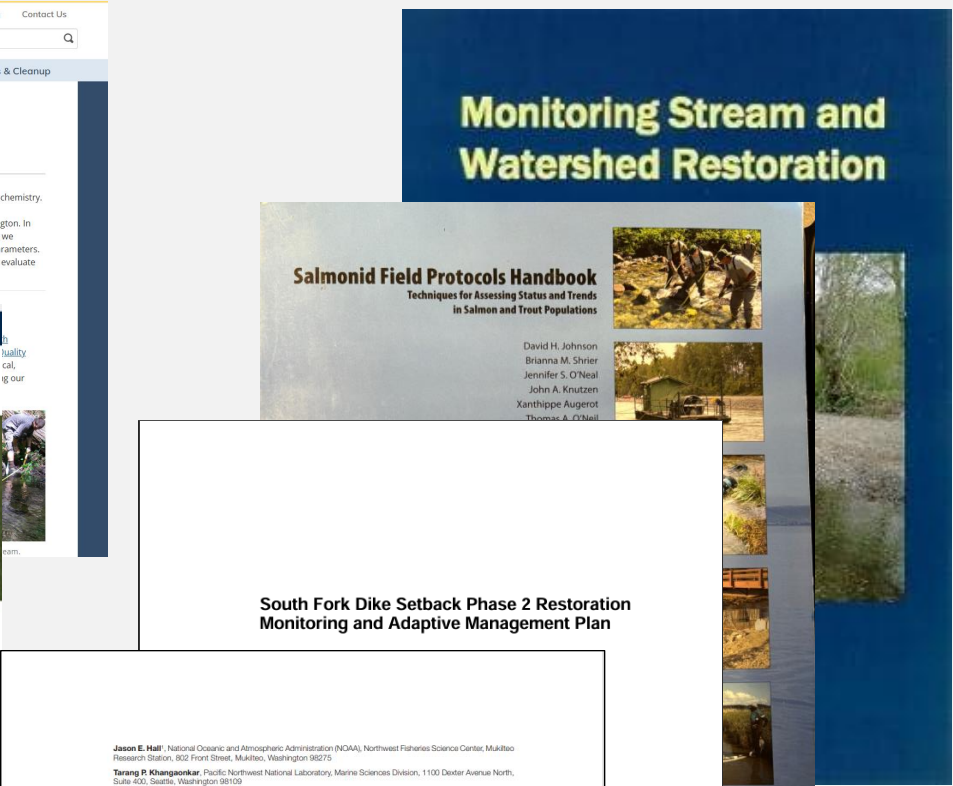
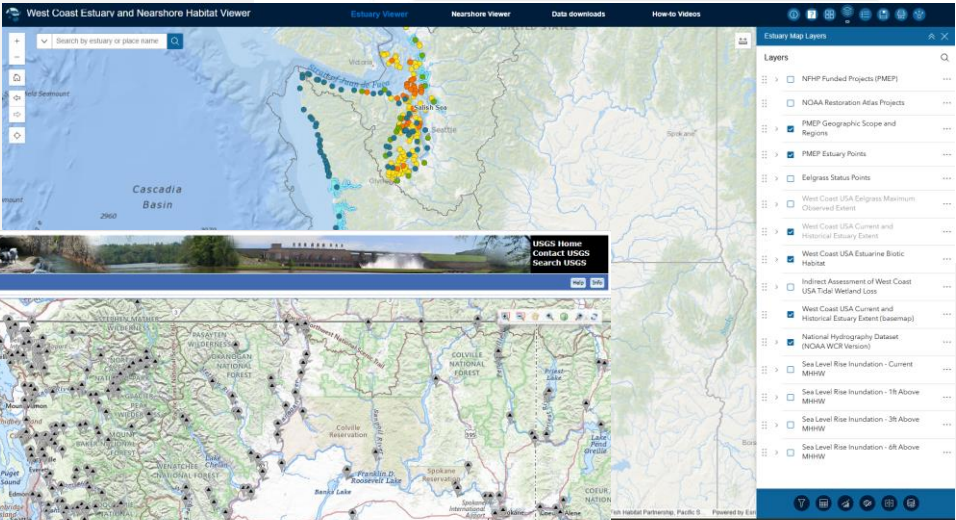
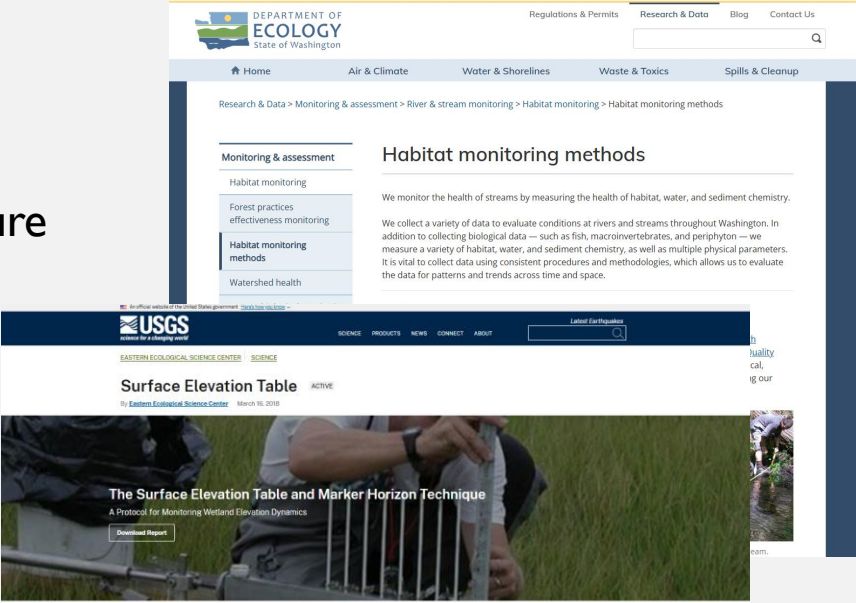
Core and supplemental monitoring elements for project and system scale monitoring

Monitoring Methods Sources

- Books & Scientific Journals
- Reports, white papers, grey literature
- Webpages
- Webtools

Content Creators:

- Universities Research Institutes
- Governments
- Tribes
- NGOs
- Consultants
- Others



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Casimir A. Rice and Joshua Chamberlin: National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center, Mukilteo Research Station, 802 Front Street, Mukilteo, Washington 98275

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Frank Loonetti and Michael Rostay: Snohomish County, Surface Water Management, 3000 Rockwell Ave., Everett, Washington 98201

Kurt Fresh, Anna Kagle, and Mindy Rowse: National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center, 2725 Montlake Blvd. E., Seattle, Washington

Characterization of Salinity and Temperature Patterns in a Large River Delta to Support Tidal Wetland Habitat Restoration

