Puget Sound National Estuary Program

Marine Vegetation Base Program Analysis

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EXECUTIVE SUMMARY

This report is one of several appendices to the Marine Vegetation Implementation Strategy Narrative. Implementation Strategies are a planning tool intended to accelerate progress towards Puget Sound ecosystem recovery targets. They serve as a road map for aligning opportunities across agencies and programs, provide priorities for the Action Agenda for Puget Sound, and guide funding decisions.

The Marine Vegetation Implementation Strategy Narrative identifies and describes five strategies expected to improve Puget Sound Vital Sign indicators tracking eelgrass and kelp:

(1) Research and Monitoring – Implement targeted research and monitoring initiatives to understand the factors driving changes in marine vegetation, with consideration of ecological and community benefits.

(2) Regulatory – Evaluate and improve implementation of existing shoreline, nearshore, water quality, and land use regulations, programs, and policies to enhance protections for marine vegetation.

(3) Protected Areas – Protect marine vegetation in existing and new reserves, refuges, and other protected areas that respect Tribal treaty and sovereign rights.

(4) Restoration – Use effective restoration methods to accelerate recolonization and expansion of marine vegetation at sites shown to possess suitable ecological and sociocultural conditions.

(5) Community Connections – Expand and promote responsible stewardship, local food harvest, and outdoor recreation to better connect communities with marine vegetation and support human wellbeing that uphold Tribal treaty and sovereign rights.

This report focuses on analysis of existing programs that could support operationalization of these strategies. It discusses barriers to progress and actions to address those barriers. This report also provides a detailed review of regulations that play a role in managing some of the human activities that result in stress to eelgrass and kelp. The need for such a review was identified in previous kelp conservation planning efforts.

RESEARCH AND MONITORING STRATEGY

The Research and Monitoring Strategy focuses on implementing targeted initiatives that aim to understand the factors driving changes in kelp and eelgrass abundance, health, and distribution along with the benefits marine vegetation provide. This strategy is foundational because it will generate information necessary for advancing all four of the other strategies.

Monitoring of marine vegetation distribution and trends is critical for understanding short- and long-term changes and informing management efforts. Section 2 provides an inventory of existing monitoring programs and projects that generate marine vegetation distribution data.

Sustained investment is critical to the success of these programs. A few programs also collect data on stressors, which is important for stressor-response research.

Research is necessary to identify and understand the factors contributing to changes in marine vegetation and the role marine vegetation plays in Puget Sound's social-ecological system. Multiple university and federal programs in the region have facilities (e.g., seawater labs, mesocosms), vessels, and diving programs that provide important infrastructure and capacity for research. Washington Department of Natural Resources (WA DNR), Washington Department of Fish and Wildlife (WDFW), and several non-governmental organizations also conduct marine vegetation research.

The Research and Monitoring Strategy includes an approach focused on supporting and leveraging existing work groups, coalitions, and partnerships to effectively share research and monitoring information; improve coordination; and synthesize results to inform management. Information on existing coordinating groups and information portals is provided.

REGULATORY CONTEXT

Section 3 covers several regulatory and aquatic lands management programs that play a role in managing some human activities that result in stress to kelp and eelgrass. These programs are not marine vegetation specific management programs, but rather legal authorities aimed at regulating activities through either review and authorization of development and construction projects or control of point and nonpoint discharges of pollutants into water bodies. These management tools are implemented by local, state, and federal agencies. At each level of government, differing priorities and legal mandates determine the specific protections applied. Impacts to marine vegetation are only one of many types of potential effects considered during permitting.

Key laws relevant to shoreline and in-water development and construction activities that can affect marine vegetation are: the state Shoreline Management Act (implemented through local Shoreline Master Programs), the state Hydraulic Code, the federal Clean Water Act Section 404, and the federal Endangered Species Act. In addition, WA DNR reviews and conditions proposed projects in their role as the manager of state-owned aquatic lands.

Some kelp and eelgrass stressors are associated with upland development (e.g., anthropogenic sediment, nutrient, and toxics loading). Wetlands and riparian corridors along streams can reduce such loading. Protections for these habitats occur via local Critical Areas Ordinances promulgated under the state Growth Management Act.

Impaired hydrology associated with impervious surfaces, excess nutrients and suspended sediment, and high temperatures are marine vegetation stressors with a nexus to water quality regulations. National Pollutant Discharge Elimination System (NPDES) permits for wastewater treatment plants (the largest source of anthropogenic nitrogen pollution to Puget Sound), Municipal Stormwater General Permits, and the state's Nonpoint Pollution Program help to

manage these stressors. The Department of Ecology's Puget Sound Nutrient Reduction Project is expected to reduce nitrogen in wastewater effluent and watershed loading by 2050.

REGULATORY STRATEGY

The Regulatory Strategy aims to evaluate and improve implementation of existing shoreline, nearshore, water quality, and land use regulations, programs, and policies to enhance protections for marine vegetation. The evaluation step is intended to identify gaps in protections, barriers to program implementation, and opportunities for improvement. This approach can build off several Puget Sound region regulatory effectiveness investigations that have already been completed.

These projects assessed several different types of regulatory outcomes: Was a change permitted? Were conditions included in a permit appropriate? Was a structure built to plans? Were permit conditions implemented? Are projects causing unmitigated impacts on ecological functions? These distinctions are important because different problems require different responses.

Section 4 summarizes earlier regulatory effectiveness projects, documents progress made towards addressing identified deficiencies in recent years, and provides recommendations for future improvements with an emphasis on elements more relevant to marine vegetation. The focus is on shoreline and nearshore regulations because there is a higher likelihood that program changes could be made to directly affect protection outcomes. Although water quality and upland regulations play an important role in reducing some stressors, the more indirect relationship between individual permits and effects on marine vegetation will make it difficult to prescribe specific changes.

PROTECTED AREAS STRATEGY

The Protected Areas Strategy provides a roadmap for protecting marine vegetation in existing and new reserves, refuges, and conservation areas. This strategy highlights the importance of engaging Tribes, user groups, recovery partners, and the public in the identification, establishment, and management of protected areas. Coordination with Tribes is emphasized to ensure protected areas are not in conflict with Tribal treaties and sovereign rights.

Washington has a long history of designating marine protected areas (MPAs) under several different authorities. Section 5 provides an inventory of existing MPAs in Puget Sound. They were formed for diverse purposes, offer varying degrees of protection, and are managed by multiple entities at all levels of government. WA DNR is currently engaged in development of a Statewide Kelp and Eelgrass Health and Conservation Plan that is complimentary to the Protected Areas Strategy as it is likely to result in additional protected area designations for marine vegetation. This plan is intended to lead to the conservation and restoration of at least 10,000 acres of kelp and eelgrass habitat in Washington by 2040.

RESTORATION STRATEGY

The Restoration Strategy focuses on accelerating recolonization and expansion of marine vegetation at sites shown to possess suitable ecological and sociocultural conditions using effective restoration methods. The restoration strategy includes both direct outplanting (transplants and seeding) as well as passive restoration methods that alter site conditions in such a way that natural recruitment or expansion could occur (e.g., removal of derelict structures, altering substrate, bathymetric or hydrologic modifications).

Section 6 focuses on issues related to reducing two programmatic barriers to restoration: funding and permitting. An inventory of restoration funding programs and discussion of ongoing restoration permitting streamlining efforts are provided.

COMMUNITY CONNECTIONS STRATEGY

The Community Connections Strategy is intended to expand and promote responsible stewardship, local food harvest, and outdoor recreation to better connect communities with marine vegetation and support human wellbeing that uphold Tribal treaty and sovereign rights related to marine vegetation habitats. Tribal governments are, and have been since time immemorial, leaders in marine vegetation monitoring, restoration, and protection using both traditional knowledge and modern science. Section 7 describes some of their work and also inventories other local and community programs and activities related to recreational boating, kelp harvest, stewardship efforts, and place-based education.

Approaches to achieve these goals include deepening understanding of how Puget Sound residents connect with marine vegetation and the barriers and benefits communities experience in accessing these resources; increasing long-term funding and support for Tribes; supporting community-driven resources and programs such as community science and place-based education; expanding equitable opportunities for sustainable and culturally significant harvest; and promoting sustainable access, quality experiences, and responsible recreation in marine vegetation habitats. By improving understanding of how Puget Sound residents connect with marine vegetation, addressing barriers, and supporting equitable opportunities for sustainable harvest and responsible recreation, these programs strengthen human-nature relationships and promote resilient, community-centered approaches to marine habitat protection.

CONTENTS

TABLES, FIGURES AND CALL-OUT BOXES

ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practices
CAO	Critical Area Ordinance
CFR	Code of Federal Regulations
Commerce	Washington Department of Commerce
DSAYs	Discounted Service Acre Years
Ecology	Washington Department of Ecology
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
GMA	Growth Management Act
HPA	Hydraulic Project Approval
HSIL	Habitat Strategic Initiative Lead
ILF	In-lieu Fee
JARPA	Joint Aquatic Resources Permit Application
MART	Multi-Agency Review Team
MLLW	Mean Lower Low Water
MPA	Marine Protected Area
MRC	Marine Resources Committee
MS4	Municipal Separate Storm Sewer Systems
NERR	National Estuarine Research Reserve
NOAA	National Oceanic and Atmospheric Administration

NPDES	National Pollution Discharge Elimination System
NWIFC	Northwest Indian Fisheries Commission
OHWL	Ordinary High Water Line
PSEMP	Puget Sound Ecosystem Monitoring Program
PSP	Puget Sound Partnership
RCO	Washington Recreation and Conservation Office
RCW	Revised Code of Washington
SAV	Submerged Aquatic Vegetation
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
SSNP	Salish Sea Nearshore Programmatic Consultation
TMDL	Total Maximum Daily Load
UAS	Uncrewed Aircraft Systems
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
UW	University of Washington
WAC	Washington Administrative Code
WA DNR	Washington Department of Natural Resources
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
WWTP	Wastewater Treatment Plant

1. INTRODUCTION

The National Estuary Program was established to protect and restore the water quality and biological integrity of estuaries of national significance. It is administered by the U.S. Environmental Protection Agency (EPA). The Puget Sound Partnership (PSP) is a Washington State agency created in 2007 to coordinate the Puget Sound National Estuary Program and Puget Sound Geographic Program by bringing together partners to mobilize action around a common agenda.[1] PSP focuses the region's collective effort through development of a shared vision and strategy articulated in the Action Agenda for Puget Sound. This comprehensive plan helps to allocate federal, state, and local recovery investments.

PSP developed a portfolio of biophysical and human dimensions Vital Signs to report on and guide assessment of progress toward Puget Sound recovery goals. These Vital Signs represent overarching measures used to communicate the health of Puget Sound and gauge improvements or declines. Each Vital Sign has one or more specific and measurable metrics, called indicators. Some indicators have targets which highlight valued aspects of the social-ecological system and articulate a regional vision for a healthy and resilient Puget Sound. These indicator targets are quantitative milestones reflecting the region's commitments to, and expectations for, significantly improving the condition of Puget Sound.

1.1 BEACHES AND MARINE VEGETATION VITAL SIGN

The Beaches and Marne Vegetation Vital Sign reports on the condition of valuable nearshore habitats. This Vital Sign has eight indicators, four of which cover marine vegetation:

The Eelgrass Area indicator tracks Sound-wide trends in area of eelgrass (*Nanozostera japonica* according to current taxonomic classification, formerly *Zostera japonica*), the most abundant native seagrass in the region, and surfgrass (*Phyllospadix* spp.). There are no targets set for this indicator. Between 2001 and 2016, eelgrass area showed an increasing trend Sound-wide. Between 2016 and 2023, there was a declining trend. The magnitude of these changes was small relative to the total amount of eelgrass present in Puget Sound.

The Floating Kelp Bed Area indicator tracks trends in the extent of canopy-forming kelps, primarily bull kelp (*Nereocystis luetkeana*), at sites within 11 oceanographic sub-basins.[2] There are no targets set for this indicator. Indicator reporting from 2024 classified approximately one-half to one-third of monitored locations as stable. Declines have been documented in Central and South Puget Sound, as well as the eastern Strait near Protection Island. There is concern

[1] The geographic scope of the Puget Sound program includes all U.S. waters of the Salish Sea, including Puget Sound, Hood Canal, the Strait of Juan de Fuca, and the southern portion of Georgia Strait. In keeping with language used by the program, these waterbodies are collectively referred to as Puget Sound herein.

[2] Giant kelp (*Macrocystis pyrifera*) occurs and is monitored in the Western Strait of Juan de Fuca and along Washington's Pacific Coast. Unlike other PSP indicators, this one extends outside of the Puget Sound region.

about declines in the San Juan Islands based on indigenous scientific knowledge and other reports. Spatial and temporal monitoring gaps precluded assessment in Admiralty Inlet and North Puget Sound.

The Short and Long-Term Change at Eelgrass Sites indicator tracks the number of eelgrass sites that are increasing, decreasing, stable, or absent in the short-term (previous 6 years) and long-term (since 2000). The two targets for this indicator are no net loss by 2030 (no significant difference between the number of sites with increases and declines in all three sub-regions) and net gain by 2050 (sites with long-term increases significantly outnumber sites with declines in all three sub-regions). Indicator reporting from 2025 showed that there was a similar number of the 214 sites with increases and declines, both long-term and in recent years. The San Juan Islands and Strait of Juan de Fuca have been identified as areas of concern because sites with declines outnumbered sites with increases, both long-term and in recent years. Some of the largest eelgrass losses have occurred in embayments, both in the San Juans and in other regions

The Understory Kelp Abundance and Condition indicator has not yet been developed. There is no reporting data available, and no targets have been set.

1.2 IMPLEMENTATION STRATEGIES

Implementation Strategies are a planning tool developed by PSP to focus regional recovery and protection priorities. They describe outcomes necessary to accelerate progress towards Vital Sign indicator targets. Implementation Strategies serve as a road map for aligning opportunities across agencies and programs, provide priorities for the Action Agenda, and guide funding decisions. They are developed collaboratively with local and regional input from experts and practitioners from multiple disciplines. Marine Vegetation is the ninth Implementation Strategy developed by Puget Sound partners since 2015.

An Implementation Strategy contains the following elements:

- A summary narrative that identifies and prioritizes approaches for achieving targets; describes strategies, actions, programs, and policy changes associated with each approach; prioritizes research and monitoring needs; identifies adaptive management opportunities; and estimates strategy costs.
- Results chain diagrams that describe the cause-effect changes necessary to make progress. They are a type of logic model that define the sequence of steps needed to achieve specific outcomes, and document hypotheses about how approaches are expected to address identified barriers.[3] Most Implementation Strategies have 4 or 5 strategies visualized with results chains.

[3] Results chains are developed and shared in software called Miradi. Results chain diagrams, descriptions, and recommended actions for all Implementation Strategies are available for viewing in the Puget Sound Recovery project on the on the Miradi Share website.

- Supporting technical reports/appendices include an analysis of ongoing programs for a Base Program Analysis (this document, Appendix II.b), a State of Knowledge report synthesizing relevant scientific information (Appendix II.a), and a compilation of research and monitoring needs identified during Implementation Strategy development (Appendix I.e).

Generally, Implementation Strategy development follows a process designed by PSP (2017). A volunteer Interdisciplinary Team recruited through a public process provides most of the technical input on what to include, focus on, and recommend as priorities within the Implementation Strategy. This occurs in facilitated workshops where Open Standards for the Practice of Conservation (Conservation Measures Partnership 2013) planning tools are used to structure group discussion and develop products.

The Marine Vegetation Implementation Strategy was developed using a modified process (described in the following section) due to the extensive foundation provided by two existing recovery plans: the Puget Sound Eelgrass Recovery Strategy (WA DNR 2015) and the Puget Sound Kelp Conservation and Recovery Plan (Calloway et al. 2020). Both plans were collaboratively developed and vetted by groups of regional subject matter experts. Standing up a new Interdisciplinary Team would have been inefficient given the existence of standing workgroups already advancing portions of these plans.

1.3 DEVELOPMENT OF THE MARINE VEGETATION IMPLEMENTATION STRATEGY

The Habitat Strategic Initiative Lead (HSIL) is a partnership between the Washington Department of Fish and Wildlife (WDFW) and Washington Department of Natural Resources (WA DNR) responsible for developing and managing Implementation Strategies; distributing EPA National Estuary Program and Geographic Program funding consistent with recovery priorities identified in Implementation Strategies and the Action Agenda; and providing capacity to connect and coordinate efforts among federal, state, and local agencies.

HSIL led development of the Marine Vegetation Implementation Strategy with technical support from PSP, University of Washington Puget Sound Institute, and Oregon State University Human Wellbeing and Conservation Lab. This team synthesized the existing strategies and priorities from the two recovery plans and developed results chains reflecting this content, then added new content to integrate human dimensions[4] and elevate Tribal perspectives. HSIL briefed and solicited feedback from several existing local and regional workgroups and hosted two stand-alone workshops that provided an opportunity to discuss the content in greater depth. WA DNR formally consulted with Tribal leadership and natural resource staff several times during the development of this strategy. A more detailed description of the Marine Vegetation Implementation Strategy development process can be found in Appendix IV.a.

[4] PSP' system of Puget Sound Vital Signs includes a Vibrant Human Quality of Life Vital Sign with five indicators and a Healthy Human Population Vital Sign with five indicators. Trimbach et al. (2020) provides guidance for integrating human dimensions into Implementation Strategies.

The resulting five strategies aiming to address documented declines in kelp and eelgrass are:

(1) Research and Monitoring – Implement targeted research and monitoring initiatives to understand the factors driving changes in marine vegetation, with consideration of ecological and community benefits.

(2) Regulatory – Evaluate and improve implementation of existing shoreline, nearshore, water quality, and land use regulations, programs, and policies to enhance protections for marine vegetation.

(3) Protected Areas – Protect marine vegetation in existing and new reserves, refuges, and other protected areas that respect Tribal treaty and sovereign rights.

(4) Restoration – Use effective restoration methods to accelerate recolonization and expansion of marine vegetation at sites shown to possess suitable ecological and sociocultural conditions.

(5) Community Connections – Expand and promote responsible stewardship, local food harvest, and outdoor recreation to better connect communities with marine vegetation and support human wellbeing that uphold Tribal treaty and sovereign rights.

1.4 SCOPE OF THIS REPORT

This report is one of several appendices to the Marine Vegetation Implementation Strategy Narrative. It provides a brief overview of the five strategies developed as part of the Implementation Strategy process, but its focus is analysis of existing programs that could support operationalization of the strategies. Additional information about the strategies, details about their development, and recommended actions is available in the narrative and other supporting appendices.

This report is consistent with EPA (1993) guidance on National Estuary Program base program analysis. It intentionally focuses on state, regional, and local tools since regional partners do not necessarily have an ability to drive changes or influence priorities for federal programs.

Sections 2 and 4 - 7 provide an overview of the five strategies and existing programs that could support their operationalization. Sub-sections correspond to priority themes identified on the strategy results chain and include review of supporting literature along with discussion of key programs, barriers, and opportunities.

Section 3 and Appendix A provide information about different agency authorities and regulations for marine vegetation. These sections were included based on a recommendation from the Kelp Policy Advisory Group et al. (2023), which identified a need for such content. This information also provides a foundation for near-term priorities associated with the Regulatory Strategy: conducting a review of regulatory protections to identify implementation barriers and identify opportunities to improve protections.

2. RESEARCH AND MONITORING STRATEGY

The Research and Monitoring Strategy focuses on implementing targeted research and monitoring initiatives that aim to understand the factors driving changes in kelp and eelgrass abundance, health, and distribution along with the benefits marine vegetation provide. This strategy is foundational because it will generate information necessary for advancing all four of the other strategies.

The Research and Monitoring Strategy addresses enabling conditions such as funding; end user and community engagement in development of research priorities; and support for community science programs. The strategy identifies three focus areas for information generation needed to improve management: distribution and trends monitoring; stressor-response research to understand and isolate contributing factors responsible for observed site-specific losses; and research to better understand ecosystem services, including human wellbeing and climate resilience considerations. This strategy aims to ensure Tribal science and community science marine vegetation programs are well supported, coordinated, and data integrated into broader regional efforts. The importance of data integration, synthesis, and sharing are also highlighted.

Since this is primarily a science-based strategy, more extensive coverage can be found in two accompanying technical appendices: State of Knowledge (Appendix II.a) and Research and Monitoring Needs (Appendix I.e). This section focuses on strategy approaches related to ongoing programs and workgroups.

2.1 MONITORING PROGRAMS

The Research and Monitoring Strategy includes two approaches involving monitoring programs:

- Increase capacity and sustained funding for long-term distribution and trends monitoring of marine vegetation.
- Ensure Tribal and community science marine vegetaion programs are well supported, coordinated, and data integrated into broader regional efforts.

Monitoring of marine vegetation distribution and trends is critical for understanding short- and long-term changes and informing management efforts. Table 1 provides an inventory of monitoring programs and projects related to marine vegetation. This list does not represent all monitoring efforts; Tribal programs are a gap. Monitoring of restoration sites is not included in Table 1 because it is a component of the Restoration Strategy.

Most of these programs and projects collect data on the distribution of kelp and/or eelgrass, but a few also collect data on stressors. WA DNR's long-term Acidification Nearshore Monitoring Network (ANeMoNe) and the Eyes on Kelp project collect data on several water quality parameters along with eelgrass or kelp data. The Padilla Bay National Estuarine Research Reserve (NERR) pairs long-term eelgrass monitoring with data on water quality and weather parameters, as well as changes in land use and land cover in the watershed. A San Juan County Marine Resources Committee (MRC) project resulted in data on the density of

Table 1. Inventory of monitoring programs and projects

Program or Activity	Implementing Organization(s)	Description	Eelgrass	Kelp
Submerged Vegetation Monitoring Program	WA DNR	Regional program using boat-based videography to assess long-term distribution and trends of nearshore vegetation, including seagrasses, floating kelp, and other macroalgae. Annual eelgrass surveys have occurred since 2000. Kayak monitoring of bull kelp in south and central Puget Sound began in 2013. Data viewers: Washington Marine Vegetation Atlas, Eelgrass data viewer, Floating kelp linear extent viewer, Floating kelp forest indicator Other Resources: eelgrass monitoring, kelp monitoring, Seagrass Monitoring in Puget Sound StoryMap	x	x
Grant-funded supplemental monitoring for the Submerged Vegetation Monitoring Program	WA DNR and local partners	In addition to ongoing monitoring funded through the state operating budget, WA DNR collaborates with counties and Tribes for more intensive local surveys. Grant funding supports some of this work. For example: Suquamish Tribe central Puget Sound eelgrass monitoring (2014-2021), Snohomish County marine vegetation monitoring (2019-2022), Pierce County eelgrass monitoring (2025-2027), Makah Tribe Science in Support of Restoration of Healthy Eelgrass Beds in Neah Bay (2025-2027)	x	x
Kelp and Nearshore Habitat Aerial Imagery Monitoring	WA DNR	In 2021, WA DNR and the Northwest Straits Commission completed a demonstration project that explored use of aerial imagery to map bull kelp canopy spatial extent and abundance. Different tools (e.g., drones and crewed fixed-wing aircraft, visible and near-infrared cameras) and processing methods were tested. The project concluded that multispectral uncrewed aircraft systems (UAS) complement kayak monitoring programs, so in 2021 WA DNR began annual UAS surveys at key monitoring sites to enhance other monitoring efforts. In 2022, WA DNR also began collecting 4-band orthophotography from a larger portion of the state's shoreline via fixed-wing aircraft. Eelgrass data are also collected through the fixed wing surveys. Resources: Demonstration project StoryMap, 2021 demonstration project report, 2024 UAS report, Fixed-wing aerial survey StoryMap, 2023 fixed wing report	x	x

Northwest Straits Initiative Floating Kelp Monitoring	Northwest Straits Commission, Clallam MRC, Island MRC, Jefferson MRC, Skagit MRC, Snohomish MRC, and Whatcom MRC	Ongoing community science kayak-based monitoring program currently conducted in six counties since 2015 (San Juan MRC had a program from 2015 to 2017). Marine Resources Committee (MRC) volunteers survey over 20 kelp beds one to four times a year between June and September. Resources: Kayak-Based Survey Protocol, data available at Sound IQ		x
Kelp kayak and snorkel surveys	Vashon Nature Center	Community science kayak-based floating kelp monitoring project launched in 2023. The Northwest Straits' protocol is used at 3 sites. Add-ons include snorkel surveys by UW's Wetland Ecosystem Team, bird surveys, and interviews with long-time residents about beds that have disappeared. Resources: Historical and current kelp bed locations around Vashon-Maury Island, presentation at 2024 Central Puget Sound kelp symposium		x
Acidification Nearshore Monitoring Network (ANeMoNe)	WA DNR	Program launched in 2015 to collect long-term data to track ocean acidification in the nearshore environment. Network of 12 intertidal sites (10 in Puget Sound) with two autonomous water quality sensors measuring pH, salinity, temperature, dissolved oxygen, and chlorophyll concentrations at 10-minute intervals year-round. One sensor is deployed within an eelgrass bed and the other in an adjacent unvegetated area. Volunteers trained by WA DNR help to monitor/maintain water quality sensors and collect biological data (eelgrass, birds, shellfish spat surveys) to complement sensor observations. Sites also support experimental research projects by scientists from WA DNR, WDFW, UW, the Swinomish Tribe, NOAA, and Puget Sound Restoration Fund. Resources: ANeMoNe Toolbox StoryMap	x	
National Estuarine Research Reserve System System-wide Monitoring Program	Padilla Bay NERR	Long-term monitoring in Padilla Bay, including eelgrass, rocky intertidal, and plankton communities; abiotic parameters (nutrients, temperature, salinity, pH, dissolved oxygen, chlorophyll, relative humidity, barometric pressure, wind speed/direction, and precipitation); biological measures (biodiversity, habitat, and population characteristics); watershed and land use classifications.	x	
A Decade of Disappearance: Kelp in the San Juan Islands	Samish Indian Nation, NOAA, and Northwest Straits Foundation	StoryMap describing efforts to develop baseline data that can be used to monitor long-term trends in bull kelp in the San Juan Islands. Presents results of a study that evaluated changes in bull kelp between 2006-2016 using aerial imagery. Describes gathering of Traditional Ecological Knowledge from Tribal fishermen. Funded by the Northwest Indian Fisheries Commission. The Samish Nation also has a kayak monitoring program that uses the Northwest Straits Commission's protocol and has continued to assess aerial data after 2016.		x

Eyes on Kelp	Puget Sound Restoration Fund, Reef Check, and Marauder Robotics	Three-year underwater kelp monitoring initiative utilizing multi-sensor logger stations, dive surveys, and ROV surveys. Established an expanded network of 14 underwater monitoring sites in Puget Sound to augment surface-based monitoring efforts. Funded by Paul G. Allen Family Foundation.		**x**
Kelp Forest Monitoring	Reef Check Foundation	Community science program using divers to survey 30 sites in Puget Sound since 2022. Their protocol involves ~30 species of fish, ~20 species of invertebrates, ~15 species of macroalgae, and seabed substrate type, cover, and relief. The Samish Indian Nation's Department of Natural Resources uses the Reef Check protocol to monitor kelp in their traditional homelands. Resources: presentation at Kelp Node Working Group meeting		X
Urban Kelp Research Project	Seattle Aquarium, Puget Sound Restoration Fund, Reef Check, and Port of Seattle	Since 2022, the Seattle Aquarium has conducted ROV and scuba surveys at eight sites in Elliott Bay to obtain data on kelp health, habitat and population trends. Data is being used to compare ROV and dive survey methods, and to enhance a bull kelp habitat suitability model to guide restoration.		x
Island County Eelgrass Monitoring	Island MRC, Sound Water Stewards, and WA DNR	Between 2009-2019, annual volunteer surveys using aerial photography and boats equipped with underwater videography were conducted at 10 sites. Sonar mapping also occurred so that results could be compared to underwater video and aerial surveys of the same sites. Resources: Eelgrass in Island County StoryMap	x	
Aerial surveys of vessel density	San Juan MRC	Systematic line-transect surveys were flown at least twice per month during summer 2024. Project aims to understand the connection between boater activity and the health of eelgrass habitats, identifying impact hotspots or priority sites for protection and restoration.	x	

recreational boat traffic in and near eelgrass beds. Marine Vegetation Implementation Strategy workshop participants highlighted the importance of collecting stressor data along with distribution data to contribute to stressor-response research.

Sustained investment is critical to the success of long-term monitoring programs. WA DNR has supported long-term monitoring of vegetation in nearshore habitats. WA DNR's Submerged Vegetation Monitoring Program has collected regional data on eelgrass area and depth distribution via boat-based surveys annually for 25 years. The Nearshore Habitat Program at WA DNR has also collected kayak survey data on canopy kelp since 2013. In 2016, they began using uncrewed aircraft systems (UAS) to collect multispectral aerial imagery of kelp beds at key monitoring sites. Annual fixed-wing aerial surveys began along the Pacific Coast and Strait of Juan de Fuca in 1989. In 2022, a new program collecting high resolution 4-band imagery expanded the survey area of aerial monitoring. Program staff also collaborate with local partners for more intensive surveys funded through interagency agreements or grants. More recently, WA DNR has been utilizing remote data collection technologies. As noted in section 6.1.1 of the Implementation Strategy narrative, it may be beneficial to explore differences in cost (data collection, processing, and analysis), spatial coverage (regional, local), and data quality (statistical power needed to identify meaningful trends) before determining which new technologies should become or remain a regular part of the program.

As shown in Table 1, volunteer community scientists are a crucial component of several local monitoring efforts. Consistent funding is needed to keep these programs running. Simmons and McNamara (2020) assessed potential funding options for volunteer-based programs to reduce dependence on grants. They identified several ideas to increase funding, including integrating volunteer and donor programs to increase fundraising; increasing emphasis on corporate social responsibility and explore partnerships with local businesses (e.g., workplace giving, corporate volunteering); improving measurement and tracking of volunteer hours to show the impact they are making to potential funders; and increasing registration costs for training programs.

Ideally, volunteer-based programs have the capacity to coordinate with regional partners to ensure that data collection protocols are well aligned with broader monitoring programs and can be shared widely to help advance recovery. Some community science programs could benefit from coordination with other organizations undertaking similar efforts and support with data management.

Many of the community science programs in Table 1 are geographically centered in the seven Northwest Straits counties. Most of Central/South Puget Sound and Hood Canal lack Marine Resources Committees (MRCs) and the associated funding[5] received through the Northwest Straits Commission. This discrepancy has implications not just for volunteer monitoring programs, but also for the level of community engagement in protected area

[5] The Northwest Straits Commission and MRCs receive Congressionally directed federal funding from EPA's Puget Sound Geographic Program via PSP and the National Atmospheric and Oceanographic Administration (NOAA) via the Department of Ecology.

planning/management (section 5) and restoration (section 6). The community science programs listed in Table 1 largely focus on kelp. There may be an opportunity to leverage the existing platform Seagrass Spotter to collect data on eelgrass.

2.2 RESEARCH PROGRAMS

Research is necessary to identify and understand the factors contributing to changes in marine vegetation and the role marine vegetation plays in Puget Sound's social-ecological system. Multiple university and government programs in the region have been engaged in marine vegetation research. Some have facilities (e.g., seawater labs, mesocosms), vessels, and diving programs that provide important infrastructure and capacity for research. Key research programs include the University of Washington's Friday Harbor Laboratories, Western Washington University's Shannon Point Marine Center, Oregon State University's Hatfield Marine Science Center, National Oceanic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center's Manchester Research Station, Padilla Bay NERR, Pacific Northwest National Laboratory's Sequim Campus, EPA's Pacific Ecological Systems Division Newport Lab, U.S. Geological Service's Marrowstone Marine Field Station, and the U.S. Department of Agriculture's Agricultural Research Service Pacific Shellfish Research Unit. These facilities attract collaborative researchers from institutions across the U.S. (e.g., University of Chicago, Cornell, University of Wisconsin). Canadian facilities at the University of British Columbia and Hakai Institute also support marine vegetation research. Sustained funding is needed to maintain these facilities and capacities. Changes in staff or leadership can change program research priorities.

State agency research programs are another important contributor to marine vegetation research. WA DNR's Nearshore Habitat Program has an eelgrass stressor-response research program that investigates factors that cause eelgrass declines. WA DNR's Aquatic Assessment and Monitoring Team is active in several lines of research relevant to marine vegetation (e.g., eelgrass bed edge dynamics, changes to sediment characteristics associated with outfall installation, ocean acidification, and impacts of rising sea levels). WDFW staff conduct research on a variety of marine vegetation topics, including the impacts of overwater structures on marine vegetation, human dimensions of kelp, and the relative impact of eelgrass stressors in the San Juan Islands. Many of these agency projects are supported through grants, including several from HSIL and their predecessor, the Marine and Nearshore Lead Organization.

Several non-governmental organizations, including Puget Sound Restoration Fund, Seattle Aquarium, Coastal Watershed Institute, and Point Defiance Zoo, have active kelp research projects at least partially funded through grants.

2.3 RESEARCH COORDINATION AND SCIENCE-POLICY INTEGRATION

The Research and Monitoring Strategy includes an approach focused on supporting and leveraging existing work groups, coalitions, and partnerships to effectively share research and monitoring information; improve coordination; and synthesize results to inform management. Existing coordinating groups and information portals include:

- The Washington State Kelp Research and Monitoring Workgroup supports information sharing related to kelp research and monitoring. It is facilitated by WA DNR.
- The Washington Kelp Project Inventory is an interactive tool to report and find information about kelp projects, programs, and initiatives in Washington State. The inventory included 80+ entries when launched in June 2025.
- The Kelp Forest Monitoring Alliance of Washington State is a collaboration among a diverse group of organizations (WA DNR, Samish Indian Nation, University of Washington's (UW) Friday Harbor Laboratories, Washington Sea Grant, Northwest Straits Commission, and Marine Agronomics) formed in 2021 to develop the PSP floating kelp canopy area indicator described in section 1.1. The Alliance plans to continue identifying priorities for enhancing and expanding the indicator.
- The Hakai Institute's Kelp Node is a cross-border network of practitioners engaged in kelp initiatives. The node consists of five topical working groups and a sixth data integrating working group. Workgroup 3 (Kelp Drivers of Change) has developed a Pressure Metadata inventory as a central source of information about stressor monitoring and stressor-response research.
- The Washington Seaweed Collaborative gathers, synthesizes, and shares relevant evidence-based information with people engaged in or concerned with seaweed cultivation.
- Marine Vegetation Implementation Strategy workshop participants indicated that eelgrass researchers do meet regularly (e.g., during Puget Sound Ecosystem Monitoring Program (PSEMP) Nearshore Workgroup meetings), but they do not have a formal workgroup.
- The Transboundary Salish Sea Eelgrass Protection Workgroup facilitated by the Northwest Straits Commission focuses on boater infrastructure and outreach.

Box 1. Shoreline Monitoring Database

The Shoreline Monitoring Database is a regional repository for Puget Sound shoreline monitoring data collected by university, state agency, and community science projects and programs. The site also houses a toolbox of 20 protocols (including bull kelp and eelgrass) for baseline and post-restoration data collection, as well as a decision tree to help guide monitoring choices.

The site was developed by Washington Sea Grant and UW's School of Aquatic and Fishery Sciences, with funding support from HISL and the PSEMP Nearshore Workgroup.

Whitty and Oster (2023)[6] identified a need for a data management plan, data repository, and dedicated data analysis capacity to support the integration and synthesis of kelp monitoring and research activities. The Shoreline Monitoring Database (Box 1) is a model to emulate or expand. A Marine Vegetation Implementation Strategy workshop participant recommended including private data from consultants (e.g., surveys included with applications, permit-required monitoring).

[6] This report documents consensus of workshop-generated input from key kelp partners.

Effectively sharing research and monitoring findings to inform management is a desired outcome of this strategy. Cereghino et al. (2023) identifies the synthesis of scientific evidence as particularly important for strengthening the science-policy interface but observes that science syntheses often fail to support regulatory decision-making. Success requires careful framing of a clear policy or management question relevant to regulatory staff and the communication of results in formats useful to regulators (Ryder et al. 2010).

In 2022-2023, WDFW and NOAA piloted a Science Sprint process to bridge the gap between science and regulatory decisions. Cereghino et al. (2023) describes the project's methods, findings, and recommendations. Key principles articulated in the report could be useful guidelines for implementing this strategy:

- Frequent two-way interactions between scientists and regulatory staff clients is necessary.
- Syntheses must be narrow, incremental, organized, and well-documented.
- Grey literature, expert elicitation, and Traditional Ecological Knowledge hold important observations and empirical evidence.
- Commit to strengthening a community of practice, increasing information sharing, and building relationships for future coordination and collaboration.

3. REGULATORY CONTEXT

This section describes regulatory and aquatic lands management programs that play a role in managing some human activities that result in stress to kelp and eelgrass.[7] This content is included in this report based on a recommendation from the Kelp Policy Advisory Group et al. (2023) to provide information about different agency authorities and regulations for kelp. This information also provides a foundation for near-term priorities associated with the Regulatory Strategy (section 4), as it is crucial to fully understand existing authorities before identifying implementation barriers and opportunities to improve existing protections.

The programs covered in this section are not marine vegetation specific management programs, but rather legal authorities aimed at regulating activities through either review and authorization of development and construction projects (section 3.1) or control of point and nonpoint discharges of pollutants into water bodies (section 3.2). These management tools are implemented by local, state, and federal agencies. At each level of government, differing priorities and legal mandates determine the specific protections applied. Impacts to marine vegetation are only one of many types of potential effects considered during permitting.

[7] WA DNR review of projects is included in section 3.1 even though their authority as a land manager is not regulatory. As described in sections 2 and 5, WA DNR's role as a land manager also provides a broader mandate to monitor and protect resources from threats not associated with development projects. Kelp harvest regulations are discussed in section 7.

Detailed information about marine vegetation stressors can be found in the accompanying State of Knowledge report (Appendix II.a).

3.1 PROJECT REVIEW AUTHORITIES

Table 2 provides an overview of four key authorities relevant to shoreline and in-water development/construction activities that may affect marine vegetation. Common project types include overwater structures, mooring buoys, marinas and terminals, boat ramps and launches, outfall and tide gate structures, utility crossing, dredging and dredged material disposal, contaminated site cleanup, bank stabilization, and aquaculture. Some kelp and eelgrass stressors are associated with upland development (e.g., anthropogenic sediment, nutrient, and toxics loading). Wetlands and riparian corridors along streams can reduce such loading. Protections for these habitats via Critical Areas Ordinances are described later in this section.

These authorities can prevent or minimize incremental losses associated with new development and construction activities, but they cannot force changes to existing development unless modifications that require permits are wanted. Major repairs to existing structures may trigger design or materials changes to reduce impacts (e.g., replacement of creosote pilings with other materials), but generally existing development is considered "grandfathered" even if it is not consistent with current regulations. This is called a "nonconforming" use or structure.[8]

MITIGATION BASICS

Regulatory agencies apply the mitigation sequence (Box 2) when reviewing applications. Mitigation requirements are called different things in different types of approvals (e.g., conditions, provisions, stewardship measures, conservation measures, or best management practices).

Box 2. Mitigation sequencing

Mitigation sequencing is a way for project proponents and regulators to reduce adverse effects associated with proposed projects. The general approach is to evaluate potential changes or additions to the project scope sequentially:

(1) ***Avoid*** impacts by considering practicable alternatives with fewer adverse impacts.

(2) ***Minimize*** impacts by incorporating measures to reduce negative effects.

(3) ***Compensate*** for any remaining unavoidable adverse impacts.

The word mitigation is not synonymous with compensatory mitigation (Ecology and WDFW 2000). Per 73 FR 19594, compensatory mitigation occurs only when unavoidable adverse impacts remain after all appropriate and practicable avoidance and minimization has been achieved.

[8] Although draft Shoreline Management Act rules (discussed in section 3.1.1) include a new section (WAC 173-26-221(2) to replace WAC 173-27-080) on nonconforming uses that would require jurisdictions to encourage property owners to bring nonconforming development into conformance where feasible or reduce the impact of nonconforming development over time.

Table 2. Regulatory and aquatic land management authorities for project review

	Shoreline Master Programs	Hydraulic Code	Clean Water Act Section 404	Aquatic Lands Transactions
Implementing agencies	12 counties and 35 cities with Puget Sound marine shorelines and Washington Department of Ecology	Washington Department of Fish and Wildlife	U.S. Army Corps of Engineers, Seattle District	Washington Department of Natural Resources
Purpose	Consist of land use designations (e.g., urban, natural), development standards, and regulations designed to manage shoreline use while protecting natural resources and allowing for responsible development while maintaining public access	Requires a permit for work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state	Requires a permit for the discharge of dredged or fill material into waters of the United States. Pilings and other materials like outfall pipes constitute fill per implementing regulations, so in and overwater structures require a permit.	Use of state-owned aquatic lands requires authorization to ensure the land is available, determine that the proposed use is appropriate, and avoid or minimize impacts to aquatic resources
Jurisdictional boundaries	Below and 200' landward of the ordinary high water mark (OHWM)	Below the ordinary high water line (OHWL), but can extend landward if bed or flow of state waters affected	For tidal waters: below the high tide line	State-Owned Aquatic Lands
Types of permits or approvals	- Substantial development permit (SDP) - Variance approval - Conditional use permit (CUP) - Exemption approval	Hydraulic project approval (HPA)	- Individual permit - Nationwide Permit (NWP) - Regional General Permit (RGP)	Aquatic use authorization, which can be in the form of a lease, right of entry license, mooring buoy registration, or a mooring buoy license
Associated regulatory requirements	- State Environmental Policy Act - Local building/grading permits - Stormwater mgmt requirements - Floodplain Development Permit - Critical Area Ordinances	State Environmental Policy Act (when local government is not the lead agency)	- 401 Water Quality Cert - Endangered Species Act - Magnuson-Stevens Fishery Conservation and Mgmt Act - Natl Historic Preservation Act - Natl Environmental Policy Act - Coastal Zone Mgmt Act - Rivers and Harbors Act	Copies of all necessary federal, state and local permits must be furnished prior to authorizing the use of aquatic lands
Special designations for marine vegetation	Critical Saltwater Habitat	Saltwater Habitat of Special Concern	- Special Aquatic Sites: Vegetated Shallows (seagrass only) - Essential Fish Habitat: Habitat Area of Particular Concern - Endangered Species Act: Critical Habitat	None in statute or rules, but common stewardship measures focus on reducing shade and sediment compaction specifically for protection of aquatic vegetation

Under most regulatory authorities, compensatory mitigation is generally not required for repair or replacement of existing structures (e.g., WAC 220-660-080(4)(h)). However, Endangered Species Act Section 7 consultations (see section 3.1.3 for more information) have required conservation offsets for enduring effects associated with projects involving repair or replacement of existing structures since 2022.

Federal rules in 73 FR 19594 and Washington's interagency mitigation policy guidance (Ecology and WDFW 2000) define different types of and mechanisms for providing compensatory mitigation. **In-kind** mitigation involves replacing the same species, habitat type, and function as those affected. **Out-of-kind** mitigation involves a resource of a different structural and functional type from the impacted resource. Permittees can either retain responsibility for their own compensatory mitigation projects, or they can purchase mitigation credits from a third party.

Third-party approaches can consolidate what would otherwise be several smaller, lower-quality compensatory mitigation projects into a single project that provides greater overall environmental benefit. **Mitigation banks** are generally sponsored by the private sector. A sponsor establishes a site or suite of sites in advance of resource impacts. The bank then sells credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor. **In-lieu fee (ILF) programs** are generally sponsored by government or non-profit entities and initiated after impacts occur. Site acquisition and construction is funded through the purchase of credits by permit applicants.

Mitigation measures to minimize damage to eelgrass are commonly applied to permits for nearshore and in-water projects. For example, design requirements to reduce shading or substrate compaction and construction or siting requirements to reduce turbidity. Many of these measures were first introduced decades ago after extensive research (e.g., Simenstad et al. 1997), and agencies have since assessed the efficacy of some of these measures (e.g., Lambert et al. 2021). There is also a long history of in-kind compensatory mitigation for eelgrass in Puget Sound, with mixed results (Merkel & Associates 1998, Thom et al. 2008, Beheshti and Ward 2021). These projects have been permittee-responsible mitigation, as currently approved mitigation bank and ILF programs have not undertaken any eelgrass restoration actions to date.

Conversely, project impacts to kelp are less understood and there is a need to improve kelp-specific mitigation guidance (Calloway et al. 2020, Kelp Policy Advisory Group et al. 2023, Whitty and Oster 2023). It is not known if measures protective for eelgrass also provide protection for kelp and/or if other avoidance and minimization mitigation measures are needed. A lack of understanding about microscopic life stages makes determining what types of projects and activities may harm kelp difficult. Marine Vegetation Implementation Strategy workshop participants indicated that there are currently no tested options for in-kind kelp compensatory mitigation.

LOCAL VARIATION

Not all of the management tools described in section 3 are available to each of the Puget Sound region's 12 counties and 112 cities, either due to geography (47 local governments regulate marine shorelines) or population size (86 local governments are municipal stormwater permittees). In addition, state laws and regulations do not apply to Tribal lands.

"Home rule" provisions in Washington's constitution delegate certain regulatory powers to counties and cities, providing local governments with authority over land use and other development regulations within their jurisdictions (Spitzer 2015). The local discretion provided by these provisions can result in wide variation in specific shoreline management policies, critical area protections, and stormwater requirements across jurisdictions. Washington differs from California and Oregon, where state agencies retain broad regulatory oversight and permit authority for activities occurring in the coastal zone.

Capacity to plan effectively and implement/enforce regulations can vary significantly at the local scale. Factors that can influence local programs and their implementation include jurisdiction size, available resources (e.g., financial; data availability and data management systems; number of staff and their experience level), and political priorities (Kinney et al. 2015, Kinney et al. 2019).

3.1.1 SHORELINE MANAGEMENT ACT

This state law (Chapter 90.58 RCW) was established to manage new uses and development within and along both public and private shorelines of the state.[9] It is administered by the Department of Ecology (Ecology) via five chapters of Title 173 WAC.[10] Two of these chapters are relevant to the management of development and uses within marine shorelines: Chapter 173-26 WAC and Chapter 173-27 WAC.

The Shoreline Management Act (SMA) requires cities and counties to develop, adopt, and implement Shoreline Master Programs (SMPs) to manage modifications and uses along marine, river, large stream, and lake shorelines. SMPs consist of shoreline environment designations (e.g., high intensity, shoreline residential, urban conservancy, rural conservancy, natural, aquatic); use standards to encourage preferred uses and public access; and development regulations that ensure compatibility with planned uses and protection of shoreline ecological

[9] Defined in RCW 90.58.030(2)(f) and (g). Puget Sound, the Strait of Juan de Fuca, and adjacent salt waters north to the Canadian border lying seaward from the line of extreme low tide are shorelines of statewide significance, a special category where statewide interests take priority and specific uses are preferred.

[10] In May 2024, Ecology initiated rulemaking to amend these five chapters. These amendments will add requirements for local governments to address the impacts of sea level rise and increased storm severity; provide clarity around SMP approval/amendment procedures; and provide clarity on permit and enforcement procedures. Preliminary draft rule language was released for comment in June 2025. Proposed rules and initiation of a formal comment period are expected in spring 2026.

functions. Local governments regulate shoreline uses and modifications through three types of permits. One or all of these permit types can be required for a single project.

- Substantial development permit – required for all activities that meet the definition of development with a total cost exceeding $8,504 (until July 1, 2027; this threshold is adjusted for inflation every 5 years), unless specifically exempt from this permit.
- Conditional use permit – required for proposals that include uses or development that are listed as a conditional use in a SMP or are unclassified (not addressed in the SMP).
- Variance – used to provide regulatory relief from extraordinary hardships imposed by SMP bulk, dimensional, or performance standards. Variances are implemented with strict approval criteria that can allow a development which supports allowed uses to deviate from a SMP's dimensional standards (e.g., setback, height, or lot coverage requirements).

Some activities that meet the definition of development are specifically exempted from the substantial development permitting process requirements by statute (see below).
Ecology provides guidance, training, technical assistance, and financial support to help local governments comply with SMA requirements. Each locally approved SMP must be reviewed and approved by Ecology before it becomes effective. Ecology also has final decision making authority over all conditional use permits and variances issued by local governments, and supports compliance and enforcement activities. Ecology has planners and permit reviewers assigned to each SMP.

WAC 173-26-221(2)(c)(iii) designates **critical saltwater habitats** and specifies that these habitats require a higher level of protection due to the important ecological functions these habitats provide. Critical saltwater habitats include all kelp beds and eelgrass beds. Local governments are directed to include SMP policies and regulations to protect critical saltwater habitats and implement planning policies and programs to restore such habitats. Table A.1 in Appendix A compiles rules mentioning master program provisions for critical saltwater habitats. Note WAC 173-26-221(2)(c)(iii)(C) specifies that surveys for critical saltwater habitats are required only until the jurisdiction completes an inventory as part of their comprehensive SMP update process; most of these updates occurred between 2006 and 2020.

A recommended action in the Kelp Conservation and Recovery Plan (Calloway et al. 2020) was to add explicit reference to kelp in existing regulations that include kelp protection but do not reference kelp specifically. The current SMA rulemaking provides an opportunity to more explicitly reference kelp in local SMPs. Conroy et al. (2023) examined 45 Puget Sound region SMPs and found that 20 had either no mention of kelp or only an implicit mention (e.g., reference to critical saltwater habitat generally) in their protective measures and regulations.

EXEMPTIONS

Several activities are specifically exempted from SMP substantial development permitting requirements by RCW 90.58.030(3)(e), including normal maintenance/repair of existing structures, bulkheads to protect single family residences, navigational aids such as channel

markers and anchor buoys, construction of single-family residences below 35 feet high, and construction of some non-commercial docks.