Abstract

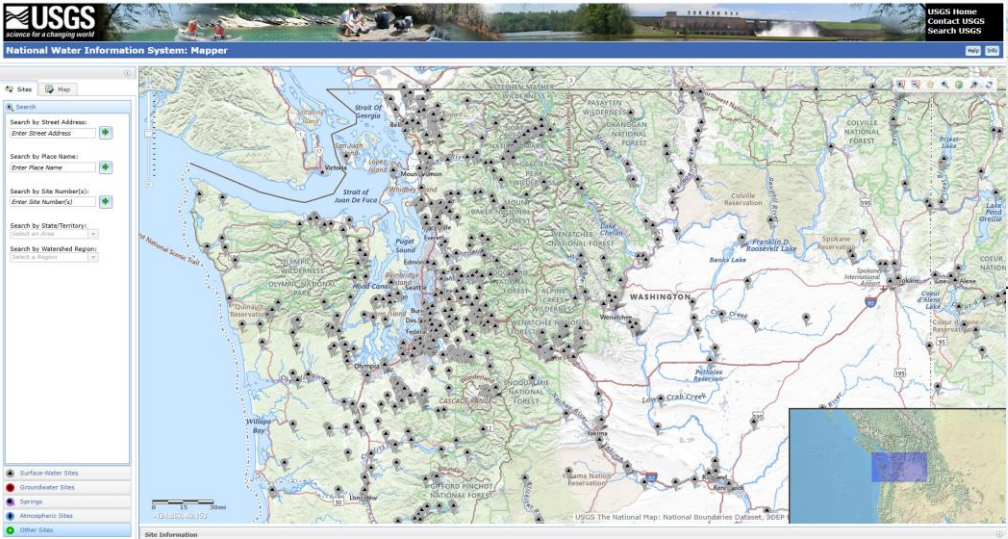
Although the Snohomish River estuary remains the second largest tidal wetland complex in Puget Sound, approximately 90% of pre-settlement habitat has been disconnected from tidal exchange. This estuary is currently the focus of the largest restoration effort in Puget Sound, with opportunity to restore tidal exchange to over 50% of pre-settlement levels. The Snohomish River also currently supports populations of all anadromous Pacific salmon species, including Endangered Species Act listed Chinook (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), and bull trout (*Salvelinus confluentus*). The combination of extant anadromous Pacific salmon populations, large existing tidal wetland complexes, and large restoration potential make the Snohomish River estuary a great opportunity to benefit salmon population recovery and conservation efforts. To support restoration planning and effectiveness monitoring, we developed baseline characterizations of key physical attributes (salinity and temperature). Our results indicated that brackish (0.5-30 ppt) conditions extended further upriver than previously described, with diel/seasonal changes downstream of the middle mainstem and lower Ebo Slough remaining brackish throughout most of the year. During extreme low flows (< 0.65 m³ s⁻¹), salt water (> 0.5 ppt) can at times intrude throughout the distributaries and up to over kilometer 15.9 above the first bifurcation. We also observed temperatures exceeding stress thresholds for juvenile salmonids throughout the estuary from July through September, a period that overlaps with juvenile rearing. This research is timely with several large restoration projects scheduled for construction by 2020, and these baseline characterizations can be used to evaluate restoration responses, as well as to inform project prioritization and monitoring.

Keywords: Salt intrusion, temperature, Snohomish River estuary, Washington, Puget Sound


Introduction

Estuaries are highly productive and dynamic ecosystems that provide critical habitat for numerous aquatic and terrestrial species. Substantial world-wide losses of estuary habitats have been linked with declines in many estuarine-dependent populations (Magnusson and Hilborn 2003, Lotze et al. 2006), including anadromous Pacific salmon (*Oncorhynchus* spp.) (Simenstad and Conkelt 2000, Beamer et al. 2005, Bottom et al. 2005). Although some species (and some life histories) of juvenile Pacific salmon migrate through estuaries relatively quickly, others are particularly dependent on estuarine habitats as they transition from riverine to marine environments (Healey 1982, Thorpe 1994, Bottom et al. 2005). Estuaries provide juvenile Pacific salmon with salinity gradients necessary to complete physiological adaptations to transition from fresh to salt water, favorable conditions

¹ Author to whom correspondence should be addressed.
Email: Jason.Hall@fish.wa.gov



Historic and Change Analysis Data




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Data Products


Home > Data Products

Applications




Estuary and Nearshore Habitat Viewer

This map viewer highlights spatial data products developed by PMEP to characterize habitats and synthesize information in support of habitat conservation and restoration goal setting. Most of the data presented in this viewer are available for download below.




West Coast Estuaries Explorer

This application is useful for quickly comparing estuaries to each other along the coastlines of Washington, Oregon, and California. Using dynamic filters and an interactive map you can find estuaries that meet specific criteria; or estuaries that provide habitat for focal species of interest to you.




West Coast USA Current and Historical Estuary Extent

This layer represents the current and historical tidal wetlands, or estuary extent, for the West Coast of the contiguous United States.




PMEP Estuary Points

This layer represents estuaries, as points, in the Pacific Marine and Estuarine Fish Habitat Partnership's (PMEP) spatial data system.



West Coast USA Estuarine Biotic Habitat

These data represent the Biotic Component (BC) of the Coastal and Marine Ecological Classification Standard (CMECS) for estuaries of the West Coast of the contiguous United States.



West Coast USA Eelgrass (Zostera sp.) Habitat

This package of map layers represents the presence and maximum observed extent of eelgrass (Zostera sp.) habitat on the West Coast of the United States (Washington, Oregon, and California), based on the best available existing spatial data showing the current and historic extent of eelgrass in the region.


<https://www.pacificfishhabitat.org/>

Puget Sound River History Project


Home | People | Research | Data | Atlas

Historical GIS data for Puget Sound available for download from this site


19th century Coast Survey topographic sheets (T-sheets)



19th century public land survey plat maps



1930s-era aerial photography



Additional GIS data

Puget Sound Lidar Consortium
Geomorphological Research Group (regional raster & vector data)

Additional non-GIS source data

19th century land survey field notes (links to BLMsite)

web server note: Our 12-year-old java zoom/pan scripts have stopped working in 2016. Please accept our weak substitutes.


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<https://riverhistory.ess.washington.edu/data.php>

Hydrology and Water Chemistry

Hydrologic monitoring network needs additional info to correct and analyze data

- Base flow data from USGS Streamflow data
- Atmospheric Pressure from local NWS station for depth logger correction



National Water Information System: Web Interface

USGS Water Resources

(Cooperator Access)

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Explore the NEW USGS National Water Dashboard Interactive map to access real-time water data from over 13,500 stations nationwide.

USGS Water Data for the Nation

Search for Sites With Data

Current Conditions

Sites with real-time or recent surface-water, groundwater, or water-quality data.

Site Information

Descriptive site information for all sites with links to all available water data for individual sites.

Map of all sites with links to all available water data for individual sites.

Frequent Searches By Data Category

Surface Water

Water flow and levels in streams and lakes.

Groundwater

Water levels in wells.

Water Quality

Chemical and physical data for streams, lakes, springs, wells and other sites.

Water Use

Water use information.

Introduction

These pages provide access to water-resources data collected at approximately 1.9 million sites in all 50 States, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa and the Commonwealth of the Northern Mariana Islands. Online access to this data are organized under the categories listed to the left.

The USGS investigates the occurrence, quantity, quality, distribution, and movement of surface and underground waters and disseminates the data to the public, State and local governments, public and private utilities, and other Federal agencies involved with managing our water resources.

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<https://waterdata.usgs.gov/nwis>



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Unsettled Weather Continues over the Southern Plains and Eastern U.S. into Mid Week

Two storm systems will continue to bring unsettled weather into the middle of the week. Severe thunderstorms, widespread showers, and/or scattered flash flooding are possible over the southern High Plains and the upper Ohio Valley into the Mid-Atlantic and southern New England. Heavy snow is possible in the higher elevations of the Rockies. [Read More >](#)

Climate

Weather.gov > Climate

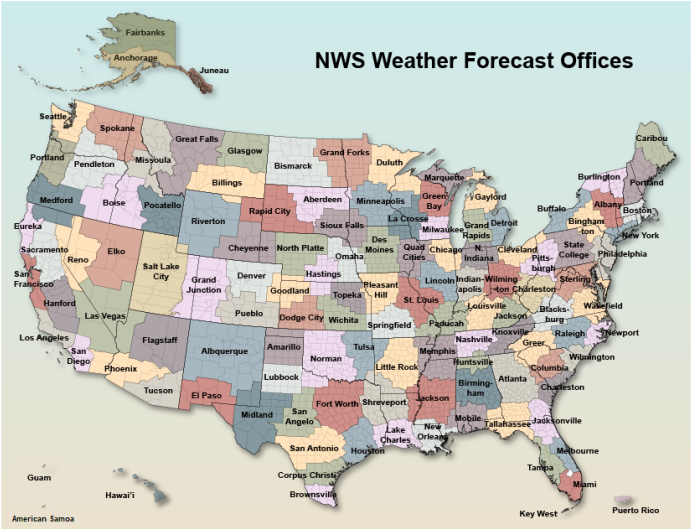
National Weather Service

National Headquarters

For the latest climate forecasts see the [Climate Prediction Center \(CPC\)](#) web page.

The map below is your portal to NWS Climate information. Select an area of interest and you will be directed to the local Weather Forecast Office page to access their climate data. [\[User Video \]](#)

NWS Weather Forecast Offices



<https://www.weather.gov/wrh/climate>

Elevation - LiDAR

Puget Sound Lidar Consortium

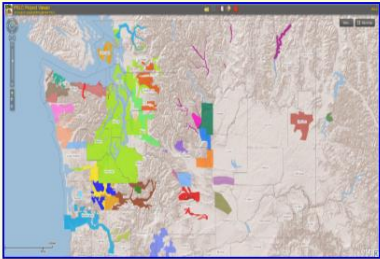
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PSLC Data by Project

PSLC datasets consist of Bare Earth and Top surface Elevation Rasters, Bare earth point data and All-returns point data. The raster data is available in USGS quarter quads and most are also available as mosaic File Geodatabases.

[PSLC projects shapefile](#) - Nov 2017

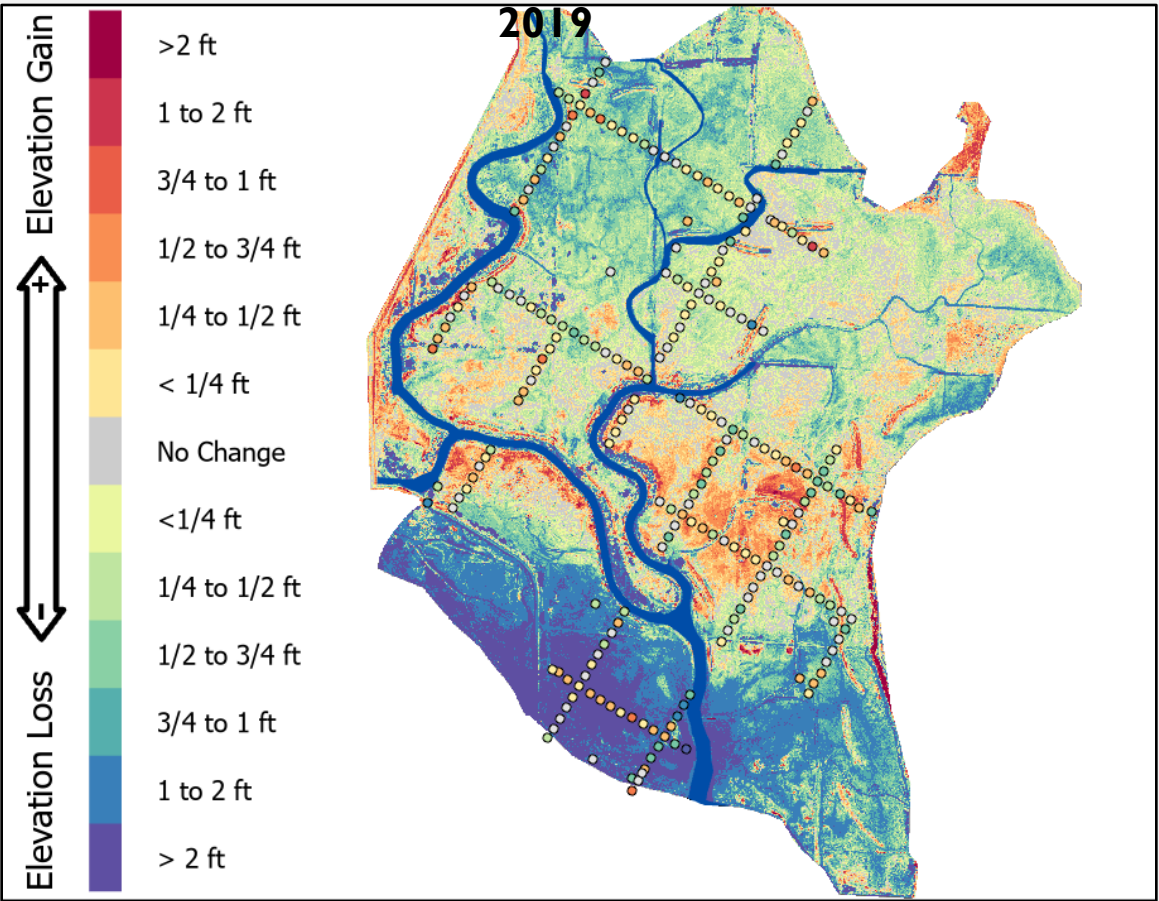
[Back](#) to Download Data Menu




PSLC Project Viewer

Projects	Acquisition Year	General Geography	Map
Puget Sound Lowlands	2000 to 2005	Partial coverage of King, Pierce, Snohomish, Jefferson and Mason Counties. Full Coverage of Kitsap, Island and Thurston counties.	MAP
Clallam County	2001-2002	Partial Coverage from the north eastern county to past Joyce. And also an area in the vicinity from Forks to La Push.	MAP
Lewis County	2003	Small section of the Snoqualmie National Forest, northwest of Packwood.	MAP
Yakima County	2003	Partial coverage of the county along the Ahtanum Creek.	MAP
Portland, Oregon	2004	Partial coverage of the following cities: Lake Oswego, Gladstone, West Linn, Oregon City.	MAP
Lewis County	2005	Partial coverage of central Lewis County.	MAP
Lower Columbia River	2005	Lower Columbia River from Bonneville Dam to the Pacific Ocean.	MAP
Olympic Peninsula	2005	Coverage in the vicinity of Sekiu. Coveing parts of the following: Hoko River, Clallam River and Reed Creek.	MAP
Yakima County	2005	Area covering part of Cowiche Creek, Toppenish Creek and Yakima River.	MAP
Lewis County	2006	Partial coverage of Western Lewis County.	MAP
Eastern Washington and Oregon River Corridors	2007	John Day, Lower and Upper Okanogan, Methow and Wenatchee rivers. Lake Roosevelt.	MAP
Sumpter, Oregon	2007	Partial coverage of City of Sumpter and the Powder River.	MAP
San Juan County and Lummi Island	2009	Partial coverage of San Juan County. Lummi Island, Point Roberts.	MAP
Umpqua River, Oregon	2009	Partial coverage of the river. Northwest of Sutherlin.	MAP
Nooksack River	2009	Coverage from Strandell to south of Acme.	MAP
Snohomish River Estuary	2009	From the mouth of the River to South of the City of Snohomish.	MAP

Remotely Sensed and RTK Elevation Change Assessments in Qwuloolt 2016 -





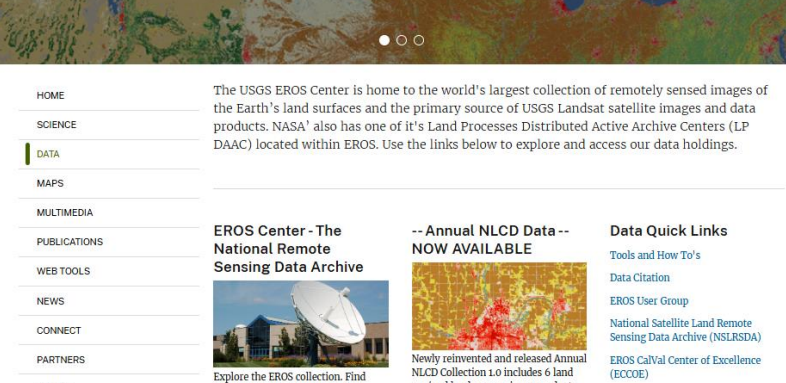
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Data



NOW ANNUAL - National Land Cover Database (NLCD)

NLCD: Every Pixel, Every Year

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The USGS EROS Center is home to the world's largest collection of remotely sensed images of the Earth's land surfaces and the primary source of USGS Landsat satellite images and data products. NASA' also has one of it's Land Processes Distributed Active Archive Centers (LP DAAC) located within EROS. Use the links below to explore and access our data holdings.


EROS Center - The National Remote Sensing Data Archive



Explore the EROS collection. Find satellite images and data, aerial photography, elevation and land cover datasets, digitized maps, and our Image Gallery collections.

Explore the Archive

-- Annual NLCD Data -- NOW AVAILABLE



Newly reinvented and released Annual NLCD Collection 1.0 includes 6 land use/and land cover science products for the lower 48 United States.