WAC 173-27-040 sets out specific requirements for projects to qualify for an exemption, specifies that an exemption is not an exemption from compliance with SMA or the local SMP, and authorizes local governments to attach conditions to the approval of exempt developments. It also states that a development that is listed as a conditional use in a local SMP must obtain a conditional use permit even though the use does not require a substantial development permit.[11]

Permit-exempt development is not handled uniformly among jurisdictions, so it is difficult to generalize how reviews are conducted and documented (Futurewise 2014a). Some local governments charge less for exempt projects, meaning fewer staff hours are allotted for processing exemptions compared to other types of SMP approvals (Barnhart et al. 2015). Exempt developments may lack adequate site-specific review and analysis (Northwest Indian Fisheries Commission 2015). Ecology's June 2025 preliminary draft of Chapter 173-27 WAC adds new requirements for exemption review, documentation, and transmittal to Ecology that will standardize processes across jurisdictions (see draft section WAC 173-27-050).

NO NET LOSS

WAC 173-26-186(8) requires SMPs to ensure that permitted development does not result in a net loss of ecological functions over time. This standard is intended to maintain or improve shoreline ecological functions necessary to sustain shoreline natural resources as communities implement their SMPs (Ecology 2023). It requires implementing the mitigation sequence at both the SMP development phase and during permitting. No net loss is necessary to achieve the overall gains intended from restoration at the watershed scale.

WAC 173-26-201(2)(c) describes mechanisms to accomplish no net loss at the program level and individual permit level. These include:

- Application of appropriate development standards;
- Inclusion of provisions to address the impacts of common shoreline uses (see Table A.2 in Appendix A for Ecology guidelines relevant to marine vegetation);
- Employment of appropriate mitigation measures through application of the mitigation sequence during project-level review; and
- Inclusion of policies that promote restoration of ecological functions.

No net loss analysis involves the review of new uses and development. Projects built without permits and climate-driven changes are not considered (Ecology 2023). The baseline for no net

[11] For example, several local jurisdictions have designated shoreline stabilization (e.g., bulkheads) as a conditional use. Details are provided in Table A.1.1 of the Shoreline Armoring Vital Sign Base Program Analysis (Kinney 2018).

loss at the SMP scale is when a jurisdiction completed an inventory and characterization report prepared as part of their comprehensive update process; most of these updates occurred between 2006 and 2020. The baseline for individual project review is the legally existing conditions at the time of permit application. Per WAC 173-26-201(2)(f), jurisdictions must also prepare a restoration plan as part of an SMP update. This plan identifies degraded areas, impaired ecological functions, and sites with potential for restoration. The plan also identifies ongoing projects and programs that support restoration goals, along with timelines, prospective funding sources, strategies, and benchmarks for implementing restoration projects.

The Shoreline Armoring Implementation Strategy (HSIL 2021a) identified inadequate guidance for local governments as a barrier to strong implementation of no net loss provisions, but updated guidance from Ecology has since been released. Ecology (2023) provides details about losses in ecosystem function associated with different project types and lists and common mitigation strategies for those losses. Appendices provide checklists covering components of no net loss analyses and mitigation plans, as well as a template for as-built reports.

3.1.2 HYDRAULIC CODE

This state law (Chapter 77.55 RCW) requires permits, called Hydraulic Project Approvals (HPAs), for activities that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. The Hydraulic Code was established for the protection of fish life and is administered by WDFW via Chapter 220-660 WAC.

WAC 220-660-320 designates **saltwater habitats of special concern** and specifies that WDFW can restrict project type, design, location, and timing when saltwater habitats of special concern are present. Three types of marine vegetation are classified as saltwater habitats of special concern: seagrass beds (*Zostera marina*, *Ruppia maritima* and *Phyllospadix* spp.), kelp beds (order Laminariales), and other macroalgae species Pacific herring use as spawning substrate.

WAC 220-660-350 describes requirements for seagrass and macroalgae surveys. Applicants are required to submit surveys for several types of projects: constructing a new dock, mooring buoy, wharf, or other over-water structure; constructing a replacement over-water structure outside the previously approved footprint; new dredging, trenching, filling (boat ramps, fixed breakwaters, artificial habitat structures); and maintenance dredging, trenching, filling, or grading outside the previously approved footprint. Surveys must be conducted between June 1 and October 1. If a preliminary survey shows the project footprint will impact existing seagrass and kelp beds or in herring spawning areas with other macroalgae beds used as spawning substrate, WDFW will require an advanced survey**.** Advanced surveys quantify project impacts to eelgrass and macroalgae and quantify the performance of mitigation actions to compensate for impacts that cannot be avoided. Interim eelgrass and macroalgae habitat survey guidelines are provided in WDFW (2008).

WAC 220-660-360 through WAC 220-660-450 specify common impact avoidance and minimization mitigation measures, called technical provisions, for different types of marine projects. Major updates occurred in 2014. Table A.3 in Appendix A provides a compilation of common technical provisions involving marine vegetation. These sections either refer to marine vegetation specifically or are meant to minimize specific stressors like shading and turbidity.

3.1.3 CLEAN WATER ACT SECTION 404 AND ENDANGERED SPECIES ACT SECTION 7

Section 404 of the federal Clean Water Act (33 U.S.C. 1344) established a program that regulates the discharge of fill into waters of the United States to protect aquatic habitats and water quality. This program is administered by the U.S. Army Corps of Engineers (USACE) and EPA via 33 CFR Part 323 and 40 CFR Part 230. USACE authorizes discharges through a few different types of 404 permits:

- Individual Permits – for discharges with potentially significant impacts
- General Permits – for similar activities that would have minimal adverse effects, both individually and cumulatively. The majority of 404 approvals are in the form of a general permit. There are two types:
    - Nationwide Permits – issued by USACE headquarters every five years. There are currently 59 Nationwide Permits (2021 reissuance). Individual districts can add regional conditions after coordination with resource agencies, Tribes, and the public.[12] When it is determined that the minimal adverse effects standard is not met, a district can also restrict use of a Nationwide Permit within certain waters.[13] For Nationwide Permits, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (33 CFR 332.3(b)(2) and (3)).
    - Regional General Permits – issued by individual USACE districts for a specific geographic region. Seattle District currently has 2 active Regional General Permits. Neither cover projects in Puget Sound marine waters. In 2022, Regional General Permit 6 (Structures in inland marine waters) was replaced by the Salish Sea Nearshore Programmatic Consultation (discussed below).

Applications for Individual Permits undergo individual public interest reviews, 404(b)(1) analyses (per 40 CFR Part 230), consultations (see below), and public comment periods. Some of these steps occur programmatically for General Permits. Prior to issuing a 404 permit, USACE must ensure compliance with other federal laws including (but not limited to):

- Endangered Species Act (ESA) Section 7 – Requires consultation with NOAA Fisheries and/or U.S. Fish and Wildlife Service (USFWS) when any action a federal agency carries out, funds,

[12] Seattle District's user guide for the 2021 Nationwide Permits is available in a July 26, 2022 Special Public Notice. It describes covered activities and all applicable national and regional conditions.

[13] For example, since 2012 Regional General Condition 4 has prohibited use of a Nationwide Permit to authorize new bank stabilization in tidal areas of Water Resource Inventory Areas (WRIA) 8, 9, 10, 11, and 12 (central and south Puget Sound).

or authorizes may affect a species listed as endangered or threatened or their designated critical habitat. USACE may add special conditions to an Individual or General Permit as a result of this consultation.

- Magnuson-Stevens Fishery Conservation and Management Act Section 305(b) – Requires consultation with NOAA Fisheries on actions that may adversely affect Essential Fish Habitat (EFH). In some cases, ESA conservation measures are adequate to avoid, minimize, or offset adverse effects to EFH. In other cases, specific EFH conservation recommendations are provided.
- Clean Water Act Section 401 – Provides Ecology, Tribes with EPA-approved Water Quality Standards, or EPA (for Tribes without approved Water Quality Standards) with authority to approve, condition, or deny a Section 404 permit.[14] Ecology, Tribes, and EPA can certify that a discharge will not violate Water Quality Standards with an individual Water Quality Certification or via regional conditions included in general permit authorizations.
- National Historic Preservation Act Section 106 – Requires consultation with Tribal Historic Preservation Officer(s), the State Historic Preservation Officer, and other consulting parties to identify cultural and historic properties that may be affected by a project. The effects of the project are assessed in consultation with interested parties and if adverse effects are anticipated, alternatives to avoid, minimize, or mitigate for those impacts are developed.

Subpart E of the 404(b)(1) Guidelines cover considerations for potential impacts on **special aquatic sites**, which include mudflats and vegetated shallows. 40 CFR 230.43 defines **vegetated shallows** as permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as turtle grass and eelgrass in estuarine or marine systems as well as a number of freshwater species in rivers and lakes. Guidance for preparing an eelgrass delineation report is provided in USACE Seattle District (2018).

Although kelp is not explicitly included in federal regulations as a special aquatic site, it does have special designations pertinent to ESA and EFH consultations. Marine vegetation (eelgrass meadows and kelp forests) has been identified as a **primary constituent element** for nearshore marine areas designated as **critical habitat** for Puget Sound Chinook salmon (70 FR 52630). Documented kelp (families Chordaceae, Alariaceae, Lessoniacea, Costariaceae, and Laminaricea) and areas where kelp can be supported by appropriate substrates such as rock and cobble have been identified as an **essential feature** of designated **critical habitat** for yelloweye rockfish, canary rockfish,[15] and bocaccio (79 FR 68042). The Pacific Fishery

[14] Per a September 25, 2020 Special Public Notice, the following Puget Sound region Tribes are certifying authorities on their respective lands: The Lummi Nation, Makah Tribe, Port Gamble S'Klallam Tribe, Puyallup Tribe of Indians, Swinomish Indian Tribal Community, and The Tulalip Tribes.

[15] The Puget Sound/Georgia Basin Distinct Population Segment of canary rockfish was removed from the list of threatened and endangered species and its critical habitat designation in 2017 (82 FR 7711).

Management Council has designated canopy kelp and seagrass as a **Habitat Area of Particular Concern**, a subset of Essential Fish Habitat, for Pacific Coast Groundfish.

As mentioned in section 3.3.1, a recommended action in the Kelp Conservation and Recovery Plan (Calloway et al. 2020) was to add explicit reference to kelp in existing regulations that include kelp protection but do not reference kelp specifically. During the public comment period for the 2021 Nationwide Permits, Seattle District received a comment recommending addition of a regional general condition relating to kelp.[16] Seattle District declined to add a kelp condition and their response to this comment emphasized that impacts to designated critical habitat are evaluated and, since kelp is an important resource for multiple ESA-listed species, effects on kelp at a project location would be reviewed even in the absence of a regional general condition.[17]

Prior to approaching EPA Headquarters about opening rulemaking on 40 CFR Part 230, the kelp community should assess the potential benefits relative to the potential risk of rolling back other nation-wide protections within the 404(b)(1) Guidelines. A much simpler approach with less potential downside is to work with Ecology when they are developing regional general conditions relating to Section 401 Water Quality Certification for the 2026 Nationwide Permits. Water Quality Certification general conditions appearing in Section 7 of the User Guide for the 2021 Nationwide Permits identify **aquatic resources of special concern** that require extra review and an individual Water Quality Certification from Ecology or EPA. For the 2021 permits, Ecology identified eelgrass, but not kelp, as an aquatic resource of special concern. In contrast, EPA Region 10 included kelp beds as an aquatic resource of special concern requiring additional review.[18]

SALISH SEA NEARSHORE PROGRAMMATIC CONSULTATION

ESA Section 7 programmatic consultations can address multiple similar, frequently occurring, or routine actions expected to be implemented in a particular geographic area. In 2022, NOAA Fisheries issued an ESA Section 7 Biological Opinion and Magnuson-Stevens Act EFH response to USACE Seattle District covering activities they permit in nearshore waters of greater Puget Sound. The Salish Sea Nearshore Programmatic Consultation (SSNP) covers a range of activities including repair, maintenance, and installation of culverts, bridges, utilities; shoreline

[16] Comments and responses are provided in Supplemental Documents on the Seattle District's Nationwide Permits page. The described comments and responses were included in the Supplemental Document for Nationwide Permit 10 (Mooring Buoys).

[17] Notably, past Seattle District documents (e.g., a 2016 Special Public Notice and now expired Regional General Permit 6 special conditions) have used the term **submerged aquatic vegetation** to describe "eelgrass and macroalgae attached to or rooted in substrate" and "rooted vascular plants and attached macroalgae."

[18] Tribal governments vary in their Water Quality Certification requirements for Nationwide Permits. Tribes have either required individual certifications for all projects, waived the certification requirement, or granted a programmatic certification when all national and regional terms and conditions are met. Decisions by individual Tribes are provided in Section 7 of the User Guide for the 2021 Nationwide Permits. None reference aquatic resources of special concern.

modifications; navigation aids, scientific measurement devices, tideland markers, buoys; installation, repair, replacement, and maintenance of in-water or over-water structures; maintenance dredging; and habitat enhancement. The SSNP can be used as long as a project fits all applicable design and construction criteria and includes "conservation offsets" where applicable.[19] More complex projects that do not fit the SSNP criteria will be evaluated in an individual consultation.

A novel element of the SSNP is a Puget Shound Nearshore Conservation Calculator (Box 3). This tool can be used to calculate the loss of nearshore habitat functions and values for ESA-listed species associated with proposed projects. The SSNP requires that those losses (debits) be offset with an equal amount of conservation actions (credits).

Box 3. Puget Sound Nearshore Conservation Calculator

NOAA Fisheries developed a Puget Sound Nearshore Habitat Conservation Calculator to standardize and simplify application of Habitat Equivalency Analysis and a Nearshore Habitat Values Model for use in ESA Section 7 consultations for listed salmonids. This tool quantifies impacts of common, small-scale Puget Sound nearshore projects and the benefits of activities developed to provide conservation offsets required under the Salish Sea Nearshore Programmatic Consultation.

The output of the calculator is Conservation Points, which can be credits or debits. The unit of measurement is Discounted Service Acre Years (DSAYs), where 1 DSAY is equal to 100 Conservation Points. DSAYs are a measure of change in habitat services for the target species (in this case juvenile salmon) provided over a specific duration in time. One DSAY represents the value of services provided by one acre of habitat in one year. A discount rate of 3% is applied for future services (i.e., habitat now is more valuable than in the future).

The calculator defines **submerged aquatic vegetation (SAV)** as rooted vascular plants and attached macroalgae. Occurrence and average percent cover of SAV within 25 feet of the project area is a key input used to determine the modeled habitat value in the lower shore zone (+5' MLLW to -10' MLLW). The Deeper Shore Zone (DSZ) begins at -10 feet MLLW or the lowest limit of SAV growth. The calculator's user guide instructs that where there is a chance SAV occurs deeper than -10 MLLW, structures in the Deeper Shore Zone must be entered into the Lower Shore Zone so impacts can be debited properly. SAV planting is an option for generating conservation credits in the calculator.

[19] The SSNP notes that compensatory mitigation required under Section 404 of the Clean Water Act can serve as conservation-offsetting measures if such mitigation is consistent with the criteria set forth by NOAA Fisheries. However, additional offsets above what USACE requires may be necessary for two reasons. First, Section 404 of the Clean Water Act does not require compensatory mitigation for repair or replacement of existing structures. Second, NOAA Fisheries considers impacts of associated upland activities (e.g., clearing of riparian vegetation) that are outside of USACE's regulatory jurisdiction when assessing loss of nearshore habitat functions and values.

The SSNP provides applicants with four options that can be used individually or in any combination to achieve required conservation offsets. Applicants can design replacement projects to avoid adverse effects (e.g., setback of bulkheads, use of soft shore designs, reducing the footprint of overwater or nearshore structures). They can implement permittee-responsible on-site or within-basin habitat improvements. They can provide funding to a local habitat restoration sponsor (e.g., state agency, Lead Entity, Conservation District, Regional Fisheries Enhancement Group) to support a within-basin restoration project that will improve nearshore or estuarine habitat. The last option is purchase of conservation credits from a NOAA Fisheries approved conservation bank, in-lieu fee program (ILF), or crediting provider to support a within-basin restoration project that will improve nearshore or estuarine habitat.

The SSNP and calculator have helped to create a new market for conservation credits. Several new ILF and mitigation bank programs now offer out-of-kind mitigation options that are more easily quantifiable and predictably approved through application of the calculator. There are currently four NOAA Fisheries approved conservation credit providers:

- Puget Sound Partnership's Nearshore Conservation Credits Program provides credits in five marine service areas. To date conservation actions have mostly involved removal of creosote-treated pilings in collaboration with WA DNR's Creosote Removal Program and local partners. In its first three years, the program generated nearly $2.9 million in funding. Some of this funding is now supporting a planned levee setback and road raising project in the Union River estuary.
- Hood Canal Coordinating Council's ILF program provides credits in the Hood Canal basin. To date, marine mitigation sites have involved acquisition and preservation of shoreline parcels, removal of derelict structures, and planting of trees and shrubs. This program has also been approved by USACE and Ecology.
- Wildlands, Inc. and Port of Everett's Blue Heron Slough Conservation Bank provides credits in the Whidbey and South Central Puget Sound basins. This site, located near the mouth of the Snohomish River, is being reconnected to riverine and tidal influence through dike breaches. This bank is being reviewed by USACE and Ecology.
- Port of Tacoma's Clear Creek Bank provides credits in a limited area around the mouth of the Puyallup River. This tidally influenced freshwater site provides off-channel rearing and foraging opportunities for juvenile salmon. This bank has also been approved by USACE and Ecology.

3.1.4 AQUATIC LANDS TRANSACTIONS

Laws pertaining to state-owned aquatic lands are in Chapter 79.105 RCW. Per RCW 79.105.030, state-owned aquatic lands are managed to provide a balance of public benefits for all citizens of the state by encouraging direct public use and access; fostering water-dependent uses; ensuring environmental protection; utilizing renewable resources; and generating revenue. State-owned aquatic lands are managed by WA DNR via Chapter 330-30 WAC. Unlike the regulatory authorities described in this section, WA DNR's authority over state-owned aquatic

lands is proprietary. WA DNR acts on behalf of the landowner to control, transfer, and benefit from the property.

Not all shorelands and tidelands are in state ownership (WA DNR 2011). Some are privately owned because until 1971 abutting landowners could purchase them from the state. In addition, submerged lands included in pre-statehood land patents and federal grants for Tribal reservations are excluded from state ownership.

WA DNR reviews applications for shoreline, over-water, and in-water projects/uses on state-owned aquatic lands. An Aquatic Use Authorization, often in the form of a lease, is issued when WA DNR determines a project provides a balance of public benefits for Washington's citizens. Common uses include navigation infrastructure (docks, piers, mooring buoys, boat launches), aquaculture, utilities, bridges, intake systems, outfalls, dredged material disposal, log storage, and mineral recovery. RCW 79.105.430 allows residential landowners abutting state-owned tidelands to install and maintain a dock or mooring buoy without charge (i.e., no lease required) if used exclusively for private recreational purposes. Landowners must still register the buoy with WA DNR, and preferred designs are described in a brochure.

WA DNR applies stewardship measures in Aquatic Use Authorizations to prevent and reduce impacts to aquatic habitats and species. For example, common stewardship measures for overwater structures focus on reducing shade, contaminants, compaction of sediment, and noise. Eelgrass and kelp are not specifically mentioned in the aquatic lands rules, with the exception of one statement in WAC 332-30-157(2) on the boundaries of clam tracts offered for lease. WAC 332-30-130 et seq. provide rules for different types of developments (e.g., marinas and moorages, private recreation docks, booming, rafting and storage of logs), but they do not mention specific design or other measures for protection of habitats. WA DNR does not include compensatory mitigation in Aquatic Use Authorizations. WAC 332-30-122(2)(a)(ii) directs that uses which cause adverse environmental impacts may be authorized only upon compliance with applicable environmental laws regulations including mitigation required by other agencies.

3.1.5 CRITICAL AREAS ORDINANCES

The state Growth Management Act (GMA) (Chapter 36.70A RCW) requires all cities and counties to designate environmentally critical areas and adopt development regulations to protect them. These regulations generally take the form of local Critical Area Ordinances (CAOs). Impacts to critical areas are usually assessed by local governments during review of development permit applications (e.g., building, land use, clearing and grading). GMA is administered by the Washington Department of Commerce (Commerce) via Chapter 365-190 WAC, Chapter 365-195 WAC, and Chapter 365-196 WAC.

Commerce provides direct assistance, grants, training, and guidebooks to assist local governments in meeting GMA requirements. Commerce reviews local comprehensive plans for consistency with GMA but does not formally approve them like Ecology approves SMPs. Commerce collaborates with other agencies during the review of local comprehensive plans

and development regulations. Commerce relies on agencies with scientific expertise to provide recommendations to local governments to ensure CAOs include best available science and meet state standards for critical area ecosystems.

Types of critical areas identified in RCW 36.70A.030(11) include wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas, frequently flooded areas, and geologically hazardous areas. Riparian areas must be considered for classification and designation as Fish and Wildlife Habitat Conservation Areas per WAC 365-190-130(3)(a)(iii). WAC 365-190-130(2)(d) requires that local governments consider kelp and eelgrass beds for designation as **Fish and Wildlife Habitat Conservation Areas**. However, when critical areas occur within SMA jurisdiction they are regulated by a jurisdiction's SMP per RCW 36.70A.480(3)(d).

The Minimum Guidelines to Classify Agriculture, Forest, Mineral Lands and Critical Areas in Chapter 365-190 WAC provide extensive substantive guidance to local governments as to how to identify, classify, and designate critical areas and natural resource lands. They include expanded definitions, procedural recommendations, and references to pertinent statutes and rules adopted by other agencies. Although the Minimum Guidelines are not binding on local governments, counties and cities must consider them when preparing and adopting development regulations to classify and designate critical areas or natural resource lands. The courts and the Growth Management Hearings Boards look to the Minimum Guidelines when interpreting the GMA's requirements and determining whether a local government has complied with those requirements.

Local governments are required by RCW 36.70A.172 to include the "best available science" in developing policies and development regulations to protect critical area functions and values. Chapter 365-195 WAC provides criteria for determining best available science, how to obtain it, and how to incorporate it into development policies and regulations. WDFW's Priority Habitats and Species Program is one source of best available science that provides data, maps, and guidance to local governments specifically to support the development and implementation of CAOs, land use plans, and development regulations. The Priority Habitats and Species Program has developed two volumes of guidance for the management of riparian areas. Quinn et al. (2020) provides a synthesis of riparian ecosystem science and implications for management. Rentz et al. (2020) provides specific Priority Habitats and Species Program management recommendations for riparian habitat to help local governments protect these critical areas.

A regional assessment of change in riparian areas between 2006 and 2017 indicated that CAOs generally seem to be shifting development away from riparian areas (Folkerts 2021). However, this assessment found that riparian buffer widths in local codes vary widely and are usually smaller than the Priority Habitats and Species Program's best available science guidelines.

GMA was amended in 2023 to add new planning requirements for climate change and resiliency. Requirements for the Climate and Resilience Element, including a greenhouse gas emissions reduction subelement and a resiliency subelement, are detailed in RCW 36.70a.070(9). The resiliency subelement must include goals, policies, and programs that

identify, protect, and enhance natural areas and communities to foster resiliency to climate impacts and address natural hazards created or exacerbated by climate change. Section 1.4 of Commerce (2023a) discusses how the requirements apply to areas in shoreline jurisdiction; climate resilience provisions intended to apply withing the shoreline jurisdiction must be added through a SMP amendment.

3.2 WATER QUALITY REGULATIONS

Excess nutrients, suspended sediment, and high temperatures are marine vegetation stressors with a nexus to water quality regulations. The federal Clean Water Act (33 U.S.C. 1251 et seq.) and state Water Pollution Control Act (RCW 90.48) provide the primary legal basis for Ecology's water quality program.

Section 402 of the Clean Water Act (33 U.S.C. 1342) established the National Pollutant Discharge Elimination System (NPDES) program to limit discharge of pollutants from point sources (i.e., a pipe) into surface waters of the United States. NPDES permits contain limits on the amount of a pollutant or pollutant parameter in a discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not degrade water quality. Individual NPDES permits cover a single facility or discharge, while general NPDES permits provide coverage for a group of related facilities or operations of a specific industry or group of industries. Ecology issues most NPDES permits in Washington under authority delegated by EPA.

Section 319 of the Clean Water Act (33 U.S.C 1329) created a grant program that provides states and Tribes funding to develop and implement nonpoint source pollution management programs. States are required to develop assessment reports that describe nonpoint source pollution problems and management measures being taken to address those problems.

3.2.1 WATER QUALITY STANDARDS

Water Quality Standards in Chapter 173-201A WAC establish goals for specific waterbodies and serve as the regulatory basis for pollution controls and strategies. Ecology has developed numeric (not to exceed a concentration) and narrative (qualitative statements) criteria for nutrients, temperature, pH, DO, turbidity, total dissolved gas, fecal coliform, more than 225 toxic substances, and radioactive substances.

Given the complex dynamics of nutrient concentrations in tidal waters, Ecology relies on surrogate indicators—dissolved oxygen levels, pH, evidence of algal mats, percent oxygen super-saturation, and chlorophyll levels—to confirm nutrient enrichment (primarily nitrogen) and drive water quality improvement actions in marine waters (Ecology 2018). Noncompliance with dissolved oxygen criteria is Ecology's primary mechanism for regulating nutrient inputs into Puget Sound.

Ecology developed the marine water quality standards in WAC 173-201A-210 to provide protection for four designated uses: aquatic life (protection of all indigenous fish and nonfish

aquatic species), shellfish harvest, recreation, and miscellaneous (wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics). WAC 173-201A-610 and WAC 173-201A-612 assign specific uses for protection to individual water bodies. As shown in Tables 3 and 4, this means that different parts of Puget Sound have different water quality standards.

Table 3. Aquatic life use designations for Puget Sound waterbodies

Aquatic life use (WAC 173-201A-610)	Use designations for marine waters (WAC 173-201A-612)
Extraordinary	Strait of Juan de Fuca, Hood Canal, Admiralty Inlet, Sequim Bay, North Puget Sound, southern Possession Sound, western South Puget Sound, Little Totten Inlet, Skookum Inlet
Excellent	Drayton Harbor, Guemes Channel, Bellingham Bay, Samish Bay, Skagit Bay, Padilla Bay, outer Commencement Bay, Elliott Bay, Dyes Inlet, Sinclair Inlet, Port Angeles, Port Gamble, Port Townsend, northern Possession Sound, Port Susan, Saratoga Passage, and south Puget Sound inlets
Good	Budd Inlet, inner Commencement Bay, Everett Harbor, Shelton Harbor, Oakland Bay
Fair	inner Thea Foss Waterway

Table 4. Marine water designated uses and numeric criteria

Aquatic life use	Dissolved oxygen (lowest 1-day minimum)	Turbidity (Nephelometric Turbidity Units, NTU)	Temperature (highest 1-day maximum)
Extraordinary	7.0 mg/L	Must not exceed: 5 NTU over background when the background is 50 NTU or less; or a 10 percent increase in turbidity when the background turbidity is more than 50 NTU	13°C (55.4°F)
Excellent	6.0 mg/L	Same as above	16°C (60.8°F)
Good	5.0 mg/L	Must not exceed: 10 NTU over background when the background is 50 NTU or less; or a 20 percent increase in turbidity when the background turbidity is more than 50 NTU	19°C (66.2°F)
Fair	4.0 mg/L	Same as above	22°C (71.6°F)

A query of Ecology's search tool for the current Water Quality Assessment provided information about conditions relative to Water Quality Standards in Puget Sound marine waters. For temperature, most waterbody segments were classified as Category 1 (meets standards) or Category 2 (some evidence of a water quality problem). Only two segments, the inner portion of Liberty Bay and Henderson Inlet, were Category 5 (impaired waters) for temperature. No turbidity results were returned, but there are no Total Maximum Daily Load

(TMDL)[20] studies for turbidity in marine waters so widespread exceedances of the turbidity standards are unlikely. There are numerous Category 5 (impaired waters) records for dissolved oxygen, most located in terminal inlets and shallow embayments. These areas and modeled data estimating the number of days of noncompliance with Water Quality Standards are shown on this map produced by Ecology.

3.2.2 PUGET SOUND NUTRIENT REDUCTION PROJECT

Ecology initiated the Puget Sound Nutrient Reduction Project in 2018 after low dissolved oxygen levels resulted in the addition of 102 Puget Sound waterbody segments to Washington's list of impaired waters. As a result of these listings, Ecology is obligated to quantify needed pollutant reductions and identify management actions necessary to bring impaired waters back into compliance with Water Quality Standards. The Puget Sound Nutrient Reduction Project is the planning effort, similar to a TMDL, through which Ecology is accomplishing this work. A large component of the Puget Sound Nutrient Reduction Project involves modeling of nutrient sources and assessments of waterbody segment response to different nutrient input scenarios.

Since Wastewater Treatment Plants (WWTPs) are the largest source of anthropogenic nitrogen to Puget Sound (Box 4), Ecology issued an NPDES Puget Sound Nutrient General Permit in 2021.[21] This permit covered the 58 WWTPs that discharge into marine waters; these facilities provide wastewater treatment for 101 municipalities, local sewer districts, and state facilities. The permit effectively capped nitrogen discharges to 2021 levels while Ecology develops water quality-based effluent limits via the Salish Sea Model and facility operators plan, design, finance, and construct advanced nutrient removal upgrades. Before the Puget Sound Nutrient General Permit, the only WWTP discharging into Puget Sound with any type of NPDES effluent limit for nitrogen was the Lacey, Olympia, Tumwater, and Thurston County (LOTT) Clean Water Alliance's Budd Inlet Treatment Plant.

[20] TMDL refers to both the planning process to identify actions needed to achieve target pollutant reductions in impaired waters and a quantitative assessment of the waterbody's assimilative capacity (the maximum load of pollutant(s) it can receive without causing or contributing to Water Quality Standard violations).

[21] In February 2025, the Pollution Control Hearings Board invalidated the Puget Sound Nutrient General Permit "insofar as it is mandatory for already-permitted dischargers" on the basis that general permits are issued "in lieu of" individual permits not "in addition to" (PCHB No. 21-082c Puget Soundkeeper Alliance, et. al. v. State of Washington, Department of Ecology).

In an April 2025 letter, Ecology gave permittees the option to voluntarily continue coverage under the general permit or have nitrogen reduction requirements addressed in their individual permits. In June 2025, Ecology released a draft reissuance of the PSNGP. This draft general permit would allow facilities to opt in and apply for permit coverage.

In January 2026, Ecology announced they would not be reissuing the Puget Sound Nutrient General Permit and would instead include monitoring, optimization, and nutrient control planning in individual permits.

Box 4. Nitrogen sources

Mohamedali et al. (2011) estimated that 68% of total nitrogen loading to Puget Sound enters via ocean exchange and 32% is from local sources within the greater Puget Sound watershed.

Of the local sources, 58% of loading is estimated to be from point sources such as municipal wastewater treatment plant effluent, 41% from nonpoint sources entering through surface water runoff, and 1% from atmospheric deposition.

The nonpoint sources are estimated to be 66% natural origin (e.g., alder trees that fix atmospheric nitrogen) and 34% anthropogenic.

In June 2025, Ecology released a public comment draft Nutrient Management Plan that provides load targets and proposed control strategies for marine point source discharges and watersheds. Implementation will occur through the addition or revision of nitrogen limits to NPDES permits and nonpoint pollution program actions (section 3.2.5).

The compliance timeline for nitrogen reductions is long; Ecology expects marine point source targets and watershed targets to be met by 2050. The schedule included in the draft Nutrient Management Plan shows WWTPs and other marine point sources having water quality-based effluent limits added to their permits by 2031, and all watershed clean-up plans complete by 2048.

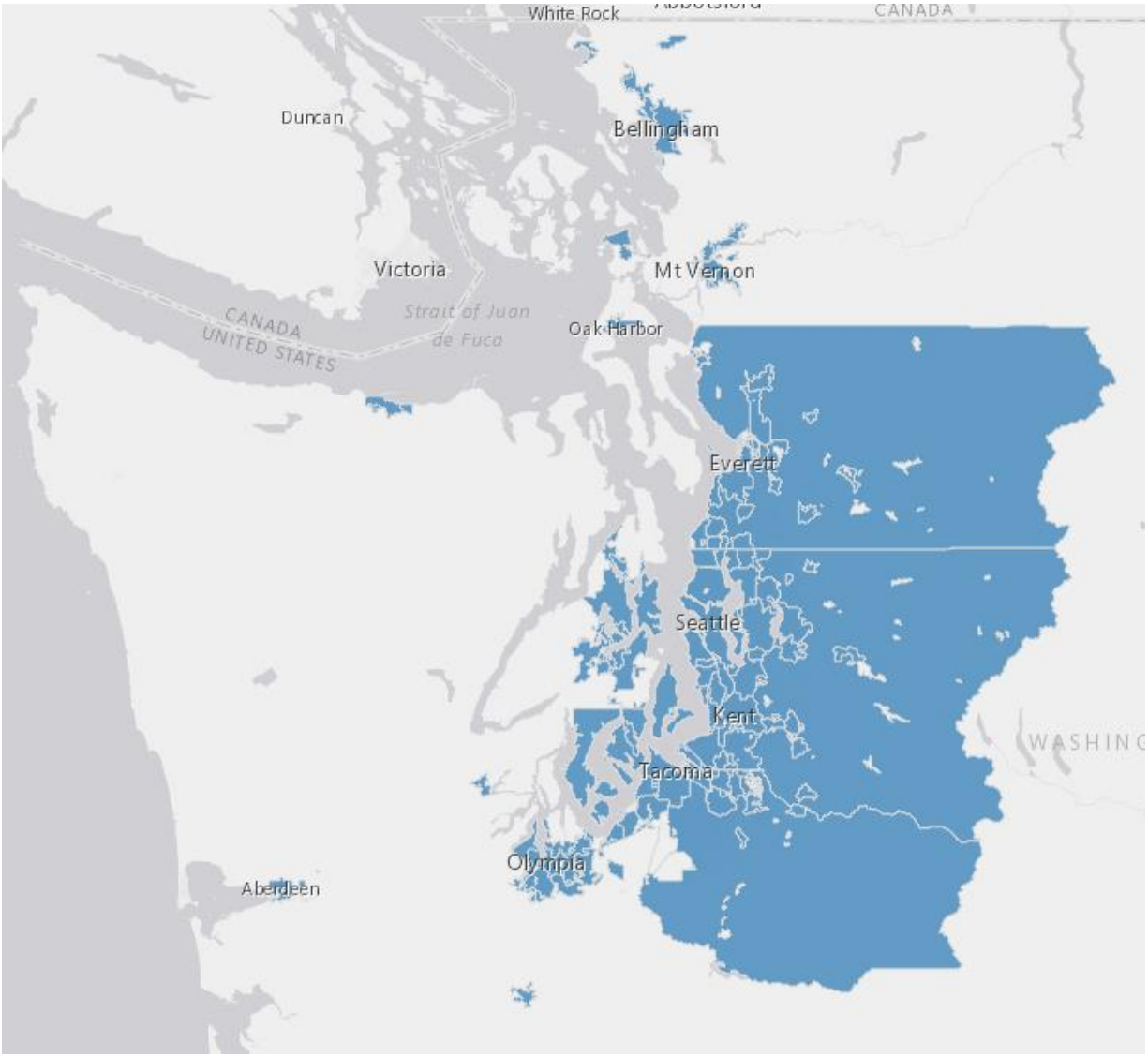
3.2.3 MUNICIPAL STORMWATER GENERAL PERMITS

Ecology regulates discharge of stormwater to and from municipal separate storm sewer systems (MS4) via NPDES Municipal General Stormwater Permits issued on five-year cycles. These permits require covered cities and counties to develop stormwater management programs and implement stormwater best management practices (BMPs)[22] to reduce pollutant concentrations, discharge volume, and flow rates. This includes incorporation of stormwater discharge controls into local development and construction permits. Ecology and the Washington Stormwater Center provide guidance, training, technical assistance, and financial support to help local government implement complex stormwater permit requirements.

Figure 1 shows the local governments covered by Ecology's Municipal General Stormwater Permits. Larger jurisdictions are subject to Phase I rules promulgated in 1990 (55 FR 47990). The regulated area was extended to smaller urban areas in 1999 under Phase II rules (64 FR 68722). Historically, the larger counties and municipalities have more permit requirements than the Phase II jurisdictions. As of Ecology's 2019 permit reissuance, the Phase I and Phase II jurisdictions share most of the same permit requirements.

[22] Stormwater BMPs are activities, prohibitions of practices, maintenance procedures, managerial practices, or structural devices that reduce volume of stormwater flows, prevent pollution from potential sources, and treat runoff to remove sediment, oils, and other pollutants.

Figure 1. Municipal Stormwater Permit jurisdiction areas for Phase I and Phase II permits



Source: Municipal Stormwater Permit jurisdiction area from the Washington Geospatial Open Data Portal, cropped to display the Puget Sound region.

Additional secondary permittees covered by the Phase I and II permits include ports, school districts, irrigation districts, and other special purpose public entities that own and operate MS4s. The Washington State Department of Transportation has had its own municipal stormwater permit since 2009. Other Ecology General Stormwater Permits cover construction operations that disturb one or more acres (section 3.2.4); sand and gravel operations; boat yards; and industrial facilities with discharges to surface water.

Recent Phase I and Phase II permits added new requirements for integration of Low Impact Development[23] provisions into local development regulations and new planning requirements that aim to expand the focus of stormwater management from the site scale to the watershed scale. This approach emphasizes identification of lands to protect/conserve from impervious surface conversions or native vegetation removal, as well as strategic retrofits to improve existing structural facilities or construct new facilities.

3.2.4 CONSTRUCTION STORMWATER GENERAL PERMIT

Disturbed soils exposed to precipitation can result in stormwater runoff with high levels of suspended sediment. Construction stormwater may also have high pH due to alkaline construction materials (e.g., concrete), elevated phosphorus and nitrogen from soils, and petroleum products.

Ecology issues a Construction Stormwater General Permit every five years; the current permit expires at the end of 2025 and a public comment period on a draft of the reissuance occurred in spring 2025. Permit coverage is required for those engaged in clearing, grading, and excavating activities that disturb one or more acres and discharge stormwater to surface waters of the state. Coverage is also required for disturbance of areas smaller than one acre if the site is part of a larger common plan of development or sale.

Site operators must apply for coverage under the General Permit by submitting an electronic Notice of Intent to Ecology, completing public notice and State Environmental Protection Act (SEPA) requirements, and preparing a Stormwater Pollution Prevention Plan. During construction, operators must implement sediment, erosion, and pollution control measures. Monitoring requirements vary by the size of the site. Additional requirements apply if the discharge will be to a waterbody on the state list of impaired waters.

3.2.5 NONPOINT POLLUTION CONTROL

Ecology's Nonpoint Pollution Program addresses pollution from agricultural, forestry, and residential sources through non-regulatory and regulatory methods. The program supports local water quality assessments and watershed-scale water quality planning efforts; provides financial assistance for the voluntary implementation of water quality improvement projects at the site scale; and takes enforcement actions when necessary. At the time of writing, Ecology was updating their Nonpoint Plan. A draft of the latest version of Washington's Water Quality Management Plan to Control Nonpoint Sources of Pollution was released for public comment in May 2025.

[23] Low Impact Development applies methods that minimize impervious surfaces and manage stormwater runoff at its source to reduce the volume and pollutant load of runoff leaving a site. It is characterized by smaller-scale distributed controls and conservation of natural site features sometimes called "green" infrastructure. Traditional stormwater management practices focused on reducing flooding risk by quickly conveying runoff to receiving waterbodies with centralized "gray" infrastructure.

Ecology works with other state agencies (e.g., Agriculture, Health, Natural Resources) and local partners (e.g., conservation districts, city and county governments, non-profit watershed groups) to support administration of, and provide a regulatory backstop for, programs addressing nonpoint source pollution. Key authorities include the Dairy Nutrient Management Act (Chapter 90.64 RCW), Forest Practices Rules (Title 222 WAC), and on-site sewage system regulations (Chapter 246-272A WAC), along with the GMA, SMA, Hydraulic Code, and stormwater permits described previously.

Forest Practice Rules are an important tool for addressing sediment loading. These rules apply to forest activities (e.g., timber harvest, pre-commercial thinning, road construction and maintenance, chemical application, reforestation) on non-federal public and private lands. Management of federal forest land is guided by the Northwest Forest Plan. The Forest Practice Rules require trees to be left within riparian areas to provide shade, protect streambank integrity, capture sediment from surface runoff, and provide woody debris that builds in-stream habitat.

3.3 PERMIT PROCESSES AND PATHWAYS

The Kelp Policy Advisory Group et al. (2023) recommended development of process guidance for the various types of permits, approvals, and leases required for different types of projects. That is beyond the scope of this report, but a few notable resources providing some of this information include:

- The Governor's Office for Regulatory Innovation and Assistance's Regulatory Handbook provides detailed summaries of each project approval described in section 3.1. These summaries provide information about how to apply, cost, related approvals, where to get assistance, review timelines, and the appeal process. Several descriptions include detailed schematics of the application, review, and approval process (e.g., Shoreline Substantial Development Permit, Aquatic Use Authorization, Hydraulic Project Approval).
- NOAA's West Coast Regional Office developed a Guide to Shellfish Aquaculture Permits in Washington that describes eight steps in the permitting process (most are relevant to other types of projects) and provides a useful permit flowchart graphic.
- Ecology et al. (2022) describes work by a Multi-Agency Review Team (MART) to evaluate and reduce permitting timelines for beneficial marine shoreline projects. The MART's baseline permit process map is provided in Appendix C of their final report. It lists needed applicant submittals, includes different approval pathways (e.g., individual versus programmatic, various shoreline permit types), and estimated permit timelines.
- Kitsap County developed a guide on Four Common Permit Pathways for Shore Friendly Projects that illustrates the potential complexity of local permitting processes.

The Joint Aquatic Resources Permit Application (JARPA) is a form that can be used to apply for more than one permit at a time. It was developed by several regulatory agencies to help streamline the permitting process.

4. REGULATORY STRATEGY

The Regulatory Strategy aims to evaluate and improve implementation of existing shoreline, nearshore, water quality, and land use regulations, programs, and policies to enhance protections for marine vegetation.

The evaluation step is intended to identify gaps in protections, barriers to program implementation, and opportunities for improvement. This approach can build off several Puget Sound region regulatory effectiveness investigations that have already been completed. HSIL and their predecessor, the Marine and Nearshore Lead Organization, funded a series of projects beginning in 2011; they have been synthesized in Kinney et al. (2015), Kinney et al. (2019), and Evrard et al. (2024). Other evaluations by the Northwest Indian Fisheries Commission (NWIFC 2015) and Windrope et al. (2016) also occurred during this timeframe. This body of work identified several opportunities to improve implementation of regulatory programs with additional compliance monitoring and enforcement; changes to project review and tracking procedures; and increased staff capacity and training.

Shoreline armoring was a focus of many of these projects, and results informed the regulatory strategy in the Shoreline Armoring Implementation Strategy (HSIL 2021a). The Shoreline Armoring Regulatory Strategy is quite complimentary to this strategy and continuing to operationalize it would help achieve priority outcomes in this strategy. Below is a summary of key regulatory effectiveness findings, progress made towards addressing identified deficiencies in recent years, and recommendations with an emphasis on elements more relevant to marine vegetation.

Other sources (e.g., Kelp Policy Advisory Group et al. 2023) have identified additional improvements also covered below. They include development of more mitigation options (particularly for kelp), improved survey guidance (particularly for kelp), and integration of climate considerations like coastal squeeze into regulatory programs.

The focus of this section is on shoreline and nearshore regulations because there is a higher likelihood that program changes could be made to directly affect protection outcomes. Although water quality and upland regulations play an important role in reducing some stressors, the more indirect relationship between individual permits and effects on marine vegetation will make it difficult to prescribe specific changes (e.g., to riparian buffer widths, numerical water quality standards, nitrogen effluent limits, or stormwater basin retrofit requirements). However, three other Implementation Strategies include approaches that identify other ways to improve implementation of these regulations: Land Development and Cover's Critical Area Strategy (HSIL 2021b), Marine Water Quality's Wastewater and Watershed Nutrient Load strategies (Stormwater SIL 2025), and Freshwater Quality/Benthic Index of Biotic Integrity's Local Stormwater Management Capacity Strategy (Stormwater SIL 2020).

4.1 PROBLEM IDENTIFICATION

Several different types of regulatory outcomes can be assessed: Was a change permitted? Were conditions included in a permit appropriate? Was a structure built to plans? Were permit conditions implemented? Are projects causing unmitigated impacts on ecological functions? These distinctions are important because different problems require different responses.

Previous compliance, implementation, and effectiveness monitoring efforts in the region have evaluated outcomes in each of these categories. An overview of specific deficiencies identified in these studies is provided in section 4.1, while recommendations to address those deficiencies and examples of progress made to date are summarized in section 4.2.

These earlier efforts involve monitoring conducted in a limited number of jurisdictions, sometimes by third parties. More jurisdictions should be encouraged to develop their own ongoing monitoring programs and address identified problems with support from regional partners.

Updated monitoring guidance was released in 2023 (Box 5). A 2024 HSIL request for proposals sought jurisdictions interested in using this guidance to develop a monitoring program. Only a few proposals were submitted, so recovery partners could consider investigating barriers jurisdictions face when initiating this type of work. Understanding specific roadblocks is necessary before designing programs that could increase uptake of funding and technical assistance opportunities.

Box 5. Regulatory monitoring and adaptive management guidance

In 2019, Commerce, Ecology, and WDFW received a grant from HSIL to provide technical assistance, training, and resources to help local governments evaluate their critical area and shoreline regulatory programs. The agency team held an 11-week webinar series in 2021 and revised the chapter of Commerce's Critical Areas Handbook that covers implementation monitoring in 2023.

These resources provide step-by-step instructions for implementation and effectiveness monitoring along with case studies from local programs, model ordinance language, and tools developed by local governments (e.g., templates, checklists).

Ecology's June 2025 preliminary draft of Chapter 173-26 WAC includes a new requirement to review and evaluate SMP implementation as part of the SMP periodic review process that occurs every 10-years (see draft section WAC 173-26-090(3)(c)(iii)). This requirement was informed by and modeled after the guidance referenced in Box 5.

4.1.1 WAS A CHANGE PERMITTED?

Several Puget Sound shoreline compliance monitoring efforts have found high rates of unpermitted residential shoreline armoring installations/modifications and other shoreline changes (King County 2014, Windrope et al. 2016, Faulkner et al. 2018, Cook et al. 2019, King County 2019, Friends of the San Juans 2022, Herrera Environmental Consultants, Inc. 2024).

Unpermitted changes represented more than 60% of observed changes in multiple studies, and in two studies non-compliance rates were as high as 96%. Several studies found that homeowners sometimes obtained either an HPA or shoreline approval, but not both. Others opted out of permit programs entirely.[24]
Where data on unpermitted residential overwater structures was also obtained, non-compliance rates tended to be much lower. Windrope et al. (2016) surmised that this could be because armor is less visible in aerial photographs or there is a perception that armor is necessary rather than an amenity.

Marine Vegetation Implementation Strategy workshop participants indicated that there are a large number of unpermitted mooring buoys. This is a priority issue in the San Juan Islands Marine Stewardship Area, and compliance monitoring is ongoing (Robertson et al. 2024). Ecology and WA DNR have both developed resources to provide guidance about review of mooring buoy installations.[25]

4.1.2 WERE CONDITIONS INCLUDED IN A PERMIT APPROPRIATE?

One element of permit implementation monitoring focuses on whether issued permits are consistent with regulations and policies. As noted in sections 3.3.1 and 3.1.2 (and detailed in Appendix A), SMA and Hydraulic Code rules provide specific standards and provisions that should be included in local SMP regulations and as permit conditions to mitigate impacts from common types of projects.

Audits of issued permits indicate that inclusion of appropriate impact mitigation conditions can be inconsistent (Barnhart et al. 2015, Dionne et al. 2015, Windrope et al. 2016, Island County 2017, Friends of the San Juans 2022).

Lack of formal review protocols with clear and unambiguous decision criteria describing when those conditions are appropriate has been identified as a potential cause for this lack of consistency (Barnhart et al. 2015, Windrope et al. 2016). Staff turnover may also play a role. When Island County (2017) audited a random sample of shoreline permits, they observed a reduction in permit quality concurrent with a period of high employee turnover. New hires with

[24] There is evidence that at least a subset of residential property owners know about permitting requirements but choose to not apply for permits due to widespread awareness of lax enforcement; lack of significant penalties; and frequent granting of after the fact permits (Johannessen 2013, Futurewise 2014a). There can be a perception that permit standards are arbitrary and inconsistently applied (Windrope et al. 2016). Interviews with county permitting staff indicate that landowners perceive permitting as so expensive and time consuming that many choose to forgo the process and face penalties (Johannessen 2013, Futurewise 2014b).

Since these reports are over a decade old and new compliance programs have emerged since 2019 (section 4.2.1), follow-up interviews with permitting staff about current perceptions around enforcement are warranted.

[25] See https://apps.ecology.wa.gov/publications/documents/2306002.pdf and https://dnr.wa.gov/aquatics/aquatic-leasing-licensing-and-transactions/mooring-buoys.

minimal experience and lack of training resulted in shoreline permits issued with mistakes, poorly written conditions, and approvals inconsistent with County regulations.

4.1.3 WAS A STRUCTURE BUILT TO PLANS?

Another element of permit implementation monitoring focuses on whether structures were built to the dimensions on plans and sited in the location included with application materials and/or as authorized in a permit.

Investigators have found evidence of projects built larger or in a different location than specified in permits. Dionne et al. (2015) found that shoreline amor as built was sometimes longer, taller, and closer to the water than specified in the permit. In some cases, project dimensions were not included in issued permits (Barnhart et al. 2015). Many shoreline stabilization permits reviewed by Dionne et al. (2015) lacked a stable reference point against which a structure on the beach profile could be measured; such a reference point is important to ensure armor is not placed below the ordinary high water mark (OHWM). Windrope et al. (2016) found that overwater structures exceeded county code for total surface area, though in some cases this could be attributable to a lack of a permit condition restricting structure size.

Friends of the San Juans (2022) noted that relatively few local permit files contained to-scale drawings and plans. Some plans had “wildly inaccurate” scales for cross sections on drawings or other application materials. Others displayed inaccurate locations for the OHWM, sometimes placing it seaward of mean higher high water (MHHW).