Annual NLCD Data Viewer

Data Quick Links

Tools and How To's

Data Citation

EROS User Group

National Satellite Land Remote Sensing Data Archive (NSLRSDA)

EROS CalVal Center of Excellence (ECCOE)

Committee on Earth Observation Satellites (CEOS)

Land Product Characterization System Data Discovery

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
APRIL 18, 2025

Early Estimates of Exotic Annual Grass (EAG) in the Sagebrush Biome, USA, 2025

These datasets provide early estimates of 2025 fractional cover for exotic annual grass (EAG) species and one native perennial grass species on a weekly basis from mid-April to late June. Typically, the EAG estimates are publicly released within 7-13 days of the latest satellite observation used for that version. Each weekly release contains five fractional cover maps along with their...

By: Earth Resources Observation and Science (EROS) Center

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National Agriculture Imagery Program (NAIP)



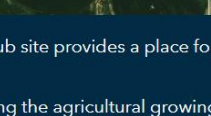
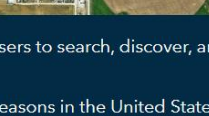
The National Agriculture Imagery Program (NAIP) GeoHub site provides a place for users to search, discover, and visualize NAIP imagery.

The NAIP imagery program acquires aerial imagery during the agricultural growing seasons in the United States. A primary goal of the NAIP program is to make digital ortho photography available to governmental agencies and the public within a year of acquisition.

NAIP is administered through the USDA's Farm Production and Conservation Business Center (FPAC-BC) Geospatial Enterprise Operations (GEO) Branch. This "leaf-on" imagery is used as a base layer for GIS programs in the Farm Service Agency's County Service Centers, and is used to maintain the Common Land Unit (CLU) boundaries.

Web Maps & Applications

Apps & Maps provide information and tools for citizens to use imagery and geospatial data. Explore the Apps & Maps below to learn more about NAIP imagery.

 <p>This map provides an overview of the NAIP imagery available on the public image services.</p>	 <p>Learn about the history and major milestones of the NAIP imagery program.</p>	 <p>Story map journal that provides information regarding the NAIP imagery program.</p>	 <p>NAIP Image Dates Data Hub</p>
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<https://naip-usdaonline.hub.arcgis.com/>

Sediment Accretion/Erosion

We utilize Sediment Elevation Tables (SETs) and horizon markers to track elevation changes in restoration and reference sites

Utilize USGS methods available on their website



USGS science for a changing world

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Surface Elevation Table

By Eastern Ecological Science Center March 16, 2018

The Surface Elevation Table and Marker Horizon Technique

A Protocol for Monitoring Wetland Elevation Dynamics

Download Report

Overview Science Publications Partners

The Surface Elevation Table (SET) is a portable mechanical leveling device for measuring the relative elevation change of wetland sediments. This website presents information on the purpose, design, and use of the SET. The website is specifically designed to be a forum for researchers in wetland science who use or might use the device and to offer more information about the proper use of the SET and interpretation of its data. But we encourage anyone who wants to learn more about research techniques and their development to visit the site as well.

The SET is currently used in a variety of wetland and shallow water environments throughout the world. SET's are currently used in the United States (22 states and the District of Columbia) and 22 countries worldwide.

Precise measures of sediment elevation in wetlands are necessary to determine rates of elevation change, particularly relative to sea level rise, and to gain an understanding of the processes responsible for elevation change. The SET provides a nondestructive method for making highly accurate and precise measurements of sediment elevation of intertidal and subtidal wetlands over long periods of time relative to a fixed subsurface datum. This technique overcomes many of the limitations of methods currently used to estimate elevation such as

The diagram illustrates two methods for measuring sediment elevation. On the left, a 'Rod SET' is shown with a vertical rod and a leveling staff, labeled 'Rod SET (1-3.2m deep)'. On the right, a 'Fieldqar Marker Horizon' is shown with a vertical rod and a leveling staff, labeled 'Fieldqar Marker Horizon (Surface)'. The diagram also shows a 'River Zone' and 'Vertical Accretion'.

Contacts

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<https://www.usgs.gov/centers/eesc/science/surface-elevation-table>

Vulnerability to Sea-Level Rise Varies Among Estuaries and Habitat

Types: Lessons Learned from a Network of Surface Elevation Tables in Puget Sound

Melanie J. Davis · Katrina L. Poppe · John M. Rybczyk · Eric E. Grossman · Isa Woo · Joshua W. Chamberlin · Michelle Totman · W. Todd Zackey · Frank Leonetti · Suzanne Shull · Susan E.W. De La Cruz

Avian Monitoring

- Initially partnered with local Audubon Society
- Tulalip Wildlife Program did surveys
- A monitoring frame work was developed by local scientists

Standardized North American Marsh Bird Monitoring Protocol

COURTNEY J. CONWAY¹

U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, 325 Biological Sciences East,
School of Natural Resources and the Environment, University of Arizona, Tucson, Arizona, 85721, USA

¹Present address: U.S. Geological Survey, Idaho Cooperative Fish and Wildlife Research Unit, P.O. Box 441141,
CNR Room 103E 6th & Line Streets, University of Idaho, Moscow, ID 83844, USA

E-mail: cconway@usgs.gov

Abstract.—Little is known about the population status of many marsh-dependent birds in North America but recent efforts have focused on collecting more reliable information and estimates of population trends. As part of that effort, a standardized survey protocol was developed in 1999 that provided guidance for conducting marsh bird surveys throughout North America such that data would be consistent among locations. The original survey protocol has been revised to provide greater clarification on many issues as the number of individuals using the protocol has grown. The Standardized North American Marsh Bird Monitoring Protocol instructs surveyors to conduct an initial 5-minute passive point-count survey followed by a series of 1-minute segments during which marsh bird calls are broadcast into the marsh following a standardized approach. Surveyors are instructed to record each individual bird from the suite of 26 focal species that are present in their local area on separate lines of a datasheet and estimate the distance to each bird. Also, surveyors are required to record whether each individual bird was detected within each 1-minute subsegment of the survey. These data allow analysts to use several different approaches for estimating detection probability. The Standardized North American Marsh Bird Monitoring Protocol provides detailed instructions that explain the field methods used to monitor marsh birds in North America. *Received 26 January 2011, accepted 2 April 2011.*

Key words.—bitterns, call-broadcast surveys, detection probability, marsh birds, rails, tape playback.