Barnhart et al. (2015) and Dionne et al. (2015) highlighted the importance of site inspections before, during, and after construction to avoid discrepancies between plans and the as built condition. Barnhart et al. (2015) found that bulkhead footing location inspections were often conducted concurrently with a final project inspection. Post-construction inspections do not provide an opportunity to fix problems (e.g., a bulkhead footing is further waterward than permitted) before construction is complete.

4.1.4 WERE PERMIT CONDITIONS IMPLEMENTED?

The final component of implementation monitoring involves assessing whether mitigation and/or other permit conditions were implemented as directed in a permit.

Results from Barnhart et al. (2015) highlighted a lack of Kitsap County staff follow-up on permits with long-term mitigation requirements (e.g., planting plans with annual monitoring requirements). The County’s SmartGov electronic permit processing and tracking software system did not have automated reminders and, because permit fees were generally spent once the permit was issued, there was no funding left for staff to follow-up.

Island County (2017) identified several instances where required mitigation was not implemented. When associated permit files were reviewed, they found that in most cases the

condition was not written in a specific or binding way. Island County also lacked a tracking system to follow-up on mitigation requirements.

4.1.5 ARE PROJECTS CAUSING UNMITIGATED IMPACTS ON ECOLOGICAL FUNCTIONS?

Ecological validation monitoring asks questions about whether permit programs are protecting shoreline and critical area functions at the city, county, watershed, and/or regional scale. This type of monitoring usually requires substantial data collection and analysis that is often beyond the resources of local governments (Commerce 2023b).

There are fewer examples of this type of monitoring in the region. Dionne et al. (2015) intended to determine if bulkhead permit conditions were effective at protecting habitat. Given the degree of difficulty they experienced evaluating implementation, the question of effectiveness remained unanswered. Windrope et al. (2016) aimed to assess SMP policy goals relative to resource outcomes but had to rely on indirect indicators of ecological function (e.g., presence of armoring and overwater structures) rather than direct measures (e.g., sediment processes, forage fish spawning distributions, and quantity of eelgrass) due to a lack of data for these metrics over the >30-year timescale of their analysis. Lambert and Chamberlin (2023) synthesized evidence about the effectiveness of beach nourishment as a mitigation measure as part of a Science Sprint to support regulatory decision-making.

Commerce (2023b) provides some examples of tools, like WDFW's High Resolution Change Detection data products, that can be used to monitor landscape-scale metrics in upland and shoreline habitats (e.g., quantifying changes in impervious surface inside/outside of critical areas). Folkerts (2021) is a good example application of that tool to assess the effectiveness of CAO riparian protections. New methods would need to be developed for marine vegetation because these data products and the imagery upon which they are based don't include subtidal areas. Controlling for stressors not associated with development activities would be crucial to isolate the factors that regulatory programs have authority over.

4.2 OPPORTUNITIES FOR IMPLEMENTATION IMPROVEMENT

Previous compliance, implementation, and effectiveness monitoring efforts and other studies have provided several recommendations about ways to address the issues summarized in section 4.1. They are described below, along with examples of progress made to date.

4.2.1 COMPLIANCE AND ENFORCEMENT

Since 2019, there have been increases in compliance monitoring and enforcement capacity:

- In 2019 and again in 2022, WDFW received appropriations for new dedicated Civil Compliance inspector positions and additional Fish & Wildlife Officer capacity. As of 2024, WDFW had four Compliance Inspectors focused on Puget Sound (Still et al. 2024).

- In 2019, Washington's Legislature increased the civil penalty for Hydraulic Code violations (up to $10,000 per violation from $100 per day) and provided WDFW with stop-work authority for Hydraulic Code violations.
- In 2022, Ecology received appropriations for a new shoreline compliance and enforcement program. As of 2024, that program had five positions state-wide; these positions are housed at Ecology regional offices so two focus on Puget Sound (Still et al. 2024).
- In 2023, the Legislature passed Senate Bill 5104 to establish and update on two-year cycles a publicly available survey and map of Puget Sound general shoreline conditions including the presence, location, and condition of nearshore development. Data products are available through Ecology's Shoreline Mapping Group. Ecology is not currently funded to conduct a change analysis, but outreach around this new monitoring program could aim to prevent future violations (Still et al. 2024).

These new resources reflect significant progress, but compliance staff capacity is insufficient relative to the extent of ongoing unpermitted activity (Still et al. 2024).

Since the study periods of the compliance monitoring projects cited in section 4.1.1 predated these new compliance programs, regional partners should consider supporting additional monitoring to observe potential effects of the new programs as well as recent changes at the federal level (e.g., Seattle District's Section 404 jurisdictional change in 2020 and new NOAA mitigation requirements for repair/replacement of existing structures in the 2022 Salish Sea Nearshore Programmatic discussed in section 3.1.3).

4.2.2 TRACKING SYSTEM IMPROVEMENTS

Poor recordkeeping can result in a lack of documentation about how permit decisions are made and the data on which they are based (NWIFC 2015). Improved management of permit data can support implementation monitoring and program adaptive management. Barnhart et al. (2015) identified several procedural deficiencies in permit recording: not including key project measurements into databases or on permits; inconsistent naming conventions (new, repair, replacement, enhancement, etc.); use different location identifiers (address versus parcel number); and lack of a mechanism to attach photos and relevant files and report submittals to the electronic database.

In response to these findings, WDFW added several new fields to their Aquatic Protection Permitting System tracking, including parcel number, GPS coordinates, length (existing/new), waterward extent (referencing a stable structure), and height. WDFW also conducted rulemaking to add WAC 220-660-370(6)(a) to require establishment of a permanent benchmark before work begins on a marine bank protection project to help WDFW ensure structures are built within the approved footprint and elevation.

Barnhart et al. (2015) found that there was little searchable data in Kitsap County's SmartGov electronic permit processing and tracking software. To address this issue, Kitsap County (2022)

used a 2020 grant from HSIL to create electronic checklists to document conditions of permit approval in a way that makes them easy to query. These electronic checklists allow staff to tag permits with critical area features in the project area and permits requiring stormwater best management practices (a shoreline parcel tag had already been added to the system). By using a simple questionnaire, the checklist can capture information typically embedded in PDF reports submitted with permit applications. This new system improves data accessibility and acquisition of monitoring data.

As noted in section 4.1.4, Kitsap County's SmartGov system did not have an automated process for reminding permittees and permit staff about reporting requirements. To fix this problem, Kitsap County (2022) created a new permit type in SmartGov that automates annual tracking of permits that require multi-year mitigation monitoring plans. The new monitoring permit sends reminders to permittees about annual reporting requirements and generates funding for staff time to follow-up on mitigation conditions. Now all applicants with permits that include a mitigation and monitoring plan are required to pay the monitoring permit fee, record a monitoring covenant with Kitsap County, and submit annual monitoring reports.

Customizing SmartGov software can be challenging (Kitsap County 2022), but the solutions developed by Kitsap County may be informative for other jurisdictions that use this and similar software systems.

Ecology's June 2025 preliminary draft of Chapter 173-27 WAC includes proposed updates to a permit data sheet that must be filed with Ecology (see draft section WAC 173-27-990 Appendix A) and adds a new exemption data sheet (see draft section WAC 173-27-995 Appendix B). The new permit data sheet adds information about the shoreline environment designation, use type, proposal characteristics (e.g., restoration, development of vacant lot, expansion of an existing use or development, re-development, subdivision), proposed modifications, special reports (e.g., geotechnical, sea level rise risk assessment, etc.), and mitigation. Ecology maintains a database of the permit data sheets along with archived older paper permit records. The revised form and new exemption form will provide significantly more information than is currently collected by Ecology.

4.2.3 REVIEW PROTOCOLS

Ecology et al. (2022) noted that permitting agencies review applications individually and staff have varying training and expertise, so they can reach different conclusions which result in different permit and mitigation conditions. Barnhart et al. (2015) recommended development of standardized permit review protocols to help address observed inconsistencies in the application of permit conditions. Windrope et al. (2016) similarly identified a need for unambiguous decision criteria that can be applied during permit review.

WDFW responded to the Barnhart et al. (2015) findings by developing an electronic project and site review form that provides Habitat Biologists (staff that review applications and issue HPAs) with a structured method for documenting existing habitat conditions, species at risk of impact

from proposed activities, existing habitat functions, project impacts, and mitigation analysis. The electronic form is prepopulated with common parameters to assist with project determinations. A detailed user guide was prepared to support application of this tool by Habitat Biologists. WDFW also developed standard operating procedures for marine bulkhead replacement and marine overwater structures that provide Habitat Biologists with standardized guidelines for processing applications, data resources, common mitigation requirements, and other resources.

Kitsap County responded to the Barnhart et al. (2015) findings by developing a staff review guide and checklist for shoreline armor projects. This guide provided information about when certain conditions should be applied to a permit.

Since 2019, Ecology has developed several resources, templates, and checklists as part of a focus on compliance and technical assistance. These include a Shoreline Permitting Manual (revised in 2019), No Net Loss and Mitigation Guidance (2023), a No Net Loss Analysis and Mitigation Plan Checklist, Variance Permit Review Guidance (2023), Conditional Use Permit Review Guidance (2024), an as-built mitigation report template, a mitigation monitoring report template, and a checklist on design considerations for avoiding and minimizing shoreline buffer impacts. Ecology's June 2025 preliminary draft of Chapter 173-27 WAC proposes new provisions to clarify shoreline permit review and approval criteria as well as minimum application submittal requirements (see draft sections WAC 173-27-035, WAC 173-27-050, and WAC 173-27-140).

Development of review protocols may be particularly relevant to improve protection outcomes for marine vegetation, although additional science may be needed prior to implementation. Development of marine vegetation guidance and protocols for local shoreline programs could provide a menu of specific options for different types of projects. However, as noted in section 3.1, additional research is needed to develop kelp impact avoidance and minimization measures. This is discussed further in section 4.2.4 below. Such guidance could potentially take the form of Ecology "Focus on" products (e.g., Focus on mooring buoys, Focus on On-site sewage systems, Focus on emergency exemptions).

4.2.4 SURVEY GUIDELINES

Another consideration is determining when marine vegetation specific review protocols should be triggered. The Kelp Policy Advisory Group et al. (2023) noted that local government processes for verifying kelp presence or absence are nonexistent or inconsistent among jurisdictions. Eelgrass survey techniques are well-established, but it is likely that local government requirements for eelgrass surveys are also inconsistent.

Unlike the Hydraulic Code, current SMA rules don't require eelgrass and kelp surveys. As noted in section 3.3.1, surveys for critical saltwater habitats are not required after a jurisdiction completes an inventory as part of their original comprehensive SMP update process (most occurred between 2006 and 2020). Since marine vegetation can show significant year-to-year

variability on smaller spatial scales and inventories are updated on ten-year cycles, these inventories may not reflect the most current site-specific conditions.

Ecology's June 2025 preliminary draft of Chapter 173-26 WAC addresses this deficiency with draft section WAC 173-26-226(1)(f)(iv)(C)(I), which states that all proposed over-water and nearshore developments in marine and estuarine waters require an inventory of the site and adjacent beach sections to assess the presence of critical saltwater habitats and functions. This section goes on to require that the methods and extent of the inventory be consistent with accepted research methodology and that local governments should consult with Ecology for technical assistance materials and guidance. Language about aquatic vegetation surveys was also added to the standards for three types of shoreline modifications (dredge material disposal, mooring buoys, outfalls and drainage dispersion systems) in the draft revisions to WAC 173-26-231(3).

The Kelp Policy Advisory Group et al. (2023) recommended developing a guidance document that identifies sources and tools to confirm kelp occurrence, as well as appropriate methods for preliminary and advanced surveys required by WDFW.

Improving coordination between WDFW Habitat Biologists and local permit staff is another potential mechanism to address discrepancies in local survey requirements. Local jurisdictions can benefit from coordination with Habitat Biologists to assist with identification of biological impacts and ways to avoid and minimize them (Futurewise 2014c). This type of collaboration does occur but is limited by staffing levels and workload demands (Barnhart et al. 2015).

4.2.5 MITIGATION GUIDANCE

The Puget Sound Eelgrass Recovery Strategy (WA DNR 2015), Puget Sound Kelp Conservation and Recovery Plan (Calloway et al. 2020), and Kelp Policy Advisory Group et al. (2023) all identified a need for mitigation guidance.

WA DNR (2015) recommended that interagency eelgrass mitigation guidance be developed to improve consistency between local, state, and federal regulatory programs. Likewise, Calloway et al. (2020) called for kelp-specific mitigation guidance. However, there is uncertainty about the project types or activities that have the potential to impact kelp (Kelp Policy Advisory Group et al. 2023, Whitty and Oster 2023). It is not known if impacts are temporary (e.g., from construction activities) and/or permanent (e.g., related to design choices or operational considerations). It is not known if measures protective for eelgrass also provide protection for kelp and/or if other avoidance and minimization mitigation measures are needed. This research need must be resolved before specific measures to avoid or minimize impacts can be developed and implemented. Regulatory programs have specific information needs, so it is important for scientists to coordinate with regulators to ensure that their research is actionable in a regulatory context. The Science Sprint process and principles described in Section 2.3 may be instructive.

These existing plans also highlight the need to determine how to achieve no net loss for eelgrass and kelp. As discussed in section 3.1.1, earlier regulatory effectiveness evaluations and the Shoreline Armoring Implementation Strategy (HSIL 2021a) found that local jurisdictions have had trouble implementing no net loss requirements. Ecology released new guidance on shoreline no net loss and mitigation in 2023, so it may be time for a new assessment to see if implementation has improved. With respect to kelp, no net loss cannot be evaluated until more is known about exactly how permitted projects impact kelp and viable mitigation options are identified. Remember that losses can occur from other stressors (e.g., temperature) and unpermitted projects, but these losses are not tracked in an SMA no net loss evaluation.

4.2.6 TRAINING

Existing kelp recovery plans recommended development of educational materials and training programs for regulators. This idea is supported by previous investigations that concluded additional training could help improve implementation of local SMPs (Johannessen 2013, Futurewise 2014b, Barnhart et al. 2015).

There are several considerations to keep in mind for this audience. Peer learning and exchange of interjurisdictional knowledge is important to local planners (Dial et al. 2021). Since training is not directly related to permit review, it can be difficult for jurisdictions that rely on a fee-based funding model to pay for staff time to attend classes. One project used grant funds to reimburse jurisdictions for cost of staff time to participate in training workshop (Johannessen 2013). Local planners tend to be generalists seeking "quick-and-dirty" rules and guidelines they can easily apply to a variety of situations; they need to know enough to determine when to bring in a specialist (Johannessen 2013).

In addition to the specific training topics identified in Kelp Policy Advisory Group et al. (2023), there is an opportunity on the horizon to have a broader influence via upcoming SMP updates.

The Shoreline and Coastal Planners Group could be a promising venue to provide planners with education about marine vegetation and coastal squeeze, discussions around specific changes to SMPs and review protocols to improve protections, and their needs for scientific support. The Shoreline and Coastal Planners Group is a collaborative project of Washington Sea Grant and Ecology that provides training and fosters communications between local governments, state agency staff, and others. Free meetings are held a few times a year, and may include field trips, case studies, and discussion of topics such as policy concerns, new technologies, emerging issues, best practices, and lessons learned. American Institute of Certified Planners continuing education credits are offered as an incentive for participation.

The Coastal Training Program at the Padilla Bay NERR is another possible venue. Several state agencies to provide training opportunities through this program, including Ecology's wetland program trainings, shoreline permit training, and WDFW eelgrass survey trainings.

5. PROTECTED AREAS STRATEGY

The Protected Areas Strategy provides a roadmap for protecting marine vegetation in existing and new reserves, refuges, and other protected areas. This strategy highlights the importance of engaging Tribes, community-based organizations, partners, and the public in the identification, development, and management of protected areas. Coordination with Tribes is emphasized to ensure protected areas respect Tribal treaty and sovereign rights.

5.1 AVAILABLE PROTECTION MEASURES

One approach recommended as part of the Protected Areas Strategy is to assess available protection measures along with information about historical and present marine vegetation distribution and trends; spatial data relating to stressors; and sites of high value from ecological, sociocultural, and/or economic perspectives to identify priority sites or regions and mechanisms for additional protections.

As shown in Table 5, Washington has a long history of designating marine protected areas (MPAs) under several different authorities. These MPAs were formed for diverse purposes, offer varying degrees of protection, and are managed by multiple entities at all levels of government (Van Cleve et al. 2009). Key types of MPAs are no-fishing areas declared by WDFW to improve fish populations, diving/no-fishing reserves developed by SCUBA enthusiasts and sanctioned by WDFW, Aquatic Reserves established by WA DNR, and Marine Stewardship Areas and voluntary no-take, no-anchor, and no-go zones formed by counties and MRCs.

In the 1990s and 2000s, there was much interest in MPAs and several new Puget Sound MPAs were proposed or established (Christie et al. 2018). Some of these efforts, like a proposed National Marine Sanctuary in the Northwest Straits region, were met with strong resistance from local governments, Tribes, commercial and recreational fisheries interests, and marine commerce industries. In 2003, the Northwest Indian Fisheries Commission (NWIFC) issued a policy statement that raised objections to declaration of no-take MPAs in Usual and Accustomed fishing areas because restricting harvest and access diminishes Treaty rights (NWIFC 2003).

The Washington State Legislature established a MPA Work Group in 2008 and tasked them to inventory MPAs, assess current MPA management, and provide recommendations on how to improve the use and effectiveness of MPAs. The resulting report, Van Cleve et al. (2009), noted that existing MPAs were developed without an overarching policy, design, or mechanism for managing agencies to coordinate efforts. The MPA Work Group Report concluded that the use of MPAs as a management tool would be greatly improved through development of a coordinated strategy to establish an ecologically meaningful network of MPAs.

Table 5. Inventory of marine protected areas and authorities

Type of MPA	Managing Entity	Authority	Conservation Focus and Level of Protection	Designations in Puget Sound
Aquatic Reserve	Washington Department of Natural Resources	RCW 79.10.210 WAC 332-30-151	- Protection of aquatic lands of special educational or scientific interest, or aquatic lands of special environmental importance threatened by degradation - Promote stewardship of aquatic habitats and species in collaboration with citizens, Tribes, resources managers, and other stakeholders - Leases for activities in conflict with reserve status will not be issued - Proposed leases for structures or activities immediately adjacent to reserve areas with the potential to degrade water quality, alter local currents, damage marine life, or increase vessel traffic will be reviewed to insure they do not conflict with the basis for reserve designation - Harvest and activity restrictions vary	- Cherry Point (2010) - Cypress Island (2007) - Fidalgo Bay (2008) - Maury Island (2004) - Nisqually Reach (2011) - Protection Island (2010) - Smith and Minor Islands (2010)
Natural Area Preserve	Washington Department of Natural Resources	RCW 79.70 WAC 332-60	- Protection of the best remaining examples of ecological communities, including rare plant and animal habitat - Human access restricted; all harvest prohibited	- Dabob Bay (1984) - Kennedy Creek (1990) - Skookum Inlet (1986)
Natural Resources Conservation Area	Washington Department of Natural Resources	RCW 79.71	- Protection of outstanding examples of native ecosystems; habitat for endangered, threatened, and sensitive species; scenic landscapes; and geologic, cultural, historical, and archaeological sites - Low impact public use allowed; recreational harvest restricted	- Woodard Bay (1987)
Conservation Area	Washington Department of Fish and Wildlife	RCW 77.12.047 RCW 77.04.012 RCW 77.04.013 RCW 77.04.020 RCW 77.04.055 WAC 220-303	- Protection of marine fish, shellfish, and habitats - Harvest of all marine resources prohibited - Tribal members of Treaty Tribes are not bound by WDFW regulations	- Brackett's Landing (1970) - City of Des Moines Park (1998) - Keystone Harbor (2002) - Octopus Hole (1994) - Orchard Rocks (1998) - Saltar's Point Beach (2000) - South 239th Street Park (1998) - Sund Rock (1994) - Waketickeh Creek (2000)

Marine Preserve	Washington Department of Fish and Wildlife	RCW 77.12.047
		RCW 77.04.012
		RCW 77.04.013
		RCW 77.04.020
		RCW 77.04.055
		
		WAC 220-302
			- Protection of marine fish, shellfish, and habitats
			- Harvest of some marine resources prohibited
			- Tribal members of Treaty Tribes are not bound by WDFW regulations
			- Additional prohibitions apply at University of Washington-owned tidelands at Argyle Lagoon and False Bay Preserves. Friday Harbor Labs' preserves management policy prohibits recreational boating and swimming at Argyle Lagoon as well as dogs, structure installation, and drones (with exceptions for scientific purposes) at Argyle Lagoon and False Bay
				- Admiralty Head (2002)
				- City of Seattle Parks (2005)
				  - Carkeek Park
				  - Discovery Park
				  - Emma Schmitz
				  - Golden Gardens
				  - Lincoln Park
				  - Richey Viewpoint
				- Colvos Passage (2000)
				- Saltwater State Park (2009)
				- San Juan Islands (1990)
				  - Argyle Lagoon
				  - False Bay
				  - Friday Harbor
				  - Shaw Island
				  - Yellow and Low Islands
				- Titlow Beach (1994)
				- Toliva Shoal (2006)
				- Z's Reef (2002)

State Park	Washington State Parks	RCW 79A.05.355 et seq.	- Provide recreational access and interpretation in a manner that preserves resources for current and future generations - Most prohibit removal of seaweed - All prohibit removal of unclassified marine invertebrates and fish (e.g., seastars and shore crabs) - Boating facilities may concentrate recreational use - Four designated underwater parks provide diverse recreational diving opportunities - Anchoring prohibited at 6 parks	- 75 Puget Sound coastal parks (1915-2008) - 57 have boat ramps - 36 offer moorage - 15 have docks
Marine Biological Preserve	University of Washington Friday Harbor Labs	RCW 288.20.320	- Conservation of biological materials useful for scientific purposes - Permission for collections must be granted by the director of the Friday Harbor Labs - Collection for human food and of the kelp Nerocystis are exempted in statute	- San Juan County/Cypress Island Marine Biological Preserve (1923)
Marine Stewardship Area	Counties and Marine Resource Committees	County ordinance	- Facilitate protection of marine habits and species, sustainable socioeconomic uses, and preservation of cultural traditions - Development of strategies to focus planning, coordinate programs and available resources, and launch local outreach efforts - Partners include Tribes, The Nature Conservancy, Washington State University Extension, and Washington Sea Grant	- San Juan Islands (2004) - Port Susan (2014)

County and Municipal MPA		County or city ordinance	- City of Tacoma sites are associated with Commencement Bay Superfund Site clean-up activities. The U.S. Coast Guard prohibits activities such as vessel grounding, anchoring, and trawling to maintain the integrity of sediment caps.	- Edmonds Underwater Park (1970)[26] - Lilly Point Marine Park (2008) - Middle Waterway (1997) - Olympic View Resource Area (1997) - Tongue Point Marine Life Sanctuary/Salt Creek Recreation Area (1989)
National Estuarine Research Reserve	National Oceanic and Atmospheric Administration and Washington Department of Ecology	16 U.S.C. 1461 15 CFR §921	- Research, monitoring, education, and professional training - Habitat protection to ensure long-term integrity of field research - Protection of one of the largest eelgrass beds in the contiguous U.S.	- Padilla Bay National Estuarine Research Reserve (1980)
National Wildlife Refuge	U.S. Fish and Wildlife Service	16 U.S.C. 742f(a)(4) 50 CFR §25 et seq.	- Provide undisturbed breeding and resting habitat for seabirds and marine mammals - Eelgrass protection is a priority for some refuges (e.g., Dungeness) - Most of the San Juan Islands Refuge's rocks, islands, and reefs (along with a 200-yard buffer zone) are closed to human activities - Protection Island Refuge is closed to all public access. Surrounding waters withing 200-yards are closed to all watercraft. - Smith and Minor Islands (part of San Juan Islands) and Protection Islands surrounded by DNR Aquatic Reserves	- Billy Frank Jr. Nisqually (1974) - Dungeness (1915) - Protection Island (1982) - San Juan Islands (1960)

Sources:
Van Cleve et al. (2009)
Environmental Law Institute (2014)
https://www.eopugetsound.org/articles/marine-protected-areas-puget-sound
https://wdfw.wa.gov/fishing/management/mpa
https://parks.wa.gov/find-parks
https://parks.wa.gov/boat-moorage

[26] Part of the larger Brackett's Landing Conservation Area co-managed with WDFW

PSP included near-term actions related to MPAs in the 2008 and 2012 Action Agendas. PSP also funded work by Osterberg (2012) to assess political, technical, and social challenges associated with and policy options for development of a Puget Sound MPA network. However, efforts to develop an expanded regional network of MPAs in Puget Sound have since stalled (Christie et al. 2018). There was no mention of MPAs, Marine Managed Areas, or Aquatic Reserves in the 2014 and subsequent Action Agendas.

Christie et al. (2018) concluded that if additional MPAs were to be developed in the future, then planning processes would need to become inclusive and attentive to a broad range of partners—especially Tribal co-managers—and designed to address compelling habitat recovery goals. The Protected Area Strategy incorporates these considerations.

Van Cleve et al. (2009) offered several recommendations to improve the effectiveness of MPAs as a management tool. Several are related to assessments and are therefore particularly relevant to this Protected Areas Strategy approach:

- Inventory and evaluate current monitoring activities to identify overlaps and gaps. Key monitoring activities should address a range of management targets, including socioeconomic targets.
- Conduct a system-wide needs assessment to determine marine conservation targets and a gap analysis of the current set of MPAs relative to identified needs. One gap analysis was conducted after the release of the MPA Work Group Report. Smith et al. (2012) assessed the level of protection provided by existing MPAs; they emphasized that more work was necessary to assess gaps by species and habitat type and provided recommendations for conducting such analyses.
- Evaluate the effectiveness of existing MPAs using specific recommendations from NWIFC (2003) to determine what would be required to create a network of MPAs. This evaluation process should include the following steps:
    - Review the goals and objectives of existing Puget Sound MPAs with a conservation focus.
    - Assess the degree to which conservation objectives may be supported by MPAs set up with different goals in mind. For example, state parks regulate certain activities to achieve recreational benefits, but there may be a conservation benefit realized as well.
    - Review the threats targeted by those MPAs (i.e., why were they established? what is the expected outcome?).
    - Evaluate whether the current management measures associated with MPAs are effective at addressing those threats and/or accomplishing those goals and objectives.
    - Assess whether additional or different management measures could address those threats or accomplish those same goals and/or strengthen the ability to achieve them.
    - Discuss whether other management tools should be used in addition to or in place of MPAs. NWIFC (2003) stressed that there should be a demonstrated need for creation of

an MPA, as they are only one of many possible tools, and that creation of new MPAs should not be a goal in and of itself.

  - Develop recommendations for changes to management measures for existing MPAs, if appropriate.
  - Discuss how to determine where additional MPAs are needed to build or strengthen different MPA networks.
- Identify and monitor reference sites to support evaluation of MPA effectiveness.

The accompanying State of Knowledge report (Appendix II.a) provides additional information about MPA design, management, and effectiveness monitoring.

5.2 AQUATIC LANDS LEASING WITHDRAWALS

Another approach recommended as part of the Protected Areas Strategy is to expand efforts to establish new protected areas at suitable sites. This could include WA DNR leasing program withdrawals and voluntary no anchor zones (covered in section 5.3). WA DNR has a few different options to withdraw state-owned aquatic lands from general leasing programs, including designation as an Aquatic Reserve (RCW 79.10.210) or through a Commissioner's withdrawal order (RCW 79.105.210(3)).

As shown in Table 5, there are currently seven marine Aquatic Reserves in Puget Sound. The presence of marine vegetation was a factor in the designation of all of these sites. Both eelgrass and kelp are noted as important habitats for the Cherry Point, Cypress Island, and Smith and Minor Island reserves. Eelgrass is a management focus for the Fidalgo Bay, Maury Island, and Nisqually Reach reserves, while kelp is a focus at Protection Island. Once an Aquatic Reserve is established, WA DNR restricts any new lease actions for conflicting activities in or near these reserves per WAC 332-30-151. Each reserve has a management plan, developed with an advisory committee of local stakeholders, that specifies management goals and objectives, as well as allowable and prohibited uses.

A 2,300-acre Kelp and Eelgrass Protection Zone was established near the mouth of the Snohomish River by a Commissioner's Withdrawal Order in 2022. This order was the result of a Snohomish Watershed Resilience Action Plan that provides a "tree to sea" strategy to promote salmon recovery and watershed health across the Snohomish Basin. In August 2025, a second Commissioner's Withdrawal Order was signed for a Squaxin Island kelp protection area managed jointly with the Squaxin Island Tribe.

WA DNR is currently engaged in a planning effort that is complimentary to the Protected Areas Strategy as it is likely to result in additional protected area designations for marine vegetation. RCW 79.135.440 became law in 2022 and directed WA DNR to create a Statewide Kelp and Eelgrass Health and Conservation Plan. This plan is intended to lead to the conservation and restoration of at least 10,000 acres of kelp and eelgrass habitat in Washington by 2040. This work is guided by an engagement plan (WA DNR 2022) that aims to remedy some of the past

planning deficiencies noted in section 5.1. Tribal consultation is a priority emphasized throughout the engagement plan. WA DNR (2024) documents the progress made to date. WA DNR is currently working with local partners in pilot areas (Eastern Strait of Juan de Fuca and South Puget Sound) to identify specific priority kelp and eelgrass beds for conservation and restoration actions.

5.3 VOLUNTARY NO-ANCHOR ZONES

Another approach recommended as part of the Protected Areas Strategy is to support place-based partnerships to develop and expand focused outreach and behavior change strategies that result in increased understanding of the role of protected areas and stewardship of marine vegetation habitat. Van Cleve et al. (2009) recommended consideration of alternatives to MPAs, such as voluntary protected areas. The Northwest Straits Commission and MRCs have been leaders in this type of work.
The MPA Work Group described in section 5.1 identified several strengths of the Marine Stewardship Area model implemented by the San Juan County MRC. Van Cleve et al. (2009) recognized their breadth of conservation and sociocultural goals, focus on monitoring and research, and emphasis on partnerships. A second Marine Stewardship Area in Port Susan was established by the Snohomish County MRC in 2014.

Voluntary No-Anchor Zones are another non-regulatory management strategy designed to protect eelgrass from physical damage caused by anchors, chains, and lines. These activities can leave deep scour marks that degrade eelgrass meadows. Voluntary No-Anchor Zones use clearly marked navigational buoys to delineate eelgrass boundaries and encourage vessel operators to anchor outside of sensitive areas. Outreach campaigns accompanying these zones emphasize the ecological importance of eelgrass and request voluntary compliance.

In 2004, Jefferson MRC installed marker buoys along the Port Townsend waterfront to delineate the outer boundaries of the eelgrass zone and ask vessel operators to “anchor out for safety and salmon.” Expanded in 2015, the zone now protects 52 acres of eelgrass. Additional buoys were installed in Mystery Bay in 2010 and Port Hadlock in 2014. These new zones also protect commercial shellfish harvest areas. Seasonal monitoring indicates that boater compliance is high (Jefferson MRC 2023). These projects were made possible through collaborative partnerships with EPA, PSP, Jefferson County, the Port Gamble S'Klallam Tribe, WA DNR, Washington Department of Health, Northwest Straits Commission, and the Port of Port Townsend.

San Juan MRC has installed voluntary anchor-out zones in Odlin County Park (Lopez Island), Westcott Bay (San Juan Island), Blind Bay (Shaw Island), and Eastsound (Orcas Island). The MRC conducts seasonal monitoring of vessel presence, behavior, and compliance.

More recently, the Northwest Straits Commission has been working to develop virtual no-anchor zones visible on navigation apps (e.g., Garmin’s Active Captain). This is a cross-border effort with the Georgia Strait Alliance. Based on a discussion during a Marine Vegetation

Implementation Strategy workshop, the partners are working on developing a virtual map viewable on the Anchor Out of Eelgrass website. Benefits of the virtual approach include the lack of physical infrastructure with associated maintenance needs and the ability to easily update zones as more information becomes available.

More information about recreational boating programs and the outreach efforts associated with them is provided in section 7.2.

6. RESTORATION STRATEGY

The Restoration Strategy focuses on use of effective restoration methods to accelerate recolonization and expansion of marine vegetation at sites shown to possess suitable ecological and sociocultural conditions. The restoration strategy includes both direct outplanting (transplants and seeding) as well as passive restoration methods that alter site conditions in such a way that natural recruitment or expansion could occur (e.g., derelict structure and debris removal, substrate alterations, bathymetric or hydrologic modifications).

Research is a critical element of this strategy because there is a need to enhance understanding and evaluate site-based stressors, site suitability, and effective restoration methods to inform project planning, prioritization, and design. Since this is primarily a science-based strategy, more extensive coverage can be found in two accompanying technical appendices: State of Knowledge (Appendix II.a) and Research and Monitoring Needs (Appendix I.e). This section focuses on issues related to reducing two programmatic barriers to restoration: access to restoration funding and project permitting.

6.1 RESTORATION FUNDING

Funding has been identified as a barrier to eelgrass and kelp restoration. As shown in Table 6, there are several programs that provide funding for restoration projects in Puget Sound.[27] However, eelgrass and kelp restoration may be less competitive for some of these programs due to the uncertainty associated with expected outcomes. This is particularly true for kelp restoration, which is still in proof-of-concept stage. Traditional funding sources have been reluctant to support kelp restoration (Whitty and Oster 2023).

A query of the Washington Recreation and Conservation Office's (RCO) PRISM Project Search substantiates these observations. No kelp restoration projects were funded by major state programs, and the number of eelgrass restoration projects funded with salmon recovery funding (see row 1 in Table 6) was low compared to the total number of projects funded. Funded projects all occurred in San Juan and Island Counties, where Lead Entity salmon

[27] This report was written in 2025, a time of rapid changes on the federal landscape and a budget deficit in Washington. There is uncertainty about future funding levels the potentially the continuation of programs. Foundation sources are not included in this table, with the exception of National Fish and Wildlife Foundation since they were established by Congress and administer conservation funding from federal agencies.

Table 6. Grant and other programs that support restoration projects

Program	Administrating agencies	Federal funds provided through	Description
Salmon Recovery Grants	Salmon Recovery Funding Board and RCO	Pacific Coastal Salmon Recovery Fund (NOAA)	Grants for projects to restore damaged habitat, fix fish migration barriers, and preserve pristine habitat. This program has funded several eelgrass restoration projects: PRISM Project # 04-1697, 08-1936, 13-1137, 18-1743, 19-1402, 22-1420. It has also funded a kelp assessment and eelgrass surveys: PRISM Project # 00-1676, 01-1222, 05-1055, 22-1423. Applicants submit proposal to their local Lead Entity, who reviews and assembles a ranked list of projects based on goals and actions in their local recovery plan. For an eelgrass or kelp project to rank, those local plans must prioritize marine vegetation protection and restoration. This accounts for the large number of projects that have been funded in San Juan County.
Puget Sound Acquisition and Restoration Fund	PSP, Salmon Recovery Funding Board, and RCO	n/a	State capital funding program for large habitat restoration and acquisition projects. Provides state match for several federal grant programs. These state funds partially supported a few of the projects mentioned in the preceding row.
Puget Sound National Estuary Program and Geographic Program	WDFW and WA DNR (HSIL), NWIFC (Tribal Implementation Lead)	Puget Sound National Recovery Office (EPA)	HSIL and the Marine and Nearshore Lead Organization have funded several marine vegetation research, restoration, and monitoring efforts. Earlier projects include research on the impact of outfalls on eelgrass (2012-2016), development of an eelgrass site suitability model (2012-2014), large-scale eelgrass transplants (2016-2017), and post-transplant monitoring (2017-2018). Several new projects are just getting underway from HSIL investment decisions in February 2023, September 2024, and December 2024. As discussed in section 7.1, Tribes are a leader in restoration activities but there are not records to tie EPA Tribal capacity grants to specific projects.
Estuary and Salmon Restoration Program	WDFW and RCO	Community-Based Restoration Program (NOAA), National Coastal Wetlands Conservation Grant Program (USFWS)	State capital funding program for process-based restoration.[28] Projects may support passive restoration of marine vegetation. For example, restoration of tidal wetlands has been associated with notable expansion of eelgrass beds (WA DNR 2015). In 2023, this program funded a study on the impacts of overwater structures to salmon and kelp (PRISM Project #22-1702).

[28] Process-based restoration focuses on key natural processes—such as hydrology, sedimentology, geomorphology—that create and sustain nearshore habitat structure and function (Goetz et al. 2004). This emphasis on underlying ecosystem processes impacted by human use and activity is expected to provide greater long-term project sustainability and less maintenance relative to species-specific enhancement efforts.

Aquatic Lands Habitat Restoration Program	WA DNR	n/a	Nearshore habitat restoration on state-owned aquatic lands is one focus of this program. Partner organizations can propose work on sites with restoration potential, though this is not a traditional grant program (most of the restoration work is implemented by WA DNR). Eelgrass planting projects have been supported in the past. Funded through aquatic lands lease revenue placed into the Aquatic Lands Enhancement Account.
Creosote Piling Removal Program	WA DNR	n/a	WA DNR removes of large collections of creosote-treated pilings and overwater structures from marine waters. Projects may support passive restoration of marine vegetation. Funded through aquatic lands lease revenue placed into the Aquatic Lands Enhancement Account, as well as PSP's Nearshore Conservation Credits Program (discussed in section 3.1.3)
Coastal Wetlands Conservation Grant Program	Ecology	National Coastal Wetlands Conservation Grant Program (USFWS)	State agencies are eligible to apply for this federal grant funded through excise taxes on sport fishing equipment, yachts and pleasure craft, and other items. Eligible projects include acquisition, restoration, enhancement, or management of coastal wetlands ecosystems. Ecology works with local and Tribal governments, land trusts, and other entities to develop proposals. In 2025, Ecology was awarded $6 million for seven projects. Program guidelines require that supported projects must ensure conservation activities endure and provide benefits for at least 20 years.
Coastal Protection Fund – Terry Husseman Account Grants	Ecology	n/a	Program supports locally sponsored projects that address water quality issues as well as fish and wildlife protection and enhancement in or adjacent to water of the state. Funding comes from penalties Ecology receives for water quality violations. Previous projects have involved removal of creosote pilings and bulkheads. In 2024, Ecology awarded $650,000 to fund 14 projects.
Multiple – Five Star and Urban Waters Restoration Grant Program, Killer Whale Conservation Program, National Coastal Resilience Fund, Seabirds	National Fish and Wildlife Foundation	Multiple – USFWS, EPA, NOAA as well as private philanthropy	Foundation created by Congress to manage several grant programs that support restoration. Many programs are national in scope, but the Puget Sound region may be more competitive for some of the more focused programs (e.g., Killer Whale Conservation Program, Seabirds Program). The Killer Whale Conservation Program was established in 2015 and funded an eelgrass restoration project in 2024.

recovery plans emphasize nearshore habitat. Many more projects funded with salmon recovery funding mentioned benefits to eelgrass and kelp associated with other restoration activities (e.g., shoreline armor removal, derelict piling removal, hydrologic restoration). The number of programs that potentially fund passive restoration is also much higher.

More certainty in restoration outcomes is likely necessary before exploration of potential private funding options is warranted (e.g., payment for ecosystem services markets[29] or mitigation banks).

6.2 PERMIT STREAMLINING

Challenges related to permitting restoration projects have also been identified as a barrier to eelgrass and kelp restoration. These challenges are not unique to eelgrass and kelp restoration projects. This issue was also raised in the Shoreline Armoring Implementation Strategy (HSIL 2021a), and much work has been done to identify potential solutions since that strategy was initially completed in 2018.

Ecology et al. (2022) describes work by a Multi-Agency Review Team (MART) to evaluate and reduce permitting timelines for beneficial marine shoreline projects. They found that permitting delays can occur on both the applicant side and the agency side. Permit processes are unclear to the applicant, which makes it hard to navigate and produce the right documents at the right time. Multiple submittals of similar information in different forms are often requested by agencies in order to finalize "complete" applications for each respective agency. This makes requirements confusing and redundant to the applicant. Many applicants do not take advantage of pre-application services, which could help to ensure the right documents are submitted at the right time.

On the agency side, sequential review requirements are a common cause of delays. For example, local jurisdiction State Environmental Policy Act (SEPA) review must be complete before issuance of a HPA by WDFW or a Section 401 Certification by Ecology. Another example is the requirement that USACE High Tide Line jurisdictional determinations must occur before other reviews (e.g., ESA Section 7) can begin. The MART found that the Section 404 permit process is most dependent on other agencies due to the need for completing reviews required under other federal laws prior to issuance of permits (as described in section 3.1.3). In addition, there are multiple ESA compliance pathways (programmatic/individual, informal/formal) and different forms and report submittals are required for different pathways.

The MART offered some tips for restoration practitioners. Early engagement with permitting agencies can reduce delays. Early engagement and pre-application meetings with WDFW Habitat Biologists hastened the HPA issuance timeline. Projects that qualified for ESA

[29] For example, RCO has developed a Carbon and Ecosystem Services Credits Policy, and WA DNR has an Ecosystem Services Work Group to explore emerging environmental markets.

programmatic consultations had relatively short NOAA Fisheries and USFWS processing times (about 35 days) compared to individual consultations that can take 6 months to 2 years.

The MART also noted that local permits took much longer than anticipated. Applicants noted frequent staff turnover of the local level, and that new local staff seemed unfamiliar with permitting and were confused by special requirements for Fish Habitat Enhancement Projects in RCW 77.55.181 (e.g., exemption from SEPA review and waiving of local permit fees). Restoration of native kelp and eelgrass beds qualify as Fish Habitat Enhancement Projects per RCW 77.55.181(1)(a)(iv).

MART findings informed a change to state law intended to that streamline permitting for qualifying fish recovery and habitat restoration projects. The Hydraulic Code was amended with the addition of RCW 77.55.480, creating the Habitat Recovery Pilot Program and a state multiagency permitting team. Initial funding for creation of the MART was through an HSIL grant. New dedicated staff positions at PSP (Salmon Permitting Projects Coordinator) and WDFW (Habitat Recovery Pilot Program Coordinator) were created as a result.

Unfortunately, this amendment expired on June 30, 2025 and funding for the Habitat Recovery Pilot Program lapsed. Three bills relating to restoration projects introduced during the 2025 Legislative session failed to pass: House Bill 1208/Senate Bill 5155 (extension of Habitat Recovery Program Pilot), Senate Bill 5305 (to fund staff at the Governor's Office of Regulatory Innovation and Assistance to track and find solutions to regulatory barriers affecting restoration project implementation), and Senate Bill 5475 (create a new budget account dedicated to restoration project maintenance). PSP will continue to explore opportunities for reappropriation for the Habitat Recovery Pilot Program (PSP 2025).

7. COMMUNITY CONNECTIONS STRATEGY

Connecting communities with marine vegetation is essential for fostering long-term stewardship, enhancing human wellbeing, and supporting Tribal treaties and sovereign rights across Puget Sound while understanding that interactions can, and will be, sensitive to cultural resources. The Community Connections Strategy is intended to expand and promote responsible stewardship, local food harvest, and outdoor recreation to better connect communities with marine vegetation and support human wellbeing that uphold Tribal treaty and sovereign.

The programs and activities described in this section contribute to building broader community engagement through research, monitoring, education, and restoration initiatives. By improving understanding of how Puget Sound residents connect with marine vegetation, addressing barriers to access, and supporting equitable opportunities for sustainable harvest and responsible recreation, these programs strengthen human-nature relationships and promote resilient, community-centered approaches to marine habitat protection.

Approaches identified to achieve these goals are:

- Improve understanding of how Puget Sound residents connect with marine vegetation, as well as the barriers and benefits for known and potential communities.
- Increase long-term funding and support for Tribes to lead marine vegetation stewardship efforts in ways that uphold cultural values and support community wellbeing.
- Support communities in developing resources and programming, such as community science and place-based education efforts, to promote stewardship of marine vegetation across user groups and the Puget Sound region.
- Identify and expand equitable opportunities to appropriately access marine vegetation habitats for sustainable, safe, and responsible harvest of local foods for personal and cultural use.
- Promote sustainable access, quality of experience, and responsible practices for outdoor recreation in marine vegetation habitats.

7.1 TRIBAL CAPACITY

Since time immemorial, Tribal nations have been the original stewards of marine ecosystems. Kelp forests and eelgrass meadows are more than habitats, they are cultural keystones that provided food, materials for bentwood hooks and kelp-fiber lines, substrates for herring and salmon spawning, and even featured in steam-baths, potlatch ceremonies, and creation myths (Naar 2020). Tribal governments lead efforts to monitor, restore, and protect these foundational species, using both traditional knowledge and modern science to safeguard the ecological integrity and resilience of kelp and eelgrass beds while honoring treaty and sovereign rights. The Suquamish, Port Gamble S'Klallam, Puyallup, Samish, and Jamestown S'Klallam Tribes are all signatories to the Puget Sound Kelp Conservation and Recovery Plan (Calloway et al. 2020).

The Marine Vegetation Implementation Strategy prioritizes support for Tribes through long-term, reliable, and flexible funding that supports Tribal efforts according to their priorities, knowledge systems, and governance structures. This includes support for Tribal research, monitoring, conservation, restoration, and culturally grounded access initiatives. Tribal-led research and research collaborations with Tribes should be integrated into broader regional research programs and priorities in ways that fully respect Tribal sovereignty.

Below is a summary of some Tribal marine vegetation education and management activities. This is not a comprehensive list of Tribal projects in Puget Sound.

- **Squaxin Island Tribe** – In July 2024, the Squaxin Island Tribe formalized a partnership with WA DNR under the Kelp and Eelgrass Health and Conservation Plan to prioritize their kelp bed for conservation and recovery. Leveraging the Tribe's dive teams and cultural knowledge, they have also collaborated with the Puget Sound Restoration Fund to cultivate bull kelp gametophytes from locally harvested kelp, then conducted experimental

outplants, seeding lines and painting rocks, in spring 2023 and 2024. Youth and Elders joined in ceremonial deployments and monitoring dives, while tribal technicians are now refining outplant timing, density, and grazing controls to guide larger-scale enhancements in coming years.

- **Swinomish Tribe** – The Swinomish Indian Tribal Community has led an inspiring revival of the native Olympia oyster, an activity that simultaneously protects and enhances Puget Sound's eelgrass meadows, by reseeding historical oyster beds and carefully managing aquaculture sites to avoid damage to underwater grasses (Sax 2022). In a parallel effort to safeguard critical intertidal habitat, Swinomish Fisheries, the WA DNR, and the Northwest Straits Commission partnered in July 2023 to remove the 65-foot derelict sailboat "Windjammer" from the Swinomish-co-managed Kukutali Preserve at Kiket Island. This project eliminated a long-standing source of pollution and physical obstruction in Similk Bay's eelgrass meadows and opening the way for future tribal-driven restoration of forage-fish spawning sites and underwater vegetation.
- **Suquamish Tribe** – The Suquamish Tribe has long prioritized eelgrass restoration as a cornerstone of nearshore habitat recovery. In 2014, the Tribe partnered with WDFW and other agencies to transplant eelgrass shoots off Bainbridge Island, successfully expanding eelgrass coverage and improving juvenile forage fish habitat. Building on this success, the Tribe secured Puget Sound Acquisition and Restoration funds to scale up restoration at Port Madison. This work earned a NOAA Excellence in Restoration Award in 2016, recognizing the project's role in advancing best practices for eelgrass recovery and bolstering Tribal stewardship of culturally significant species (PSP 2016). The Suquamish Tribe initiated the West Sound Eelgrass monitoring program with WA DNR with funding provided by HSIL (Christiaen et al 2021). In 2024, the Suquamish Tribe also co-hosted the Central Puget Sound Kelp Knowledge Exchange & Symposium alongside Puget Sound Restoration Fund.
- **Samish Tribe** – Recognizing a 36% decline in bull kelp over Samish territory from 2006-2016, Samish elders and technicians created hand-traced maps from elders' memories to map historical distribution and inform targeted transplant and restoration efforts (Mesa 2023). The Samish Tribe has taken a lead role in monitoring and restoring kelp forests, a foundational cultural and ecological resource, by training tribal divers as community scientists and deploying Reef Check protocols to gather comparable, long-term data on kelp health across the Salish Sea (Reyna 2023). The Samish Department of Natural Resources dive team works closely with the Shannon Point Marine Center's scientific program, which oversees dive safety, assists team members in obtaining certification, and mentors them as they establish an independent, sovereign diving program. This dive team will be taking on scoping for restoration sites around the San Juan Islands (Reyna 2023). In partnership with NOAA and the Northwest Straits Foundation, the Samish Tribe initiated a Bull Kelp Project to fill knowledge gaps and establish baseline data for bull kelp in the San Juans (Samish Indian Nation 2024). This data is entered into a relational database and used to create GIS maps that outline historical and current data of kelp (Samish Indian Nation Department of Natural Resources 2019).