Waterbirds 34(3): 319-346, 2011

<https://pubs.usgs.gov/publication/70034495>

Takes you to a link where you can download the paper

SALISH SEA ESTUARIES AVIAN MONITORING FRAMEWORK

FINAL REPORT



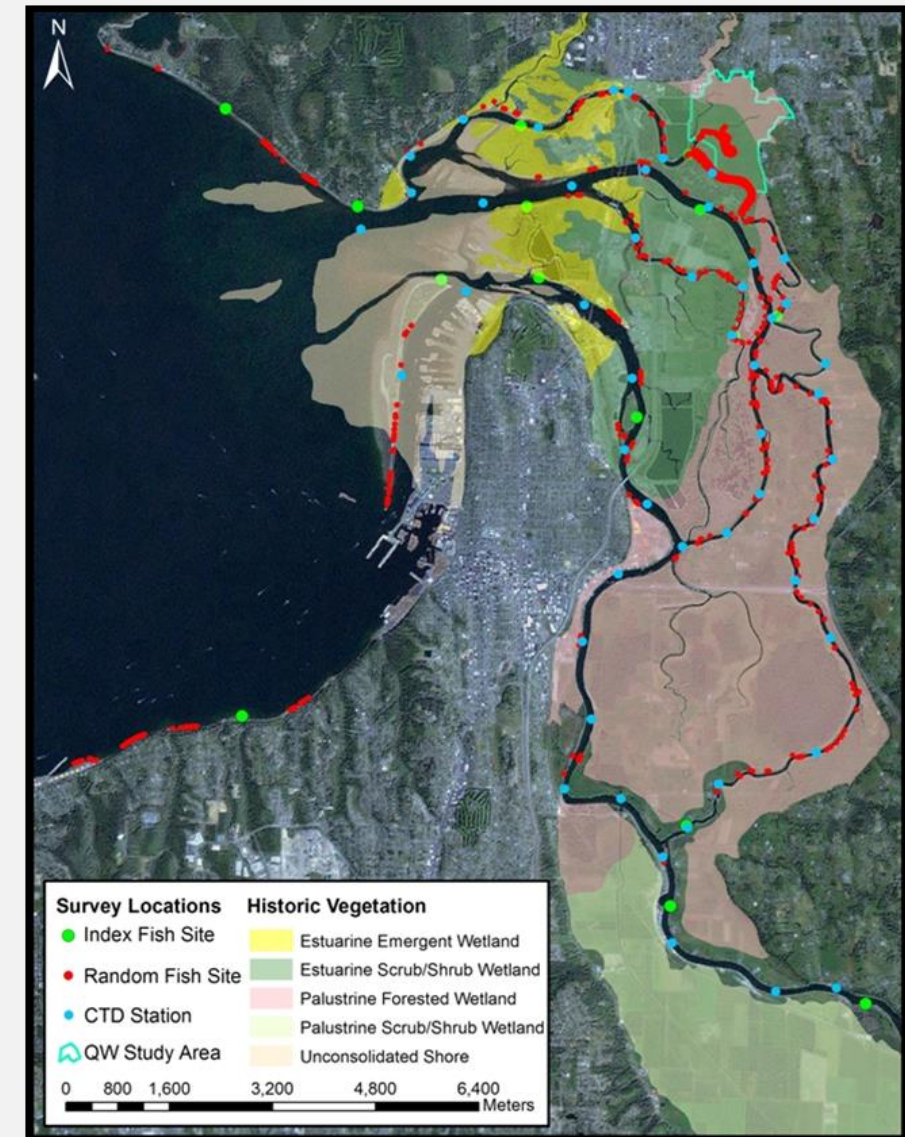
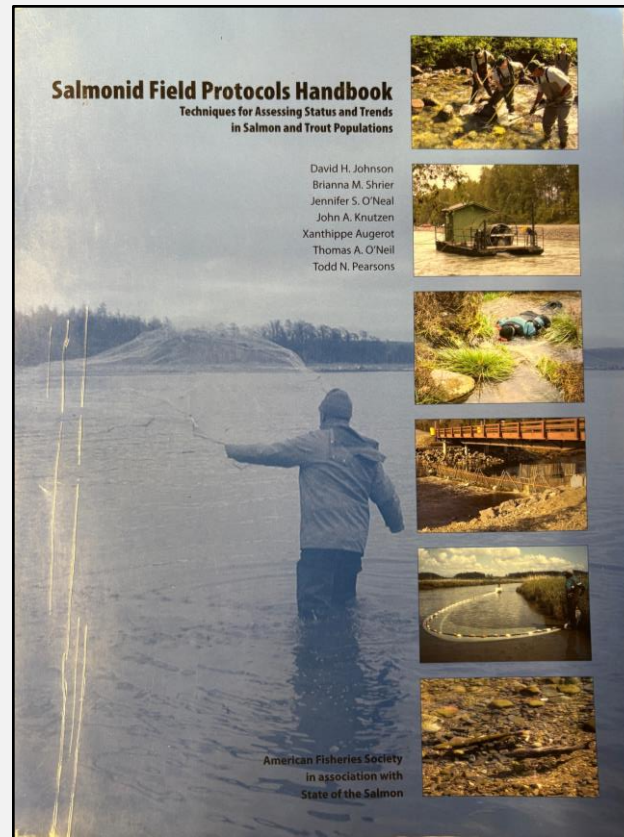
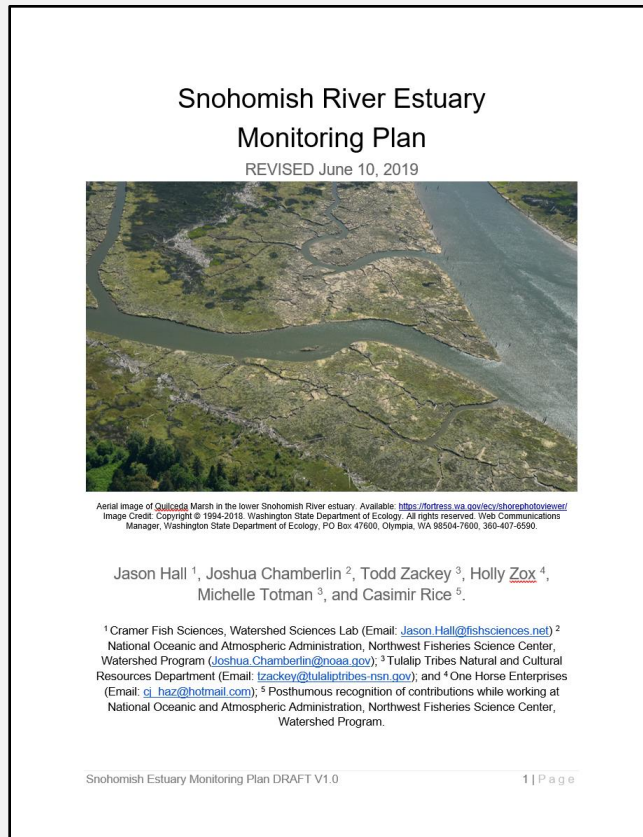
Prepared by: Amanda Summers (Stillaguamish Tribe), Trina Bayard (Audubon Washington),
Catie Porro (Ecostudies Institute), Nicole Michel (Audubon Washington), Gary Slater (Ecostudies
Institute), and Kyle Spragen (Washington Department of Fish and Wildlife).

30 June 2023

<https://ecoinst.org/>

Fish Sampling

- The study design for fish sampling was developed by staff at NOAA Northwest Fisheries Science Center
- Utilized standard sampling methods which can be found in the, *Salmonid Field Protocols Handbook*
- Methods can also be found in the, *Snohomish River Estuary Monitoring Plan Report* – available on the Salish Sea Restoration Platform



Invertebrates

Stationary sampling posts

Reliant on flow rate $\sim >0.01 \text{ m/s}$ to collect invertebrates

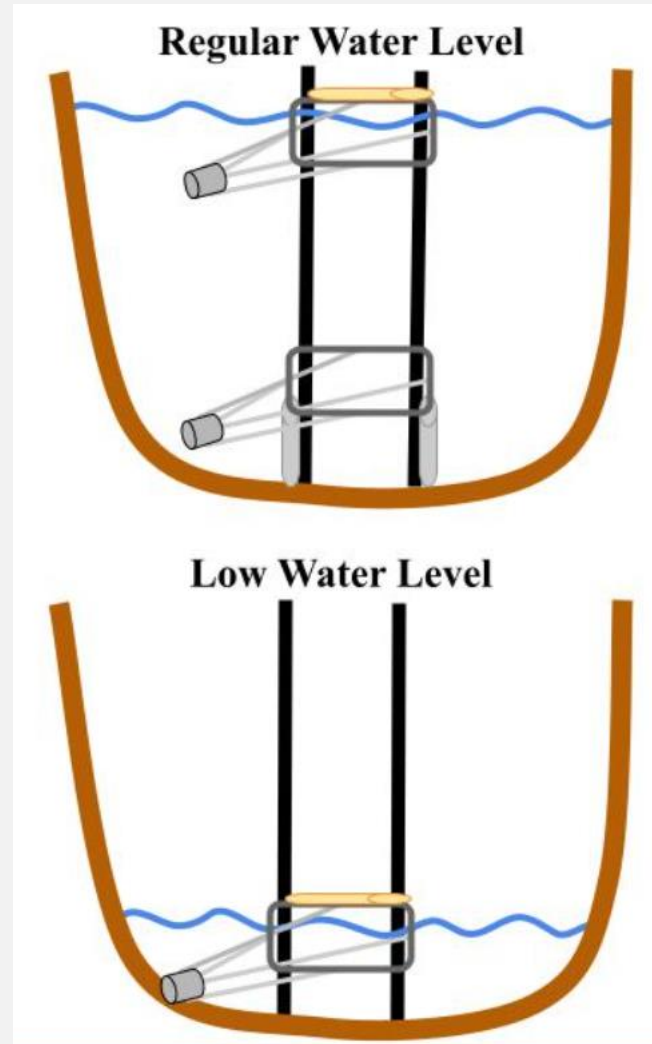
Laboratory Work

Identification down to the order level for all organisms

Organisms were filtered into three size fractionations (0.5mm, 1.0mm and 5.6mm)