- **Makah Tribe** – Since 2002, the Makah Tribe has systematically removed abandoned and derelict vessels and other marine debris from Neah Bay. In 2024, their efforts are growing through a $6 million Bipartisan Infrastructure Law grant administered via NOAA's National Marine Sanctuary Foundation. Leveraging that award with $3 million from Washington Senate Bill 5433 and $200,000 from PSP, the Tribe and partners are contracting a single mobilization to remove six sunken vessels and eleven abandoned at Makah Marina, three sunken vessels and creosote piles at the former I-90 bridge pontoon site, and two sunken vessels at the High Tide Seafood Facility (Reamer 2024). This coordinated, well-funded removal campaign delivers permanent intertidal and aquatic habitats benefits and embodies the Tribe's intergenerational stewardship of their treaty resources (Reamer 2024). Part of their Climate Adaptation strategies, Makah Tribe outlined carbon sequestration highlighting the need to restore eelgrass beds and kelp habitats (Wrubel et al. 2017). The Makah Tribe was also awarded HSIL funding in 2024 to support the science of restoration of healthy eelgrass beds project. This project will advance new research, conduct community outreach and traditional ecological knowledge gathering, and conduct test transplanting at selected sites in Neah Bay.
- **Nisqually Indian Tribe** – In 2021, the Nisqually Tribe in partnership with Long Live the Kings tested sinking cedar boughs to attract spawning herring. They also employed a rake survey method to locate eelgrass beds to assess plant and spawn densities in an area not surveyed by WDFW. This project applied traditional knowledge and recognized the critical role that eelgrass meadows play in supporting forage fish essential to Tribal fisheries and ecosystem health.
- **Port Gamble S'Klallam Tribe** – The Port Gamble S'Klallam Tribe is active in both eelgrass and kelp restoration efforts in Port Gamble Bay. The Tribe's ongoing eelgrass monitoring program assesses bed structure, water quality, and transplant survival to ensure the long-term success of habitat restoration projects. The Port Gamble S'Klallam Tribe began collaborating with the Puget Sound Restoration Fund in 2012 to reestablish kelp and oyster beds in Port Gamble Bay. Tribal Chair Jeromy Sullivan emphasized that revitalizing these habitats is essential not only for cultural practices, such as using kelp in traditional clam bakes, but also for ensuring a healthy ecosystem for future generations. In 2015, funded by Ecology and in partnership with the WA DNR and Pacific Northwest National Laboratory, the Port Gamble Bay project aimed to restore over two acres of eelgrass to help reverse declines. This project is also intended to spur natural eelgrass recovery in adjacent bay areas (Ecology et al. 2014). In 2018, the Port Gamble S'Klallam Tribe demolished and began replacing the dock at Point Julia with a dock that meets the Tribe's environmental and fishers' needs, contributing to the health and vitality of intertidal ecosystems (Lin 2023).
- **Jamestown S'Klallam Tribe** – The Jamestown S'Klallam Tribe has partnered with the Puget Sound Restoration Fund on a two-year research effort to survey existing seaweed stands and develop a seed bank of key kelp species—ensuring genetic stock is preserved for future restoration needs. The Tribe documents and monitors the health of eelgrass beds in Sequim Bay and surrounding nearshore areas. Surveys in 2012 revealed that eelgrass in Sequim Bay

is far more extensive than previously believed, a finding that bodes well for the bay's ESA-listed summer chum salmon populations.

- **Lower Elwha Klallam Tribe** – Leading successful eelgrass restoration initiatives in Port Angeles Harbor the Lower Elwha Klallam Tribe worked under a mitigation agreement with the U.S. Navy to rescue and replant approximately 3,600 eelgrass shoots displaced by construction activities. These shoots were carefully relocated to suitable subtidal habitats to offset losses from shading and prop wash. In May 2024, the Port Angeles Harbor Trustee Council, which includes NOAA, state, and Tribal partners, funded and launched the first restoration action under its Port Angeles Harbor Restoration Program. The Council awarded the Lower Elwha Klallam Tribe, in collaboration with Pacific Northwest National Laboratory, resources to cultivate eelgrass in outdoor tanks, transfer the plants to rebar-mounted lines, and have tribal divers bury them at appropriate depths. This approach, kicking off in summer 2024 with a second planting planned for 2026, aims to expand critical forage and shelter habitat for juvenile salmon, herring, and crabs in a system where eelgrass seldom produces viable seed naturally. They have also collaborated with Washington Sea Grant and the U.S. Geological Survey to monitor kelp and associated fauna near the mouth of the Elwha River, assessing ecological changes associated with dam removals.

7.2 RECREATIONAL BOATING

Recreational boating is a beloved activity in many coastal communities, offering opportunities for leisure, tourism, and connection to marine environments. As part of a Community Connections Strategy, design of boating infrastructure and initiatives (mooring buoys and voluntary no-anchor zones) play a crucial role in promoting responsible boating practices that protect sensitive nearshore habitats such as eelgrass beds. These tools not only help reduce environmental impacts but also foster a sense of shared stewardship among boaters, residents, and local organizations. By emphasizing education and collaboration, communities can build stronger relationships between communities and a sense of place while supporting sustainable recreation.

7.2.1. BOATER EDUCATION

Boater education programs are an important component of fostering environmental stewardship on the water. The Puget Sound region has several resources to equip recreational boaters with practical knowledge to reduce their impacts on marine ecosystems. The Waggoner Cruising Guide includes maps that show documented eelgrass beds in anchorage areas, helping boaters choose locations that avoid damaging sensitive habitats, along with educational resources like Anchoring Using a Fishfinder, which illustrates how eelgrass and kelp appear on sonar. Puget SoundKeeper's Sound Information: A Boater's Guide emphasizes how everyday boating activities, such as fueling, cleaning, and waste disposal, directly affect water quality and marine life, while providing clear best practices to prevent pollution and protect sensitive habitats like eelgrass and kelp. By promoting simple, practical steps, the guide empowers boaters to actively contribute to the long-term health of Puget Sound. Local stewardship groups also play an essential role: San Juan MRC volunteers perform shore-based vessel counts and

lead “Dock Talks” to educate boaters about eelgrass and ways to reduce impacts, while Friends of the San Juans’ Green Boating website provides a free downloadable eelgrass depth map, laminated versions, and an Anchor Out for Eelgrass video. The Puget Sound Harbor Safety Committee further contribute by offering best practices and guidance through the Puget Sound Harbor Safety Plan, giving mariners advice on unique conditions in the region’s interconnected waterways. By convening quarterly public meetings and fostering collaboration among industry, government, and community representatives, Puget Sound Harbor Safety Committee strengthens awareness of both safety and environmental stewardship.

On-the-water outreach further enhances this connection by directly engaging boaters where their actions matter most. The Soundwatch Boater Education Program, for example, works with recreational boaters in real time to reduce vessel impacts on whales, seabirds, and nearshore ecosystems, including kelp and eelgrass. This immediate and interactive approach not only improves compliance with safe and responsible practices but also builds a stronger sense of shared responsibility among boaters and coastal communities. Together, these education efforts cultivate awareness, collaboration, and stewardship that are vital to the ecological health of Puget Sound.

Workshop participants also discussed communication avenues such as interpretive kiosks and boating publications as potential platforms to enhance public understanding and voluntary compliance with these evolving protection zones.

7.2.2. MOORING BUOYS

Boating is an integral part of life in Puget Sound, offering opportunities for sightseeing, fishing, crabbing, diving, tourism and shrimping. These activities help connect residents and visitors to the marine environment. Promoting access to low-impact moorage options, such as properly sited and designed mooring buoys, can help preserve these cultural and recreational practices while minimizing harm to sensitive habitats like eelgrass and kelp beds. Compared to anchoring, properly placed mooring buoys present a biologically sound solution that reduces seabed disturbance and supports long-term stewardship. Ensuring that local boaters have access to low-impact mooring infrastructure is a practical step toward balancing community use with habitat protection (San Juan Journal 2024).

Participants in Marine Vegetation Implementation Strategy workshops noted that coordination around mooring buoys and No Anchor Zones is increasing across jurisdictions, with resource sharing and cross-checking underway. Recent imagery analysis by Wilmerding et al. (2022) revealed 1,863 mooring buoys in San Juan County. A Marine Vegetation Implementation Strategy Workshop participant suspected that many of these buoys were likely installed without permits due to long-standing permitting challenges, particularly where Tribal objections have paused new approvals. A comment provided in USACE’s July 26, 2022 Special Public Notice recommended that mooring buoys proposed within the Boldt case area require individual permits and Tribal consent, noting that the site-specific nature of treaty fisheries makes it difficult to apply a blanket rule for buoy placement. This is a concern for the NWIFC,

and some participants suggested that legislative changes, such as amending RCW 79.105.430, may be needed to enable stronger enforcement and address misconceptions around private buoy entitlements.

State agencies are also actively working on solutions. One participant shared that Washington State Parks and Recreation Commission (State Parks) is updating permits and replacing outdated mooring systems with helical anchors. State Parks is advancing a region-wide effort to maintain 258 recreational mooring buoys and five marker buoys across Puget Sound in alignment with recommendations from a 2021 buoy and anchor condition assessment. To reduce environmental impacts on sensitive nearshore ecosystems, including eelgrass and macroalgae habitats, State Parks will replace aging or failing systems with embedded anchor technology where feasible. A biennial diving inspection and maintenance program will support these systems by removing marine debris (e.g., derelict crab pots, fishing gear, abandoned anchors), cleaning buoy components, surveying aquatic vegetation, and replacing worn or damaged hardware. These efforts aim to enhance safe public moorage while minimizing anchor-related substrate disturbance. This work spans nine counties and multiple jurisdictions, including San Juan, Skagit, Thurston, King, Jefferson, Kitsap, Clallam, Mason, and Pierce counties, as well as the Cities of Des Moines and Port Townsend (State Parks 2024).

Information about mooring buoys regulations can be found in section 3.1.4, 4.4.1, and Table A.3 in the appendix.

7.3 KELP HARVEST

Kelp harvest in Puget Sound is regulated to ensure sustainable practices that support both ecological integrity and meaningful community connections. Marine vegetation plays a foundational role in healthy marine ecosystems. Kelp beds offer vital habitat for fish, birds, invertebrates like snails and crabs, and marine mammals by providing refuge, feeding grounds, and nursery areas. Because so many species rely on these habitats, responsible harvest practices are essential to keeping ecosystems resilient. Washington State has established guidelines for recreational seaweed harvesting, including seasonal limits and low-impact techniques, to minimize harm and promote regrowth (see section 7.3.1 below). These efforts reinforce stewardship values and help ensure that future generations can benefit from both the ecological and cultural richness of these habitats, but there have been few studies to date of recreational kelp harvest practices (e.g., WA DNR 2019).

Harvesting nearshore resources also reflects a broader connection to place, linking people to shared coastal landscapes, cultural identity, recreation, and community well-being. While eelgrass is rarely consumed directly, many locally harvested species like Dungeness crab, Pacific herring, and salmon depend on both eelgrass and kelp habitats. These ecosystems not only support important fisheries and recreation opportunities such as crabbing, kayaking, and wildlife watching, but also carry cultural significance. For example, for many Asian and Pacific Islander communities harvesting seaweed and kelp is a tradition rich with meaning, nourishment, and heritage (Sechena et al. 2003). Kelp also carries significant indigenous cultural

significance to Pacific Northwest Tribes in the Puget Sound (Naar 2020). See section 7.1 for more information on Pacific Northwest Tribes' kelp and eelgrass projects.

Yet important gaps remain in our understanding of how marine vegetation is used for food, what ecological impacts result from harvesting and recreation, and what barriers communities face in accessing these resources. Recreational crab pots, for instance, can unintentionally damage kelp and eelgrass beds, and future limitations on recreational kelp harvest may be needed to protect vulnerable areas. In response, community groups, including the Northwest Straits Foundation and MRCs, are leading educational efforts to raise awareness and promote responsible practices (e.g. Catch More Crab). Supporting this work through culturally relevant education, expanded stewardship opportunities, and equitable access will be essential for protecting marine vegetation while deepening community connections to Puget Sound. For more on community use and data gaps, see section 6.1.1 of the accompanying State of Knowledge Report ((Appendix II.a).

In 2025, Lummi Island hosted its first-ever Seaweed Festival, celebrating the many ways kelp can nourish people and foster a sense of place. The event featured hands-on demonstrations such as cooking with kelp, incorporating it into foot baths, and educational booths that fostered learning and curiosity. To support continued community engagement with seaweed as a local resource, Washington Sea Grant has published a series of blog posts called *Kelp in the Kitchen,* where visitors can explore culturally diverse dishes like Chinese Kelp Salad and Cochayuyo Chocolates.

While there are no programs specifically for harvesting local foods, there are existing programs focused on education, outreach, stewardship, and responsible behavior that could potentially support new programs about kelp harvest.

7.3.1. HARVEST REGULATIONS

RCW 79.135.410 allows and sets a daily limit for harvest of seaweed for personal use and prohibits commercial harvest of naturally growing seaweed from state-owned aquatic lands and all privately owned tidelands, except for approved herring spawn-on-kelp fisheries. Enforcement by the WDFW is authorized under RCW 79.135.420 and RCW 79.135.430.

RCW 77.32.010(1) and RCW 77.32.520 require harvesters to obtain a recreational shellfish/seaweed collection license from the WDFW.

WAC 352-32-350 closes most state parks to harvest of all species of marine algae and flowering seagrasses. Harvest is allowed at Fort Ebey, Fort Flagler and Fort Worden state parks from April 16 - May 15 each year. Several specific harvest techniques and requirements are included in WAC 352-32-350(3):

- Bull kelp must be cut a minimum of 24" above the bulb and short stemmed kelps must be cut a minimum of 12" above the anchor point.

- Cutting will be done using a knife or similar instrument, leaving the anchor point in place at all times. No tearing of the plants from the substrate or trimming is allowed, and rakes, tined forks, or similar tools are prohibited.
- The limit weight is ten pounds wet weight (fresh-picked before cleaning) per person per day. Drying or partial drying is prohibited prior to weighing. Each harvester must use a scale to determine when the harvest weight limit has been reached and use their own container. Multiple limits may not be combined in the same container.

WA DNR authorizes collection of kelp from state-owned aquatic lands for scientific and display uses. WA DNR is also responsible for authorizing use of state-owned aquatic lands for commercial kelp aquaculture.

Whitty and Oster (2023) note that current levels of outreach and monitoring around kelp harvest are not adequate, and that enforcement is not happening. Kelp harvesters are not currently required to report their harvest. A participant at a Marine Vegetation Implementation Strategy Workshop suggested adding a reporting element to seaweed licenses. This change would allow the WDFW to collect information about where harvest occurs and what species are harvested. Whitty and Oster (2023) suggest that increased license fees could be used to fund enforcement. Such changes should be considered with an environmental justice lens to assess potential impacts to access and consumption.

7.4 PROMOTING STEWARDSHIP

The Community Connections Strategy recognizes the interconnectedness of human wellbeing and the recovery of kelp and eelgrass by supporting stewardship and strengthening community connections to local food, recreation, and other human wellbeing benefits. Communities are leading a diversity of stewardship efforts, including place-based educational programming and community science, which provide accessible ways for residents and visitors, especially boaters and waterfront landowners, to engage in conservation. Eelgrass and kelp are more likely to thrive as people adopt positive environmental behaviors and avoid harmful ones. Community science programs such as kelp surveys, vessel monitoring, and shoreline observations empower individuals to contribute to ecological restoration while fostering connection, place-based knowledge, and local leadership. By empowering community organizations to elevate local systems and reflect diverse values, this strategy aims to promote equity in conservation, ensure cultural continuity, and build partnerships that support both ecological and community resilience.

7.4.1. STEWARDSHIP

Stewardship is a central pillar of the Community Connections Strategy, advancing both ecological recovery and human wellbeing by encouraging responsible care for kelp and eelgrass habitats. Through hands-on engagement, place-based education, and community science, stewardship programs empower communities to actively protect nearshore ecosystems. These efforts often focus on reducing harmful activities, supporting habitat restoration, and building

lasting connections between people and places. We acknowledge that stewardship and education are similar and there will be overlap in programs in Puget Sound but have decided to have dedicated stewardship and education sections to follow the logic in this Strategy's results chain. The following programs highlight a range of community-based stewardship initiatives that reflect community practices, promote a sense of place, and foster collaborative approaches to marine vegetation conservation.

- **Wildcat Cove Stewardship and Outreach** – In response to a reduction of eelgrass cover and intertidal tire track scars near the boat launch in Larrabee State Park, Whatcom MRC, the Northwest Straits Foundation, and State Parks engaged in focused outreach efforts in Wildcat Cove. Peak Sustainability Group (2023) observed and conducted interviews with boat launch users and conducted an online survey to identify factors and messaging that could alter boat launch behaviors. During summer 2024, two NWSF Salish Sea Conservation Assistant Interns were stationed at the boat launch to chat with kayakers, paddleboarders, and crabbers about the importance of eelgrass habitat and ways to reduce impacts (e.g., carrying equipment instead of dragging it, and driving only on established trails instead of through the eelgrass beds). By combining social marketing research with real-time conversations, the program fosters behavioral change and empowers community members to actively participate in stewardship.
- **Puget Soundkeeper Alliance** – Puget Soundkeeper Alliance hosts community volunteers in shoreline cleanups and pollution patrols that help protect nearshore habitats, including eelgrass and kelp beds. By reducing pollutants that degrade sensitive marine ecosystems, the program not only improves habitat quality but also fosters community stewardship and active participation in the protection of Puget Sound's marine vegetation.
- **Puget Sound Estuarium** – The Puget Sound Estuarium offers public education programs and volunteer opportunities that focus on estuarine and shoreline habitat health. Through marine vegetation outreach and hands-on engagement, the Estuarium builds community awareness of the ecological importance of eelgrass and kelp ecosystems and encourages stewardship and community involvement.
- **San Juan Islands Conservation District** – Youth Stewardship in the San Juan Islands is a stewardship and education program focused on working with youth ages 12-18 on a variety of projects (PRISM Project Snapshot #22-2234). Program discussed in more detail in section 7.4.3 below.
- **Seattle Aquarium** – The Seattle Aquarium's Urban Kelp Research Project is exploring why bull kelp thrives in some areas of Elliott Bay but not others, with the goal of guiding restoration efforts across Puget Sound. Also, in partnership with the Port of Seattle, researchers use remotely operated vehicles equipped with high-tech cameras, lights, and sensors to survey eight sites and collect video data analyzed with open-source artificial intelligence. Findings on kelp health, habitat, and population trends are shared publicly to encourage collaboration with Tribes, government, nonprofits, and local communities. Through this blend of cutting-edge technology, education, and advocacy, the Aquarium is

working to restore kelp forests, strengthen marine ecosystems, and inspire stewardship of Elliott Bay and the broader Salish Sea.

A recommendation for further progress is to advocate for equitable access to environmental stewardship. By advocating for equitable access, there would be a reduction in barriers to ensure that all residents, regardless of income, background, or proximity to the shoreline, have access to educational opportunities and stewardship programs.

7.4.2. COMMUNITY SCIENCE

Community science projects were consistently elevated by participants in the Marine Vegetation Implementation Strategy workshops. As shown in Table 1 in section 2, several MRCs and the Vashon Nature Center conduct kayak-based floating kelp surveys to monitor the size and health of kelp beds within their counties, contributing to a broader understanding of trends in canopy forming kelp across Puget Sound. Several MRCs have also led or partnered on eelgrass monitoring efforts. In addition, some MRCs are engaged in monitoring key species that depend on marine vegetation for habitat and food, such as forage fish and abalone, further emphasizing the ecological value of these habitats and the connection to local foods.

7.4.3. PLACE BASED EDUCATION

Place-based education is a vital tool for supporting the protection and recovery of kelp and eelgrass habitats in Puget Sound. By fostering direct connections between communities and the nearshore environment, place-based education helps build awareness of the ecological and cultural importance of kelp and eelgrass, inspiring stewardship, responsible recreation and informed decision-making that can lead to long-term habitat protection.

Current programs participating in place-based education for kelp and eelgrass:

- **IslandWood** – IslandWood's Environmental Education and Place-Based Learning programs foster meaningful connections between people and nearshore marine environments. Through immersive, hands-on learning experiences focused on shoreline and marine vegetation ecosystems, participants, particularly youth, develop a deeper understanding of the ecological roles of eelgrass and kelp. By inspiring stewardship and cultivating ecological literacy, IslandWood strengthens long-term community engagement with marine habitat conservation.
- **Port Townsend Marine Science Center** – The Port Townsend Marine Science Center's special exhibit, *Bull Kelp: Our Remarkable Underwater Forests*, is a traveling, immersive experience that brings the vibrant world of kelp forests to schools, libraries, and community venues across the region. Using 3D visuals, interpretive materials, and storytelling, the exhibit highlights the ecological importance of bull kelp and its role in supporting marine biodiversity, carbon cycling, and nearshore resilience. This work builds on Port Townsend Marine Science Center's long tradition of inspiring stewardship through exhibits at Fort Worden State Park and the Flagship Landing building, where visitors encounter live marine animals, rotating gallery displays, and an iconic orca skeleton. Each year, more than 20,000

people engage with Port Townsend Marine Science Center's hands-on educational programs, ranging from school visits and summer camps to low-tide walks, lectures, wildlife cruises, and sustainability workshops, while citizen science projects, supported by over 100 volunteers, further strengthen its role as both a community hub and a vital contributor to marine conservation.

- **Northwest Straits Commission** – The Northwest Straits Commission's The Under Story campaign uses short social media videos to raise public awareness and foster a sense of stewardship for kelp forests. This campaign highlights the ecological importance of kelp and promotes actions from the Puget Sound Kelp Conservation and Recovery Plan. By reaching broad audiences and encouraging informed community engagement, the initiative strengthens connections between people and the marine ecosystems they depend on. Many Marine Resources Committees facilitate year-round educational programming on marine vegetation. For instance, the Jefferson MRC hosted multiple public presentations on kelp, drawing more than 50 participants, at a local library event and offered an additional kelp-focused session at the Wooden Boat Festival. Likewise, the Snohomish MRC contracted specialists to develop outreach materials for its "Dive into Kelp" initiative, which featured a 2024 presentation on kelp in Edmonds and a 2025 presentation on kelp and eelgrass in Mukilteo.
- **Youth Stewardship in the San Juan Islands** – This San Juan Islands Conservation District program engages in hands-on stewardship projects across San Juan County since 2023. More than 60 youth, ages 12-18, participate in activities such as collecting eelgrass shoots for propagation, improving local food access, trail building, invasive weed removal, forest stand analysis, and restoring nearshore marine habitats. The program also includes education on forest health, agriculture, and endangered species recovery (PRISM Project Snapshot #22-2234).
- **Friends of the San Juans** – Friends of the San Juans is advancing marine education and stewardship through its immersive video series, including Eelgrass in Peril: Tracing the Mystery. This short film takes viewers beneath the surface of Puget Sound to highlight the critical role eelgrass plays in supporting marine ecosystems, while showcasing collaborative research with Friday Harbor Labs, WA DNR, and community science volunteers. Originally developed as a youth education tool, the series has become a broader resource for community-wide learning (Cope 2025).
- **Nisqually Reach Aquatic Reserve** – Formed in 2011 with WA DNR, the Nisqually Reach Aquatic Reserve is managed as an educational, environmental, and scientific reserve to protect its unique habitats, plants, and wildlife. Ongoing projects include benthic habitat studies with the U.S. Geological Survey, expanded fish use surveys in partnership with the Nisqually Tribe, and habitat preservation efforts such as the Jacobs Point Park acquisition on Anderson Island. Within the Nisqually Reach Aquatic Reserve there is a program of dedicated volunteers, Aquatic Reserve Citizen Stewardship Committee, that leads scientific monitoring, promotes environmental literacy and education, encourages local stewardship, and cooperation with government and nongovernmental agencies.

- **Harbor WildWatch** – Harbor WildWatch, founded in 2004, inspires stewardship of the Salish Sea by connecting communities with the region's marine ecosystems, including vital kelp and eelgrass habitats. Through interactive education programs, guided beach walks, and exhibits at the Marine Life Center, the organization teaches residents and visitors about the ecological importance of these underwater forests, which provide shelter, food, and nursery grounds for countless marine species. Harbor WildWatch also shares resources highlighting the role of kelp in supporting biodiversity and resilience in Puget Sound, helping foster a deeper public appreciation for the protection and restoration of kelp and eelgrass ecosystems.
- **Feiro Marine Life Center** – The Feiro Marine Life Center, opened in 1981 by local teacher and biologist Arthur D. Feiro, connects people to their local environment by offering hands-on marine and watershed learning experiences that highlight the deep interdependence between communities and nature. In partnership with the Olympic Coast National Marine Sanctuary, the Center is developing a Marine Discovery Center on the Port Angeles waterfront that will guide visitors from mountain streams to estuaries and the deep ocean, showcasing the diverse marine life of the Olympic Coast and the Strait of Juan de Fuca/Salish Sea. The new facility will also highlight how water shapes culture, history, and daily life, including its enduring significance for Indigenous communities. As part of the Port Angeles Waterfront Campus alongside the Field Arts & Events Hall and the Lower Elwha Klallam Tribe, the Center will advance marine education.
- **Marine Life Center** – The Marine Life Center at the Port of Bellingham promotes marine stewardship by providing community access and open dialogue about the Salish Sea and its ecosystems. Through its exhibits and educational programs, including a special Toddler Time program designed to engage the youngest learners, the center invites residents and visitors alike to discover the beauty and diversity of the Salish Sea, fostering awareness and responsibility for protecting this vital marine environment.
- **Padilla Bay National Estuarine Research Reserve** – The Padilla Bay Reserve is dedicated to studying and protecting one of the largest eelgrass meadows on North America's Pacific Coast, spanning more than 8,000 acres. This vital habitat serves as a nursery for juvenile salmon, crab, and herring, provides refuge for waterfowl and marine birds, and plays a key role in Puget Sound restoration and state shoreline planning. As part of the National Estuarine Research Reserve system, Padilla Bay supports long-term research, monitoring, education, and stewardship. Visitors may encounter school groups exploring mudflats, researchers conducting field studies, or engaging exhibits and aquariums at the Breazeale Interpretive Center. Trails and overlooks also offer opportunities to observe eagles, herons, ducks, and migratory birds, while programs such as the Coastal Training Program, education initiatives, and community stewardship efforts invite people of all ages to connect with and help protect this unique estuary.