Ash-Free Dry Weight

After Identification, the 1.0mm and 5.6mm organisms were recombined for AFDW



Blind Channel Sampling Locations in the Snohomish River Estuary in Everett Washington, USA

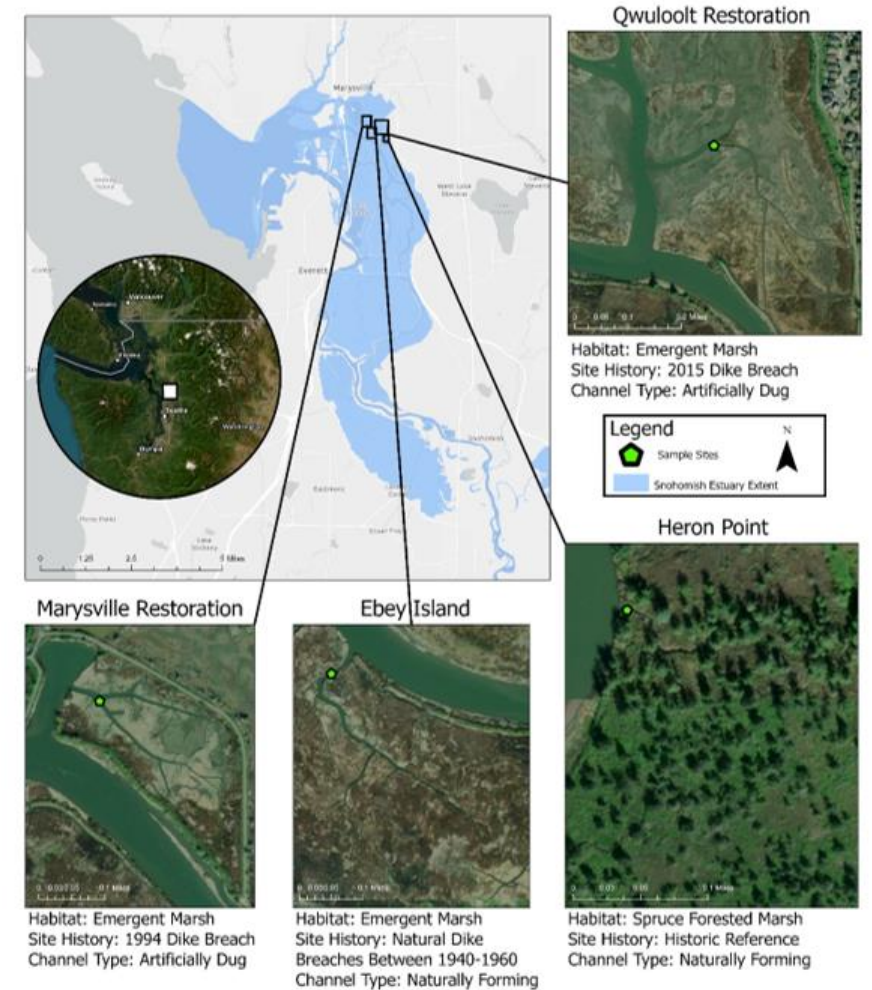
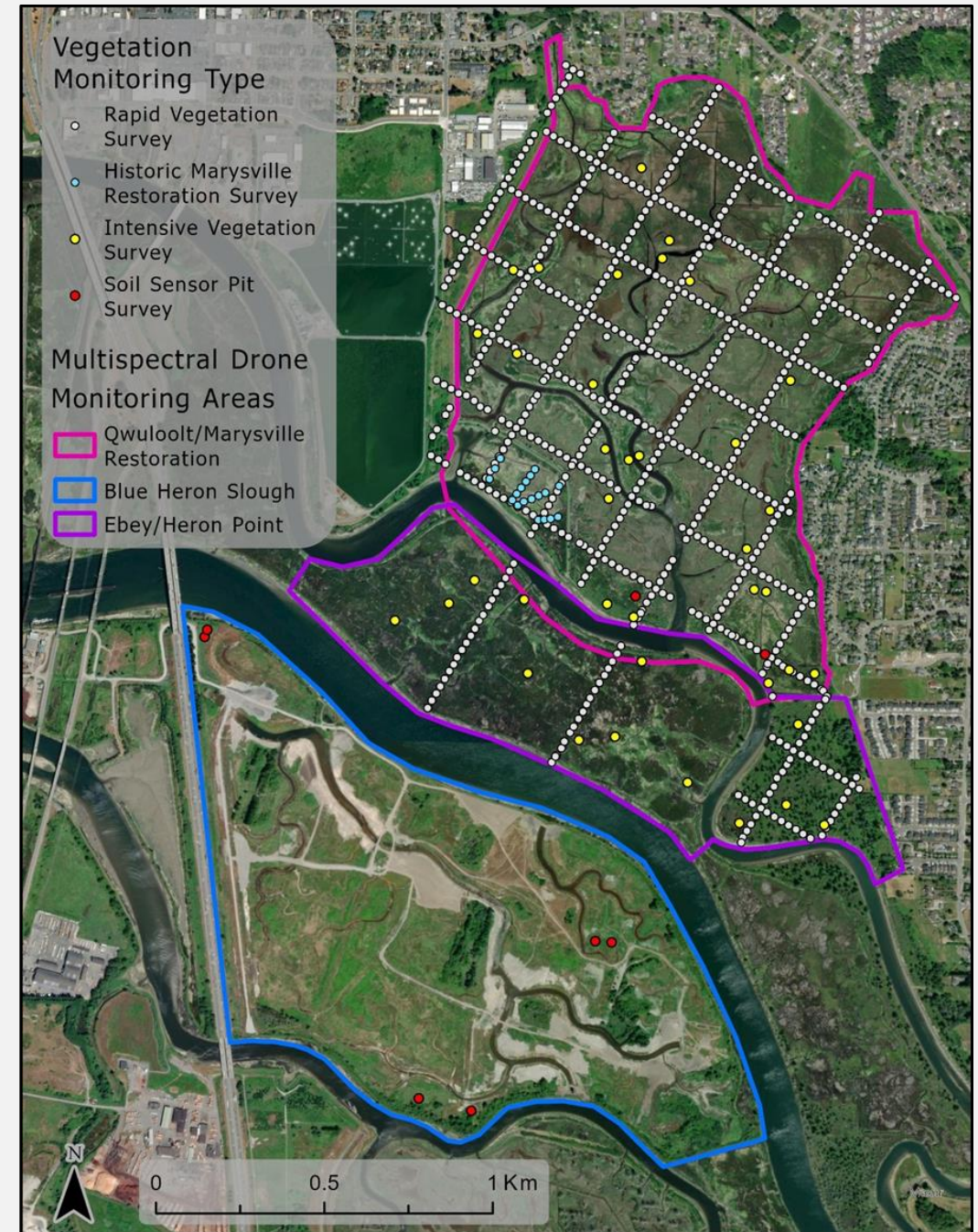
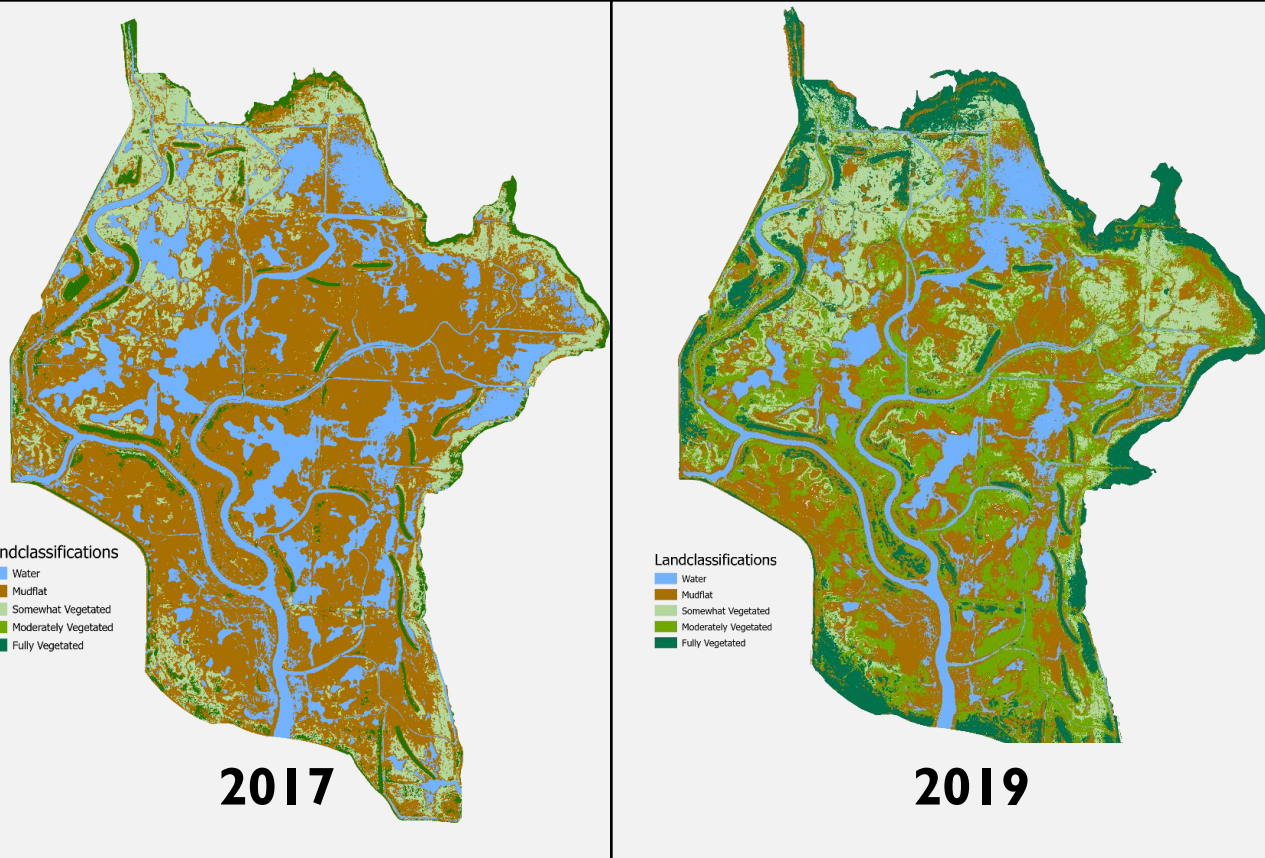