7.5 COMMUNITY UNDERSTANDING

Participants in the Marine Vegetation Implementation Strategy workshops highlighted the lack of equitable training in water safety, including drowning prevention, life jacket use, and

responsible behavior on the water. They also emphasized limited access to education and job opportunities in fields like science, policy, and resource management, particularly for first-generation professionals. These gaps point to a need for improved education outputs within the Community Connections Strategy.

A lack of knowledge about what the community knows or has a desire to know about marine vegetation presents a significant barrier to effective engagement and conservation efforts as participants of the marine vegetation workshop pointed out. Without a clear understanding of existing awareness, values, and knowledge gaps, outreach strategies risk missing the mark or failing to resonate with local priorities. This disconnect can hinder stewardship, reduce the relevance of messaging, and limit participation in programs. Tailoring communication and education efforts requires not only ecological insight but also a deeper grasp of community perceptions and motivations.

A recommendation for progress in this area is to fund and participate in community knowledge assessments. This would encourage research that investigates what community members already know, value, or want to learn about marine vegetation. To further expand this aspect of the Marine Vegetation Implementation Strategy, we must first refer to the compilation of research and monitoring needs in Appendix I.e. to ensure our research needs align with known knowledge and understanding gaps.

8. SUMMARY OF RECOMMENDATIONS

Below is a summary of recommendations for operationalizing the Implementation Strategy.

1) Regional partners should consider investments to increase the capacity of community and non-governmental organizations in geographies outside of the Northwest Straits region. There is a large discrepancy in funding and organizational support for volunteer and community engagement efforts in counties that lack Marine Resources Committees (south/central Puget Sound and Hood Canal). This has implications not just for volunteer monitoring programs, but also for the level of community engagement in protected area planning/management and restoration. Organizations in the Northwest Straits region would also benefit from additional funding to expand their work.
2) Regional partners should champion long-term funding that enables Tribes to lead marine vegetation stewardship in line with their priorities, knowledge systems, and governance structures. This includes support for Tribal research, monitoring, conservation, restoration, and culturally grounded access initiatives, as well as the intentional inclusion of Traditional Ecological Knowledge to ensure that existing, place-based knowledge meaningfully informs regional research, management, and decision-making. Tribal-led research and research collaborations with Tribes should be integrated into broader regional research programs and priorities in ways that fully respect Tribal sovereignty.
3) Regional partners should support the development of a data repository. The Shoreline Monitoring Database developed by Washington Sea Grant and UW's School of Aquatic and Fishery Sciences is a potential model to emulate as it provides a mechanism for a diverse

array of partners (e.g., university researchers, state agencies, and community science organizations) to upload data. The standardized protocols and data repository provided by this platform have enabled integration and analysis of datasets from different sources. Private consultants generate a large amount of marine vegetation survey data, including surveys submitted with project permit applications and permit-required post-construction monitoring. When developing a data repository, regional partners should design the system in a way to capture this data source.

4) Regional partners should continue to invest in and provide technical support for regulatory effectiveness monitoring. Many of the region's foundational regulatory effectiveness studies are more than a decade old and focused on shoreline armor. The extent to which identified problems persist is not known. It is time to revisit this past work with a focus on reviewing issued permits that contain conditions for eelgrass and kelp.

   4.1 Provide financial and technical support for local jurisdiction SMP implementation and effectiveness monitoring using guidance developed by Commerce and Ecology in 2023.

   4.2 Continue to invest in compliance monitoring and provide political support (e.g., non-governmental organization advocacy, PSP's Boards Program) for dedicated compliance programs and enforcement efforts at state agencies.

   4.3 Interview local planning staff and waterfront property owners to see how perceptions around permitting processes and enforcement may have changed since Johannessen (2013), Futurewise (2014b), Windrope et al. (2016).

   4.4 Assess local implementation of SMP no net loss requirements to determine if permit outcomes have improved since Ecology released updated guidance in 2023.

5) Use the Shoreline and Coastal Planners Group to educate local planners about marine vegetation; develop standardized protocols and guidelines for project review; and provide a venue for scientists and regulators to develop actionable research proposals.

6) Regional partners should fund an assessment of existing and proposed MPAs, following recommendations from NWIFC (2003) and Van Cleve et al. (2009).

7) Ecosystem services research on the importance of marine vegetation to salmon could be used to leverage salmon recovery funding for eelgrass and kelp monitoring and restoration projects. San Juan and Island Lead Entities have local salmon recovery plans that emphasize nearshore habitat and they have been successful in obtaining Salmon Recovery Funding Board grants for marine vegetation projects. Active information sharing and engagement with other Lead Entities about incorporating marine vegetation into their recovery plans could potentially result in ranked project lists that are more favorable to eelgrass and kelp projects.

8) Marine vegetation restoration practitioners and other regional partners should collaborate with shoreline, floodplain, and salmon restoration practitioners in their advocacy for continuation of the Habitat Recovery Pilot Program's state multiagency permitting team, which was able to reduce permit review timelines for restoration projects.

9) Regional partners should advocate for equitable access to environmental stewardship. Equitable access would reduce barriers and ensure that all residents, regardless of income, background, or proximity to the shoreline, have access to educational opportunities and stewardship programs.

10) Regional partners should consider funding and participating in community knowledge assessments to encourage research that investigates what community members already know, value, or want to learn about marine vegetation.

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10. APPENDIX A.

This appendix provides a compilation of Washington Administrative Code (WAC) language relevant to review of projects that may affect marine vegetation. This information is included here based on a Kelp Policy Advisory Group et al. (2023) recommendation to describe different agency regulations and allowable project design features.

At the time of writing, Shoreline Management Act rulemaking was underway. Preliminary draft rules for four WAC chapters were released for comment in June 2025. Proposed changes relevant to marine vegetation are provided in footnotes to Tables A.1 and A.2.

Table A.1 Shoreline Master Program provisions for critical saltwater habitats

Type of development	General master program provisions
Principles WAC 173-26-221(2)(c)(iii)(B)	The management planning should address the following, where applicable: • Establishing adequate buffer zones around these areas to separate incompatible uses from the habitat areas; • Protecting existing and restoring degraded nearshore habitat;
Standards WAC 173-26-221(2)(c)(iii)(C)	Docks, piers, bulkheads, bridges, fill, floats, jetties, utility crossings, and other human-made structures shall not intrude into or over critical saltwater habitats except[30] when all of the conditions below are met: • The public's need for such an action or structure is clearly demonstrated and the proposal is consistent with protection of the public trust, as embodied in RCW 90.58.020; • Avoidance of impacts to critical saltwater habitats by an alternative alignment or location is not feasible or would result in unreasonable and disproportionate cost to accomplish the same general purpose; • The project including any required mitigation, will result in no net loss of ecological functions associated with critical saltwater habitat. Private, noncommercial docks for individual residential or community use may be authorized provided that: • Avoidance of impacts to critical saltwater habitats by an alternative alignment or location is not feasible; • The project including any required mitigation, will result in no net loss of ecological functions associated with critical saltwater habitat. Until an inventory of critical saltwater habitat has been done, shoreline master programs shall condition all over-water and near-shore developments in marine and estuarine waters with the requirement for an inventory of the site and adjacent beach sections to assess the presence of critical saltwater habitats and functions.[31] The methods and extent of the inventory shall be consistent with accepted research methodology. At a minimum, local governments should consult with department technical assistance materials for guidance.

[30] The preliminary draft of Chapter 173-26 WAC removes these exceptions. Proposed WAC 173-26-226(1)(f)(iv)(C)(II) states that docks, piers, bulkheads, seawalls, bridges, fill, floats, jetties, utility crossings, other human-made structures, and shoreline modifications shall not intrude into or over critical saltwater habitats.

[31] The preliminary draft of Chapter 173-26 WAC changes this requirement with WAC 173-26-226(1)(f)(iv)(C)(I), which states that all proposed over-water and nearshore developments in marine and estuarine waters require an inventory of the site and adjacent beach sections to assess the presence of critical saltwater habitats and functions.

Table A.2 Shoreline Master Program guidelines relating to marine vegetation

Type of development[32]	Shoreline modification and use guidelines
WAC 173-26-231(3)(b) Piers and docks	• Pier and dock construction shall be restricted to the minimum size necessary. • New pier or dock construction, excluding docks accessory to single-family residences, should be permitted only when the applicant has demonstrated that a specific need exists to support the intended water-dependent uses. • Where new piers or docks are allowed, master programs should contain provisions to require new residential development of two or more dwellings to provide joint use or community dock facilities, when feasible, rather than allow individual docks for each residence. • Piers and docks, including those accessory to single-family residences, shall be designed and constructed to avoid or, if that is not possible, to minimize and mitigate the impacts to ecological functions, critical areas resources such as eelgrass beds[33] and fish habitats and processes such as currents and littoral drift. See WAC 173-26-221 (2)(c)(iii) – Critical Saltwater Habitats. Master programs should require that structures be made of materials that have been approved by applicable state agencies.
WAC 173-26-231(3)(c) Fills	• Fills shall be located, designed, and constructed to protect shoreline ecological functions and ecosystem-wide processes, including channel migration. • Fills waterward of the ordinary high-water mark shall be allowed only when necessary to support: Water-dependent use, public access, cleanup and disposal of contaminated sediments as part of an inter-agency environmental clean-up plan, disposal of dredged material considered suitable under, and conducted in accordance with the dredged material management program of the department of natural resources, expansion or alteration of transportation facilities of statewide significance currently located on the shoreline and then only upon a demonstration that alternatives to fill are not feasible, mitigation action, environmental restoration, beach nourishment or enhancement project. Fills waterward of the ordinary high-water mark for any use except ecological restoration should require a conditional use permit.
WAC 173-26-231(3)(f) Dredging and dredge material disposal	• Dredging and dredge material disposal shall be done in a manner which avoids or minimizes significant ecological impacts and impacts which cannot be avoided should be mitigated in a manner that assures no net loss of shoreline ecological functions. • New development should be sited and designed to avoid or, if that is not possible, to minimize the need for new and maintenance dredging. Dredging for the purpose of establishing, expanding, or relocating or reconfiguring navigation channels and basins should be allowed where

[32] The preliminary draft of Chapter 173-26 WAC adds language about aquatic vegetation surveys to three types of modifications: dredge material disposal, mooring buoys, and outfalls and drainage dispersion systems.

[33] The preliminary draft of Chapter 173-26 WAC adds native kelp.

	necessary for assuring safe and efficient accommodation of existing navigational uses and then only when significant ecological impacts are minimized and when mitigation is provided. Maintenance dredging of established navigation channels and basins should be restricted to maintaining previously dredged and/or existing authorized location, depth, and width. • Dredging waterward of the ordinary high-water mark for the primary purpose of obtaining fill material shall not be allowed, except when the material is necessary for the restoration of ecological functions. When allowed, the site where the fill is to be placed must be located waterward of the ordinary high-water mark. The project must be either associated with a MTCA or CERCLA habitat restoration project or, if approved through a shoreline conditional use permit, any other significant habitat enhancement project. Master programs should include provisions for uses of suitable dredge material that benefit shoreline resources. Where applicable, master programs should provide for the implementation of adopted regional interagency dredge material management plans or watershed management planning. • Disposal of dredge material on shorelands or wetlands within a river's channel migration zone shall be discouraged. In the limited instances where it is allowed, such disposal shall require a conditional use permit. This provision is not intended to address discharge of dredge material into the flowing current of the river or in deep water within the channel where it does not substantially affect the geohydrologic character of the channel migration zone.
WAC 173-26-231(3)(g) Shoreline habitat and natural systems enhancement	• Master programs should include provisions fostering habitat and natural system enhancement projects. Such projects may include shoreline modification actions such as modification of vegetation, removal of nonnative or invasive plants, shoreline stabilization, dredging, and filling, provided that the primary purpose of such actions is clearly restoration of the natural character and ecological functions of the shoreline.
WAC 173-26-241(3)(b) Aquaculture	• Aquaculture should not be permitted in areas where it would result in a net loss of ecological functions, adversely impact eelgrass and macroalgae, or significantly conflict with navigation and other water-dependent uses. Aquacultural facilities should be designed and located so as not to spread disease to native aquatic life, establish new nonnative species which cause significant ecological impacts, or significantly impact the aesthetic qualities of the shoreline. Impacts to ecological functions shall be mitigated according to the mitigation sequence described in WAC 173-26-201 (2)(e).
WAC 173-26-241(3)(c) Boating facilities	• Shoreline master programs shall contain provisions to assure no net loss of ecological functions as a result of development of boating facilities while providing the boating public recreational opportunities on waters of the state.
WAC 173-26-241(3)(d) Commercial development	• Master programs shall assure that commercial development will not result in a net loss of shoreline ecological functions or have significant adverse impact to other shoreline uses, resources and values provided for in RCW 90.58.020 such as navigation, recreation and public access.

WAC 173-26-241(3)(f) Industry	• Regional and statewide needs for water-dependent and water-related industrial facilities should be carefully considered in establishing master program environment designations, use provisions, and space allocations for industrial uses and supporting facilities. Lands designated for industrial development should not include shoreline areas with severe environmental limitations, such as critical areas.
WAC 173-26-241(3)(i) Recreational development	• Provisions related to public recreational development shall assure that the facilities are located, designed and operated in a manner consistent with the purpose of the environment designation in which they are located and such that no net loss of shoreline ecological functions or ecosystem-wide processes results. • In accordance with RCW 90.58.100(4), master program provisions shall reflect that state-owned shorelines are particularly adapted to providing wilderness beaches, ecological study areas, and other recreational uses for the public and give appropriate special consideration to the same.
WAC 173-26-241(3)(j) Residential development	• Single-family residences are the most common form of shoreline development and are identified as a priority use when developed in a manner consistent with control of pollution and prevention of damage to the natural environment. • Master programs shall include policies and regulations that assure no net loss of shoreline ecological functions will result from residential development. Such provisions should include specific regulations for setbacks and buffer areas, density, shoreline armoring, vegetation conservation requirements, and, where applicable, on-site sewage system standards for all residential development and uses and applicable to divisions of land in shoreline jurisdiction. • New over-water residences, including floating homes, are not a preferred use and should be prohibited.
WAC 173-26-241(3)(k) Transportation and parking	• Master programs shall include policies and regulations to provide safe, reasonable, and adequate circulation systems to, and through or over shorelines where necessary and otherwise consistent with these guidelines. • Transportation and parking plans and projects shall be consistent with the master program public access policies, public access plan, and environmental protection provisions. • Plan, locate, and design proposed transportation and parking facilities where routes will have the least possible adverse effect on unique or fragile shoreline features, will not result in a net loss of shoreline ecological functions or adversely impact existing or planned water-dependent uses. Where other options are available and feasible, new roads or road expansions should not be built within shoreline jurisdiction. • Parking facilities in shorelines are not a preferred use and shall be allowed only as necessary to support an authorized use.
WAC 173-26-241(3)(l) Utilities	• All utility facilities are designed and located to assure no net loss of shoreline ecological functions, preserve the natural landscape, and minimize conflicts with present and planned land and shoreline uses while meeting the needs of future populations in areas planned to accommodate growth.

	• Utility production and processing facilities, such as power plants and sewage treatment plants, or parts of those facilities, that are non-water-oriented shall not be allowed in shoreline areas unless it can be demonstrated that no other feasible option is available. • Transmission facilities for the conveyance of services, such as power lines, cables, and pipelines, shall be located outside of the shoreline area where feasible and when necessarily located within the shoreline area shall assure no net loss of shoreline ecological functions. • Development of pipelines and cables on tidelands, particularly those running roughly parallel to the shoreline, and development of facilities that may require periodic maintenance which disrupt shoreline ecological functions should be discouraged except where no other feasible alternative exists. When permitted, provisions shall assure that the facilities do not result in a net loss of shoreline ecological functions or significant impacts to other shoreline resources and values.

Table A.3 Hydraulic Code technical provisions relating to marine vegetation

Type of development	Technical provisions
Recreational docks, piers, ramps, floats, watercraft lifts, and buoys WAC 220-660-380	**Residential and public recreational pier, ramp, float, watercraft lift, and buoy design generally:** • WAC 220-660-380(3)(b)(iii) requires a seagrass/macroalgae habitat survey for all new construction unless WDFW can determine the project will not impact seagrass and kelp beds, and in herring spawning beds other macroalgae used as spawning substrate. A survey is not required for replacement of an existing structure within its original footprint. • WAC 220-660-380(3)(b)(iii)(A) requires structures to be located at least 25 horizontal feet and 4 vertical feet from seagrass and kelp beds. • WAC 220-660-380(3)(d) requires installation of functional grating when replacing more than 33% or 250 square feet of decking or replacing decking substructure **Pier and ramp design:** • WAC 220-660-380(4)(a) requires piers be designed to maximize height over the bed to improve light transmission. The bottom of the pier must be at least 6 feet above the bed at the landward end. • WAC 220-660-380(4)(b) limits the width of residential piers to no more than 6 feet. • WAC 220-660-380(4)(c) et seq. set out requirements for grating material openness and installation configuration based on pier orientation (e.g., north/south, northeast/southwest). • WAC 220-660-380(4)(c) limits the width of residential ramps to four feet wide and requires the ramp surface to be grating. **Float design:** • WAC 220-660-380(5)(a) directs that the largest dimension of a float be oriented north/south whenever feasible. • WAC 220-660-380(5)(b) et seq. set out limits for float width and length; requirements for stoppers that keep floats at least one foot from the substrate; and grating requirements **Piling design:** • WAC 220-660-380(6)(a) et seq. requires the smallest diameter and number of pilings and sets a 12-inch diameter limit for steel pilings. • WAC 220-660-380(6)(c) prohibits the use of creosote or pentachlorophenol pilings. **Watercraft lift/grid design:** • WAC 220-660-380(7) requires designs to minimize shading; place the bottom at least one foot above the bed; and use the minimum number of pilings. **Buoy design:** • WAC 220-660-380(8) requires buoy systems to be located and designed to minimize damage in water bodies where they might damage submerged aquatic vegetation. • WAC 220-660-380(8)(a) requires embedded anchors to be used whenever feasible.

	• WAC 220-660-380(8)(a)(i) states a seagrass/macroalgae habitat survey is not required if an embedment-style mooring system is installed. WDFW will require the diver/installer to locate the anchor so that the system will not damage seagrass and kelp beds. • WAC 220-660-380(8)(a)(ii) states a seagrass/macroalgae habitat survey will be required if a surface-style mooring anchor is installed. The survey is needed to ensure the mooring buoy system is installed at a location where seagrass and kelp will not be damaged. • WAC 220-660-380(8)(b) requires buoys be placed deep enough to prevent vessel grounding. • WAC 220-660-380(8)(c) requires buoys be located to avoid vessel propeller damage to submerged aquatic vegetation. • WAC 220-660-380(8)(d) requires buoy designs with mid-water floats so that anchor lines do not drag. • WAC 220-660-380(8)(e) requires mooring to be adequately sized to prevent the anchor from shifting or dragging along the bed. **Replacement floating docks:** • WAC 220-660-380(9) allows replacement floating docks as long as the structure is not expanded; the design includes stoppers that keep floats at least one foot from the substrate; and meets specified grating requirements. **Residential and public recreational pier, ramp, float, floating dock, watercraft lift, and buoy construction:** • WAC 220-660-380(10)(a) requires the dock or pier centerline to be reestablished during construction using the same methodology used to establish the centerline during the seagrass/macroalgae habitat survey.
Boat ramps and launches WAC 220-660-390	• WAC 220-660-390(3)(a) requires the design and location of ramps and launches to avoid adverse impacts to saltwater habitats of special concern. • WAC 220-660-390(3)(a)(i) requires a seagrass/macroalgae habitat survey for all new ramp or launch construction unless WDFW can determine the project will not impact seagrass and kelp beds, and in herring spawning beds other macroalgae used as spawning substrate. • WAC 220-660-390(3)(g) requires that design and location of new ramps and launches prevents the need for dredging.
Marinas and terminals WAC 220-660-400	• WAC 220-660-400(3)(b) requires a seagrass/macroalgae habitat survey for new construction unless WDFW can determine the project will not impact seagrass and kelp beds, and in herring spawning beds other macroalgae used as spawning substrate. A survey is not required for replacement of an existing structure within its original footprint. • WAC 220-660-400(3)(c) provides a list of design elements to minimize impacts to fish life, including locate new marinas and terminals in naturally deep areas to minimize the need for dredging and protect the bed from propeller wash impacts. • WAC 220-660-400(3)(d) requires designs to allow light penetration to intertidal and shallow subtidal water areas, through minimizing the width of structures, constructing above-water structures as high as feasible, and using light-reflective on the undersides of over-water structures that are not grated. • WAC 220-660-400(4)(b) requires the mitigation sequence be followed so that the location and construction of new marinas protects surf smelt and Pacific

	sand lance spawning beds, seagrass and kelp beds and intertidal wetland vascular plants. • WAC 220-660-400(4)(c) specifies that WDFW may require grating to minimize impacts to juvenile salmonid migration corridors and native aquatic vegetation. Grating must have at least a 60% open area and be oriented lengthwise. • WAC 220-660-400(4)(e) requires new boathouses, houseboats, and covered moorages waterward of the phototropic zone. • WAC 220-660-400(4)(f) requires use of translucent materials or skylights for any replacement covered moorage or a boathouse roof landward of the phototrophic zone. • WAC 220-660-400(5) requires the mitigation sequence be followed so that the location and construction of new terminals protects saltwater habitats of special concern. • WAC 220-660-400(6) requires use of the smallest diameter and number of pilings to construct a safe structure and prohibits the use of creosote or pentachlorophenol pilings. • WAC 220-660-400(7)(b) requires pier and dock(s) centerline to be reestablished during construction using the same methodology used to establish the centerline during the seagrass/macroalgae habitat survey. • WAC 220-660-400(8) directs WDFW to issue renewable 5-year permits to a marina or marine terminal for regular maintenance activities (per RCW 77.55.151). Regular maintenance activities include maintenance and repair of overwater structures in their original footprint; maintenance and repair of pilings; dredging less than fifty cubic yards of material; maintenance or repair an existing outfall.
Dredging WAC 220-660-410	• WAC 220-660-410(3)(d) requires a seagrass/macroalgae habitat survey for all new dredging. A survey is not required for maintenance dredging or deepening the channel within the original dredged footprint. • WAC 220-660-410(3)(e) requires dredging to avoid adverse impacts to seagrass and kelp beds, intertidal wetland vascular plants, and geoduck tracts. • WAC 220-660-410(4)(c) requires that dragline or clamshell dredges be operated to minimize turbidity and prohibits stockpiling of dredged material waterward of OHWL. • WAC 220-660-410(4)(d) specifies that disposal of dredged material occur at an approved in-water disposal site[34] or in an upland location. WDFW may allow dredged material placement for beneficial uses such as beach nourishment or capping of contaminated sediments. • WAC 220-660-410(4)(e) requires hopper dredges, sows, and barges used to transport dredged materials to disposal or transfer sites to completely contain dredged material to minimize turbidity.
Outfall and tide gate structures WAC 220-660-430	• WAC 220-660-430(4)(b) requires the design and location of outfalls, outflow, and any associated energy dissipaters to follow the mitigation sequence to protect saltwater habitats of special concern.

[34] An interagency Dredged Material Management Program manages eight unconfined open-water dredged material disposal sites in Puget Sound.

	• WAC 220-660-430(4)(d) specifies that WDFW may require the outlet of submerged outfall piping not protrude above grade landward of -30 feet MLLW to minimize impacts to saltwater habitats of special concern. • WAC 220-660-430(4)(e) requires a seagrass/macroalgae habitat survey for all new outfalls unless WDFW can determine the project will not impact seagrass and kelp beds, and in herring spawning beds, other macroalgae used as spawning substrate. A survey is not required to replace an existing structure within its original footprint. • WAC 220-660-430(5)(e) requires the conveyance pipe centerline to be reestablished during construction using the same methodology used to establish the centerline during the seagrass/macroalgae habitat survey. • Note about WDFW authority over direct hydraulic impacts of discharges (e.g., scouring and erosion): RCW 77.55.161 limits WDFW authority to provision permits in locations covered by NPDES municipal stormwater general permits. In these locations, the HPA covers only the construction of any stormwater outfall or associated structures. WAC 220-660-430(3)(b) et seq. describe the process for adding provisions relating to hydraulic effects in locations not covered by municipal stormwater general permits.
Utility crossing WAC 220-660-440	• WAC 220-660-440(3) requires the design and location of utility crossings follow the mitigation sequence to protect saltwater habitats of special concern. • WAC 220-660-440(4)(b) requires a seagrass/macroalgae habitat survey for new construction unless WDFW can determine the project will not impact seagrass and kelp beds, and in herring spawning beds, other macroalgae used as spawning substrate. A survey is not required to replace an existing structure within its original footprint. • WAC 220-660-440(4)(c) requires the utility line centerline to be reestablished during construction using the same methodology used to establish the centerline during the seagrass/macroalgae habitat survey. • WAC 220-660-440(4)(e) prohibits stockpile of excavated materials containing silt, clay, or fine-grained soil or bed material waterward of the OHWL. • WAC 220-660-440(4)(f) requires backfill of all construction-related trenches, depressions, or holes that are waterward of the OHWL before they are filled by tidal waters.