Figure 1. Invertebrate sampling locations within blind channels in the lower Snohomish Estuary. Estuary extent is from the Pacific Marine and Estuarine Fish Habitat Partnership (PMEP 2019). Map created in ARCGIS Pro 3.2.0.

Vegetation Monitoring


Initially worked with experts from University of Washington and USACE for vegetation monitoring plan.

Ultimately we designed our own plan utilizing a variety of methods



Specific Restoration Site Information

Salish Sea Restoration Platform



Salish Sea
Restoration
Platform

Connecting people to ecosystems

Search Salish Sea Wiki

Menu

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Personal

The Big Picture

The Social Contract

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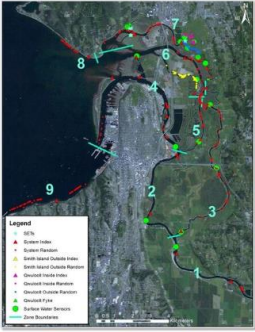
Toolbox

Discussion

View form

View history

Snohomish Delta Ecosystem Monitoring and Evaluation



The **Northwest Fisheries Science Center** in collaboration with the **Tulalip Tribes** and **Snohomish County** has implemented a long term research program to evaluate Chinook salmon use of estuarine habitats and response to restoration in the **Snohomish Delta**. Through comprehensive monitoring of biological and physical conditions across the estuary, the program aims to characterize spatial and temporal variability in Chinook salmon distribution and habitat conditions/availability and document changes due to restoration within the delta. Specifically, the research program will develop/implement protocols and build a framework for intensive and extensive monitoring of topography (elevation, accretion), hydrology (temperature, salinity), vegetation, invertebrates, and fish and use the information to evaluate fish-habitat interactions and Chinook salmon response to current and future restoration projects.

Efforts

Efforts describe the work of workgroups

Involved Workgroups:


- Knowledge Creation
 - Adaptive Management
 - Arts and Crafts
 - Lessons
 - Monitoring
 - Research
- Protection
 - Acquisition
 - Green Infrastructure
 - Regulation
- Restoration
 - Beach Nourishment
 - Engineered Log Jams
 - Fish Passage
 - Revegetation
- Social Change
 - Advocacy
 - Coordination
 - Education
 - Funding
 - Integrated Ecosystem Management
 - Legislation
 - Planning

Objectives

- Characterize trends in fish density/distribution throughout the delta and relative to project sites before/after restoration. Relate trends to temperature, salinity, and outmigration abundance.

<https://salishsearestoration.org/>

PRISM Project Search



WASHINGTON STATE
Recreation and
Conservation Office

About PRISM and Project Search

Project Search

Choose Search Criteria

1 - Click criteria links below:

Organization

Geographic Area

Theme or Fund Source

Project Status

Project Type

Project Number

Project Name

Keyword

Fiscal Year

Selected Criteria

All organizations

All areas

All themes and fund sources

All statuses

All types

All project numbers

All names

All words

All fiscal years

2 - Select list or chart format:

Project Category Charts

3 - Click Search to see results:

Search

Clear Criteria

Search Results

Number of worksites: 0

Source: PRISM Database

Data as of 5/5/2025

<https://secure.rco.wa.gov/prism/search/projectsearch.aspx>

Other Sources for Methods Documents

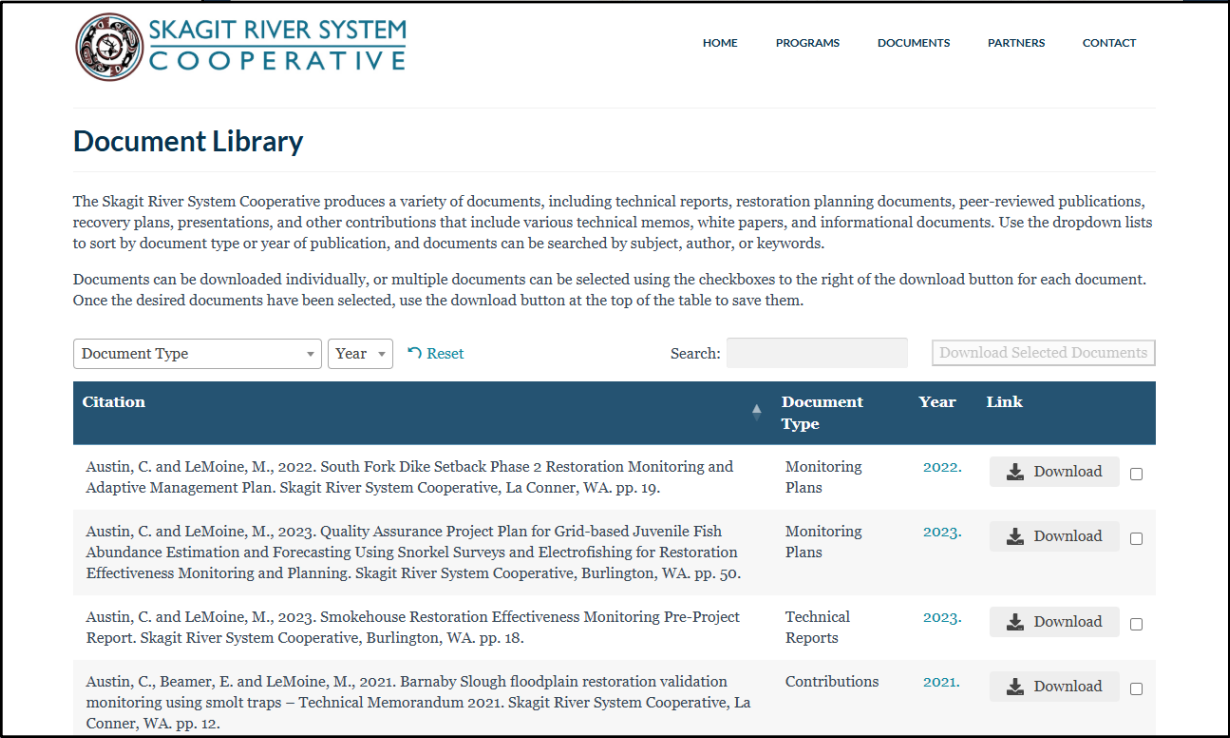
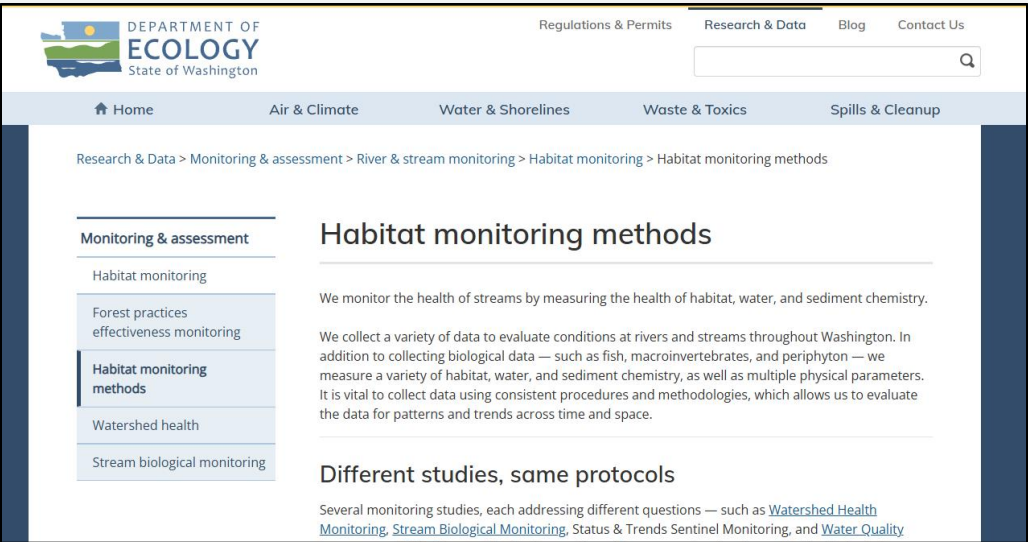
State and Federal Environmental Agencies Quality Assurance Project Plans (QAPPs)

- Washington Dept of Ecology
 - <https://ecology.wa.gov/research-data/monitoring-assessment/river-stream-monitoring/habitat-monitoring>

Research Centers and NGOs

Tribal Environmental and Natural Resources Depts

- Skagit River System Cooperative
 - <https://skagitcoop.org/document-library/>
- Tulalip Tribes
 - <https://nr.tulaliptribes.com/Topics/HabitatMonitoringAndResearch>



Other Sources for Environmental Data

Washington Dept of Ecology EIM

WASHINGTON STATE
Department of Ecology

EIM Search Environmental Information Management System

Search Home All Studies Locations Results Bioassay Groundwater Help Center Contact EIM EIM News

EIM data last updated on Sunday, May 4, 2025

Search:

[ALL](#)

Studies + Locations + Results

[Studies](#)

Example: Study ID AODE6815

[Locations](#)


Example: Nooksack River

[Results](#)

Example: Copper

[Bioassay](#)

Example: Neanthes 20 day



Click to search by map

Search does not include physical habitat data and metrics - see Watershed Health below.

Search Monitoring Programs within EIM Datasets collected by Ecology and affiliates, with specific monitoring objectives and consistent protocols. Most are long-term and regularly-scheduled. Each Monitoring Program has a custom search form and map to help you find data.

Groundwater

Groundwater quality and level data. Collected by many groups with various objectives and protocols, 1929 to present.

[Get Data](#) [About groundwater](#)

Freshwater Information Network (FIN)

Monthly river and stream water quality monitoring data and Water Quality Index (WQI), 1960s to present.

[Get Data](#) [About freshwater information network \(fin\)](#)

Watershed Health Monitoring (WHM)

Physical habitat, biological field, and chemistry data; physical and biological metrics. Includes only EIM Studies with habitat data, 2009 to present.

[Get Data](#) [About watershed health monitoring \(whm\)](#)

Marine Sediments

Chemistry, bioassay, and benthic invertebrate data measuring Puget Sound sediment quality, collected by Ecology's Marine Monitoring Unit, 1989 to present.

[Get Data](#) [About marine sediments](#)

BEACH Program

Weekly bacteria data from Puget Sound and coastal beaches, Memorial Day through Labor Day, 2004 to present.

[Get Data](#) [About BEACH program](#)

River and Stream Flow (Freshwater DataStream)

Real-time and historical time series streamflow monitoring data from across Washington, 1997 to present. This data isn't currently in EIM, but is available via the Get Data link.

[Get Data](#) [About river and stream flow \(freshwater datastream\)](#)

EPA - STORET

An official website of the United States government Here's how you know

United States
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Water Data and Tools

Integrated Water Analysis

Ambient Water Quality

Community Financing

Drinking Water

Water Restoration

Water Quality Models

[Contact Us About Water Data and Tools](#)

Water Quality Data



Water Quality Data Download

Water quality data submitted from over 900 federal, state and tribal agencies, watershed organizations and other groups are available to support your water quality analyses.



Water Quality Data Upload with WQX

The Water Quality eXchange (WQX) is a universal format for sharing water quality data. Users can prepare their data for upload using spreadsheet Templates, develop custom imports in WQXWeb, or submit WQX-ready data via the Exchange Network.



Learn More about Water Quality Data

General Information, Data Assistance, Tools, Training Videos, User Community, and Funding. Learn how to get "1 on 1" data assistance with WQX .

Water Quality eXchange (WQX), WQXWeb, and the Water Quality Portal (WQP)

Water quality monitoring allows us to better understand and protect water resources. Under the Clean Water Act, state, tribal and federal agencies monitor lakes, streams, rivers and other types of water bodies to determine water quality condition. Additional data is collected by local governments, non-governmental organizations, and volunteers. The data generated from these monitoring activities help water resource managers know where pollution problems exist, where to focus pollution control efforts and where progress has been made.

<https://www.epa.gov/waterdata/water-quality-data>

<https://apps.ecology.wa.gov/eim/search/default.aspx>

List of webpage links referenced

National Weather Service – climate observation data - <https://www.weather.gov/wrh/climate>

USGS Streamflow Site - <https://waterdata.usgs.gov/nwis>

Puget Sound LiDAR Consortium - <https://pugetsoundlidar.ess.washington.edu/index.html>

USGS Earth Resources Observation & Science Center - <https://www.usgs.gov/centers/eros/data>

USGS Sediment Elevation Table Methods - <https://www.usgs.gov/centers/eesc/science/surface-elevation-table>

Nation Agricultural Inventory Program - <https://naip-usdaonline.hub.arcgis.com/>

Snohomish River Estuary - https://salishsearestoration.org/wiki/Snohomish_Delta_Ecosystem_Monitoring_and_Evaluation

Pacific Marine and Estuarine Fish Habitat Partnership (PMEP) - <https://www.pacificfishhabitat.org/>

Puget Sound River History Project - <https://riverhistory.ess.washington.edu/data.php>

Ecostudies Institute – Avian Monitoring - <https://ecoinst.org/>

Standardized North American Marsh Bird Monitoring Protocol - <https://pubs.usgs.gov/publication/70034495>

Salish Sea Restoration Platform - <https://salishsearestoration.org/>

Washington State Restoration Project Tracking PRISM - <https://secure.rco.wa.gov/prism/search/projectsearch.aspx>

Washington Dept of Ecology Habitat Monitoring - <https://ecology.wa.gov/research-data/monitoring-assessment/river-stream-monitoring/habitat-monitoring>

Skagit River System Cooperative Documents - <https://skagitcoop.org/document-library/>

Washington State EIM – <https://apps.ecology.wa.gov/eim/search/default.aspx> Tulalip Tribes <https://nr.tulaliptribes.com/Topics/HabitatMonitoringAndResearch>

EPA STORET - <https://www.epa.gov/waterdata/water-quality-data>

